

## CHAPTER 2.

# OVERVIEW OF BEST MANAGEMENT PRACTICES AND PROPOSED MITIGATION MEASURES

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This chapter presents an overview of all Best Management Practices (BMPs) and the proposed mitigation measures discussed in Volumes 2 through 6 of this EIS. In addition, the chapter introduces the mitigation measures monitoring plan and construction-phase adaptive program management. The Council on Environmental Quality (CEQ) drafted a *Guidance for NEPA Mitigation and Monitoring* (February 18, 2010) that outlines three goals to improve agency mitigation measures and monitoring. These goals and Final EIS consistency with these goals is summarized as follows:

1. *Proposed mitigation measures should be considered throughout the NEPA process. Decisions to employ mitigation measures should be clearly stated and those mitigation measures adopted by the agency should be identified as binding commitments to the extent consistent with agency authority and reflected in the NEPA documentation and any agency decision documents.*

The Final EIS, Volume 7, Chapter 2 includes a summary table of mitigation measures proposed in Volumes 2 through 6. Mitigation measures coordinated with agencies continue to evolve as regulatory agency consultations and permit application reviews (i.e., Biological Opinions, Programmatic Agreements, etc.) proceed. The Final EIS proposes mitigation measures to reduce or avoid environmental impacts identified during the NEPA environmental review process; however, the Final EIS and NEPA environmental review process do not commit the DoD to the proposed mitigation measures. Commitment to a mitigation measure would be established in the Record of Decision (ROD), which is informed by the Final EIS. Environmental requirements can also change or emerge post-ROD as a result of agency consultations and coordination, permit conditions, and new laws, regulations, and policies.

2. *A monitoring program should be created or strengthened to ensure measures are implemented and effective.*

A Post-ROD Mitigation Monitoring Plan would be developed with the ROD to track the implementation of mitigation measures committed within the ROD. Naval Facilities Engineering Command Marianas (NAVFAC MAR) ultimately would be responsible for preparing and implementing the post-ROD monitoring plan. As a matter of policy, the Navy adaptively manages its construction programs to monitor the effectiveness of mitigation measures and adjusts them as necessary to improve effectiveness during and after construction (CNO 2007, CMC 2008).

3. *Public participation and accountability should be supported through proactive disclosure of and access to agency mitigation monitoring reports and documents.*

The DoD will commit to implementing mitigation measures identified in the ROD. The DoD intends to work collaboratively with members of the public and agencies throughout implementation of the proposed action and mitigation measures. Many of the mitigation measures proposed in this Final EIS were recommended or coordinated with agencies or recommended to the DoD in comments. Virtually all monitoring reports and documents are available to the public and access is provided under the Freedom of Information Act, within a reasonable timeframe, upon request to DoD public affairs or community planning and liaison offices.

Mitigation is a general term that refers to actions implemented to avoid, minimize, rectify, reduce/eliminate, or provide compensation for an environmental impact. In 40 Code of Federal Regulations (CFR) 1508.20, the CEQ defines mitigation as:

- Avoidance: Avoids the impact by changing the action. Does not take certain actions that would cause the environmental effect.
- Minimization: Minimizes impacts by changing the intensity, timing, magnitude, or duration of the action and its implementation.
- Rectifying: Rehabilitating, repairing, or restoring damage that may be caused by implementing the proposed action.
- Reducing/Eliminating: Reduction or elimination of the impact over time.
- Compensation: Replacing damage and improving the environment elsewhere, or provide substitute resources such as funds to pay for the environmental impact.

*Best Management Practices (BMPs)*. This EIS distinguishes between BMPs and mitigation measures. Although both meet the CEQ definition of mitigation described above, for the purposes of this EIS, BMPs are existing policies, practices, and measures required by law, regulation, or Department of Defense (DoD) policy that reduce the environmental impacts of designated activities, functions, or processes. Although BMPs mitigate potential impacts by avoiding, minimizing, or reducing/eliminating impacts, BMPs are distinguished from mitigation measures in this EIS because BMPs are 1) existing requirements for the proposed action, 2) ongoing, regularly occurring practices, and 3) not specific to this proposed action. In other words, the BMPs identified in this EIS are inherently part of the proposed action and are not additional mitigation measures proposed as a result of the NEPA environmental review process for the proposed action. An exhaustive list of BMPs is not provided in this EIS; only those BMPs referred to in analysis in this EIS are identified.

*Proposed Mitigation Measures*. For the purpose of this EIS, mitigation measures are additional, project-specific measures proposed as a result of the NEPA environmental review process. Mitigation measures may be routinely applied across many DoD projects, but DoD commitment to a mitigation measure, as defined herein, is determined on a project-by-project basis. The proposed mitigation measures are not existing requirements or components of the proposed action presented in this EIS and their implementation is not assumed in the analysis presented in this EIS. Instead, this EIS proposes mitigation measures for implementation to avoid, minimize, rectify, reduce, or compensate for project-specific impacts of the proposed action identified during the environmental review of the proposed action. The proposed mitigation measures would become requirements upon decision to implement the measures as recorded in a ROD. Compensatory mitigation measures may have a regulatory driver, such as the Clean Water Act, but the compensatory mitigation measure is a project-specific mitigation measure determined on a project-by-project basis. Likewise, conditions of a USFWS Biological Opinion or State Historic Preservation Office (SHPO) Programmatic Agreement under NHPA for cultural resources, if finalized, are treated as mitigation measures in this EIS.

A Post-ROD Mitigation Monitoring Plan would be developed with the ROD to track the implementation of mitigation measures identified in the ROD. NAVFAC MAR ultimately would be responsible for preparing and implementing the post-ROD monitoring plan. As a matter of policy, the Navy adaptively manages its construction programs to monitor the effectiveness of mitigation measures and adjusts them as necessary to improve effectiveness during and after construction (CNO 2007, CMC 2008).

Navy personnel would provide oversight for successful implementation of the proposed mitigation measures. Many construction-related environmental requirements are attached to permits since conditions

and mitigation measures are often developed in coordination with agencies and expressed in agency opinions or agreements. For mitigation measures involving opinions, agreements, or permits with agencies, the applicable agencies also often provide oversight. For example, there would be agency and Navy personnel involved with monitoring terrestrial biological and cultural resources mitigation measures. Additional agency coordination is proposed to mitigate impacts to utility infrastructure under the Adaptive Program Management mitigation measure detailed in Section 2.4.

## **2.1 BEST MANAGEMENT PRACTICES ON GUAM AND TINIAN**

This section provides a summary of BMPs considered in the analysis in this EIS. These BMPs are implemented during design, construction or operations by the DoD and are embedded in numerous policies and orders. Table 2.1-1 provides a summary of the key BMPs referred to in the analysis in this EIS; however, the list is not intended to be exhaustive by including all BMPs that would be implemented as part of the proposed action. The table indicates the phase of the project the BMP would be applied. In addition, the primary resources that would benefit from the BMP are identified.

**Table 2.1-1. Summary of Key Best Management Practices (Guam and Tinian)**

Item	BMP	Description	Activities			Resources				
			Design	Construction	Operation	Geological & Soil	Water	Terrestrial Biological	Marine Biological	Hazardous Materials
1	Erosion Control	<p>A range of BMPs would control erosion during construction and operations to eliminate and/or minimize nonpoint source pollution in surface waters due to sediment. Erosion control BMPs include, but are not limited to, the following practices and procedures.</p> <p><b>Construction:</b></p> <ul style="list-style-type: none"> <li>• Erosion control through site approval process (whereby the Navy reviews each proposed project for its erosion potential, and involves the designated installation Natural Resource Specialist in the process).</li> <li>• Topsoil removed from the site would be placed in the immediate area and reused for re-compaction purposes (if appropriate, in accordance with geotechnical recommendations).</li> <li>• Soil exposed near water as part of the project would be protected from erosion with erosion control blankets (organic or synthetic fibers held together with net to cover disturbed areas) after exposure, and stabilized as soon as practicable (with vegetation matting, hydroseeding, etc.).</li> <li>• Flatten landfill slopes for increased soil stability.</li> <li>• Silt-containment (silt fences and other physical barriers that intercept runoff from drainage areas).</li> <li>• Re-vegetate as soon as possible after any ground disturbance or grading.</li> <li>• Minimize construction and grading during times of inclement weather.</li> <li>• Soil piles and exposed slopes covered during times of inclement weather.</li> <li>• Stockpiling of excavated materials behind impermeable berms and away from the influence of river waters and runoff.</li> <li>• Implement a re-vegetation program to ensure graded benches are fully vegetated as landfills mature.</li> <li>• Vegetation/mulch stabilization (applying coarse plant residue to cover soil surface. The vegetation/mulch should be free of invasive species viable reproductive parts, such as rhizomes, seeds, and plants).</li> <li>• Level spreader (non-erosive outlet for runoff to disperse flow uniformly across slope).</li> <li>• Rock outlet protection (rock protection placed at end of culverts).</li> <li>• Sediment basin (barrier that retains sediment from runoff).</li> </ul>		X	X	X	X	X	X	X

