Final
Environmental Assessment
For
Removal Action Activities
Associated with the Kwajalein Landfill

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U.S. ARMY GARRISON–KWAJALEIN ATOLL (USAG-KA)
ENVIRONMENTAL ASSESSMENT
FOR
REMOVAL ACTION ACTIVITIES ASSOCIATED WITH THE
KWAJALEIN LANDFILL

AGENCY: U.S. Department of the Army

ACTION: Finding of No Significant Impact

BACKGROUND: Pursuant to the provisions of the National Environmental Policy Act (NEPA) of 1969, as amended (42 United States Code § 4321 et seq.); the Council on Environmental Quality (CEQ) Regulations for Implementing the Procedural Provisions of NEPA (Title 40 Code of Federal Regulations [CFR] §§ 1500-1508); Department of Defense (DoD) Instruction 4715.9, *Environmental Planning and Analysis;* Army Regulation 200-1, *Environmental Protection and Enhancement*; U.S. Army Kwajalein Atoll/Reagan Test Site Environmental Standards (UES), 13th Edition and 32 CFR Part 187, *Environmental Effects of Major Department of Defense Actions,* the U.S. Army Space and Missile Defense Command/Army Forces Strategic Command (USASMDC/ARSTRAT) has conducted an assessment of the potential environmental consequences of environmental cleanup project alternatives at USAG-KA intended to reduce the release of contaminants to the environment at and near the Kwajalein Landfill. The assessment focused on those activities that have the potential to change the human and natural environments.

The U.S. Government has operated a facility at Kwajalein Island since 1944 after the liberation of the island during World War II (WWII). The primary activity on Kwajalein Island is related to activities supporting the USASMDC/ARSTRAT and Reagan Test Site mission. USAG-KA’s mission is to conduct base operations and installation management functions in support of a diverse community of military, Department of the Army Civilians, and contract personnel and their families, while also fulfilling the U.S. Ambassador's Military Liaison Office requirements with regard to the Government of the Republic of the Marshall Islands relations at this geographically strategic location.

All of the Removal Action Memorandum Alternatives analyzed in this EA are located (1) along the shoreline that extends from Glass Beach west to beyond the landfill area; and (2) at the existing landfill area.

Shoreline Area. The shoreline in the project area could be separated into two distinct areas or shoreline environments: (1) high-energy shoreline from Glass Beach to Mt. Olympus; and (2) lower-energy (reef flat) from the western side of Mt. Olympus to west of the landfill (to the Surf Shack). Extensive metallic debris and other forms of armoring (concrete and rock) have been placed along these areas to stabilize the shore from erosion. The shoreline debris has been deposited in these areas since sometime after WWII and before 1988. The metallic debris consists of rebar, ship and vehicle parts, pipe, scrap metal, wire, and other debris. The current shoreline configuration is not stable in either area and may continue to erode, which would potentially destabilize the existing, regraded landfill, or proposed new landfill and Mt. Olympus.

The high-energy shoreline is highly armored with metallic debris and to a lesser degree concrete and rock. The metallic debris is fused together in most areas, either through corrosion or with what appears to be an asphaltic matrix. The metal in this area consists of very large pieces or large conglomerations of smaller metallic debris. Some small cove-type beaches have formed between some of the larger accumulations of material. From visual field observations, it appears most of the metallic debris remains in place at the shoreline. The most significant source of copper in the marine water at the landfill area is the extensive amount of copper along the shoreline to the east of the landfill. This copper is directly in the marine waters and is directly exposed to wave action, leaching, and dissolution. The western prevailing wind and littoral drift are likely transporting the dissolved copper in marine water from the east to the landfill area. The groundwater seeps are also a likely source of copper.

The western, lower energy area has a higher ratio of concrete and rock armoring to metallic debris, and the metallic debris in this area generally consists of smaller, less fused materials. However, metallic and other debris is being released from the toe of the landfill in this area due to shoreline erosion.

Kwajalein Landfill Area. The current unlined landfill area is located on the southwest portion of the island on fill from the WWII-era, which is located in the solid waste management facility portion of the island that includes other waste related operations and occupies approximately 13 acres. The landfill area is composed of the solid waste management complex and includes one incinerator constructed in 2009 that contains three chambers, a scrap metal segregation and storage area, a composting area, a recycling center, stockpiled cover material, the landfill (6 acres), and several small trailer offices. The unlined landfill has been in operation since the early 1960s.

Prior to 1996, solid wastes generated on Kwajalein were burned in an open chamber located on the northeast corner of the landfill area or open burned within the landfill area. An incinerator was brought to the island in 1996. Ash and residue from the burning was then deposited in the landfill. Wastes disposed of in the landfill since 1996 are reported to include only incinerator ash and biosolids from the wastewater treatment plant (WWTP).

Prior to 1996, medical wastes from the Kwajalein hospital and dental clinic were also open burned prior to disposal in the landfill. Medical waste is now burned in the closed chamber incinerator. Other past practices at the landfill included burning oil and solvents in two unlined pits, and disposal of asbestos in a designated burial area. According to the U.S. Army Public Health Command (USAPHC) *Draft Kwajalein Landfill Baseline Risk Assessment* completed in 2014, the unlined pits have reportedly been remediated; however, the asbestos burial area has not been remediated. Hazardous and regulated wastes and metals are no longer disposed of in the landfill. Hazardous and regulated wastes are shipped back to the United States for disposal. Metal wastes are stored separately until they are shipped off island for recycling.

Therefore, the purpose of and need for the Proposed Action is to eliminate or decrease the potential for contaminants to migrate further into the environment (reef flat, ocean, soils, sediment, groundwater, and surface water).

DESCRIPTION OF THE PROPOSED ACTION: The Proposed Action is to implement a combination of the removal action components listed in Table 1. The components consist of (1) removing metal debris along the shoreline east of the landfill, (2) removing metal debris between Glass Beach and the Shark Pit, (3) removing metals debris from storage area adjacent to landfill, and (4) re-armoring of the shoreline east of the landfill between Glass Beach and the landfill within the original landfill shoreline footprint only. This component would remove and reduce the total volume of metal debris along the shoreline east of the landfill area continuing all the way to Glass Beach and also create a stable shoreline along this same shoreline with a regraded new stone-armored revetment capable of withstanding storm wave energy to avoid future erosion (replaces the metal debris currently serving this purpose) protecting the boundary and integrity of the landfill; (5) closing, grading, and placing impermeable cap on the existing landfill; (6) closing the existing landfill by excavating and shipping refuse to CONUS and placing impermeable cap on the existing landfill; (7) constructing a new landfill for future refuse; (8) transporting future reuse (incinerator ash) to CONUS landfill; (9) stabilizing the shoreline by constructing a new revetment along the landfill shoreline only; (10) 1-year quarterly and an additional 5-year monitoring plan of water quality to evaluate remedial effectiveness for executing components 1–4, (this is not post-closure monitoring per UES Section 3-6.5.7(c)(6)(vii)); and (11) 30-year water quality monitoring plan to evaluate remedial effectiveness of the execution of components 1–9.

The project area for the Proposed Action includes the shoreline from Glass Beach, the shoreline of the landfill area, the aggregate area, the incinerator operation area, the salvage yard area, and the debris removal area between Glass Beach and the Shark Pit.

Table 1. Summary of the components of the Proposed Action.

Removal Action Components	Removal Action Memorandum Alternatives			
	A	B	C	D
1) Remove metals from shoreline between Glass Beach and Mt. Olympus	X	X	X	X
2) Remove metal debris from storage area adjacent to landfill	X	X	X	X
3) Remove metal debris from mound area between Glass Beach and the Shark Pit	X	X	X	X
4) Re-armor shoreline east of Landfill (Glass Beach to Mt. Olympus)	X	X	X	X
5) Close existing landfill (grading and cap)		X		X
6) Close existing landfill (excavate and ship refuse to CONUS; topsoil cover)			X	
7) Construct new landfill for future refuse		X	X	
8) Transport future refuse (incinerator ash) to CONUS landfill				X
9) Stabilize shoreline (construct new revetment—original landfill shoreline footprint only)		X	X	X
10) 6-year water quality monitoring plan (ocean/reef flat area – this is not post-closure monitoring per UES Section 3-6.5.7(c)(6)(vii))	X			
11) 30-year water quality monitoring plan (ocean/reef flat area)		X	X	X

NO-ACTION ALTERNATIVE: Under the No-action Alternative, the shoreline would remain in its current condition. This option would not reduce the potential for landfill contaminants or metal debris entering the marine environment from erosion of the shoreline. The existing landfill would remain in its current condition. Incinerator ash would continue to be placed into the refuse piles. Metal debris would remain on-site. This option would not decrease contaminant loading to groundwater or marine water. Future refuse generated on the island would be incinerated and placed in the existing landfill. This option would not decrease contaminant loading to groundwater and marine water.

ENVIRONMENTAL EFFECTS: Fourteen broad areas of environmental consideration were considered to provide a context for understanding the potential effects of the Proposed Action and the Other Alternatives Considered, and to provide a basis for assessing the severity of potential environmental impacts. These areas include air quality, airspace, biological resources, cultural resources, geology and soils, hazardous materials and waste, health and safety, land use, noise, socioeconomics, transportation, utilities, visual aesthetics, and water resources. Of the 14 broad areas considered, 9 resources were carried forward for analysis (air quality, biological resources, geology and soil, hazardous material and waste, health and safety, noise, socioeconomics, utilities, and water). The remaining resource areas (airspace, cultural, land use, transportation, and visual and aesthetics) were not analyzed further.

1. AIR QUALITY

The beach sand would be compressed by the tidal water flow into the area, which would reduce the conversion of the sand to fugitive dust. Additionally, the prevailing year-round winds from the east have the potential to decrease the effects of the short-term fugitive dust to a negligible impact. Any generation of dust would be expected to cause minor short-term impacts on air quality and would vary in occurrence based on completion schedules for metals removal and re-armoring activities.

All direct and indirect emissions generated during the removal and re-armoring process would be localized to the project area and short-term. Additionally, the prevailing year-round winds from the east have the potential to decrease the effects of the short-term emissions to a negligible impact.

The transport of future refuse would be a long-term beneficial impact to human health and the environment on Kwajalein Island.

Climate Change: The use of fossil fuel from the potential operation of generators, construction equipment, and work vehicles is also of concern because it can lead to the direct and indirect emission of greenhouse gases. The new revetment has been designed to sustain higher wave height, which is anticipated to mitigate or prevent any adverse impacts of breaking waves along the shoreline of the Kwajalein Landfill. The final armoring design will review sea level rise values, wave heights, and the near-shore variance. However, contractors would employ best management practices (BMPs) throughout the removal and re-armoring project process to ensure operation of construction equipment, generators, and work vehicles emit minimal emissions.

2. BIOLOGICAL RESOURCES

No threatened or endangered terrestrial or marine species have been identified within the region of influence or are likely to be impacted by the Proposed Action. Some short-term impacts to biological resources are possible from the increase in human activity, higher noise levels from machinery, or even direct impacts from removal of debris with coral attached. These impacts may affect, but are not likely to adversely affect, any of the resources potentially present in the project area. No alteration of terrestrial habitats is included in the Proposed Action, and beneficial impacts are expected to water quality in marine habitats following completion of the debris removal.

3. GEOLOGY AND SOIL

No impacts to the geological framework of Kwajalein Island are anticipated by the execution of the components. A percentage of the concrete and stone removed during the re-armoring process would be reused for the new revetments. These soil disturbance activities are anticipated to have no adverse environmental impacts to the soil. The use of the equipment would be short-term, and any adverse impacts would be minor. The closure of the existing landfill, the construction of a new landfill and the option of transporting refuse to CONUS, would be a long-term beneficial impact to human health and the environment on Kwajalein Island.

4. HAZARDOUS MATERIAL AND WASTE

Refuse removal from the existing landfill would have a negligible adverse impact. Additionally, the removal of the existing refuse would be expected to cause greater reduction of pollutant reaching the groundwater, which in turn would be beneficial to the environment. If a spill occurs, these materials could be transported in the soil by stormwater runoff. Standard construction BMPs and procedures outlined in the revised SPI-1530 and the Kwajalein Environmental Emergency Plan (KEEP) would be implemented to reduce or minimize the risk of accidental release of hazardous materials to the environment and to prevent stormwater runoff. No explosive would be used in the execution of the components for Removal Action Memorandum Alternatives A–D.

5. HEALTH AND SAFETY

The execution of the components for Removal Action Memorandum Alternatives A-D is not expected to increase health and safety risk to USAG-KA contract personnel or members of the public. All applicable UES and USAG-KA construction safety precautions and regulations would be implemented to minimize the potential for accidents and injuries during the demolition and construction process. Hazardous materials would be monitored and/or removed to prevent potential exposure to workers and the public and to prevent releases. Unexploded ordnance (UXO) may be inadvertently discovered during the soil disturbance activities on the island. Should UXO be encountered as part of the removal activities, personnel should proceed in accordance with the USAKA Document of Environmental Protection (DEP) DEP-02-001.1, *Disposal of Munitions and Other Explosive Material,* which states that when explosives are discovered, the Garrison's Explosive Ordnance Disposal (EOD) Department is contacted for their safe removal and disposition. The EOD Department would make a determination as to whether explosives can be removed from the site of discovery.

6. NOISE

Construction is customarily performed in steps and/or phases, and the noise connected to the different steps and/or phases can fluctuate. With the use of BMPs and mitigation measures, the impact to construction workers would be short-term and minor to negligible based on the proximity of the worker to the noise sources. Based on their proximity to the project area (≥ 1,300 feet), members of the general public exposure to noise associated with the removal activities would be below the Occupational Safety and Health Administration (OSHA) regulated noise levels.

7. SOCIOECONOMICS

Any additional workers on-island during the execution of the components for Removal Action Memorandum Alternatives A–D would be short-term. Any increase in the population associated with execution of the components and Removal Action Memorandum Alternatives A–D would have a negligible impact on the socioeconomics of Kwajalein. The existing fishing prohibition for the waters adjacent to the Kwajalein Landfill will continue until such a time as the appropriate medical agency has determined whether a consumption advisory should be developed and implemented. The completion of any and/or all of the Removal Action Memorandum Alternatives is anticipated to have long-term benefit in the reduction of the release of contaminants to the environment at and near the Kwajalein Landfill.

8. UTILITIES

The new active landfill would be constructed and created with a leachate collection system, which would add a leachate pond that would be lined with an impermeable liner and approximately 0.2 acre in size. The amount of leachate from the landfill to the pond would be reduced/minimized by the use of a portable cover to prevent precipitation from entering the landfill open area. Also, the amount of leachate can be minimized (and almost completely eliminated) by using a portable building that would be installed over the open area of the landfill cell and sheds rain off the waste. The remainder can be bermed and not active, and the clean stormwater can be infiltrated using ditches. The water from the leachate pond would be pre-treated (if required) before it is released/transported to the Wastewater Treatment Plant (WWTP). USAG-KA would determine if the WWTP would need to be upgraded as part of the final design process for the new landfill. As part of the final design for the new landfill, the engineering team would identify the best method to deal with leachate.

9. WATER

In accordance with DEP-10-002.0 (Dredging and Filling) baseline turbidity monitoring would be conducted approximately 164 feet from the dredging site prior to dredging activities. During dredging activities, turbidity monitoring would be conducted daily approximately 164 feet from the site of activity. In the event turbidity levels exceed 10 nephelometric turbidity units (NTUs) from the baseline measurement, work would cease until the turbidity level returns below the 10

NTUs above the baseline turbidity values. Any impacts from turbidity are anticipated to be short-term and minor.

Any spillage from the use of fuel in construction would follow established hazardous materials and waste procedures. Any impacts from a spill are anticipated to be short-term and minor.

The closure of the existing landfill and the construction of a new landfill would be expected to further reduce the pollutants (including PCBs and pesticides) reaching the groundwater, which in turn would be beneficial to the environment. Additionally, the removal of the existing refuse would be expected to further reduce the pollutants (including PCBs and pesticides) reaching the groundwater, which in turn would be beneficial to the environment.

MONITORING AND MITIGATION

AIR QUALITY

Fugitive Dust. The BMPs listed in Table 2 would be used during removal activities for the reduction of fugitive dust during the execution of the components for the Alternatives (A–D).

Table 2. Best management practices or reasonably available control measures to mitigate air pollution from fugitive dust.

Source Category	Control Measure
Removal Activity	• Use wind breaks/screens • Apply dust suppressants
Disturbed Surfaced Area (general)	• Use fences, barriers, wind breaks/screens • Plant vegetation • Apply dust suppressants • Cover with gravel • Compact the surface
Earth-Moving	• Haul truck materials covered or watered • Haul truck wheel washers • Street sweeping
Storage Pile (open)	• Use wind breaks/screens • Use enclosures around storage piles • Apply dust suppressants
Application of Dust Suppressants: Where appropriate, dust suppressants or liquid surfactants would be applied to areas where dust could be disturbed by construction or traffic.	
Sprinkling/Irrigation: The practice of sprinkling the ground surface with water until it is moist can be used to control dust on haul roads and other traffic routes. This practice can be applied to almost any site. When suppression methods involving water are used, care would be exercised to minimize over-watering that could cause the transport of mud onto adjoining roadways, which ultimately could increase the dust problem. Mechanical removal of mud from tires would be implemented if necessary.	

Emissions. To reduce emissions from fossil fuel, measures such as the use of clean diesel and implementation of anti-idling measures for construction equipment would be implemented when practicable.

BIOLOGICAL RESOURCES

The following are specific BMPs or mitigation measures to be used during implementation of the Proposed Action.

I. BEST MANAGEMENT PRACTICES

A. Prior to Metal Debris Removal:

1. Absent further ecological evaluations, limit metal debris removal activities to proposed shorelines and reef flat areas.

2. Instruct workers in avoidance of corals and other notable marine invertebrates by training workers to take care where they walk and how they remove and transport debris on the reef. Avoidance of corals may be most difficult along the shallow reef bench fronting the metal cliffs, as wave activity close to shore is likely to increase the focus on risks to human safety. Impacts to corals in this region are expected to be very limited, because removal activities will be restricted to reef flat and bench-top areas.

3. Instruct workers to carefully translocate any corals that occur on debris to the immediate vicinity of their original location.

4. Establish a mandatory shutdown safety zone corresponding to where protected mollusks, fish, sea turtles, and marine mammals could be disturbed within 50 yards of the shoreline. A mandatory shutdown will be invoked when protected mollusks, fish, sea turtles, or marine mammals are observed within this 50-yard area.

5. Instruct workers about compliance with BMPs for protected mollusks, fish, sea turtles, or marine mammals and provide illustrated guidance with photographs to assist in identification and avoidance of those species.

6. Instruct workers to avoid *Trochus* that may wander into the work area. Since minimal in-water work is proposed with this project, a need to relocate *Trochus* is not anticipated; however, if the species is observed in the project area, work will cease in that area until the animal has left the project vicinity.

7. An emergency spill response plan will be prepared; workers will be trained in implementation; and appropriate spill response equipment will be ready and available for deployment onsite.

8. All activities will be done in compliance with the Dredge and Fill Document of Environmental Protection and a "Dredge and/or Unconsolidated Fill Project Description Sheet 2" would be completed by the project proponent and forwarded to the USAG-KA Environmental Engineer and the base operation contractor's environmental department no later than 75 days prior to beginning work for coordination with and approval by the UES agencies.

B. During Metal Debris Removal:

1. If any birds are observed nesting in the immediate vicinity of staging or operations areas, demarcate nests and avoid the area. White terns may nest in pandanus trees and tropical almonds usually between January and July. However, the vegetation will be searched for white tern eggs or chicks before removal. If a white tern is observed incubating or with a chick, the tern must not be displaced. Nearby vegetation can be removed, and the tern will remain on the nest, and the nest trees can be removed after the chick fledges.

2. During installation of the heavy-duty silt curtain, ensure that protected species are not trapped inside the curtain or impacted by the curtain weights and anchors.

3. Wherever possible, conduct removal activities on reef flats by hand to limit disturbance to marine resources. The distribution of metals is greater on shorelines than on reef flat areas, with the number of items greatly decreasing beyond 33 to 66 ft from shore. This distribution should reduce the clean-up effort as land-based objects are much easier to locate, and machinery can more readily be positioned on land to remove larger items and accumulations. It appears that debris observed further out on the reef flat can be removed by hand, although in some cases items might need to be pried from the substrate.

4. As much as possible, conduct clean-up activities at low tide, which will reduce sound transmittal and the potential for sea turtles and other mobile species of concern to be present in the action area.

5. Corals observed growing on items being removed will be scraped off and placed near to where they were initially located to the maximum extent possible. Onsite capacity for restoration, such as a trained coral expert with knowledge of restoration methods and necessary equipment, will be available in the event that coral are damaged and need to be reattached to the substrate or there is a need to salvage coral from marine debris (in the event that coral has colonized debris and is broken during debris salvage).

6. Prior to removal activities each day, beach areas will be surveyed for sea turtle tracks to find newly laid nests. Any nests will be demarcated and avoided.

7. Observers with binoculars will be posted along the shore in the immediate vicinity of the project area. If protected marine species, including *Trochus*, protected fish, sea turtles, or marine mammals, are seen within the safety zone, work will cease until the animal has exited the safety zone or 15 minutes has passed without re-detection of the animal in the safety zone. Work may continue if, in the best judgment of the project supervisor, the animal(s) would not be adversely affected by the activity. No attempt will be made to feed, touch, ride, or otherwise intentionally interact with sea turtles or marine mammals.

8. Observers will record all sightings of protected fish, sea turtles, and marine mammals that occur during the proposed project. Information collected will include species; any recognizable

individual characteristics if possible to discern; time, location, and approximate distance from the observer to the species; and species behavior.

9. In the event of inclement weather, operations would be suspended, and all equipment would be moved to protected sites and secured with appropriate mooring devices.

10. Turbidity monitoring will be conducted daily, and activities would cease if turbidity levels exceed 10 NTUs from baseline measurement, in accordance with guidelines provided in the *Dredging and Filling Document of Environmental Protection* (DEP-10-002.0).

C. Following Completion of Debris Removal:

1. All salvaged material will be recycled and/or disposed of properly.

2. A report of all observations will be delivered to NMFS and USFWS in a post-activity report within 180 days of project completion.

II. BEST MANAGEMENT PRACTICES FOR EQUIPMENT USE DURING METALS REMOVAL AND REVETMENT PLACEMENT (Incorporates BMPs from I above plus these listed below)

1. Prior to any work on or near the shore, beach areas will be surveyed for sea turtle tracks to find newly laid nests. Any nests will be demarcated and avoided.

2. Special attention shall be given to verify that no UES-protected *Trochus* (or top shell snail), sea turtles, or marine animals are in the area where equipment, anchors, or materials are expected to contact the substrate before that equipment may enter the water. Someone trained in the identification of *Trochus* will survey the work area from access point into the water to the edge of the work zone to ensure any *Trochus* in the area are identified. If any are present, work will not progress in that area until the *Trochus* are no longer found in the area. Instruct workers to avoid *Trochus* that may wander into the work area. Since minimal in-water work is proposed, a need to relocate *Trochus* is not anticipated; however, if the species is observed in the project area, work will cease in that area until no *Trochus* are present. Surveys shall be made prior to the start of work each day, and prior to resumption of work following any break of more than one half hour. Periodic additional surveys throughout the work day are strongly recommended.

3. All workers associated with this project, irrespective of their employment arrangement or affiliation (e.g., employee, contractor, etc.) shall be fully briefed on the BMPs and the requirement to adhere to them for the duration of their involvement in this phase of the project.

4. Instruct workers in avoidance of corals and other notable marine invertebrates (primarily *Trochus sp.*) by training workers to take care where they walk on the reef.

5. Develop and implement a contingency plan to control and contain toxic spills, including petroleum products, and ensure appropriate materials to contain and clean potential spills will be maintained and readily available at the work site.

6. Ensure that the project manager and heavy equipment operators will perform daily pre-work equipment inspections for cleanliness and leaks and that all construction project-related materials and equipment will be cleaned of pollutants prior to being placed in the water. All heavy equipment operations will be postponed or halted should a leak be detected, and will not proceed until the leak is repaired and equipment cleaned.

7. Ensure that fueling of construction project-related vehicles and equipment will take place at least 50 feet away from the water, preferably over an impervious surface.

8. Develop and implement a plan to prevent construction debris from entering or remaining in the marine environment during the project.

9. Develop and implement a contingency plan for the removal and adequate securing of equipment in the event of approaching storms.

10. Undergo site introductions and briefings by appropriately qualified personnel that would cover the procedures to be used to mitigate potential effects.

11. Turbidity and siltation from project-related work will be minimized and contained through the appropriate use of effective silt containment devices and the curtailment of work during adverse tidal and weather conditions. Silt curtains will completely enclose the operations. The area to be enclosed with silt curtains will be verified to be clear of *Trochus*, sea turtles, marine mammals, and protected fish species prior to the deployment of the silt curtains.

12. All heavy material placed in the water or on shore for the revetment will be lowered slowly by equipment and placed, not dumped, into position to ensure the revetment does not roll into the marine environment.

III. BEST MANAGEMENT PRACTICES FOR AFTER-COMPLETION MONITORING OF IN-WATER METALS REMOVAL (Incorporates BMPs from I and II above plus these listed below)

1. All workers associated with this project, irrespective of their employment arrangement or affiliation (e.g., employee, contractor, etc.) shall be fully briefed on the BMPs and the requirement to adhere to them for the duration of their involvement in this phase of the project.

2. Instruct workers in avoidance of corals and other notable marine invertebrates (primarily *Trochus sp.*) by training workers to take care where they walk on the reef during collection of water quality samples.

3. Instruct workers to avoid *Trochus* that may wander into the work area. Since minimal in-water work is proposed with the water quality monitoring, a need to relocate *Trochus* is not anticipated; however, if the species is observed in the project area, workers will actively avoid *Trochus* while collecting the water quality sampling.

4. If any birds are observed nesting in the immediate vicinity of water quality access points on shore, demarcate nests and avoid the immediate area while accessing the water quality collection point. White terns may nest in pandanus trees and tropical almonds usually between January and July, but may occur outside that season. If a white tern is observed incubating or with a chick, the tern must not be disturbed.

5. Prior to collection of the water quality samples, beach areas where access to the marine environment will be used will be surveyed for sea turtle tracks to find newly laid nests. Any nests will be demarcated and avoided. Additionally, someone trained in the identification of *Trochus* will survey the area from access point into the water to the collection point to ensure any *Trochus* in the area are identified to the water quality sample collector, if other than the trained monitor.

6. Constant vigilance shall be kept for the presence of UES-protected marine species during all aspects of the water quality collection effort.

7. Water samples will be collected in clean containers and brought to shore. For any sample requiring treatment at collection (preservative, acidification, etc), the sample bottle will be filled on shore from the clean container used to collect the original sample.

Protection of Birds:

Water accumulation is unavoidable with the creation of the approximately 0.2-acre leachate collection pond. A physical bird deterrent will make an area inaccessible to birds, keeping them from landing, roosting, or nesting, and forcing them to move on to a new location.

- Netting or some other deterrent will be employed to discourage birds from frequenting the area.

- To minimize the potential for impacts to migratory birds, scare techniques such as the use of noisemakers (e.g., propane cannons, sirens, and recorded distress calls) and visual deterrents (e.g., scarecrows, Mylar flags, helium-filled balloons, and strobe lights) would be implemented to discourage birds from nesting in the intended impact area.

GEOLOGY AND SOIL

Site-specific BMPs, as listed for air quality, can be used to stabilize disturbed soils, which would minimize the potential for soil erosion from wind.

The following are specific BMPs from DEP-10-002.0. Table 3 lists suggested BMPs for mitigating adverse impacts to soil.

- Any fill material to be placed in the marine environment shall be non-hazardous, non-polluting, and placed in such a manner as to minimize any potential adverse environmental impacts to marine flora and fauna associated with siltation, spillage, and turbidity.

- For each dredge and fill project in the proposed work area requiring dredge and/or unconsolidated fill greater than 25 cubic yards of materials, a "Dredge and/or Unconsolidated Fill Project Description Sheet 2" would be completed by the project proponent and forwarded to the USAKA Environmental Engineer and the base operation contractor's environmental department no later than 75 days prior to beginning work.

- Projects shall be designed to result in minimal damage to reef areas. Specific controls, such as selection of shoreline protection methods, selecting the appropriate time of year so as to cause the least impact to coral growth and reproduction success, employment of silt curtains, turbidity testing, and planning for identifying and/or relocating endangered marine life in the area of the activity, shall be evaluated and selected.

Table 3. Best management practices for mitigating soil erosion during removal activities.

Best Management Practices for Mitigating Soil Erosion During Removal Activities	
1	Preservation of existing vegetation, if practicable, to provide natural protection against soil erosion
2	Mulch applied over disturbed soil to prevent erosion during and following precipitation events
3	Silt fencing to provide a barrier to sediment movement from disturbed areas
4	Gravel applied to disturbed soils to prevent wind erosion
5	Chemical dust suppression using appropriate chemicals based on the soil type, temperature, humidity, and wind velocity
6	Slope protection measures to minimize erosion from disturbed slopes, which could include one or more of geotextiles, vegetation, and mulch
7	Wet suppression to prevent wind erosion and dust generation would be applied at least daily but not in excessive amounts

HAZARDOUS MATERIAL AND WASTE

1. Perform work in compliance with the KEEP.

2. Storage or disposal of waste (hazardous and non-hazardous) removed during removal activities would be performed in accordance with the requirements in Chapter 3-6 (Material and Waste Management) of the UES.

3. Due to the fragile ecosystem on Kwajalein Island, a hazardous materials release or spill must be reported and cleaned up in a timely manner. The following procedures for hazardous materials shall be used:
   a. In case of a spill, notify Fire Department at 5-3364, and report the spill in accordance with the revised SPI 1530.

b. Report any spill leaving a visible sheen on the water.
c. Report any ground spill totaling 1 gallon (3.8 liters) or larger.
d. All spills regardless of size must be cleaned up immediately.
e. Call 911 in case of an emergency.
f. Hazardous materials include but are not limited to oil, gasoline, diesel, paint, solvents, aviation fuels, pesticide, bleach, and hydraulic fluid.

4. An employee discovering a spill shall:

a. Immediately isolate and contain any spillage if it can be accomplished safely.
b. Notify immediate supervisor.
c. Immediately call 911 for large spills. Answer all questions asked by the dispatcher.
d. Meet the responding crew at the spill site.

HEALTH AND SAFETY

1. Prior to removal activities, the contractor shall provide a Site Specific Health and Safety Plan to the Government.

2. The use of construction equipment (e.g., heavy and dump trucks, concrete mixer, jackhammer, dozer, crane, grader, forklift, etc.) during demolition/removal and construction would follow standard industry practices.

3. Appropriate personal protection equipment should be used during the demolition/removal and construction process (e.g., hardhat, eye protection, gloves for expected job hazards, and respiratory protection as necessary).

4. Should UXO be encountered during construction activities, personnel should proceed in accordance with the USAKA DEP-02-001.1, *Disposal of Munitions and Other Explosive Material,* which states that when explosives are discovered, the Garrison's EOD Department is contacted for their safe removal and disposition. The EOD Department would make a determination as to whether explosives can be removed from the site of discovery.

NOISE

As a means of reducing noise during removal activities, the BMPs listed in Table 4 should be considered.

Table 4. Noise reduction practices.

Control Measure
Mufflers (Silencers)—Can be used on noisy, pressurized air equipment to reduce noise at the source; mufflers absorb some noise before it can reach the receptor/receiver.
Preventive Maintenance—Properly lubricate and align moving parts.
Speed—Decrease the speed of the equipment
Reduce Pneumatic and Compressed Air Systems—Lower pressure is not only quieter, but it saves energy and is safer. (To reduce serious injuries, OSHA requires that air pressure be held to 30 pounds per square inch or less when it could potentially contact skin.)
Personal Protection Equipment—Hearing protection, ear plugs, ear muffs.
Noise Barrier—Barriers can be constructed on the work site from common construction building material (plywood, block, stacks, or spoils), or barriers can be constructed from commercial panels that are lined with sound absorbing material to achieve the maximum shielding effect possible.

SOCIOECONOMICS

1. Continue the existing fishing prohibition for the waters adjacent to the Kwajalein Landfill until such a time that medical personnel have determined whether a consumption advisory should be developed and implemented.

2. Reduce the discharge of degraded groundwater to the surface waters adjacent to the Kwajalein Landfill. UES Section 3-2.6.2 (Groundwater Anti-degradation) states that USAG-KA operations shall not degrade the quality of Class III groundwater in such a way that results in increases of contaminant concentrations that will adversely affect public health, the marine environment…or protected beneficial uses of surface water. The UES further states that the Commander, USAG-KA, ensures that appropriate actions are taken to protect public health under situations that involve exposure to degraded groundwater.

WATER

Turbidity. A turbidity-monitoring plan would be prepared to define the action to be taken if turbidity levels exceed 10 NTUs.

Spillage. BMPs should be in place to prevent any spill materials from entering the inter-tidal water from the shoreline side and the landfill area.

CONCLUSION: The resulting environmental analysis shows that no significant adverse impacts would occur from the execution of the proposed removal action components associated with the Kwajalein Landfill. In totality, the execution of any and/or all of the removal action components would have a long-term benefit on the reduction of contaminants released to the environment at and near the Kwajalein Landfill. Preparation of an Environmental Impact Statement, therefore, it is not required. A follow-up action list would be developed and completed by the Executing Agent to ensure compliance with the actions described in the EA.

The Final EA and Final Finding of No Significant Impact are available at **http://www.usagkacleanup.info.**

POINT OF CONTACT: The deadline for receipt of comments was 28 October 2016. Requests for a copy of the Removal Action Activities Associated with the Kwajalein Landfill Final EA and Draft Finding of No Significant Impact should be addressed to:

U.S. Army Space and Missile Defense Command/
Army Forces Strategic Command

Attention: SMDC-ENE (Tom Craven)
Post Office Box 1500
Huntsville, AL 35807-3801

U.S. ARMY GARRISON – KWAJALEIN ATOLL (USAG-KA)
REMOVAL ACTION ACTIVITIES ASSOCIATED WITH THE KWAJALEIN LANDFILL

ENVIRONMENTAL ASSESSMENT

AGENCY: U.S. Department of the Army

ACTION: Finding of No Significant Impact

CONCUR:

_______________________________________ Date: _______________________
DEREK MILLER
USAG-KA Environmental Division
Installation Environmental Coordinator

APPROVE:

_______________________________________ Date: _______________________
MICHAEL LARSEN
COL, SF
U.S. Army Garrison-Kwajalein Atoll

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FINAL ENVIRONMENTAL ASSESSMENT
FOR
REMOVAL ACTION ACTIVITIES ASSOCIATED WITH THE KWAJALEIN LANDFILL

U.S. ARMY GARRISON–KWAJALEIN ATOLL
REPUBLIC OF THE MARSHALL ISLANDS

PREPARED FOR:

BERING-KAYA SUPPORT SERVICES

AND

U.S. ARMY SPACE AND MISSILE DEFENSE COMMAND

PREPARED BY:

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January 2017

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14. ABSTRACT
This Environmental Assessment (EA) is being prepared by USASMDC/ARSTRAT to analyze proposed environmental cleanup project Removal Action Memorandum alternatives at USAG-KA intended to reduce the release of contaminants to the environment at and near the Kwajalein Landfill. The EA analyzes the impacts and cumulative effects of activities associated with Removal Action Memorandum Alternatives A, B, C, and D.

15. SUBJECT TERMS
Environmental Assessment

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Executive Summary

Executive Summary

Introduction

This Environmental Assessment (EA) is being prepared by the United States (U.S.) Army Space and Missile Defense Command/Army Forces Strategic Command (USASMDC/ARSTRAT) to analyze proposed environmental cleanup project alternatives at U.S. Army Garrison–Kwajalein Atoll (USAG-KA) intended to reduce the release of contaminants to the environment at and near the Kwajalein Landfill. The USASMDC/ARSTRAT is executing the Compliance Cleanup Program at U.S. Army Kwajalein Atoll (USAKA) for USAG-KA under a Support Agreement signed in 2013. Past investigations of contaminated sites at USAKA have identified the need for further investigation and remediation of the Kwajalein Landfill. The investigations revealed that water quality contaminants including copper, polychlorinated biphenyls (PCBs), and pesticides have been detected in fish (food chain), groundwater-monitoring wells, groundwater seeps, and inter-tidal zone surface water at the landfill and metal debris storage area located on the southwestern side of the island of Kwajalein.

The executive summary presents the prominent and relevant key points of the EA and prepares the reader for the upcoming content; therefore, the entire document should be read for full details.

This EA analyzes the potential environmental impacts from implementing any combination of the components considered in various alternatives (See Table E-1), including:

Table E-1. Components of Alternatives for the Proposed Action.

Removal Action Components	Removal Action Memorandum Alternatives			
	A	B	C	D
1) Remove metals from shoreline between Glass Beach and Mt. Olympus	X	X	X	X
2) Remove metal debris from storage area adjacent to landfill	X	X	X	X
3) Remove metal debris from mound area between Glass Beach and the Shark Pit	X	X	X	X
4) Re-armor shoreline east of Landfill (Glass Beach to Mt. Olympus)	X	X	X	X
5) Close existing landfill (grading and cap)		X		X
6) Close existing landfill (excavate and ship refuse to CONUS; topsoil cover)			X	
7) Construct new landfill for future refuse		X	X	
8) Transport future refuse (incinerator ash) to CONUS landfill				X
9) Stabilize shoreline (construct new revetment—original landfill shoreline footprint only)		X	X	X
10) 6-year water quality monitoring plan (ocean/reef flat area – this is not post-closure monitoring per UES Section 3-6.5.7(c)(6)(vii))	X			
11) 30-year water quality monitoring plan (ocean/reef flat area)		X	X	X

Proposed Action

The Proposed Action is to implement a combination of the removal action components listed above. The components consist of (1) removing metal debris along the shoreline east of the landfill, (2) removing metal debris between Glass Beach and the Shark Pit, (3) removing metal debris from storage area adjacent to landfill, and (4) re-armoring the shoreline east of the landfill between Glass Beach and the landfill. This component would remove and reduce the total volume of metal debris along the shoreline east of the landfill area continuing all the way to Glass Beach and also create a stable shoreline along this same shoreline with a regraded new stone-armored revetment capable of withstanding storm wave energy to avoid future erosion (replaces the metal debris currently serving this purpose) protecting the boundary and integrity of the landfill; (5) closing, grading, and placing impermeable cap on the existing landfill; (6) closing the existing landfill by excavating and shipping refuse to CONUS and placing impermeable cap on the existing landfill; (7) constructing a new landfill for future refuse; (8) transporting future reuse (incinerator ash) to a CONUS landfill; (9) stabilizing the shoreline by constructing a new revetment along the original landfill shoreline footprint only; and (10) 1-year quarterly and an additional 5-year monitoring plan of water quality to evaluate remedial effectiveness for the executing components 1-4, (this is not post-closure monitoring per UES Section 3-6.5.7(c)(6)(vii)); and (11) 30-year water quality monitoring plan to evaluate remedial effectiveness of the execution of components 1-9.

No-Action Alternative

Under the No-action Alternative, the shoreline would remain in its current condition. This option would not reduce the potential for landfill contaminants or metal debris entering the marine environment from erosion of the shoreline. The existing landfill would remain in its current condition. Incinerator ash would continue to be placed into the refuse piles. Metal debris would remain on-site. This option would not decrease contaminant loading to groundwater or marine water. Future refuse generated on the island would be incinerated and placed in the existing landfill. This option would not decrease contaminant loading to groundwater and marine water.

Impact Assessment Methodology

Fourteen broad areas of environmental consideration were considered to provide a context for understanding the potential effects of the Proposed Action and the Other Alternatives Considered, and to provide a basis for assessing the severity of potential environmental impacts. These areas include air quality, airspace, biological resources, cultural resources, geology and soils, hazardous materials and waste, health and safety, land use, noise, socioeconomics, transportation, utilities, visual aesthetics, and water resources.

Of the 14 broad areas considered, 9 resources were carried forward for analysis (air quality, biological resources, geology and soil, hazardous material and waste, health and safety, noise, socioeconomics, utilities, and water). The remaining resources were not analyzed for the following reasons:

Airspace. The Proposed Action and the Other Alternatives Considered would not have the potential to adversely affect airspace. The delivery of necessary project equipment would be the only activity associated with airspace usage and would utilize existing flights resulting in no impacts to airspace.

Cultural Resources. There are no identified Areas of Potential Effects (APE) within the potential project areas. There is always the potential for subsurface remains to be unexpectedly encountered during intentional and unanticipated ground disturbing activities. On-site archaeological monitoring may be used, when deemed necessary, during the removal action process; the installation's Cultural Resources Manager would be notified when large or potentially significant metal debris is being pulled out of the shoreline.

Land Use. There are no planned changes to the current land designation or zoning codes for land use patterns on Kwajalein Island.

Transportation. The transport of equipment and project materials in support of the Proposed Action could be accomplished by ocean vessels or by plane. These types of transport actions are routine and are not anticipated to result in any additional impacts to the existing transportation systems. The number of barge trips to ship refuse to the CONUS is not anticipated to increase beyond the current number.

Visual Aesthetics. The Proposed Action would not alter the current scenic quality of the areas in view of the shoreline and landfill. The removal the metal debris would be a benefit to the aesthetic view of the shoreline area.

Results

Tables ES-2 through ES-10 summarize the results taken from the EA; this entire EA document should be read for all details and analysis of each environmental resource.

Table ES-2. Air quality.

Components	Results
Remove metals from shoreline between Glass Beach and Mt. Olympus. Remove metal debris from storage area adjacent to landfill. Remove metal debris from mound area between Glass Beach and the Shark Pit. Re-armor shoreline east of the landfill (Glass Beach to Mt. Olympus)	Contribution would be short-term and anticipated to have a minor impact on local air quality. Additionally, the prevailing year-round winds from the east have the potential to decrease the effects of the short-term emissions to a negligible impact. Mitigation measures would be used to reduce impacts.
Close existing landfill (grading and cap)	Overall, the effects of executing this component would be short-term and have negligible impact on air quality and it would have a long-term benefit to the environment.
Close existing landfill (excavate and ship refuse to CONUS; topsoil cover)	Overall, the effects of executing this component would be short-term and have negligible impact on air quality.
Construct new landfill for future refuse	Overall, the effects from fugitive dust and emissions for executing this component would be short-term and have negligible impact on air quality, and it would have a long-term benefit to the environment.
Transport future refuse (incinerator ash) to CONUS landfill	Overall, the effects of executing this component would be short-term and have negligible impact on air quality.
Stabilize shoreline (construct new revetment—original landfill shoreline footprint only)	Overall, the effects from fugitive dust and emissions for executing this component would be short-term and have negligible impact on air quality and it would have a long-term benefit to the environment.
Water quality monitoring plan (ocean/reef flat area)	No impact to air quality is anticipated from long-term water quality monitoring.
No-action Alternative	Under the No-action Alternative, the shoreline and landfill area would continue in its current condition.

Table ES-3. Biological resources.

Components	Results
Remove metals from shoreline between Glass Beach and Mt. Olympus. Remove metal debris from storage area adjacent to landfill. Remove metal debris from mound area between Glass Beach and the Shark Pit. Re-armor shoreline east of the landfill (Glass Beach to Mt. Olympus)	Terrestrial: Vegetation Overall, this component, the removal of metals and re-armoring along the shoreline, may affect, but is not likely to adversely affect, vegetation. Wildlife Direct Impacts—With adherence to the proposed best management practices and mitigation measures, terrestrial biological resources may be affected, but are not likely to be adversely affected. Exposure to Noise—Once construction activities are complete, noise levels would return to existing levels, and terrestrial wildlife species would be expected to return to the area. Wastes and Discharges—The mitigation and conservation measures described in Section 4.4.2 are intended to prevent the introduction of wastes and toxicants into the terrestrial environment, therefore, construction-related discharges and spills would be infrequent, small, and quickly cleaned if they do occur. Habitat Loss or Degradation—Impacts would be expected to be temporary behavioral changes, and the project area includes only a small portion of the available foraging habitat on the island. Marine Vegetation No effects to marine vegetation are predicted Wildlife Direct Impacts—With adherence to the proposed best management practices and mitigation measures, marine biological resources are not likely to be adversely affected. Turbidity or Sediment—The turbidity should decrease rapidly with the cessation of the work since the grain size in the project area are coarse to fine sands which tend to rapidly settle from the water column. The Project Area occurs along the shoreline where heavy wave action is common. Beyond 50 meters, the determination of turbidity levels caused by the Proposed Action would be difficult to differentiate from turbidity caused by the wave action. Exposure to Noise—Conducting debris removal and shoreline stabilization during periods of low tide will effectively prevent marine species and other mobile species of concern from being exposed to noise at received levels that might be expected to cause adverse consequences. Waste and Discharges—The potential for exposure of protected mollusks, fish, sea turtles, and marine mammals to construction-related wastes and discharges is discountable. Habitat Los or Degradation—The removal of the metal debris likely would result in a net benefit for the entire community that would far outweigh the potential adverse impacts to coral (Kolinski, 2015). Kolinski reported: "Overall, the ecological benefits of reduced metal concentrations are expected to, over time, greatly exceed project related impacts on UES coordination corals in this area."
Close existing landfill (grading and cap)	Terrestrial—The execution of this component may also result in additional direct impacts and general disturbance to wildlife species. Marine—Impacts to marine biological resources would be similar to that described for Removal of Metals and Re-armoring along the Shoreline East of Landfill. In totality, the environmental benefits of closing the landfill and reducing the metal concentrations over time greatly exceed project related short-term impacts in this area.
Close existing landfill (excavate and ship refuse to CONUS; topsoil cover)	Impacts of additional shipping on the marine environment include possible ship strikes, vessel noise, and accidental spills. Potential direct impacts on marine mammals from vessel traffic would include an increase in noise and harassment of animals in the form of disturbance and possible serious injuries or death.

Components	Results
Construct new landfill for future refuse	Direct impacts would also include permanent removal of vegetation to construct a new 2-acre landfill in place of the existing metal debris storage area. The creation of 0.2-acre leachate pond has the potential to establish a new habitat for birds. Birds will have a new source of water, bathing, loafing and potential nesting in vegetation growth. Birds would remain in a habitat during the breeding season if they have a place to nest and raise young. Nesting of seabirds in the project area is possible but not likely.
Transport future refuse (incinerator ash) to CONUS landfill	Terrestrial—Future refuse generated on-island would be transported to an off-island landfill. Impacts to terrestrial biological resources would be less than RAM Alternative C since no new construction would take place. Marine—Impacts to marine resources would be greater than RAM Alternative C since vessel traffic would increase for regular shipments of refuse that would take place indefinitely, rather than the short-term impacts of increased vessel traffic from removal of excavated refuse.
Stabilize shoreline (construct new revetment—original landfill shoreline footprint only)	Impacts to marine biological resources would be similar to that described in row 1.
Water quality monitoring plan (ocean/reef flat area)	Terrestrial—No impacts to terrestrial biological resources are expected from this monitoring activity and would be consistent with previously conducted water quality monitoring procedures that have taken place previously in the project area.
No-action Alternative	Under the No-action Alternative, the shoreline and landfill area would continue in its current condition.

Table ES-4. Geology and soils.

Components	Results
Remove metals from shoreline between Glass Beach and Mt. Olympus. Remove metal debris from storage area adjacent to landfill. Remove metal debris from mound area between Glass Beach and the Shark Pit. Re-armor shoreline east of the landfill (Glass Beach to Mt. Olympus)	Geology—No impacts to the geological framework of Kwajalein Island are anticipated by the execution of this component. Soils—The re-armoring is not anticipated to alter the natural ocean current or tidal effects. The removal is anticipated to have a negligible to minor adverse environmental impact. The prevailing easterly wind is anticipated to further render any adverse impacts from emissions to a negligible adverse impact.
Close existing landfill (grading and cap)	Geology—No impacts to the geological framework of Kwajalein Island are anticipated by the execution of this component. Soils—These soil disturbance activities are anticipated to have no adverse environmental impacts to the soil. The use of the equipment would be short-term and any adverse impacts would be minor.
Close existing landfill (excavate and ship refuse to CONUS; topsoil cover)	Geology—No impacts to the geological framework of Kwajalein Island are anticipated by the execution of this component. Soils—These soil disturbance activities are anticipated to have no adverse environmental impacts to the soil. The use of the equipment would be short-term, and any adverse impacts would be minor. The impacts form the execution of this component would be a long-term beneficial impact to human health and the environment on Kwajalein Island.
Construct new landfill for future refuse	Geology—No impacts to the geological framework of Kwajalein Island are anticipated by the execution of this component. Soils—The removal, stockpiling, and loading of 110,000 cubic yards of refuse are anticipated to have no adverse impact to soils.
Transport future refuse (incinerator ash) to CONUS landfill	Geology—No impacts to the geological framework of Kwajalein Island are anticipated by the execution of this component. Soils—The transport of future refuse would have no adverse impacts on soils. Additionally, the execution of this component would reduce the amount of refuse available to contribute to contaminated leachate (including metals, PCBs, and pesticides) from entering or seeping into the groundwater.
Stabilize shoreline (construct new revetment—original landfill shoreline footprint only)v	Geology—No impacts to the geological framework of Kwajalein Island are anticipated by the execution of this component. Soils—Grading and compacting of soils and the shoreline stabilization are not anticipated to alter the natural ocean current or tidal effects.

Components	Results
	Requirements and limitations pertaining to shoreline protection at Kwajalein Island are specified in the Dredging and Filling Document of Environmental Protection (DEP-10-002.0, 30 April 2011).
Water quality monitoring plan (ocean/reef flat area)	Geology—No impacts to the geological framework of Kwajalein Island are anticipated by the execution of this component. Soils—There are no adverse impacts anticipated on the soil from the quarterly and annual water sampling. Water samples would be taken from an established and fixed collection point and no ground disturbance is anticipated.
No-action Alternative	Under the No-action Alternative, the shoreline and landfill area would continue in its current condition.

Table ES-5. Hazardous materials and waste.

Components	Results
Remove metals from shoreline between Glass Beach and Mt. Olympus. Remove metal debris from storage area adjacent to landfill. Remove metal debris from mound area between Glass Beach and the Shark Pit. Re-armor shoreline east of the landfill (Glass Beach to Mt. Olympus)	Minor impacts would be anticipated during the removal activities from hazardous materials and waste. All persons generating hazardous waste at USAKA shall be ultimately responsible for its shipment and disposal. it is anticipated that the refuse removal from the existing landfill would have a negligible adverse impact. Additionally, the removal of the existing refuse would be expected to cause greater reduction of pollutant reaching the groundwater, which in turn would be beneficial to the environment. If a spill occurs, these materials could be transported in the soil by stormwater runoff. Standard construction best management practices and procedures outlined in the revised SPI-1530 and the Kwajalein Environmental Emergency Plan would be implemented to reduce or minimize the risk of accidental release of hazardous materials to the environment and to prevent stormwater runoff.
Close existing landfill (grading and cap)	
Close existing landfill (excavate and ship refuse to CONUS; topsoil cover)	
Construct new landfill for future refuse	
Transport future refuse (incinerator ash) to CONUS landfill	
Stabilize shoreline (construct new revetment—original landfill shoreline footprint only)	
Water quality monitoring plan (ocean/reef flat area)	
No-action Alternative	Under the No-action Alternative, the shoreline and landfill area would continue in its current condition.

Table ES-6. Health and safety.

Components	Results
Remove metals from shoreline between Glass Beach and Mt. Olympus. Remove metal debris from storage area adjacent to landfill. Remove metal debris from mound area between Glass Beach and the Shark Pit. Re-armor shoreline east of the landfill (Glass Beach to Mt. Olympus)	The execution of the components for Removal Action Memorandum Alternatives A–D is not expected to increase health and safety risk to USAG-KA contract personnel or members of the public. All applicable UES and USAG-KA construction safety precautions and regulations would be implemented to minimize the potential for accidents and injuries during the demolition and construction process. Hazardous materials would be monitored and/or removed to prevent potential exposure to workers and the public and to prevent releases.
Close existing landfill (grading and cap)	
Close existing landfill (excavate and ship refuse to CONUS; topsoil cover)	
Construct new landfill for future refuse	
Transport future refuse (incinerator ash) to CONUS landfill	
Stabilize shoreline (construct new revetment—original landfill shoreline footprint only)	
Water quality monitoring plan (ocean/reef flat area)	
No-action Alternative	Under the No-action Alternative, the shoreline and landfill area would continue in its current condition.

Table ES-7. Noise.

Components	Results
Remove metals from shoreline between Glass Beach and Mt. Olympus. Remove metal debris from storage area adjacent to landfill. Remove metal debris from mound area between Glass Beach and the Shark Pit. Re-armor shoreline east of the landfill (Glass Beach to Mt. Olympus)	Construction (Removal) Noise—The average peak noise level for stationary and impact equipment could be above the OSHA beginning regulations of 85 dB, which could risk hearing damage. The use of standard industry best management practices and mitigation measures would have a noise reduction. General Public—Based on their proximity to the project area, members of the general public (USAG-KA personnel, contractors, and dependents) have the potential to be affect by noise generating activities associated with the components for Alternatives A–D.
Close existing landfill (grading and cap)	
Close existing landfill (excavate and ship refuse to CONUS; topsoil cover)	
Construct new landfill for future refuse	
Transport future refuse (incinerator ash) to CONUS landfill	
Stabilize shoreline (construct new revetment—original landfill shoreline footprint only)	
Water quality monitoring plan (ocean/reef flat area)	
No-action Alternative	Under the No-action Alternative, the shoreline and landfill area would continue in its current condition.

Table ES-8. Socioeconomics.

Components	Results
Remove metals from shoreline between Glass Beach and Mt. Olympus. Remove metal debris from storage area adjacent to landfill. Remove metal debris from mound area between Glass Beach and the Shark Pit. Re-armor shoreline east of the landfill (Glass Beach to Mt. Olympus)	Population—Any additional workers on-island during the execution of the components for Removal Action Memorandum Alternatives A–D would be short-term. Any increase in the population associated with execution of the components and Removal Action Memorandum Alternatives A–D would have a negligible impact on the socioeconomics of Kwajalein. Subsistence Fishing—The ingestion of fish caught from the contaminated area below the landfill poses unacceptable cancer risk to U.S. residents and Marshallese citizens and may pose a noncancerous hazard to all human receptors; particularly for Marshallese citizens engaging in subsistence fishing. USAG-KA will continue the existing fishing prohibition for the waters adjacent to the Kwajalein Landfill until such a time that medical personnel have determined whether a consumption advisory should be developed and implemented.
Close existing landfill (grading & cap)	
Close existing landfill (excavate and ship refuse to CONUS; topsoil cover)	
Construct new landfill for future refuse	
Transport future refuse (incinerator ash) to CONUS landfill	
Stabilize shoreline (construct new revetment—original landfill shoreline footprint only)	
Water quality monitoring plan (ocean/reef flat area)	
No-action Alternative	Under the No-action Alternative, the shoreline and landfill area would continue in its current condition.