Item	BMP	Description	Activities			Resources				
			Design	Construction	Operation	Geological & Soil	Water	Terrestrial Biological	Marine Biological	Hazardous Materials
		<p><b>Operation:</b></p> <ul style="list-style-type: none"> <li>Restrict vehicles in training areas (ensure that all training areas, including transit routes necessary to reach training areas, are clearly identified or marked. Restrict vehicular activities to designated/previously identified areas).</li> </ul>								
2	Stormwater Management under the Clean Water Act (CWA): Stormwater Management Plan (SWMP)	<p>In compliance with the federal CWA under Section 401, the proposed actions would require a SWMP. A SWMP is a document that describes the minimal procedures and practices used to reduce the surface flow and subsequent discharge of pollutants to storm drainage systems. Elements of a SWMP include structural and non-structural practices such as:</p> <ul style="list-style-type: none"> <li>Check dams (small temporary stone dam across drainage).</li> <li>Diversion dike/swale (berm or ditch that channels water to desired location).</li> <li>Lined waterway (lined outlet for drainage).</li> <li>Stormdrain inlet protection (permeable barrier around inlets reducing sediment let into storm drain).</li> <li>Stormwater ponds and wetlands.</li> <li>Infiltration practices (capture/temporarily store water before infiltrating into the soil).</li> <li>Use of groundwater recharge wells and infiltration basins, where applicable.</li> <li>Filtering practices (capture/temporarily store water and pass through filter beds of sand, organic matter, soil, or other media).</li> </ul>	X	X	X	X	X	X	X	X

Item	BMP	Description	Activities			Resources				
			Design	Construction	Operation	Geological & Soil	Water	Terrestrial Biological	Marine Biological	Hazardous Materials
3	Stormwater Management under the CWA: Stormwater Pollution Prevention Plan (SWPPP)	<p>Stormwater Management Pollution Prevention Plan (SWPPP). A SWPPP is a self-implementing plan for compliance with an installation’s stormwater permit.</p> <ul style="list-style-type: none"> <li>• Facilities would be required to comply with the SWPPP during construction and then during day-to-day operations to ensure that stormwater remains free of contaminants.</li> <li>• The SWPPP requires development of pollution prevention measures to reduce and control pollutants in stormwater discharge.</li> <li>• Where applicable, provisions of any Construction General Permit(s) would be fully implemented on non-DoD properties.</li> <li>• Where applicable, consistency with CNMI and/or Guam Stormwater Management Manuals.</li> <li>• A site-specific SWPPP tailors the plan to the facility and associated activities most likely to have a negative impact on stormwater. Applicable SWPPPs would manage stormwater and erosion at each training location.</li> </ul>		X	X	X	X	X	X	X
4	Water Quality Monitoring Plan (WQMP)	<p>Development of Water Quality Monitoring Plan (WQMP). WQMPs evaluate the effectiveness of environmental permits and/or performance standards. Monitoring plans identify ambient or control conditions at a particular site and capture deviations from those conditions resulting from a project or operations of a facility. WQMPs may range in complexity from visual inspections for sedimentation and protection measure failure to laboratory or field analysis of chemical and biological effects on water quality or organisms (acute/chronic bioassay), dependent on a given water resource.</p>		X	X	X	X	X	X	X

Item	BMP	Description	Activities			Resources				
			Design	Construction	Operation	Geological & Soil	Water	Terrestrial Biological	Marine Biological	Hazardous Materials
5	Leadership in Energy and Environmental Design (LEED) Certification	<p>Current Navy/Marine Corps policy supports Leadership in Energy and Environmental Design (LEED). The policies support and facilitate Silver certification for bases. LEED is a voluntary point system tool that measures the degree of sustainability features incorporated into a development. Some LEED requirements include:</p> <ul style="list-style-type: none"> <li>• Reduction of electrical energy use in buildings by 10% to save power.</li> <li>• Construction materials: use of local sources. Navy guidance and qualification for LEED Silver points requires that 50% non-hazardous waste and demolition debris are recycled.</li> <li>• Increased water efficiency.</li> <li>• Renewable energy.</li> </ul> <p>The sustainability/LEED initiatives would help reduce potable water use and should have a positive effect on demand for wastewater treatment.</p>	X	X	X	X	X	X	X	X
6	Low Impact Development (LID)	<p>The Navy would implement Low Impact Development (LID) design technology to make use of innovative methods to capture stormwater. Recommendations of a Comprehensive Drainage and LID Implementation Study would also be implemented. Examples of LID design include:</p> <ul style="list-style-type: none"> <li>• Grassed channel (channel stabilized by vegetation to convey water down a slope).</li> <li>• Grassed vegetation maintained on berms.</li> <li>• Integrated pest management, including proper handling of construction waste (cans, tires, drums, etc.) to avoid stagnant water collection that could harbor mosquitoes and other vectors.</li> <li>• Native plant landscaping.</li> <li>• Avoidance of pesticides and fertilizers.</li> <li>• Bio-retention strips.</li> <li>• Watershed-based management.</li> </ul> <p>A watershed protection management approach could consider:</p> <ul style="list-style-type: none"> <li>• Participating in the development of a watershed management plan.</li> <li>• Implementing and adopting specific watershed protection strategies.</li> <li>• Designing land use planning techniques that reduce or shift impervious cover and enhance percolation.</li> <li>• Work towards achieving important water resource goals.</li> </ul>	X	X	X	X	X	X	X	X

Item	BMP	Description	Activities			Resources				
			Design	Construction	Operation	Geological & Soil	Water	Terrestrial Biological	Marine Biological	Hazardous Materials
		On Tinian, LID would include the use of ecologically, leach field friendly chemicals for treatment of wastewater.								
7	Energy Policy Act of 2005 (EPACT)	Energy Policy Act (EPACT) compliance includes analysis and life-cycle cost analysis using a simulated model and the following energy conservation measures: <ul style="list-style-type: none"> <li>• Buildings achieve an energy consumption level that is 30% below the level achieved by ASHRAE Standard 90.1.</li> <li>• Use low energy consuming products that are either Energy Star-qualified or Federal Energy Management Program-recommended.</li> <li>• Optimize building orientation to reduce cooling loads or energy loads to cool the buildings.</li> <li>• Optimize building insulation.</li> <li>• Seal building envelope for air tightness.</li> <li>• Incorporate “cool roof” building designs.</li> <li>• Use motion detectors to reduce lighting and to setback cooling in unoccupied buildings.</li> <li>• Natural lighting.</li> </ul>	X	X	X	X	X	X		X

Item	BMP	Description	Activities			Resources				
			Design	Construction	Operation	Geological & Soil	Water	Terrestrial Biological	Marine Biological	Hazardous Materials
8	Water Conservation Plan	<p>Water Conservation Plans include as the use of:</p> <ul style="list-style-type: none"> <li>• Low-flow faucets.</li> <li>• Ultra-low-consumption toilets/urinals with electric flush sensors.</li> <li>• Low-flow showerheads.</li> <li>• Lower flow commercial-type “Energy Star” washing machines in housing units.</li> <li>• Energy and water-saving dishwashers (Energy Star).</li> <li>• Water softeners only as needed.</li> <li>• wastewater recycling in industrial washing and rinsing of aircraft and vehicles.</li> <li>• Water-efficient cooling systems.</li> <li>• Minimal landscape irrigation and no irrigation at housing.</li> <li>• Rainwater collection and reuse.</li> <li>• Meters installed at all facilities and key locations within the water distribution system that can significantly improve the ability to quickly identify leaks and take corrective action.</li> </ul> <p>In addition, educate the military population regarding practices that would conserve water (including full-load clothes washing).</p>	X	X	X		X			
9	Hazardous Materials Management Plans (HMMP)	<p>HMMPs describe implementation procedures for the transportation, storage, use, and disposal of hazardous materials. HMMPs would also include waste minimization plans that provide protocols designed to encourage and promote the efficient use of hazardous materials, substitute products that are less toxic whenever feasible, minimization of their use, and promote recycling and reuse of hazardous materials. HMMPs would contain procedures such as:</p> <ul style="list-style-type: none"> <li>• Hazardous materials spill/release control (use of secondary containment and leak detection methods in operations involving liquid hazardous substances).</li> <li>• Construction materials and all construction-related materials should be free of leachable pollutants.</li> <li>• Train personnel (DoD personnel and contractors are trained in proper labeling, container, storage, staging, and transportation requirements for hazardous substances. Also, they are trained in accordance with spill prevention, control, and cleanup methods).</li> </ul>		X	X	X	X		X	X

Item	BMP	Description	Activities			Resources			
			Design	Construction	Operation	Geological & Soil	Water	Terrestrial Biological	Marine Biological
		<ul style="list-style-type: none"> <li>• Perform all vehicle maintenance activities at existing DoD maintenance shops.</li> <li>• Ensure that all personnel and contractors store, handle, and dispose of all POL per all applicable local and federal laws, regulations, and requirements.</li> <li>• As necessary, expand Defense Reutilization Marketing Offices (DRMO) hazardous materials storage, transportation, and disposal capacity prior to any expected increases. Note that a Joint Military Master Plan provides specific details regarding several new facilities. These new facilities would be required to store, handle, and dispose of the estimated increases in hazardous substances that would occur from the potential DoD unit transfers to Guam.</li> <li>• Contaminated topsoil removed from the site should be properly disposed of in an approved landfill in accordance with applicable regulatory requirements</li> <li>• Ensure that sediments to be dredged and soils to be excavated are well characterized, properly handled, and disposed of to minimize dispersal of any contaminants that may be present.</li> <li>• Temporary equipment laydown or construction staging areas would be located in previously disturbed (e.g., paved) areas.</li> <li>• Minimize the use of contaminated sites for new construction. When new construction occurs on sites where contamination and/or munitions and explosives of concern have been identified, ensure that the risk of human/ecological risk and exposure is minimized via the use of site-specific health and safety plans, engineering and administrative controls, and PPE. These site-specific health and safety plans must specifically address how these controls would be implemented to ensure the protection of human health and the environment. In addition, as appropriate conduct Phase I and II Environmental Site Assessments prior to construction activities and ensure that designs consider and address contaminated sites as appropriate.</li> </ul>							