Table ES-9. Utilities.

Components	Results
Remove metals from shoreline between Glass Beach and Mt. Olympus. Remove metal debris from storage area adjacent to landfill. Remove metal debris from mound area between Glass Beach and the Shark Pit. Re-armor shoreline east of the landfill (Glass Beach to Mt. Olympus)	Electrical—The landfill would be fully operational during the duration of the action activities. Wastewater—The amount of leachate from the landfill to the pond would be reduced/minimized by the use of a portable cover to prevent precipitation from entering the landfill open area. Also, the amount of leachate can be minimized (and almost completely eliminated) by using a portable building that would be installed over the open area of the landfill cell and sheds rain off the waste.
Close existing landfill (grading and cap)	
Close existing landfill (excavate and ship refuse to CONUS; topsoil cover)	
Construct new landfill for future refuse	
Transport future refuse (incinerator ash) to CONUS landfill	
Stabilize shoreline (construct new revetment—landfill shoreline only)	
Water quality monitoring plan (ocean/reef flat area)	
No-action Alternative	Under the No-action Alternative, the shoreline and landfill area would continue in its current condition.

Table ES-10. Water.

Components	Results
Remove metals from shoreline between Glass Beach and Mt. Olympus. Remove metal debris from storage area adjacent to landfill. Remove metal debris from mound area between Glass Beach and the Shark Pit. Re-armor shoreline east of the Landfill (Glass Beach to Mt. Olympus)	The execution of this component would have the potential to impact the inter-tidal marine waters from Mt. Olympus to Glass Beach. The removal of the metal debris, existing relic stone and regarding the shoreline has the potential to temporarily increase the turbidity of the Class B water by increasing the amount of total suspended solids in the water. In the event turbidity levels exceed 10 nephelometric turbidity units (NTUs) from the baseline measurement, work would cease until the turbidity level returns below the 10 NTUs above the baseline turbidity values. The implementation of best management practices for hazardous materials and waste, would be followed in the event of a spill. Any impacts from a spill are anticipated to be short-term and minor.
Close existing landfill (grading & cap)	No direct or indirect impacts to groundwater are anticipated from the closing of the existing landfill. There are no surface water bodies in the landfill area.
Close existing landfill (excavate and ship refuse to CONUS; topsoil cover)	Any impacts from the execution of this component are anticipated to be short-term and negligible. Additionally, the removal of the existing refuse would be expected to further reduce the pollutants (including metals, PCBs, and pesticides) reaching the groundwater, which in turn would be beneficial to the environment.
Construct new landfill for future refuse	Any impacts from the execution of this component are anticipated to be short-term and negligible. Additionally, the new landfill is anticipated to reduce contaminant transport to groundwater by placing future waste in a lined landfill with proper leachate control, which in turn would be beneficial to the long-term operation of the landfill and groundwater protection.
Transport future refuse (incinerator ash) to CONUS landfill	Any impacts from the execution of this component are anticipated to be short-term and negligible. Additionally, the removal of the existing refuse would be expected to have a greater reduction of pollutant reaching the groundwater, which in turn would be beneficial to the long-term monitoring process.
Stabilize shoreline (construct new revetment—original landfill shoreline footprint only)	Any impacts from turbidity are anticipated to be short-term and minor. Any impacts from a spill are anticipated to be short-term and minor. Additionally, the new shoreline revetment is anticipated to keep any future landfill refuse from being eroded onto the shoreline, which in turn would be beneficial to the long-term operation of the landfill, groundwater protection, and inter-tidal contamination.
Water quality monitoring plan (ocean/reef flat area)	The execution of this component would have no adverse impact on water resources.
No-action Alternative	Under the No-action Alternative, the shoreline and landfill area would continue in its current condition.

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APPENDICES

FIGURES

TABLES

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Acronyms and Abbreviations

Acronyms and Abbreviations

°F	Fahrenheit
amsl	above mean sea level
APE	Areas of Potential Effect
bgs	below ground surface
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CONUS	Continental United States
COPC	Chemicals of Potential Concern
dB	decibel
dBA	A-weighted decibels
DEP	Document of Environmental Protection
DoD	Department of Defense
EA	Environmental Assessment
EIS	Environmental Impact Statement
EOD	Explosive Ordnance Disposal
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FONSI	Finding of No Significant Impact
ft	feet/foot
GCL	geosynthetic clay liner
HDPE	high-density polyethylene
KEEP	Kwajalein Environmental Emergency Plan
KRS	Kwajalein Range Services
MMPA	Marine Mammal Protection Act
mph	miles per hour
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NOA	Notice of Availability
NOAA	National Oceanic and Atmospheric Administration
NTU	Nephelometric Turbidity Unit
OSHA	Occupational Safety and Health Administration

PA	Preliminary Assessment
PCB	polychlorinated biphenyl
PM_{10}	particulate matter equal to or less than 10 microns in size (also called respirable particulate and suspended particulate)
$PM_{2.5}$	particulate matter equal to or less than 2.5 microns in size
POL	petroleum, oil, or lubricant
ppm	parts per million
RAM	Removal Action Memorandum
RMI	Republic of the Marshall Islands
SPCC	spill prevention, control, and countermeasure
TTS	Temporary Threshold Shift
U.S.	United States
U.S.C.	United States Code
UES	USAKA Environmental Standards
USAG-KA	U.S. Army Garrison–Kwajalein Atoll
USAKA	U.S. Army Kwajalein Atoll
USAPHC	U.S. Army Public Health Command
USASMDC/ARSTRAT	U.S. Army Space and Missile Defense Command/Army Forces Strategic Command
USFWS	U.S. Fish and Wildlife Service
UXO	unexploded ordnance
WWII	World War II
WWTP	Waste Water Treatment Plant
$\mu g/m^3$	micrograms per cubic meter
µg/L	micrograms per liter

1 Purpose and Need for Proposed Action

1 Purpose and Need for Proposed Action

1.1 INTRODUCTION

The United States (U.S.) Army Space and Missile Defense Command/Army Forces Strategic Command (USASMDC/ARSTRAT) is executing the Compliance Cleanup Program at U.S. Army Kwajalein Atoll (USAKA) for U.S. Army Garrison–Kwajalein Atoll (USAG-KA) under a Support Agreement signed in 2013. Past investigations of contaminated sites at USAKA have identified the need for further investigation and remediation of the Kwajalein Landfill. The investigations revealed that water quality contaminants including copper, polychlorinated biphenyls (PCBs), and pesticides have been detected in fish (food chain), groundwater-monitoring wells, groundwater seeps, and inter-tidal zone surface water at the landfill and metal debris storage area located on the southwestern side of the island of Kwajalein.

This Environmental Assessment (EA) is being prepared by USASMDC/ARSTRAT to analyze the environmental effects of implementing any of 11 proposed components of the four proposed alternatives from the Kwajalein Landfill Removal Action Memorandum. Some of the components are common to some or all of the Removal Action Memorandum alternatives, and two are unique to one of two alternatives. The Removal Action Memorandum alternatives are intended to reduce the release of contaminants to the environment at and near the Kwajalein Landfill. The removal actions are considered interim steps that in totality of completion, will render the best results in eliminating or reducing the potential for contaminants to migrate further into the environment. The components of each interim removal action include:

- Removal Action Memorandum **Alternative A:** Remove metals along shoreline east of landfill; re-armor shoreline east of landfill; remove metal debris from storage area adjacent to landfill; remove debris from area between Glass Beach and the Shark Pit; and 6-year monitoring plan for water quality (this is not post-closure monitoring per UES Section 3-6.5.7(c)(6)(vii)).
- Removal Action Memorandum **Alternative B:** Remove metals along shoreline east of landfill; re-armor shoreline east of landfill; remove metal debris from storage area adjacent to landfill; remove debris from area between Glass Beach and the Shark Pit; close existing landfill; construct new landfill for future refuse; stabilize shoreline at landfill; and 30-year monitoring plan for water quality

- Removal Action Memorandum **Alternative C:** Remove metals along shoreline east of landfill; re-armor shoreline east of landfill; remove metal debris from storage area adjacent to landfill; remove debris from area between Glass Beach and the Shark Pit; excavate and ship refuse to a Continental United States (CONUS) landfill; close existing landfill; construct new landfill for future refuse; and stabilize shoreline at landfill; and 30-year monitoring plan for water quality

- Removal Action Memorandum **Alternative D:** Remove metals along shoreline east of landfill; re-armor shoreline east of landfill; remove metal debris from storage area adjacent to landfill; remove debris from area between Glass Beach and the Shark Pit; close existing landfill, transport future refuse to a CONUS landfill, stabilize shoreline at landfill; and 30-year monitoring plan for water quality

A Removal Action Memorandum, consistent with UES requirements, has been completed for the proposed environmental cleanup project in the Kwajalein Landfill area.

This EA is in compliance with the U.S. Army National Environmental Policy Act (NEPA) implementing guidance at 32 CFR, Part 651; the U.S. Army Environmental Compliance related Cleanup Policy Guidance; the NEPA of 1969 as amended; and regulations/policies listed in Section 1.6.

1.2 OVERVIEW OF KWAJALEIN ISLAND

Kwajalein is the largest island in the Kwajalein Atoll located in the western chain of the Republic of the Marshall Islands (RMI) in the West Central Pacific Ocean (Figure 1-1). Approximately 1,200 to 1,500 people live on the island (U.S. Army Public Health Command, 2011a). Kwajalein Island is approximately 748 acres in size; the U.S. Government created 205 of those acres after World War II (WWII) by filling in the reef flat (U.S. Army Public Health Command, 2014). Much of the southwest area of the island was created by fill of debris placed over the reef after the 1944 WWII liberation of the island, which historically and currently provides the land mass for the landfill. The fill reportedly included concrete, vegetative debris, metallic waste (i.e., abandoned vehicles, heavy equipment, war debris, etc.), and locally dredged coral and sand to create usable land (U.S. Army Space and Missile Defense Command, 2014).

Explanation

Kwajalein Atoll

NORTH

0 5 10 20

Nautical Miles

Regional Location

Kwajalein Atoll, Marshall Islands

Figure 1-1

The U.S. Government has operated a facility at Kwajalein Island since 1944 after the liberation of the island during WWII. The primary activity on Kwajalein Island is related to activities supporting the USASMDC/ARSTRAT and Reagan Test Site mission. USAG-KA's mission is to conduct base operations and installation management functions in support of a diverse community of military, Department of the Army Civilians, and contract personnel and their families, while also fulfilling the U.S. Ambassador's Military Liaison Office requirements with regard to the Government of the Republic of the Marshall Islands relations at this geographically strategic location (U.S. Army Garrison–Kwajalein Atoll, 2015).

1.3 OVERVIEW OF PROJECT AREA

All of the Alternatives analyzed in this EA are located (1) along the shoreline that extends from Glass Beach west to beyond the landfill area; and (2) at the existing landfill area (Figure 1-2).

Shoreline Area. The shoreline in the project area could be separated into two distinct areas or shoreline environments: (1) high-energy shoreline from Glass Beach to Mt. Olympus; and (2) lower-energy (reef flat) from the western side of Mt. Olympus to west of the landfill (to the Surf Shack). Extensive metallic debris and other forms of armoring (concrete and rock) have been placed along these areas to stabilize the shore from erosion. The shoreline debris has been deposited in these areas since sometime after WWII and before 1988. The metallic debris consists of rebar, ship and vehicle parts, pipe, scrap metal, wire, and other debris. The current shoreline configuration is not stable in either area and may continue to erode, which would potentially destabilize the existing, regraded landfill, or proposed new landfill and Mt. Olympus.

The high-energy shoreline is highly armored with metallic debris and to a lesser degree concrete and rock. The metallic debris is fused together in most areas, either through corrosion or with what appears to be an asphaltic matrix. The metal in this area consists of very large pieces or large conglomerations of smaller metallic debris. Some small cove-type beaches have formed between some of the larger accumulations of material. From visual field observations, it appears most of the metallic debris remains in place at the shoreline. The most significant source of copper in the marine water at the landfill area is the extensive amount of copper along the shoreline to the east of the landfill. This copper is directly in the marine waters and is directly exposed to wave action, leaching, and dissolution. The western prevailing wind and littoral drift are likely transporting the dissolved copper in marine water from the east to the landfill area. The groundwater seeps are also a likely source of copper.

Explanation

- Former Outfall KISW14
- Former Outfall KISW14A
- Monitoring Well
- Shoreline Monitoring Well
- Current Landfill Boundary
- Incinerator Operation Area
- Region of Influence/Project Work Area
- Former Drummed Waste Storage Area
- Former Fire Training Area
- Former Oil Pit
- Salvage Yard Area
- Former Ash Disposal Area
- Metal Accumulation Area
- Shoreline with Metals Debris (Landfill Area)
- Shoreline with Metals Debris (Mt. Olympus to Glass Beach)

NORTH

0 150 300 450 600 Feet

0 50 100 150 200 250 Meters

Landfill Area Details Region of Influence - Project Work Area (ROI/PWA)

West Kwajalein Island

Figure 1-2

The western, lower energy area has a higher ratio of concrete and rock armoring to metallic debris, and the metallic debris in this area generally consists of smaller, less fused materials. However, metallic and other debris is being released from the toe of the landfill in this area due to shoreline erosion.

Kwajalein Landfill Area. The current unlined landfill area is located on the southwest portion of the island on fill from the WWII-era, which is located in the solid waste management facility portion of the island that includes other waste related operations and occupies approximately 13 acres. The landfill area is composed of the solid waste management complex and includes one incinerator constructed in 2009 that contains three chambers, a scrap metal segregation and storage area, a composting area, recycling center, stockpiled cover material, the landfill (6 acres), and several small trailer offices. The unlined landfill has been in operation since the early 1960s (U.S. Army Center for Health Promotion and Preventive Medicine, 1999). Figure 1-2 depicts the current land features of the landfill area.

Prior to 1996, solid wastes generated on Kwajalein were burned in an open chamber located on the northeast corner of the landfill area or open burned within the landfill area. An incinerator was brought to the island in 1996. Ash and residue from the burning was then deposited in the landfill (U.S. Army Environmental Hygiene Agency, 1991). Wastes disposed of in the landfill since 1996 are reported to include only incinerator ash and biosolids from the wastewater treatment plant (WWTP) (U.S. Army Public Health Command, 2011a).

Prior to 1996, medical wastes from the Kwajalein hospital and dental clinic were also open burned prior to disposal in the landfill (U.S. Army Center for Health Promotion and Preventive Medicine, 1999). Medical waste is now burned in the closed chamber incinerator. Other past practices at the landfill included burning oil and solvents in two unlined pits, and disposal of asbestos in a designated burial area. According to the U.S. Army Public Health Command (USAPHC) *Draft Kwajalein Landfill Baseline Risk Assessment*, completed in 2014, the unlined pits have reportedly been remediated; however, the asbestos burial area has not been remediated (U.S. Army Public Health Command, 2011). Hazardous and regulated wastes and metals are no longer disposed of in the landfill. Hazardous and regulated wastes are shipped back to the United States for disposal. Metal wastes are stored separately until they are shipped off island for recycling.

1.4 OVERVIEW OF THE PROPOSED ACTION

The Proposed Action is to implement a combination of the components listed in Table 1-1. The purpose of and need for the Proposed Action is to eliminate or decrease the potential for contaminants to migrate further into the environment (fish tissue, reef flat, ocean, soils, sediment, groundwater, and surface water). Table 1-1 summarizes the removal action components for accomplishing the purpose and need of the Proposed Action.

Table 1-1. Summary of the removal action components of the Proposed Action.

Removal Action Components	Removal Action Memorandum Alternatives			
	A	B	C	D
1) Remove metals from shoreline between Glass Beach and Mt. Olympus	X	X	X	X
2) Remove metal debris from storage area adjacent to landfill	X	X	X	X
3) Remove metal debris from mound area between Glass Beach and the Shark Pit	X	X	X	X
4) Re-armor shoreline east of Landfill (Glass Beach to Mt. Olympus)	X	X	X	X
5) Close existing landfill (grading and cap)		X		X
6) Close existing landfill (excavate and ship refuse to CONUS; topsoil cover)			X	
7) Construct new landfill for future refuse		X	X	
8) Transport future refuse (incinerator ash) to CONUS landfill				X
9) Stabilize shoreline (construct new revetment—original landfill shoreline footprint only)		X	X	X
10) 6-year water quality monitoring plan (ocean/reef flat area(this is not post-closure monitoring per UES Section 3-6.5.7(c)(6)(vii))	X			
11) 30-year water quality monitoring plan (ocean/reef flat area)		X	X	X

1.5 SCOPE OF ANALYSIS

This EA has been developed by the U.S. Army and was prepared in accordance with the following:

- 48 U.S.C. 1681 Compact of Free Association (Compact) between the United States of America and the Republic of the Marshall Islands
- National Environmental Policy Act (NEPA) of 1969, as amended
- The Council on Environmental Quality (CEQ), NEPA-implementing regulations found in 40 Code of Federal Regulations (CFR) Parts 1500 through 1508
- Environmental Standards for United States Army Kwajalein Atoll (USAKA) Activities in the Republic of the Marshall Islands, 13th Edition, October 2014

- Department of Defense (DoD) instruction 4715.19, Environmental Planning and Analysis
- Army Regulation 200-1, Environmental Protection and Enhancement
- 32 CFR Part 651, Environmental Effects of Army Actions
- Executive Order 12114, Environmental Effects of Major Federal Actions
- 32 CFR Part 187, Environmental Effects of Major Department of Defense Actions

The purpose of this EA is to ensure that environmental information is available to public officials and the affected public and to inform decision-makers of the impacts on the human and natural environment that could result from the Proposed Action in their decision process.

The Proposed Action and the No-action Alternative are described in Chapter 2. Current environmental conditions or “baseline” conditions are described in Chapter 3. Analysis of key resource areas and the expected impacts of all the components for each potentially affected environmental resource are described in Chapter 4. Some resources are only discussed briefly in Chapter 3 if it was determined that the Alternatives present no potential effect to that resource. Chapter 4 also addresses the findings and the potential for cumulative impacts, with recommended mitigation measures to eliminate or reduce adverse environmental impacts where appropriate.

1.6 AGENCY AND PUBLIC PARTICIPATION

In accordance with the CEQ and DoD regulations for implementing NEPA, USASMDC/ARSTRAT will invite public involvement in this proposed federal action. Consideration of the views and information of all interested persons promotes open communication and enables better decision making. All agencies, organizations, and members of the public having a potential interest in the Proposed Action, including minority, low-income, disadvantaged, and Native Marshallese, will be urged to participate in the decision making process. Chapter 7 of this EA lists the agencies and individuals that will be contacted. Public involvement opportunities with respect to this EA and decision making on the Proposed Action are guided by 32 CFR Part 651. Upon completion of the EA, the EA and Draft Finding of No Significant Impact (FONSI) will be made available to the public for comment for 30 days. At the end of the public review, the U.S. Army will consider all comments submitted by individuals, agencies, and organizations. As appropriate, USASMDC/ARSTRAT may then execute the FONSI and proceed with implementation of the Proposed Action. If it were determined that the implementation of the Proposed Action or selection of one of the Other Alternatives Considered would result in significant impacts, the U.S. Army would publish in the Federal Register a Notice of Intent to prepare an Environmental Impact Statement (EIS) or would not take the action.

A Notice of Availability (NOA) for this EA and Draft FONSI was published in the newspapers listed in Table 1-2. Throughout this process, the public may obtain information on the status and progress of the Proposed Action and the EA through the NEPA website located at www.usagkacleanup.info. Copies of the EA, Draft FONSI, and signed Final FONSI will be placed in the Grace Sherwood Library, Kwajalein Island; the Roi-Namur Library, Marshall Islands; and RMI Environmental Protection Agency (EPA) offices (Ebeye and Majuro). The 30-day review period was from 19 September 2016 to 28 October 2016.

Table 1-2. Local newspapers.

Country or State	City/Town	Newspaper
Republic of the Marshall Islands	Majuro	*Marshall Islands Journal*
	USAKA	*Kwajalein Hourglass*

1.7 RELATED ENVIRONMENTAL DOCUMENTATION

- Bering–KAYA Support Services, Removal Action Memorandum Kwajalein Landfill, 2016
- Bering–KAYA Support Services and HDR, Electrical Resistivity and Electromagnetic Survey of the Kwajalein Landfill Area, 2015
- U.S. Army Space and Missile Defense Command, Landfill Source Metals Removal Action Memorandum, 2015
- U.S. Army Public Health Command, Kwajalein Landfill Baseline Risk Assessment, Project # S.0010319-13, 2014
- U.S. Army Public Health Command, Draft Site Investigation Report, 2012
- WHPacific Preliminary Assessment/Site Inspection, 2011
- U.S. Army Center for Health Promotion and Prevention Medicine, Groundwater Monitoring Reports, 1999-2013

- U.S. Army Center for Health Promotion and Prevention Medicine, Geohydrologic Study, 1998-1999
- U.S. Army Environmental Hygiene Agency, Soil and Groundwater Contamination Study, 1989
- U.S. Geological Survey, Groundwater Investigations, 1980, 1996, and 1991

2 Description of the Proposed Action and Alternatives

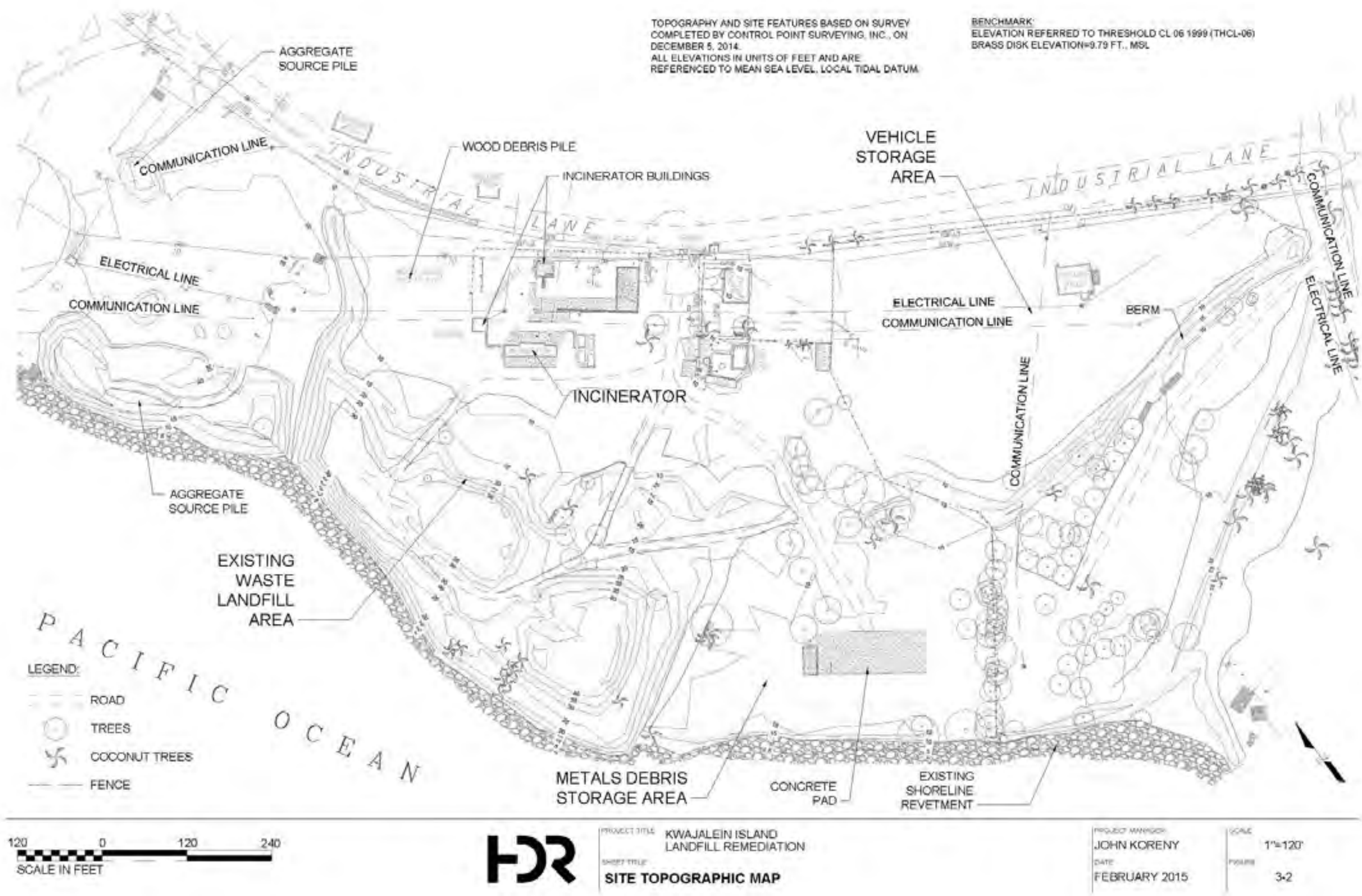
2 Description of the Proposed Action and Alternatives

This chapter describes the removal action components associated with the Proposed Action and the No-action Alternative. Section 2.1 describes the components for executing the Proposed Action; Section 2.2 describes the construction phase and noise-generating activities associated with the components; Section 2.3 describes the No-action Alternative; and Section 2.4 describes the Component Considered But Eliminated from Detailed Analysis. Table 2-1 (see Section 2.1.8) summarizes the potential combination of the removal action components.

2.1 THE PROPOSED ACTION

The Proposed Action is to implement a combination of the removal action components listed in Tables 1-1 and 2-1. The components consist of (1) removing metal debris along the shoreline east of the landfill, (2) removing metal debris between Glass Beach and the Shark Pit, (3) removing metal debris from storage area adjacent to landfill, and (4) re-armoring the shoreline east of the landfill between Glass Beach and the landfill. This component would remove and reduce the total volume of metal debris along the shoreline east of the landfill area continuing all the way to Glass Beach and also create a stable shoreline along this same shoreline with a regraded new stone-armored revetment capable of withstanding storm wave energy to avoid future erosion (replaces the metal debris currently serving this purpose) protecting the boundary and integrity of the landfill; (5) closing, grading, and placing impermeable cap on the existing landfill; (6) closing the existing landfill by excavating and shipping refuse to CONUS and placing impermeable cap on the existing landfill; (7) constructing a new landfill for future refuse; (8) transporting future reuse (incinerator ash) to a CONUS landfill; (9) stabilizing the shoreline by constructing a new revetment along the original landfill shoreline footprint only; and (10) 1-year quarterly and an additional 5-year monitoring plan of water quality to evaluate remedial effectiveness for the executing components 1-4, (this is not post-closure monitoring per UES Section 3-6.5.7(c)(6)(vii)); and (11) 30-year water quality monitoring plan to evaluate remedial effectiveness of the execution of components 1-9.

The project area for the Proposed Action includes the shoreline from Glass Beach, the shoreline of the landfill area, the aggregate area, the incinerator operation area, the salvage yard area, and the debris removal area between Glass Beach and the Shark Pit (Figures 2-1 and 1-2). Each component of the Proposed Action is discussed in Sections 2.1.1 through 2.1.7.



Landfill Site Surface Topography Map

West Kwajalein Island

Figure 2-1

2.1.1 Removal of Metals on the Shoreline (Glass Beach to Mt. Olympus), Removal of Metal Debris from Storage Area Adjacent to Landfill, Removal of Metal Debris from the Area between Glass Beach and the Shark Pit, and Re-armor along the Shoreline East of Landfill (Component in Removal Action Memorandum Alternatives A, B, C, and D)

Metal debris (pipes, vehicle parts, engines, wire, and larger metal pieces) is present throughout most of this reach of the shoreline. In places, the metallic debris extends beyond the toe of the shoreline. This metal debris is being eroded and swept to the west onto the landfill shoreline and is likely a contributing cause of the high copper concentrations measured in the inter-tidal marine water near the landfill.

The approximately 6,700 tons of metal debris stored adjacent (east) of the landfill will be removed and transported to the CONUS, Guam, or Hawaii for recycling; Asian markets would also be considered for a transport location for the metal debris. The surface soils in this area will be sampled to determine if there is soil contamination that requires remediation. If there is surface soil with contamination, it will be removed and stockpiled and remediated appropriately.

The area between Glass Beach and the Shark Pit is a heavily vegetated mound of debris (likely concrete, metal, and coral) along and up-gradient from the shoreline that needs to be removed to facilitate the investigation of the old dump. It is estimated that the debris mound covers about 3 acres. The debris mound is estimated to include approximately 30,000 cubic yards of material. To remove the mound, the area would be cleared and grubbed of vegetation and trees, and the debris would be excavated, sorted, and tested (including the soil). Recyclable metal would be sent off-island for recycling, clean soil would be stockpiled, and refuse would be placed in the existing landfill. The area would be re-vegetated with an appropriate plant cover (i.e., grasses, shrubs). A Preliminary Review of the removal actions for the mound between Glass Beach and the Shark Pit was submitted to the U.S. Fish and Wildlife Service for review and comment (Appendix D). The metal along the shoreline (Glass Beach to Mt. Olympus) is also serving as an armoring system for this portion of the shoreline. It is assumed that metal debris will need to be removed over about 1,200 linear ft (two-thirds of the 1,800 linear ft) of shoreline from the east end of the landfill area to Glass Beach. It is assumed that the shoreline work area from the bottom toe to the top crest is about 45 linear ft. Construction work would require heavy equipment on the shoreline and out up to 15 ft from the toe of the shoreline on an as-needed basis. This would likely destabilize the already unstable shoreline and perhaps result in erosion of the area around

Mt. Olympus. Therefore, removal of metallic debris in this area would also require shoreline re-armoring.

Shoreline re-armoring (i.e., shoreline stabilization/revetment) consists of improving the shoreline to stop ocean erosion of the shoreline by constructing a new stone-armored revetment capable of withstanding storm wave energy to maintain a stable shoreline and to avoid future erosion of the shorelines. All new revetment would be placed within the original shoreline footprint. The re-armoring (shore stabilization) design took into consideration future rises in sea level, wave energy and heights, and near-shore depth variance. A shoreline stabilization design has been prepared and is summarized below (the full text and figures are located in the Kwajalein Landfill Removal Action Memorandum):

- Design armor stone size is based on the anticipated storm wave energy. The armoring stone would be obtained from the most feasible location, preferably from the United States. The breaking wave height was also used to design the elevation of the crest of the revetment. Breaking waves cause a flux of water toward the shoreline and up-slope until washing back offshore. The crest elevation was estimated to minimize the water volume overtopping the crest of the revetment due to this uprush of water. Extreme (i.e., storm) waves are depth-limited at the site because of the existence of the offshore reef. This means the depth of the reef acts to limit the size of the waves that can impact the shoreline unbroken. As a conservative estimate, the design wave height was based on the maximum storm wave height that would break at the reef edge at high tide level (+3.4 ft msl, determined from a local National Oceanic and Atmospheric Administration [NOAA] Tides and Currents station) and anticipated sea level rise (+1.60 ft over 50–100 years) at this location. The resulting breaking wave height (5.4 ft) was used to design the necessary stone size for stability (using equations from the United States Army Corps of Engineers [USACE] Coastal Engineering Manual). A 4,000-pound (2-ton) median weight stone was estimated, which has an approximate diameter of 3 ft. The median design bedding stone size is typically estimated at 10 percent of the armor stone size, yielding a 400-pound design bedding stone weight. This corresponds to an approximate diameter of 1.3 ft. Both armor and bedding stone would comprise a range of sizes around their median values of approximately 2 to 4 ft and 0.5 to 1.5 ft, respectively. The final armoring design will review sea level rise value, wave energy and heights and the near-shore depth variance.

- Remove existing trash, concrete, rubble, concrete, and metal debris from the shoreline to expose the native material and reef rock under the debris. Sort and stockpile concrete and stone that can be used as bedding stone for the new revetment. Stockpiled concrete on the island from prior demolition projects may be useful for bedding stone. This stockpiled debris will be tested for lead based paint, asbestos, and other possible contaminants before use. Recovered metal would be sent to the CONUS for recycling, and the concrete and stone would be crushed and stockpiled for later use as aggregate in other parts of the project.

- Grade and compact the shoreline as necessary to achieve a stable slope (3:1 maximum slope) and to achieve the grade necessary to construct the shoreline armoring. A geotechnical investigation would be conducted to determine the design requirements for a stable slope. Place geotextile fabric to prevent erosion of the sub-base.

- Construct the rock revetment. All new revetment would be placed within the original shoreline footprint. The revetment would be supported at the base by an approximately 9-ft wide structural “toe” comprising armor and imported bedding stone. From the inshore edge of the toe, the armor and bedding stone would extend up the bank to crest at an elevation similar to that of the shoreline behind. The crest would extend inshore, horizontally, a minimum of 9 ft from the top of the slope, and would roughly match up with the surface elevation at the top of the shoreline. Large armor rock and bedding stone would be placed to stabilize the shoreline. The revetment would be constructed of a 6-ft thick layer of armor stone placed over a 2- to 3-ft thick layer of bedding stone. The bedding stone would be placed on top of the geotextile fabric on the graded shoreline. General designs for a revetment should include a consideration of the main components of the structure, namely the filter layer (if applicable), the armor layer, and the toe protection. To avoid and prevent undermining the toe from wave attack, anchors (e.g., revetment pins, stakes, poles, toe apron, etc.) would be used to stabilize the toe stones and secure the toe stone in place. There is a sizeable quantity of construction debris/concrete stockpiled on the island (slabs, rubble) remaining from various demolition projects. Some of the stockpiled concrete may be useful to provide bedding stone and temporary armoring during the project. This stockpiled debris would be tested for lead based paint, asbestos, and other possible contaminants before use.

All construction would be contained within the existing footprint of the shoreline debris disturbed area; if construction maneuvering outside of the existing footprint of the shoreline debris disturbed area is required, action would be discussed with the Environmental Manager prior to execution. The reef flat is a previous disturbed area, and heavy equipment would be on the reef flat within 15 feet of the toe of the shoreline on a “as needed” basis to accomplish the metal removal and shoreline stabilization. New fill would not be placed beyond the limits of existing fill. The limits of existing fill would be clearly marked. To minimize the transport of materials or sediment, erosion control would be placed on the shoreline above the high tide level. Work would be staged and sequenced to minimize erosion of sediment or debris to the reef. Before construction begins, a heavy-duty silt curtain would be installed on the reef, just offshore of the construction extents, to act as an environmental barrier and to prevent material from eroding and reaching the reef. The silt curtain would be anchored at the bottom, and the top would have buoys so it floats on the tide. A work plan would be developed that presents the full details of sediment and erosion control. A turbidity-monitoring plan would be prepared to define the action to be taken if turbidity levels exceed 10 Nephelometric Turbidity Units (NTUs) above background levels.

2.1.2 Close Existing Landfill with Impermeable Cap (Component in Removal Action Memorandum Alternative B)

The existing landfill would be closed by grading the refuse together and constructing an impermeable cover with a stormwater drainage system to stop precipitation infiltration and contaminant leaching through the waste. Metal debris would be removed and transported off-island to an appropriate location for recycling. This option would stop precipitation infiltration and contaminant leaching through the waste to groundwater and marine water.

Vegetation would be chipped and cleared. The refuse remaining in the landfill would be graded together and compacted to form one waste pile covering approximately 5 acres in size with a maximum height of 35 to 40 ft. The remaining refuse would become one landfill prism/pile, in a consolidated area with suitable slopes. The bottom of the refuse in the landfill is expected to be above the seasonal high groundwater table. The landfill would be set back 60 ft from the top of the shoreline to allow space for access, stormwater control, and vegetative shoreline planting, and to place the landfill waste further from the marine environment. This material would have sides with a maximum slope of 3:1 (horizontal: vertical) for stability. An impermeable liner with a vegetated cover would be constructed to isolate the waste from precipitation. The cover would be composed (from top to bottom) of a vegetative grass cover, top soil, drain sand, a high-density polyethylene (HDPE) liner, a geosynthetic clay liner (GCL), and a low-permeability silty-clay soil layer. All of these materials are required to be imported because there is no on-island source.

The cover system would be designed to shed precipitation and prohibit infiltration of water into the waste, thereby preventing contaminants from migrating down through the waste and into groundwater. The soil layer in the cover prevents waste from puncturing the HDPE liner and GCL. The cover would be designed to shed all precipitation as non-contaminated runoff to the perimeter where it would be captured and conveyed in a stormwater ditch to an ocean outfall pipe. It is anticipated that low-growing vegetation may be used in the cover. Six landfill gas vents would be installed to remove landfill gas so it does not collect under the liner.

Stormwater at the closed landfill would sheet flow to ditches around the cover and discharge to an outfall at the top of the shoreline revetment. A new outfall would be constructed (previous outfall no longer in use). The Point Sources DEP (DEP-06-002.1) would be updated to include the new outfall as a continuous discharge, and routine monitoring requirements would be established. Additionally, UES Section 3-2.7.1 would be followed. Ditches would be lined and riprapped to prevent erosion. A tide gate is not needed because the new outfall would be designed and constructed to be above future high tide level and storm wave action. The stormwater ditch sizing is based on NOAA rainfall intensity values for the Marshall Islands, and designed to provide capacity for conveying the 25-year design rainfall event with a minimum of 9 inches of freeboard or available space. Long-term monitoring would continue to confirm that the cap is an effective remedy. If the water table rises and flushes out more contaminants that are currently in the vadose zone, a slurry wall on the up-gradient side of the capped landfill might be considered to divert groundwater around the landfill.

Figure 2-2a is an aerial photograph of the south end of the landfill looking northwest. Figure 2-2b is an aerial photograph of the south end of the landfill looking south.

NORTH

Aerial Photograph of South End of Landfill Looking Northwest

West Kwajalein Island

Figure 2-2a

NORTH

Aerial Photograph of North Side of Landfill Looking South

West Kwajalein Island

Figure 2-2b

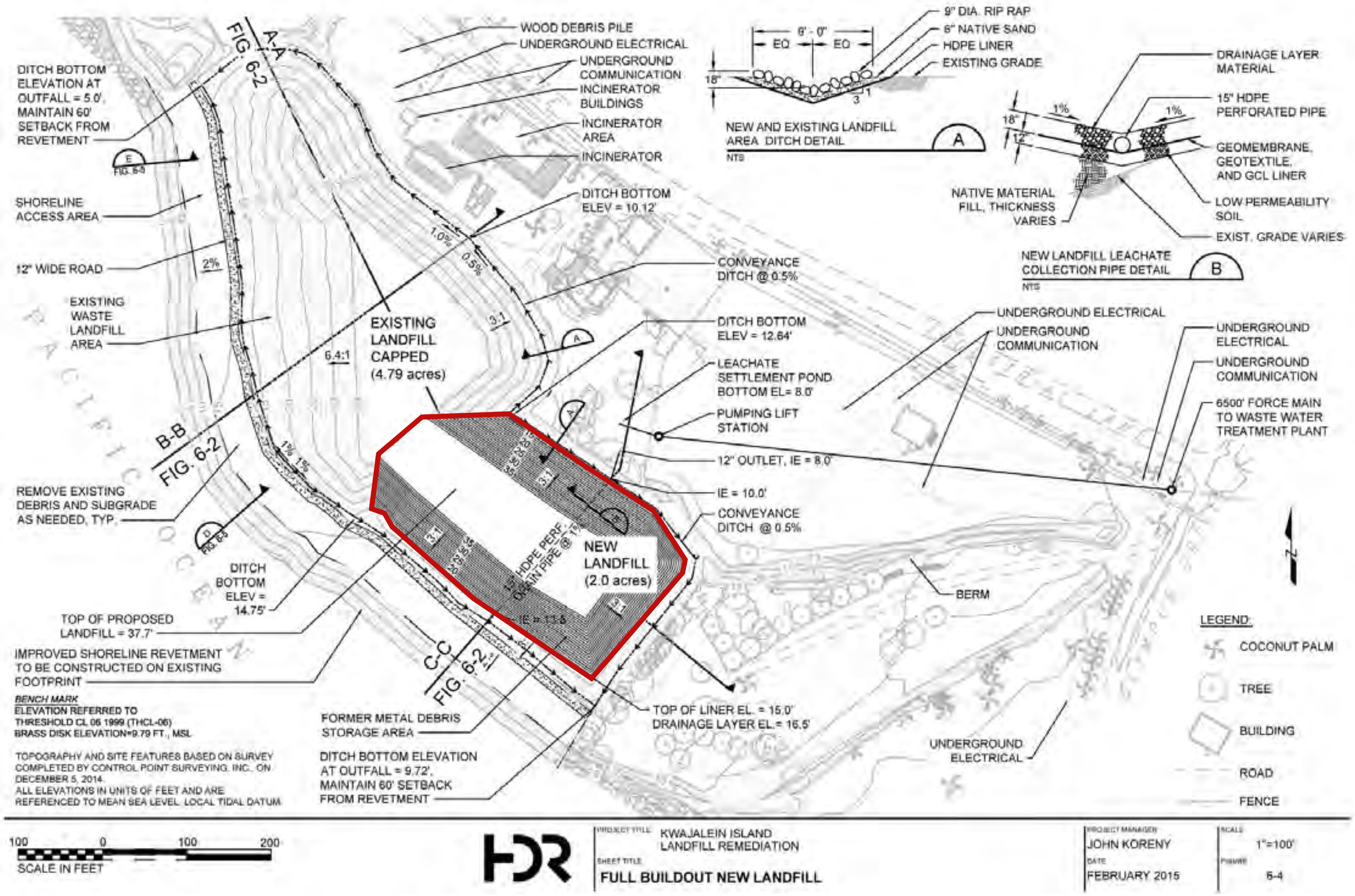
2.1.3 Close Existing Landfill, Excavate and Transport Existing Refuse CONUS and Cover with Top-soil (Component in Removal Action Memorandum Alternative C)

Under Removal Action Memorandum Alternative C, the landfill would be closed, and the 110,000 cubic yards of waste would be excavated, stockpiled, and transported by tug and barge to a western CONUS port and transported by rail to an appropriate CONUS disposal location. The former landfill area would be covered with a 6-inch thick layer of topsoil and hydro-seeded. The 6 acres in the existing landfill area would then be available for other appropriate land uses.

2.1.4 Construct New Landfill (Component in Removal Action Memorandum Alternatives B and C)

A new, lined sanitary landfill would be constructed for future disposal of incinerator ash, plant material, and biosolids; metal refuse would be sent off-island for recycling. It is anticipated that future construction and demolition debris would either be recycled or shipped off island to the CONUS for disposal. A new 2-acre landfill would be created in the area to the southeast of the existing landfill (within the current metals storage area and to the southwest of the buried fiber optic cable). To achieve full capacity, the new landfill waste would be placed against the south side of the regraded and closed existing landfill (Figure 2-3). This configuration provides for 41,000 cubic yards of capacity. The landfill capacity lifespan would be about 99 years based on the assumption that municipal waste is incinerated and the combined ash and biosolids landfill rate is 1 cubic yard/day plus 2 inches of cover soils, which are the biosolids.

The new landfill bottom would be graded, and the new landfill would be a minimum of 60 ft from the shoreline to provide access and to set the waste back from the marine environment. The landfill grade would be designed with a 1 percent slope and to balance cut and fill. The new landfill liner would be composed of (from top to bottom) a drainage layer, geotextile, geomembrane, a GCL, and low permeability soil. There would be at least 10 ft of vertical separation between the liner (minimum elevation 13 ft above mean sea level [amsl]) and the seasonal high groundwater table (maximum elevation 2 ft amsl). The final design will consider the sea level rise and its impact on the seasonal high water table level value.



Explanation

Proposed New Landfill Boundary

Location of Proposed New Kwajalein Landfill

West Kwajalein Island

Figure 2-3

The new landfill would be constructed to operate in a multi-cell operation where waste is placed in an active cell within a portion of the overall lined facility. Earthen berms would be constructed to isolate the waste in the active cell as the landfill is being filled to limit exposed area and leachate generation. A temporary movable cover is included as an option to be placed atop the active cell waste area to reduce or prevent leachate generation. However, to be conservative the sizing of the leachate collection system is based on full exposure of the entire waste area to precipitation.

The new landfill stormwater ditches would be sized to drain precipitation from the entire landfill area. This design allows the ditch to be used when the new landfill is closed and collects runoff from the final covered surface.

The ditches would flow around the cover perimeter and discharge to the newly constructed outfall on the corner of the new landfill. The new landfill ditches are sized for the 25-year design rainfall event with 9-inches of freeboard.

The new active landfill would be constructed and created with a leachate collection system, with a floor and integral perimeter berm to contain the waste material within the landfill footprint. The collected contaminated stormwater runoff would be conveyed via a gravity pipe to a leachate pond for settling and then pumped in a force main pipeline to the island's WWTP. The leachate pond would be lined with an impermeable liner and approximately 0.2 acre in size. The bottom of the pond would be excavated down to an elevation of 8 ft amsl, so leachate gravity-flows from the landfill to the pond through a conveyance pipe. The conveyance pipe from the landfill cell to the leachate pond would be a 15-inch diameter HDPE pipe running at a 0.5 percent slope for approximately 400 ft between the edge of the landfill and the leachate pond. The leachate pond and discharge pipe have been sized to accommodate the 100-year storm event for the landfill and the pond. The leachate collection pond would discharge to the island WWTP.

However, the existing sanitary sewer pipeline to the WWTP does not have the excess capacity needed for the landfill leachate, so a new pipeline would be needed. The design includes a 6,500-ft-long force main pipeline (8-inch diameter). The pump station and force main pipe would be designed to handle a 100-year 24-hour rainfall event, including all precipitation that falls into both the active landfill and the leachate pond. The collected water would be discharged to the WWTP and then to the lagoon.

Waste would be placed in the new landfill so that the side slopes are 3:1. The maximum estimated capacity of the new 2-acre landfill is approximately 41,000 cubic yards. Once waste placement is complete at the new landfill, it would need to be closed by constructing an impermeable covered cap as described previously for the existing landfill.

2.1.5 Transport Future Refuse (Component in Removal Action Memorandum Alternative D)

Future incinerator ash and biosolids would be placed in roll-off containers and periodically shipped to the CONUS for disposal in a licensed sanitary waste landfill. There is regular container shipping from Kwajalein to the CONUS. No additional facility improvements would be needed. A new landfill would not be constructed if it is determined that all future refuse would be transported to the CONUS.

2.1.6 Shoreline Stabilization for Landfill Shoreline (Component in Removal Action Memorandum Alternatives B, C, and D)

The current shoreline at the landfill is composed of concrete debris (blocks and slabs), rubble, coral, and embedded metal debris (the surface metal debris was removed during the summer of 2015). The concrete debris was evidently remnants of former foundations, roads, or runway. In places the shoreline has eroded back into the landfill debris, and the concrete debris was placed along the shoreline in an effort to stop erosion. The current shoreline configuration is not stable and may continue to erode which would potentially destabilize the existing or proposed new landfill.

The shoreline stabilization process for the landfill area shoreline is the same concept design for the re-armoring of the shoreline east of the landfill (as discussed in Section 2.1.1). It is also assumed that metal debris from this portion of the shoreline would need to be removed over about 1,200 linear ft (two-thirds of the 1,800 linear ft) of shoreline in front of the landfill. Part of this reach of the shoreline near the Shark Pit already has a rock revetment, and there likely are some areas without metal debris that do not require restoration. It is assumed that the shoreline work area from the bottom toe to the top crest for this portion of the shoreline is also about 45 linear ft.

Refer to Section 2.1.1 for the full discussion on the shoreline stabilization process.

2.1.7 Water Quality Monitoring (Component in Removal Action Memorandum Alternatives A, B, C, and D)

Water quality monitoring would occur to evaluate the remedial effectiveness for the metal removal and shoreline re-armoring. For Removal Action Memorandum Alternative A, remedial water quality monitoring would occur quarterly for 1 year followed by an additional 5-year period to evaluate the reduction load of contaminants to groundwater and inter-tidal marine water. This monitoring is not post-closure monitoring per UES Section 3-6.5.7(c)(6)(vii). Water quality monitoring will include all of the contaminants of concern, and the need for more-frequent monitoring will be evaluated after quarterly monitoring has been completed. A water quality monitoring plan would be developed as part of the proposed alternative. If after the additional 5 years the monitoring data indicates removal actions were not effective to restore water quality, additional alternatives would be considered and its components would be implemented. If it is determined additional alternatives would be necessary, a full re-analysis of all environmental resources would be conducted to ensure that there have not been any changes in the affected environment.

Water quality monitoring would occur to evaluate the remedial effectiveness of (1) landfill closure by grading and capping; (2) landfill closure for with landfill excavation and shipping of refuse to CONUS; (3) construction of a new landfill; (4) transport of future refuse incinerator ash to CONUS landfill; and (5) stabilization of shoreline by constructing a new revetment alone the original landfill shoreline footprint. For these components, which are associated with Removal Action Memorandum Alternatives B–D, a long-term (30-year) post-closure monitoring plan would be developed implemented. If it is determined additional alternatives would be necessary, a full re-analysis of all environmental resources would be conducted to ensure that there have not been any changes in the affected environment.

2.1.8 Summary of Removal Action Memorandum Alternatives and Components

Table 2-1 provides a summary of Removal Action Memorandum Alternatives and components.

Table 2-1. Summary of Removal Action Memorandum Alternatives and components.

Alternative A—Remove metals along shoreline east of landfill and long-term monitoring to determine effectiveness
1. Remove the large quantity of metals along the shoreline east of the landfill to Glass Beach (from Mt Olympus) 2. Remove the metal debris between Glass Beach and the Shark Pit 3. Remove metal debris from storage area east of and adjacent to existing landfill 4. Re-armor/reinforce the shoreline (Mt. Olympus to Glass Beach) 5. 6-year water quality monitoring to evaluate remedial effectiveness of components 1-4
Alternative B—Remove metals along shoreline east of landfill, close and cap existing landfill, new landfill for future refuse, stabilize shoreline at landfill, and long-term monitoring to determine effectiveness
1. Remove the large quantity of metals along the shoreline east of the landfill to Glass Beach (from Mt Olympus) 2. Remove the metal debris between Glass Beach and the Shark Pit 3. Remove metal debris from storage area east of and adjacent to existing landfill 4. Re-armor/reinforce the shoreline (Mt. Olympus to Glass Beach) 5. 4a—Close the existing landfill by grading the waste together and construct an impermeable cover. 6. 5a—Build a new landfill for future waste management. 7. Stabilize the shoreline at the landfill with a new revetment (original landfill shoreline footprint only) 8. 30-year water quality monitoring to evaluate remedial effectiveness of components 1-7
Alternative C—Remove metals along shoreline east of landfill, close (and cap) and transport existing landfill refuse to a CONUS landfill, new landfill for future refuse, and stabilize shoreline at landfill
1. Remove the large quantity of metals along the shoreline east of the landfill to Glass Beach (from Mt Olympus) 2. Remove the metal debris between Glass Beach and the Shark Pit 3. Remove metal debris from storage area east of and adjacent to existing landfill 4. Re-armor/reinforce the shoreline (Mt. Olympus to Glass Beach) 5. 4b—Existing refuse in landfill would be excavated and shipped to CONUS. Landfill would be covered with soil. 6. 5a—Build a new landfill for future waste management 7. Stabilize the shoreline at the landfill with a new revetment (original landfill shoreline footprint only) 8. 30-year water quality monitoring to evaluate remedial effectiveness of components 1-7
Alternative D—Remove metals along shoreline east of landfill, close and cap existing landfill, transport future refuse to a CONUS landfill, stabilize shoreline at landfill, and long-term monitoring to determine effectiveness
1. Remove the large quantity of metals along the shoreline east of the landfill to Glass Beach (from Mt Olympus) 2. Remove the metal debris between Glass Beach and the Shark Pit 3. Remove metal debris from storage area east of and adjacent to existing landfill 4. Re-armor/reinforce the shoreline 5. Close the existing landfill by grading the waste together and construct an impermeable cover 6. 5b—Future incinerator ash would be transported to a licensed sanitary waste landfill; a new landfill would not be built 7. Stabilize the shoreline at the landfill with a new revetment (original landfill shoreline footprint only) 8. 30-year water quality monitoring to evaluate remedial effectiveness of components 1-7

Notes:

Blue = Common to all Alternatives (A–D)
Green = Common to Alternatives B, C, and D
Red = Unique to Alternative C
Orange = Unique to Alternative D

2.2 CONSTRUCTION PHASE AND NOISE GENERATING ACTIVITIES ASSOCIATED WITH THE COMPONENTS

The construction phase is anticipated to be 12 months. The mobilization of materials and equipment would be for 6 months; the construction period would be for 9 months. Table 2-2 provides an overview of the construction phases.

Table 2-2. Construction phase.

Construction Phase	Quarter 1	Quarter 2	Quarter 3	Quarter 4
Contractor Mobilizes Materials and Equipment				
Construction Period				
Construct Shoreline Improvements				
Construction Management				
Construction Completion				

During execution of the components in Removal Action Memorandum Alternatives A–D, noise would be generated from construction equipment used for clearing, grubbing, and grading of 2 to 7 acres. Noise would also be generated during removal and stockpile of soils, excavation of stormwater ditches, excavation of trenches, and removal of existing relic stone and regrading of the shoreline. Tables 2-3 through 2-7 list potential noise generating activities anticipated for each component in Removal Action Memorandum Alternatives A–D.

Table 2-3. Noise generating activities for Removal Action Memorandum Alternative A—shoreline metals removal east of landfill.

Item	Noise Generating Activity	Unit	Quantity
1	Remove metal debris, existing relic stone and regrade shoreline	CY	6,897
2	Heavy duty geotextile (including placement)	SY	6,492
3	Bedding stone (modified from relic stone and placed)	ton	7,985
4	Armor stone (including placement)	ton	14,288

Notes: CY = cubic yards SY = square yards

Table 2-4. Noise generating activities for Removal Action Memorandum Alternative A—Remove Debris Mound between Glass Beach and the Shark Pit.

Item	Noise Generating Activity	Unit	Quantity
1	Cleaning and grubbing	acre	4
2	Excavation, sorting metals, stocking soil	CY	30,000
3	Revegetating	acre	4

Notes: CY = cubic yards

Table 2-5. Noise generating activities for Removal Action Memorandum Alternative B—close existing landfill, new landfill for future refuse, stabilize shoreline at landfill area.

Item	Noise Generating Activity	Unit	Quantity
CLOSE EXISTING LANDFILL			
1	Clearing and grubbing	acre	7
2	Refuse relocation	CY	59,727
3	Existing landfill grading	acre	5
4	6" HPDE pipe LFG vents	feet	150
5	12" cover low-permeability soil	CY	8,006
6	Cover GCL	SY	24,019
7	Cover 60 mil HDPE geomembrane	SY	24,019
8	Geomembrane strip drain	LF	13,900
9	12" drain sand	CY	8,006
10	12" topsoil	CY	8,006
11	Hydroseed	acre	7
12	Stormwater ditch excavation and haul	CY	650
13	Stormwater ditch quarry spalls	ton	1,000
14	Stormwater ditch 60 mil HDPE geomembrane	SY	2,000
15	Stormwater outfall (north)	LS	1
CONSTRUCT NEW LANDFILL			
16	Clearing and grubbing	acre	2
17	Load and haul existing metal debris	ton	6,700
18	Remove and stockpile soils	CY	4,594
19	New landfill grading	acre	2
20	Liner GCL	SY	9,678
21	Liner 60 mil HDPE geomembrane	SY	9,678
22	16 oz. geotextile	SY	9,678
23	18" drainage layer material	CY	4,839
24	12" liner low permeability soil	CY	3,226
25	15" HDPE pipe for leachate toe collector	LF	351
26	Berm soil	CY	4,594
27	Stormwater ditch excavation incl. haul	CY	60
28	Stormwater ditch quarry spalls	ton	325
29	Stormwater ditch 60 mil HDPE geomembrane	SY	700
30	Stormwater outfall (south)	LS	1
31	Lining of leachate pond, 60 mil geomembrane	SY	1,000
32	Leachate pipe force main incl. trench. & install	LF	6,600
33	Leachate system lift station (prefab unit)	LS	1
34	Structure excavation trench and haul	LF	1,000
35	18" diameter drain pipe (Installed)	LF	200
36	Crushed surface base course 12' wide x 1' deep	ton	954
37	Fabric building 75 x 100 complete	EA	1
38	Fabric structure concrete stem walls installed	LS	1
LANDFILL SHORELINE REVETMENT WITH ARMOR STONE (original landfill shoreline footprint only)			
39	Remove existing relic stone and regrade shoreline	CY	6,897
40	Heavy duty geotextile (including placement)	SY	6,492
41	Bedding stone (modified from relic stone and placed)	ton	7,985
42	Armor stone (including placement)	ton	14,288

Notes: CY = cubic yards LF = linear feet LS = lump sum SY = square yards

Table 2-6. Noise generating activities for Removal Action Memorandum Alternative C—transport existing landfill refuse to a CONUS landfill, new landfill for future refuse, stabilize shoreline at landfill.

Item	Bid Item Description	Unit	Quantity
TRANSPORT REFUSE AT EXISTING LANDFILL TO CONUS LANDFILL			
1	Clearing and grubbing (equipment only, no materials shipping)	acre	7
2	Remove, stockpile, and load refuse	CY	110,000
3	Topsoil	CY	7,623
4	Hydroseed	acre	6
5	Dispose of refuse in mainland United States	CY	110,000
CONSTRUCT NEW LANDFILL			
6	Clearing and grubbing	acre	2
7	Remove and stockpile soils	CY	4,594
8	New landfill grading	acre	2
9	Liner GCL	SY	9,678
10	Liner 60 mil HDPE geomembrane	SY	9,678
11	16 oz. geotextile	SY	9,678
12	18" drainage layer material	CY	4,839
13	12" liner low permeability soil	CY	3,226
14	15" HDPE pipe for leachate toe collector	LF	351
15	Berm soil	CY	4,594
16	Surface water conveyance ditch excavation including haul	CY	60
17	Surface water ditch quarry spalls	ton	325
18	Surface water ditch 60 mil HDPE geomembrane	SY	700
19	Surface water outfall (south)	LS	1
20	Lining of leachate pond complete, 60 mil geomembrane	SY	1,000
21	Leachate pipe force main	LF	6,600
22	Leachate system lift station (prefab unit)	LS	1
23	Structure excavation trench and haul	LF	1,000
24	18" Diameter drain pipe (Installed)	LF	200
25	Crushed surface base coarse for 12' wide, 12" deep	ton	954
26	Fabric building 75 x 100 complete	EA	1
27	Fabric structure concrete stem walls installed	LS	1
LANDFILL SHORELINE REVETMENT WITH ARMOR STONE (original landfill shoreline footprint only)			
28	Remove existing relic stone and regrade shoreline	CY	6,897
29	Heavy duty geotextile (including placement)	SY	6,492
30	Bedding stone (modified from relic stone and placed)	ton	7,985
31	Armor stone (including placement)	ton	14,288

Notes: CY = cubic yards LF = linear feet LS = lump sum SY = square yards

Table 2-7. Noise generating removal activities for Removal Action Memorandum Alternative D—close existing landfill, transport future refuse to a CONUS landfill, stabilize shoreline at landfill.

Item	Bid Item Description	Unit	Quantity
CLOSE EXISTING LANDFILL			
1	Clearing and grubbing	acre	7
2	Refuse relocation	CY	59,727
3	Existing landfill grading	acre	5
4	6" HPDE pipe LFG vents	feet	150
5	12" cover low-permeability soil	CY	8,006
6	Cover GCL	SY	24,019
7	Cover 60 mil HDPE geomembrane	SY	24,019
8	Geomembrane strip drain	LF	13,900
9	12" drain sand	CY	8,006
10	12" topsoil	CY	8,006
11	Hydroseed	acre	7
12	Stormwater ditch excavation and haul	CY	650
13	Stormwater ditch quarry spalls	ton	1,000
14	Stormwater ditch 60 mil HDPE geomembrane	SY	2,000
15	Stormwater outfall (north)	LS	1
TRANSPORT FUTURE REFUSE TO CONUS LANDFILL			
N/A			
LANDFILL SHORELINE REVETMENT WITH ARMOR STONE (original landfill shoreline footprint only)			
16	Remove existing relic stone and regrade shoreline	CY	6,897
17	Heavy duty geotextile (including placement)	SY	6,492
18	Bedding stone (modified from relic stone and placed)	ton	7,985
19	Armor stone (including placement)	ton	14,288

Notes: CY = cubic yards LF = linear feet LS = lump sum SY = square yards

2.3 NO-ACTION ALTERNATIVE

Under the No-action Alternative, the shoreline would remain in its current condition. This option would not reduce the potential for landfill contaminants or metal debris entering the marine environment from erosion of the shoreline. The existing landfill would remain in its current condition. Incinerator ash would continue to be placed into the refuse piles. Metal debris would remain on-site. This option would not decrease contaminant loading to groundwater or marine water. Future refuse generated on the island would be incinerated and placed in the existing landfill. This option would not decrease contaminant loading to groundwater and marine water.

2.4 COMPONENT CONSIDERED BUT ELIMINATED FROM DETAILED ANALYSIS

Groundwater Capture or Control. This option involves constructing an interceptor trench between the landfill and the shoreline to capture and treat groundwater contaminants and piping the captured water to the on-island WWTP. Another variation is to isolate the groundwater under the landfill by constructing impermeable cut-off walls around the landfill. Both of these options are likely to be ineffective. A groundwater capture system would capture both clean seawater and contaminated groundwater, which would require treatment of a large quantity of water. Treatment of seawater is extremely difficult and expensive and would require a major upgrade to the WWTP. Impermeable subsurface walls around the landfill would be difficult to construct (because of the high permeability of the subsurface soils), and they would not likely be effective because the contaminants would migrate through the porous reef rock under the upper sand aquifer.

3 Affected Environment

3 Affected Environment

This chapter describes the environmental characteristics that may be affected by the Proposed Action and the Other Alternatives Considered at USAG-KA. To provide a baseline point of reference for understanding any potential impacts, the affected environment is concisely described; any components of concern are described in greater detail.

Available reference materials, including the Kwajalein Landfill Removal Action Memorandum, Kwajalein Landfill Baseline Risk Assessment, EAs, Biological Assessments, and Biological Surveys were reviewed. Questions were directed to project, installation, and facility personnel as needed.

Environmental Resources. Fourteen broad areas of environmental consideration were considered to provide a context for understanding the potential effects of the Proposed Action and the Other Alternatives Considered, and to provide a basis for assessing the severity of potential environmental impacts. These areas include air quality, airspace, biological resources, cultural resources, geology and soils, hazardous materials and waste, health and safety, land use, noise, socioeconomics, transportation, utilities, visual aesthetics, and water resources. Of the 14 broad areas considered, 9 resources were carried forward for analysis (air quality, biological resources, geology and soil, hazardous material and waste, health and safety, noise, socioeconomics, utilities, and water). The remaining resources were not analyzed for the following reasons:

Airspace. The Proposed Action and the Other Alternatives Considered would not have the potential to adversely affect airspace. The delivery of necessary project equipment would be the only activity associated with airspace usage and would utilize existing flights resulting in no impacts to airspace. All other activities associated with the Proposed Action and the Other Alternatives Considered would occur on-ground. Therefore, no increases to the carbon footprint from activities associated with the components in Removal Action Memorandum Alternatives A–D on Kwajalein Island are anticipated.

Cultural Resources. There are no identified Areas of Potential Effects (APE) within the potential project areas. Figure 3-1 shows high sensitivity cultural sites adjacent to or situated away from the potential project areas. A historical structure (Facility 1559) is 958 ft from the landfill and 2,077 ft from the shoreline; Building 698 is 946 ft from the landfill and 1,559 ft from the shoreline; Building 1004 is 834 ft from the landfill and 999 ft from the shoreline; and the Japanese Burial (Facility 1012) is 1,132 ft from the landfill and 1,606 ft from the shoreline. There is always the potential for subsurface remains to be unexpectedly encountered during intentional and unanticipated ground disturbing activities. If any unexpected resources are encountered during the proposed activities, the activities would cease in the immediate area and the Kwajalein Cultural Resources Manager would be notified. The documentation and curation of any WWII artifacts would be coordinated with the Cultural Resources Manager. Subsequent actions and notifications would follow the guidance provided in the UES Section 3-7 and the Cultural Resources DEP. On-site archaeological monitoring may be used, when deemed necessary, during the removal action process; the installation's Cultural Resources Manager would be notified when large or potentially significant metal debris is being pulled out of the shoreline.

Land Use. There are no planned changes to the current land designation or zoning codes for land use patterns on Kwajalein Island. The designated use of the landfill (i.e., receiving, storing, and incinerating refuse) and shoreline area would not alter due to the execution of the components in Removal Action Memorandum Alternatives A–D.

Transportation. The transport of equipment and project materials in support of the Proposed Action and the Other Alternatives Considered could be accomplished by ocean vessels or by plane. These types of transport actions are routine and are not anticipated to result in any additional impacts to the existing transportation systems. The presence of equipment and personnel may result in a temporary disruption to island transportation in the immediate vicinity of the work sites; however, any potential effects on island roads or ocean routes would be short-term. Transportation procedures would continue to comply with all applicable safety regulations. The number of barge trips to ship refuse to the CONUS is not anticipated to increase beyond the current number; therefore, no noticeable increases to the carbon footprint from transportation activities associated with the components in Removal Action Memorandum Alternatives A–D on Kwajalein Island are anticipated.

Explanation

- Road Curbline
- Current Landfill Boundary
- Shoreline with Metals Debris (Landfill Area)
- Shoreline with Metals Debris (Mt. Olympus to Glass Beach)
- Japanese Burials
- High Sensitivity
- Moderate Sensitivity
- Low Sensitivity
- Post-1945 Fill

NORTH

0 250 500 1,000 Feet

Cultural Resources

Kwajalein Island

Figure 3-1

3-1_Cultural, 1/20/2016

Visual Aesthetics. The Proposed Action would not alter the current scenic quality of the areas in view of the shoreline and landfill. The removal the metal debris would be a benefit to the aesthetic view of the shoreline area.

3.1 AIR QUALITY

Air quality is determined by the concentration of various pollutants in the atmosphere. The air quality standards are designed to maintain current air quality at USAKA. Ambient air concentrations for criteria pollutants are not allowed to increase above the level predicted to exist on the effective date (February 2013) of these standards by more than an increment of 25 percent of the U.S. National Ambient Air Quality Standards (NAAQS) for the criteria pollutant. In no case shall ambient air quality concentrations for a criteria pollutant be allowed to exceed 80 percent of any U.S. NAAQS.

3.1.1 Existing Conditions

For the air quality analysis, the region of influence for the Proposed Action is Kwajalein Island. Current ambient air quality standards are provided in the UES (U.S. Department of the Army, 2014). Table 3-1 lists these air quality standards, and Table 3-2 lists air pollutant thresholds for major stationary sources that have the potential to adversely impact the air quality standards.

Table 3-1. USAG-KA ambient air quality standards.

Pollutant	Averaging Period	USAG-KA Ambient Standard*	USAG-KA Increment Degradation Standards** (µg/m³)
Carbon monoxide (CO)	1-hour	32,000 µg/m³ (28 ppm)	10,000
	8-hour	8,000 µg/m³ (7.2 ppm)	2,500
Nitrogen dioxide (NO_2)	1-hour	150 µg/m³ (0.08 ppm)	47
	Annual	80 µg/m³ (0.04 ppm)	25
Ozone (O_3)	8-Hour	120 µg/m³ (0.06 ppm)	38
Sulfur oxide (SO_X)	1-hour	157 µg/m³ (0.08 ppm)	49
Lead (Pb)	3 months	0.12 µg/m³	0.40
Particulate matter ($PM_{2.5}$)	24-hour	28 µg/m³	9
	Annual	9.6 µg/m³	3.0
Particulate matter (PM_{10})	24-hour	120 µg/m³	38

Source: U.S. Department of the Army, 2014, Table 3-1.6.1
Notes:
* = Values reflect 80% of U.S. NAAQS
** = Values reflect 25% of U.S. NAAQS
µg/m³ = micrograms per cubic meter ppm = parts per million $PM_{2.5}$ = particulate matter equal to or less than 2.5 microns in size
PM_{10} = particulate matter equal to or less than 10 microns in size (also called respirable particulate and suspended particulate)

Table 3-2. USAG-KA air pollutant thresholds for major stationary sources.

Pollutant/Parameter	Potential to Emit
Carbon monoxide	100 tons per year (tpy)
Nitrogen oxides	40 tpy
Ozone	40 tpy of volatile organic compounds
Sulfur oxide	40 tpy
Lead	0.6 tpy
Particulate matter ($PM_{2.5}$)	25 tpy of particulate matter emissions 15 tpy of PM_{10} emissions 10 tpy of $PM_{2.5}$ emissions
Municipal waste combustor organics (measured as total tetra-through octaclorinated dibenzo-p-dioxins and dibenzofurans)	3.5×10^{-6} tpy
Municipal waste combustor metals (measured as particulate matter)	15 tpy
Municipal waste combustor acid gases (measured as sulfur dioxide and hydrogen chloride)	40 tpy
Municipal solid waste landfill emissions (measured as no-methane organic compounds)	50 tpy
Fluorides	3 tpy
Sulfuric acid mist	7 tpy
Hydrogen sulfide (H_2S)	10 tpy
Total reduced sulfur (including H_2S)	10 tpy
Reduced sulfur compounds (including H_2S)	10 tpy

Source: U.S. Department of the Army, 2014, Table 3-1.5.2; 40 CFR 52.21(b)(23)(i), Amended at 73 FR 28349, 16 May 2008; 1 July 2011
PM_{10} = particulate matter equal to or less than 10 microns in size (also called respirable particulate and suspended particulate)
$PM_{2.5}$ = particulate matter equal to or less than 2.5 microns in size

3.1.2 Climate Change

Kwajalein Island has a marine tropical climate characterized by warm and humid conditions. A relatively dry windy season occurs from mid-December to mid-May, with a wet calm season occurring from mid-May to mid-December. The island receives approximately 100 inches of rainfall a year, over 70 percent of which occurs in the form of showers during the wet season. Thunderstorms are infrequent on Kwajalein and only occur an average of 12 days a year. Additionally, tropical storms with sustained winds of 40 to 74 miles per hour (mph) typically only impact the atoll once every 4 to 7 years (Atmospheric Technology Services Company/Reagan Test Site, 2015). Yearly rainfall totals can vary considerably (59 to 138 inches/year) (Gingerich, 1992). The wettest month on Kwajalein is generally September (11.82 inches), whereas February is typically the driest month with a monthly average of 3.73 inches. The maximum monthly average temperature of 87 degrees Fahrenheit (°F) occurs in September, and the minimum monthly temperature (85.6°F) occurs in January. Prevailing winds are from the east year round. Humidity on Kwajalein Atoll is relatively high year-round, with an average annual humidity of approximately 80 percent (U.S. Army Center for Health Promotion and Preventive Medicine, 1998).

3.2 BIOLOGICAL RESOURCES

Native or naturalized vegetation, wildlife, and the habitats in which they occur are collectively referred to as biological resources. For the purpose of discussion, biological resources have been divided into the areas of vegetation, wildlife, threatened and endangered species, and environmentally sensitive habitat.

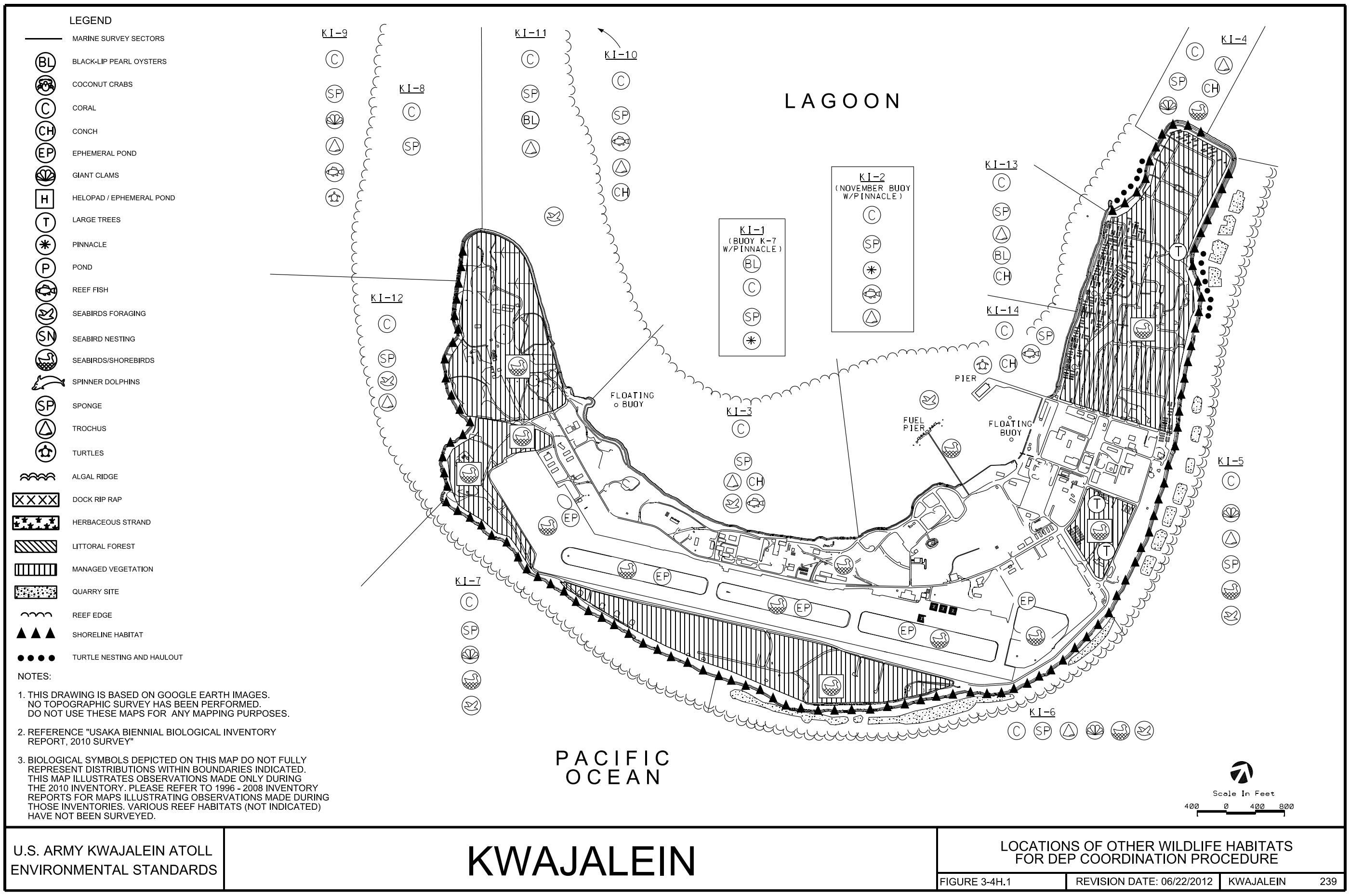
The descriptions of biological resources with the potential to occur in the project area are based on past surveys conducted by the U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS). Regulations governing endangered species and wildlife resources at USAKA are specified in UES Section 3-4. Reef protection standards at USAKA are specified in Section 3-2 of the UES.

In accordance with the UES, a natural resource baseline survey must be conducted every 2 years to identify and inventory protected or significant fish, wildlife, and habitat resources. Biennial survey reports for endangered species and other terrestrial resources were prepared by USFWS and NMFS for surveys conducted on USAKA in 2004, 2008, 2010, and 2012. A site-specific survey for marine resources was conducted by NMFS in the project area in September 2015 (Kolinski, 2015).

The UES provide protection for a wide variety of marine mammals, sea turtles, fish, coral species, migratory birds, and other terrestrial and marine species and habitat that are considered of significant biological importance. The UES address procedures for consultation on effects to both protect species and habitats and those of local or regional significance.

3.2.1 Existing Conditions

The region of influence for biological resources includes areas within the shoreline east of the landfill area continuing southeast along the shoreline to Glass Beach. Removal of metal debris and shoreline armoring and stabilization in this area has the potential to affect terrestrial resources within 50 yards of the shoreline toe and marine water resources in the ocean surrounding Kwajalein that could be affected by proposed activities. Closure of the existing landfill and construction of a new landfill have the potential to affect terrestrial resources in the immediate area of disturbance (approximately 9 acres) and within 50 yards of construction activities. Figure 3-2 shows the categories of biological resources observed during the 2010 surveys around Kwajalein. The project area corresponds to survey sites KI-7 and KI-12.



Categories of Biological Resources - Kwajalein Island - 2010 Survey

Kwajalein Atoll

Figure 3-2

3.2.1.1 Vegetation

Kwajalein Island has undergone extensive development since the 1930s, and as a result, very little natural vegetation is present. The open areas of vegetation identified in the 2010 surveys are considered managed and contain nonnative grasses and weeds that are maintained by mowing. Small areas of herbaceous strand still exist along the coast in some places, and patches of littoral shrub land dominated by the genera *Tournefortia* and *Scaevola* are present in some areas (U.S. Fish and Wildlife Service and National Marine Fisheries Service, 2012). No littoral shrub or herbaceous strand vegetation has been recorded in the project area.

Globally, marine vegetation groups include dinoflagellates; blue-green algae; green algae; diatoms, brown and golden-brown algae; red algae; and seagrass and mangroves. The marine vegetation category serves a vital function in part by maintaining a healthy coral reef. Dinoflagellates, diatoms, and radiolarians serve as Foraminiferan shells and are food to many animals and are major components in the lowest level of the marine food web, the phytoplankton. Coralline algae serve as the “cement” to hold the pieces of stony corals, mollusk shells, and other materials together, so dry land can be formed.

Abundant blue-green, green, brown, red, and coralline algae are present at Kwajalein (U.S. Army Space and Strategic Defense Center, 1993). Little information is published for marine vegetation for the southwestern shore of Kwajalein. While the rare seagrass *Halophila minor*, a UES coordination seagrass species, is known for the lagoon on Kwajalein (U.S. Army Space and Strategic Defense Center, 1993), none were documented within the project area. Kolinski (2015) conducted an assessment of the project area in September 2015—between the Surfers’ Steps and outer landfill region of Mount Olympus—he noted that the bottom substrate along the inner reef flat consisted mainly of sand, algae, and scattered corals with consolidated limestone pavement, but did not specify the type/species of algae.

Observed marine plant genera in the region of the project area during the 2010 marine biological inventory conducted for USAKA included green algae (Caulerpa, Dictyosphaeria, Halimeda, Microdictyon, and Neomeris), brown algae (Dictyota and Padina), red algae (Asparagopsis, Jania, and Hydrolithon), and blue-green algae (Lyngbya) (U.S. Fish and Wildlife Service and National Marine Fisheries Service, 2012).

3.2.1.2 Wildlife

3.2.1.2.1 Terrestrial

Kwajalein Island attracts a variety of migratory birds due to its relatively large size, fresh water habitats, and expansive areas of managed vegetation (U.S. Fish and Wildlife Service and National Marine Fisheries Service, 2012). Surveys for shorebirds and seabirds have been conducted bi-annually by the USFWS for almost 20 years, and during these surveys, over 30 different avian species have been recorded on Kwajalein Island. A list of all bird species recorded on USAKA and on Kwajalein Island is shown in Table 3-3.

Table 3-3. List of bird species observed throughout USAKA during 1996-2010 biological inventories.

Common Name	Scientific Name	UES Coordination Species	Observed on Kwajalein Island During 1996-2010 Surveys
short-tailed shearwater	*Puffinus tenuirostris*		
sooty shearwater	*Puffinus griseus*	X	
wedge-tailed shearwater	*Puffinus pacificus*	X	
brown booby	*Sula leucogaster*	X	X
red-footed booby	*Sula*	X	
great frigatebird	*Fregata minor*	X	X
Pacific reef heron	*Egretta sacra*	X	X
mallard	*Anas platyrhynchos*	X	X
northern pintail	*Anas acuta*	X	X
American wigeon	*Anas americana*		X
black-bellied plover	*Pluvialis squatarola*	X	
Pacific golden plover	*Pluvialis fulva*		X
common ringed plover	*Charadrius hiaticula*	X	
semipalmated plover	*Charadrius semipalmatus*	X	X
lesser (Mongolian) sand-plover	*Charadrius mongolus*	X	
marsh sandpiper	*Tringa stagnatilis*	X	
common greenshank	*Tringa nebularia*	X	X
wood sandpiper	*Tringa glareola*	X	X
wandering tattler	*Heteroscelus incanus*	X	X
gray-tailed tattler	*Heteroscelus brevipes*	X	X
whimbrel	*Numenius phaeopus*	X	X
bristle-thighed curlew	*Numenius tahititensis*	X	X
Hudsonian godwit	*Limosa haemastica*	X	X
bar-tailed godwit	*Limosa lapponica*	X	X
ruddy turnstone	*Arenaria interpres*	X	X

Common Name	Scientific Name	UES Coordination Species	Observed on Kwajalein Island During 1996-2010 Surveys
red knot	*Calidris canutus*	X	X
sanderling	*Calidris alba*	X	X
red-necked stint	*Calidris ruficolla*	X	X
pectoral sandpiper	*Calidris melanotos*	X	X
sharp-tailed sandpiper	*Calidris acuminata*	X	X
curlew sandpiper	*Calidris ferruginea*	X	
ruff	*Philomachus pugnax*	X	
long-billed dowitcher	*Limnodromus scolopaceus*	X	X
Japanese snipe	*Gallinago hardwickii*		
common snipe	*Gallinago*	X	X
black-naped tern	*Sterna sumatrana*	X	X
great crested tern	*Sterna bergii*	X	X
white-winged tern	*Chlidonias leucopterus*	X	X
brown noddy	*Anous stolidus*	X	X
black noddy	*Anous tenuirostris minutus*	X	X
white tern	*Gygis alba*	X	X
long-tailed cuckoo	*Eudynamis taitensis*	X	
Eurasian tree sparrow	*Passer montanus*		X
chicken	*Gallus gallus domesticus*		

Source: U.S. Fish and Wildlife Service and National Marine Fisheries Service, 2006;2010; 2012

The most commonly observed bird species include black noddies (*Anous tenuirostris minutus*), white terns (*Gygis alba*), Pacific golden plovers (*Pluvialis fulva*), ruddy turnstones (*Arenari interpres*), whimbrels (*Numenius phaeopus*), and wandering tattlers (*Heteroscelus incanus*). The introduced Eurasian tree sparrow (*Passer montanus*) was also a common avian species recorded on Kwajalein Island during the 2010 surveys. White terns may nest in pandanus trees and in tropical almonds (U.S. Fish and Wildlife Service, 2016). The common birds are either seabirds, which nest on the ground or in trees, or are migratory shorebirds, which nest in the Arctic in warmer months and migrate to winter and forage at USAKA and other Central Pacific islands. During the 2010 survey on Kwajalein Island, the largest numbers of migratory birds were observed in the water catchments, drainage ditches, and puddles near the runways and in adjacent managed vegetation (U.S. Fish and Wildlife Service and National Marine Fisheries Service, 2012).

The 2010 surveys noted that ruddy turnstones, Pacific golden plovers, and whimbrels foraged and rested on grass during periods of high tide and foraged the shoreline and exposed reef flat during low tide. Shorebirds were noted to frequently forage more on the southern and eastern shores where there is no riprap, and seabirds were present feeding offshore in this same area (U.S. Fish and Wildlife Service and National Marine Fisheries Service, 2012).

Nesting seabirds observed during the 2010 surveys included black-naped terns (*Sterna sumatrana*) and white terns (*Gygis alba*). Black-naped tern chicks were observed on harbor buoys and white terns were observed nesting in numerous locations around the island, and chicks were observed in large trees, near the town center and building areas, but not along the golf course (U.S. Fish and Wildlife Service and National Marine Fisheries Service, 2012). No nesting seabirds were recorded near the landfill area.

3.2.1.3 Threatened, Endangered, and Other Protected Wildlife Species

3.2.1.3.1 Vegetation, Birds, Non-Avian Terrestrial Wildlife

The only UES consultation avian species, the Ratak Micronesia pigeon (*Ducula oceania ratakensis*), has not been observed on Kwajalein and does not have the potential to occur in the project area. Several UES coordination avian species have the potential to occur in the project area as shown in Table 3-3. No threatened or endangered vegetation species have been identified on or offshore of Kwajalein. No U.S. federally listed terrestrial wildlife species have been identified on Kwajalein Island. No observations of seabirds nesting in the project area have been recorded.

Other non-avian terrestrial wildlife species include a limited number of native invertebrates, such as blue-spot butterfly (*Hypolimnas bolina*) and vertebrates, such as blue-tailed skink (*Emoia caeurelocauda*), as well as non-native, introduced domestic dogs (*Canis lupus familiaris*), cats (*Felis catus*), and black rats (*Rattus rattus*) (U.S. Fish and Wildlife Service and National Marine Fisheries Service, 2012). No focused surveys of native terrestrial wildlife have been conducted on Kwajalein Island.

3.2.1.3.2 Marine

The shoreline and exposed reef flat adjacent to the landfill are evident during low tide. The high energy, wave-swept reef flat supports a well-developed coral reef community. Shallow marine communities are composed of thousands of plants and animals that are part of the greater coral-reef ecosystem (U.S. Fish and Wildlife Service and National Marine Fisheries Service, 2012). Most of the area adjacent to the landfill lacks a sediment substrate and is characterized as having a hard bottom.

Previous marine biological surveys in the general area of the proposed activity have highlighted the presence of UES consultation and coordination species (U.S. Fish and Wildlife Service and National Marine Fisheries Service, 2006; 2010; 2012; 2013). The wave-swept reef flat supports a well-developed coral reef community. Various fish species from various families are included; the most common families observed here are Acanthuridae, Pomacentridae, and Labridae (U.S. Fish and Wildlife Service and National Marine Fisheries Service, 2012). Various families of non-coral macroinvertebrates are known for the project area (U.S. Fish and Wildlife Service and National Marine Fisheries Service, 2012). A marine biological inventory conducted in September 2015 of the project area recorded a few scattered UES coordination coral species (in particular, scleractinian corals) present on the outer reef flat and reef crest areas, which included *Porites* sp. (lobate) and *Pocillopora meandrina*. Sea turtles and cetaceans might be encountered here, but there have been no dedicated in-water surveys at Kwajalein focused on these species.

3.2.1.3.3 Threatened, Endangered, and Other Protected Marine Wildlife Species

UES consultation marine species that may possibly occur in and around Kwajalein Atoll include one mollusk, the top shell snail (*Trochus [Tectus] niloticus*); five fish species, including bumphead parrotfish (*Bolbometopon muricatum*), humphead wrasse (*Cheilinus undulatus*), reef manta ray (*Manta alfredi*), oceanic giant manta ray (*Manta birostris*), scalloped hammerhead shark (*Sphyrna lewini*); two sea turtles, the green turtle (*Chelonia mydas*) and hawksbill turtle (*Eretmochelys imbricata*); and 11 cetaceans, including common dolphin (*Delphinus delphis*), Risso's dolphin (*Grampus griseus*), melon-headed whale (*Peponocephala electra*), offshore spotted dolphin (*Stenella attenuata attenuate*), coastal spotted dolphin (*Stenella attenuata graffmani*), striped dolphin (*Stenella coeruleoalba*), spinner dolphin (*Stenella longirostris*), Costa Rican spinner dolphin (*Stenella longirostris centroamericana*), whitebelly spinner dolphin (*Stenella longirostris longirostris*), Eastern spinner dolphin (*Stenella longirostris orientalis*), and the sperm whale (*Physeter catodon*). These invertebrate, fish, sea turtle, and marine mammal species are widely distributed species that are protected under the UES and Endangered Species Act (ESA) or Marine Mammal Protection Act (MMPA) and have been documented near or have the potential to occur in the project area (see Table 3-4).

Several UES coordination species of coral, non-coral macro-invertebrates, and one UES coordination fish have also been observed or have the potential to occur in the project area. These species are listed in Table 3-4 and are described in the sections that follow.

Table 3-4. Threatened, Endangered, and other protected marine wildlife species with the potential to occur in the project area.

Scientific Name	Common Name	ESA or MMPA Protected Species	UES Consultation Species	UES Coordination Species
CORALS				
Acropora abrotanoides				X
Acropora digitifera				X
Hydrophora microconis				X
Leptastrea purpurea				X
Montipora digitata				X
Pocillopora damicornis				X
Pocillopora eydouxi				X
Pocillopora meandrina				X
Pocillopora verrucosa				X
Porites sp. *(lobate)*				X
NON-CORAL MACRO-INVERTEBRATES				
Tridacna squamosa	giant clam			X
Tridacna maxima	giant clam			X
Trochus (Tectus) niloticus	top shell snail		X	
FISH				
Bolbometopon muricatum	bumphead parrotfish		X	
Cheilinus undulatus	humphead wrasse		X	
Manta alfredi	reef manta ray	ESA (C)	X	
Manta birostris	oceanic giant manta ray	ESA (C)	X	
Plectropomus laevis	giant coral trout			X
Sphyrna lewini	scalloped hammerhead shark	ESA	X	
SEA TURTLES				
Chelonia mydas	green turtle	ESA	X	X
Eretmochelys imbricata	hawksbill turtle	ESA	X	X
CETACEANS				
Delphinus delphis	common dolphin		X	X
Grampus griseus	Risso's dolphin		X	X
Peponocephala electra	melon-headed whale		X	X
Stenella attenuata	offshore spotted dolphin		X	X
Stenella attenuata graffmani	coastal spotted dolphin		X	X
Stenella coeruleoalba	striped dolphin		X	X
Stenella longirostris	spinner dolphin		X	X
Stenella longirostris centroamericana	Costa Rican spinner dolphin		X	X
Stenella longirostris	whitebelly spinner dolphin		X	X
Stenella longirostris orientalis	Eastern spinner dolphin		X	X
Physeter catodon	sperm whale	ESA, MMPA	X	X

Sources: Kolinski, 2015; USFWS and NMFS 2006, 2010, 2012, 2013
ESA = Protected under the Endangered Species Act
(C) = Candidate for listing under the ESA
MMPA = Protected under the Marine Mammal Protection Act

3.2.1.3.3.1 Coral

Coral reefs are the largest biological structures on earth and are composed of millions of coral colonies. Healthy coral reefs provide shoreline protection for coastal communities and a wide range of shelter, foraging, and reproductive habitats for a variety of species (Brainard et al., 2011).

In 2004, a biological inventory survey identified 24 hard coral species of special concern on the reef flat on Kwajalein (U.S. Fish and Wildlife Service and National Marine Fisheries Service, 2006). Kolinski (2015) surveyed the reef flat habitats on the southwestern side of Kwajalein Island in September 2015 (Figure 3-3).

A = Locations of observed metal debris at distances greater than 10 to 20 meters from shore
__ = 50-meter indicator

Figure 3-3. Surveyed Reef Flat Habitats on the southwestern side of Kwajalein Island—September 2015.


Scattered UES coordination coral species


Glass Beach at low tide

In the Glass Beach area, no UES consultation species were observed in the outer portion of the reef flat where metal debris was recorded; however, a few scattered UES coordination coral species were present on the outer reef flat and reef crest areas, including *Porites* sp. (lobate) and *Pocillopora meandrina.*

From Glass Beach to Mount Olympus, the location of the majority of shoreline metal debris, UES coordination species were not observed along the shallow bench formations that extend approximately 16 ft from shore. A few scattered UES coordination coral species (in particular, scleractinian corals) were present on the outer reef flat and reef crest areas and included *Porites* sp. (lobate) and *Pocillopora meandrina*.

The reef flat between the Surfers' Steps and outer landfill region of Mount Olympus had scattered corals with consolidated limestone pavement and an increase in coral cover and diversity occurring in the outer reef flat areas. A variety of UES coordination species were observed, including *Acropora abrotanoides*, *A. digitifera*, *Hydrophora microconos*, *Leptastrea purpurea*, *Montipora digitata*, *Pocillopora damicornis*, *P. eydouxi*, *P. meandrina*, *P. verrucosa*, and *Porites* sp. (lobate) (Kolinski, 2015). Coral distributions on and in the vicinity of metal debris were found to be very limited.

3.2.1.3.3.2 Non-Coral Macroinvertebrates

Biennial surveys conducted around Kwajalein have recorded various families of non-coral macroinvertebrates are observed at the reef flat near the landfill including Axinellidae (sponges), Aplysillidae (sea hares), Halichondriidae (demosponges), Plankinidae (sea snails), Spirastrellidae (sponges), Spongiidae (horny sponges), Subertidae (sponges), Thorectidae (sponges), Serpulidae (tube building worms), Chromodorididae (sea slugs), Phyllidiidae (sea slugs), Trochidae (top snails), Vermetidae (worm snails), Strombidae (true conchs), Cypraeidae (sea snails), Cymatiidae (tritons), Muricidae (rock snails), Turbinellidae (gastropod mollusk), Conidae (cone shells), Pinnidae (pen shells), Osteridae (oysters), Tridacnidae (giant clam), Xanthidae (small crabs), Ophiuroidae (brittle stars), Echinometridae (sea urchins), Holothuridae (sea cucumbers), and Ascidiidae (sea squirts) (U.S. Fish and Wildlife Service and National Marine Fisheries Service, 2012).

Four species of giant clam are found at Kwajalein Atoll. All giant clam species are UES coordination species. Kolinski (2015) recorded the giant clam *Tridacna squamosa* during the September 2015 survey conducted between the Surfers' Steps and outer landfill region of Mount Olympus (Kolinski, 2015). Additionally, U.S. Fish and Wildlife Service and National Marine Fisheries Service (2012) recorded the giant clam *Tridacna maxima* during 2010 on the south side of Kwajalein at survey station KI-7.

The top shell snail *Trochus (Tectus) niloticus* is a UES consultation species that has a broad distribution in surveyed USAKA islands (U.S. Army Space and Strategic Defense Command, 2012). During the September 2015 survey conducted between the Surfers' Steps and outer landfill region of Mount Olympus, the top shell snail was seen on the outer reef flat areas approximately 590 ft from shore (Kolinski, 2015). The survey report also noted that individuals were located in areas where project activities are not likely to occur (Kolinski, 2015).

3.2.1.3.4 Fish

The reef flat on the southern shore of Kwajalein supports a well-developed coral reef community that includes a wide variety of reef fish species. As noted in the *Baseline Risk Assessment for the Kwajalein Landfill* (U.S. Army Public Health Command, 2014), various fish species are observed here from various families including Serranidae (groupers and anthiases) Lutjanidae (snappers), Lethrinidae (emperors), Holocentridae (squirrelfishes), Chaetodontidae (butterflyfishes), Chanidae (milkfish), Cirrhitidae (hawkfishes), Pomacanthidae (angelfishes), Pomacentridae (damselfishes), Pinguipedidae (sandperches), Labridae (wrasses), Microdesmidae (dartfishes), Monacanthidae (filefishes), Mullidae (goatfishes), Scaridae (parrotfishes), Synodontidae (lizardfishes), Ballistidae (triggerfishes), Blenniidae (blennies), and Acanthuridae (surgeonfishes and unicornfishes). The most common families observed are Acanthuridae, Pomacentridae, and Labridae (U.S. Army Public Health Command, 2014).

During the 2010 USFWS and NMFS biological inventory surveys, 69 species from 20 families were recorded including Diodontidae (spiny pufferfish), Tetradontidae (smooth pufferfish), Ballistidae (triggerfish), Acanthuridae, Zanclidae, Pinguipedidae (sandperch), Scaridae, Labridae, Pomacentridae, Kuhliidae (rudderfish), Pomacanthidae, Chaetodontidae, Pemperidae (sweepers), Mullidae, Nemipteridae, Lethrinidae, Serranidae, Holocentridae, and Belonidae (needlefish).

One UES coordination species of reef fish, the giant coral trout (*Plectropomus laevis*) was recorded during the 2004 biennial survey (U.S. Fish and Wildlife Service and National Marine Fisheries Service, 2006) on the lagoon side, and has the potential to occur in the project area.

Five UES consultation fish species have been recorded near the project area or in other waters surrounding Kwajalein. The bumphead parrotfish and the humphead wrasse were both recorded during 2008 surveys in the ocean waters of the landfill area (U.S. Fish and Wildlife Service and National Marine Fisheries Service, 2010). The reef manta ray and oceanic giant manta ray were recently added to the UES consultation species list in response to the 23 February 2016 announcement from NMFS on the *Petition To List Three Manta Rays as Threatened or Endangered Under the Endangered Species Act*. The oceanic giant manta ray was observed on the lagoon side of Kwajalein during the 2010 biennial surveys (U.S. Fish and Wildlife Service and National Marine Fisheries Service, 2012), and there are anecdotal observations of the reef manta ray in the area. The scalloped hammerhead shark has not been recorded during biennial surveys, but is known to occur at other islets in the Kwajalein Atoll.

3.2.1.3.5 Sea Turtles

Five species of ESA-listed sea turtles potentially occur in the Kwajalein Atoll and RMI: green, hawksbill, olive ridley, loggerhead, and leatherback. All sea turtles are UES consultation species.

The two UES consultation sea turtle species most likely to be encountered at Kwajalein Island are the green turtle and the hawksbill turtle. The green turtle is the most common species in the RMI, whereas the hawksbill turtle is considered rare or scarce (Maison et al., 2010). There likely is low-level residence for those two species in the Kwajalein Atoll (U.S. Fish and Wildlife Service and National Marine Fisheries Service, 2013), and correspondingly also in the project area. Five green, two hawksbill, and one unidentified turtle were observed during the most recent surveys (4–20 November 2012) of reef areas in the Mid-Atoll Corridor (note: Kwajalein Island was not part of this survey area) conducted by NMFS and USFWS (U.S. Fish and Wildlife Service and National Marine Fisheries Service, 2013). Both green and hawksbill turtles were recorded in some of the patch habitats, while only green turtles were observed in some of the lagoon slope habitats (National Marine Fisheries Service and U.S. Fish and Wildlife Service, 2013). No sea turtles were recorded during the September 2015 survey of the project area (Kolinski, 2015), although it was noted that some of the beach approaches may be suitable for turtle nesting.

Sea turtles are highly migratory, and are present in coastal and open ocean waters. Lagoons throughout Marshall Islands atolls provide significant areas of potential shallow-water foraging habitat for sea turtles (Eckert, 1993).

Green turtles are classified as threatened under the ESA throughout their Pacific range, except for the population that nests on the Pacific coast of Mexico, which is classified as endangered (National Marine Fisheries Service and U.S. Fish and Wildlife Service, 2007). There is no critical habitat for the green turtle in the Pacific Ocean. Adult green turtles feed primarily on seagrasses, macroalgae, and reef-associated organisms (Bjorndal, 1997). Green turtles also consume jellyfish, salps, and sponges (Bjorndal, 1997). The main nesting sites for green turtles in the RMI are on the atolls of Bikar, Jemo, and Erikub; there is also nesting on other northern RMI atolls (Maison et al., 2010).

Nesting in the RMI occurs from May through November, peaking mid-June to mid-September. There is very little sea turtle nesting activity documented for Kwajalein Island. Sea turtle nesting has been documented at Emon Beach and among coastal vegetation along the northeastern shoreline of Kwajalein (National Marine Fisheries Service and U.S. Fish and Wildlife Service, 2012). USFWS and NMFS (2012) observed suitable sea turtle nesting habitat along the southeastern side of the island.

The hawksbill turtle is listed as endangered under the ESA, and critical habitat is not designated for the hawksbill in the Pacific Ocean (National Marine Fisheries Service and U.S. Fish and Wildlife Service, 2013). Hawksbills eat both animals and plants during the early juvenile stage, feeding on such prey as sponges, algae, mollusks, crustaceans, and jellyfish (Bjorndal, 1997). Older juveniles and adults are more specialized, feeding primarily on sponges, which comprise as much as 95 percent of their diet in some locations, although the diet of adult hawksbills in the Indo-Pacific region includes other invertebrates and algae (Meylan, 1988; Witzell, 1983).

Two captive sea turtles (one mature female green and one mature male hawksbill) were fitted with satellite transmitters and released off Nell Island in April 2006 by USAKA and Kwajalein Range Services environmental personnel and tracked for almost 2 months before the tags stopped transmitting (Drumheller, 2006). These individuals, however, were still resighted (recognized due to painted numbers and tags still attached) in the area for at least 5 years from the time the turtles were released. Two other green sea turtles were also released but did not have transmitters attached. Data received from the transmitters indicated the turtles had not traveled outside the Kwajalein Atoll. In 2007, five adult female green turtles nesting at Erikub Atoll in the RMI were satellite-tagged and tracked to various parts of the Pacific with distances ranging between approximately 1,740 and 4,287 miles (Parker et al., 2015).

3.2.1.3.6 Marine Mammals

Marine mammals are afforded protection by the MMPA and the RMI Marine Mammal Protection Act and all marine mammal are UES consultation species. Eight marine mammal species with confirmed or possible occurrence in Micronesian waters are also listed under the ESA, the North Pacific right whale, humpback whale, sei whale, finback whale, blue whale, sperm whale, bryde's whale, and the dugong. Sixteen species of baleen and toothed whales have confirmed occurrence for the Marshall Islands (Reeves et al., 1999). A marine resources assessment prepared for part of Micronesia (specifically, the Mariana Islands) doubled this number to a possible 32 species for Micronesian waters when taking into consideration marine mammal distribution and their habitat preferences (Department of the Navy, 2005). A stable component of four oceanic or semi-oceanic species is present in all areas of the tropical Pacific: spinner and pantropical spotted dolphins (*Stenella longirostris* and *Stenella attenuata*, respectively), Risso's dolphin (*Grampus griseus*), and short-finned pilot whale (*Globicephala macrorynchus*) (Gannier, 2002). Spinner and pantropical spotted dolphins are among the two most frequent species in all tropical areas (Gannier, 2002). The dugong very rarely strays into Micronesian waters, and no pinniped species is known to be a regular inhabitant of the Micronesia region (Reeves et al., 1999). There are rare anecdotal reports of seals at these islands; however, species identification could not be verified. Eldredge (1991) called attention to the possibility that Hawaiian monk seals and northern elephant seals (*Mirounga angustirostris*) wander far enough from their normal ranges to appear at the Marshall or Gilbert Islands in the Micronesia region.

The vast majority of the species (29 of 32) are cetaceans (whales and dolphins). Cetaceans are divided into two major suborders: Mysticeti and Odontoceti (baleen and toothed whales, respectively). Toothed whales use teeth to capture prey, while baleen whales use baleen plates to filter their food from the water. Beyond contrasts in feeding methods, there are also life history and social organization differences between baleen and toothed whales (Tyack, 1986).

One notable characteristic of atolls in the Marshall Islands is the steep slopes along the seaward sides of the reef. Around Kwajalein Atoll, the depth plunges to as much as 5,900 ft within 2 miles of the atoll, and over 13,000 ft within 11 miles. Since deep water is close to shore at Kwajalein Island, there is the possibility of deep-water species coming close to shore. For example, for Kwajalein Island specifically, there is a well-known incident from 1990 of a group of melon-headed whales (*Peponocephala electra*, an oceanic species) wandering disoriented into the lagoon on the lee side of the island (and later some individuals being consumed by humans) (Reeves et al. 1999).

No cetaceans were recorded during the most recent NMFS and USFWS surveys (4 through 20 November 2012) of reef areas in the Mid-Atoll Corridor (note: Kwajalein Island was not part of this survey area) (U.S. Fish and Wildlife Service and National Marine Fisheries Service, 2013) or during the September 2015 survey of the project area (Kolinski 2015).

Within the project area, 11 UES consultation species of cetaceans have the potential to occur based on unrecorded observations and species known to occur in other areas of the Kwajalein Atoll. These include common dolphin, Risso's dolphin, melon-headed whale, offshore spotted dolphin, coastal spotted dolphin, striped dolphin, spinner dolphin, Costa Rican spinner dolphin, whitebelly spinner dolphin, Eastern spinner dolphin, and sperm whales, which have been observed on the ocean side of the atoll. These species could potentially transit on the ocean side offshore of the project area, although it is unlikely that any would transit within the immediate action area due to the close proximity to the shoreline and relatively shallow waters.

3.2.1.4 Environmentally Sensitive Habitat

No RMI-designated critical habitat or NMFS-designated Essential Fish Habitat is located at USAKA. According to the UES, seabird colonies and shorebird sites on Kwajalein are terrestrial habitat types that are potentially significant and both occur within the project area. Marine habitat of significant biological importance includes the ocean-facing reef slope and reef flat, which also occurs in the project area. Significant features include coral. The reef flat was surveyed and described in September 2015 by Kolinski (2015). The reef flat at Glass Beach was found to extend 82 ft out from the shore. The bottom substrate consisted mainly of consolidated limestone pavement with accumulated sands on the western end.

3.3 GEOLOGY AND SOILS

Geology and soils include those aspects of the natural environment related to the earth, which may be affected by the Proposed Action. This resource is described in terms of existing information on the landforms, geology, and associated soil development as it may be subject to erosion, flooding, mass wasting, mineral resource consumption, contamination, and alternative land uses resulting from proposed construction.

3.3.1 Existing Conditions

3.3.1.1 Geology Characteristics

Kwajalein Island is the largest and southernmost in the elongated ring of approximately 100 small sandy islands that form Kwajalein Atoll (U.S. Army Public Health Command, 2011). The overall geology of Kwajalein Island consists of approximately 3,200 to 9,800 ft of reef-derived carbonate deposits overlying a basalt volcanic core (Hunt, 1995). The deposits of Kwajalein Island geology include (1) unconsolidated, well-sorted beach sand and gravel overlaying (2) unconsolidated lagoon sediments of mud, sand, gravel and coral fragments, overlaying (3) dense, well consolidated Pleistocene (approximately 2-million-year-old) limestone (U.S. Army Public Health Command, 2011). The contact between Pleistocene limestone and unconsolidated sediments is found at approximately 60 to 80 ft below ground surface (bgs) across the island (Tribble, 1997).

Well drilling logs indicate that the shallow subsurface on Kwajalein consists of an unconsolidated mixture of sand, coralline gravel and rubble, interbedded with thin layers of hard coral. Thicker accumulations of low permeability back-reef sands typically occur on the lagoon side of the island, while higher permeability coarser-grained sediments are more commonly found on the ocean side of the island (WH Pacific, 2012; Hunt, 1996). Large portions of the northern end, lagoon shore, and western end of Kwajalein Island (totaling 205 acres) were reclaimed by the U.S. Government after WWII using dredge spoils, fill material, and debris (U.S. Army Center for Health Promotion and Preventive Medicine, 1999). This fill material was placed over the reef flat.

3.3.1.2 Soil Characteristics

The surface soils present on Kwajalein consist mainly of permeable unconsolidated calcium carbonate sand and gravel. The portion of Kwajalein Island where the landfill is located was created by debris filled over the reef. Based on soil samples collected at the Kwajalein Landfill, soils range from fine sand to gravel (U.S. Army Center for Health Promotion and Preventive

Medicine, 1998). It is unknown if there is soil contamination in the project area above action levels, because the presence of the metal debris has limited the ability to test soils in the area for contamination.

3.3.1.3 Paleontological Resources

Paleontological resources consist of the physical remains of extinct life forms or species that may have living relatives. These physical remains include fossilized remains of plants and animals, casts or molds of the same, or trace fossils such as impressions, burrows, and tracks. Geological studies indicate that the reefs and atolls of the Marshall Islands formed 70 to 80 million years ago; however, the natural processes from which atolls are built (U.S. Army Space and Strategic Defense Command, 1993) preclude the occurrence of paleontological remains.

3.4 HAZARDOUS MATERIALS AND WASTE

3.4.1 Regulatory Requirement

The UES are modeled after U.S. statutes and regulations to establish protection of public health and safety and the environment. The UES references the U.S. Department of Transportation definition of a hazardous material which is a substance or material that is capable of posing an unreasonable risk to health, safety, or property when transported in commerce and has designated as hazardous under section 5103 of Federal hazardous materials transportation law (49 U.S.C. 5103). Hazardous waste is further defined as any solid waste not specifically excluded which meets specified concentrations of chemical constituents or has certain toxicity, ignitability, corrosivity, or reactivity characteristics.