Item	BMP	Description	Activities			Resources				
			Design	Construction	Operation	Geological & Soil	Water	Terrestrial Biological	Marine Biological	Hazardous Materials
10	Hazardous Waste Management Program (HWMP)	<p>HWMPs include waste minimization plans that provide protocols designed to encourage and promote the efficient use of hazardous waste, substitute products that are less toxic whenever feasible, minimize their use, and promote recycling and reuse of hazardous waste. HWMPs include the following recommendations:</p> <ul style="list-style-type: none"> <li>• Update and implement the existing HWMP to include procedures for the transportation, storage, use, handling, and disposal of hazardous waste. Also, modify project-specific hazardous waste disposal protocol as appropriate.</li> <li>• Ensure personnel and contractor training regarding project- and facility-specific hazardous waste plans.</li> <li>• The use of spill/release control (use of secondary containment and leak detection methods in operations involving liquid hazardous substances).</li> <li>• Ensure all DoD personnel and contractors are trained in accordance with the Guam public law (PL) 29-26 regarding the importation, handling, use, and application of pesticides (e.g., during maintenance, pre and post construction, and general operations activities).</li> <li>• Ensure appropriate housekeeping protocol (improving overall hazardous waste housekeeping practices, keeping area swept, wiping up spills, etc.).</li> <li>• Perform all maintenance activities at existing DoD maintenance shops.</li> <li>• Ensure that DRMO has sufficient hazardous waste storage, transportation, and disposal capacity prior to any expected increases. Note that a Joint Military Master Plan provides specific details regarding several new facilities. These new facilities would be required to store, handle, and dispose of the estimated increases in hazardous substances that would occur from the potential DoD unit transfers to Guam.</li> <li>• Ensure all federal, local, and DoD laws and regulations are being observed via inspections/audits/surveillances and implement corrective actions as necessary. Also ensure that all personnel and contractors manage, store, handle, transport, and dispose of hazardous wastes in accordance with applicable local (Guam EPA or CNMI Department of Environmental Quality (DEQ), USEPA, RCRA, and HSWA requirements).</li> <li>• Ensure that contaminated topsoil removed from sites is properly disposed</li> </ul>		X	X	X	X			X

Item	BMP	Description	Activities			Resources			
			Design	Construction	Operation	Geological & Soil	Water	Terrestrial Biological	Marine Biological
		<p>of in accordance with applicable regulatory requirements.</p> <ul style="list-style-type: none"> <li>• Ensure that sediments to be dredged and soils to be excavated are well characterized, properly handled, and disposed of to minimize dispersal of any contaminants that may be present.</li> <li>• Temporary equipment laydown or construction staging areas would be located in previously disturbed (e.g., paved) areas.</li> <li>• Minimize the use of contaminated sites for new construction. When new construction occurs on sites where contamination and/or MEC has been identified, ensure that the risk of human/ecological risk and exposure is minimized via the use of site-specific health and safety plans, engineering and administrative controls, and PPE in accordance with CFR 29 1910.120 (hazardous waste operations and emergency response operations). These site-specific health and safety plans must specifically address how these controls would be implemented to ensure the protection of human health and the environment. In addition, as appropriate conduct Phase I and II Environmental Site Assessments prior to construction activities and ensure that designs consider and address contaminated sites as appropriate.</li> </ul>							

Item	BMP	Description	Activities			Resources				
			Design	Construction	Operation	Geological & Soil	Water	Terrestrial Biological	Marine Biological	Hazardous Materials
11	Spill Prevention, Control and Counter-measures Plans (SPCC) and Facility Response Plans (FRPs)	<ul style="list-style-type: none"> <li>Update and implement existing SPCC plan to assess and respond to hazardous substance spills and/or releases.</li> <li>Update and implement existing FRPs for responding to releases, leaks, or spills of hazardous substances.</li> <li>Ensure DoD personnel are trained as to proper labeling, container, storage, staging, and transportation requirements for hazardous substances. Also, ensure they are trained in accordance with spill prevention, control, and cleanup methods.</li> <li>Ensure petroleum, oil and lubricants (POL)/fuel transfers kept away from water bodies and a response/contingency plan is in place in the event of any releases, leaks, or spills.</li> <li>Ensure proper labeling of all hazardous substance containers to prevent inappropriate storage or use.</li> <li>Contaminant migration control (e.g., reducing contaminant migration pathways by preventing releases to drains, pipelines, and sewers and the use of absorbent pads and materials to prevent and control spills and releases).</li> <li>Ensure that contaminants (e.g., oils, greases, lubrication fluids for heavy equipment) are properly stored at work sites and temporary construction staging areas to avoid spills, releases, and leaks.</li> <li>Ensure that emergency response plans are in place for responding to releases, leaks, or spills of hazardous substances.</li> <li>Minimize the risk of uncontrolled leaks, spills, and releases through industry and Navy accepted methods for spill prevention, containment, control, and abatement.</li> <li>Minimize the risk of human exposure to contaminated media through the use of a site-specific health and safety plan, engineering and administrative controls, and appropriate personal protective equipment (PPE) (e.g., indicating where eye-wash stations, fire extinguishers, etc., are located).</li> </ul>		X	X	X	X	X	X	X

Item	BMP	Description	Activities			Resources				
			Design	Construction	Operation	Geological & Soil	Water	Terrestrial Biological	Marine Biological	Hazardous Materials
12	Integrated Pest Management Plan (IPMP)	<ul style="list-style-type: none"> <li>DoD would develop and implement a comprehensive IPMP. This IPMP would encompass all activities regarding the importation, handling, storage, use, and application of pesticides as well as address prevention of the introduction of potential invasive species to Guam.</li> <li>DoD personnel and contractors would be trained in accordance with Guam public law (PL) 29-26 regarding the importation, handling, use, and application of pesticides (e.g., during maintenance, pre and post construction, and general operations activities).</li> </ul>		X	X					X
13	Munitions and Explosives of Concern (MEC)	<ul style="list-style-type: none"> <li>Comply with all applicable MEC protocol, procedures, and guidance including, but not limited to the Naval Ordnance Safety and Security Activity (NOSSA) Instruction 8020.15B Explosives Safety Review, Oversight, and Verification of Munitions Responses prior to any construction/demolition or other site activities.</li> <li>Reduce the potential exposure to unexploded ordnance (UXO) through surveys or other means to identify and remedy this hazard prior to building upon a site. Work would be conducted by qualified UXO specialists.</li> <li>Implement routine firing range clearance operations (e.g., annually or as needed), perform sampling and analysis as deemed necessary, and implement all applicable DoD MEC operations guidance to minimize or eliminate potential MEC explosion hazards and other adverse impacts (including depositions with potential to leach into the subsurface).</li> <li>Implement land use controls, signage, periodic inspections, and other means to ensure no unauthorized access to firing ranges, MEC, and/or hazardous substances.</li> <li>Train construction crews on identifying and responding to MECs encountered in the field. UXO personnel would be available to monitor earthmoving activities.</li> </ul>		X	X		X		X	X

Item	BMP	Description	Activities			Resources				
			Design	Construction	Operation	Geological & Soil	Water	Terrestrial Biological	Marine Biological	Hazardous Materials
14	Land Use Planning and Project Design	<p>Land Use Planning and Project Design BMPs include:</p> <ul style="list-style-type: none"> <li>Minimize impacts through design, and incorporating site plans that attempt maximum land use efficiency. Place future industrial use sites in the vicinity of similar DoD industrial uses.</li> <li>Use the community development planning process to minimize impacts to land use.</li> <li>Maintain a perimeter buffer within DoD property boundaries.</li> <li>Reduce seismic, liquefaction and ground shaking by following Unified Facility Code 3-310-04 Seismic Design for Buildings (USACE 2007).</li> <li>Construction planning would avoid locating new buildings over unstable karst features to prevent collapse and reduce unnecessary compaction.</li> <li>Avoid locating new building construction in flood hazard areas, or if necessary, fortify or elevate them above base flood elevation where possible.</li> <li>Minimize land acquisitions.</li> <li>Install utilities in existing corridors to the extent possible.</li> <li>Avoid the acquisition of public facilities, such as park land, to the extent practical (FHWA).</li> </ul>	X	X		X	X	X		
15	Natural Resource Management (Terrestrial Focused)	<p>Various measures are currently used to minimize impacts to the terrestrial environment from project-related activities such as:</p> <ul style="list-style-type: none"> <li>No-Training Areas within a 328-ft (100-m) radius around Mariana swiftlet caves at Naval Munitions Site (NMS).</li> <li>No-Training Areas around wetlands with known Mariana common moorhen nesting activity.</li> <li>Implement Brown Tree Snake (BTS) Control and Interdiction or Management Plans (COMNAV Instruction 5090.10A, dated February 2005; Andersen AFB 36 WG Instruction 32-7004 dated March 2006).</li> <li>Prevent the spread of invasive species by implementing a training SOP; troops would receive awareness training and would inspect all gear and clothing (e.g., boots, bags, weapons, pants) for soil accumulations, seeds, invertebrates, and possible inconspicuous stow away BTS.</li> <li>Trap BTS at swiftlet caves. The Navy has been contracting with USDA Wildlife Services to trap BTS at the swiftlet caves and in housing areas.</li> </ul>		X	X		X	X		X