The UES classify all materials as general-use material, hazardous material and petroleum products, and prohibited materials. Regulations governing hazardous material and hazardous waste management at USAG-KA are specified in the UES, Section 3-6. The goal of the management strategy is to prevent pollution by minimizing the procurement, use, storage, and transport of all substances that might endanger the environment and the health and safety of the population at USAKA.

3.4.1.1 Hazardous Materials Management

Hazardous materials at USAG-KA are used in a variety of operations, including facility infrastructure support, supply, transportation, power generation, and medical. Hazardous materials include various cleaning solvents, paints, cleaning fluids, motor fuels and other petroleum products, and other materials. These substances are shipped to USAG-KA by ship or by air. Upon arrival at USAG-KA, hazardous materials to be used are distributed, as needed, to various satellite supply facilities, from which they are distributed to the individual users. Distribution is coordinated through the base supply system; however, the issue of such materials requires prior authorization by the USAG-KA Environmental Office to prevent unapproved uses of hazardous materials. An activity-specific Hazardous Materials Procedure must be submitted to the Commander, USAG-KA, for approval within 15 days of receipt of any hazardous material or before use, whichever comes first. Hazardous materials to be used by organizations on the test range and its facilities are under the direct control of the user organization, which is responsible for ensuring that these materials are stored and used in accordance with UES requirements.

3.4.1.2 Hazardous Waste Management

The treatment of hazardous wastes at USAKA without a Document of Environmental Protection (DEP) is prohibited. In addition, hazardous wastes must be disposed (shipped) off the island. The UES require preparation and implementation of a contingency plan (the Kwajalein Environmental Emergency Plan [KEEP]), for responding to releases of oil, hazardous material, pollutants, and contaminants to the environment. The KEEP (Section 3-6.4.1) is substantively similar to the spill prevention, control, and countermeasure (SPCC) plan required in the United States. Under no circumstances shall hazardous wastes or waste petroleum products generated by activities at USAKA be exported from USAKA to the RMI for treatment or disposal.

Hazardous waste may be accumulated and stored for up to 90 days, with possible extensions of 30 days (up to 120 days), before the waste must be shipped off USAG-KA. At the 90-Day Storage Facility any sampling of waste is performed (for waste from uncharacterized waste streams), and waste is prepared for final off-island shipment for disposal. Hazardous wastes are shipped off-island for disposal in the continental United States (U.S. Army Space and Missile Defense Command, 2014). The barge departs Kwajalein approximately every 2 weeks.

3.4.1.3 Non-Hazardous Waste

EPA defines solid waste as any garbage or refuse, sludge from a wastewater treatment plant, water supply treatment plant, or air pollution control facility and other discarded material, including solid, liquid, semi-solid, or contained gaseous material resulting from industrial, commercial, mining, and agricultural operations, and from community activities. Nearly everything we do leaves behind some kind of waste. (U.S. Environmental Protection Agency, 2016)

Solid Waste

The Solid Waste Management Facility is located in the southwest portion of the island, and is located within 0.25 mile of the aircraft landing strip. The Kwajalein landfill borders the Pacific Ocean, Class B waters, to the south. Drinking water resources are also located within 300 yards to the east-southeast. The Kwajalein Solid Waste Management Facility is the central receiving area for solid wastes generated on all islands. (Kwajalein Range Services, 2012a)

Kwajalein currently has a residential population of approximately 1,300. Approximately 5,000 tons of solid waste are generated annually (27,500 pounds per day); 30 percent from residential areas, 60 percent commercial and industrial areas, 10 percent construction debris, and less than 1 percent of medical waste. (Kwajalein Range Services, 2012a)

The Kwajalein landfill occupies 13 acres on the western edge of the island. A historic asbestos burial site exists in the landfill; it is marked with notification signs, and access is restricted. There is no active management of asbestos containing material at USAKA. (Kwajalein Range Services, 2012a)

Construction and Demolition (C&D) debris typically generated at USAKA includes lumber, timber, reinforcing steel, pipes, wires, concrete, brick, metal, wall board, roofing, insulation, and asphalt. Metal and steel items are segregated at the solid waste facility and staged until shipped off island, while concrete rubble is stockpiled for later use as riprap and shoreline protection. Lumber is removed and managed as mulch. Other materials such as wires, roofing material, insulation, and wall board are land-filled directly. (Kwajalein Range Services, 2012a)

Non-aggregate C&D debris, including fiberglass or unique items not suitable for the incinerator or shoreline protection activities, is placed in separate areas next to ash from the incinerator, and is crushed with heavy equipment for compaction. While Kwajalein is used as the primary location for direct disposal of C&D debris, smaller amounts of C&D debris can be staged at other landfills. (Kwajalein Range Services, 2012a)

3.4.2 Existing Conditions

The region of influence consists of shoreline, landfill, incinerator and wood storage area, and the metal debris storage area. Unless other wised noted, the information in this section was taken from the 2016 Removal Action Memorandum for the Kwajalein Landfill.

3.4.2.1 Shoreline

In the landfill area, the shoreline currently consists of broken concrete debris (foundations, slabs, rubble, and some rebar) with a smaller amount of loose metal debris. The shoreline has eroded into the toe of the landfill in places, and refuse has spilled out onto the shoreline. To the east of the landfill continuing all the way to Glass Beach there is extensive metal debris placed on the shoreline. Metal in this area includes ship and vehicle parts, pipe, scrap metal, wire, and other debris. The distribution pattern of metal debris indicates that the metal debris is being eroded and transported west by the littoral drift to the shoreline in front of the landfill.

3.4.2.2 Landfill

Existing landfill

An unlined waste landfill is present at the southwest portion of the island that abuts against the shoreline. The landfill is partially vegetated with vines and grasses. The landfill elevation ranges up to 20 to 45 ft above mean sea level (amsl) at individual refuse piles. The surface of the landfill is rough and uneven and mainly composed of incinerator ash with some metal debris. Drainage is currently by infiltration through the debris during precipitation events. Surface runoff was formerly to the ocean through ditches/outfalls, but the ditches have been blocked and surface runoff is now infiltrated. The refuse in the interior of the waste piles is expected to


Spilling refuse

contain municipal trash, incinerator ash, metal debris, and other unknown materials. A topographic survey of the site in December 2014 indicates that approximately 110,000 cubic yards of refuse is present at the landfill above the older fill grade that was approximately 10 ft amsl. Metal debris was pushed to all ends of the island during the formation of new sections of Kwajalein Island. The deeper fill material that was used to build this area of the island is expected to contain a large quantity of metal debris, based on the results of a 2015 geophysical survey.

3.4.2.3 Incinerator Operating Area and Wood Storage Area

A solid-waste incinerator is located north of the landfill along Industrial Avenue. Wood debris is stored to the west of the incinerator. The incinerator has the capacity for 32 tons/day, and approximately 1 cubic yard of incinerator ash is reportedly generated on a daily basis and is spread periodically at the top of the landfill.

3.4.2.4 Metal Debris Storage Area

Metal waste and debris are stored in the area to the east of the landfill. A covered storage area and a concrete pad are present in the metal storage area. A survey was previously conducted to determine the type and volume of metal stored (U.S. Army Public Health Command, 2014). The metal debris consists of approximately 6.7 tons of baled aluminum cans, 300 tons of baled scrap metal, and 6,500 tons of unbaled scrap metal. Scrap metal consists of vehicle parts, old appliances, transformers, boat motors, empty metal drums, wiring, various metal parts, and other debris.

Metal debris storage area

3.4.2.5 Salvage Yard Area

The savage yard area contains large pieces of material, conex boxes, and some storage buildings.

3.4.2.6 Aggregate Area

The aggregate area contains metal debris and other piles of wood, road debris (e.g., asphalt, rocks) and rubble (e.g., broken concrete, vegetation, and sand).

3.4.2.7 Debris Mound Between Glass Beach and the Shark Pit

This area is a mound of heavily vegetated debris along and up-gradient from the shoreline between Glass Beach and the Shark Pit. The mound is vegetated with Kiden (*Tournefortia argentea)*, Scaevola (*Scaevola taccada*), coconut trees *(Cocos nucifera),* beach morning glory (*Ipomoea imperati*), tropical almond (*Terminalia catappa*), Kamani (*Calophyllum inophyllum*), Kaonon (*Cassytha filiformis*), Kio (possibly *Sida fallax*), and a Pandanus (*Pandanus tectorius*) is near the mound, but not on top of it. The mound contains other debris most likely to be concrete, metal, and coral. This mound needs to be removed to facilitate the investigation of the old dump.

3.5 HEALTH AND SAFETY

Health and safety includes consideration of any activities, occurrences, or operations that have the potential to affect (1) the well-being, safety, or health of workers, and (2) the well-being, safety, or health of members of the public.

3.5.1 Existing Conditions

The region of influence for potential impacts to worker health and safety includes the proximate work areas, any laydown areas, and any stockpile areas associated with the Proposed Action. The region of influence for potential impacts to members of the public is the potential to come in contact with or the ingestion of contaminants with levels above the UES criteria.

Groundwater and Surface Water Contaminants. Although there are no specific quantitative criteria for Class 3 groundwater in the UES, there is a qualitative anti-degradation criterion. The detection of PCBs violating this anti-degradation criterion is thus relevant to this EA, and the EA uses requirements for Class I and Class II water to evaluate the anti-degradation. UES Section 3-2.6.2 (Groundwater Anti-degradation) states that USAG-KA operations shall not degrade the quality of Class III groundwater in such a way that results in increases of contaminate concentrations that will adversely affect public health, the marine environment…or protected beneficial uses of surface water. The landfill area is Class III groundwater and the UES standards do not apply, but groundwater quality standards are noted for a point of comparison and anti-degradation requirements. Table 3-5 lists the maximum detection of contaminants of concern found in the Groundwater Seep within the region of influence; Table 3-6 lists the maximum detection of contaminants of concern found in surface water within the region of influence; Table 3-7 lists the maximum detection of contaminants of concern found in the Landfill Monitoring Wells within the region of influence. The UES Acute Criteria and the UES Chronic Criteria were used as the baseline for the exceedance level for a surface water contaminant.

Table 3-5. Kwajalein Landfill Contaminants of Concern maximum detection in groundwater that exceeded the screen levels.

Contaminant	Groundwater Quality Standards		Groundwater Seep Max Detection (mg/L)
	Primary(mg/L)	Secondary (mg/L)	
Metals			
Copper	1.3	1.0	14.5
PCBs			
Aroclor-1242	0.0005	NL	0.044
Pesticides			
Chlordane	0.002	NL	6.3

Sources: Table 3-3: 2011 Analytical Results from Landfill Water Samples, U.S. Army Garrison-Kwajalein Atoll, 2015; Table 3-2D.1, U.S. Army Space and Missile Defense Command, 2014
Notes: NL= Not listed in UES ND = Not detected

Table 3-6. Kwajalein Landfill Contaminants of Concern maximum detection in surface water that exceeded the screen levels.

Contaminant	Surface Water Quality Standards		Surface Water Max Detection (µg/L)
	CMC (µg/L)	CCC (µg/L)	
Metals			
Copper	4.8	3.1	9.28

Sources: Table 3-3: 2011 Analytical Results from Landfill Water Samples, U.S. Army Garrison-Kwajalein Atoll, 2015
Notes: NL= Not listed in UES ND = Not detected

Table 3-7. Kwajalein Landfill Contaminants of Concern maximum detection from landfill monitoring wells that exceeded the screen levels.

Contaminant	Groundwater Quality Criteria		Groundwater Max Detection (µg/L)
	Primary (mg/L)	Secondary (mg/L)	
Metals			
Zinc	NL	5.0	19.9
Iron	NL	0.3	1,790
PCBs			
Aroclor-1016	0.0005	NL	2.6

Sources: Table 3-3: 2011 Analytical Results from Landfill Water Samples, U.S. Army Garrison-Kwajalein Atoll, 2015
Notes: NL= Not listed in UES ND = Not detected

Fish Ingestion. An ecological and human health risk assessment was conducted to determine if the observed release adversely affects the marine environment and human health. The hazard identification (HI) component of a risk assessment identifies COPCs as chemical detected in a sufficient number of samples and with a maximum detected concentration exceeding an appropriate chronic exposure. Groundwater seep concentration showed source contamination but is not used in the risk assessment because surface water samples are more representative of receptor exposure. Table 3-8 lists the maximum detection of contaminants of concern found in fish tissue within the region of influence. The results in Table 3-9 suggest that ingestion of fish from the contaminated area may pose a noncancer hazard to all receptors, particularly for Marshallese citizens engaging in a subsistence lifestyle. (U.S. Army Public Heath Command, 2012)

Table 3-8. Kwajalein Landfill contaminants of concern maximum detection in fish tissue that exceeded the Regional Screening Level for fish ingestion.

Contaminant	Chronic RSL Fish Ingestion (µg/kg)	Fish Tissue Max Detection (µg/kg)
Metals		
Copper	54,000	62,000
PCBs		
Aroclor-1254	1.6	17,000
Aroclor-1260	1.6	1,500
Pesticides		
4,4-DDT	9.3	14.2
4,4'-DDE	9.3	124
Mirex	0.18	0.577
Dieldrin	0.2	2.07
Chlordane (total)	9.0	174.9
Heptachlor Epoxide	0.35	1.67

Sources: Table 2; U.S. Army Public Heath Command, 2012

Table 3-9. Noncancerous hazard indicators.

Exposure Scenario	Non Cancer Hazard Index		
	Exposure Duration (years)	Surface water	Fish ingestion
Adult U.S. Citizen	1	0.05	7.72*
Adult U.S. Citizen	30	0.05	7.72*
Adult Marshallese Citizen	30	0.18	162.07*
Adult Marshallese Citizen	70	0.18	396.07*
Children Marshallese Citizen	6	N/A	160.03*

Sources: Table 5; U.S. Army Public Heath Command, 2012

N/A = not available. *=indicates COPCs

Orange shading denotes a hazard index (HI) greater than 1.0, which indicates that the levels of COPCs detected may be of potential concern.

As an initial estimate of the carcinogenic risk associated with of surface water exposure (dermal contact and incidental ingestion) and ingestion of contaminated fish, the individual chemical cancer risks were added together to derive the overall site cancer risk for each receptor. The combined calculated cancer risk levels for dermal absorption and incidental ingestion of chemicals detected in surface water did not exceed the 1E-4 level. However, the risk to U.S. residents and Marshallese resident and lifetime adults from eating contaminated fish did exceed the 1E-4 threshold, indicating that an unacceptable cancer risk may exist at the site. Table 3-10 lists the calculated cancer risk levels for U.S. and Marshallese adults. (U.S. Army Public Heath Command, 2012)

Table 3-10. Cancer risk level.

Exposure Scenario	Cancer Risk Level		
	Exposure Duration (years)	Surface water	Fish ingestion
Adult U.S. Transient	1	2.1E-08	4.4E-06
Adult U.S. Resident	30	8.0E-07	1.3E-04*
Adult Marshallese Resident	30	2.7E-06	2.8E-03*
Adult Marshallese Lifetime	70	6.2E-06	1.6E-02*

Source: Table 6; U.S. Army Public Heath Command, 2012

N/A = not available. *=indicates COPCs

Orange shading denotes a hazard index (HI) greater than 1.0, which indicates that the levels of COPCs detected may be of potential concern

3.6 NOISE

The region of influence consists of the shoreline east of the landfill area continuing southeast along the shoreline to Glass Beach, the landfill, the incinerator operating area, the wood storage area, the salvage yard area, and the metal debris storage area.

3.6.1 Noise Sources

Current noise sources in the project area would include noise from the vehicle, the incinerator, equipment used within the land area such as bulldozers, compactors, dump truck, crane, excavator, shredder, and background ocean (wave action) noise. Table 3-11 shows the noise level of typical equipment that could be used during the execution of the components in Removal Action Memorandum Alternatives A–D.

Table 3-11. Typical in-air noise levels for common equipment.

Source	Peak In-Air Noise Level (dB)	In-Air Noise Level- 50 Feet from Sources (dB)
Air compressor	95	78
Backhoe	116	80
Chainsaw	100	85
Compactor, Roller	104	88
Crane	90	85
Dump Truck	101	84
Excavator	107	90
Grader	108	85
Jackhammer	105	85
Portable or Standby Generator	96	82
Scraper	109	99

Sources: U.S. Department of Transportation, 2015; University of Washington, 2004

3.7 SOCIOECONOMICS

3.7.1 Affected Environment

Socioeconomics is the social science that studies how economic activity affects and is shaped by social processes. In general, it analyzes how societies progress, stagnate, or regress because of their local or regional economy, or the global economy. It describes the social and economic character of a community through the review of metrics such as population size, employment characteristics, income generated, and the type and cost of housing.

Population. The region of influence for socioeconomic analysis is Kwajalein Island. Approximately 1,200 to 1,500 persons currently live on the island (U.S. Army Public Health Command, 2011). Three miles north of Kwajalein Island is the island of Ebeye, home to approximately 9,614 Marshallese nationals (Republic of the Marshall Island, 2011); approximately 1,000 of whom make up a part of the Kwajalein Range Services (KRS) workforce on Kwajalein Island (Kwajalein Range Services, 2015).

Subsistence Fishing. A standard definition of subsistence fisheries is ‘‘local, non-commercial fisheries, oriented not primarily for recreation but for the procurement of fish for consumption of the fishers, their families, and community’’ (Schuman and Macinko, 2007). Generally, it also implies the use of low tech “artisanal” fishing techniques and is carried out by people who are very poor. Quite often, this fishing is part of a life that also relies on small-scale agriculture and other sources of income, and may include some sale of fish. (World Fisheries Trust, 2008)

Subsistence fishing is a part of the cultural lifestyle of Marshallese citizens on and near Kwajalein Island.

Based on the conclusions of the 2012 Kwajalein Landfill Baseline Risk Assessment, ingestion of fish caught from the contaminated areas below the landfill possesses an unacceptable cancer risk to U.S. residents and Marshallese citizens and may pose a noncancerous hazard to all human receptors, particularly for Marshallese citizens engaging in subsistence fishing. Of the three USAG-KA-utilized islands where fish consumption was considered for U.S. adults (Kwajalein, Meck, and Illeginni), there is borderline unacceptable noncancerous hazard at Kwajalein. (U.S. Army Public Health Command, 2011)

3.8 UTILITIES

This section describes the major attributes (existing capacity and existing demand) of utilities serving the project area, which include water, wastewater, electrical, and stormwater.

3.8.1 Water

Seasonal rainfall is the primary source of freshwater at Kwajalein Atoll. Freshwater is most abundant in the central part of Kwajalein Island where the aircraft runways are located. Rainfall is captured for use as potable water from a 52-acre catchment area located adjacent to the runway. The water collected in two lined, rectangular catchment areas (FN972 and FN973) is consolidated at a sump located at the center of the easternmost catchment area (FN973) and conveyed to the raw water storage tanks. A third catchment area between the runways (FN1707, the most western area) is not lined and serves to recharge the freshwater lens. (Kwajalein Range Services, 2013a)

Up to 45 percent of the fresh water may come from the lens wells (groundwater). However, groundwater is taken as needed during the dry seasons. Groundwater is filtered first and then treated with a reverse osmosis system (Jazwinski, 2014). On Kwajalein Island, the freshwater lens is thicker on the lagoon side than on the ocean side, with a maximum thickness of 37 feet. (Kwajalein Range Services, 2013a). The combined system of rain catchments and lens wells yielded an average production of 256,882 gallons per day (based on January 2009 through July 2011 data), of which 45 percent was from groundwater. The combined system of catchments and lens wells is capable of producing over 1,000,000 gallons per day. The average daily water consumption at Kwajalein for July 2011 was 133,750 gallons (506,299 liters). (Kwajalein Range

Services, 2013a) Kwajalein Island has a total of fifteen 1-million-gallon reinforced concrete tanks used to store raw water collected from the catchments and lens wells. Of the 15 tanks, 2 were converted to store temporary treated potable water, 2 tanks store non-potable reclaimed water, and the remaining 11 are raw water tanks. Raw water is pumped from storage to treatment in the package water treatment plant. The treated water receives pH adjustment and chlorination before being stored in the covered concrete tank. The water plant supplies potable water for use in bath showers and sinks and non-potable water for toilets. (Jazwinski, 2014) The current daily water consumption at Kwajalein is 145,774 gallons per day, and maximum production of the Kwajalein Water Plant is between 450,000 to 500,000 gallons per day (reverse osmosis vs. conventional treatment filters). (Harris, 2014)

3.8.2 Wastewater

The wastewater system on Kwajalein consists of a force main and gravity collection system, nine pump stations, a secondary wastewater treatment plant, and an outfall extending into the lagoon. A second treatment plant for added filtration was installed to comply with regulatory standards for wastewater. As of 2014, the current wastewater treatment plant is approximately 34 years old. (Jazwinski, 2014).

The Kwajalein wastewater treatment plant has a peak capacity of 600,000 gallons per day. The current average usage is 316,500 gallons per day (effluent to the lagoon and reclaim wastewater system combined). (Harris, 2014)

3.8.3 Electricity

Kwajalein has one power plant with the current electrical capacity of 27.2 megawatts (MW).

3.8.4 Stormwater

Stormwater has the reasonable potential to discharge to ocean waters, lagoon waters, or tidal ponds due to the close proximity of these waters to land activities. Kwajalein Island has unlined drainage ditches for redirecting stormwater flow and lined ditches and piping systems for discharging stormwater. Kwajalein Island has 25 point source discharges, with 3 associated with the fuel farm (Vehicle Maintenance, North side-KISW05; Aircraft Maintenance, South side-KISW07; and Fuel Farm Containment Area Oil/Water Separator-KIWW07). (Kwajalein Range Services, 2005) The Kwajalein Stormwater Pollution Prevention Plan (SWPPP) manages activities that fall within the definition of stormwater discharge associated with construction activity. Construction activities that involve soil disturbance must comply with this general SWPPP and implement stormwater management controls. Construction activities are divided into two categories: large construction activities and small construction activities. Large construction activities (where disturbance is equal to or greater than 5 acres of land) require additional soil erosion and sediment controls and periodic inspections. Large projects must prepare a project-specific SWPPP in accordance Section 5.7 of the SWPPP. (Kwajalein Range Services, 2005)

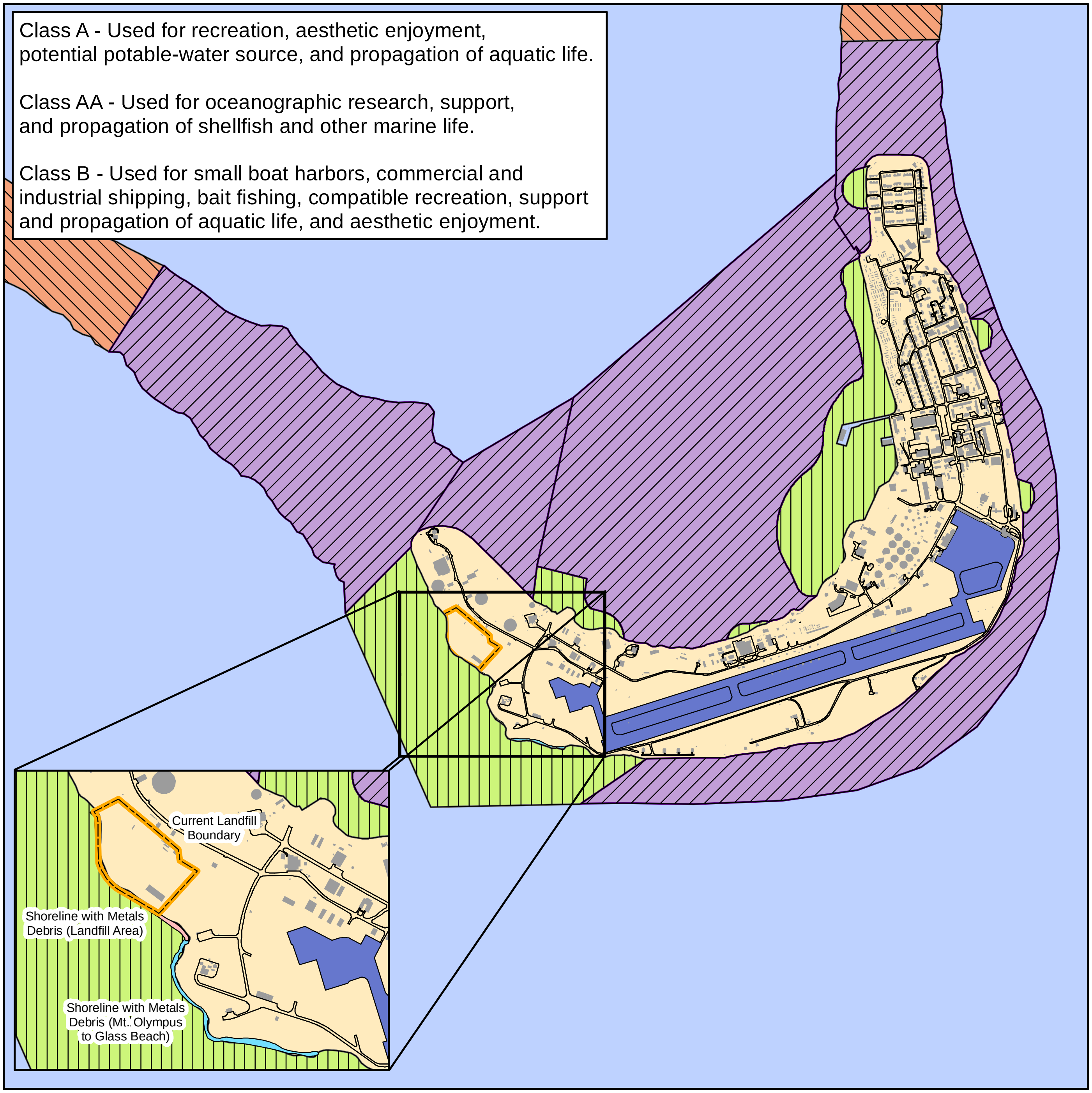
For small construction or demolition activities (i.e., projects that will disturb less than 5 acres), controls primarily consist of minimizing the area of disturbance, preserving vegetation where practical, good housekeeping, spill prevention, dust control, waste management, erosion and sediment controls, and stabilizing disturbed areas. (Kwajalein Range Services, 2005)

Activities that will disturb 1 acre or less may be considered a construction activity, and the requirements of Section 4 may be applicable. (Kwajalein Range Services, 2005)

These activities are reviewed under NEPA to minimize environmental impacts and to provide requirements for making improvements regarding stormwater runoff. Additionally, sediment and erosion control measures are implemented to prevent runoff during construction activities.

3.9 WATER RESOURCES

This section describes the existing marine water resource conditions at the proposed site. Water classifications for Kwajalein Island are shown in Figure 3-4 and are provided in Appendix 3-2A of the UES, 13th edition.



Explanation

- Road Curbline
- Class A
- Class AA
- Class B
- Current Landfill Boundary
- Shoreline with Metals Debris (Landfill Area)
- Shoreline with Metals Debris (Mt. Olympus to Glass Beach)
- Existing Structure
- Airfield
- Land Area

NORTH

0 0.25 0.5 1 Miles

Kwajalein Classification of Coastal Water Use

Kwajalein Island

Figure 3-4

3-4_Water_Classification, 1/12/2017

3.9.1 Existing Conditions

3.9.1.1 Hydrogeology

Aquifer. The shallow subsurface on Kwajalein consists of an unconsolidated mixture of sand, coralline gravel and rubble, interbedded with thin layers of hard coral which is underlain by consolidated limestone rock at depths of approximately 80 ft bgs. Groundwater on the island occurs within the near-surface sediments as a shallow unconfined water table aquifer. The upper-most aquifer is anticipated to be very permeable. Slug testing conducted in August 1998 at wells in the landfill vicinity have shown that near-surface deposits have estimated hydraulic conductivity values of approximately 27 ft/day. However, the U.S. Geological Survey in Honolulu later determined that slug testing was not a reliable method for estimating hydraulic conductivity in the atoll environment at USAG-KA, and it likely produced results that are one order of magnitude lower than expected (U.S. Army Center for Health Promotion and Preventive Medicine, 1998). Therefore, we estimate hydraulic conductivity of the upper unconfined aquifer at the landfill to be in the range of 200 to 300 ft/day, or higher.

Groundwater Flow Levels and Flow Direction. The depth to groundwater is typically 5 to 8 ft bgs and is usually no higher than 2 ft amsl (WH Pacific, 2012; Hunt, 1996). Groundwater flows from the center of the island radially out to the shoreline (Hunt, 1996). A thin freshwater lens is present on top of the salt water in the island's shallow subsurface. The freshwater lens is thickest (approximately 40 ft thick) near the central portion of the island and tapers towards the shoreline. A mixing or transition zone exists between the freshwater and underlying saltwater. Seasonal variability in the freshwater lens thickness (of at least 5 ft) occurs as a result of seasonal changes in precipitation and recharge (Hunt, 1996). In the western area of the island where the landfill is located, the freshwater lens is less thick (10 to 20 ft maximum). Groundwater at the landfill flows to the southwest towards the ocean at a measured hydraulic gradient of 0.00051 (U.S. Army Public Health Command, 2011). At the landfill site, the groundwater freshwater lens thins to the south towards the ocean and transitions to brackish and then saline groundwater at the shoreline. Groundwater levels fluctuate between approximately 0.4 to 1.8 ft/day, depending on the tidal fluctuations and the distance to the ocean.

Aquifer Recharge. Based on an evaluation conducted to determine the amount of precipitation that enters the ground water system as recharge using the EPA Hydrologic Evaluation of Landfill Performance (HELP) model version 3.07, it was determined that the long-term average annual precipitation on Kwajalein is estimated to be about 95 inches. At the existing landfill the recharge to groundwater is estimated to be 44 inches, or about 46% of total precipitation. Over the 4-acre landfill area it is estimated that an average of 2.6 million gallons of precipitation is infiltrating through the surface soils and waste and entering ground water per year. At the metal debris storage area, the recharge to groundwater is estimated to be 49 inches or about 52% of total precipitation. Over the 2-acre metal debris storage area it is estimated that an average of 4.8 million gallons of precipitation is infiltrating through the surface soils and entering into ground water.

The difference in recharge between the landfill and the metal debris storage area is mainly due to the larger amount of vegetation at the landfill (and therefore the larger amount of precipitation consumed by evapotranspiration). There is very little vegetation at the metal debris storage area; therefore, evapotranspiration is lower and recharge is higher.

3.9.1.2 Water Quality

Water samples collected from monitoring wells and groundwater seeps since 1998 as part of ongoing monitoring activities provide groundwater quality data in the vicinity of the landfill (U.S. Army Center for Health Promotion and Preventive Medicine 1999 to 2008; U.S. Army Public Health Command, 2009 to 2012). Water quality in the intertidal zone surface water was also monitored more recently in 2011. The following discussion for contaminants of concern (metals, PCBs, and pesticides) of groundwater and surface water quality (unless cited otherwise) is primarily taken from the 2011 Preliminary Assessment/Site Inspection (PA/SI) Report, and the 2012 Baseline Risk Assessment (U.S. Army Public Health Command, 2011b, 2012).

Additionally, UES Section 3-2.6.2 (Groundwater Anti-degradation) states that USAG-KA operations shall not degrade the quality of Class III groundwater in such a way that results in increases of contaminant concentrations that will adversely affect public health, the marine environment…or protected beneficial uses of surface water. Although there are no specific quantitative criteria for Class III ground water in the UES, there is a qualitative anti-degradation criterion. Therefore, for samples that appear to violate this anti-degradation criteria, comparison to Class I and II waters and the discussion of samples is relevant. Appendix C shows the full analytical results from landfill monitoring wells and seeps.

3.9.1.2.1 Metals

Copper was detected in groundwater seeps (along the shoreline) in 2011 at concentrations up to 14.5 µg/L, and all of the shoreline sampling results exceeded the UES acute and chronic water quality criteria for marine surface water of 4.8 and 3.1 µg/L, and primary and secondary ground water quality standard of 1.3 and 1.0 mg/L respectively. Copper was detected at concentrations up to 14.2 µg/L during the 2012 Baseline Risk Assessment. Copper was detected in 2011 in the inter-tidal zone (shallow reef flat) marine water samples at concentrations ranging from 0.078 to 9.3 µg/L. Copper was identified in fish tissue samples in one fish species (Orangespine Unicorn [*Naso lituratus*]) above the Regional Screening Level (RSL) at a concentration of 62,000 µg/kg.

Other than copper, no other metal concentrations from surface water samples were detected above the UES surface water quality criteria during either the 2011 PA/SI or the 2012 Baseline Risk Assessment (U.S. Army Public Health Command, 2011b; 2012).

3.9.1.2.2 Pesticides

The 2011 Preliminary Assessment/Site Inspection report indicates that the three groundwater seeps exhibit concentrations of the pesticide chlordane ranging from 4.1 to 6.3 µg/L, which slightly exceed the UES chronic water quality criteria of 4 µg/L.

The 2012 Baseline Risk Assessment identified the pesticide DDT (or its breakdown products) and chlordane in groundwater seeps at concentrations ranging from 1 to 18 µg/L. DDT was identified in two samples at 1.1 and 2.0 µg/L, which is above the chronic surface water standard of 1.0 µg/L. No other pesticides were identified in groundwater seeps above the chronic or acute surface water standards.

The 2012 Baseline Risk Assessment also identified numerous pesticides detected in fish tissue samples at concentrations above the RSL values for fish ingestion (See Table 3-8 under Health and Safety). The most common were DDT and its breakdown products, chlordane and dieldrin. DDE (a DDT breakdown product) was identified in 28 fish sampled and in 12 fish species at concentrations above the RSL. All 30 fish sampled contained detectable concentrations of chlordane (or a breakdown product), and two samples had chlordane constituents greater than the RSL.

3.9.1.2.3 PCBs

In the 2011 PA/SI report, one groundwater seep exhibited detected concentrations of the PCB Aroclor-1242 at 0.044 µg/L, which slightly exceeded the UES acute marine surface water quality criteria of 0.03 µg/L.

In the 2012 Baseline Risk Assessment, PCBs were detected in one sample above the UES surface water standards. PCBs were detected in two samples exceeding the UES surface water standards. In 2012, the Baseline Risk Assessment indicated PCBs were detected in fish tissue samples in all 30 fish sampled at concentrations ranging from 91 to 17,000 µg/kg, which exceeds the 1.6 µg/kg RSL limit for fish ingestion. PCB data from fish samples show evidence of significant bioaccumulation. The 2012 risk assessment indicated that PCB contamination in fish and ingestion by humans is a human health risk both for cancer and non-cancer hazards.

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4 Environmental Consequences

4 Environmental Consequences

This chapter discusses the impacts of executing the components of the alternatives (A–D) for each of the environmental resources discussed in Chapter 3. Impacts are described for each resource identified in Chapter 3 as potentially affected by the component activities listed in Chapter 2. These resources areas include air quality, biological resources, geology and soils, hazardous materials and waste, health and safety, noise, socioeconomics, and water.

The intensity of a potential impact refers to its severity, and takes into account beneficial and adverse impacts to human health and the environment. Unless otherwise noted, the following categories were used to classify the potential impacts of each component on the resources:

- **No Impact (None)—**An incident that, if it occurred, would be expected to have no measurable impacts.
- **Negligible Impact**—An incident that, if it occurred, would have no effect, or barely observable/noticeable adverse impacts are expected.
- **Minor Impact**—An incident that, if it occurred, would be short-term, but measurable adverse impacts are expected.
- **Moderate Impact**—An incident that, if it occurred, would cause noticeable adverse impacts, would have a measurable effect on a resource, and is not short-term.
- **Severe Impact**—An incident that, if it occurred, would cause obvious adverse impacts, both short-term and long-term, and would have serious consequences on a resource. The impacts would be considered significant.
- **Beneficial**—An incident that, if it occurred, the impacts would benefit the resource.

4.1 AIR QUALITY

4.1.1 Removal of Metals and Re-armoring Along the Shoreline East of Landfill, Removal of Metal Debris from Storage Area Adjacent to Landfill, Removal of Metal Debris from the Area between Glass Beach and the Shark Pit (Component in Removal Action Memorandum Alternatives A, B, C, and D)—Air Quality

Excavation, grading, moving, and compacting of materials normally involves the use of equipment such as bulldozers, scrapers, backhoes, roller drums, and trucks. Removal and re-armoring activities would (1) generate temporary fugitive dust and (2) generate diesel exhaust emissions from the use of diesel engines.

Fugitive Dust. The removal of metal debris and re-armoring of the shoreline would have the potential to affect 2,100 linear feet of shoreline and 74,220 square feet of total area (Mt. Olympus to Glass Beach). Overall, the local soil within this area is coarse and not easily converted to fugitive dust. The beach sand would be compressed by the tidal water flow into the area, which would reduce the conversion of the sand to fugitive dust. Standard dust control measures would be employed to reduce fugitive dust emissions in areas where general population or workers' exposure is of concern. Additionally, the prevailing year-round winds from the east have the potential to decrease the effects of the short-term fugitive dust to a negligible impact. The implementation of Best Management Practices (BMPs) would minimize fugitive dust emissions. Therefore, any generation of dust would be expected to cause minor short-term impacts on air quality and would vary in occurrence based on completion schedules for metals removal and re-armoring activities. Table 4-2 in Section 4.1.8—Mitigation Measures lists BMPs available to mitigate air pollution from fugitive dust.

Emissions. Direct emissions will be generated from the use of fossil fuel in equipment (e.g., bulldozers, scrapers, backhoes, roller drums, trucks, and generators) and the use of vehicles for the transportation of equipment and personnel. All direct emissions generated during the removal and re-armoring process would be localized to the project area and short-term. Emission factors for typical construction equipment are listed in Table 4-1. For example, the typical operations of a diesel generator would contribute an additional 7.14 tons per year of carbon monoxide and 0.42 percent of PM_{10} to the current yearly threshold. However, this contribution would be short-term and anticipated to have a minor impact on local air quality. Additionally, the prevailing year-round winds from the east have the potential to decrease the effects of the short-term emissions to a negligible impact. Mitigation measures would be used to reduce impacts from emissions associated with the execution of the components of the Alternatives (A–D) (see Section 4.1.5, Mitigation Measures).

Table 4-1. Comparison of USAG-KA air pollutant thresholds emissions and construction equipment emissions.

Pollutant	USAG-KA Thresholds	Mobile Stationary Construction Equipment (tpy)	Diesel Engine Emission (tpy)	Diesel Generators Operations (tpy)
Carbon Monoxide	100 tpy	3.32	0.047	7.14
Nitrogen Oxides	40 tpy	0.34	0.053	26.9
Ozone	40 tpy of VOC	0.16	N/A	2.97
Sulfur Oxide	40 tpy	0.0034	0.00	0.0
Lead	0.6 tpy	N/A	N/A	N/A
$PM_{2.5}$	15 tpy	N/A	N/A	N/A
PM_{10}	10 tpy	0.017	0.002	0.42

Sources: Eastshore Energy Center, 2007; Air Force Center for Engineering and the Environmental, 2010; Air Quality Impact Report, 2012

Note: N/A = not applicable tpy= tons per year VOC = volatile organic compound
$PM_{2.5}$ = particulate matter equal to or less than 2.5 microns in size PM_{10} = particulate matter equal to or less than 10 microns in size

4.1.2 Climate Change

Greenhouse Gases. The use of fossil fuel from the potential operation of generators, construction equipment, and work vehicles is also of concern because it can lead to the direct and indirect emission of greenhouse gases. Table 4-2 further illustrates that in a worst-case scenario of the use of construction equipment for 8-hours a day for 365 days, the direct emission factors from the use of construction equipment would be below the USAG-KA yearly threshold and would add less than 2.0 percent of CO to the threshold standards for USAG-KA. As noted above, this contribution would be short-term and anticipated to have a minor impact on local air quality. Additionally, the prevailing year-round winds from the east have the potential to decrease the effects of the short-term emissions to a negligible impact. Nonetheless, contractors would employ BMPs throughout the removal and re-armoring project process to ensure operation of construction equipment, generators, and work vehicles emit minimal emissions.

Sea Level Rise. All construction of the new revetment for the shoreline re-armoring will take place alone the footprint of the original shoreline. The new revetment has been designed to sustain higher wave height, which is anticipated to mitigate or prevent any adverse impacts breaking waves alone the shoreline of the Kwajalein Landfill. The final armoring design will review sea level rise values, wave heights and the near-shore variance.

Table 4-2 Emission Factors, EF (ton/yr) for Construction Equipment (8 hours/day/365 days)

	Emission Factors, EF (ton/yr.) for Construction Equipment (8 hours/day/365 days)												
Equipment	MaxHP	CO	USAG-KA Threshold	2012 EF @ Incinerator	NO_X	USAG-KA Threshold	2012 EF @ Incinerator	SO_X	USAG-KA Threshold	2012 EF @ Incinerator	PM	USAG-KA Threshold*	2012 EF @ Incinerator
Air Compressor	750	1.11	100	N/A	3.34	40	7.24	.0053	40	11.77	0.108	25	2.61
Backhoe/Loader	750	1.03	100	N/A	2.33	40	7.24	.0057	40	11.77	0.081	25	2.61
Cranes	750	1.14	100	N/A	2.99	40	7.24	.0044	40	11.77	0.106	25	2.61
Excavators	750	1.2	100	N/A	2.91	40	7.24	.0057	40	11.77	0.102	25	2.61
Generator Sets	750	1.56	100	N/A	4.74	40	7.24	.0080	40	11.77	0.136	25	2.61
Industrial Saws	175	1.27	100	N/A	1.69	40	7.24	.0026	40	11.77	0.085	25	2.61
Scrubber	250	0.48	100	N/A	1.33	40	7.24	.0026	40	11.77	0.042	25	2.61
Surface Equipment	750	0.84	100	N/A	2.02	40	7.24	.0032	40	11.77	0.683	25	2.61

Sources: South Coast Air Quality Management District (SCAQMD) Annual Emission Reporting, 2015
Note: Calculations are based on EFs of 8 hrs./day and 365 days/yr.; 1 pound =0.0005 tons; EF were converted from lb/year to ton/year
*25 tpy is based on 15 tpy for PM_{10} and 10 tpy for $PM_{2.5}$

4.1.3 Closing Existing Landfill with Impermeable Cap (Component in Removal Action Memorandum Alternatives B and D)—Air Quality

Under this component, construction equipment will be required to remove the 6,700 tons of metal debris stored adjacent to the landfill, for grading and compacting waste in a 5-acre pile, and for digging of ditches around the cover for the flow of stormwater runoff. As discussed in Section 4.1.1, excavation, grading, moving, and compacting of materials normally involves the use of equipment such as bulldozers, scrapers, backhoes, roller drums, and trucks and the use of vehicles for the transportation of equipment and personnel. The use of this equipment would generate temporary fugitive dust and direct exhaust emissions from the use of diesel engines. The addition of six landfill gas vents to remove landfill gas so it does not collect under the liner is not anticipated to trigger any UES air quality requirements not presently being considered. The environmental impacts to air quality are discussed in detail in Section 4.1.1. Overall, the effects of executing this component would be short-term and have negligible direct impact on air quality, and would have a long-term benefit to the environment.

4.1.4 Close Existing Landfill, Excavate and Transport Existing Refuse CONUS, and Cover with Topsoil (Component in Removal Action Memorandum Alternative C)—Air Quality

Under this component, the use of construction equipment will be required to excavate, stockpile, and transport the refuse to a tug or barge, the 110,000 cubic yards of waste and the 6,700 tons of metal debris adjacent to the landfill. The use of this equipment would generate temporary fugitive dust and diesel direct exhaust emissions from the use of diesel engines. The environmental impacts to air quality are discussed in detail in Section 4.1.1. Overall, the effects of executing this component would be short-term and have negligible impact on air quality and is anticipated to have a long-term benefit to the environment.

4.1.5 Construction of New Landfill (Component in Removal Action Memorandum Alternatives B and C)—Air Quality

Under this component, construction equipment will be required to construct a new 2-acre landfill, dig stormwater ditches, and vehicles would be used for the transportation of equipment and personnel. The environmental impacts to air quality are discussed in detail in Section 4.1.1. Overall, the effects from fugitive dust and direct diesel exhaust emissions from the use of diesel engines. This component would be short-term and have negligible impact on air quality, and is anticipated to have a long-term benefit to the environment.

4.1.6 Transport Future Refuse for Disposal in CONUS Landfill (Component in Removal Action Memorandum Alternative D)—Air Quality

Under this component, the landfill would be closed and all future refuse would be shipped to the CONUS. No new landfill would be built. The use of construction equipment would be required to close the current landfill. The use of this equipment would generate temporary fugitive dust and direct diesel exhaust emissions from the use of diesel engines. The environmental impacts to air quality are discussed in detail in Section 4.1.1. Overall, the effects of executing this component would be short-term and have negligible impact on air quality and is anticipated to have a long-term benefit to the environment.

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4.1.7 Stabilize Shoreline—Landfill Shoreline Only (Component in Removal Action Memorandum Alternatives B, C, and D)—Air Quality

Under this component, the use of construction equipment will be required for the removal of existing trash, concrete, rubble, metal debris from the shoreline, as well as grading and compacting the shorelines. The environmental impacts to air quality are discussed in detail in Section 4.1.1. Overall, the effects from fugitive dust and emissions for executing this component would be short-term and have negligible impact on air quality, and anticipated to have a long-term benefit to the environment.

4.1.8 Water Quality Monitoring (Component in Removal Action Memorandum Alternatives A, B, C and D)—Air Quality

Water quality monitoring would occur for all Removal Action Memorandum Alternatives. For Removal Action Memorandum Alternative A, over a 6-year period the evaluation of the remedial effectiveness of the metal removal and shoreline re-armoring will be completed. Collection of water samples for analysis would be conducted in accordance with a Sampling and Analysis Plan. Sampling techniques do not typically require fuel burning to operate the sampling equipment. Therefore, no impact to air quality is anticipated from long-term water quality monitoring.

For Removal Action Memorandum Alternatives B-D, over a 30-year period the evaluation of the remedial effectiveness of the components (1) landfill closure by grading and capping; (2) landfill closure for with landfill excavation and shipping of refuse to CONUS; (3) Construction of a new landfill; (4) transport of future refuse incinerator ash to CONUS landfill; and (5) stabilization of shoreline by constructing a new revetment alone the original landfill shoreline footprint would be completed. Collection of water samples for analysis would be conducted in accordance with a Sampling and Analysis Plan and UES Section 3-6.5-7(c)(6)(vii). If it is determined additional alternatives would be necessary, a full re-analysis of all environmental resources would be conducted in accordance to ensure that there have not been any changes in the affected environment.

4.1.9 Best Management Practices/Mitigation Measures—Air Quality

Fugitive Dust. The BMPs listed in Table 4-2 would be used during removal activities for the reduction of fugitive dust during the execution of the components for Removal Action Memorandum Alternatives (A–D).

Table 4-3. Best management practices or reasonably available control measures to mitigate air pollution from fugitive dust.

Source Category	Control Measure
Removal Activity	• Use wind breaks/screens • Apply dust suppressants
Disturbed Surfaced Area (general)	• Use fences, barriers, wind breaks/screens • Plant vegetation • Apply dust suppressants • Cover with gravel • Compact the surface
Earth-Moving	• Haul truck materials covered or watered • Haul truck wheel washers • Street sweeping
Storage Pile (open)	• Use wind breaks/screens • Use enclosures around storage piles • Apply dust suppressants
Application of Dust Suppressants: Where appropriate, dust suppressants or liquid surfactants would be applied to areas where dust could be disturbed by construction or traffic.	
Sprinkling/Irrigation: The practice of sprinkling the ground surface with water until it is moist can be used to control dust on haul roads and other traffic routes. This practice can be applied to almost any site. When suppression methods involving water are used, care would be exercised to minimize over-watering that could cause the transport of mud onto adjoining roadways, which ultimately could increase the dust problem. Mechanical removal of mud from tires would be implemented if necessary.	

Emissions*.* To reduce direct and indirect emissions from fossil fuel, measures such as the use of clean diesel and implementation of anti-idling measures for construction equipment would be implemented when practicable.

4.2 BIOLOGICAL RESOURCES

Potential impacts to biological resources were analyzed against a list of possible stressors that are applicable to the components of the Removal Action Memorandum Alternatives (A–D). The stressors analyzed include (1) *direct impacts,* such as removal or displacement, (2) *turbidity or sedimentation,* (3) *exposure to noise* from machinery or other sources, (4) *wastes and discharges* from construction activities or equipment, and (5) *loss or degradation of habitat*, including shelter or forage resources.

The intensity of a potential impact refers to its severity and takes into account beneficial and adverse impacts to biological resources. The following categories were used to classify impacts from the stressors to biological resources:

No Effect—means there will be no impacts, positive or negative, to listed or proposed resources. Generally, this means listed resources will not be exposed to the Proposed Action and its environmental consequences. Concurrence from NMFS or USFWS is not required.

May Affect but Not Likely to Adversely Affect—means the Proposed Action may affect the listed species or critical habitat but the effects will be insignificant, discountable, or completely beneficial. Beneficial effects have contemporaneous positive effects without any adverse effects to the species or habitat. Insignificant effects relate to the size of the impact and include those effects that are undetectable, not measurable, or cannot be evaluated. Discountable effects are those extremely unlikely to occur. These determinations require written concurrence from NMFS or USFWS.

Likely to Adversely Affect—means the Proposed Action may negatively and significantly affect the listed species or critical habitat; this includes “take” of an individual of the listed species.

Likely to Result in Jeopardy to Species—means the Proposed Action will jeopardize the continued existence of a listed species.

4.2.1 Removal of Metals and Re-armoring Along the Shoreline East of Landfill, Removal of Metal Debris from Storage Area Adjacent to Landfill, Removal of Metal Debris from the Area between Glass Beach and the Shark Pit (Component in Removal Action Memorandum Alternatives A, B, C, and D)—Biological Resources

Terrestrial. Terrestrial biological resources are those that live predominantly or entirely on land. Impacts to terrestrial species are analyzed according to two of the five listed stressors as applicable that may potentially be caused by the Proposed Action. The stressors analyzed for this component include (1) direct impacts such as removal or displacement, (2) exposure to noise, (3) wastes and discharges, and (4) habitat loss or degradation including shelter and/or forage resources. Impacts from turbidity and/or sedimentation are not expected.

Vegetation. No significant impacts from the stressors are predicted under this component. Some localized direct impacts from vegetation removal would occur at staging areas for equipment or removed metal debris and during construction of the new landfill; however, the majority of vegetation on Kwajalein Island is managed, and areas of natural vegetation have not been recorded in the project area. The area within the construction footprint for the new landfill is currently occupied by the metal debris storage area and has vegetation that consists of isolated, individual trees and shrubs that have not been recorded as providing any nesting or foraging habitat for avian species. This area has not been surveyed to determine the amount of vegetation that would be required to be removed during construction. General disturbance from increased human presence would be short-term. Overall, this component, the removal of metals and re-armoring along the shoreline, may affect, but is not likely to adversely affect, vegetation.

Wildlife

<u>Direct Impacts</u>. Nesting of seabirds in the project area is possible but not likely. The 2010 survey by USFWS and NMFS observed the black-naped tern nesting on Kwajalein Island using the concrete platforms at the fuel pier on the lagoon side. White terns were observed nesting in large trees near the town center and building areas (National Marine Fisheries Service and U.S. Fish and Wildlife Service, 2012) and in trees on the golf course during the 2014 biological inventory (U.S. Fish and Wildlife, 2016). White terns may nest in pandanus trees and tropical almonds. No observations of seabird nesting in the project area have been recorded.

Direct impacts to nesting habitat could occur from the placement of shore-based machinery and the creation of staging areas for equipment of removed debris. On other islets, terns have been most frequently documented nesting in intact littoral forest; however, terns build cryptic nests in open areas and on the beaches, which increases their susceptibility to human traffic. Eggs and chicks can easily be trampled or crushed (National Marine Fisheries Service and U.S. Fish and Wildlife Service, 2012).

Disturbance impacts could result from the presence of humans, which can cause the flushing of adult birds from eggs and chicks. If the adults are flushed for a long enough period of time, this could be detrimental to the chick or egg because it can lead to overheating and death (National Marine Fisheries Service and U.S. Fish and Wildlife Service, 2012). This effect would be short term and limited to times of Proposed Action activity.

Workers would be trained in identification and avoidance procedures for migratory birds and nests. Prior to daily activities, workers would perform a survey of the area to ensure no new nests have been established. If a white tern is observed incubating or with a chick, the tern must not be displaced. Nearby vegetation can be removed, the tern will remain on the nest, and the nest tree can be removed after the chick fledges. If a UES coordination species is disturbed, injured, or killed during the Proposed Action activities, the USFWS and the RMI Environmental Protection Authority shall be informed within 24 hours. The construction phase would be over a 12-month period with varying times for each project.

With adherence to the proposed BMPs and mitigation measures, terrestrial biological resources may be affected, but are not likely to be adversely affected.

<u>Exposure to Noise</u>. Increased noise levels from earth-moving equipment used during debris removal and shoreline armoring (see Section 4.6) would not negatively affect wildlife resources. Current noise levels are consistent with an industrial area, and increases from machinery and workers would be short-term and temporary. Wildlife species that may use this area for shelter and foraging may be temporarily displaced by increased noise within 50 ft, but the project area includes only a small portion of the available foraging habitat on the island. Once construction activities are complete, noise levels would return to existing levels, and terrestrial wildlife species would be expected to return to the area.

<u>Wastes and Discharges</u>. Construction wastes may include small plastic trash and bags that may be ingested and cause digestive blockage or suffocation in birds. Equipment spills, discharges, and run-off from the project area could contain hydrocarbon-based chemicals such as fuel oils,

gasoline, lubricants, hydraulic fluids, and other toxicants, and could contaminate the soil or impact vegetation. The mitigation and conservation measures described in Section 4.4.2 are intended to prevent the introduction of wastes and toxicants into the terrestrial environment; therefore, construction-related discharges and spills would be infrequent, small, and quickly cleaned if they do occur.

Habitat Loss or Degradation. The execution of this component would not negatively affect migratory birds or other wildlife resources and habitats. Removal of a relatively small amount of vegetation during debris removal may eliminate some potential nesting, foraging and loafing habitat; however, no migratory birds or other wildlife resources have been recorded using the project area for routine loafing, nesting, or foraging. While seabirds and shorebirds have been observed foraging and feeding along the shoreline and exposed reef flat at low tide on the southern shores, the presence of workers is likely to discourage them from using the immediate area. Impacts would be expected to be temporary behavioral changes, and the project area includes only a small portion of the available foraging habitat on the island.