Item	BMP	Description	Activities			Resources				
			Design	Construction	Operation	Geological & Soil	Water	Terrestrial Biological	Marine Biological	Hazardous Materials
16	Natural Resource Management (Marine Focused)	<p>Minimize contamination of the marine environment from project-related activities through actions such as:</p> <ul style="list-style-type: none"> <li>Contractors are required to have and to implement a contingency plan to control and contain toxic spills, including petroleum products. Appropriate materials to contain and clean potential spills would be maintained and readily available at the work site.</li> <li>All construction project-related materials and equipment placed in the water would be free of pollutants. The project manager and heavy equipment operators would perform daily pre-work equipment inspections for cleanliness and leaks. All heavy equipment operations would be postponed or halted should a leak be detected, and would not proceed until the leak is repaired and equipment cleaned. This information is written into the construction contract conditions.</li> <li>Fueling of construction project-related vehicles and equipment would take place at least 50 feet away from the water, preferably over an impervious surface. With respect to construction equipment (dredging barges) that cannot be fueled out of the water, spill prevention booms would be employed to contain any potential spills. Any fuel spilled would be cleaned up immediately.</li> <li>A plan would be developed and implemented to prevent construction debris from entering or remaining in the marine environment during the project.</li> </ul>		X	X		X		X	X

Item	BMP	Description	Activities			Resources				
			Design	Construction	Operation	Geological & Soil	Water	Terrestrial Biological	Marine Biological	Hazardous Materials
17	Public Outreach/ Education	<p>Develop and implement a Public Outreach Program to:</p> <ul style="list-style-type: none"> <li>• Inform residents, businesses, and service providers about the project schedule and other relevant information.</li> <li>• Implement public awareness education seminars and workshops regarding the dangers of munitions and explosives of concern (MEC) the importance of staying off firing ranges, and what to do if MEC is suspected or observed.</li> <li>• Promote public meeting announcements by posting ads and placing public notices in multiple places and on the internet.</li> <li>• Provide public meeting written materials translated in Chamorro and Filipino, supply an interpreter at public meetings. Mail announcements of public meetings to areas that may be disproportionately impacted by proposed actions (i.e., residents of Dededo, Yigo, Barrigada, Mangilao, Piti, Santa Rita, Agat, and Talofofo).</li> <li>• Mail announcements of public meetings to more rural areas in the south (i.e., Agat and Talofofo).</li> <li>• Hold public meetings in areas accessible to public transportation and in the southern region in locations accessible to as many people in that region as possible noting that public transportation may not be available in all rural areas.</li> </ul>		X		X		X	X	X
18	Army Corps of Engineers (USACE)	<p>USACE permit conditions and BMPs from recent Apra Harbor projects (that minimize degradation of water quality and impacts to fish and wildlife resources) provide the following recommendations (the project-specific permit may have additional conditions and protective measures):</p> <ul style="list-style-type: none"> <li>• All project-related materials and equipment (dredges, barges, etc.) placed in the water should be clear of pollutants prior to use; i.e., no project-related materials (fill, revetment rock, etc.) should be stockpiled in the water (intertidal zones, reef flats, etc.).</li> <li>• All debris removed from the marine/aquatic environment should be disposed at an approved upland or ocean-dumping site.</li> <li>• No contamination (trash or debris disposal, alien species introductions, etc.) of adjacent marine/aquatic environments (reef flats, channels, open ocean areas, stream channels, etc.) should result from project-related</li> </ul>		X	X	X	X	X	X	

Item	BMP	Description	Activities			Resources				
			Design	Construction	Operation	Geological & Soil	Water	Terrestrial Biological	Marine Biological	Hazardous Materials
		<p>activities.</p> <ul style="list-style-type: none"> <li>Fueling of project-related vehicles and equipment should take place away from the water.</li> <li>A contingency plan to control petroleum products accidentally spilled during the project should be developed.</li> <li>Absorbent pads and containment booms should be stored on-site to facilitate the clean-up of accidental petroleum releases.</li> <li>Any under-layer fills used should be protected from erosion with stones (or concrete cover layer units) as soon after placement as practicable.</li> <li>Dredged material dewatering areas should be constructed and operated in accordance with all permit requirements. (Where applicable, a dewatering plan would be submitted to the GEPA prior to placing dredged material in upland placement sites.)</li> <li>Whenever possible, dredged material would be reused. Where applicable, prior to disposal of dredge materials, a sampling and analysis plan would be submitted to the GEPA.</li> <li>Provide advanced public notice of dredging activities to minimize conflicts with commercial shipping, recreational boating and other recreational activities.</li> <li>Additional ship traffic should be addressed through scheduling and communications between Port Operations and contractors.</li> </ul> <p>In addition, USACE 404 and 401 permits require compliance with conditions and measures to protect water quality such as:</p> <ul style="list-style-type: none"> <li>The installation of silt curtains in nearshore, shallow water areas to control turbidity.</li> <li>Dredging operations may be suspended during inclement weather to prevent accidental release of dredged material and to ensure the integrity of silt curtains or other containment barriers, if utilized.</li> <li>Water quality monitoring.</li> <li>Adjustments resulting from water quality monitoring such as slowing or stopping operations.</li> </ul>								
19	Transportation Federal Highway	<p>Roadway project construction BMPs include the following recommendations:</p> <ul style="list-style-type: none"> <li>Individual roadway projects should be designed and constructed in</li> </ul>		X		X	X	X		X

Item	BMP	Description	Activities			Resources				
			Design	Construction	Operation	Geological & Soil	Water	Terrestrial Biological	Marine Biological	Hazardous Materials
	Administration-(FHWA) specific	<p>accordance with the Safe, Accountable, Flexible, and Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) objectives.</p> <ul style="list-style-type: none"> <li>• Final roadway designs should avoid contaminated sites where possible.</li> <li>• Temporary equipment laydown or construction staging areas should be located in previously disturbed (e.g., paved) areas.</li> <li>• Material from demolition of existing road pavements should be stored in previously disturbed areas whenever possible.</li> <li>• Final roadway designs should include coordination with the responsible party to ensure that roadway construction does not interfere with ongoing remediation activities.</li> <li>• A Phase II environmental site assessment should be conducted for roadway projects with Right-of Way (ROW) acquisitions of non-residential property.</li> <li>• Individual roadway projects should be designed and constructed in accordance with recommendations of the project- and site-specific geotechnical investigation, and applicable geotechnical code requirements.</li> <li>• In accordance with Section 10106 (<i>General Requirements: Erosion and Sediment Control Plans</i>) of the GSESCR, an Erosion and Sediment Control Plan for roadway construction/work should be prepared, submitted to the GEPA for review and approval, and implemented in construction plans and practices to the maximum extent practicable.</li> <li>• Prevent leaks or spills of contaminants by ensuring all temporary equipment laydown or construction staging areas are constructed with secondary containment for storage of any hazardous or petroleum products (FHWA).</li> <li>• Locate temporary equipment laydown or construction staging areas in previously disturbed (e.g., paved) areas (FHWA).</li> </ul>								

Item	BMP	Description	Activities			Resources				
			Design	Construction	Operation	Geological & Soil	Water	Terrestrial Biological	Marine Biological	Hazardous Materials
20	Noise Abatement	<p>BMPs to abate noise from roadway construction include the following:</p> <ul style="list-style-type: none"> <li>• Ensure that all equipment items have the manufacturers' recommended noise abatement measures, such as mufflers, engine enclosures, and engine vibration isolators, intact and operational.</li> <li>• Inspect all construction equipment at periodic intervals to ensure proper maintenance and presence of noise control devices (e.g., mufflers and shrouding).</li> <li>• Turn off idling equipment.</li> <li>• Implement a construction noise monitoring program to limit the impacts.</li> <li>• Plan noisier operations during times least sensitive to receptors.</li> <li>• Avoid scheduling construction during nighttime hours (10:00 p.m. to 7:00 a.m.) and on weekends.</li> <li>• Keep noise levels relatively uniform and avoid impulsive noises.</li> <li>• Maintain good public relations with the community to minimize objections to the unavoidable construction impacts.</li> <li>• Provide frequent activity updates of all construction activities.</li> </ul>		X	X			X		
21	Utilities	<p>For roadway projects, planning and continued coordination with utility providers during the preliminary engineering and final design, and construction stages of the project should minimize or eliminate interruption in utility service to customers.</p> <ul style="list-style-type: none"> <li>• Where feasible, utility relocations should be undertaken prior to roadway construction activities.</li> </ul>		X						
22	Cultural Resources	<ul style="list-style-type: none"> <li>• Archaeological monitoring of medium probability areas during construction in consultation with the State Historic Preservation Officer.</li> <li>• For post review discoveries, an assessment would be made for National Register of Historic Places eligibility in consultation with the State Historic Preservation Office.</li> <li>• For areas or properties that have not been inventoried for historic properties, the DoD would follow Standard Operating Procedures as outlined in the Integrated Cultural Resources Management Plan and Section 106 consultation.</li> </ul>		X	X	X				
23	Range Training Area Management	<p>Update the existing training area management plans to include the new ranges. There are many management practices addressed in the plan including the following:</p>			X	X	X	X	X	X