Marine. Impacts to marine species are also analyzed to the list of stressors that may potentially be caused by executing this component. Stressors analyzed are (1) direct impacts such as removal or displacement, (2) turbidity or sedimentation, (3) exposure to noise, (4) wastes and discharges, and (5) habitat loss or degradation.

Vegetation. As noted in Chapter 3, no UES coordination marine plant species are present in the project area, and blue-green, green, brown, and red algae are known for the southern coast of Kwajalein. No effects to marine vegetation are predicted under this component.

Wildlife

Direct Impacts. Debris removal would be limited to shoreline and shallow reef flat habitats. Kolinski (2015) noted that all debris observed further out on the reef flat appeared amenable to removal by hand, although in some cases items may need to be pried from the substrate. He further noted that UES consultation species were not observed in the immediate vicinity of metal debris or along potential pathways that might be used for extraction. This suggests a formal UES consultation for marine species may not be needed, particularly if reef flat clean-up activities are conducted at low tide, which would reduce sound transmittal and the potential for sea turtles and other mobile species of concern to be present in the area of affect.

The removal is proposed to be conducted using large machinery, such as cranes, gradalls, other forklifts, and/or front-loaders. The equipment would be used to facilitate removal of debris, but it is anticipated such machinery would mainly reach out from shoreline-based positions. The Proposed Action is restricted to the shoreline and will take place during periods of low tide. Species must be directly beneath the equipment in order to be injured or killed by direct impact, which is extremely unlikely at low tide.

Any impacts to UES coordination corals are expected to be very limited, as long as removal activities are restricted to reef flat and bench-top areas. Workers will be instructed to carefully translocate any corals that occur on debris to the immediate vicinity of their original location.

In the event that *Trochus* is observed within the project area, work will immediately cease. Since this species is motile, there is potential for it to enter the action area, but may require a longer period of time (multiple days) to leave the area. In order to avoid direct impacts to *Trochus* from relocation, project work and equipment that may cause direct impacts would temporarily relocate to another area along the shoreline. Activity in that area could proceed once the project supervisor concludes the *Trochus* would not be adversely affected by the activity.

Sea turtles and cetaceans might avoid the project area while humans were present. Above-water noise effects associated with use of any light equipment (e.g., crane) operation would be expected. In-air noise could temporarily degrade resting habitat for sea turtles. Avoidance of an area might increase sea turtles' and cetaceans' energy expenditure and physical stress. The effect would not likely be permanent, and turtles and cetaceans would be free to return to the project area once the component has been completed. Furthermore, the project area would constitute only a small fraction of the entire Kwajalein Atoll and RMI where green and hawksbill turtles would be able to forage, nest, and rest without being disturbed. The southern shore of Kwajalein Island also does not appear to be used often by turtles. Sea turtle tracks were not observed on shoreline sands during the marine biological/debris assessment survey, but it was noted that some of the beach approaches may be suitable for turtle nesting (Kolinski, 2015). The potential for direct contact with nesting sea turtles on the shoreline in the action area is unlikely, as sea turtles have not been recorded nesting on these shoreline areas and will likely avoid the project area due to the increased activity. Shorelines will also be observed daily prior to work commencing for any signs of turtle nesting.

Little information is available for marine mammal occurrence off the southern coast of Kwajalein, which suggests this is not an area often frequented by them. If a cetacean were to be sighted during debris removal operations, activity would cease, and the cetacean would be allowed to transit the area without injury or harassment. Proactive monitoring of the project area would be performed to limit unnecessary interactions with wildlife. Impacts would be expected to be temporary behavioral changes caused by human presence and activity.

Removal of metallic debris near Mount Olympus would require shoreline armoring. Shoreline armoring consists of constructing a new stone-armored revetment (original landfill shoreline footprint only) capable of withstanding storm wave energy to maintain a stable shoreline and to avoid future erosion of the landfill areas. This component includes placing geotextile fabric to prevent erosion of the sub-base. It should be noted that after interaction with wind and/or surf, geotextile fabric can be uncovered and present hazards to sea turtles. Concerns have been raised that the installation of sloped geotextile coastal armoring may inhibit sea turtle nesting due to an increase in the slope of the shoreline (West et al., 2010). Other possible problems include the possibility that the plastics associated with the geotextile tubes could diminish the viability of sea turtle eggs and hatchlings due to the effects of plasticizers from the geotextile fabric, and impacts resulting from changes in the moisture level of the sea turtle nest, and other detrimental impacts to nesting habitat (West et al., 2010). However, as noted in Chapter 3, nesting is rarely recorded for Kwajalein Island. A post-construction monitoring program should include monitoring of the armoring, including any potential impacts to sea turtles.

No debris removal operations would occur at night; however, during hours of darkness, some lighting may be required on equipment to provide visibility. No lighting would be pointed directly into the water but would likely alter habitat for sea turtles somewhat during the night, particularly if they were to use the shallow waters near the action area to rest. Although lighting has been related to impacts on adult sea turtle nesting behavior, as well as the behavior of recent hatchling, nesting only infrequently is reported for Kwajalein.

With adherence to the proposed best management practices and mitigation measures, marine biological resources are not likely to be adversely affected.

Turbidity or Sedimentation. During construction, potential short-term, minor, adverse effects on water quality may be caused by localized increases in turbidity and downstream sedimentation. Terrestrial sediment runoff and deposition on coral reefs can significantly impact coral health by blocking light and inhibiting photosynthesis, as well as directly smothering and abrading coral tissue, reducing larval survival, reducing coral polyp activity, and reducing the reproductive rate (e.g., Dodge et al., 1974; Rogers, 1983, 1990; Jokiel et al., 2014). Short-term, minor to moderate, direct and indirect, adverse impacts on fish could result from sediment displacement and an increase in turbidity. The extent of the turbidity plume generated would depend on the amount of sediment disturbed, the grain size, and weight of the disturbed sediment particles; and the ambient current dynamics.

High suspended sediment levels can affect fish in a variety of ways, including: (1) adversely affecting their swimming, reducing growth, reducing disease tolerance, or causing death (normally caused by clogging gill filaments); (2) reducing habitat quality (suitability), particularly spawning habitats affecting eggs and developing larvae by smothering; (3) forcing the modification of migration patterns; (4) reducing food availability (primary production, plants, and benthic invertebrates); and (5) altering predatory efficiency (Berry et al., 2003). Fish, however, are highly mobile, and turbid plumes would be spatially and temporally limited. Affected species would be expected to recover soon after construction ceased and would represent only a small portion of food available to marine mammals in the area. Short-term, minor, indirect, adverse impacts on cetaceans could result from sediment displacement and an increase in turbidity. Cetaceans would be indirectly affected by impacts to their prey items, fish and invertebrate species. Toothed whales (e.g., members of the dolphin family and sperm whale) have a sophisticated sonar system (echolocation), so any likelihood of impaired navigation or predator detection would probably not be an issue. At worst, the animals might temporarily avoid turbid waters and opt for clearer areas nearby, resulting in short-term stress for the animals. Any such disruption in their behavior would cease after construction is ceased, sediments resettle, and the water quality returns to ambient levels. Additionally, natural events such as storms and tidal currents stir up substantial amounts of sediments, and any animals occurring in the project area are exposed to these turbidity events on a regular basis.

During debris removal and shoreline stabilization, turbidity will be monitored within 50 meters of the shoreline, both up current and down current of the work area, on at least a daily basis. If the turbidity in the project area exceeds 10 NTUs above background levels, work will cease until the turbidity levels are below 10 NTUs above background per the requirements stipulated in the existing *Dredging and Filling Document of Environmental Protection* (DEP-10-002.0).

For other projects in the Kwajalein Atoll, data has been collected that supports the effectiveness of using a silt curtain to control turbidity. The Roi Fuel Pier Repair project required monitoring of turbidities outside the silt curtain at the project site and at two background stations outside the influence of the project. The lowest turbidities at the background stations ranged from 0.08 to 0.23 NTUs. While the project was dredging the pier site, turbidities outside the silt curtains at the project site were 0.73 and 3.00 NTUs above the lowest turbidities at either of the two background stations. Turbidity in the project area while dredging was ongoing averaged only 2.00 NTUs above background (USAKA, undated).

The turbidity should decrease rapidly with the cessation of the work since the grain size in the project area are coarse to fine sands which tend to rapidly settle from the water column. The Project Area occurs along the shoreline where heavy wave action is common. Beyond 50 meters, the determination of turbidity levels caused by the Proposed Action would be difficult to differentiate from turbidity caused by wave action. To minimize the impact of increased turbidity on marine species, the Proposed Action would occur during periods of low tide, in addition to monitoring turbidity levels.

Exposure to Noise. Sources of noise from the Proposed Action will be generated by heavy equipment based on the shoreline and placed approximately 10 to 20 ft from the water. The types of noise sources and the maximum sound noise (L_{max}) generated by each piece of equipment are summarized in Table 3-9. The Proposed Action has a maximum in-air sound level of 116 dB, and will diminish to less than 100 dB over 50 ft away from the construction. This does not exceed the 120 dB in-water noise threshold for continuous non-impulsive noise for behavioral effects to marine mammals.

The coupling of land-based vibrations and nearshore sounds into the underwater acoustic field is not well understood. In-air noise measurements use a standard reference sound pressure of 20 micropascals (μPa), or 0 decibels (dB). In-water measurements use a standard reference sound pressure of 1 micropascal (re 1 μPa). The difference (of about 26 dB) between the sound pressure levels of an air reference pressure and those of a water reference pressure can be compared by inserting their respective reference pressures in the following equation: difference (dB) = 20log10 (air reference pressure/water reference pressure) = 26 dB (Bradley and Stern 2008). Most standards for assessing potential impact of sounds on marine resources, use the root-mean-square (dBrms) of an acoustic pulse. In the discussion below, all further references to SPL assume dB_{rms} re 1 μPa.

Sounds generated from onshore construction activities from the Proposed Action are not likely to enter the water column at levels that would cause physical, physiological, or behavioral responses in marine mammals or other marine resources that might occur near the shoreline.

Although the study of invertebrate sound detection is still rather limited, it is becoming clear that many marine invertebrates are sensitive to sounds and related stimuli (Popper and Hawkins, 2016). This sensitivity has been demonstrated in tropical waters where crustacean and coral larvae can respond to acoustic cues (e.g., reef noise) (Vermeij et al., 2010). Since they occur infrequently in the area and have not been recorded in the immediate Action Area, and because noise generation will be limited to periods of low tide to reduce transmission through water, the in-water noise is unlikely to affect protected mollusks.

Fish utilize sound for navigation and selection of habitat, mating, predator avoidance and prey detection, and communication. Impeding the ability of fish to hear biologically relevant sounds might interfere with these critical functions and use of the ”acoustic scene” or ”soundscape” to learn about the overall environment. Larval stages of coral reef fish can detect and are attracted to the sound of coral reefs, thereby using reef noise as an acoustic cue for orientation (Simpson et al., 2004).

Fish can experience injury at ≥206 dB_{rms} SEL (re: 1 μPa) in water (see Table 4-3) and behavior modification at ≥150 dB_{rms}. The Proposed Action has a maximum in-air noise level of 116 dB and less than 100 dB at 50 ft away from the construction. If a fish occurred 50 ft from these sound sources, these noise levels are not likely to cause behavioral modifications or injury.

Table 4-4: Harassment levels and biological thresholds for fish.

In-Water Sounds- Biological Thresholds For Fish		
Functional Hearing Group	Behavior Effects Threshold	Injury Threshold
Fish (all sizes)	≥ 150 dBrms	≥ 206 dB cumulative SEL
Fish (2 grams or larger)	≥ 150 dBrms	≥ 187 dB cumulative SEL
Fish (under 2 grams)	≥ 150 dBrms	≥ 183 dB peak

Source: Fisheries Acoustic Working Group, 2008

Notes: dB: decibels; rms: root-mean-square; SEL: Sound Exposure Level

The UES is the regulatory document for environmental issues for activities at USAKA. Although the MMPA is not applicable at USAKA, the UES incorporates the intent of the MMPA in its requirements. For purposes of this EA, the MMPA criteria are used for analyses. Specific threshold criteria are not established for sea turtles; therefore, this analysis uses the NMFS marine mammal thresholds, which provides a conservative approach in favor of the turtles.

Given that hearing is one of the most important sensory receptors for marine mammals, noise could affect marine mammals in several ways and is highly variable (Richardson et al., 1995). Marine mammals can show the full range of types of behavioral response, including altered headings; fast swimming; changes in dive, surfacing, and respiration patterns; and changes in vocalizations (National Research Council, 2003).

The cetacean permanent threshold shift (PTS) for exposure to in-water sounds is ≥180 dB_{rms} re: 1 µPa (i.e., Level A Harassment—zone of hearing loss, discomfort, or injury) (see Table 4-4). Acoustic thresholds that would be expected to cause adverse behavioral responses in marine mammals have not been identified for the purposes of the ESA of 1973, as amended. However, under the MMPA, exposure to impulsive in-water sounds at ≥160 dB_{rms} re: 1 µPa or exposure to non-impulsive sound (continuous noise) is ≥120 dB_{rms} re: 1 µPa are used as thresholds for behavioral responses that would qualify as Level B Harassment. Using the MMPA thresholds as a benchmark, the Proposed Action has a maximum noise level of 116 dB and will be less than 100 dB 50 ft away from the construction. These noise levels would not exceed a Level B Harassment. Additionally, the maximum radius over which the noise may influence is very small compared to the distribution ranges of marine mammals in the region. If a sea turtle or marine mammal occurred 50 ft from these sound sources, these noise levels are not expected to cause behavioral modifications or injury.

Table 4-5. Harassment levels and biological thresholds for marine mammals.

In-Water Sounds- Biological Thresholds for Marine Mammals Under MMPA		
Criterion	Criterion Definition	Threshold
Level A	PTS (injury) conservatively based on Temporary Threshold Shift	≥ 180 dB_{rms} for cetaceans
Level B	Behavioral disruption for impulsive noise (e.g., impact pile driving)	≥ 160 dB_{rms}
Level B	Behavioral disruption for non-pulse noise (e.g., vibratory pile driving, drilling)	≥ 120 dB_{rms}

Source: National Oceanic and Atmospheric Administration Fisheries, 2016

Notes: dB: decibels; rms: root-mean-square; SEL: Sound Exposure Level

Conducting debris removal and shoreline stabilization during periods of low tide will effectively prevent marine species and other mobile species of concern from being exposed to noise at received levels that might be expected to cause adverse consequences. Increased noise levels may result in temporary avoidance of the immediate area around the work site; however, since these protected marine species are highly mobile and distributed widely throughout the region, temporary avoidance of a small part of the reef habitat during a limited number of hours each day will have insignificant effects.

Wastes and Discharges. Construction wastes may include plastic trash and bags that may be ingested and cause digestive blockage or suffocation in protected fish, sea turtles, or marine mammals. Corals can be directly affected by plastic macro debris as well, mainly by suffocation, shading, or abrasion. Larger waste may include discarded sections of ropes and lines, which may entangle marine life (Laist, 1997).

There will be equipment operating at the shoreline, where fuels could spill or hydraulic fluids could leak and be discharged into the marine environment. Equipment spills, discharges, and run-off from the project area could contain hydrocarbon-based chemicals such as fuel oils, gasoline, lubricants, hydraulic fluids, and other toxicants. The impacts of hydrocarbons are caused by either the physical nature of the oil (physical contamination and smothering) or by its chemical components (toxic effects and bioaccumulation) (Saadoun, 2015). Depending on the chemicals and their concentration, the effects of exposure may range from animals temporarily avoiding an area to death of the exposed animals.

Local and federal regulations prohibit the intentional discharge of toxic wastes and plastics into the marine environment. Additionally, the mitigation and conservation measures described in Section 4.4.2 are intended to prevent the introduction of wastes and toxicants into the marine environment; therefore, construction-related discharges and spills would be infrequent, small, and quickly cleaned if they do occur. The potential for exposure of protected mollusks, fish, sea turtles, and marine mammals to construction-related wastes and discharges is discountable.

Habitat Loss or Degradation. No permanent loss or degradation of in-water habitat would occur from the Proposed Action. Short-term, minor impacts, primarily related to increased turbidity, may result from the Proposed Action. Once debris removal and shoreline construction are complete, habitat conditions are expected to return to current or, more likely, improved levels due to improvements in water quality. The Proposed Action would have long-term, significant beneficial impacts to habitat for protected species.

Aquatic community receptors including aquatic plants, aquatic invertebrates, and fish were evaluated considering the following assessment endpoint: survival, growth, and reproduction of aquatic community receptors. Copper is highly toxic in aquatic environments and has effects in fish and invertebrates including damage, and interferes with osmoregulatory processes (U.S. Army Public Health Command, 2014). Copper bioconcentrates in many different organs in fish and mollusks; however, there is low potential for bioconcentration in fish, but high potential in mollusks (U.S. Army Public Health Command, 2014). Copper, in particular, is known to negatively affect various life history stages of many common coral reef marine invertebrates (Heslinga, 1976; Reichelt-Brushett and Harrison, 2000, 2005; Nystrom et al., 2001; Bielmyer et al., 2010) and may be accumulating, along with other contaminants, in locally-utilized fisheries resources in the area (U.S. Army Public Health Command, 2014). The addition of iron in waters where it is otherwise naturally limited may be stimulating cyanobacteria and algae abundance (National Marine Fisheries Service and U.S. Fish and Wildlife Services, 2006), and may have tipped the balance or at least enhanced the risk of a phase shift to “black reefs” in iron exposed areas (Kelly et al., 2012). Kolinski (2015) noted that qualitatively, the reefs within the project zone do appear to be in a degraded state (U.S. Fish and Wildlife Service and National Marine Fisheries Service, 2006; 2012); however, seasonal wave energy, tidal driven aerial exposure, and warming waters likely confound or act synergistically in generating this perception. The limited activities planned for debris removal and water quality monitoring would not likely result in cumulative impacts on marine biological resources. The removal of the metal debris likely would result in a net benefit for the entire community that would far outweigh the potential adverse impacts to coral (Kolinski, 2015). Kolinski reported: “Overall, the ecological benefits of reduced metal concentrations are expected to, over time, greatly exceed project related impacts on UES coordination corals in this area.”

4.2.2 Closing Existing Landfill with Impermeable Cap (Component in Removal Action Memorandum Alternatives B and D)—Biological Resources

Terrestrial. Direct impacts to vegetation would include clearing and chipping of approximately 5 acres of managed vegetation that currently covers the landfill area. The area would then be graded and sealed using a combination of liners, soils, and sand, with a replacement vegetative grass cover.

The execution of this component may also result in additional direct impacts and general disturbance to wildlife species. Vegetation that would be removed at the existing landfill provides cover and forage for birds and other wildlife. Additionally, noise exposure would increase due to the presence of additional construction equipment for a longer duration.

Marine*.* Impacts to marine biological resources would be similar to that described for Removal of Metals and Re-armoring along the Shoreline East of Landfill, and additional impacts under Removal Action Memorandum Alternative B would be limited to terrestrial areas.

In totality, the environmental benefits of closing the landfill and reducing the metal concentrations are over time, greatly exceed project related short-term impacts in this area.

4.2.3 Close Existing Landfill, Excavate and Transport Existing Refuse CONUS and Cover with Topsoil (Component in Removal Action Memorandum Alternative C)—Biological Resources

Impacts of additional shipping on the marine environment include possible ship strikes, vessel noise, and accidental spills. Potential direct impacts on marine mammals from vessel traffic would include an increase in noise and harassment of animals in the form of disturbance and possible serious injuries or death. Disturbance from vessel traffic (whether it be visual/physical presence of the vessels or acoustic) could cause short-term behavioral disturbance to the animals, or even displace animals from their preferred habitats (Richardson et al., 1995). Sublethal injuries from vessel strikes would reduce fitness through a number of negative health consequences. These may include weakness from hemorrhage and opportunistic infections, stress-induced immunity impairment and hampered movements resulting in compromised foraging efficiency, predator avoidance, and reproductive fitness (Van Waerebeek et al., 2007).

4.2.4 Construction of New Landfill (Component in Removal Action Memorandum Alternatives B and C)—Biological Resources

Direct impacts would also include permanent removal of vegetation to construct a new 2-acre landfill in place of the existing metal debris storage area. Most of this 2-acre area is already cleared of vegetation; however, some large trees may require removal for construction. Large vegetation that is removed for construction of a new landfill could result in loss of nesting habitat for seabirds. Additionally, noise exposure would increase due to the presence of additional construction equipment for a longer duration.

The creation of 0.2-acre leachate pond has the potential to establish a new habitat for birds. Birds will have a new source of water, bathing, loafing, and potential nesting in vegetation growth. Birds would remain in a habitat during the breeding season if they have a place to nest and raise young. Nesting of seabirds in the project area is possible but not likely. The 2010 survey by USFWS and NMFS observed the black-naped tern nesting on Kwajalein Island using the concrete platforms at the fuel pier on the lagoon side. White terns were observed nesting in large trees near the town center and building areas (National Marine Fisheries Service and U.S. Fish and Wildlife Service, 2012). No observations of seabird nesting in the project area have been recorded. The leachate pond would be monitored for the establishment of nests. Personnel would be trained in the identification and avoidance procedures for migratory birds and nests.

4.2.5 Transport Future Refuse for Disposal in CONUS Landfill (Component in Removal Action Memorandum Alternative D)—Biological Resources

Terrestrial. Future refuse generated on-island would be transported to an off-island landfill. Impacts to terrestrial biological resources would be less than Removal Action Memorandum Alternative C since no new construction would take place.

Marine. Impacts to marine resources would be greater than Removal Action Memorandum Alternative C since vessel traffic would increase for regular shipments of refuse that would take place indefinitely, rather than the short-term impacts of increased vessel traffic from removal of excavated refuse.

4.2.6 Stabilize Shoreline—Landfill Shoreline Only (Component in Removal Action Memorandum Alternatives B, C, and D)—Biological Resources

Impacts to marine biological resources would be similar to that described in Section 4.2.1.

4.2.7 Water Quality Monitoring (Component in Removal Action Memorandum Alternatives A, B, C, and D)—Biological Resources

Terrestrial. Water quality monitoring would occur over a 6-year period to evaluate the remedial effectiveness for the metal removal and shoreline re-armoring. No impacts to terrestrial biological resources are expected from this monitoring activity and would be consistent with previously conducted water quality monitoring procedures that have taken place previously in the project area.

Marine

Long-term Water Quality Monitoring. As with terrestrial resources, no impacts to marine biological resources are expected from water quality monitoring activity. Kolinski (2015) noted that bulk metals have previously been observed in deeper habitats along the proposed project shoreline, particularly in the Shark Pit region. Removal of metal debris beyond reef flat areas is not presently being proposed in this phase of remediation activities; however, documenting the location, amounts, and type of debris in adjacent deeper habitats may be useful to understanding potential metal contamination sources if UES-criteria exceedance issues continue.

4.2.8 Summary of Results—Biological Resources

No UES consultation or threatened or endangered terrestrial or marine species have been identified within the region of influence or are likely to be impacted by the Proposed Action. Some short-term impacts to biological resources are possible from the increase in human activity, higher noise levels from machinery, or even direct impacts from removal of debris with coral attached. These impacts may affect, but are not likely to adversely affect, any of the resources potentially present in the project area. No alteration of terrestrial habitats is included in the Proposed Action, and beneficial impacts are expected to water quality in marine habitats following completion of the debris removal.

Table 4-5 summarizes the potential for impacts to biological and marine wildlife resources under the Proposed Action.

Table 4-6. Summary of impacts to biological resources from the Proposed Action.

Stressor	Species Type	No Effect	May Affect but Not Likely to Adversely Affect	Likely to Adversely Affect	Likely to Result in Jeopardy to Species
Direct Impacts	Terrestrial Wildlife		X		
	Coral		X		
	Mollusk		X		
	Fish		X		
	Sea Turtle		X		
	Marine Mammal		X		
Turbidity or Sedimentation	Terrestrial Wildlife	X			
	Coral		X		
	Mollusk		X		
	Fish		X		
	Sea Turtle		X		
	Marine Mammal		X		
Exposure to Noise	Terrestrial Wildlife		X		
	Coral		X		
	Mollusk		X		
	Fish		X		
	Sea Turtle		X		
	Marine Mammal		X		
Wastes and Discharges	Terrestrial Wildlife	X			
	Coral		X		
	Mollusk		X		
	Fish		X		
	Sea Turtle		X		
	Marine Mammal		X		
Habitat Loss Degredation	Terrestrial Wildlife		X		
	Coral		X		
	Mollusk		X		
	Fish		X		
	Sea Turtle		X		
	Marine Mammal		X		

4.2.9 Best Management Practices/Mitigation Measures—Biological Resources

The following are specific best management practices (BMPs) or mitigation measures to be used during implementation of the Proposed Action.

I. BEST MANAGEMENT PRACTICES

A. Prior to Metal Debris Removal:

1. Absent further ecological evaluations, limit metal debris removal activities to proposed shorelines and reef flat areas.

2. Instruct workers in avoidance of corals and other notable marine invertebrates by training workers to take care where they walk and how they remove and transport debris on the reef. Avoidance of corals may be most difficult along the shallow reef bench fronting the metal cliffs, as wave activity close to shore is likely to increase the focus on risks to human safety. Impacts to corals in this region are expected to be very limited, because removal activities will be restricted to reef flat and bench-top areas.

3. Instruct workers to carefully translocate any corals that occur on debris to the immediate vicinity of their original location.

4. Establish a mandatory shutdown safety zone corresponding to where protected mollusks, fish, sea turtles, and marine mammals could be disturbed within 50 yards of the shoreline. A mandatory shutdown will be invoked when protected mollusks, fish, sea turtles, or marine mammals are observed within this 50-yard area.

5. Instruct workers about compliance with BMPs for protected mollusks, fish, sea turtles, or marine mammals and provide illustrated guidance with photographs to assist in identification and avoidance of those species.

6. Instruct workers to avoid Trochus that may wander into the work area. Since minimal in-water work is proposed with this project, a need to relocate Trochus is not anticipated; however, if the species is observed in the project area, work will cease in that area until the animal has left the project vicinity.

7. An emergency spill response plan will be prepared; workers will be trained in implementation; and appropriate spill response equipment will be ready and available for deployment onsite.

8. All activities will be done in compliance with the Dredge and Fill Document of Environmental Protection (DEP) and a “Dredge and/or Unconsolidated Fill Project Description Sheet 2” would be completed by the project proponent and forwarded to the USAG-KA Environmental Engineer and the base operation contractor’s environmental department no later than 75 days prior to beginning work for coordination with and approval by the UES agencies.

B. During Metal Debris Removal:

1. If any birds are observed nesting in the immediate vicinity of staging or operations areas, demarcate nests and avoid the area. White terns may nest in pandanus trees and tropical almonds usually between January and July. However, the vegetation will be searched for white tern eggs or chicks before removal. If a white tern is observed incubating or with a chick, the tern must not be displaced. Nearby vegetation can be removed, and the tern will remain on the nest, and the nest trees can be removed after the chick fledges.

2. During installation of the heavy-duty silt curtain, ensure that protected species are not trapped inside the curtain or impacted by the curtain weights and anchors.

3. Wherever possible, conduct removal activities on reef flats by hand to limit disturbance to marine resources. The distribution of metals is greater on shorelines than on reef flat areas, with the number of items greatly decreasing beyond 33 to 66 ft from shore. This distribution should reduce the clean-up effort as land-based objects are much easier to locate, and machinery can more readily be positioned on land to remove larger items and accumulations. It appears that debris observed further out on the reef flat can be removed by hand, although in some cases items might need to be pried from the substrate.

4. As much as possible, conduct clean-up activities at low tide, which will reduce sound transmittal and the potential for sea turtles and other mobile species of concern to be present in the action area.

5. Corals observed growing on items being removed will be scraped off and placed near to where they were initially located to the maximum extent possible. Onsite capacity for restoration, such

as a trained coral expert with knowledge of restoration methods and necessary equipment, will be available in the event that coral are damaged and need to be reattached to the substrate or there is a need to salvage coral from marine debris (in the event that coral has colonized debris and is broken during debris salvage).

6. Prior to removal activities each day, beach areas will be surveyed for sea turtle tracks to find newly laid nests. Any nests will be demarcated and avoided.

7. Observers with binoculars will be posted along the shore in the immediate vicinity of the project area. If protected marine species, including Trochus, protected fish, sea turtles, or marine mammals, are seen within the safety zone, work will cease until the animal has exited the safety zone or 15 minutes has passed without re-detection of the animal in the safety zone. Work may continue if, in the best judgment of the project supervisor, the animal(s) would not be adversely affected by the activity. No attempt will be made to feed, touch, ride, or otherwise intentionally interact with sea turtles or marine mammals.

8. Observers will record all sightings of protected fish, sea turtles, and marine mammals that occur during the proposed project. Information collected will include species; any recognizable individual characteristics if possible to discern; time, location and approximate distance from the observer to the species; and species behavior.

9. In the event of inclement weather, operations would be suspended, and all equipment would be moved to protected sites and secured with appropriate mooring devices.

10. Turbidity monitoring will be conducted daily, and activities would cease if turbidity levels exceed 10 NTUs from baseline measurement, in accordance with guidelines provided in the Dredging and Filling Document of Environmental Protection (DEP-10-002.0).

C. Following Completion of Debris Removal:

1. All salvaged material will be recycled and/or disposed of properly.

2. A report of all observations will be delivered to NMFS and USFWS in a post-activity report within 180 days of project completion.

II. BEST MANAGEMENT PRACTICES FOR EQUIPMENT USE DURING METALS REMOVAL AND REVETMENT PLACEMENT (Incorporates BMPs from I above plus these listed below)

1. Prior to any work on or near the shore, these beach areas will be surveyed for sea turtle tracks to find newly laid nests. Any nests will be demarcated and avoided.

2. Special attention shall be given to verify that no UES-protected Trochus (or top shell snail), sea turtles or marine animals are in the area where equipment, anchors, or materials are expected to contact the substrate before that equipment may enter the water. Someone trained in the identification of Trochus will survey the work area from access point into the water to the edge of the work zone to ensure any Trochus in the area are identified. If any are present, work will not progress in that area until the Trochus are no longer found in the area. Instruct workers to avoid Trochus that may wander into the work area. Since minimal in-water work is proposed, a need to relocate Trochus is not anticipated; however, if the species is observed in the project area, work will cease in that area until no Trochus are present. Surveys shall be made prior to the start of work each day, and prior to resumption of work following any break of more than one half hour. Periodic additional surveys throughout the work day are strongly recommended.

3. All workers associated with this project, irrespective of their employment arrangement or affiliation (e.g. employee, contractor, etc.) shall be fully briefed on the BMPs and the requirement to adhere to them for the duration of their involvement in this phase of the project.

4. Instruct workers in avoidance of corals and other notable marine invertebrates (primarily Trochus sp.) by training workers to take care where they walk on the reef.

5. Develop and implement a contingency plan to control and contain toxic spills, including petroleum products, and ensure appropriate materials to contain and clean potential spills will be maintained and readily available at the work site;

6. Ensure that the project manager and heavy equipment operators will perform daily pre-work equipment inspections for cleanliness and leaks and that all construction project-related materials and equipment will be cleaned of pollutants prior to being placed in the water. All heavy equipment operations will be postponed or halted should a leak be detected, and will not proceed until the leak is repaired and equipment cleaned.

7. Ensure that fueling of construction project-related vehicles and equipment will take place at least 50 feet away from the water, preferably over an impervious surface.

8. Develop and implement a plan to prevent construction debris from entering or remaining in the marine environment during the project.

9. Develop and implement a contingency plan for the removal and adequate securing of equipment in the event of approaching storms.

10. Undergo site introductions and briefings by appropriately qualified personnel that would cover the procedures to be used to mitigate potential effects.

11. Turbidity and siltation from project-related work will be minimized and contained through the appropriate use of effective silt containment devices and the curtailment of work during adverse tidal and weather conditions. Silt curtains will completely enclose the operations. The area to be enclosed with silt curtains will be verified to be clear of Trochus, sea turtles, marine mammals and protected fish species prior to the deployment of the silt curtains.

12. All heavy material placed in the water or on shore for the revetment will be lowered slowly by equipment and placed, not dumped, into position to ensure the revetment does not roll into the marine environment.

III. BEST MANAGEMENT PRACTICES FOR AFTER-COMPLETION MONITORING OF IN-WATER METALS REMOVAL (Incorporates BMPs from I and II above plus these listed below)

1. All workers associated with this project, irrespective of their employment arrangement or affiliation (e.g. employee, contractor, etc.) shall be fully briefed on the BMPs and the requirement to adhere to them for the duration of their involvement in this phase of the project.

2. Instruct workers in avoidance of corals and other notable marine invertebrates (primarily Trochus sp.) by training workers to take care where they walk on the reef during collection of water quality samples.

3. Instruct workers to avoid Trochus that may wander into the work area. Since minimal in-water work is proposed with the water quality monitoring, a need to relocate Trochus is not anticipated; however, if the species is observed in the project area, workers will actively avoid Trochus while collecting the water quality sampling.

4. If any birds are observed nesting in the immediate vicinity of water quality access points on shore, demarcate nests and avoid the immediate area while accessing the water quality collection point. White terns may nest in pandanus trees and tropical almonds usually between January and July but may occur outside that season. If a white tern is observed incubating or with a chick, the tern must not be disturbed.

5. Prior to collection of the water quality samples, beach areas where access to the marine environment will be used will be surveyed for sea turtle tracks to find newly laid nests. Any nests will be demarcated and avoided. Additionally, someone trained in the identification of Trochus will survey the area from access point into the water to the collection point to ensure any Trochus in the area are identified to the water quality sample collector, if other than the trained monitor.

6. Constant vigilance shall be kept for the presence of UES-protected marine species during all aspects of the water quality collection effort.

7. Water samples will be collected in clean containers and brought to shore. For any sample requiring treatment at collection (preservative, acidification, etc), the sample bottle will be filled on shore from the clean container used to collect the original sample.

Protection of Birds:

Water accumulation is unavoidable with the creation of the approximately 0.2-acre leachate collection pond. A physical bird deterrent will make an area inaccessible to birds, keeping them from landing, roosting, or nesting, and forcing them to move on to a new location.

- Netting or some other deterrent will be employed to discourage birds from frequenting the area.
- To minimize the potential for impacts to migratory birds, scare techniques such as the use of noisemakers (e.g., propane cannons, sirens, and recorded distress calls) and visual

deterrents (e.g., scarecrows, Mylar flags, helium-filled balloons, and strobe lights) would be implemented to discourage birds from nesting in the intended impact area.

4.3 GEOLOGY AND SOILS

4.3.1 Geology

No impacts to the geological framework of Kwajalein Island are anticipated by the execution of the components.

4.3.2 Soils

The results of previous studies showed low concentrations of various metals and chlorinated and non-chlorinated VOCs in the soils (U.S. Army Institute of Public Health, 2011). If during the removal process it is determined that concentrations of hazardous substances require remediation, a remedial action decision would be made. Section 4.4 and UES Section 3.6 should be reviewed for material and waste management.

4.3.2.1 Removal of Metals and Re-armoring Along the Shoreline East of Landfill, Removal of Metal Debris from Storage Area Adjacent to Landfill, Removal of Metal Debris from the Area between Glass Beach and the Shark Pit (Component in Removal Action Memorandum Alternatives A, B, C, and D)—Geology and Soils

Work along the shoreline with metal involves approximately 6,897 cubic yards of disturbances (removal of metal debris, existing relic stone, and regraded shoreline). A percentage of the concrete and stone removed during the re-armoring process would be reused for the new revetments. The re-armoring is not anticipated to alter the natural ocean current or tidal effects. The removal is anticipated to have a negligible to minor adverse environmental impact.

The emissions from the use of fuel burning equipment are not anticipated to produce concentration of sediment pollutants in the soil. The use of the equipment would be short-term, and any adverse impacts would be minor. As noted in Section 4.1, the prevailing easterly wind is anticipated to further render any adverse impacts from emissions to a negligible adverse impact. In totality, the completion of these removal actions is anticipated to have a long-term benefit to the environment.

4.3.2.2 Closing Existing Landfill with Impermeable Cap (Component in Removal Action Memorandum Alternatives B and D)—Geology and Soils

The closing of the existing landfill would involve the grading of 5 acres, the clearing and grubbing of 7 acres, 6,600 linear feet pipe trench, and the excavation and hauling of 650 cubic yards for the stormwater ditch. These soil disturbance activities are anticipated to have no adverse environmental impacts to the soil. The use of the equipment would be short-term and any adverse impacts would be minor. In totality, the completion of this removal action is anticipated to have a long-term benefit to the environment. Any effect from emissions on soil is discussed in Section 4.3.2.1.

4.3.2.3 Construction of New Landfill (Component in Removal Action Memorandum Alternatives B and C)—Geology and Soils

The construction of a new landfill would involve the grading, clearing, and grubbing of 2 acres, removing, and stock piling of 4,594 cubic yards of soils, excavation of 1,000 linear feet from a trench, and the excavation and hauling of 60 cubic yards for the stormwater ditch. These soil disturbance activities are anticipated to have no adverse environmental impacts to the soil. The use of the equipment would be short-term, and any adverse impacts would be minor. Any effect from emissions on soil is discussed in Section 4.3.2.1. Additionally, the execution of this component would include a lined landfill designed to prevent leachate from entering the groundwater, which is anticipated to reduce the amount of future contaminants in ash (including metals, PCBs, and pesticides) from entering or seeping into the groundwater. The impacts form the execution of this component is anticipated to have long-term beneficial impacts to human health and the environment on Kwajalein Island.

4.3.2.4 Close Existing Landfill, Excavate and Transport Existing Refuse to CONUS and Cover with Topsoil (Component in Removal Action Memorandum Alternative C)—Geology and Soils

The closing of the existing landfill under this component would involve the clearing and grubbing of 7 acres. The impacts from this component would be similar to that described in Section 4.3.2.2. The removal, stockpiling, and loading of 110,000 cubic yards of refuse are anticipated to have no adverse impact to soils. BMPs for the preventions of soil erosion and stormwater runoff should be implemented to reduce the potential for any adverse impacts. The impacts form the execution of this component is anticipated to have long-term beneficial impacts to human health and the environment on Kwajalein Island.

4.3.2.5 Transport Future Refuse for Disposal in CONUS Landfill (Component in Removal Action Memorandum Alternative D)—Geology and Soils

The transport of future refuse would have no adverse impacts on soils. Additionally, the execution of this component would reduce the amount of refuse available to contribute to contaminated leachate (including metals, PCBs, and pesticides) from entering or seeping into the groundwater. The impacts form the execution of this component is anticipated to have a long-term beneficial impact to human health and the environment on Kwajalein Island.

4.3.2.6 Stabilize of Landfill Shoreline (Component in Removal Action Memorandum Alternative B, C, and D)—Geology and Soils

Work along the landfill area shoreline involves approximately 1,800 linear feet. A percentage of the concrete and stone removed during the shoreline stabilization would be reused for the new revetments. Grading and compacting of soils and the shoreline stabilization are not anticipated to alter the natural ocean current or tidal effects.

The emissions from the use of fuel burning equipment are not anticipated to produce concentration of sediment pollutants in the soil. The use of the equipment would be short-term, and any adverse impacts would be minor. As noted in Section 4.1 the prevailing easterly winds would further render any adverse impacts from emissions to a negligible adverse impact. The completion of this component is anticipated to have a long-term benefit on the environment.

Filling and/or Shoreline Protection. An estimated 1,800 linear feet would be affected along the shoreline with metal debris (landfill area) and 2,100 linear feet of shoreline with metal debris east of the landfill (Mt. Olympus to Glass Beach). Filling involves the placement of earthen materials (rock, sand, or soil) and, sometimes, concrete shapes or rubble, either on the shoreline or off-shore, for the protection and maintenance of existing shorelines or facilities to replace materials lost to erosion, damage, or marine accident, or to reinforce existing foundations and supports. Requirements and limitations pertaining to shoreline protection at Kwajalein Island are specified in the *Dredging and Filling Document of Environmental Protection* (DEP-10-002.0 30 April 2011). Any disturbance (trenching, digging) along the shoreline greater than 200 linear feet and more than 25 cubic yards of material would at a minimum follow the mitigation measures listed in Section 4.3.3.

4.3.2.7 Long-term Water Quality Monitoring (Component in Removal Action Memorandum Alternatives A, B, C, and D)- Geology and Soils

There are no adverse impacts anticipated on the soil from the quarterly and annual water sampling. Water samples would be taken from an established and fixed collection point, and no ground disturbance is anticipated.

4.3.3 Best Management Practices/Mitigation Measures—Geology and Soils

Site-specific BMPs, as listed in Section 4.1.8 for air quality, can be used to stabilize disturbed soils, which would minimize the potential for soil erosion from wind.

The following are specific BMPs from the *Dredging and Filling Document of Environmental Protection*. Table 4-6 lists suggested BMPs for mitigating adverse impacts to soil.

- Any fill material to be placed in the marine environment shall be non-hazardous, non-polluting, and placed in such a manner as to minimize any potential adverse environmental impacts to marine flora and fauna associated with siltation, spillage, and turbidity.

- For each dredge and fill project in the proposed work area requiring dredge and/or unconsolidated fill greater than 25 cubic yards of materials, a “Dredge and/or Unconsolidated Fill Project Description Sheet 2” would be completed by the project proponent and forwarded to the USAKA Environmental Engineer and the base operation contractor’s environmental department no later than 75 days prior to beginning work.

- Projects shall be designed to result in minimal damage to reef areas. Specific controls, such as selection of shoreline protection methods, selecting the appropriate time of year so as to cause the least impact to coral growth and reproduction success, employment of silt curtains, turbidity testing, and planning for identifying and/or relocating endangered marine life in the area of the activity, shall be evaluated and selected.

Table 4-7. Best management practices for mitigating soil erosion during removal activities.

Best Management Practices for Mitigating Soil Erosion during Removal Activities	
1	Preservation of existing vegetation, if practicable, to provide natural protection against soil erosion.
2	Mulch applied over disturbed soil to prevent erosion during and following precipitation events.
3	Silt fencing to provide a barrier to sediment movement from disturbed areas.
4	Gravel applied to disturbed soils to prevent wind erosion
5	Chemical dust suppression using appropriate chemicals based on the soil type, temperature, humidity, and wind velocity.
6	Slope protection measures to minimize erosion from disturbed slopes, which could include one or more of geotextiles, vegetation, and mulch.
7	Wet suppression to prevent wind erosion and dust generation would be applied at least daily but not in excessive amounts.

4.4 HAZARDOUS MATERIALS AND WASTE

4.4.1 Components in Removal Action Memorandum Alternatives A–D—Hazardous Materials and Waste

Minor impacts would be anticipated during the removal activities from hazardous materials and waste. All persons generating hazardous waste at USAKA shall be ultimately responsible for its shipment and disposal.

Refuse Removal. As stated in UES Section 3-6.6.5, except as allowed in Section 3-6.5.7(b)(4) no hazardous waste may be treated or disposed of at USAKA except as documented in a final DEP. The treatment of hazardous waste at USAKA without a DEP is prohibited. In addition, hazardous wastes must be shipped off the island. Based on these requirements, it is anticipated that the refuse removal from the existing landfill would have a negligible adverse impact. Additionally, the removal of the existing refuse would be expected to cause greater reduction of pollutant reaching the groundwater, which in turn would be beneficial to the environment.

Equipment Use. During execution of components, hazardous material would be associated with the potential spill of petroleum, oil, or lubricant products (POL) (i.e., fuels, oils) from construction equipment and generators. If a spill occurs, these materials could be transported in the soil by stormwater runoff. Standard construction BMPs and procedures outlined in the revised SPI-1530 and the KEEP would be implemented to reduce or minimize the risk of accidental release of hazardous materials to the environment and to prevent stormwater runoff. It is anticipated that the equipment use would have a negligible adverse impact.

Unexploded Ordnance (UXO). No explosive would be used in the execution of the components for Removal Action Memorandum Alternatives A–D. General operational and safety procedures would include methods for UXO anomaly assessment and avoidance both in terrestrial and aquatic environment. USAKA is a former World II battlefield and as such, UXO may be present on the sea floor and in shore-side support areas. The proposed removal activities are located on an artificial filled area of the island, and UXO is not anticipated. Should UXO be encountered during construction and demolition activities, personnel should proceed in accordance with the USAKA DEP-02-001.1, *Disposal of Munitions and Other Explosive Material,* which states that when explosives are discovered, the Garrison's Explosive Ordnance Disposal (EOD) Department is contacted for their safe removal and disposition. The EOD Department would make a determination as to whether explosives can be removed from the site of discovery.

Spills. There is a potential for spills to occur as metal debris is being collected within the Proposed Action operation area (Figure 2-1). Responsible personnel would immediately clean up such spills or leaks as soon as the spill occurs. Cleanup will be in compliance with site spill plan and all applicable government and local laws and regulations. Spills would be reported in accordance with government and local law or regulation. Based on these requirements and BMPs listed in Section 4.4.2, it is anticipated that the any impacts from spills would have a minor adverse impact.

Scrap Collection Site. Metal debris scrap would be collected and stored during the execution of the Proposed Action. The collection, management, transportation, removal, recycling, and disposal of scrap materials from the USAKA scrap accumulation site to include fuel for and maintenance of their equipment would meet the requirements established by local, International ordinances and regulations that govern collection, transportation, processing, recycling, and disposal of scrap, and other materials. The site would be organized to facilitate the segregation of scrap materials and subject rolling stock by type. Based on these requirements, it is anticipated that any adverse impacts from scrap collection and management would be minor. Additionally, the removal of the existing scrap would be expected to cause greater reduction of pollutant reaching the groundwater, which in turn would be beneficial to the environment.

Disposal/Recycling Outside the Country of Origin. There is the potential for scrap and recyclable materials collected during the execution of the Proposed Action to be transported to another country for disposal or recycling; therefore to the greatest extent possible, all applicable international and environmental laws and regulations of the exporting / importing and transit countries, including, but not limited to: base notification and any provisions governing the prior notification of competent authorities, transportation, temporary storage, identification, customs clearances, packaging, and labeling would be followed. Removal and recycling of the existing scrap would be expected to cause greater reduction of pollutant reaching the groundwater and other sectors of the environment (e.g. soil, air, surface water), which in turn would be beneficial to the environment.

4.4.2 Best Management Practices/Mitigation Measures—Hazardous Materials and Waste

1. Perform work in compliance with the KEEP.
2. Storage or disposal of waste (hazardous and non-hazardous) removed during removal activities would be performed in accordance with the requirements in Chapter 3-6 (Material and Waste Management) of the UES.
3. Due to the fragile ecosystem on Kwajalein Island, a hazardous materials release or spill must be reported and cleaned up in a timely manner. The following procedures for hazardous materials shall be used:
    a. In case of a spill, notify call 911 to notify the Fire Department, and report the spill in accordance with the revised SPI 1530.
    b. Report any spill leaving a visible sheen on the water.
    c. Report any ground spill totaling 1 gallon (3.8 liters) or larger.
    d. All spills regardless of size must be cleaned up immediately.
    e. Call 911 in case of an emergency.
    f. Hazardous materials include but are not limited to oil, gasoline, diesel, paint, solvents, aviation fuels, pesticide, bleach and hydraulic fluid.
4. An employee discovering a spill shall:
    a. Immediately isolate and contain any spillage if it can be accomplished safely.
    b. Notify immediate supervisor.
    c. Immediately call 911 for large spills. Answer all questions asked by the dispatcher.
    d. Meet the responding crew at the spill site.

4.5 HEALTH AND SAFETY

4.5.1 Components in Removal Action Memorandum Alternatives A–D—Health and Safety

The execution of the components for Removal Action Memorandum Alternatives A–D is not expected to increase health and safety risk to USAG-KA contract personnel or members of the public. All applicable UES and USAG-KA construction safety precautions and regulations would be implemented to minimize the potential for accidents and injuries during the demolition and construction process.

The use of construction equipment (e.g., dump trucks, concrete mixer, jackhammer, dozer, crane, grader, rollers, forklift, etc.) during removal and construction would follow standard industry practice. The appropriate personal protection equipment should be used during the removal and construction process (e.g., hardhat, eye protection, gloves for expected job hazards, and respiratory protection).

Hazardous materials would be monitored and/or removed to prevent potential exposure to workers and the public and to prevent releases. UXO may be inadvertently discovered during the soil disturbance activities on the island. Should UXO be encountered as part of the removal activities, personnel should proceed in accordance with the USAKA DEP-02-001.1, *Disposal of Munitions and Other Explosive Material,* which states that when explosives are discovered, the Garrison's EOD Department is contacted for their safe removal and disposition. The EOD Department would make a determination as to whether explosives can be removed from the site of discovery.

Human Health Risk Assessment. The human health risk for fish consumption is discussed in Section 4.7, Socioeconomics—Subsistence Fishing.

Any mitigation of health and safety issues associated with contaminated soil are addressed in Section 4.3.3, Geology and Soil—Mitigation Measures/Best Management Practices.

4.5.2 Mitigation Measures/Best Management Practices—Health and Safety

1. Prior to removal activities, the contractor shall provide a Site Specific Health and Safety Plan to the Government.

2. The use of construction equipment (e.g., heavy and dump trucks, concrete mixer, jackhammer, dozer, crane, grader, forklift, etc.) during demolition/removal and construction would follow standard industry practices.

3. The appropriate personal protection equipment should be used during the demolition/removal and construction process (e.g., hardhat, eye protection, gloves for expected job hazards, and respiratory protection as necessary).

4. Should UXO be encountered during construction activities, personnel should proceed in accordance with the USAKA DEP-02-001.1, *Disposal of Munitions and Other Explosive Material,* which states that when explosives are discovered, the Garrison's EOD Department is contacted for their safe removal and disposition. The EOD Department would make a determination as to whether explosives can be removed from the site of discovery.

4.6 NOISE

This section describes the potential effects on the human terrestrial environment associated with the executing the components in Removal Action Memorandum Alternatives A–D. The potential impact of noise on marine biological resources is addressed in Section 4.2, Biological Resources.

Noise measurements assessed relative to human exposure commonly use an "A-weighted" scale that filters out very low and very high frequencies in order to replicate human sensitivities. Human hearing range is generally considered to be 20 dB (the threshold of hearing) to 120 dB (the threshold of pain). Sound levels of typical noise sources and environments are presented in Figure 4-1. Table 4-7 shows the noise level of typical equipment (and its associated hearing damage peak levels) that could be used during the execution of the components for Removal Action Memorandum Alternatives A–D.

Table 4-7. Typical in-air noise levels for common equipment.

Source	Peak In-air Noise Level (dB)	Risk of Hearing Damage at Peak Level	In-Air Noise Level- 50 Feet from Sources	Risk of Hearing Damage 50 Feet from Source
Air compressor	95	4 hours	78	Below OSHA Regulation*
Backhoe	116	15 minutes	80	Below OSHA Regulation*
Chainsaw	100	30 minutes	85	8 hours
Compactor, Roller	104	1 hour	88	8 hours
Crane	90	8 hours	85	8 hours
Dump Truck	101	1 hour	84	Below OSHA Regulation*
Excavator	107	30 minutes	90	8 hours
Grader	108	30 minutes	85	8 hours
Jackhammer	105	1 hour	85	8 hours
Portable or Standby Generator	96	2 hours	82	Below OSHA Regulation*
Scraper	109	30 minutes	99	4 hours

Sources: U.S. Department of Transportation, 2015; University of Washington, 2004

Notes: *=85 dBA OSHA = Occupational Safety and Health Administration

Shoreline with Metals
Debris (Landfill Area)

Source: Arnold Hearing Centers, 2013

Sound Levels of Typical Noise Sources

Kwajalein Island

Figure 4-1

4-1_SoundLevels, 1/12/2017

4.6.1 Components in Removal Action Memorandum Alternatives A–D—Noise

Construction (Removal) Noise. Construction is customarily performed in steps and/or phases, and the noise connected to the different steps and/or phases can fluctuate. Stationary equipment such as generator and air compressor has an average peak noise level of 95.5 dB. Impact equipment such as compactor, jackhammer, and backhoe has an average peak noise level of 108 dBA. As indicated in Table 4-5, as the distance from the source increases the noise level decreases. The average peak noise level for stationary and impact equipment could be above the OSHA beginning regulations of 85 dB, which could risk hearing damage (see Table 4-7). The use of standard industry BMPs and mitigation measures would have a noise reduction. For example, if the level of noise exposure is 100 dB, the use of ears plugs would reduce the noise level (Noise Reduction Rating) to 67 dB (Cooper Safety, 2015). With the use of BMPs and mitigation measures, the impact to construction workers would be short-term and minor to negligible based on the proximity of the worker to the noise sources.

General Public. Based on their proximity to the project area, members of the general public (USAG-KA personnel, contractors, and dependents) have the potential to be affected by noise-generating activities associated with the components for Removal Action Memorandum Alternatives A–D. Figure 4-2 shows the distance from the project areas to Building 1116. Building 1116 is approximately 1,300 ft from the shoreline with metals, approximately 1,800 ft from the landfill area, and approximately 2,120 ft from the landfill shoreline. At these distances, it is anticipated that the general public would be below the OSHA regulated noise levels. Therefore, the impact to the general public is anticipated to be short-term and negligible. Any member of the general public entering the project area would be subject to the BMPs/mitigation measures listed in Section 4.6.2.

Explanation

- Former Outfall KISW14
- Former Outfall KISW14A
- Monitoring Well
- Shoreline Monitoring Well
- Current Landfill Boundary
- Incinerator Operation Area
- Region of Influence/Project Work Area
- Former Drummed Waste Storage Area
- Former Fire Training Area
- Former Oil Pit
- Salvage Yard Area
- Former Ash Disposal Area
- Metal Accumulation Area
- Shoreline with Metals Debris (Landfill Area)
- Shoreline with Metals Debris (Mt. Olympus to Glass Beach)

NORTH

0 150 300 450 600 Feet

0 50 100 150 200 250 Meters

Distance of General Public from Project Area

Figure 4-2

4.6.2 Best Management Practices/Mitigation Measures—Noise

As a means of reducing noise during removal activities, the BMPs listed in Table 4-8 should be considered.

Table 4-8. Noise reduction practices.