Item	BMP	Description	Activities			Resources				
			Design	Construction	Operation	Geological & Soil	Water	Terrestrial Biological	Marine Biological	Hazardous Materials
	Plan	<ul style="list-style-type: none"> <li>Remove expended rounds from the ranges periodically and transporting them to an appropriate recycling contractor or smelter in accordance with appropriate regulations.</li> <li>Develop and implement a Range Safety Program to conduct or coordinate training area safety, emergency response (medical and fire), Explosive Ordnance Disposal, Training Mishap Investigations, safety training, and range inspections.</li> <li>Develop and implement a Fire Management Plan.</li> <li>Implement all applicable DoD Range Management procedures and protocol.</li> <li>Adhere to protective measures established in natural and cultural resource management plans.</li> <li>Controls for training area airspace in accordance with Federal Aviation Administration regulations and agreements, with an objective of use by multiple agencies with minimal interference and maximum safety.</li> <li>Manage of movement and access into and within the training area by monitoring and controlling use of surface roads, shorelines and adjacent water areas, and airspace above the Range Training Area.</li> <li>Publication of advanced notice for periods of range use to airman, mariners, and the general public as required for safe training area operations.</li> <li>Comply with water protection measures and Military Handbook 1027/3B to minimize the potential for groundwater leachate to affect the production wells, proposed range maintenance activities and training operations would be in compliance with</li> <li>Implement Military Handbook 1027/3B contains procedures for reducing potential impacts from ranges. These include adding soil amendments to maintain the soil pH between 6 and 8, maintaining vegetation on berms and drainage ways and turf on the range, contaminant monitoring, and reclamation and recycling of spent ammunition.</li> <li>Implement a monitoring program to identify any early indications of lead movement so that action could be taken to address any potential water quality impacts.</li> </ul>								

Item	BMP	Description	Activities			Resources			
			Design	Construction	Operation	Geological & Soil	Water	Terrestrial Biological	Marine Biological
24	Environmental Protection Plan (EPP)	An Environmental Protection Plan (EPP) is required for projects at the discretion of the GEPA Administrator. EPPs are specifically identified in 22 Guam Annotated Regulations, Division II, Chapter 10, Section 10103.C.5 (d). EPPs would include nonpoint source control management measures including erosion and sedimentation control, vegetation, wildlife resource protection measures, fugitive dust control, solid and hazardous waste management and disposal procedures, nutrient management plan, integrated pest management strategy/plan, confined animal facilities management plan, irrigation water management plan, personnel safety procedures, work site maintenance, and typhoon contingency plans, as necessary, depending on the work, project, activity and facility function.		X	X	X	X	X	X
25	Seismic Design for Buildings (SD4B)	During project design and construction, hazards associated with earthquakes and fault rupture would be minimized by adherence to UFC 3-310-04 Seismic Design for Buildings (USACE 2007).	X	X		X			
26	Armed Forces Ballast Water Management Program	Ships must strictly comply with fuel transfer and ballasting procedures to ensure ballast water does not become contaminated with oil or any other waste. Ships using self-compensating fuel tanks are required to ensure adequate margin is preserved to prevent inadvertent discharges of oil with the compensating water. Navy ships must prevent the introduction of non-native organisms into natural ecosystems. Ship Ballast Water and Anchor System Sediment Control provide measures to prevent introductions of aquatic species.			X			X	
27	Awareness Training	Increase awareness training regarding the consequences of drug and alcohol use.		X	X				
28	Domestic Animal Control (MCO 11000.22)	Limits the number and type of household pets allowed per military family and requires microchip identification of pets.		X	X			X	

Item	BMP	Description	Activities			Resources				
			Design	Construction	Operation	Geological & Soil	Water	Terrestrial Biological	Marine Biological	Hazardous Materials
29	US Army Corps of Engineers (USACE)	Compliance with USACE 404 and 401 permit conditions such as: <ul style="list-style-type: none"> <li>• The installation of silt curtains in nearshore shallow water areas to control turbidity.</li> <li>• Dredging operations may be suspended during inclement weather to prevent accidental release of dredged material and to ensure the integrity of silt curtains or other containment barriers, if utilized.</li> <li>• Water quality monitoring.</li> <li>• Adjustments resulting from water quality monitoring such as slowing or stopping operations.</li> </ul>		X			X		X	

## 2.2 PROPOSED MITIGATION MEASURES ON GUAM AND TINIAN

Implementing the proposed actions described in each volume of this EIS would result in impacts to various resources either during construction or from steady-state operations after construction. This section lists the proposed mitigation measures identified during the NEPA environmental review of the proposed actions. Implementation of the mitigation measures would avoid or reduce the impacts resulting from proposed construction and operations. Generally, there are two categories of proposed mitigation measures that are discussed in this EIS:

- Mitigation measures within DoD control - DoD has statutory authority to implement actions taking place on lands under its control. DoD has limited statutory authority to implement natural and cultural resources mitigation measures on non-DoD land.
- Mitigation measures outside of DoD control - Except for the limited authority applicable to natural/cultural resources identified above, DoD does not have statutory authority to undertake mitigation measures on non-DoD land.

Mitigation measures involving expansion or improvement to utilities, roadways, and other public services can be addressed by state and local governments using revenues from an expanded tax base, adjusted utility rates, connection fees, and other service charges. Taxes, rates, fees, and service charges are the tools state and local governments commonly use to address increased demand or improvements to public services they provide or control. Recognizing Guam's unique circumstances and that world economic conditions may make it difficult for Guam to address measures on non-DoD lands using normal revenue sources, the DoD is committed to working with Guam and the full array of federal executive agencies to identify potential sources of funding to assist Guam in implementing mitigation measures on non-DoD land.

Both DoD-controlled and non-DoD controlled mitigation measures that would avoid, minimize, replace, or compensate for impacts if implemented by DoD or non-DoD agencies are included in Table 2.2-1. The measures listed in Table 2.2-1 are applicable to the preferred alternatives, unless noted otherwise. Reasonable alternatives were developed based on a consideration for avoiding and/or minimizing potential impacts as a result of implementing the proposed alternatives. All proposed mitigation measures identified in the table are considered within DoD control and would be implemented by DoD unless otherwise noted in **bold** text in the table (e.g., **This measure falls within GovGuam authority to implement**). Some of the mitigation measures are applicable to multiple resource areas and these are noted in *italics*. The table provides only a brief summary of each mitigation measure proposed in the EIS. For more information about a mitigation measure, refer to the section(s) of the EIS identified in the third column of the table.

**Table 2.2-1. Summary of Proposed Mitigation Measures (Guam and Tinian)**

<i>Proposed Mitigation Measure</i>		<i>Reference</i>
<b>Geological and Soil Resources (GS)</b>		
GS-1	Avoid known sinkholes and place a buffer zone of vegetation around them to prevent further erosion or expansion. Erect educational signs and/or fencing where appropriate. Any sinkholes discovered would be evaluated to determine significant impacts and projects would be designed in consideration of these sinkholes as appropriate.	V2.3.2.3.5 V2.3.2.8 V3.3.2.6 V3.3.2.7 T3.3.2-6 V5.3.2.2.1 T5.3.2-5
<b>Water Resources (WR; See also Marine Biological Resources category)</b>		
WR-1	Attempt to avoid impacts to wetlands; if avoidance is not possible then minimize potential impacts. Section 404 of the CWA requires mitigation of unavoidable wetland disturbances. Compensate by creating new wetlands or restoring, enhancing, or preserving existing wetland areas to, at a minimum, replace the area.	V2.4.2.4.6 V2.4.2.5.6 T2.4.2-8 V2.4.2.9 V5.4.2.2.3 T5.4.2-4
WR-2	Channel widening, lining and/or re-contouring.	V6.6.2.6.7 T6.6.2-7
WR-3	Pier placement and/or reconfiguration.	V6.6.2.6.7 T6.6.2-7
WR-4	Utility line relocation where utilities cause obstructions to stream flow.	V6.6.2.6.7 T6.6.2-7
WR-5	Debris removal, incorporation of debris noses upstream of piers and wingwalls.	V6.6.2.6.7 T6.6.2-7
WR-6	Aquatic habitat enhancements at Camp Covington or other identified areas to mitigate for bridge and culvert replacements in accordance with Section 404 of CWA permitting requirements.	V6.6.2.6.7 T6.6.2-7
<b>Air Quality (AQ)</b>		
AQ - 1	Install permanent ambient air quality monitoring station for SO <sub>2</sub> and PM in coordination with USEPA and GEPA.	V2.5.2.8
AQ - 2	Install temporary air quality monitoring station for SO <sub>2</sub> and PM near Northern Guam construction site.	V2.5.2.8
<b>Noise (N) Human Receptors</b>		
N-1	Operations (Firing Ranges): noise barriers installed where feasible and practical.	V2.6.2.2.2
N-2	During construction, install noise barriers where feasible and practical such as constructing concrete block walls as sound barriers to reduce noise levels.	V2.6 V2.6.2-19 V5.6.2.2.1 V5.6.2.7 T5.6.2-4
N-3	Techniques for reducing noise impacts from firing ranges include: <ul style="list-style-type: none"> <li>• Maintaining the current dense foliage, and</li> <li>• Constructing berms to contain the sound, when practical.</li> </ul>	V2.6.2.2.1
N-4	Operations (Roadways): sound walls were determined to be feasible (based on engineering considerations) and reasonable in accordance with Guam's Traffic Noise Abatement Policy following identification of noise receptors within project corridors and preparation of noise studies. <b>(This measure would fall within DoD, FHWA, and GovGuam authority to implement)</b>	V5.6.2.2.1 V5.6.2.5 V5.6.2.6 V6.8.2.1.2
<b>Airspace – No Mitigation Measures</b>		
<b>Land and Submerged Land Use (LU)</b>		