Control Measure
Mufflers (Silencers)—Can be used on noisy, pressurized air equipment to reduce noise at the source; mufflers absorb some noise before it can reach the receptor/receiver.
Preventive Maintenance—Properly lubricate and align moving parts.
Speed—Decrease the speed of the equipment
Reduce Pneumatic and Compressed Air Systems—Lower pressure is not only quieter, but it saves energy and is safer. (To reduce serious injuries, OSHA requires that air pressure be held to 30 pounds per square inch or less when it could potentially contact skin).
Personal Protection Equipment—Hearing protection, ear plugs, ear muffs
Noise Barrier—Barriers can be constructed on the work site from common construction building material (plywood, block, stacks, or spoils) or the barriers can be constructed from commercial panels which are lined with sound absorbing material to achieve the maximum shielding effect possible.

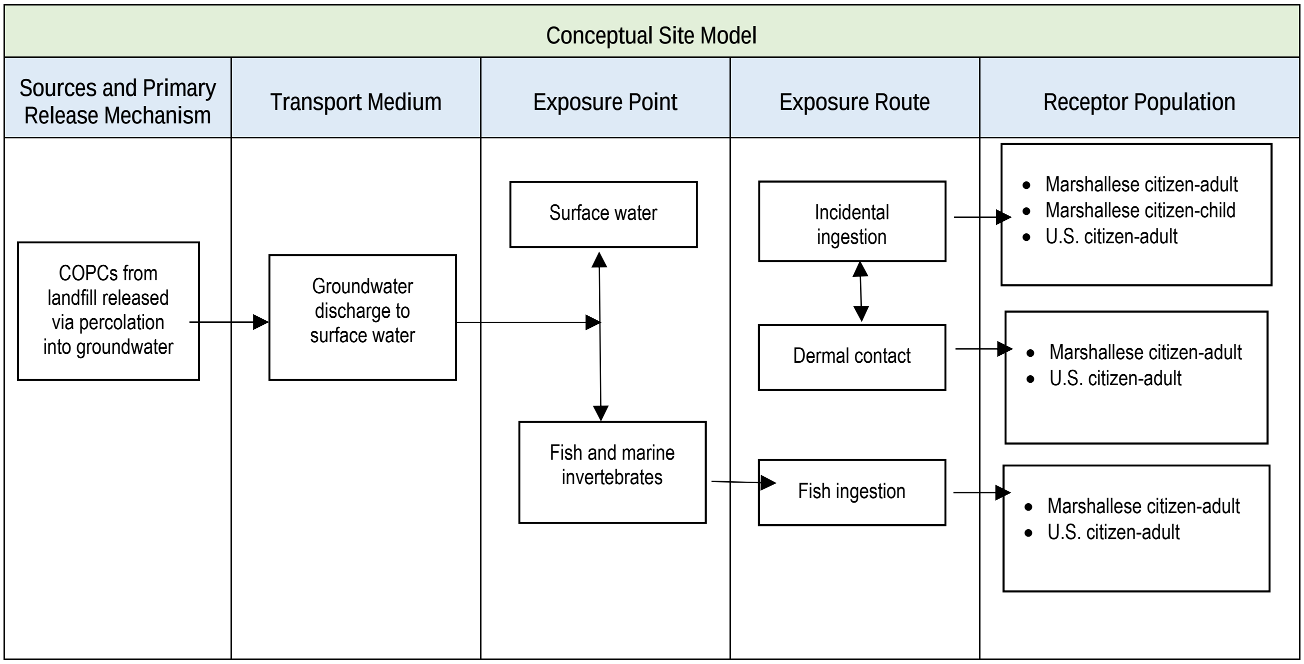
Source: U.S. Department of Labor, 2015

4.7 SOCIOECONOMICS

4.7.1 Components in Removal Action Memorandum Alternatives A–D—Socioeconomics

Population. Any additional workers on-island during the execution of the components for Removal Action Memorandum Alternatives A–D would be short-term. Any increase in the population associated with execution of the components and Removal Action Memorandum Alternatives A–D would have a negligible impact on the socioeconomics of Kwajalein.

Subsistence Fishing. As noted in Chapter 3 (Section 3.7.1 and Table 3-8), ingestion of fish caught from the contaminated area below the landfill poses unacceptable cancer risk to U.S. residents and Marshallese citizens and may pose a noncancerous hazard to all human receptors; particularly for Marshallese citizens engaging in subsistence fishing. The primary source of the chemicals of potential concern (COPC) from the Kwajalein Landfill and is defined as groundwater discharges of COPC into surface water on the reef flat below the landfill. Secondary and tertiary sources of COPC are from marine invertebrate and fish species that are potentially consumed by humans. Figure 4-3 illustrates the exposure pathway considered for Kwajalein Landfill. The recommendations (taken from U.S. Army Public Health Command, 2014) listed under the BMPs/Mitigation Measures in Section 4.7.2 are to be considered for the continuing mitigation of risk exposure to U.S. citizens and Marshallese. (U.S. Army Public Health Command, 2014) The completion of any and/or all of the Removal Action Memorandum Alternatives is anticipated to have long-term benefit in the reduction of the release of contaminants to the environment at and near the Kwajalein Landfill.



Source: Figure 4, U.S. Army Public Health Command, 2014

Figure 4-3. Exposure Pathway considered for Kwajalein Landfill.

4.7.2 Best Management Practices/Mitigation Measures—Socioeconomics

1. Continue the existing fishing prohibition for the waters adjacent to the Kwajalein Landfill until such a time that medical personnel have determined whether a consumption advisory should be developed and implemented.

2. Reduce the discharge of degraded groundwater to the surface waters adjacent to the Kwajalein Landfill. UES Section 3-2.6.2 (Groundwater Anti-degradation) states that USAG-KA operations shall not degrade the quality of Class III groundwater in such a way that results in increases of contaminate concentrations that will adversely affect public health, the marine environment…or protected beneficial uses of surface water. The UES further states that the Commander, USAG-KA, ensures that appropriate actions are taken to protect public health under situations that involve exposure to degraded groundwater.

4.8 UTILITIES

4.8.1 Components in Removal Action Memorandum Alternatives A–D—Utilities

Electrical

The landfill would be fully operational during the action activities. Several power/phone lines run parallel to Industrial Avenue and cross the vehicle storage area and the incinerator area. They do not extend into the landfill or the metal debris storage area. The project was designed to avoid the Micronesian Cable immediately adjacent to the proposed project site.

Wastewater

The new active landfill would be constructed and created with a leachate collection system, which would add an approximately 0.2-acre leachate pond that would be lined with an impermeable liner. The bottom of the pond would be excavated down to an elevation of 8 ft amsl, so leachate gravity-flows from the landfill to the pond through a conveyance pipe. The water from the pond would be released to the WWTP and then to the ocean.

Currently, the WWTP has a peak capacity of approximately 600,000 gallons per day; current average usage is 316,500 gallons per day, which leaves 283,500 gallons per day of available capacity space. It is estimated that a 0.2-acre leachate pond would hold 5,400 gallons of water after 1 inch of rain per day. August 14 was the wettest day on Kwajalein in 2015, with approximately 6.83 inches of rain, which could place approximately 5,431 gallons of rain per day into the leachate pond. If approximately 5,431 gallons of water per day are released from the leachate pond to the WWTP, it would occupy an additional 2.0 percent of the daily available capacity space, which would leave space for 278,069 additional gallons of water per day.

The amount of leachate from the landfill to the pond would be reduced/minimized by the use of a portable cover to prevent precipitation from entering the landfill open area. Also, the amount of leachate can be minimized (and almost completely eliminated) by using a portable building that would be installed over the open area of the landfill cell which would shed rain off the waste. The remainder can be bermed and not active, and the clean stormwater can be infiltrated using ditches.

The leachate would be managed by performing leachate testing and monitoring for contaminants in the water prior to discharging into the ocean. The water from the leachate pond would be pre-treated (if required) before it is released/transported to the WWTP. USAG-KA would determine if the WWTP would need to be upgraded as part of the final design process for the new landfill. As part of the final design for the new landfill, the engineering team would identify the best method to deal with leachate.

4.8.2 Best Management Practices/Mitigation Measures—Utilities

No BMP/mitigation measures are required for utilities.

4.9 WATER RESOURCES

4.9.1 Removal of Metals and Re-armoring Along the Shoreline East of Landfill, Removal of Metal Debris from Storage Area Adjacent to Landfill, Removal of Metal Debris from the Area between Glass Beach and the Shark Pit (Component in Removal Action Memorandum Alternatives A, B, C, and D)—Water Resources

The execution of this component would have the potential to impact the inter-tidal marine waters from Mt. Olympus to Glass Beach. The direct impact from turbidly and spillage are discussed below. Any acoustic impacts in or near the water are discussed under Biological Resources, Section 4.2.

Turbidity. Turbidity is a measure of the degree to which water loses its transparency due to the presence of suspended solids (silt or sediment) in the water. It is a measure of the water clarity and how much the material suspended in water decreases the passage of light through the water. The more total suspended solids are in the water, the murkier it appears and thus the higher the turbidity. Higher turbidity increases water temperature because suspended solids absorb more heat. This in turn reduces the concentration of dissolved oxygen because warm water holds less dissolved oxygen than cold. The removal of the metal debris, existing relic stone, and re-armoring the shoreline have the potential to temporarily increase the turbidity of the Class B water (see Figure 3-4) by increasing the amount of total suspended solids in the water.

In accordance with DEP-10-002.0 (Dredging and Filling) baseline turbidity monitoring would be conducted approximately 164 feet from the removal site prior to removal activities. During removal activities, turbidity monitoring would be conducted daily approximately 164 ft from the site of activity. In the event turbidity levels exceed 10 NTUs from the baseline measurement, work would cease until the turbidity level returns below the 10 NTUs above the baseline turbidity values. Any impacts from turbidity are anticipated to be short-term and minor.

Spillage. Spillage from the use of fuel in construction would have the potential to occur during the execution of this component. The implementation of BMPs listed under Section 4.4, Hazardous Materials and Waste, would be followed in the event of a spill. Any impacts from a spill are anticipated to be short-term and minor.

4.9.2 Closing Existing Landfill with Impermeable Cap (Components in Removal Action Memorandum Alternatives B and D)—Water Resources

No direct or indirect impacts to groundwater are anticipated from the closing of the existing landfill. There are no surface water bodies in the landfill area. Standard BMPs for the prevention of stormwater runoff would be followed to prevent pollutants from reaching the inter-tidal waters during the closure and capping process. The implementation of BMPs listed under Section 4.4, Hazardous Materials and Waste, would be followed to mitigate impacts from stormwater runoff. Any impacts from the execution of this component are anticipated to be short-term and negligible. Additionally, the closure of the existing landfill would be expected to further reduce the pollutants (including PCBs and pesticides) reaching the groundwater, which in turn would be beneficial to the environment.

4.9.3 Close Existing Landfill, Excavate and Transport Existing Refuse CONUS, and Cover with Topsoil (Component in Removal Action Memorandum Alternative C)—Water Resources

Impacts from the execution of this component would be similar to those discussed in Section 4.8.2. The implementation of BMPs listed under Section 4.4, Hazardous Materials and Waste, would be followed to mitigate impacts from stormwater runoff. Any impacts from the execution of this component are anticipated to be short-term and negligible. Additionally, the removal of the existing refuse would be expected to further reduce the pollutants (including metals, PCBs, and pesticides) reaching the groundwater, which in turn would be beneficial to the environment.

4.9.4 Construction of New Landfill (Component in Removal Action Memorandum Alternatives B and C)—Water Resources

Impacts from the execution of this component would be similar to those discussed in Section 4.8.2. The implementation of BMPs listed under Section 4.4, Hazardous Materials and Waste, would be followed to mitigate impacts from stormwater runoff. Any impacts from the execution of this component are anticipated to be short-term and negligible. Additionally, the new landfill is anticipated to reduce contaminant transport to groundwater by placing future waste in a lined landfill with proper leachate control, which in turn would be beneficial to the long-term operation of the landfill and groundwater protection.

4.9.5 Transport Future Refuse for Disposal in CONUS Landfill (Component in Removal Action Memorandum Alternative D)—Water Resources

Impacts from the execution of the component would include the impacts and BMPs discussed in Section 4.8.2. Any impacts from the execution of this component are anticipated to be short-term and negligible. Additionally, the removal of the existing refuse would be expected to have a greater reduction of pollutant reaching the groundwater, which in turn would be beneficial to the long-term monitoring process.

4.9.6 Stabilize Shoreline—Landfill Shoreline Only (Component in Removal Action Memorandum Alternatives B, C, and D)—Water Resources

Impacts from the execution of this component would be similar to those discussed in Section 4.8.1. Any impacts from turbidity are anticipated to be short-term and minor. The implementation of BMPs listed under Section 4.4, Hazardous Materials and Waste, would be followed in the event of a spill. Any impacts from a spill are anticipated to be short-term and minor. Additionally, the new shoreline revetment is anticipated to keep any future landfill refuse from being eroded onto the shoreline, which in turn would be beneficial to the long-term operation of the landfill, groundwater protection, and inter-tidal contamination.

4.9.7 Water Quality Monitoring (Components in Removal Action Memorandum Alternatives A, B, C and D)—Water Resources

The execution of this component would have no adverse impact on water resources. The execution of this component would be beneficial with the evaluations of the effectiveness of the components discussed in Sections 4.8.1 through 4.8.6.

Water quality monitoring would occur for all Removal Action Memorandum Alternatives. For Removal Action Memorandum Alternative A, over a 5-year period the evaluation of the remedial effectiveness of the metal removal and shoreline re-armoring will be completed. Collection of water samples for analysis would be conducted in accordance with a Sampling and Analysis Plan. Sampling techniques do not typically require fuel burning to operate the sampling equipment. Therefore, no impact to air quality is anticipated from long-term water quality monitoring.

For Removal Action Memorandum Alternatives B-D, over a 30-year period the evaluation of the remedial effectiveness of the components (1) landfill closure by grading and capping; (2) landfill closure for with landfill excavation and shipping of refuse to CONUS; (3) Construction of a new landfill; (4) transport of future refuse incinerator ash to CONUS landfill; and (5) stabilization of shoreline by constructing a new revetment along the original landfill shoreline footprint would be completed. Collection of water samples for analysis would be conducted in accordance with a Sampling and Analysis Plan and UES Section 3-6.5-7(c)(6)(vii). If it is determined additional alternatives would be necessary, a full re-analysis of all environmental resources would be conducted in accordance to ensure that there have not been any changes in the affected environment.

4.9.8 Best Management Practices/Mitigation Measures—Water Resources

Turbidity. A turbidity monitoring plan would be prepared to define the action to be taken if turbidity levels exceed 10 NTUs above background as described in Section 4.8.1.

Spillage. BMPs should be in place to prevent any spill materials from entering the inter-tidal water from the shoreline side and the landfill area.

4.10 CUMULATIVE IMPACTS

The NEPA requires an assessment of cumulative impacts arising from the Proposed Action and alternatives. Council on Environmental Quality regulations define “cumulative effects” as: “. . . the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time” (40 CFR 1508.7).

4.10.1 Air Quality

Minor short-term increases in air emissions may occur as a result of executing one or more of the components. The nature of the execution of the removal activities would be in steps or phases with no significant ongoing air emission, and when combined with existing air emissions, none would exceed the thresholds standards found in the UES. Execution of the components in Removal Action Memorandum Alternatives A–D would not result in a significant increase in air emissions within the region of influence, and cumulative impacts would be negligible. There are no past, present, or foreseeable future projects that would be occurring at the same time as the execution of the components in Removal Action Memorandum Alternatives A–D. Therefore, the adverse cumulative effects on air quality from executing the components in Removal Action Memorandum Alternatives A–D would be negligible.

4.10.2 Biological Resources

There are no other past, present, or reasonably foreseeable future programs identified within the region of influence that, when added to the potential impacts of the execution of the components in Removal Action Memorandum Alternatives A–D, would result in adverse cumulative impacts.

kolinski (2015) noted that qualitatively, the reefs within the project zone do appear to be in a degraded state (U.S. Fish and Wildlife Service and National Marine Fisheries Service, 2006, 2012); however, seasonal wave energy, tidal driven aerial exposure, and warming waters likely confound and/or act synergistically in generating this perception. The limited activities planned for debris removal and water quality monitoring would not likely result in cumulative impacts to marine biological resources. The removal of the metal debris likely would result in a net benefit for the entire community that would far outweigh the potential adverse impacts to coral (Kolinski, 2015).

4.10.3 Geology and Soils

Implementation of the components in Removal Action Memorandum Alternatives A–D would not result in significant impacts on geology and soil within the region of influence. The impacts on geology are very minor and mostly consist of localized soil disturbance in previously disturbed areas on the island. Erosion is a naturally recurring issue, but it is not heavily exacerbated by USAG-KA activities. Overall adverse cumulative effects would be negligible since BMPs for soil disturbing activities are typically implemented during any removal activity. The removal of the metal debris, re-arming of shoreline, closure of landfill and transport of future reuse, and stabilization of the shoreline likely would result in a net benefit for soils, and the entire community.

4.10.4 Hazardous Materials and Waste

Execution of the components in Removal Action Memorandum Alternatives A–D would not result in cumulative impacts associated with the use of hazardous materials within the region of influence. Adherence to the standard procedures in place to minimize amassing would preclude the potential accumulation of hazardous materials or waste. As required by the UES, the Army has prepared the KEEP, which addresses the procedure for responding to release of hazardous materials and the management of hazardous material (e.g., import, use, and inventory). Overall, adverse cumulative effects would be negligible since BMPs for hazardous materials and waste are typically implemented during any removal activities. The removal of the metal debris, and closure of landfill and transport of future reuse, likely would result in a net benefit with a reduction hazardous materials and waste, which in turns benefit the entire community.

4.10.5 Health and Safety

Execution of the components in Removal Action Memorandum Alternatives A–D would not affect public health and safety within the region of influence. The major factors influencing this analysis are: (1) impacts to contract personnel and (2) comprehensive USAG-KA and UES safety procedures in place to ensure that members of the general public are not placed in physical jeopardy due to the execution of the components in Removal Action Memorandum Alternatives A–D. Based on these factors, no significant adverse cumulative impacts would occur relative to public health and safety.

4.10.6 Noise

The general public or residents in the vicinity of the project area would not be affected by the noise for executions of the components in Removal Action Memorandum Alternatives A–D. When mitigated and OSHA standards are implemented, workers are not affected by the executions of the components in Removal Action Memorandum Alternatives A-D. Overall adverse cumulative effects would be negligible since BMPs for soil disturbing activities are typically implemented during any removal activity.

4.10.7 Socioeconomics

Adverse cumulative impacts on socioeconomics would consist of a continuation of the restriction for subsistence fishing in the landfill area. There would be no significant change to regional employment, income, housing, or infrastructure impacts through the execution of the components in Removal Action Memorandum Alternatives A–D.

To minimize any impacts to the socioeconomics characteristic of Kwajalein Island, the temporary requirements (lodging, food, laundry service, etc.) for the temporary increase in personnel needed to complete the Space Fence project is being provided by the contractor. The personnel located on-land associated with the Space Fence project in conjunction with temporary personnel associated with the Proposed Action are not anticipated to have a significant effect on regional employment, income, housing, or infrastructure impacts through the execution of the components in Removal Action Memorandum Alternatives A–D.

As it relates to cumulative impacts from the primary source of the chemicals of potential concern in the groundwater discharges into surface water on the reef flat below the landfill and the secondary and tertiary sources of chemicals of potential concern from marine invertebrate and fish species that are potentially consumed by humans, the removal of metal debris, closing of the landfill, and transport of future refuse likely would result in a net benefit with a reduction chemicals of potential concern, which in turns benefit the entire community.

4.10.8 Utilities

No adverse cumulative impacts to utilities are anticipated as a result of execution of the components in Removal Action Memorandum Alternatives A–D. No long-term adverse effects to the wastewater treatment plant are anticipated.

4.10.9 Water Resources

No adverse cumulative impacts to water quality are anticipated as a result of execution of the components in Removal Action Memorandum Alternatives A–D. No long-term adverse effects to water resources are anticipated. There are no other past, present, or reasonably foreseeable future programs identified within the region of influence that, when added to the potential impacts of the execution of the components in Removal Action Memorandum Alternatives A–D, would result in adverse cumulative impacts. The cumulative impacts from the execution of components likely would result in a net benefit with a reduction chemicals of potential concern, which in turns benefit the entire community.

4.11 NO-ACTION ALTERNATIVE

Under the No-action Alternative, no environmental consequences associated with the removal activities associated with the Kwajalein Landfill would occur. However, impacts regarding contaminations from metals, PCBs, and pesticides would continue and potentially could worsen from current conditions.

4.12 FEDERAL ACTION TO ADDRESS ENVIRONMENTAL JUSTICE IN MINORITY POPULATIONS AND LOW-INCOME POPULATION (EXECUTIVE ORDER 12898)

Proposed activities would be conducted in a manner that would not substantially affect human health and the environment. This EA has identified no effects from the execution of the components in Removal Action Memorandum Alternatives A–D that would result in a disproportionately high or adverse effect on minority or low-income populations in the area. Any restrictions on subsistence fishing that were in place prior to the preparation of this EA would continue to be in effect. The activities for the execution of components in Removal Action Memorandum Alternatives A–D would also be conducted in a manner that would not exclude persons from participating in, deny persons the benefits of, or subject persons to discrimination because of their race, color, national origin, or socioeconomic status.

4.13 FEDERAL ACTION TO ADDRESS PROTECTION OF CHILDREN FROM ENVIRONMENTAL HEALTH RISKS AND SAFETY RISKS (EXECUTIVE ORDER 13045, AS AMENDED BY EXECUTIVE ORDER 13229)

This EA has not identified any additional environmental health and safety risks that may disproportionately affect children, in compliance with Executive Order 13045, as amended by Executive Order 13229. Any restrictions on subsistence fishing that were in place prior to the preparation of this EA would continue to be in effect.

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5 References

5 References

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6 List of Preparers

6 List of Preparers

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7 Agencies Contacted

7 Agencies Contacted

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National Marine Fisheries Service
Pacific Island Regional Office
Honolulu, Hawaii

Republic of the Marshall Islands Environmental Protection Authority
Ebeye, MH

Republic of the Marshall Island Environmental Protection Authority
Majuro, MH

U.S. Army Corps of Engineers-Honolulu
Fort Shafter, HI

U.S. Army Kwajalein Atoll–Reagan Test Site
Environmental Management Office

U.S. Environmental Protection Agency, Region IX
Pacific Island Office
San Francisco, CA

U.S. Fish and Wildlife Service
Pacific Island Office
Honolulu, Hawaii

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Appendix A
Distribution List

Appendix A Distribution List

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Habitat Conservation Division
Honolulu, HI

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Mr. Kawa Jatios
Republic of the Marshall Islands Environmental Protection Authority (RMIEPA)
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Huntsville, AL

Mr. Glen Shonkwiler
U.S. Army Space and Missile Defense Command/
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Huntsville, AL

LIBRARIES AND REPOSITORIES

Grace Sherwood Library
Kwajalein, MH

Roi-Namur Library
Roi-Namur, MH

Republic of the Marshall Islands Environmental Protection Authority
Office Lobby
Delap, Majuro, MH

Republic of the Marshall Islands Environmental Protection Authority
Office Lobby
Ebeye, MH

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Appendix B
Correspondence

Appendix B Correspondence

DEPARTMENT OF THE ARMY
U.S. ARMY SPACE AND MISSILE DEFENSE COMMAND/
ARMY FORCES STRATEGIC COMMAND
POST OFFICE BOX 1500
HUNTSVILLE, ALABAMA 35807-3801

REPLY TO
ATTENTION OF

June 8, 2016

Environmental Division

Dr. Michael Fry
U.S. Fish and Wildlife Service (USFWS)
Pacific Island Fish and Wildlife Office
P.O. Box 50088
Honolulu, HI 96850

Dear Dr. Fry:

The United States (U.S.) Army Space and Missile Defense Command/Army Forces Strategic Command (USASMDC/ARSTRAT) is executing the Compliance Cleanup Program at U.S. Army Kwajalein Atoll (USAKA) for U.S. Army Garrison–Kwajalein Atoll (USAG-KA). As part of the Cleanup Program, the USAKA Environmental Standards (UES) Appropriate Agencies reviewed the Draft Removal Action Memorandum (RAM) analyzing cleanup alternatives for the Kwajalein Landfill in early 2016.

Since the release of that document, another adjacent area has come to light as a potential issue. The area in question is a roughly 3-acre vegetated mound at the west end of the runway between Glass Beach and the Shark Pit. In March 2016, there was a near miss between an approaching aircraft and a vehicle attempting to traverse the road near the end of the runway. The near miss was attributed to the vehicle occupants' view of the approaching aircraft being obscured by the vegetated mound. The mound was already under investigation to determine if it covered the old dump area used from the 1940's to the 1960's prior to the creation in the 1960's of the portion of the island on which the landfill now sits. The metal debris piles on the shoreline between Glass Beach and the Shark Pit are also believed to be remains of this dump area.

The U.S. Army is preparing a Draft Environmental Assessment (EA) for the removal action activities associated with the Kwajalein Landfill. Based on the results of environmental analysis for this EA, the U.S. Army has drafted the attached/enclosed preliminary review, in accordance with UES Section 3-4.6.3(a), as a synopsis to discuss the alteration of the mound area between Glass Beach and the Shark Pit.

Based on the 2016 RAM for the Kwajalein Landfill, the area between Glass Beach and the Shark Pit is a mound of heavily vegetated debris along and up-gradient from the shoreline between Glass Beach and the Shark Pit (the project area). The project area is covered with managed vegetation. An April 2016 geophysical survey determined that the mound is approximately 5% metallic debris. The other materials could not be determined with the geophysics performed, although it also has a significant amount of concrete debris on the surface. It is estimated that the debris mound covers approximately 3 acres and includes approximately 30,000 cubic yards of material.

The mound is vegetated with kiden (*Tournefortia argentea)*, konnat (scaevola) (*Scaevola taccada*), ni (coconut trees) *(Cocos nucifera),* topo (beach morning glory) (*Ipomoea imperati and/or Ipomoea pes-caprae*), ekkon (tropical almond) (*Terminalia catappa*), lukwej (kamani) (*Calophyllum inophyllum*), kaonon (*Cassytha filiformis*), and kio (possibly *Sida fallax*); a bob (*Pandanus tectorius*) is near the mound, but not on top of it.

This mound area needs to be removed to improve the line-of-sight visibility for aircraft on the west end of the runway. The preliminary review discusses the activity description (removal and revegetation), the environmental setting (terrestrial species and habitat use), and direct and indirect impacts.

The conclusions of the evaluation outlined in the preliminary review indicate no long-term adverse effect to vegetation and terrestrial wildlife, and that overall there would be no negative effect from the removal of the mound. The cumulative impacts would be beneficial because the removal of the mound would provide better access along the beach to further reduce the amount of metal debris on the island, would provide access to any additional metallic debris buried by the mound, and would improve line-of-sight visibility for aircraft on the west end of the airplane runway. The area would be cleaned of metal debris and revegetated with appropriate plants that would not obscure the line-of-sight visibility for aircraft in the future. Therefore, USASMDC requests your review of the preliminary review and seeks your concurrence in our assessment of no adverse effect. Your response to this request will be incorporated into the Environmental Assessment.

If you have any question or concerns, please contact Mr. Thomas Craven, Environmental Protection Specialist, USASMDC/ARSTRAT, Environmental Division, (256) 955-1533, fax (256) 955-6659, or email him at thomas.m.craven2.civ@mail.mil.

Sincerely,

Weldon Hill
Deputy Chief of Staff, Engineer

Enclosure

2

From: Michael Fry

Sent: Sunday, July 10, 2016 11:21 PM

To: Craven, Thomas M CIV USARMY SMDC (US)

Cc: Dan Polhemus; Miller, Derek D CIV USARMY USAG (US) ; Aljure, Gustavo A CTR USARMY SMDC (US); Anthony Montgomery

Subject: [Non-DoD Source] RE: Removal Action Activities Associated with the Kwajalein Landfill - Preliminary Review- Removal of Metal Debris between Glass Beach and the Shark Pit. (UNCLASSIFIED)

Aloha Tom,

Dan Polhemus is away on family business.

The Service concurs with the decision to remove the mound near Glass Beach and revegetate the area. We will consult on appropriate vegetation at a later date.

Attached are the Service comments on the glass beach mound removal action and a photo of a white tern nesting in a tree on the golf course in 2014.

We would expect white terns to nest in Pandamus trees and tropical almomds anywhere on Kwajalein island. If an incubating tern is discovered, or a white tern chick, the tree it is in cannot be removed during the nesting season.

Adjacent vegetation can be removed, and the tern will remain in the nest tree until the chick fledges. At that time the tree can be removed.

Thanks very much,

Michael Fry

White Tern 2014 Nesting on Kwajalein Golf Course

COMMENT FORM

COMMENT INCORPORATOR:	DATE: July 10, 2016
COMMENTOR: Michael Fry	ORGANIZATION OF COMMENTOR: USFWS, Pacific Islands Fish and Wildlife Office
TITLE OF DOCUMENT: Preliminary Review: Removal Action Activities Associated with the Kwajalein Landfill - Removal of Metal Debris between Glass Beach and the Shark Pit U.S. Army Garrison, Kwajalein Atoll	DATE OF DOCUMENT: 8 June 2016

ITEM NO.	PAGE NO.	SECT NO.	LINE NO.	FIGURE NO.	TABLE NO.	RECOMMENDED CHANGES (Exact wording of suggested change)	INCOR-PORATED? (Yes/No)	HOW COMMENT WAS INCORPORATED (If not incorporated, why?)
1	8	5.0	10			White terns may nest in Pandamus trees		
2						and in Tropical Almonds. White terns were		
3						seen nesting in trees on the golf course		
4						during the 2014 biological inventory. A		
5						photo of a white tern incubating an egg in a		
6						tree on the golf course is attached.		
7						white terns are protected under the		
8						Migratory Bird Treaty Act, and nests cannot		
9						be destroyed during the nesting season. If		
10						a white tern is observed incubating or with		
11						a chick, the tern must not be displaced.		
12						Nearby vegetation can be removed, and		
13						tern will remain on the nest, and the nest		
14						tree can be removed after the chick		
15						fledges.		
16	11	6.4				The Service agrees that this vegetation		
17						removal will not have adverse effects in		
18						the long term. Replacement of shrubs will		
19						be beneficial		
20	12	7.0				The Service concurs with the removal		
21						action, provided nesting terns are protected		

DEPARTMENT OF THE ARMY
U.S. ARMY SPACE AND MISSILE DEFENSE COMMAND/
ARMY FORCES STRATEGIC COMMAND
POST OFFICE BOX 1500
HUNTSVILLE, ALABAMA 35807-3801

REPLY TO
ATTENTION OF

SEP 12, 2016

Environmental Division

Dr. Steven P. Kolinski
National Marine Fisheries Service
Pacific Island Regional Office
NOAA IRC NMFS PIRO HCD
1845 Wasp Blvd., Building 176
Honolulu, HI 96818

Dear Dr. Kolinski:

The U.S. Army Space and Missile Defense Command/Army Forces Strategic Command (USASMDC/ARSTRAT) is assisting the U.S. Army Garrison – Kwajalein Atoll (USAG-KA) in clean up and remediation activities associated with removal action activities designed to eliminate or decrease the potential for contaminants to migrate further into the environment (fish tissue, reef flat, ocean, soils, sediment, groundwater, and surface water) from the Kwajalein landfill. Therefore, USASMDC/ARSTRAT, in accordance with the U.S. National Environmental Policy Act of 1969 and 32 CFR Part 651, Environmental Analysis of Army Actions, has prepared an Environmental Assessment (EA) and Draft Finding of No Significant Impacts (FONSI) to evaluate the potential environmental effects of implementing the proposed combination of removal action components associated with the Kwajalein landfill.

Please find enclosed the *Environmental Assessment for Removal Action Activities Associated with the Kwajalein Landfill and Draft Finding of No Significant Impact (FONSI),* provided for your review and comment between September 19 and October 19, 2016. A comment form is also enclosed for your use in recording your comments, corrections, or suggestions. Your comments are due by October 19, 2016.

A Notice of Availability of the EA and Draft FONSI will be published in the local newspapers in Kwajalein and the Republic of the Marshall Islands on or before September 17, 2016. The documents will also be available at public libraries in Kwajalein and Republic of the Marshall Islands Environmental Protection Authority offices in Majuro and Ebeye. Additionally, the EA and Draft FONSI are accessible on the internet at www.usagkacleanup.info.

-2-

The EA and Draft FONSI examines the potential environmental effects of implementing a combination of removal actions components associated with the Kwajalein landfill. The project area for the Proposed Action includes the shoreline from Glass Beach, the shoreline of the landfill area, the aggregate area, the incinerator operation area, the salvage yard area, and the debris removal area between Glass Beach and the Shark Pit.

I am also providing a transmittal letter, the EA, and Draft FONSI, for comment, to Mr. Derek Miller, USAKA/RTS Environmental Management Office; Ms. Moriana Phillip, RMI Environmental Protection Authority Majuro; Mr. Kawa Jatios, RMI Environmental Protection Authority Ebeye; Ms. Helene Takemoto, U.S. Army Corps of Engineers; Dr. Dan Polhemus, U.S. Fish and Wildlife Service; and Mr. Norwood Scott, U.S. Environmental Protection Agency.

If you have any questions or concerns, please contact Mr. Thomas Craven, Environmental Protection Specialist, USASMDC/ARSTRAT, Environmental Division, (256) 955-1533, fax (256) 955-6659, or email him at thomas.m.craven2.civ@mail.mil. Email your comments to him or postmark written comments by 19 October 2016 to Thomas Craven, USASMDC/ARSTRAT, ATTN: SMDC-EN, P.O. Box 1500, Huntsville, AL 35807-3801.

Sincerely,

Weldon Hill
Deputy Chief of Staff, Engineer

Enclosures

DEPARTMENT OF THE ARMY
U.S. ARMY SPACE AND MISSILE DEFENSE COMMAND/
ARMY FORCES STRATEGIC COMMAND
POST OFFICE BOX 1500
HUNTSVILLE, ALABAMA 35807-3801

REPLY TO
ATTENTION OF

SEP 12, 2016

Environmental Division

Republic of the Marshall Island Environmental Protection Authority
Attn: Ms. Moriana Phillip
General Manager
P.O. Box 1322
Majuro, MH 96960-1322

Dear Ms. Phillip:

The U.S. Army Space and Missile Defense Command/Army Forces Strategic Command (USASMDC/ARSTRAT) is assisting the U.S. Army Garrison – Kwajalein Atoll (USAG-KA) in clean up and remediation activities associated with removal action activities designed to eliminate or decrease the potential for contaminants to migrate further into the environment (fish tissue, reef flat, ocean, soils, sediment, groundwater, and surface water) from the Kwajalein landfill. Therefore, USASMDC/ARSTRAT, in accordance with the U.S. National Environmental Policy Act of 1969 and 32 CFR Part 651, Environmental Analysis of Army Actions, has prepared an Environmental Assessment (EA) and Draft Finding of No Significant Impacts (FONSI) to evaluate the potential environmental effects of implementing the proposed combination of removal action components associated with the Kwajalein landfill.

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Copies of the EA and Draft FONSI are also being provided for the office lobby. Please provide a space in your office for these documents so that the public can review them.

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-2-

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I am also providing a transmittal letter, the EA, and Draft FONSI, for comment, to Dr. Steve Kolinski, National Marine Fisheries Services; Mr. Kawa Jatios, RMI Environmental Protection Authority Ebeye; Mr. Derek Miller, USAKA/RTS Environmental Management Office; Ms. Helene Takemoto, U.S. Army Corps of Engineers; Dr. Dan Polhemus, U.S. Fish and Wildlife Service; and Mr. Norwood Scott, U.S. Environmental Protection Agency.

If you have any questions or concerns, please contact Mr. Thomas Craven, Environmental Protection Specialist, USASMDC/ARSTRAT, Environmental Division, (256) 955-1533, fax (256) 955-6659, or email him at thomas.m.craven2.civ@mail.mil. Email your comments to him or postmark written comments by 19 October 2016 to Thomas Craven, USASMDC/ARSTRAT, ATTN: SMDC-EN, P.O. Box 1500, Huntsville, AL 35807-3801.

Sincerely,

Weldon Hill
Deputy Chief of Staff, Engineer

Enclosures

DEPARTMENT OF THE ARMY
U.S. ARMY SPACE AND MISSILE DEFENSE COMMAND/
ARMY FORCES STRATEGIC COMMAND
POST OFFICE BOX 1500
HUNTSVILLE, ALABAMA 35807-3801

REPLY TO
ATTENTION OF

SEP 12, 2016

Environmental Division

Republic of the Marshall Islands Environmental Protection Authority
Attn: Mr. Kawa Jatios
P.O. Box 5223
Ebeye, MH 96970

Dear Mr. Kawa Jatios:

The U.S. Army Space and Missile Defense Command/Army Forces Strategic Command (USASMDC/ARSTRAT) is assisting the U.S. Army Garrison – Kwajalein Atoll (USAG-KA) in clean up and remediation activities associated with removal action activities designed to eliminate or decrease the potential for contaminants to migrate further into the environment (fish tissue, reef flat, ocean, soils, sediment, groundwater, and surface water) from the Kwajalein landfill. Therefore, USASMDC/ARSTRAT, in accordance with the U.S. National Environmental Policy Act of 1969 and 32 CFR Part 651, Environmental Analysis of Army Actions, has prepared an Environmental Assessment (EA) and Draft Finding of No Significant Impacts (FONSI) to evaluate the potential environmental effects of implementing the proposed combination of removal action components associated with the Kwajalein landfill.

Please find enclosed the *Environmental Assessment for Removal Action Activities Associated with the Kwajalein Landfill and Draft Finding of No Significant Impact (FONSI)*, provided for your review and comment between September 19 and October 19, 2016. A comment form is also enclosed for your use in recording your comments, corrections, or suggestions. **Please provide your comments to Ms. Moriana Phillip, RMIEPA General Manager before October 19, 2016.**

Copies of the EA and Draft FONSI are also being provided for your office lobby. Please provide a space in your office for these documents so that the public can review them.

A Notice of Availability of the EA and Draft FONSI will be published in the local newspapers in Kwajalein and the Republic of the Marshall Islands on or before September 17, 2016. The documents will also be available at public libraries in Kwajalein and Republic of the Marshall Islands Environmental Protection Authority offices in Majuro and Ebeye. Additionally, the EA and Draft FONSI are accessible on the internet at www.usagkacleanup.info.

-2-

The EA and Draft FONSI examines the potential environmental effects of implementing a combination of removal actions components associated with the Kwajalein landfill. The project area for the Proposed Action includes the shoreline from Glass Beach, the shoreline of the landfill area, the aggregate area, the incinerator operation area, the salvage yard area, and the debris removal area between Glass Beach and the Shark Pit.

I am also providing a transmittal letter, the EA, and Draft FONSI, for comment, to Dr. Steve Kolinski, National Marine Fisheries Services; Ms. Moriana Phillip, RMI Environmental Protection Authority Majuro; Mr. Derek Miller, USAKA/RTS Environmental Management Office; Ms. Helene Takemoto, U.S. Army Corps of Engineers; Dr. Dan Polhemus, U.S. Fish and Wildlife Service; and Mr. Norwood Scott, U.S. Environmental Protection Agency.

If you have any questions or concerns, please contact Mr. Thomas Craven, Environmental Protection Specialist, USASMDC/ARSTRAT, Environmental Division, (256) 955-1533, fax (256) 955-6659, or email him at thomas.m.craven2.civ@mail.mil.

Sincerely,

Weldon Hill
Deputy Chief of Staff, Engineer

Enclosures

DEPARTMENT OF THE ARMY
U.S. ARMY SPACE AND MISSILE DEFENSE COMMAND/
ARMY FORCES STRATEGIC COMMAND
POST OFFICE BOX 1500
HUNTSVILLE, ALABAMA 35807-3801

REPLY TO
ATTENTION OF

SEP 12, 2016

Environmental Division

Derek Miller
U.S. Army Kwajalein Atoll–Reagan Test Site
Environmental Management Office
P.O. Box 26
APO, AP 96555-2526

Dear Mr. Miller:

The U.S. Army Space and Missile Defense Command/Army Forces Strategic Command (USASMDC/ARSTRAT) is assisting the U.S. Army Garrison – Kwajalein Atoll (USAG-KA) in clean up and remediation activities associated with removal action activities designed to eliminate or decrease the potential for contaminants to migrate further into the environment (fish tissue, reef flat, ocean, soils, sediment, groundwater, and surface water) from the Kwajalein landfill. Therefore, USASMDC/ARSTRAT, in accordance with the U.S. National Environmental Policy Act of 1969 and 32 CFR Part 651, Environmental Analysis of Army Actions, has prepared an Environmental Assessment (EA) and Draft Finding of No Significant Impacts (FONSI) to evaluate the potential environmental effects of implementing the proposed combination of removal action components associated with the Kwajalein landfill.

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If you have any questions or concerns, please contact Mr. Thomas Craven, Environmental Protection Specialist, USASMDC/ARSTRAT, Environmental Division, (256) 955-1533, fax (256) 955-6659, or email him at thomas.m.craven2.civ@mail.mil. Email your comments to him or postmark written comments by 19 October 2016 to Thomas Craven, USASMDC/ARSTRAT, ATTN: SMDC-EN, P.O. Box 1500, Huntsville, AL 35807-3801.

Sincerely,

Weldon Hill
Deputy Chief of Staff, Engineer

Enclosures

DEPARTMENT OF THE ARMY
U.S. ARMY SPACE AND MISSILE DEFENSE COMMAND/
ARMY FORCES STRATEGIC COMMAND
POST OFFICE BOX 1500
HUNTSVILLE, ALABAMA 35807-3801

REPLY TO
ATTENTION OF

SEP 12, 2016

Environmental Division

Dr. Dan Polhemus
U.S. Fish and Wildlife Service
Pacific Island Fish and Wildlife Office
300 Ala Moana Blvd., Room 3-122
Honolulu, HI 96850

Dear Dr. Polhemus:

The U.S. Army Space and Missile Defense Command/Army Forces Strategic Command (USASMDC/ARSTRAT) is assisting the U.S. Army Garrison – Kwajalein Atoll (USAG-KA) in clean up and remediation activities associated with removal action activities designed to eliminate or decrease the potential for contaminants to migrate further into the environment (fish tissue, reef flat, ocean, soils, sediment, groundwater, and surface water) from the Kwajalein landfill. Therefore, USASMDC/ARSTRAT, in accordance with the U.S. National Environmental Policy Act of 1969 and 32 CFR Part 651, Environmental Analysis of Army Actions, has prepared an Environmental Assessment (EA) and Draft Finding of No Significant Impacts (FONSI) to evaluate the potential environmental effects of implementing the proposed combination of removal action components associated with the Kwajalein landfill.

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If you have any questions or concerns, please contact Mr. Thomas Craven, Environmental Protection Specialist, USASMDC/ARSTRAT, Environmental Division, (256) 955-1533, fax (256) 955-6659, or email him at thomas.m.craven2.civ@mail.mil. Email your comments to him or postmark written comments by 19 October 2016 to Thomas Craven, USASMDC/ARSTRAT, ATTN: SMDC-EN, P.O. Box 1500, Huntsville, AL 35807-3801.

Sincerely,

Weldon Hill
Deputy Chief of Staff, Engineer

Enclosures

DEPARTMENT OF THE ARMY
U.S. ARMY SPACE AND MISSILE DEFENSE COMMAND/
ARMY FORCES STRATEGIC COMMAND
POST OFFICE BOX 1500
HUNTSVILLE, ALABAMA 35807-3801

REPLY TO
ATTENTION OF

SEP 12, 2016

Environmental Division

Norwood Scott
U.S. Environmental Protection Agency, Region IX
Pacific Island Office
75 Hawthorne Street (CED-6)
San Francisco, CA 94105

Dear Mr. Scott:

The U.S. Army Space and Missile Defense Command/Army Forces Strategic Command (USASMDC/ARSTRAT) is assisting the U.S. Army Garrison – Kwajalein Atoll (USAG-KA) in clean up and remediation activities associated with removal action activities designed to eliminate or decrease the potential for contaminants to migrate further into the environment (fish tissue, reef flat, ocean, soils, sediment, groundwater, and surface water) from the Kwajalein landfill. Therefore, USASMDC/ARSTRAT, in accordance with the U.S. National Environmental Policy Act of 1969 and 32 CFR Part 651, Environmental Analysis of Army Actions, has prepared an Environmental Assessment (EA) and Draft Finding of No Significant Impacts (FONSI) to evaluate the potential environmental effects of implementing the proposed combination of removal action components associated with the Kwajalein landfill.

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If you have any questions or concerns, please contact Mr. Thomas Craven, Environmental Protection Specialist, USASMDC/ARSTRAT, Environmental Division, (256) 955-1533, fax (256) 955-6659, or email him at thomas.m.craven2.civ@mail.mil. Email your comments to him or postmark written comments by 19 October 2016 to Thomas Craven, USASMDC/ARSTRAT, ATTN: SMDC-EN, P.O. Box 1500, Huntsville, AL 35807-3801.

Sincerely,

Weldon Hill
Deputy Chief of Staff, Engineer

Enclosures

DEPARTMENT OF THE ARMY
U.S. ARMY SPACE AND MISSILE DEFENSE COMMAND/
ARMY FORCES STRATEGIC COMMAND
POST OFFICE BOX 1500
HUNTSVILLE, ALABAMA 35807-3801

REPLY TO
ATTENTION OF

SEP 12, 2016

SMDC-EN

MEMORANDUM FOR

Commander, U.S. Army Corps of Engineers, ATTN: CEPOH-PP-E (H. Takemoto), Building 252, Ft. Shafter, HI 96858-5440

SUBJECT: Environmental Assessment for Removal Action Activities Associated with the Kwajalein Landfill and Draft Finding of No Significant Impact (FONSI)

1. The U.S. Army Space and Missile Defense Command/Army Forces Strategic Command (USASMDC/ARSTRAT) is assisting the U.S. Army Garrison – Kwajalein Atoll (USAG-KA) in clean up and remediation activities associated with removal action activities designed to eliminate or decrease the potential for contaminants to migrate further into the environment (fish tissue, reef flat, ocean, soils, sediment, groundwater, and surface water) from the Kwajalein landfill. Therefore, USASMDC/ARSTRAT, in accordance with the U.S. National Environmental Policy Act of 1969 and 32 CFR Part 651, Environmental Analysis of Army Actions, has prepared an Environmental Assessment (EA) and Draft Finding of No Significant Impacts (FONSI) to evaluate the potential environmental effects of implementing the proposed combination of removal action components associated with the Kwajalein landfill.

2. Please find enclosed the *Environmental Assessment for Removal Action Activities Associated with the Kwajalein Landfill and Draft Finding of No Significant Impact (FONSI),* provided for your review and comment between September 19 and October 19, 2016. A comment form is also enclosed for your use in recording your comments, corrections, or suggestions. Your comments are due by October 19, 2016.

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4. The EA and Draft FONSI examines the potential environmental effects of implementing a combination of removal actions components associated with the Kwajalein landfill. The project area for the Proposed Action includes the shoreline from Glass Beach, the shoreline of the landfill area, the aggregate area, the incinerator operation area, the salvage yard area, and the debris removal area between Glass Beach and the Shark Pit.

SMDC-EN
SUBJECT: Environmental Assessment for Removal Action Activities Associated with the Kwajalein Landfill and Draft Finding of No Significant Impact (FONSI)

5. I am also providing a transmittal letter, the EA, and Draft FONSI, for comment, to Dr. Steve Kolinski, National Marine Fisheries Services; Ms. Moriana Phillip, RMI Environmental Protection Authority Majuro; Mr. Kawa Jatios, RMI Environmental Protection Authority Ebeye; Mr. Norwood Scott, U.S. Environmental Protection Agency; Dr. Dan Polhemus, U.S. Fish and Wildlife Service; and Mr. Derek Miller, USAKA/RTS Environmental Management Office.

6. If you have any questions or concerns, please contact Mr. Thomas Craven, Environmental Protection Specialist, USASMDC/ARSTRAT, Environmental Division, (256) 955-1533, fax (256) 955-6659, or email him at thomas.m.craven2.civ@mail.mil. Email your comments to him or postmark written comments by 19 October 2016 to Thomas Craven, USASMDC/ARSTRAT, ATTN: SMDC-EN, P.O. Box 1500, Huntsville, AL 35807-3801.

Sincerely,

WELDON H. HILL
Deputy Chief of Staff, Engineer

Encls

2

DEPARTMENT OF THE ARMY
U.S. ARMY SPACE AND MISSILE DEFENSE COMMAND/
ARMY FORCES STRATEGIC COMMAND
POST OFFICE BOX 1500
HUNTSVILLE, ALABAMA 35807-3801

REPLY TO
ATTENTION OF
Environmental Division

SEP 12, 2016

Grace Sherwood Library
P.O. Box 23
APO, AP 96555

SUBJECT: Draft Environmental Assessment for Removal Action Activities Associated with the Kwajalein Landfill and Draft Finding of No Significant Impact (FONSI)

TO WHOM IT MAY CONCERN:

Please provide space in your library or offices for public access to the enclosed *Environmental Assessment for Removal Action Activities Associated with the Kwajalein Landfill and Draft Finding of No Significant Impact (FONSI).* The Environmental Assessment and Draft FONSI are also available on the internet at www.usagkacleanup.info.

The public comment period is from September 19, 2016 to October 19, 2016. Comments should be postmarked no later than October 19, 2016. Comments can be mailed to:

U.S. Army Space and Missile Defense Command/Army Forces Strategic Command
Attn.: SMDC-EN (Mr. Thomas Craven)
P.O. Box 1500, Huntsville, AL 35807-3801
or fax to SMDC-EN (Craven), Huntsville, AL, (1) - (256) 955-6659

Questions regarding these documents or requests for additional copies should be sent to the address above.

Sincerely,

Weldon Hill
Deputy Chief of Staff, Engineer

Enclosure

1

DEPARTMENT OF THE ARMY
U.S. ARMY SPACE AND MISSILE DEFENSE COMMAND/
ARMY FORCES STRATEGIC COMMAND
POST OFFICE BOX 1500
HUNTSVILLE, ALABAMA 35807-3801

SEP 12, 2016

REPLY TO
ATTENTION OF
Environmental Division

Roi-Namur Library
P.O. Box 23
Roi-Namur, Marshall Islands
APO, AP 96555

SUBJECT: Draft Environmental Assessment for Removal Action Activities Associated with the Kwajalein Landfill and Draft Finding of No Significant Impact (FONSI)

TO WHOM IT MAY CONCERN:

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U.S. Army Space and Missile Defense Command/Army Forces Strategic Command
Attn.: SMDC-EN (Mr. Thomas Craven)
P.O. Box 1500, Huntsville, AL 35807-3801
or fax to SMDC-EN (Craven), Huntsville, AL, (1) - (256) 955-6659

Questions regarding these documents or requests for additional copies should be sent to the address above.

Sincerely,

Weldon Hill
Deputy Chief of Staff, Engineer

Enclosure

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Pacific Islands Regional Office
1845 Wasp Blvd., Bldg 176
Honolulu, Hawaii 96818
(808) 725-5000 · Fax: (808) 725-5215

DEC 15 2016

Weldon Hill
U.S. Army Space and Missile Defense Command/
Army Forces Strategic Command
Post Office Box 1500
Huntsville, Alabama 35807-3801

Dear Mr. Hill:

This letter responds to your September 9, 2016 letter, Biological Assessment (BA), your response to our information request, electronic mail messages, and other correspondence regarding your proposed Removal Action Activities Associated with the Kwajalein Landfill at Kwajalein Atoll. In the letter, the U.S. Army Space and Missile Defense Command/Army Forces Strategic Command (USASMDC/ARSTRAT) on behalf of US Army Garrison-Kwajalein Atoll (USAG-KA) determined that the proposed project may affect but is not likely to adversely affect species protected under the standards and procedures described in the Environmental Standards and Procedures for US Army Kwajalein Atoll (USAKA) Activities in the Republic of Marshall Islands (USAKA Environmental Standards or UES), and requested our concurrence with that determination.

Proposed Action
In summary, the USAG-KA is proposing to remove and reduce the volume of metal debris along the shoreline east of the landfill area and Glass Beach, create a stable shoreline east of the landfill with a regraded, new, stone-armored revetment, and monitor water quality for 5 years to evaluate remedial effectiveness. The USAG-KA will use various heavy equipment to remove up to 7,000 cubic yards of metal debris from the beaches, and also remove some debris from in-water or sensitive areas by hand.

The revetment is necessary because of the shoreline is exposed to high surf regularly, and is seaward of a landfill. The revetment is being designed to maximum storm wave height at high tide plus 1.6 feet in anticipation of sea level rise. The USAG-KA is placing 4,000-lb median weight rocks for the top layer. Total height is proposed higher than +11.5 Mean sea level. The USAG-KA will use various heavy equipment as needed to install rock revetment to the shoreline after removing the metal debris.

The USAG-KA will ship the recovered metal to the Continental United States for recycling, and concrete will be stockpiled, and either re-used within the project, or disposed of in a proper facility on or off island.

The USAG-KA will implement best management practices (BMP) to avoid and minimize disturbance and injury to UES-consultation species and their habitat in the action area. These BMPs include sediment and erosion control during removal of debris and revetment installation, incorporating lookouts and monitoring for UES during in-water construction, avoidance of coral and other favorable habitat, and contingency plans and equipment on site to deal with accidental spills or debris.

Action Area

The action area for this project includes all areas affected by noise, turbidity, and general construction-related disturbance from debris removal and placement of revetment. The USAG-KA estimated the action area, pictured in Figure (1), to include all shorelines associated with removal and placement of revetment, and a buffer area of 50 yards to include areas where UES-consultation species may be exposed to sound or turbidity.

Figure 1. Action area.

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USAKA Environmental Standards

The RMI has agreed to allow the US Government to use certain areas within the RMI, including eleven islets at Kwajalein Atoll that are administered by USAKA. The relationship between the US and RMI Governments is governed by the Compact of Free Association (Compact), as Amended in 2003 (48 USC 1921). The Compact obligates the US to apply the National Environmental Policy Act of 1969 (NEPA) to its actions in the RMI as if the RMI were a part of the US. However, the Endangered Species Act (ESA) does not apply at USAKA. Instead, the Compact specifically requires the US Government to develop and apply environmental standards that are substantially similar to several US environmental laws, including the ESA and the Marine Mammal Protection Act (MMPA). The standards and procedures described in the UES were developed to satisfy that requirement. As such, the US Government must apply the UES to its activities at USAKA and for all USAKA activities in the RMI.

The USAG-KA determined that the UES-consultation species under NMFS jurisdiction listed in Table (1) are known to occur, or could reasonably be expected to occur at the transect sites or transit routes, and may be present in the action area.

Table (1) – UES-consultation species considered in this consultation.

Scientific Name	Common name	ESA or MMPA status
Chelonia mydas	Green sea turtle	ESA - Central West Pacific Distinct Population Segment (DPS) – Endangered
Eretmochelys imbricata	Hawksbill sea turtle	ESA - Endangered
Sphyrna lewini	Scalloped hammerhead shark	ESA - Indo West Pacific DPS – threatened
Trochus (Tectus) *niloticus*	Top shell snail	None
Bolbometopon muricatum	Bumphead parrotfish	None
Cheilinus undulatus	Humphead wrasse	None
Manta alfredi	Reef manta ray	ESA - candidate
Manta birostris	Oceanic giant manta ray	ESA - candidate
Delphinus delphis	Common dolphin	MMPA
Grampus griseus	Risso's dolphin	MMPA
Peponocephala electra	Melon-headed whale	MMPA
Stenella attenuata	Offshore spotted dolphin	MMPA
Stenella attenuata graffmani	Coastal spotted dolphin	MMPA
Stenella coeruleoalba	Striped dolphin	MMPA
Stenella longirostris	Spinner dolphin	MMPA
Stenella longirostris centroamericana	Costa Rican spinner dolphin	MMPA
Stenella longirostris	Whitebelly spinner dolphin	MMPA
Stenella longirostris orientalis	Eastern spinner dolphin	MMPA
Physeter catodon	Sperm whale	ESA - Endangered, MMPA

Analysis of Effects

The UES does not specifically describe how to determine that a proposed action is not likely to adversely affect UES-consultation species. However, Section 161 of the Compact specifically requires the US to apply standards that are substantially similar to the ESA. In order to determine that a proposed action is not likely to adversely affect (NLAA) UES-consultation species, NMFS

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must find that the effects of the proposed action are expected to be insignificant, discountable, or beneficial as defined in the joint USFWS-NMFS Endangered Species Consultation Handbook: (1) insignificant effects relate to the size of the impact and should never reach the scale where take occurs; (2) discountable effects are those that are extremely unlikely to occur; and (3) beneficial effects are positive effects without any adverse effects (USFWS & NMFS 1998). This standard, as well as consideration of the probable duration, frequency, and severity of potential interactions, was applied during the analysis of effects of the proposed action on ESA-UES-consultation marine species, as is described in detail in the USASMDC/ARSTRAT's consultation request.

The USAG-KA may affect UES-consultation species during and after construction in the following ways: direct contact, general construction disturbance from human activity and equipment operation, elevated noise, elevated turbidity and sedimentation, and exposure to wastes and discharges.

The USAG-KA could potentially affect sea turtles, fish, top snails, and elasmobranchs by directly contacting or visually disturbing them during debris removal, revetment construction, or water quality sampling. The USAG-KA will operate almost exclusively upland of mean sea level and plan to limit construction during low tides. The USAG-KA will operate heavy equipment from above the bank, but may traverse the beach and occasionally the reef flat for removal of debris seaward of the bank. The workers will also enter intertidal and shallow subtidal areas by foot and hand-remove debris. Water quality sampling will be limited to collecting a cup of water from intertidal or subtidal areas near the sites a few times per year for five years. The USAG-KA will inform all workers to avoid all marine wildlife, including sessile or slow-moving animals like top snails. Neritic sea turtles, fish, sharks, and rays are large and agile, and capable of swimming away safely from any disturbance that would harm them. The USAG-KA will implement several BMPs such as working during low tide when exposure is less likely, workers will avoid all living organisms and important habitat features, and will not enter water if UES-consultation species are present in the work area. The USAG-KA will survey all areas seaward of the bank prior to entry by heavy equipment or vehicles to avoid crushing marine life. Rocks will be lowered and placed individually to prevent rolling off into intertidal or subtidal areas where it can crush marine organisms. The USAG-KA will have an observer on site, who will alert workers to stop work if a sea turtle, shark, ray or large organism is near construction sites where they may be contacted by falling debris or equipment, and will not restart until the animal has left the area. We expect effects on UES-consultation species from direct contact or disturbance to be discountable.

The USAG-KA may affect UES-consultation species exposed to construction related noises, both in-air and in-water. Man-made sounds can affect animals exposed to them in three ways: non-auditory damage to gas-filled organs, hearing loss expressed in permanent threshold shift (PTS) or temporary threshold shift (TTS), and behavioral responses or changes. The sounds generated during construction include common construction noises from land-based heavy equipment and upland construction. Average airborne recordings of sounds from common "earthmoving" activities were identified in Knauer et al. (2006). Earthmoving heavy equipment ranged from 78 to 81 dBA 50 feet away from the source. These recordings are well below 90 dBA, where hearing loss and behavior response could occur in some marine mammals through airborne sound. Sound transfers from air to water poorly and is not likely to have effects on marine life under the surface. Sound can travel from upland sources through ground by peak particle velocity and average particle velocity. Through average particle velocity, sound can transfer from that medium to the water column, where UES-consultation species can be exposed. None of the sounds produced during upland construction are great enough to rise to levels that would be injurious, or even noticeable to animals in the water column near the construction site during excavation. Occasional impulsive sounds may occur during

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operation, such as breaking debris with shovel drop, or placement of rocks if dropped from short distances. These could generate brief high levels of particle movement that could be detected by fish with lateral lines. However, upland noise sources dissipate as they travel through ground, and energy is further refracted or lost during the transfer from ground to water. The sounds generated on land, even impulsive sounds will not be great enough to generate peak sound levels in the water column that would injure fish or other UES-consultation species exposed to them, and its irregular and temporary nature of the exposures would make it unlikely to create sound exposure levels that would harm them or change their behavior. We expect the sounds generated during construction will have insignificant effects to UES-consultation species.

The USAG-KA may expose UES-consultation species to elevated turbidity or sedimentation. Although most of the construction activities are upland, the USAG-KA anticipates some increases in suspended sediments during or shortly after construction. Some turbidity is expected to leave the work site but not at levels that would harm UES-consultation species. The beach sediments at the work site are a mixture of sand, coralline rubble, and gravel. The USAG-KA will limit construction to low tides to avoid disturbing sediments while the areas are inundated and susceptible to suspension. Turbidity, if any, would settle close to the source. The USAG-KA will adhere to BMPs such as halting construction when UES-consultation species are adjacent to the work areas which would further minimize their exposure. We expect turbidity from the project activities would have insignificant effects to UES-consultation species.

The USAG-KA may expose UES-consultation species to waste and discharge associated with heavy equipment and vehicles. However, all equipment and vehicles will be checked prior to the start of each day's activities and maintained in proper working condition. In addition, the USAG-KA will strictly adhere to the BMPs UES-consultation in USAG-KA's BA, and conservation measures which include BMPs for fueling sites, hazardous waste management and disposal, spill kits and absorption pads on site, and recovery of spilled materials. This will reduce the likelihood of a discharge or accidental release of wastes. Discharges and spills could occur but they are expected to be infrequent, small, and quickly cleaned. Based on properly maintaining all equipment, and adherence to proposed BMPs, we expect waste or discharge from the project activities would have insignificant effects to UES-consultation species.

Based on consideration of the record as presented in the information and assessments in the USASMDC/ARSTRAT's consultation request and follow-up materials, and the best scientific information available about the biology and expected behaviors of the UES-consultation marine species considered in this consultation, NMFS concurs with 1) the list of UES-consultation species potentially exposed to the effects of the action, 2) the suite of identified stressors, and 3) the USASMDC/ARSTRAT's assessment of exposure risk and significance of exposure to those stressors.

Conclusion

NMFS concurs with your determination that the Removal Action Activities Associated with the Kwajalein Landfill at Kwajalein Atoll project is not likely to adversely all of the UES-consultation species UES-consultation in Table 1. This conclusion is based on your description of the action, the methods and material identified, and BMPs included in the description of the action. We expect all aspects of the project are implemented as described, including BMPs. This concludes your consultation responsibilities for this action under the ESA for species under NMFS' jurisdiction. If necessary, consultation pursuant to Essential Fish Habitat would be completed by NMFS' Habitat Conservation Division in separate communication.

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ESA Consultation must be reinitiated if: 1) take occurs; 2) new information reveals effects of the action that may affect UES-consultation species or designated critical habitat in a manner or to an extent not previously considered; 3) the identified action is subsequently modified in a manner causing effects to UES-consultation species or designated critical habitat not previously considered; or 4) a new species is listed or critical habitat designated that may be affected by the identified action.

If you have further questions please contact Joel Moribe on my staff at (808) 725-5142 or joel.moribe@noaa.gov. Thank you for working with NMFS to protect our nation's living marine resources.

Sincerely,

A M Garrett

Ann M. Garrett
Assistant Regional Administrator

Cc: Tom Craven, USASMDC/ARSTRAT
Steve Kolinski, NMFS

PIRO Reference No.: I-PI-16-1454-AG

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Appendix C
Analytical Results—Landfill Monitoring Wells, Groundwater Seeps, and Surface Water Samples

Appendix C Analytical Results—Landfill Monitoring Wells, Groundwater Seeps, and Surface Water Samples

Table C-1. Analytical results from landfill monitoring wells and seeps.

	Landfill Monitoring Wells							Groundwater Seeps					Surface Water Quality Standards		Ground Water Quality Standards	
Sample ID	***KW-1***	***KW-2***	***KW-3***	***KW-4***	***KW-5***	***KW-7***	***KW-8***	***KS-4***	***KS-5***	***SP-1***	***SP-2***	***SP-3***	***CMC***	***CCC***	***Primary***	***Secondary***
Date Sampled	***26 Sep 2011***	***26 Sep 2011***	***26 Sep 2011***	***26 Sep 2011***	***26 Sep 2011***	***26 Sep 2011***	***26 Sep 2011***	***27 Sep 2011***	***27 Sep 2011***	***27 Sep 2011***	***28 Sep 2011***	***28 Sep 2011***	***µg/L***	***µg/L***	***mg/L***	***mg/L***
Nutrients mg/L																
Total Phosphorus	0.024	0.0078 J	0.022	0.0048 J	<0.010	0.0068 J	0.0064 J	0.0019 J	<0.010	<0.010	<0.010	<0.010				
Ammonia	0.18	0.044 J	0.36	0.10	0.20	0.14	0.062 J	0.023 J	0.037 J	0.052 J	<0.10	0.085 J				
Nitrate + Nitrate	<0.05	2.7	<0.05	<0.05	<0.05	<0.05	0.12	0.39	0.032 J	0.14	0.092	<0.050			10	
Total Kjeldahl Nitrogen	0.48	0.40	0.52	0.23	0.27	0.26	0.26	0.14	0.15	0.090 J	0.10	0.15				
Metals, µg/L																
Arsenic	0.33	0.043	0.17	0.12	0.11	0.17	0.37	1.30	0.79	0.80	0.81	0.98	69	36	0.05	
Chromium	0.050 J	0.704	0.296 J	0.084 J	1.32	0.223	0.088 J	0.877 J	0.545 J	0.806 J	0.877 J	0.483 J			0.1	
Copper	0.0646	1.10	4.38	0.399	9.88 J	0.0537	0.249	14.1	8.79	4.36	11.5	14.5	4.8	3.1	1.3	1.0
Lead	0.0068	0.0147	1.51	0.650	2.37	0.251	0.0333	3.30	2.58	0.572	0.505	3.02	210	8.1	0.015	
Mercury	0.00017	0.00029	0.00094	0.00161	0.00241	0.00035	<0.00040	0.00319	0.003473	0.00276	0.00177	0.00359	1.8	0.94	0.002	
Nickel	0.600	2.00	1.33	0.165	10.5	0.188	1.13	2.05	1.72	1.83	2.26	1.12	74	8.2		
Silver	0.020	0.043	0.044	0.033	0.063	0.039	0.034	0.514	0.250	3.16	1.96	0.344	1.9			0.1
Zinc	0.080 J	0.382 J	5.71	0.820 J	19.9	0.171 J	0.482 J	16.5	15.1	8.61	8.49	4.32	90	81		5
Iron	120	71.2	1230	1040	1790	385	138	223	263	226	367	282				0.3
Butyltins, µg/L																
Tetra-n-butyltin	<0.047	<0.047	<0.047	<0.047	<0.047	<0.047	<0.047	<0.047	<0.047	<0.047	<0.047	<0.047				
Tri-nbutyltin	<0.021	<0.021	<0.021	<0.021	<0.021	<0.021	<0.021	<0.021	<0.021	<0.021	<0.021	<0.021	0.42	0.0074		
Di-n-butyltin	<0.018	<0.018	<0.018	<0.018	0.012 J	<0.018	<0.018	<0.018	<0.018	<0.018	<0.018	<0.018				
n-Butyltin	<0.047	<0.047	<0.047	<0.047	<0.047	<0.047	<0.047	<0.047	<0.047	<0.047	<0.047	<0.047				
PCBs, µg/L														0.03 [1]	0.0005 [1]	
Aroclor-1016	<0.020	<0.0020	2.6	<0.0020	<0.0020	<0.0020	<0.034	<0.0096	<0.018	<0.026	<0.0020	<0.030				
Aroclor-1221	<0.10	<0.010	<0.10	<0.010	<0.010	<0.010	<0.036	<0.024	<0.027	<0.024	<0.010	<0.087				
Aroclor-1232	<0.020	<0.0020	<0.020	<0.0020	<0.0020	<0.0020	<0.029	<0.020	<0.059	<0.063	<0.0020	<0.13				
Aroclor-1242	<0.11	<0.0020	<0.020	0.21	0.16	<0.0020	<0.033	<0.0088	<0.018	<0.025	0.044	<0.032				
Aroclor-1248	<0.020	<0.0020	<0.020	<0.0020	<0.0020	<0.0020	<0.025	<0.0085	<0.027	<0.021	<0.0020	<0.046				
Aroclor-1254	<0.020	<0.0072	<0.020	<0.0020	<0.045	<0.0020	<0.0020	<0.0020	<0.0020	<0.0082	<0.0020	<0.0020				
Aroclor-1260	<0.020	<0.0020	<0.020	<0.0020	<0.024	<0.0020	<0.0020	<0.0020	<0.0020	<0.0033	<0.0020	<0.0020				
Pesticides With UES Criteria, µg/L																
Aldrin	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1300			
Gamma-BHC (Lindane)	<1.9	<0.50	28	<0.78	<0.71	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	160		0.0002	
Chlordane[2]	<0.50	<0.50	2.34	<0.50	0.27 J	<0.50	<0.50	2.5	6.3	4.1	1.53 J	5.4	90[2]	4 [2]	0.002	
4-4'-DDT	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.46 J	<0.50	<0.50	<0.50	<0.50	130	1		
Dieldrin	<0.50	<0.50	<0.50	1.2	0.75	<0.50	<0.50	<0.50	<0.50	<0.50	0.94	<0.50	710	1.9		
alpha-Endosulfan	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	34	8.7		
beta-Endosulfan	<0.50	<0.50	<0.97	<0.50	<1.5	<0.50	<0.50	<0.50	1.0	<0.50	<0.50	<0.50	34	8.7		
Endrin	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	37	2.3	0.0002	
Heptachlor	0.65	<0.40	<1.2	<1.0	<1.7	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	53	3.6	0.0004	
Heptachlor Epoxide	<0.40	<0.40	<0.40	<0.40	<1.8	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	53	3.6	0.0002	
Toxaphene	<120	<43	<76	<67	<1.9	<25	<50	<37	<53	<38	<64	<71	210	0.2	0.003	
Detected Pesticides Without UES Criteria																
Hexachlorobenzene	12	<0.50	35	1.2	<0.54	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.30 J				
Beta-BHC	0.50<	<0.50	<0.50	<0.75	0.57	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50				
4.4'DDE	<0.50	<0.50	1.3	1.2	1.5	0.25 J	<0.50	0.26 J	<0.50	0.22 J	0.21 J	0.43 J				
4.4'DDD	<0.50	<0.50	<0.50	1.2	0.63	1.2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50				
2.4'-DDE	<0.25	<0.25	<0.25	0.97	<3.5	<0.25	<0.25	<0.25	<1.9	<0.25	<0.25	<1.0				
Endrin Ketone	<0.50	<0.50	<0.50	<0.50	0.39 J	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50				
Methoxychlor	<1.0	<1.0	<1.0	<1.0	0.83 J	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0				

Notes: CMC = UES Acute Criteria; CCC = UES Chronic Criteria; J = estimated value; red and orange shading indicates surface water concentration exceedance of UES CMC and CCC surface water criteria, respectively.

Surface water quality criteria from USAKA Environmental Standards, 12th Ed. (2011), Table 3-2C.2, Ground water quality criteria from USAKA Environmental Standards, 12th Ed. (2011), Table 3-2D.1 and 3-2D.2. However, the landfill area is Class III groundwater according to the USAKA Env. Standards Section 3-2.4.2(c,d), and these standards do not strictly apply to Class III groundwater. The USAKA Env. Standards Section 3-2.6.2 state that the groundwater quality standard for Class III water is, "USAKA operations shall not degrade the quality of Class III groundwater in such a way that results in increases of contaminate concentrations that will adversely affect public health, the marine environment, the quality of adjacent Class I or II groundwater, or protected beneficial uses of surface waters."

[1] Aroclors 1016, 1221, 2132, 1242, 1248, 1254, 1260

[2] Chlordane is a mixture of > 140 related compounds, major constituents summed in this table are : a-chlordane, y-chlordane, oxychlordane, *cis* and *trans*-nonachlor (Source: Adapted from USAPHC, 2011b)

Table C-2. Analytical results from marine inter-tidal landfill surface water samples

	Surface Water Samples											Surface Water Quality Criteria		Equipment Blank	Ground Water Quality Criteria	
Sample ID	***SW-01***	***SW-02***	***SW-03***	***SW-04***	***SW-05***	***SW-06***	***SW-07***	***SW-08***	***SW-09***	***SW-10***	***SW-12***	***CCC***	***CMC***	***28 Sep 2011***	***Primary***	***Secondary***
Date Sampled	***27 Sep 2011***	***27 Sep 2011***	***27 Sep 2011***	***27 Sep 2011***	***27 Sep 2011***	***27 Sep 2011***	***28 Sep 2011***	***28 Sep 2011***	***28 Sep 2011***	***28 Sep 2011***	***28 Sep 2011***	***µg/L***	***µg/L***		***mg/L***	***mg/L***
Nutrients mg/L																
Total Phosphorus	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.0073 J	0.095	<0.010			<0.010		
Ammonia	0.061 J	0.044 J	0.036 J	0.023 J	0.035 J	<0.10	<0.10	0.023 J	0.037 J	0.028 J	0.038 J			0.061 J		
Nitrate + Nitrate	<0.050	<0.050	<0.050	<0.050	0.047 J	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050			<0.050	10	
Total Kjeldahl Nitrogen	0.18	0.11	0.16	0.10	0.13	0.12	0.15	0.13	0.27	0.19	0.11			0.21		
Metals, µg/L																
Arsenic	1.35	1.26	1.21	1.13	1.19	1.65	1.10	1.95	1.23	1.34	1.46	69	36	<0.10	0.05	
Chromium	0.558 J	0.908 J	0.595 J	0.524 J	0.590 J	1.62 J	0.569 J	2.04 J	0.516 J	0.518 J	0.671 J			0.354 J	0.1	
Copper	.0788	3.16	3.42	4.53	4.64	4.93	3.61	8.88	9.28	2.01	4.01	4.8	3.1	0.0800	1.3	1.0
Lead	0.489	1.45	1.27	2.30	1.11	1.76	1.05	5.02	1.84	2.92	2.37	210	8.1	0.0297	0.015	
Mercury	0.00148	0.00087	0.00093	0.00099	0.00163	0.00190	0.0178	0.00186	0.00146	0.00118	0.00073	1.8	0.94	0.00039	0.002	
Nickel	0.253	0.391	0.450	0.622	0.626	0.377	0.355	1.15	0.504	0.300	0.478	74	8.2	0.0116		
Silver	0.115	0.131	0.136	0.115	0.135	0.120	0.139 J	0.154 J	0.146 J	0.150 J	0.157 J	1.9		0.135		0.1
Zinc	2.31	1.52	1.57	5.16	2.73	1.97	1.77	4.02	2.32	1.93	1.56	90	81	1.78		5
Iron	344	375	363	560	313	359	284	658	347	489	505			<1.01		0.3
Butyltins, µg/L																
Tetra-n-butyltin	<0.047	<0.047	<0.047	<0.047	<0.047	<0.047	<0.047	<0.047	<0.047	<0.047	<0.047			<0.047		
Tri-nbutyltin	<0.021	<0.021	<0.021	<0.021	<0.021	<0.021	<0.021	<0.021	<0.021	<0.021	<0.021	0.42	0.0074	<0.021		
Di-n-butyltin	<0.018	<0.018	<0.018	<0.018	<0.018	<0.018	<0.018	<0.018	<0.018	<0.018	<0.018			<0.018		
n-Butyltin	<0.047	<0.047	<0.047	<0.047	<0.047	<0.047	<0.047	<0.047	<0.047	<0.047	<0.047			<0.047		
PCBs, µg/L													0.03[1]			
Aroclor-1016	<0.0021	<0.0095	<0.019	<0.014	<0.018	<0.035	<0.0077	<0.0020	<0.0097	<0.0043	<0.0020			<0.011		
Aroclor-1221	<0.011	<0.030	<0.073	<0.067	<0.053	<0.12	<0.023	<0.010	<0.01	<0.023	<0.010			<0.048		
Aroclor-1232	<0.0069	<0.015	<0.020	<0.023	<0.025	<0.044	<0.017	<0.0020	<0.024	<0.0093	<0.0020			<0.028		
Aroclor-1242	<0.0023	<0.0089	<0.017	<0.016	<0.016	<0.029	<0.0086	<0.0020	<0.011	<0.0043	<0.0020			<0.0096		
Aroclor-1248	<0.0021	<0.014	<0.025	<0.024	<0.037	<0.070	<0.030	<0.0020	<0.0081	<0.0082	<0.0020			<0.0047		
Aroclor-1254	<0.002	<0.0029	<0.0056	<0.0037	<0.0076	<0.0060	<0.0043	0.015	<0.0025	<0.0023	<0.0050			<0.0020		
Aroclor-1260	<0.0020	<0.0027	<0.0037	<0.0030	<0.0065	<0.0058	<0.0031	<0.0020	<0.0020	<0.0034	<0.0020			<0.020		
Pesticides With UES Criteria, ng/L																
Aldrin	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1,300		<0.93		
Gamma-BHC (Lindane)	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	160		<0.50	0.0002	
Chlordane[2]	<0.50	<0.50	<0.50	<0.50	0.33 J	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	90[2]	4 [2]	<1.3	0.002	
4-4'-DDT	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.71	<0.50	<0.50	<0.50	130	1	<0.71		
Dieldrin	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	710	1.9	<2.1		
alpha-Endosulfan	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	34	8.7	<0.70		
beta-Endosulfan	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	34	8.7	<0.50		
Endrin	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	37	2.3	<0.50	0.0002	
Heptachlor	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	53	3.6	<0.40	0.0004	
Heptachlor Epoxide	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	53	3.6	<3.2	0.0002	
Toxaphene	<62	<87	<56	<57	<61	<62	<56	<32	<35	<32	<63	210	0.2	<55	0.003	
Detected Pesticides Without UES Criteria, ng/L																
Delta-BHC	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40			<2.0		

Notes: CMC = UES Acute Criteria; CCC = UES Chronic Criteria; J = estimated value; red and orange shading indicates exceedance of UES criteria in surface water

Surface water quality criteria from USAKA Environmental Standards, 12th Ed. (2011), Table 3-2C.2. Ground water quality criteria from USAKA Environmental Standards, 12th Ed. (2011), Table 3-2D.1 and 3-2D.2. However, the landfill area is Class III groundwater according to the USAKA Env. Standards Section 3-2.4.2(c,d), and these standards do not strictly apply to Class III groundwater. The USAKA Env. Standards Section 3-2.6.2 state that the groundwater quality standard for Class III water is, "USAKA operations shall not degrade the quality of Class III groundwater in such a way that results in increases of contaminate concentrations that will adversely affect public health, the marine environment, the quality of adjacent Class I or II groundwater, or protected beneficial uses of surface waters."

[1] Aroclors 1016, 1221, 2132, 1242, 1248, 1254, 1260.

[2] Chlordane is a mixture of > 140 related compounds, major constituents summed in this table are : a-chlordane, y-chlordane, oxychlordane, *cis* and *trans*-nonachlor (Source: Adapted from USAPHC, 2011b)

Appendix D
Preliminary Review of the Removal Actions for the Mound between Glass Beach and the Shark Pit

Removal Action Activities Associated with the Kwajalein Landfill

Preliminary Review—Removal of Metal Debris between

Glass Beach and the Shark Pit

U.S. Army Garrison–Kwajalein Atoll

1.0 INTRODUCTION

The United States (U.S.) Army Space and Missile Defense Command/Army Forces Strategic Command (USASMDC/ARSTRAT) is executing the Compliance Cleanup Program at U.S. Army Kwajalein Atoll (USAKA) for U.S. Army Garrison–Kwajalein Atoll (USAG-KA). As part of the Cleanup Program, the USAKA Environmental Standards (UES) Appropriate Agencies reviewed the Draft Removal Action Memorandum (RAM) analyzing cleanup alternatives for the Kwajalein Landfill in early 2016. Since the release of that document, another adjacent area has come to light as a potential issue. The area in question is a roughly 3-acre vegetated mound at the west end of the runway between Glass Beach and the Shark Pit. In March 2016, there was a near miss between an approaching aircraft and a vehicle attempting to traverse the road near the end of the runway. The near miss was attributed to the vehicle occupants' view of the approaching aircraft being obscured by the vegetated mound. The mound was already under investigation to determine if it covered the old dump area used from the 1940's to the 1960's prior to the creation in the 1960's of the portion of the island on which the landfill now sits. The metal debris piles on the shoreline between Glass Beach and the Shark Pit are also believed to be remains of this dump area. The U.S. Army is preparing a Draft Environmental Assessment (EA) for the removal action activities associated with the Kwajalein Landfill. Based on the results of environmental analysis for this EA, the U.S. Army has drafted this preliminary review in accordance with UES Section 3-4.6.3 (a), as a synopsis to discuss the alteration of the mound area between Glass Beach and the Shark Pit (Figure 1).

2.0 BACKGROUND

Kwajalein is the largest island in the Kwajalein Atoll located in the western chain of the Republic of the Marshall Islands (RMI) in the West Central Pacific Ocean. Approximately 1,200 to 1,500 people live on the island. Kwajalein Island is approximately 748 acres in size; the U.S. Government created 205 of those acres after World War II by filling in the reef flat (U.S. Army Space and Missile Defense Command, 2016).

Explanation

- Project Area
- Existing Structure

NORTH

0 50 100 200 Feet

Project Area

Kwajalein Island

Figure 1

Kwajalein shoreline on the south and east area of the island in front of the mound has extensive metallic debris and other objects (concrete and rock) that have been placed along these areas to stabilize the shore from erosion. The shoreline debris has been deposited in these areas since sometime after World War II and before 1988. The metallic debris consists of rebar, ship and vehicle parts, pipe, scrap metal, wire, and other debris. The current shoreline configuration is not stable in either area and may continue to erode, which would potentially destabilize the existing, regraded landfill, or proposed new landfill and Mt. Olympus.

3.0 PROJECT AREA

Based on the 2016 RAM for the Kwajalein Landfill, the area between Glass Beach and the Shark Pit is a mound of heavily vegetated debris along and up-gradient from the shoreline between Glass Beach and the Shark Pit (the project area). The project area is covered with managed vegetation. An April 2016 geophysical survey determined that the mound is approximately 5% metallic debris. The other materials could not be determined with the geophysics performed, although it also has a significant amount of concrete debris on the surface. It is estimated that the debris mound covers approximately 3 acres and includes approximately 30,000 cubic yards of material. The mound is vegetated with kiden (*Tournefortia argentea)*, konnat (scaevola) (*Scaevola taccada*), ni (coconut trees) *(Cocos nucifera),* topo (beach morning glory) (*Ipomoea imperati and/or Ipomoea pes-caprae*), ekkon (tropical almond) (*Terminalia catappa*), lukwej (kamani) (*Calophyllum inophyllum*), kaonon (*Cassytha filiformis*), and kio (possibly *Sida fallax*); a bob (*Pandanus tectorius*) is near the mound, but not on top of it. Figures 2 and 3 are photos of some of the vegetation identified on the mound.

Suspected kio *(Sida fallax)*

Tropical almond *(Terminalia catappa)*

Leaves of tropical almond *(Terminalia catappa)*

Explanation

Mound Vegetation

Kwajalein Island

Figure 2

Kaonon *(Cassytha filiformis)*

Kiden *(Tournefortia argentea)*

Leaves of lukwej (kamani) *(Calophyllum inophyllum)*

Explanation

Mound Vegetation

Kwajalein Island

Figure 3

4.0 ACTIVITY DESCRIPTION

This mound area needs to be removed to improve the line-of-sight visibility for aircraft on the west end of the runway (U.S. Army Space and Missile Defense Command, 2016). The area would be cleared of vegetation, metal debris, and other items (e.g., concrete).

Removal

To remove the mound and the visual obstruction, the area would be cleared and grubbed of vegetation, metal debris, and other items (e.g., possibly including concrete). The metal debris and other items would be excavated, sorted, and tested. Recyclable metal would be sent off-island for recycling. Soil would be stockpiled and tested. Clean soil would be determined through visual observations and analytical testing. After appropriate testing, any asbestos or other hazardous material (e.g., copper, polychlorinated biphenyls [PCBs], lead-based paint [LBP], pesticides) would be handled appropriately. Clean soil would be stockpiled, and if contaminated soil is identified, it would be shipped to CONUS for disposal. All remaining refuse would be placed in the existing landfill.

Revegetation

The area would be revegetated with an appropriate grass, shrubs, and/or trees. To prevent the planting of vegetation that may affect the line-of-sight visibility for aircraft in the future, USAG-KA would confer with the U.S. Fish and Wildlife Service (USFWS) to determine appropriate vegetation.

5.0 ENVIRONMENTAL SETTING

TERRESTRIAL SPECIES AND HABITAT USE

Vegetation

Kwajalein Island has undergone extensive development since the 1930s, and as a result, very little native vegetation is present. No threatened or endangered vegetation species have been identified on or offshore of Kwajalein. The open areas of vegetation identified in the 2010 surveys are considered managed and contain nonnative grasses and weeds that are maintained by mowing. Small areas of herbaceous strand still exist along the coast in some places, and patches of littoral shrub land dominated by the genera *Tournefortia* and *Scaevola* are present in some areas (U.S. Fish and Wildlife Service and National Marine Fisheries Service, 2012). No littoral shrub or herbaceous strand vegetation has been recorded in the project area. The mound is vegetated with kiden (*Tournefortia argentea)*, konnat (scaevola) (*Scaevola taccada*), ni (coconut trees) *(Cocos nucifera),* topo (beach morning glory) (*Ipomoea imperati and/or Ipomoea pes-caprae*), ekkon (tropical almond) (*Terminalia catappa*), lukwej (kamani) (*Calophyllum inophyllum*), kaonon (*Cassytha filiformis*), and kio (possibly *Sida fallax*); a bob (*Pandanus tectorius*) is near the mound, but not on top of it. See Section 8.1 of mitigation measures for the revegetation process for the project area.

Avian Wildlife

Kwajalein Island attracts a variety of migratory birds due to its relatively large size, fresh water habitats, and expansive areas of managed vegetation (U.S. Fish and Wildlife Service and National Marine Fisheries Service, 2012). Surveys for shorebirds and seabirds have been conducted bi-annually by the USFWS for almost 20 years, and during these surveys, over 30 different avian species have been recorded on Kwajalein Island. Table 1 is a list of all bird species recorded on USAKA and on Kwajalein Island.

The most commonly observed bird species include black noddies (*Anous tenuirostris minutus*), white terns (*Gygis alba*), Pacific golden plovers (*Pluvialis fulva*), ruddy turnstones (*Arenari interpres*), whimbrels (*Numenius phaeopus*), and wandering tattlers (*Heteroscelus incanus*). The introduced Eurasian tree sparrow (*Passer montanus*) was also a common avian species recorded on Kwajalein Island during the 2010 surveys. The common birds are either seabirds, which nest on the ground or in trees, or are migratory shorebirds, which nest in the Arctic in warmer months and migrate to winter and forage at USAKA and other Central Pacific islands. During the 2010 survey on Kwajalein Island, the largest numbers of migratory birds were observed in the water catchments, drainage ditches, and puddles near the runways and in adjacent managed vegetation (U.S. Fish and Wildlife Service and National Marine Fisheries Service, 2012).

The 2010 surveys noted that ruddy turnstones, Pacific golden plovers, and whimbrels foraged and rested on grass during periods of high tide and foraged the shoreline and exposed reef flat during low tide. Shorebirds were noted to frequently forage more on the southern and eastern shores where there is no riprap, and seabirds were present feeding offshore in this same area (U.S. Fish and Wildlife Service and National Marine Fisheries Service, 2012).

Nesting seabirds observed during the 2010 surveys included black-naped terns (*Sterna sumatrana*) and white terns (*Gygis alba*). Black-naped tern chicks were observed on harbor buoys, and white terns were observed nesting in numerous locations around the island. White tern chicks were observed in large trees, near the town center and building areas, but not along the golf course (U.S. Fish and Wildlife Service and National Marine Fisheries Service, 2012). No nesting seabirds were recorded near the landfill area.

The only UES consultation avian species, the Ratak Micronesia pigeon (*Ducula oceania ratakensis*), has not been observed on Kwajalein and does not have the potential to occur in the project area. Several UES coordination avian species have the potential to occur in the project area as shown in Table 1. No U.S. federally listed terrestrial wildlife species have been identified on Kwajalein Island. No observations of seabirds nesting in the project area have been recorded. See Section 8.2 of mitigation measures for the avian wildlife within the project area.

Non-Terrestrial Wildlife

<u>Non-Avian Terrestrial Wildlife</u>: Other non-avian terrestrial wildlife species include a limited number of native invertebrates, such as blue-spot butterfly (*Hypolimnas bolina*) and vertebrates, such as blue-tailed skink (*Emoia caeurelocauda*), as well as non-native, introduced domestic dogs (*Canis lupus familiaris*), cats (*Felis catus*), and black rats (*Rattus rattus*) (U.S. Fish and Wildlife Service and National Marine Fisheries Service, 2012). No focused surveys of native terrestrial wildlife have been conducted on Kwajalein Island.

<u>Marine Wildlife</u>: Sea turtles are known to nest and haul out on Kwajalein Island; however, there is no known sea turtle nesting or haul out area within the project area; therefore, there would be no effect to sea turtles. See Section 8.3 of mitigation measures for the avian wildlife within the project area. See Section 8.3 of mitigation measures for the avoidance of potential sea turtles within the project area.

Table 1. List of bird species observed throughout USAKA during 1996-2010 biological inventories.

Common Name	Scientific Name	UES Coordination Species	Observed on Kwajalein Island During 1996-2010 Surveys
short-tailed shearwater	*Puffinus tenuirostris*		
sooty shearwater	*Puffinus griseus*	X	
wedge-tailed shearwater	*Puffinus pacificus*	X	
brown booby	*Sula leucogaster*	X	X
red-footed booby	*Sula*	X	
great frigatebird	*Fregata minor*	X	X
Pacific reef heron	*Egretta sacra*	X	X
mallard	*Anas platyrhynchos*	X	X
northern pintail	*Anas acuta*	X	X
American wigeon	*Anas americana*		X
black-bellied plover	*Pluvialis squatarola*	X	
Pacific golden plover	*Pluvialis fulva*		X
common ringed plover	*Charadrius hiaticula*	X	
semipalmated plover	*Charadrius semipalmatus*	X	X
lesser (Mongolian) sand-plover	*Charadrius mongolus*	X	
marsh sandpiper	*Tringa stagnatilis*	X	
common greenshank	*Tringa nebularia*	X	X
wood sandpiper	*Tringa glareola*	X	X
wandering tattler	*Heteroscelus incanus*	X	X
gray-tailed tattler	*Heteroscelus brevipes*	X	X
whimbrel	*Numenius phaeopus*	X	X
bristle-thighed curlew	*Numenius tahititensis*	X	X
Hudsonian godwit	*Limosa haemastica*	X	X
bar-tailed godwit	*Limosa lapponica*	X	X
ruddy turnstone	*Arenaria interpres*	X	X
red knot	*Calidris canutus*	X	X
sanderling	*Calidris alba*	X	X
red-necked stint	*Calidris ruficolla*	X	X
pectoral sandpiper	*Calidris melanotos*	X	X
sharp-tailed sandpiper	*Calidris acuminata*	X	X
curlew sandpiper	*Calidris ferruginea*	X	
ruff	*Philomachus pugnax*	X	
long-billed dowitcher	*Limnodromus scolopaceus*	X	X
Japanese snipe	*Gallinago hardwickii*		
common snipe	*Gallinago*	X	X
black-naped tern	*Sterna sumatrana*	X	X

Common Name	Scientific Name	UES Coordination Species	Observed on Kwajalein Island During 1996-2010 Surveys
great crested tern	*Sterna bergii*	X	X
white-winged tern	*Chlidonias leucopterus*	X	X
brown noddy	*Anous stolidus*	X	X
black noddy	*Anous tenuirostris minutus*	X	X
white tern	*Gygis alba*	X	X
long-tailed cuckoo	*Eudynamis taitensis*	X	
Eurasian tree sparrow	*Passer montanus*		X
chicken	*Gallus gallus domesticus*		

Source: U.S. Fish and Wildlife Service and National Marine Fisheries Service, 2006;2010; 2012

6.0 DIRECT AND INDIRECT IMPACTS

Potential impacts from the planned activity to terrestrial biological resources were analyzed against a list of possible stressors that are applicable to the planned activity. The stressors analyzed include (1) *direct impacts,* such as removal or displacement, (2) *exposure to noise* from machinery or other sources, (3) *wastes and discharges*, and (4) *habitat loss or degradation*, including shelter or forage resources.

6.1 Direct Impacts

Localized direct impacts from vegetation removal would occur. This vegetation removal within the project area comprises approximately 3 acres. The project area currently consists of heavy shrubs (mainly *Scaevola* and *Tournefortia argentea*), a small number of coconut trees, and other low-growing ground covering (i.e., morning glory). No observation of nesting or foraging habitat for avian species has been recorded for the project area. No observation of loafing for avian species has been recorded for this project area.

Temporary direct impacts to potential nesting habitat, potential foraging, and potential loafing could occur from removal of vegetation. The 2010 survey by USFWS and the National Marine Fisheries Service observed the black-naped tern nesting on Kwajalein Island using the concrete platforms at the fuel pier on the lagoon side. White terns were observed nesting in large trees near the town center and building areas (National Marine Fisheries Service and U.S. Fish and Wildlife Service, 2012). No observations of seabird nesting or loafing in the project area have been recorded (National Marine Fisheries Service and U.S. Fish and Wildlife Service, 2012).

Therefore, there would be no adverse effect from direct impacts associated with the potential nesting habitat, foraging, and loafing of avian species from the removal of vegetation from the project area.

6.2 Exposure to Noise

Increased noise levels from earth-moving equipment used during vegetation and debris removal would not negatively affect wildlife resources. Current noise levels are consistent with an industrial area, and increases from machinery and workers would be short-term and temporary. Wildlife species that may use this area for shelter, foraging, and loafing may be temporarily displaced by increased noise within 50 feet, but the project area includes only a small portion of the available foraging and loafing habitat on the island. Once removal activities are complete, noise levels would return to existing levels, and terrestrial wildlife species would be expected to return to the area. Therefore, there would be no adverse effect from noise associated with the potential avian (nesting habitat, foraging, and loafing) and other terrestrial species from the removal action in the project area. Additionally, the removal would not change the current noise exposure to avian and other terrestrial species from aircraft landing and take-off.

6.3 Wastes and Discharges

Construction (removal of vegetation and metal, concrete, and coral debris) wastes may include small plastic trash and bags that may be ingested and cause digestive blockage or suffocation in birds. Equipment spills, discharges, and run-off from the project area could contain hydrocarbon-based chemicals such as fuel oils, gasoline, lubricants, hydraulic fluids, and other toxicants, and could contaminate the soil or impact vegetation. The mitigation measures described in Section 8.4 are intended to prevent the introduction of wastes and toxicants into the terrestrial environment; therefore, construction-related discharges and spills would be infrequent, small, and quickly cleaned if they do occur. Therefore, these measures should prevent any avian or other terrestrial species from being adversely affected by exposure to waste and discharges.

6.4 Habitat Loss or Degradation

Removal of vegetation may eliminate some potential nesting, foraging, and loafing habitat; however, no migratory birds or other wildlife resources have been recorded using the project area. Although seabirds and shorebirds have been observed foraging and feeding along the shoreline and exposed reef flat at low tide on the southern shores, the presence of workers and equipment is likely to discourage them from using the immediate project area. Impacts would be expected to be temporary behavioral changes, and the project area includes only a small portion of the available foraging habitat on the island. Therefore, there would be no adverse effects from habitat loss or degradation to terrestrial species from the removal action.

7.0 CONCLUSIONS OF EVALUATION

Overall there would be no adverse effects to any avian or other terrestrial species from the removal of the mound as it relates to (1) *direct impacts,* such as removal or displacement, (2) *exposure to noise* from machinery or other sources, (3) *wastes and discharges*, and (4) *habitat loss or degradation*, including shelter or forage resources.

The area would be revegetated with appropriate plants that would not obscure the line-of-sight visibility for aircraft in the future. Once removal activities are complete, noise levels would return to existing levels, and any terrestrial wildlife species would be expected to return to the area. mitigation measures described in Section 8.4 are intended to prevent the introduction of wastes and toxicants into the terrestrial environment; therefore, construction-related discharges and spills would be infrequent, small, and quickly cleaned if they do occur.

The cumulative impacts would be beneficial because (1) the removal of the mound would provide better access along the beach to further reduce the amount of metal debris on the island; (2) it would provide access to any additional metallic debris buried by the mound; and (3) it would improve the line-of-sight visibility for aircraft on the west end of the airplane runway.

Therefore, based on the evaluation of the potential stressors, it has been concluded that no long-term adverse effect to vegetation and terrestrial wildlife is anticipated from the removal of the mound.

8.0 MITIGATION MEASURES

8.1 Revegetation

1. USAG-KA will confer with USFWS to determine the appropriate plants (grasses, shrubs, and/or trees, etc.) to best revegetate the project area.

2. Selected vegetation would enhance wildlife habitat but not affect line-of-sight visibility for aircraft.

8.2 Avian Species

1. Prior to removal activities each day, the project area would be surveyed (walk the area) to ensure there are no tree or ground nesting birds in the area.

2. If any avian species are observed nesting in the project area, nests should be demarcated, and the USAG-KA Environmental Manager should be contacted.

8.3 Sea Turtles Avoidance

1. Although the project area is not a known location for sea turtle haul-out or nesting, prior to removal activities each day, beach area would be surveyed (walk the area) for sea turtles and sea turtles tracks to observe newly laid nests.

8.4 Hazardous Material and Wastes

1. Perform work in compliance with the Kwajalein Environmental Emergency Plan.
2. Storage or disposal of waste (hazardous and non-hazardous) removed during removal activities would be performed in accordance with the requirements in Chapter 3-6 (Material and Waste Management) of the UES.
3. Due to the fragile ecosystem on Kwajalein Island, a hazardous materials release or spill must be reported and cleaned up in a timely manner. The following procedures for hazardous materials shall be used:
    a. In case of a spill, call 911 to notify the Fire Department, and report the spill in accordance with the revised SPI 1530.
    b. Report any spill leaving a visible sheen on the water.
    c. Report any ground spill totaling 1 gallon (3.8 liters) or larger.
    d. All spills regardless of size must be cleaned up immediately.
    e. Call 911 in case of an emergency.

   f. Hazardous materials include but are not limited to oil, gasoline, diesel, paint, solvents, aviation fuels, pesticide, bleach, and hydraulic fluid.

4. An employee discovering a spill shall:
   a. Immediately isolate and contain any spillage if it can be accomplished safely. If possible, the employee would have a spill response kit on site for potential fuel and other POL spills.
   b. Notify immediate supervisor.
   c. Immediately call 911 for large spills. Answer all questions asked by the dispatcher.
   d. Meet the responding crew at the spill site.

9.0 REFERENCES

U.S. Army Space and Missile Defense Command, 2016. Draft Kwajalein Landfill Source Metals Removal Action Memorandum, U.S. Army Garrison Kwajalein Atoll, Republic of the Marshall Islands. Site ID CCKWAJ-002. February.

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Appendix E
Air Emissions Calculation

Appendix E Air Emissions Calculation

Air Emission Factor Calculations:

		Emission Factors, EF (lb/hr.)					
Equipment	MaxHP	CO	NO_X	SO_x	PM	CO_2 (carbon dioxide)	CH_4 (methane)
Air Compressor	750	0.7595	2.2932	0.0036	0.0743	358	0.206
Backhoe/Loader	750	0.7089	1.6070	0.0039	0.0559	345	0.0188
Cranes	750	0.7835	2.049	0.0030	0.0729	303	0.0213
Excavators	750	0.8225	1.9923	0.0039	0.0698	387	0.0237
Generator Sets	750	1.0718	3.2483	0.0055	0.0934	544	0.0234
Industrial Saws	175	0.8674	1.1593	0.0018	0.0585	160	0.0121
Scrubber	250	0.3286	0.9094	0.0018	0.0289	162	0.0093
Surface Equipment	750	0.5759	1.3809	0.0022	0.468	221	0.0121

South Coast Air Quality Management District (SCAQMD) Annual Emission Reporting, 2015

		Emission Factors, EF (ton/yr.) for Construction Equipment (24 hours/day/365 days)											
Equipment	MaxHP	CO	USAG-KA Threshold	2012 EF @ Incinerator	NO_X	USAG-KA Threshold	2012 EF @ Incinerator	SO_X	USAG-KA Threshold	2012 EF @ Incinerator	PM	USAG-KA Threshold*	2012 EF @ Incinerator
Air Compressor	750	3.33	100	N/A	10.04	40	21.72	0.016	40	35.06	0.33	25	7.84
Backhoe/Loader	750	3.06	100	N/A	7.27	40	21.72	0.02	40	35.06	0.245	25	7.84
Cranes	750	3.43	100	N/A	18.39	40	21.72	0.013	40	35.06	0.32	25	7.84
Excavators	750	3.60	100	N/A	8.73	40	21.72	0.018	40	35.06	0.306	25	7.84
Generator Sets	750	4.89	100	N/A	14.23	40	21.72	0.022	40	35.06	0.410	25	7.84
Industrial Saws	175	3.80	100	N/A	5.08	40	21.72	0.008	40	35.06	0.256	25	7.84
Scrubber	250	1.44	100	N/A	3.98	40	21.72	0.008	40	35.06	0.127	25	7.84
Surface Equipment	750	2.52	100	N/A	6.05	40	21.72	0.010	40	35.06	2.05	25	7.84

Sources: South Coast Air Quality Management District (SCAQMD) Annual Emission Reporting, 2015

Note: Calculations are based on EFs of 24 hrs./day and 365 days/yr.; 1 pound =0.0005 tons; EF were converted from lb/year to ton/year

*25 tpy is based on 15 tpy for PM_{10} and 10 tpy for $PM_{2.5}$

		Emission Factors, EF (ton/yr) for Construction Equipment (8 hours/day/365 days)											
Equipment	MaxHP	CO	USAG-KA Threshold	2012 EF @ Incinerator	NO_X	USAG-KA Threshold	2012 EF @ Incinerator	SO_X	USAG-KA Threshold	2012 EF @ Incinerator	PM	USAG-KA Threshold*	2012 EF @ Incinerator
Air Compressor	750	1.11	100	N/A	3.34	40	7.24	.0053	40	11.77	0.108	25	2.61
Backhoe/Loader	750	1.03	100	N/A	2.33	40	7.24	.0057	40	11.77	0.081	25	2.61
Cranes	750	1.14	100	N/A	2.99	40	7.24	.0044	40	11.77	0.106	25	2.61
Excavators	750	1.2	100	N/A	2.91	40	7.24	.0057	40	11.77	0.102	25	2.61
Generator Sets	750	1.56	100	N/A	4.74	40	7.24	.0080	40	11.77	0.136	25	2.61
Industrial Saws	175	1.27	100	N/A	1.69	40	7.24	.0026	40	11.77	0.085	25	2.61
Scrubber	250	0.48	100	N/A	1.33	40	7.24	.0026	40	11.77	0.042	25	2.61
Surface Equipment	750	0.84	100	N/A	2.02	40	7.24	.0032	40	11.77	0.683	25	2.61

Sources: South Coast Air Quality Management District (SCAQMD) Annual Emission Reporting, 2015

Note: Calculations are based on EFs of 8 hrs./day and 365 days/yr.; 1 pound =0.0005 tons; EF were converted from lb/year to ton/year
*25 tpy is based on 15 tpy for PM_{10} and 10 tpy for $PM_{2.5}$

Carbon Monoxide-24 hrs

lb/hr.	lb/24 hrs	lb/365 days	x 0.0005 tons
0.7595	18.228	6653.22	3.33
0.7089	17.723	6124.896	3.06
0.7835	18.804	6863.46	3.43
0.8225	19.74	7205.1	3.60
1.0718	25.724	9780.175	4.89
0.8674	20.818	7600.176	3.80
0.3286	7.887	2878.536	1.44
0.5759	13.822	5044.884	2.52

Carbon Monoxide-8 hrs

lb/hr	lb/8 hrs.	lb/ 365 days	x 0.0005 tons
0.7595	6.076	2217.74	1.11
0.7089	5.672	2070.28	1.04
0.7835	6.268	2287.82	1.14
0.8225	6.58	2401.7	1.2
1.0718	8.575	3129.875	1.56
0.8674	6.940	2533.100	1.27
0.3286	2.629	959.585	0.48
0.5759	4.608	1681.92	0.84

Nitrogen Oxide-24 hrs

lb/hr	lb/ 24 hrs.	lb/365 days	x 0.0005 tons
2.2932	55.037	20088.505	10.04
1.6070	39.85	14547.732	7.27
2.049	100.762	36778.130	18.39
1.9923	47.816	17452.84	8.73
3.2483	77.960	28455.400	14.23
1.1593	27.824	10155.76	5.08
0.9094	21.8256	7966.344	3.98
1.3809	33.142	12096.83	6.05

Nitrogen Oxide-8 hrs

lb/hr.	lb/8 hrs.	lb/365 days	x 0.0005 tons
2.2932	18.346	6696.29	3.34
1.6070	12.856	4692.44	2.33
2.049	16.392	5983.08	2.99
1.9923	15.939	5817.735	2.91
3.2483	25.987	9485.255	4.74
1.1593	9.275	3385.375	1.69
0.9094	7.276	2655.74	1.33
1.3809	11.048	4032.520	2.02

Sulfur Oxide-24 hrs

lb/hr	lb/24 hrs	lb/365 days	x 0.0005 tons
0.0036	0.087	31.755	0.016
0.0039	0.0936	34.164	0.02
0.0030	0.072	26.28	0.013
0.0039	0.094	34.164	0.018
0.0055	0.032	43.800	0.022
0.0018	0.044	15.768	0.008
0.0018	0.044	15.768	0.008
0.0022	0.053	19.272	0.010

Sulfur Oxide-8 hrs

lb/hr	lb/8 hrs.	lb/365 days	x 0.0005 tons
0.0036	0.029	10.585	.006
0.0039	0.032	11.68	.006
0.0030	0.024	8.760	.005
0.0039	0.032	11.68	.006
0.0055	0.044	16.06	.008
0.0018	0.015	5.475	.003
0.0018	0.015	5.475	.003
0.0022	0.018	6.57	.004

PM- 24 hrs

lb/hr	lb/ 24 hrs	lb/365 days	x 0.0005 tons
0.0743	1.784	651.16	0.326
0.0559	1.342	489.68	0.245
0.0729	1.750	638.60	0.32
0.0698	1.676	611.448	0.306
0.0934	2.242	818.184	0.410
0.0585	1.404	512.460	0.256
0.0289	0.694	253.164	0.127
0.468	11.232	4099.68	2.05

PM-8 hrs

lb/hr	lb/8 hrs	lb/365 days	x 0.0005 tons
0.0743	0.595	217.175	0.109
0.0559	0.448	163.52	0.082
0.0729	0.584	213.16	0.107
0.0698	0.559	204.035	0.102
0.0934	0.748	273.02	0.137
0.0585	0.468	170.82	0.086
0.0289	0.232	84.68	0.043
0.468	0.0375	136.875	0.690

Appendix F
Response to Comments

Appendix F Response to Comments

COMMENT INCORPORATOR Dr. Karen Barnes	DATE 20 December 2016
COMMENTOR: Helene Takemoto, Joel Moribe, Steve Kolinski, Norwood Scott, Michael Fry, Jatios Kewa, Moriana Phillip	ORGANIZATION OF COMMENTOR: USACE, NMFS, USEPA, USFWS, RMIEPA/Ebeye, RMIEPA/Majuro
TITLE OF DOCUMENT Draft EA and Draft FONSI for Removal Action Activities Associated with the Kwajalein Landfill—USAG-KA	DATE OF DOCUMENT 9 September 2016

COLUMNS ***CONTRACTOR RESPONSE***

ITEM NO.	PAGE NO.	PARA-GRAPH	LINE NO.	FIGURE NO.	TABLE NO.	RECOMMENDED CHANGES *(Exact wording of suggested change)*	INCORP.? *(Yes/No)*	HOW COMMENT WAS INCORPORATED *(If not incorporated, why?)*
EA and FONSI								
1.	General					No comment from our end, Ebeye. – **RMIEPA, Kewa Jatios**	N/A	Thank you for your review.
2.	General					I reviewed the draft EEA and FNOSI and do not have any comments. I agree with the preferred alternative A. (25 Oct 2016) Yes, I reviewed both documents and agree with the RA Memo as well. (26 Oct 2016) – **USACE, Helene Takemoto**	N/A	Thank you for your review.
3.	General					The Draft Environmental Assessment appears to minimize the benefits of Alternative B on environmental quality, and the US Fish and Wildlife Service,	Partially	The use of the terms Alternative A, B, etc. in this EA is confusing in the NEPA sense. Rather than being alternatives from which Army will select only one, they are in fact a series of components,

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						Pacific Islands Fish and Wildlife Office (Service) believes that monitoring the continued contaminants leaching from the landfill for an additional five years prior to developing an additional course of action as proposed by Alternative A alone is not appropriate in this situation. The Service agrees with the proposal in Alternative A to remove shoreline metal debris and re-armor the shoreline. The shoreline cleanup, however, will not address the continuing landfill groundwater seepage of pesticides and PCBs at levels above UES standards documented more than 4 years ago. The Service recommends Alternative B, which includes: Closing and capping the existing landfill, constructing a new landfill for future refuse, and stabilizing the shoreline adjacent to the landfill. This will stop the rainfall infiltration and migration of contaminants to groundwater, and reduce or eliminate contaminant seepage to the ocean. The engineering analysis and plans for Alternative B appear adequate, and implementing Alternative B will bring USAKA into compliance with UES Section 3-6.5.8(h)(4). Verification under UES Section 3-6.5.8(i) will be required after the removal action is complete. The Service recommends that Table ES-3, section titled "Close existing		measures or initiatives that could be taken over time to remedy the contaminants issues from the current landfill. The EA does not select an alternative, but instead analyzes all of the potential actions that are included in the proposed action of removing contamination from the existing landfills. The EA's proposed action encompasses all of the long-term actions the Army is considering to take at the landfill to minimize the discharge of contaminants to the environment. The EA describes Alternative B in Section 2.1.2 and uses Section 4 to examine environmental consequences of the proposed action. The EA analyzes actions the Army intends to take in the long-term and does not select an individual alternative at this point. Many actions still require higher Army HQ decisions on how to proceed (for example, whether to open a new landfill will decide whether Alternative B or Alternative D would be utilized). In the short term, the Army has prepared a Removal Action Memorandum, which by definition under Section 3-6.5.8(g) of the USAKA Environmental Standards, is an analysis of a proposed **interim** action. If the Army was selecting a **final remedy**, the Army would be preparing a Document of Environmental Protection (DEP) under Section 3-6.5.8(o). The Army is pursuing an interim action to mitigate the release of contaminants from the former 1940s-1960s US Navy dump (shoreline metal debris from Glass Beach to Mount Olympus are the remains of this former dump). The Army sees two landfills that need to be addressed (the former US Navy dump

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						landfill grading and cap" be expanded to include the significant benefits of reduced contaminant leaching from the existing landfill. The Service also recommends that Section 4.2.2 be revised to include the expected benefits of reduced contaminant leaching from the capped landfill. – **USFWS, Michael Fry**		and the current operating US Army landfill). The Army is taking this interim action (metals and debris pile removal) to address the US Navy dump while it secures funding and authorization to proceed with the larger final remedy to address the closure of the current operating landfill. The removal of the former US Navy dump will eliminate a source of copper, lead, and PCBs from the environment. The former US Navy dump is upgradient of Mount Olympus. Mount Olympus is upgradient of the current operating landfill. During the Baseline Risk Assessment (BRA) for the operating landfill, PCBs and metals were detected in levels that exceeded UES screening criteria at Mount Olympus in groundwater seeps and surface water. Only three locations exceeded criteria throughout the Kwajalein Landfill Area and two of these were at Mount Olympus. Mount Olympus was sampled as an expected upgradient or background location for the operating landfill. The discovery of contaminants exceeding criteria at this location indicated a major source of contaminants upgradient of the operating landfill. The Army believes the former US Navy dump is the source of these contaminants. The RAM and EA utilized a 5-year monitoring scheme at this point for cost estimating purposes. All present and future actions (even a final remedy) would include monitoring to confirm the action was effective. It is not Army's intention to enact a measure (or alternative) and then monitor the effectiveness of that single measure for 5 years before taking other actions known

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								to be needed. The Army plans to enact the metal removal measure while planning to proceed with follow-on actions as soon as funding can be secured and a DEP can be put in place. Whether the Army selects Alternative B or D described in the Draft EA depends on whether the Army higher Headquarters (HQ) approves the construction of a new landfill. The Army appreciates the USFWS comments on the preference for Alternative B and will add additional text to Table ES-3 and Section 4.2.2 in the EA as requested. We are also minimizing and clarifying the use of the term Alternative A, Alternative B, etc. (making it clearer that Alternatives refer to Removal Action Memorandum Alternatives) to Component A, Component B to clarify that the EA is looking at a series of measures to be taken, not choosing just one.
4.	General					I have looked at the BE, the EA, and the Removal Action Memorandum, and have seen discussion about the shore stabilization, some drawings, even calculations to determine heights based on predicted sea level rise. I cannot find any information on where exactly the bank stabilization will be placed in relation to what is there now. There is one drawing (Figure 6-4 of the Removal Action Memorandum) that says the revetment would be constructed on existing footprint. That is the only indication of where it would be placed in relation to the current situation (i.e., the metal). The drawings of the rock revetment that were included show me the cross section, the slope and where it would be placed	Yes	The shoreline revetment would be placed along the shoreline where the existing concrete rubble bank protection is located. For the shoreline from the landfill to Glass Beach, the existing concrete rubble would be behind (landward) from some of the metal debris that juts out into the reef. The process to build the revetment would involve removing the existing concrete and metals debris and then placing bedding stone and revetment stone down within the original shoreline footprint. There would be a key trench cut into the bottom of the shoreline within original shoreline footprint that the big bottom anchor stone would site in.