<i>Proposed Mitigation Measure</i>		<i>Reference</i>
LU-1	Provide access to land and submerged land to extent practical. DoD is working with stakeholders to develop plans for cultural stewardship and access that balance operational needs, public safety concerns, and the continuing public use and enjoyment of these sites.	V2.8.2.9
LU-2	GovGuam to revise community land use plans to address proposed DoD land uses. <b>(This measure would falls within GovGuam authority to implement)</b>	V2.8.3.1 V2.8.3.6 V2.8.2.9 V2.8.2.6
LU-3	In the event legal access to a non-federally controlled property is acquired under the proposed action, DoD would assist the landowner in obtaining a new legal access.	V2.8.2.6
<b>Recreational Resources (RR)</b>		
RR-1	GovGuam to update Guam Comprehensive Outdoor Recreation Plan that addresses recreational user use, demand, preference, conflicts, and conditions. <b>(This measure would falls within GovGuam authority to implement)</b>	V2.9.2.2.6 V2.9.2.8 T2.9.2-1
RR-2	DoD would offer resources consistent with DoD policy in the form of time and donation or use of equipment to assist the volunteer conservation officer (VCO) at Andersen AFB.	V2.9.2.2.6 V2.9.2.8 T2.9.2-1
RR-3	Collaborate with the GDAWR to establish outreach programs and docent (person who leads guided tours) programs for the five marine preserves and other environmentally sensitive areas on Guam.	V2.9.2.2.6 V2.9.2.8 T2.9.2-1
RR-4	Provide for improvements and maintenance of federally owned portions of Tanguisson Beach, along with the management of the coastline to the north of Hilaan that contains significant natural, cultural, scenic, and recreational resources.	V2.9.2.2.6 V2.9.2.8 T2.9.2-1
RR-5	To alleviate impacts to the limited recreational resources at Polaris Point during construction and carrier visits, additional on-base shuttle bus services to Dadi Beach, Gab Gab Beach, and other DoD recreational facilities would be provided to ensure Sailors and airmen have the ability to access comparable and/or alternate recreational resources. For off-base recreational resources, Sailors and airmen would be able to take commercial shuttles and taxis.	V4.9.2.6.1 T4.9.2-6
RR-6	Establishment of outdoor recreation areas on NCTS Finegayan. This would also mitigate impacts to biological resources.	V2.9.2.2.6 V2.9.2.8 T2.9.2-1
RR-7	To compensate for potentially significant impacts to beach and ocean recreational resources from the proposed actions on Guam, DoD to improve the Seaman Service Club Beach in Piti. The existing beach pilings, shelter, and bathroom would be improved. Available recreational activities include: kayaking, snorkeling, and beach combing.	V2.9.2.2.6
<b>Terrestrial Biological Resources (TB)</b>		
TB-1	Translocate Guam tree snails at Navy Barrigada to another site on DoD lands after approval by USFWS and Guam DAWR. (Note that these are not required for Main Cantonment Alternatives 1, 2, and 8. Alternative 2 is the Preferred Alternative.)	V2.10.2.1 T2.10.2-22 V5.10.2.7 T5.10.2-8
TB-2	Approximately one week prior to clearing vegetation a qualified biologist would survey the project site for the occurrence of ESA-listed species (e.g., Mariana fruit bats, Mariana crows, and Mariana moorhens), and if present, the work would be postponed. Additionally, conduct biological surveys for Mariana common moorhens prior to initiating pavement strengthening or bridge replacement adjacent to wetlands.	V2.10.2.1 T2.10.2-22 V3.10.2.2.3 V3.10.2.7 T3.10.2-14 V5.10.2.3.1 V6,12

<i>Proposed Mitigation Measure</i>		<i>Reference</i>
TB-3	Ensure periodic updates of the Joint Region Marianas Training Handbook with procedures to protect special-status species during project-specific training.	V2.10.2.1 T2.10.2-22 V2.10.2.2.6 V3.10.2.2.3 V3.10.2.7 T3.10.2-14
TB-4	Appropriate native and non-invasive species would be planted in all new landscapes upon completion of proposed construction activities. Plants to be used would be selected from a list of recommended plants identified in the consolidated landscape plan. Construction specifications would address salvaging valuable tree species from areas to be cleared during construction.	V2.10.2.1 T2.10.2-22 V2.10.2.2.6
TB-5	Lighting will be designed to meet minimum safety, anti-terrorism, and force protection requirements. To the maximum extent practical, hooded lights would be used at all new roads and facilities proposed for construction and use near sea turtle land based habitat and within Mariana fruit bat habitat.	V2.10.2.1 T2.10.2-22 V2.10.2.2.6 V4.10.2.2.2 V4.10.2.3.1
TB-6 (MB)	To prevent disturbance of sensitive species in recreational areas, restrictions on the use of Haputo Beach and ERA would be included within the Joint Region INRMP. <i>This mitigation measure is also applicable to the marine biological resources category (MB).</i>	V2.10.2.1 T2.10.2-22 V2.10.2.2.2 V2.10.2.2.6 V2.11.2.7 V2.11.2.2.6 T2.11.2-16 V4.11.1
TB-7	Pyrotechnics would only be used during low-fire risk conditions in accordance with Range Training Area Management Plan SOPs.	V2.10.2.2.4
TB-8	The DoD would fund research on the Mariana fruit bat. The long-term goal is to develop guidelines to be used in recovery and sustainable management of fruit bats on different islands.	V2.10.2.1 T2.10.2-22
TB-9	An ungulate management plan would be finalized by the DoD for DoD lands on Guam to include specific management and control of ungulates.	V2.10.2.1 T2.10.2-22 V2.10.2.2.6
TB-10	The U.S. Forest Service (USFS) has developed a fire management plan that the DoD would use to develop Instruction to implement fire management actions on DoD (USFS 2008). The Instruction would also include BMPs such as for cleaning gear and equipment to prevent the spread of non-native invasive species resulting from wildfire suppression.	V2.10.2.1 T2.10.2-22 V2.10.2.2.6 V3.10.2.2.3 V3.10.2.7 T3.10.2-14
TB-11	To compensate for the removal of a portion of the existing FAA Mitigation Area, the mitigation area would be expanded and reconfigured and the replacement would be at a minimum 2:1 ratio.	V3.10.2.2.3 V3.10.2.7 T3.10.2-14
TB-12	The 5-Step HACCP planning method for reducing or eliminating the spread of unwanted species would be used for high-risk activities. HACCP methodology would be incorporated into contracting documents associated with high-risk projects.	V2.10.2.1 T2.10.2-22 V2.10.2.2.6 V3.10.2.7 T3.10.2-14
TB-13	Comprehensive pre-construction surveys for the eight-spot butterfly host plants in the Route 15 range area would be conducted to determine the presence of host plants, larvae, and adult butterflies within the project area for Mariana eight spot butterflies. As part of the Joint Region INRMP, periodic surveys would be conducted once the ranges are operational to	V2.10.2.1 T2.10.2-22 V2.10.2.2.6

	<i>Proposed Mitigation Measure</i>	<i>Reference</i>
	provide long-term monitoring of the status and presence of this species within the Route 15 Range Complex.	
TB-14 (MB)	The DoD would develop a biosecurity program to be employed throughout the construction phase of the military build-up. The program would have terrestrial and aquatic resource response capabilities. The DoD's biosecurity program would address non-native, invasive species issues on DoD property within Guam and the CNMI. <i>This mitigation measure is also applicable to the MB category.</i>	V2.10.2.1 T2.10.2-22 V2.10.2.2.6 V2.11.2.7 V2.11.2.2.6 T2.11.2-16 V4.11.1
TB-15	To prevent the spread of coconut rhinoceros beetle, the DoD would include specifications in contracts for inspections, proper re-use or disposal of vegetation within coconut rhinoceros beetle quarantine area. Biosecurity measures would ensure that yard waste and vegetation debris is not harboring coconut rhinoceros beetle or the waste is treated prior to re-use or movement off construction site.	V2.10.2.1 T2.10.2-22 V2.10.2.2.6
TB-16	Management options would be assessed for invasive species that are threatening special-status or SOGCN species.	V2.10.2.1 T2.10.2-22 V2.10.2.2.6
TB-17	DoD would provide funding during the construction phase of the Proposed Action to develop methods to eradicate or significantly suppress BTS on DoD lands.	V2.10.2.1 T2.10.2-22 V2.10.2.2.6
TB-18	Require DoD recreational boaters departing from DoD marinas who travel to other islands to conduct BTS self-inspections.	V2.10.2.1 T2.10.2-22 V2.10.2.2.6
TB-19	The DoD would expand the existing environmental education program for new personnel arrivals (personnel undergoing Permanent Change of Station).	V2.10.2.1 T2.10.2-22 V2.10.2.2.6
TB-20	DoD would submit proposals: <ul style="list-style-type: none"> <li>• To expand the existing Orote ERA to protect Orote Island (seabird nesting habitat), Adotgan Point, and the Spanish Steps area that supports sea turtle nesting. The expansion would add approximately 32 ac (13 ha) of terrestrial habitat to the Orote ERA;</li> <li>• For a NMS ERA. The proposed ERA would encompass approximately 553 ac (234 ha) of habitat for listed species;</li> <li>• For a Ritidian Point ERA. The entire proposed Ritidian Point ERA would be approximately 781 ac (316 ha) of habitat for listed species;</li> <li>• For a Pati Point ERA. The proposed ERA would include approximately 713 ac (289 ha) of habitat for listed species, and</li> <li>• To develop a continuous band of protected area from Andersen AFB at the proposed Pati Point ERA through GovGuam's Anao Conservation Area south to the proposed Route 15 Range Complex.</li> </ul> <p><b>(This measure falls within DoD and GovGuam authority to implement).</b> <i>This mitigation measure is also applicable to the MB category.</i></p>	V2.10.2.1 T2.10.2-22 V2.10.2.2.6 V2.11.2.7 V2.11.2.2.6 T2.11.2-16 V4.11.1
TB-21	The DoD would develop a restoration plan for the Camp Covington wetlands in an effort to increase suitable habitat for the Mariana common moorhen. If Camp Covington is deemed unsuitable for wetland enhancement or restoration, the Atantano wetlands would be evaluated for restoration potential.	V2.10.2.1 T2.10.2-22 V2.10.2.2.6
TB-22	The DoD would enter into an MOU with USFWS and NMFS outlining the	V2.10.2.1

<i>Proposed Mitigation Measure</i>		<i>Reference</i>
(MB)	<p>details of a joint investigation on sea turtle population abundance estimates, demographic information, near shore habitat use, baseline populations, and long-term population parameters. This would be a 3 to 5 year joint DoD-USFWS-NMFS capture-mark-recapture laparoscopy program for green sea turtles occurring in near shore waters surrounding Guam, Saipan, Tinian, and Rota.</p> <p><i>This mitigation measure is also applicable to the MB category.</i></p>	<p>T2.10.2-22 V2.10.2.2.6 V4.10.2.6 V2.11.2.7 V2.11.2.2.6 T2.11.2-16 V4.11.1</p>
TB-23	Additional surveys for the moth skink and Pacific slender-toed gecko on DoD lands will be addressed in the Joint Region INRMP.	V2.10.3.6
TB-24	The DoD would establish an outdoor recreation area at the proposed Main Contonment area at NCTS Finegayan to help direct recreation away from sensitive habitats near and within the Haputo ERA (beaches, cliff line forests).	V2.10.2.1 T2.10.2-22
TB-25	Collect demographic information for the Mariana fruit bat in the Marianas archipelago.	V2.10.2.1 T2.10.2-22 V2.10.2.2.6
TB-26	Develop and implement a Guam and Tinian Native Forest Enhancement Plan to improve and restore the ecosystem and control erosion.	V2.10.2.1 T2.10.2-22 V2.10.2.2.6 V3.10.2.2.3 V3.10.2.7 T3.10.2-14
TB-27	Upon termination of any agricultural leases in the leaseback area on Tinian, DoD would work with CNMI land use and natural resource officials to ensure that native forest habitat concerns for ESA-listed species are taken into account.	V2.10.2.1 T2.10.2-22 V2.10.2.2.6 V3.10.2.2.3 V3.10.2.7 T3.10.2-14
TB-28	If nesting Mariana common moorhens are present within the limits of construction, clearing and construction would be postponed until the chicks have fledged. If work stops for more than 1 week, pre-construction surveys would be repeated to ensure that no moorhens have begun to nest.	V3.10.2.2.3 V3.10.2.7 T3.10.2-14
TB-29	On Tinian, if Micronesian megapodes are present within 492 ft (150 m) of the project site, the work would be postponed until the megapode has left the area. If megapodes are nesting within 984 ft (300 m) of the project site, the work would be postponed and the USFWS contacted immediately as no nesting is known to occur there	V3.10.2.2.3 V3.10.2.7 T3.10.2-14
TB-30	<p>Construction personnel would receive natural resource awareness briefings which address special-status species, avoidance measures and reporting requirements.</p> <p><i>This mitigation measure is also applicable to the MB category.</i></p>	<p>V2.10.2.1 T2.10.2-22 V2.10.2.2.6 V3.10.2.2.3 V3.10.2.7 T3.10.2-14 V2.11.2.7 V2.11.2.2.6 T2.11.2-16 V4.10 V4.11.1</p>
TB-31	The DoD would hire two full-time biological monitors during the construction phase on Guam and Tinian. The Biological Monitors would be responsible for oversight of avoidance, minimization, mitigation measures, and conservation measure implementation by the construction contractors for projects associated with the proposed action.	V2.10.2.1 T2.10.2-22 V2.10.2.2.6 V3.10.2.2.3 V3.10.2.7 T3.10.2-14

<i>Proposed Mitigation Measure</i>		<i>Reference</i>
TB-32	The DoD would re-evaluate and re-structure the current vegetation monitoring and anchor points that have been established on Guam and Tinian to provide information necessary for long-term habitat monitoring associated with DoD natural resources management efforts.	V2.10.2.2.2 V2.10.2.2.6 T2.10.2-22 V3.10.2.2.3 V3.10.2.7 T3.10.2-14
TB-33	The Micronesia Biosecurity Plan is being developed to address potential invasive species impacts associated with the actions proposed in this EIS as well as to provide a plan for a comprehensive regional approach. The MBP would include risk assessments for invasive species throughout Micronesia and procedures to avoid, minimize, and mitigate these risks. It is being developed in conjunction with experts within other federal agencies including the NISC, USDA-APHIS, the USGS, and the SERC. The MBP is intended to be a comprehensive evaluation of risks in the region, including all Marine Corps and Navy actions on Guam and Tinian. For actions proposed in this EIS, biosecurity measures would be implemented to supplement existing practices to address invasive species. <i>This mitigation measure is also applicable to the MB category.</i>	V2.10.2.1 T2.10.2-22 V2.10.2.2.6 V3.10.2.2.3 V3.10.2.7 T3.10.2-14 V3.11.2.7 T3.11.2-6 V4.10.2.2.2 V4.11.2 V5.10.2.3.1 T5.10.2-8
<b>Marine Biological Resources (MB)</b>		
MB-1	No in-water blasting would be allowed.	V4.11.2.2.4 T4.11.2-22
MB-2	Water quality would be monitored for in-water construction projects during the construction phase.	V2.11.2.2.6 T2.11.2-16 V4.4 V4.11.2.2.4 T4.11.2-22
MB-3	Preliminary shutdown safety zones corresponding to where sea turtles could be injured or harassed would be established based upon empirical field measurements of pile driving sound levels at the construction site. The sound pressure levels (SPLs) would be monitored on the first day of pile driving to ensure accuracy of contours. Until validation of the harm threshold, no pile driving may occur within 100 m of sea turtles and no dredging operations shall occur within 50 m of sea turtles. Safety zones would be re-established to accommodate validated harm threshold and reported to NMFS with acoustic monitoring data. Monitoring of sea turtle harassment safety zones would be conducted by qualified observers, including two observers for safety zones around each pile driving and dredging site. Monitoring shall commence 30 minutes prior to the start of pile driving. If a sea turtle is found within the safety zone, pile driving or dredging of the segment shall be until the animal(s) has been visually observed beyond the impact zone or 30 minutes have passed without re-detection. Pile driving or dredging may continue into the night, but where there has been an interruption of the activity the activity would not be initiated or re-initiated during nighttime hours when visual clearance cannot be conducted.	V2.11.2.2.6 T2.11.2-16 V4.11.2.2.4 T4.11.2-22
MB-4	Pile driving and dredging would commence using soft-start or ramp-up techniques, at the start of each work day or following a break of more than 30 minutes. Pile driving would employ a slow increase in hammering, whereas dredging would commence with slow and deliberate deployment of the bucket or chisel to the bottom for the first several cycles to alert protected species and allow them an opportunity to vacate the area prior to full-intensity operations.	V2.11.2.2.6 T2.11.2-16 V4.11.2.2.4 T4.11.2-22
MB-5	No pile driving or dredging would be conducted after dark unless that work has proceeded uninterrupted since at least one hour prior to sunset,	V2.11.2.2.6 T2.11.2-16