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						but not in relation to the metal being removed. I consider the "existing footprint" to mean the same exact location, meaning the revetment wall will not be placed any closer to the water than the current metal bank. Can you confirm for me if that is the case? Moving a hardened structure closer to the water could redirect wave energy, which could increase erosion somewhere else, or intensify the erosive forces that are already there due to the hardened shoreline. With an increasing footprint of bank, or a banks closer to the wave energy, it could have detrimental effects to the reef flat around it and any UES species that would use that area. – **NMFS, Joel Moribe**		All revetment would go within the original shoreline footprint.
5.	General					USEPA disagrees with the Army's selection of Alternative A. Alternative A does not satisfactorily address the contamination that has been detected in ground water monitoring wells or ground water seeps. Although removing metals from the metals storage area and the shoreline is an important step in reducing contamination, the main source of pesticide and PCB contamination is the leachate produced from precipitation infiltration and contaminant leaching through the refuse and ash contained in the landfill and then migrating offsite to the reef flat. Closing and capping the landfill will greatly reduce leachate production and	No	See response to comment 3. The Army appreciates the USEPA comments on the preference for Alternative B. The Army also concurs with USEPA comment that monitoring the continued contaminant leaching for an additional five years prior to developing an additional RAM is not appropriate (and wasn't intended). The Army will clarify language in both documents to clarify long-term monitoring objectives. As noted in comment 3, Army is seeking funding and is moving to initiate other measures as soon as that funding is available.

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						the high levels of PCBs and pesticides that currently exceed water quality standards and pose an unacceptable risk to human health and the environment. *A risk assessment was completed in 2012 which indicated the ground water seeping out into the reef flat below the landfill is degraded with the contaminants copper, PCBs, and pesticides above risk thresholds for aquatic community receptors and to human health from subsistence-level fish consumption and that most of the hazard quotient risk to human health is from PCBs (USAPHC, 2012). The risk assessment document recommends reducing contaminant concentrations in ground water, ground water seeps, and in inter-tidal surface water (DRAM Kwajalein Landfill, 1-1).* At a minimum USEPA recommends Alternative B, which includes: 1. Remove metals and re-armor shoreline east of the landfill 2. Close existing landfill and open new landfill for future refuse 3. Stabilize shoreline at the landfill, and		

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						4. Conduct water quality monitoring Alternative B should help the Army comply with the following UES sections: *3-6.5.7(c)(6)(iv)(G) Run-On and Run-Off Control and Surface Water Requirements. All general solid waste landfill and composting facilities shall be designed, constructed, operated and maintained to control run-on and run-off to prevent flow onto or from the active part of the facility from violating any water quality requirement in Section 3-2.* *3-2.6.2(b) USAKA operations shall not degrade the quality of Class III groundwater in such a way that results in increases of contaminate concentrations that will adversely affect public health, the marine environment, the quality of adjacent Class I or II groundwaters, or protected beneficial uses of surface waters.* USEPA believes that monitoring the continued contaminant leaching for an additional five years prior to developing an additional RAM, as		

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						proposed in Alternative A, is not appropriate. – **USEPA, Norwood Scott**		
6.	ES-2	1	18-19			UES Section 3-6.5.7(c)(6)(vii) (dd) Maintenance of the final cover and groundwater monitoring program established in accordance with Section 3-6.5.7(c)(vi) above for a period of 30 years or when the facility is no longer under USAKA's control, whichever is sooner. Recommend changing "5-year" to "30-year." Recommend searching "5-year" and replacing with "30-year throughout document. Instead of changing 5-year to 30-year you could clarify that this is not a long-term monitoring plan for post-closure care. It is an intermediate step prior to closure. – **USEPA, Norwood Scott**	Yes	The Army will update both the RAM and the EA for Alternative A to indicate that the 5-year monitoring is not post closure monitoring per UES Section 3-6.5.7(c)(6)(vii) and we will add 30 years of monitoring to Alternatives B, C, and D for the post closure monitoring.
7.	E-2	1	4, 13-17			Replace "Proposed Action" with "Possible Actions" The Proposed Action Alternative A in the RAM does not include (2), (3), (4), (5), or (6). – **USEPA, Norwood Scott**	No	The use of the terms Alternative A, B, etc. in the Removal Action Memorandum led to confusion when it was transferred into the EA. The RAM analyzes only the next step and selects the next step from the alternatives. The EA looks at the entire approach, and therefore the use of Alternatives in the EA is confusing and misleading in the NEPA sense. For the EA, rather than being alternatives from which Army will select only one, they are in fact a series of components, measures or initiatives that could be taken over time to remedy the contaminants issues from the current landfill. The EA does not select an alternative, but instead analyzes all of the potential actions that are

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								included in the proposed action of removing contamination from the existing landfills. The EA's proposed action encompasses all of the long-term actions the Army is considering to take at the landfill to minimize the discharge of contaminants to the environment. The EA describes Alternative B in Section 2.1.2 and uses Section 4 to examine environmental consequences of the proposed action. The EA analyzes actions the Army intends to take in the long-term and does not select an individual alternative because many actions still require higher Army HQ decisions on how to proceed (for example, whether to open a new landfill will decide whether Alt B or D will be utilized). Although the use of Alternative A, Alternative B, etc is used in the Removal Action Memorandum, the EA refers to these as components. The Final EA will clarify that the EA is looking at a series of measures to be taken, not choosing just one. The EA addresses all possible Army actions for the long-term in attempting to minimize contaminant discharge from the Landfill Area. The RAM, however, addresses the selection of a short-term interim removal action (see response to comment #5. Therefore, the EA analyzes Proposed Actions because many are planned to be selected over the long-term. The RAM selects the current action for which the Army will seek Army HQ approval.

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								As a side note, the Army believes it can be confusing and duplicative to complete both the restoration process documentation and its public participation process as set forth in the UES, as well as undertaking the NEPA documentation and its public participation process. Both public participation processes allow similar public comment and participation. The documents, however, can have conflicting purposes. NEPA documents are supposed to look at the bigger picture and not segment a planned action. Restoration documents, however, are focused on the immediate action at hand unless they are a Document of Environmental Protection which selects a final remedy. A RAM, by definition, is selecting an interim action that is not intended to be the final remedy for the site. Therefore, the selection of an Alternative in a RAM may not necessarily be identical with the overall approach the Army is pursuing in the EA because the RAM only includes the current step. The Army intends to submit a discussion paper at the next UES review meeting seeking to use one process or the other, but not both during restoration (proposal would be for restoration process to govern for restoration documents and NEPA to govern for non-restoration activities). The Army has to seek approval of restoration documents within the Army chain of command. Therefore, the restoration documents would be proposed as the vehicle for this proposed change in the UES. Requirements of NEPA would be included in the restoration documents.

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8.	2-4	1	6-9			This is the first mention of climate change (sea level rise). Consider mentioning this in the beginning of the document or even having a separate Climate Change section in the document. – **USEPA, Norwood Scott**	Yes	The Army will add a separate Climate Change section as requested.
9.	2-6	26	25			What is the anticipated duration the bottom of the landfill expected to be above seasonally high groundwater table given rising sea levels? Please clarify and enumerate if possible. – **NMFS, Dr. Steven Kolinski**	Yes	The Army plans to add a separate Climate Change section to the final EA which will address this question.
10.	3-20	4	22			The USFWS and NMFS have no authority to designate critical habitat or EFH in foreign waters, so the suggestion of its absence is misleading in a weird kind of way. The RMI does have the right to designate critical habitat in their own waters, and there is table in the UES specifically reserved for any such listing. Recommend changing USFWS and NMFS to RMI in this sentence. – **NMFS, Dr. Steven Kolinski**	Yes	Changed as requested
11.	C-1, 2			App. C		Why is a 2016 document utilizing 2011 monitoring data? If it because of the damaged monitoring wells and lack of recent monitoring data, consider letting the reader know with a footnote. Will there be any impacts from fixing the damaged monitoring wells? – **USEPA, Norwood Scott**	Yes	2011 was the last time surface water and groundwater were sampled from all locations in a single event (results presented in the 2012 PA/SI). Since this time, only groundwater from seeps and existing monitoring wells have been sampled under the Solid Waste DEP. Text to this effect has been added to the document. No impacts are expected from fixing the damaged monitoring wells on land. The Army has not identified a method yet for permanently replacing the lost monitoring wells on the shoreline and

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								will consult with appropriate agencies when a method is identified.
RAM								
12.						No. I think the only other thing that isn't fully clear is whether the toe of the new shoreline protection will go beyond the current metal footprint in shoreline waters. The docs seems to indicate no, just looking to make sure it all adds up (it's a question Joel has too). Not sure it raises much issue even if it does, just would need the distance to be defined to allow for the best PR review. Related to the comment on USFWS and NMFS designated critical habitat and EFH, as noted, NMFS has no authority to designate such in foreign areas; however, if the lands and waters of USAKA actually belonged to the US, there is no question the entire waters in and surrounding the atoll would be designated as EFH, and I would not be surprised if, with the coming efforts related to critical habitat reviews for corals and sea turtles, critical habitat also would have come to apply. I'm not aware RMI has a process for designating critical habitat, but its 100% their Kuleana. Hope this helps. – **NMFS, Dr. Steven Kolinski**	Yes	See responses to comments #4 and #10 on the EA.
BA								
13.						I am reviewing the landfill project and wanted to know who the best person to talk to about best management practices and details of the certain	Yes	All construction would be strictly contained within the exiting footprint of the shoreline debris disturbed area. Heavy vehicle access will be limited to

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						activities. Can you have them either call me or let me know who to call? Thanks. **(3 Nov 2016)** Specifically, I am wanting to discuss: 1. The observer BMP. The marine mammal/animal monitoring for 50 yards requirement. 2. Details on potential equipment on the beach or reef flat. How much would you anticipate and what kind of BMPs are likely to be implemented? 3. The after-completion monitoring for 5 years. Explain how they will be done, and any BMPs that would apply to them. **(4 Nov 2016)** – **NMFS, Joel Moribe**		15 ft from the toe of the shoreline and only on an as-needed basis. The limits of existing fill would be clearly marked and new fill would not be placed beyond the limits of existing fill. To minimize the transport of materials or sediment, erosion control would be placed on the shoreline above the high tide level. Work would be staged and sequenced to minimize erosion of sediment or debris to the reef. Before construction begins, a heavy-duty silt curtain would be installed on the reef, just offshore of the construction extents, to act as an environmental barrier and to prevent material from eroding and reaching the reef. The silt curtain would be anchored at the bottom and the top would have buoys so it floats on the tide. A work plan would be developed that presents the full details of sediment and erosion control. Additional BMPs for equipment have been developed and will be provided. After-completion monitoring is Post-remedial water quality monitoring on a quarterly basis for 1 year and thereafter for a total 5-year monitoring period to evaluate the effectiveness of the removal action at reducing contaminant loading to ground water and inter-tidal marine water. The frequency of the monitoring after the first year will be based on the results of the first year of monitoring. We will provide the BMPs to be used while performing water quality monitoring. Concur with the 10 yard limit.

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								Tom Craven had a conversation with Joel on 22 Nov 2016. Shown below is summary of the discussion. His original questions were: 1. The observer BMP. The marine mammal/animal monitoring for 50 yards requirement. 2. Details on potential equipment on the beach or reef flat. How much would you anticipate and what kind of BMPs are likely to be implemented? 3. The after-completion monitoring for 5 years. Explain how they will be done, and any BMPs that would apply to them. On the first question, we had a good discussion about the dedicated observer. He did say that although NMFS and us have used the 50 yard monitoring requirement, he thought in this case it was too hard to actually do, especially see protected fish (given that the observer would be only about 10 feet above MSL). He also said weather tends to decrease the sight distance. So he thought that since this project was pretty benign to protected species he would recommend in the LOC that we use a 10 yard limit. On the second question, I gave him Craig's response. He was ok with the heavy equipment being 15 feet back. However, he was more concerned with the lighter equipment that may be used (like a bobcat) down on the sand. He would like us to describe what equipment we would be using on the sand and

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								shore and what BMPs we would be employing while that equipment was being used. On the third question, I also gave him Craig's response. He understood, but wanted us to specify the BMPs that would be used while wading out to collect the samples, e.g., observing the area for protected species, especially top snail, watching the sand for evidence of turtle nesting, etc. He raised a fourth question that came up when he discussed the project with Steve Kolinski. His concern was how we were going to place the larger rock for the revetment. His concern was that if we dumped it from shore, heavy rocks could roll out beyond the toe and potentially damage protected species, (top snails, turtles in particular). A description of how the larger rock will be placed and BMPs that we would use to ensure that the large rocks don't roll out onto the reef flat will be provided.
RMI EPA Majuro – Moriana Phillip								
14.	General					RMI EPA raises attention of the letter of RMI Foreign Minister John Silk to Col. Larsen dated 29 July 2016 which addresses and seeks formal written response to a number of relevant issues relating to the landfill directly, as well as wider contamination issues (to provide a comprehensive evaluation), and increased public outreach and involvement. RMI EPA is not aware of any formal written response prior to the EA and RAM or if this communication was taken into account.	No	The Army provided a briefing to Minister Silk and a distinguished Marshallese delegation in Huntsville AL on October 26, 2016. Most of the topics in Minister Silk's letter were addressed at that time. The Army is preparing a follow-up response letter and response package which will also relay raw data and other items requested in the letter or in the briefing. The Army plans continued public outreach and public meetings with the release of the next fish study report (currently targeting March 2017 for public meetings). The Army envisions the

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								proposed shoreline metals removal action as a first step in a series of actions to minimize the release of contaminants from the Kwajalein Landfill Area (see comment 3 response). The Army has two landfills that need to be addressed. Data clearly indicates that PCBs and metals are also coming from an upgradient location from the current operating landfill since these contaminants have been found in groundwater and surface water at Mount Olympus (upgradient of the current landfill). The Army believes this upgradient source of these contaminants is the former US Navy dump. Therefore, the first proposed interim action addresses the former Navy dump which operated from the 1940s to the 1960s (the shoreline metals from Glass Beach to Mount Olympus are a portion of the remains of this dump). While the Army is addressing the former US Navy dump, the Army is also seeking the funding and authorization to address the closure and capping of the active landfill. The proposed Alternative A is an interim removal action that will be followed by additional actions to address the entire landfill area.
15.	General					RMI EPA agrees with the substance of USEPA recent comments on the draft RAM, in particular that the preferred alternative A is inadequate for complying with UES sections on run-off/run-on and surface water requirements (including landfill design, operation and maintenance), and degredation of class III groundwater and beneficial use of surface water. RMI EPA also agrees with recent USFWS comments on the draft RAM, in	No	Please see response to comment #3 and comment #5. The Army is not aware of what is being referenced by "other recent comments on contamination elsewhere at USAKA."

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						particular that alternative A will not be adequate or appropriate to address continuing landfill groundwater seepage. RMI EPA also agrees with other recent comments on contamination elsewhere at USAKA.		
16.	General					RMI EPA finds aspects of the RAM, EA and US Army's selection of the preferred alternative to be inconsistent with measures and procedures set forward within the UES, including an incomplete description of the magnitude of health and environmental risk, as well as inadequate to protect human health and environment, and therefore arbitrary and capricious. In summary, US Army's preferred alternative was selected solely on the basis of cost, and the unquestionable remaining environmental hazard is unaddressed in any specificity or commitment, beyond monitoring of the ongoing problem, and thus inconsistent with US legal obligations for environmental stewardship under the Compact of Free Association, and inconsistent with the intent of NEPA to provide a "hard look".	No	See comment 3. The EA does not select an alternative, but instead analyzes all of the potential actions that are included in the proposed action. The proposed action encompasses all of the long-term actions the Army is considering to take at the Landfill to minimize the discharge of contaminants to the environment, and therefore is the Army's attempt to take a "hard look" at resolution of the release of contaminants from the Kwajalein Landfill Area. The EA analyzes actions the Army intends to take in the long-term and does not select an individual alternative. In the short term, the Army has prepared a Removal Action Memorandum, which by definition under Section 3-6.5.8(g) of the USAKA Environmental Standards, is an analysis of a proposed **interim** action. If the Army was selecting a **final remedy**, the Army would be preparing a Document of Environmental Protection (DEP) under Section 3-6.5.8(o). The Army is pursuing an interim action to mitigate the release of contaminants from the former 1940s-1960s US Navy dump (shoreline metal debris from Glass Beach to Mount Olympus are the remains of this former dump). The Army sees two landfills that need to be addressed (the former US Navy dump and the current operating US Army landfill). The Army is taking this interim action to address the US Navy dump while it secures funding and

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								authorization to proceed with the larger final remedy to address the closure of the current operating landfill. The RAM and EA utilized a 5-year monitoring scheme just for cost estimating purposes and all actions (even a final remedy) would have monitoring to confirm it was effective. The Army plans to proceed with follow-on actions as soon as funding can be secured and a DEP can be put in place. Whether the Army selects Alternative B or D depends on whether the Army higher HQ approves the construction of a new landfill. Selecting an alternative that the Army does not have funds for (and thus cannot execute) is effectively selecting a no action alternative. The Army selected an interim action as a portion of the overall action that it knows it can execute in the short term in order to make progress on removing the sources of contaminants from the environment. This is consistent with an interim action in the UES. The RAM and the EA reference the studies that define the "magnitude of health and environmental risk" and summarize these studies in a manner that could be understood by the general public. The reader is encouraged to consult the document repository at http://usagkacleanup.info for more detailed information in each individual study. See also the end of the response to Comment #7 concerning how the completion of both restoration and NEPA documents on the same action is duplicative and confusing since the two processes have different focuses (NEPA examines long-term and broader areas of

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								resources, and an interim restoration document examines a short-term action).
RAM – (RMI EPA Majuro – Moriana Phillip)								
17.	RAM					The RAM is inconsistent with the content and procedures for a RAM as defined under the UES and Compact. The RAM is, under UES Section 3-6.5.8., to include both "an estimation of risk to public health, safety, and the environment; delineation of the relative magnitude of the threat; and an evaluation of all factors necessary to determine the extent of a warranted removal action." The RAM clearly fails to delineate the relative magnitude of the threat, summarizing prior reports which point to "unacceptable" cancer risks, and other health risks, but not disclosing the magnitude, including that addressed in prior reports. For example, in a very direct and clear sense, the EA and RAM should disclose and take into account in decision-making the quantified extent to both water quality standards are exceeded and addressed, and in which fish tissue at Marshallese rates and methods of consumption is known to exceed regional safety levels, including through visual aids or graphs as well as tables, and the foreseeable extent, quantified or not, that various alternatives will affect this exposure. For example, we could understand at Chronic regional safety levels for PCB Aroclor-1254 in fish ingestion are 1.6 ug/kg (wet), and that maximum detection in tissue proximate to the landfill is 17,000 ug/kg (wet). This potential magnitude, and	No	The Army does not concur that the presented RAM is inconsistent with the UES. Magnitude of risk is subjective and variable due to the immense variability of the studies. The studies have looked at different parts of the fish, different geographical areas, different contaminants, and have been subject to changing health based criteria. Exposure to the actual public varies widely - from people who consume all of their fish from the studied area to people who only have some or none of their lifetime of fish consumption from the protected area. Sampling variability also shows that fish contamination varies widely from fish to fish. The highest concentrations of PCBs have been detected in reef fish near the landfill, but there have also been reef fish with non-detects for PCBs at the landfill. The Army does not concur that magnitude of risk is easily relayed to the general public, due to the many variables involved in the different studies and the varied contaminant distribution. The fact that unacceptable increased cancer risks have been identified is the threshold that warrants action. The only action that will have a real quantifiable impact on the protection of human health in the short term has already been taken (banning fishing in contaminated areas). The Army seeks RMI government support in enforcing these no fishing restrictions at the Kwajalein Landfill and the Kwajalein Harbor (the two most contaminated areas) and also Meck Harbor, Illeginni

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						Corresponding human and environmental risks, does not appear to be specifically addressed, nor does the analysis speak in adequate detail the extent to which various options do or do not address this, or at what level, with timeframes and specificity. Under various alternatives (on a stand-alone basis) how does each provide a future picture of health and environment, and in what timeframe? The RAM references that alternative A addresses surface debris that "is likely contributing much" of copper contamination, but does not provide detailed rationale for why landfill contamination is also not likely contributing much of the contamination. There is inadequate information provided as to why this proposed action will adequately address copper contamination (in particular, a detailed scientific assessment as to why surface removal will "likely" provide adequate copper remediation).		Harbor, the Roi-Namur Fuel Pier, and the Roi-Namur Landfill (Wendy Point), All response actions on the landfill area are only going to minimize the release of additional contaminants to the environment. Removal of the former US Navy dump which operated from the 1940s to the 1960s (the shoreline metal debris between Glass Beach and Mount Olympus are part of the remains of this former dump) will remove sources of copper, lead, and PCBs (if transformers were disposed of here). These actions will not reduce contaminant levels already in the fish that pose an unacceptable increased cancer risk. It is impossible to determine how quickly water quality and fish tissue contaminant levels will decrease with the elimination of certain contributing contamination loads. The majority of contamination in the environment has accumulated over the last 70 years. The Army has been changing practices and eliminating sources for many years, actions which continue to reduce the contaminants that reach the environment. For instance, the burning of PCB containing oil at the landfill ceased in the late 1980's. The unrestricted disposal of any waste into the landfill was eliminated with the Solid Waste DEP first put in place during the 1990s under the UES. Hazardous waste and Toxic Substances Control Act waste are now shipped to the United States for disposal instead of being deposited in the Kwajalein landfill. Stormwater outfalls from the landfill were dammed up in the early 2000s to prevent surface water runoff from directly carrying contaminants to the ocean. Control measures and

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								preventive measures have reduced the amount of contaminants that enter the environment at the landfill over time. So, because we can't define how contaminants entered the environment over the last 70 years and what magnitude has already been turned off by our actions, it is also impossible to predict how much impact one additional action will have on the level of contaminants in the environment. The proposed interim action and future actions once funded will continue to minimize the release of contaminants from the Landfill Area. The Army emphasizes that the proposed activity will have a positive effect on the environment by the removal of this contaminant source material from the environment. Metallic debris is in the water at the shoreline between Glass Beach and Mount Olympus. The corrosivity of ocean water and the constant high energy of the wave action continually breaks down the debris along the shoreline (copper, lead, and even PCBs if transformers are also buried in this former dump). These contaminants exposed to corrosive and high energy impacts are more easily transferred into the environment. The landfill, on the other hand, does not have the waste sitting in the ocean water and the buried waste is not battered by constant high energy tides. The landfill contaminants are instead buried within the landfill and it is the slow percolation of rainfall through the waste column that could mobilize these contaminants down into the groundwater at the base of the landfill. It is this groundwater that migrates to the ocean that could carry contaminants from the

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								landfill. Intuitively, the debris exposed to the more aggressive high energy waves and corrosivity of the ocean water will be more expediently broken down and carried into the marine environment. The Army is proposing to take this interim action to address the debris in the tidal zone while it secures funding and authorization for the larger effort to close and cap the active landfill.
18.	RAM					Further, the proposed preferred alternative will not address the primary or greatest risk to public health. Specifically, the RAM states that Alternative A "does not address the source of pesticide, PCB and copper groundwater contamination or improve groundwater quality at the landfill area." The RAM goes on to state that "PCB contamination... poses the greatest risk to human health." The RAM's preferred alternative offers no information or indication as to how or where such health risks, across all known or predictable metals and contaminants, and corresponding violations of UES water quality and other relevant standards, will actually be addressed with the appropriate specificity which accompanies an actual agency decision. The RAM alternative A allows for an extended or indefinite timeframe of continuing and worsening pollution. US responsibilities are not adequately addressed under this alternative; violations of standards would remain.	No	See responses to Comments #3, #5, #16, and #17. This is an interim action intended to be followed by subsequent actions. The Army is conducting an interim action to address the former Navy dump while it secures funding and authorization to conduct the more complex project of closing and capping the active landfill. The amount of PCB containing wastes in the former Navy Dump has not been defined and will not be known until removed. Because the dump is already in the ocean water (unlike the landfill which has a shoreline and berm between the wastes and the ocean), it is impossible to measure groundwater discharges downgradient of the dump (because discharges are directly in the ocean). It is also not realistic to drill through the dump debris to install monitoring wells due to the high percentage of metal. Removal (instead of investigation to justify the seemingly obvious need to remove it) is the most practical way to remove this contaminant source from the environment. Upon completion of the removal action, soil sampling will be performed to verify absence of contamination.

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19.	RAM					The RAM's own conclusions indicate that the preferred alternative is superficial (for aesthetic purposes) and does not address the underlying causes of contamination (neither closing the landfill nor addressing future incinerator ash) and does not address sources of metal, pesticide and in particular PCB contamination which have resulted in both a longstanding violation of UES water quality standards (by US Army's own admission and data) as well as a grave human health hazard to Marshallese. The RAM states that the alternative may address some degree of copper contamination as well as to improve "the aesthetics of the shoreline." Thus by the US Anny's own statement, the RAM preferred alternative does not address the greatest risk to human health, and in particular Marshallese health, but addresses only one of several contaminants, and appears to be targeted for aesthetic or landscaping design purposes. By the RAM's admission, it will not address relevant UES violations and environmental and public health impacts, and will be ineffective in reducing contaminant concentrations in ground and marine water, but rather postpones addressing this to future and unspecified action (stating inconsistently that a future remediation plan would be developed, or that it would be one of the other alternatives, without a defined commitment, selection or timeline), and thus providing the impression that relevant violations and risks could exist in perpetuity (would another future	No	Please see responses to Comments #3, #5, #16, #17, and #18 above. The RAM indicates aesthetic purposes are a benefit (not the purpose). The proposed action is an interim step in the overall Landfill Area contaminant release minimization. The Army recognizes that there are two landfills that need to be addressed. Funding timing is currently being discussed internally in Army. Army HQ believes it is procedurally correct to fund the closure of the landfill under the compliance program (closure of the landfill after its normal life cycle has completed) which will result in funding not provided for at least 5 more years (and possibly 10 years). USAG-KA believes it is possible to have the landfill closure funded under the cleanup program which would allow funding to be received sooner. USAG-KA has not yet been successful in securing funds sooner, which is why there is no definitive commitment to close the landfill sooner in the RAM/EA. While this debate is going on, and while the Army seeks internal approval to construct a new landfill (which will determine whether Alternative B or Alternative D is ultimately selected), the Army wants to address the former Navy dump (the metal debris on the shorelines is part of this dump that operated from the 1940s to the 1960s) as an interim action. This action will be followed by subsequent actions to address the active landfill as soon as funding and authorization to close the landfill is obtained. Comments #17 and #18 address further justification on executing this source metal removal. Comments #3, #5, and #16 address how this is an interim removal action and is

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						RAM action be to continue monitoring? If not, what will happen, and why is there a rational basis to wait five or more years?). To comply with the UES and other relevant standards, this current RAM must be that plan, in a comprehensive basis that provides more direct information on when, and how, compliance will be achieved, and public health protected, without unclear allusions to unspecified future action. RMI EPA must emphasize that the US Army acknowledged in some sense environmental contamination issues with the landfill during the original 1989 EIS at Kwajalein and other documents, and even with having much more detailed information now at hand, still does not propose any adequate measure to address such contamination. The only specific measure to address the primary environmental and human health impacts, outside of copper, is continued water quality monitoring for a period of 5 years. Not only is this extended timeframe inadequate, but it is an admission that many relevant water quality standards violations will persist, as well as corresponding health risks, without treatment. This decision is inconsistent with the UES' stated purpose of the RAM and legal responsibilities under the RMI-US Compact, related agreements and instruments, which place a very high priority on RMI's natural environment.		intended to be part of a series of actions addressing contaminant releases from the Kwajalein landfill area. The Army will pursue subsequent actions as soon as funding allows. Post-action monitoring will be performed regardless of the type of action to monitor progress toward correcting the issue. The Army will not wait a specified time period if it can secure funding to address other aspects of minimizing contaminant releases from the Kwajalein Landfill Area.
20.	RAM					The RAM does not contain a detailed analysis of the respective impacts or benefits to human health and	No	Although the Army agrees with the comment that the US legal obligations under the Compact are not subject to

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						environment between various options. It merely states that there is a cost differential. The US' legal obligations to address environmental contamination under the Compact are not subject to it's domestic budgetary constraints. The RAM states that "all of the alternatives (B, C and D) that address closure of the existing landfill and provide alternative methods for future disposal of refuse are more expensive than Alternative A" as the primary basis for the decision on the preferred alternative. While there is a "hard look" at budgetary costs, there is no separate and specific "hard look" at environmental and health risks from various alternatives alone, and affects on relevant compliance including water and solid waste, between the various alternatives (which are addressed in a combined aggregate within the EA's statement of proposed action, and of which only one is selected in the RAM, without due regard for either the magnitude or distinguishing impacts between various alternatives). The EA and RAM fail to state with confidence what will happen, and when, beyond removal of surface debris, and appear to lead to continuing public health risk and violation of relevant environmental standards on a substantial basis, and with a significant impact.		domestic budgetary constraints, addressing those obligations must be done in accordance with law. Congress limits the authority of DoD and other executive agencies to use appropriated funds. The Anti-deficiency Act prohibits federal employees from obligating or expending federal funds before an appropriation or in amounts that exceed the appropriation [31 U.S.C. § 1341(a)(1)(A-B)]. The Army may not knowingly enter into or authorize government contracts in the absence of sufficient government funds to pay for them. It does no benefit to select an alternative for which the Army does not have funds. This would in effect be selecting a no action alternative. The Army has two landfills at which contaminant discharges need to be minimized. The Army has the funding to address the older former US Navy dump (the shoreline metal debris are part of the remains of this former dump that operated from the 1940s to the 1960s). While the Army is continuing to pursue the funding for the more complicated and complex closure of the current operating landfill, the Army plans to proceed with an interim action to address the older landfill. This interim action will be followed by subsequent actions as soon as the Army can secure funding for the closure of the current operating landfill. Comments #3, #5, and #16 address how this is an interim removal action and is intended to be part of a series of actions addressing contaminant releases from the Kwajalein Landfill Area.

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21.	RAM					RMI EPA does not find that the US Army has adequately considered every significant environmental impact of it's proposed action. The material contained in draft US Army Public Health Command reports makes clear the magnitude of the risk, that when applied to estimates of Marshallese rates and methods of fish consumption, that regional safety standards are exceeded hundreds-fold. The public has not been informed of this in the context of the RAM and EA. There is no indication that, beyond budgetary analysis, the US Army has taken a "hard look" at environmental consequences, in particular continued exposure (with exposure first disclosed in 1989, nearly 3 decades ago, and likely starting in the early postwar period, including use of fill). There are clear limitations as to the measures in place regarding no take fish consumption at a prime fishing ground for a subsistence population. Further, there is no indication that water quality standards, already in violation, will improve in that timeframe, beyond (perhaps) copper. This is an uninformed US agency action; beyond a passing budgetary reference, there is no "hard look" or explanation as to why alternatives are rejected, postponed or not chosen, as relates to health and environment. It is apparent that water quality standards will persist and worsen, and those violations will only be monitored. The EA and RAM do not adequately describe or address the magnitude of anticipated direct or indirect/secondary impacts of	No	The Army does not expect that the execution of any of the proposed actions will have an immediate impact on the level of contamination already in the fish and posing unacceptable increased cancer and noncancer health effects to subsistence fishers. The only action that does have an immediate effect has already been taken - banning fishing in these areas. The Army requests RMI Government and RMI EPA assistance in ensuring that subsistence fishers comply with these banned areas. The Army notes that worldwide, fish are found to be more easily contaminated than other sources of protein in the human diet. Man's industrial presence in the world and our use of chemicals has led to contamination consequences wherever man has been. This is an international consequence of industrialization that many nations are attempting to address (rather than an issue unique to the Kwajalein environment). The action being considered is the cleanup of sources of these contaminants to the environment, not the continued deposition of these contaminants into the environment. The actions being considered are not going to, in the long term, negatively affect water quality or the levels of contaminants in fish, but are instead intended to remove sources of these contaminants from the environment. The proposed action is an interim action to clean up the debris that is in the marine environment that is left over from the operation of the US Navy dump during the 1940s to the 1960s. The Army is continuing to pursue the approval

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						continued water quality violations on either the environment or human health, including an analysis of the significance (e.g. the context and intensity). The unique character of the setting, including fish consumption, nor the severity of reasonably foreseeable impacts, are described. The proposal further does not adequately acknowledge what RMI EPA considers as the high potential for further violation of legal requirements enacted to protect the environment.		of funds and authorization to close the current operating landfill. The Army notes that sources of contamination on Ebeye, including an unlined landfill, open burning of wastes and discharges of untreated sewage also present an acute short term threat to health and public welfare. The Army supports Marshallese action to reduce discharges to the environment pursuant to its reciprocal obligations set forth in Compact Section 161(b).
22.	RAM					If further actions are planned or anticipated, eg that this is a "first step" this is not disclosed nor adequately considered; further documentation would be considered inappropriate segmentation (as such actions would be connected), and RMI EPA has no reason to assume or rely that any such further steps will be taken as there is no direct specificity or timeline beyond continued monitoring. In summary, there is no reason for RMI EPA to think that in five or more years time, that alternative A will have significantly reduced primary health and environmental issues, or that there is a clear agency decision on how or when such issues will be addressed. There is no rational explanation on why the agency would further postpone a longstanding issue, and only monitor what itself acknowledges is unacceptable or in violation, with the exception of more nominal surface debris. There must be a rational explanation or justification on such a	No	See responses to Comments #3, #5, #16, #17, and #18 above. The EA looks at all actions the US Army is considering taking for the long-term at the Kwajalein Landfill Area. The EA does not select a single action, but instead proposes a long series of possible actions. The proposed metals removal, Alternative A, is not the only action analyzed in the EA. The EA looks at all the currently proposed possible response actions to ultimately minimize contaminants coming from the Kwajalein Landfill Area. A RAM, by definition under the UES, is defined as an interim action. If this was the final action, the US Army would have prepared a DEP. The Army cannot commit to steps for which it has not secured funding. The Army is committed to securing the funding and will execute follow-on actions as soon as funding (and the establishment of a DEP) allows.

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						decision as it relates to the objectives of protecting health and environment.		
EA (RMI EPA Majuro – Moriana Phillip)								
23.	EA					The draft EA and FONSI proposed action is described as to implement a "combination" of removal action components, yet does not provide clarity on which will be implemented and when. The EA states that the execution of components in alternatives is not expected to increase health and safety risk, and that the closure of the existing landfill and construction of a new landfill would be expected to further reduce pollutants, and that the removal of existing refuse would further reduce pollutants in groundwater. However, the RAM is not consistent with the EA as the RAM does not specify which components will actually be addressed and in what timeframe, other than selecting a relatively nominal action (addressing only copper), and proposing long-term monitoring with further but unspecified action as a potential outcome. It may be that the EA should also consider the RAM's preferred alternative A and address and analyze this as a possible action, in addition to also addressing the various possible components. If so, as alternative A does not address with clarity the persistence of environmental violations and health risks, it appears that health and safety risks, as well as environmental pollutants, would be a negative – and significant - impact, and may thus require preparation of an EIS. The EA states that a follow-up action list to ensure compliance with actions	No	Please see the response to Comment #22 above with regard to the Army's position on fishing bans and subsistence fishing. Please also see comments #3, #5, #16 through #22, The EA analyzes the possible long-term actions the Army plans to take to minimize contaminant releases at the Kwajalein Landfill Area. Many of these actions have procedural funding complications to sort out. Army Higher HQ believes it is proper to fund the closure of the landfill under compliance and operations (the normal life cycle of the landfill) which will take longer to secure funding. USAG-KA seeks to close the Kwajalein Landfill under cleanup funding, which would allow closure in a much more timely manner. Furthermore, USAG-KA needs to secure approval for either constructing a new landfill (for Alternative B) or for increasing future operating budgets to ship wastes back to the US for disposal under Alternative D. While the US Army is attempting to secure funding for the closure of the operating landfill, the Army proposes to proceed with an interim removal action to address the former US Navy dump (metal debris on the shoreline between Glass Beach and Mount Olympus are part of the remains of this dump which operated from the 1940s to the 1960s. The RAM only looks at the action at hand. Therefore, restoration documents that are interim actions are not going to be consistent with NEPA documents which take an unsegmented look at the entire planned

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						described in the EA would be developed. RMI EPA *would* seek to know which particular actions, eg relating to which alternatives, would be included in this action list, and the timeframe for their compliance. Would only alternative A, the preferred alternative, be included in this action list? If not, what other components are included, and how? RMI EPA would seek clarification on the consistency between the EA's proposed action, and the preferred alternative under the RAM. The EA states that recommendations from the US Army Public Health Command 204 report are to be "considered" for the continuing mitigation of risk exposure, yet it is unclear how these are considered by the RAM's preferred alternative, which by it's own admission does not address many of the greatest risks in specific and timebound action. There is an inconsistency between the EA's description of proposed action (various components, including removing debris, closing/capping the landfill, excavating future waste and capping, shoreline stabilization and monitoring) and the RAM's preferred alternative, which only addresses with any confidence one of these many components. This same lack of clarity also continues in the EA's analysis of cumulative impacts, as the EA appears to only analyze the combined and unspecified aggregate of alternatives (A-D) and compare these to the no-action alternative. Adequate decision-making would require that the EA and RAM are consistent, and thus analyze		series of actions. The action proposed itself does not contribute to the long-term release of contaminants, so the Army is confused by the need to conduct an EIS. First, the Army believes that removal of these contaminants through whichever initiative examined in the EA is selected would not produce a significant negative effect on the environment but would be a positive effect. Additionally, an EIS would only lead to more delays (several years) in taking action and would lead to the same conclusions of the EA (that a series of actions are required in the long-term to minimize the contaminant releases in the Kwajalein Landfill Area). Interim Action restoration documents and NEPA documents, by their very nature, have different purposes. The National Environmental Policy Act (NEPA) is a decision-making tool for federal agencies contemplating actions that could significantly affect the environment. Although the law does not require that any particular result be attained under NEPA, the objective is to build into the agency decision-making process an appropriate and careful consideration of all environmental aspects of proposed actions. By doing so, the potential long-term affects of such decisions are elucidated for the benefit and review of both those making such decisions and those who could be impacted by them, with the expectation that the least intrusive action will result. All federal agencies are required to integrate NEPA into their decision-making process. The

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						stand-alone alternatives separately as well as in more precise combinations. RMI EPA agrees with the EA's finding that the no-action alternative would continue and potentially worsen impacts regarding contamination from metals, PCBs and pesticides (and RMI EPA would posit with more certainty that impacts will worsen under a no-action alternative). As the RAM only selects alternative A as the preferred alternative, generally addressing only copper contamination in any verifiable manner, in large part the no-action alternative appears to be selected. Further, while the EA states that any action on restrictions on subsistence fishing will continue to be in effect, there are widely acknowledged limitations on the effectiveness of such restrictions, and wide knowledge that subsistence fishing continues on a large scale despite such restrictions. It is true that RMI also has a considerable role in addressing such restrictions.		US EPA is charged with protecting the US environment and remediating chemical impacts. Both through the EPA's interpretation of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and through case law it has been established that the CERCLA decision making process is sufficiently protective of the environment and for EPA to also incorporate NEPA would be redundant. Section 121(e) and Part 300 of CERCLA support the NEPA exemption. Preparation of NEPA documents under CERCLA are entirely voluntary on US EPA's part. For this action, Army also produced a NEPA document, in accordance with current UES and Compact requirements. The Army will be preparing a discussion paper for the next UES review meeting to examine whether restoration documents produced under the UES have a similar public participation process as NEPA documents and that if so, whether the execution of both is duplicative.
24.	EA					Further, RMI EPA notes that beyond circulation of complex technical documents written in a foreign language, there is no dedicated public participation or public involvement. From a practical standpoint, this may only serve to widen the gap between perception and agency decision-making, and does not adequately take into account views which may be forthcoming from a closely-affected population. Reliance on the SEIS' public hearings, conducted in the mid-1990s, are	No	The Army is open to suggestions on how best to reach the Marshallese public in future. Currently, the Army prepares summary fact sheets for each cleanup action in both English and Marshallese and includes those summaries with the more technical documents as they are displayed for public comment on Majuro, Ebeye, Kwajalein, and Roi-Namur. The Army also places all documents on-line at http://usagkacleanup.info. The Army publishes notices of availability in the Marshall Islands Journal and the Kwajalein Hourglass in both Marshallese

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						inadequate, and defeat the purposes of both NEPA and the UES. The EA states that members of the public, including minority, low income, disadvantaged and Native Marshallese, will be urged to participate in this decision-making process. RMI EPA would request greater clarification on how specific and adequate measures for this have been taken to urge such participation, including non-English speakers (or those for whom English is a second language), beyond publication of notice in newspapers and placement in the RMI EPA office, and the effectiveness of such urging action. RMI EPA would suggest this would generate a high degree of public controversy and that an EIS would be warranted.		and English. In an effort to encourage public participation, many of the actions the Army is taking exceed the requirements of the UES, The Army would appreciate RMI EPA suggestions for better public outreach.
25.	EA					Real environmental harm may best be avoided through sufficient foresight and deliberation; neither are present in the EA and RAM, which merely evaluate options on the basis of budget, do not distinguish them in analysis, and fail to take a "hard look" at environmental consequences. The high likelihood, and indeed certainty that relevant UES standards will continue to be in violation, and the failure to take a "hard look" at health and environmental impacts in decision-making, is an indication that the decision for alternative A is arbitrary and capricious. It is functionally ineffective, as an admitted persistence of relevant violations and human health risks through selecting Alternative A only invites immediate and future NODs or	No	The Army has attempted to engage the RMI EPA in deliberation. Documents are sent to UES Agencies well ahead of any public comment periods. The RAM was sent to the RMI EPA in January of 2016. The RMI EPA provided no comments until November 2016. It is difficult to work towards a common solution when RMI EPA ignores US Army requests for input at the earliest stages. Unfortunately, budgetary decisions play an important role in response actions. Selecting an alternative that is not funded is essentially selecting a no action alternative. The Army is proposing an interim removal action to address the contaminant releases from the former US Navy dump while it pursues funding for the more complicated project of closing the operating landfill. The Army will close the

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						other related actions :from RMI EPA and/or others, and thus returning to the very same analysis which should have taken place now within this RAM and EA. This is a circular and inefficient outcome, instead of developing, analyzing and selecting a comprehensive means to address such issues, including on the basis of other alternatives presented. The failure to provide any specifics on a future remediation plan is essentially the same as no remediation plan at all beyond the immediate and specific measures in alternative A, which leave major risks and violations unaddressed. This analysis within the EA and RAM is also improper segmentation - it does not provide a "hard look" at a series of directly connected actions to address the same goal at the same site, as the future unspecified action is unidentified or not selected. Presumably a future EA and RAM would be developed, and this appears to artificially divide an issue which would otherwise be addressed in a comprehensive approach.		operating landfill as soon as funding allows. The EA acknowledges that currently there is ongoing contaminant releases and looks at all the presently identified long-term plans to address contaminant releases in the entire Kwajalein Landfill Area to reduce or eliminate these releases. It does not identify a preferred alternative but examines the effects of all the potential initiatives to reduce these releases, so it is not segmented. The RAM, by definition as an interim removal action plan, only looks at the immediate step to be taken. The EA is already in place for these future actions. If the next step in also an interim action, another RAM would be prepared. If the next step could be considered a final action, then a Document of Environmental Protection will be prepared. Additionally, if during the process of reaching a Final DEP new actions are identified, the Army will supplement the existing NEPA analysis as needed. The Army is following the restoration process as laid out in the UES.
26.	EA					It is impossible to see that current preferred alternative, and the accompanying documentation of the RAM and EA, as anything other than "slow walking" what we now understand to be a major environmental and public health issue that has been present for several decades. The only apparent reason for so doing is the issue of cost, rather than undisclosed or inadequately	No	See responses to comments #23 and #25. The EA does not have a preferred alternative but examines the environmental consequences of all currently identified initiatives or measures to reduce or eliminate contaminant releases from the landfill. The difficulties in obtaining funding for the closure of the landfill are discussed in the response to comment #19 above. The Army intends to minimize contaminant releases from

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						disclosed health and environmental consequences not taken into full account in decision-making.		the Landfill Area as soon as funding allows. Unfortunately, fiscal constraints are a reality that prevents the execution of projects on a timeline that both the Army and the RMI EPA expect. Therefore, the Army proposes to remove the contaminant source that is the former US Navy dump while it proceeds with efforts to secure funding for the more complicated closure of the existing operating landfill.
27.	EA					RMI EPA would consider that a "hard look" in the EA and RAM would include a rational connection between the facts found and the choices made, including considering important aspects of the problem, explanations which are consistent with evidence, and avoiding deficiencies in reasoning. There is no convincing case made for the finding and selection of the preferred alternative, significant impacts persist and there are no specific safeguards in the project which would sufficiently reduce the impact to a minimum. The explanation of decision appears to be limited to cost, and runs counter to the evidence at hand. While the EA's alternatives appear to address core environmental and health issues at some level, the selection of the RAM alternative A does not in large substance. The decision is not based on consideration of relevant factors, including health and environment, and is a clear error of agency judgement; the relevant environmental violations and risks persist (perhaps outside of copper contamination) without	No	See responses to comments #23, #25, and #26. The EA does not have a preferred alternative but examines the environmental consequences of all currently identified initiatives or measures to reduce or eliminate contaminant releases from the landfill. The RAM selection of Alternative A is an interim removal action that allows contaminant source reductions to be made while the Army pursues funding for the more complex closure of the operating landfill. Selecting an alternative that the Army cannot complete does not benefit the environment. The operating landfill needs to be capped in one effort to be effective. Selecting capping of the landfill without securing funding would be the same as selecting the no action alternative. The Army is going to pursue the removal of the US Navy dump as a source of contaminants while it continues to pursue the funds and approvals required to complete the more complex closure of the operating landfill.

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						confident clarity on when or how they will be addressed.		
28.	EA					RMI EPA notes further that the revised UES now in effect commits to taking into account projected climate change-driven impacts, which would include sea level rise. This is not adequately addressed in the EA and/or RAM, taking into account recent statements of the recent USGS study on sea level rise and wave action at USAG-KA, which points to a revised methodology on wave action risks which will apparently well exceed of the RAM's analysis of 1.5 feet (pointing to wave action over wash "in the next couple decades" and not centuries as previously thought). This is further evidence of a failure to take a "hard look" at environmental conditions and impacts.	Yes	The draft RAM and draft EA were completed prior to the 14th Edition of the UES taking effect. Climate change considerations will be added to both documents before finalizing.
29.	EA					Finally, RMI EPA has submitted these two documents for independent third-party review. RMI EPA does not have adequate time within the initial public review period, but may seek to provide further comments. Before proceeding through any formal dispute resolution process, RMI EPA may wish to provide further information which should be taken into account, with a view to attempt to resolve any such dispute in a timely, efficient and effective manner. On the basis of information presented in the EA and RAM, RMI EPA would only find that alternative D appears to be adequate as it has the highest confidence in	No	The Army welcomes all comments from RMI EPA, regardless of timeliness. We note that the draft RAM was first sent out for comment in January, 2016. More timely comments, responses and outreach may better shape Army's understanding of RMI EPA's concerns and lead to more cooperative development of contamination removal efforts. The Army notes that this historical contamination is not unique to military or U.S. operations and may well be present at other industrial sites in RMI. The Army believes a collaborative approach to remedying industrial contamination will better serve the Compact's environmental goals, set forth at Section 161. The Army has banned fishing at known

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						removing the underlying cause of landfill contamination and ensuring future operations avoid repetition.		contaminated areas. The Army needs RMI government help in ensuring Marshallese citizens follow the bans and seek reef fish in areas away from industrial areas. The Army appreciates the RMI EPA's comments on the preference for Alternative D. The Army will continue to pursue funding for the closure of the current operating landfill (which will allow the execution of Alternative B or D in the future). The Army will proceed with closure of the current operating landfill as soon as funding is secured.
30.	EA					Pending publication of a final RAM and it's content, including the preferred alternative, RMI EPA is prepared to avail itself of future NODs as well as the dispute resolution procedures under the UES, as well as to relief afforded by applicable sections of the Compact.	No	Thank you for the comments from the RMI EPA indicating your preference for the selection of Alternative D. The Army believes that the proposed action (Alternative A) is a positive interim step in an anticipated series of actions that will remove significant debris from the marine environment. Alternative A removes the old US Navy dump which operated from the 1940s to the 1960s while the Army secures funding to address the active landfill in a follow-on action. The old Navy dump is upgradient of Mt Olympus and is a constant source of contaminants (copper, lead, and PCBs have been detected in groundwater seeps and surface water around Mt Olympus). The Army has two landfills (one former and one active) at Kwajalein islet contaminant contributions to the environment must be minimized. We welcome cooperative discussion regarding which actions best reduce that contamination.