	<i>Proposed Mitigation Measure</i>	<i>Reference</i>
	and no protected species have been observed near the respective safety range for that work.	V4.11.2.2.4 T4.11.2-22
MB-6	If a sea turtle or other listed species is found injured within the vicinity of the action area, all in-water pile driving or dredging activities shall cease immediately, regardless of their effect on the noted turtle and the Navy would contact the regional NMFS stranding coordinator.	V2.11.2.2.6 T2.11.2-16 V4.11
MB-7	Construction related vessels within Apra Harbor shall remain at least 50 yards from sea turtles, reduce speed to 10 knots or less in the proximity of sea turtles (if practicable, 5 knots or less in areas of suspected turtle activity), and, when consistent with safety practices, put engine in neutral and allow the turtle to pass if approached by a turtle. Additionally, sea turtles shall not be encircled or trapped between multiple construction-related vessels or between construction-related vessels and the shore.	V2.11.2.2.6 T2.11.2-16 V4.11
MB-8	All construction-related equipment would be operated and anchored to avoid contacting coral reef resources during construction activities or extreme weather conditions. Anchor lines from construction vessels would be deployed with appropriate tension to avoid entanglement with sea turtles. Construction-related materials that may pose an entanglement hazard would be removed from the project site if not actively being used.	V2.11.2.2.6 T2.11.2-16 V4.11
MB-9	Anchors, anchor chain, wire rope and associated anchor rigging from construction related vessels would be restricted to designated anchoring areas within the construction footprint (ie, soft bottom) or within the area that would be permanently impacted.	V4.11 V2.11.2.7 V2.11.2.2.6 T2.11.2-16
MB-10	As prescribed in permits for previous construction activities (i.e., Kilo Wharf) during pile driving or dredging activities, if a visible plume is observed outside the silt curtains, the construction activity would be suspended, evaluated, and corrective measures taken. <i>This mitigation measure is also applicable to the water resources category (WR).</i>	V2.4.2.7 T2.4.2-8 V2.11.2.2.6 T2.11.2-16 V4.4.2.2.6 T4.4.2-6 V4.11.2.2.4
MB-11	Incorporate seasonal dredging prohibitions, which may include: <ul style="list-style-type: none"> <li>• Cessation of dredging operations during the period of peak coral spawning (7-10 days after the full moon in July) in consultation with the University of Guam (UoG) Marine Lab.</li> <li>• Dredging or filling of tidal waters would not occur during hard coral spawning periods, usually around the full moons of June, July, and August.</li> </ul>	V2.11.2.2.6 T2.11.2-16 V4.11.2.2.4 T4.11.2-22
MB-12	Construction related vessels would be restricted from Sasa Bay so as to reduce potential impacts to sea turtles and other protected marine and/or wildlife species. <i>This mitigation measure is also applicable to the terrestrial biological resources category (TB).</i>	V4.10.2.2.1 V4.10.2.2.2 V4.10.2.6 V2.11.2.2.6 T2.11.2-16 V2.11.2.7
MB-13	Provide marine biological resources education and training on Endangered Species Act (ESA), Marine Mammal Protection Act (MMPA) and Essential Fish Habitat (EFH) to military personnel. This may include Base Orders, natural resource educational training (i.e., watching of short ERA/MPA video) and documentation (i.e., preparation of <i>Military Environmental/ Natural Resource Handbook</i> , distribution of natural resource educational materials to dive boat operators), or a combination of all.	V2.11.2.7 V2.11.2.2.6 T2.11.2-16 V4.11
MB-14	Aboard dredge-related tug, barge or scow vessels at sea, use the minimum lighting necessary to comply with navigation rules and best safety practices to help reduce potential impacts on protected species such as sea	V2.10.2.1 T2.10.2-22 V2.10.2.2.6

<i>Proposed Mitigation Measure</i>		<i>Reference</i>
	turtles. <i>This mitigation measure is also applicable to the TB category.</i>	V2.11.2.2.6 T2.11.2-16
MB-15	No barge overflow during dredging operations. <i>This mitigation measure is also applicable to the WR category.</i>	V2.4.2.7 T2.4.2-8 V4.4.2.2.6 T4.4.2-6 V4.11
MB-16	Where practicable, installation of silt curtains during channel and/or harbor dredging operations to maintain water quality and provide coral protection. <i>This mitigation measure is also applicable to the WR category.</i>	V2.4.2.7 T2.4.2-8 V4.4.2.2.6 T4.4.2-6 V2.11.2.2.6 T2.11.2-16 V4.11.2.2.4
MB-17	The following are being considered as elements for coral mitigation measures for consideration under the development of the compensatory mitigation plan: <ul style="list-style-type: none"> <li>• Coral reef restoration via water quality improvements through watershed restoration.</li> <li>• Coral reef restoration via water quality improvements through WWTP upgrades/improvements.</li> <li>• Coral reef restoration via site-specific water quality improvements through retrofitting road stormwater controls at a range of sites on Guam.</li> <li>• Coral reef restoration within non-DOD federal property.</li> <li>• Aquaculture of native herbivorous fish</li> <li>• Coral transplantation</li> <li>• Establishment of marine protected area(s) MPA(s)</li> <li>• Artificial reefs</li> <li>• Support for enhanced enforcement of fishing and recreational diving regulations.</li> <li>• Marine debris removal</li> <li>• Remove nuisance algae</li> <li>• Installation of recreational mooring buoys</li> <li>• Coral reef restoration inside Apra Harbor through water quality and habitat improvements.</li> </ul>	V4.11.2.2.4
<b>Cultural Resources (CR) – (based on ongoing NHPA Section 106 Consultations, unless otherwise noted)</b>		
CR-1	Data recovery of historic properties such as archaeological sites on the island of Guam in accordance with Section 106 consultation.	V2.12.2.2.5 V2.12.2.8 T2.12.2-6 V5.12.2.3.3 T5.12.2-4
CR-2	CNMI Curation Assessment. Artifacts from non-DoD properties follow local regulations regarding the handling and repatriation of cultural materials or human remains.	V3.12.2.2.3 V3.12.2.6 T3.12.2-5
CR-3	Historic property awareness training of DoD employees to promote protection of sensitive sites. (All Alternatives for Volume 2; all Alternatives for Volume 5).	V5.12.2.2.1 V2.12.2.2.5 V2.12.2.8 T2.12.2-6
CR-4	Data recovery of historic properties such as archaeological sites on the	V3.12.2.7

	<i>Proposed Mitigation Measure</i>	<i>Reference</i>
	island of Tinian in accordance with Section 106 consultation.	T3.12.2-5
CR-5	Guam Synthesis – Data would be compiled and synthesized into one document written for the public. This disseminates information to the public and mitigate for limited access (All Alternatives).	V2.12.2.2.5 V2.12.2.8 T2.12.2-6 V5.12.2.2.1 V5.12.2.7 T5.12.2-4
CR-6	Cultural Landscape Report (CLR) for Northern Guam – the CLR would focus on installations affected by the relocation in the Northern Limestone Plateau and includes Finegayan, Andersen AFB, the Rte. 15 Range areas, Andersen South, and Barrigada (All Alternatives).	V2.12.2.2.5 V2.12.2.8 T2.12.2-6 V5.12.2.2.1 V5.12.2.7 T5.12.2-4
CR-7	Guam Curation Assessment. Curation of cultural materials and/or artifacts from DoD properties would be in a facility that meets 36 CFR 79. Curation Assessment would help in making determination of where DoD collections are curated. Artifacts from non-DoD properties follow local regulations regarding the handling and repatriation of cultural materials or human remains.	V2.12.2.2.5 V2.12.2.8 T2.12.2-6 V5.12.2.2.1 V5.12.2.7 T5.12.2-4
CR-8	Incorporate recommendations of Cultural Landscape Report (CLR) for Tinian NHL in the next version of the Cultural Resource Management Plan when not in conflict with natural resources.	V3.12.2.7 T3.12.2-5
CR-9	Thematic Synthesis Publications for the areas affected by the ranges on Tinian. Themes include: <ul style="list-style-type: none"> <li>• Camp Churo “Old Village”</li> <li>• Japanese Farmsteads on Tinian</li> <li>• West Field</li> </ul>	3.12.2.7 T3.12.2-5
CR-10	Update North Tinian Historic Properties Driving Tour Pamphlet.	3.12.2.7 T3.12.2-5
CR-11	Natural resources of cultural concern would be avoided if possible. However in places where impacts could not be avoided, artisans would be given an opportunity to harvest and collect these resources. (NEPA mitigation) <i>This mitigation measure is also applicable to the TB category.</i>	V2.12.2.2.5 V2.12.2.8 T2.12.2-6 V5.12.2.2.1 V5.12.2.7 T5.12.2-4
CR-12	Allow <i>suruhanus</i> access for medicinal plant collection on DoD properties, if the plants collected are not threatened or endangered species and where security requirements are not prohibitive. (NEPA mitigation) <i>This mitigation measure is also applicable to the TB category.</i>	V2.12.2.2.5 V2.12.2.8 T2.12.2-6 V5.12.2.2.1 V5.12.2.7 T5.12.2-4
CR-13	Indirect effects to Pagat (Sites 04-0021 and 04-0022) would be mitigated by the development of an access plan in the Range Management Plan. Public consultation in the form of a public meeting or public review would occur as part of the plan development process.	V2.12.2.2.5 V2.12.2.8 T2.12.2-6
CR-14	Update and execution of Pagat (Sites 04-0021 and 04-0022) Preservation Plan.	V2.12.2.2.5 V2.12.2.8 T2.12.2-6
CR-15	Avoidance of Latte Stone Park (Site 08-0141). Interpretive signage to be corrected and upgraded.	V2.12.2.3.4 T2.12.2-6 V5.12.2.2.1 V5.12.2.7 T5.12.2-4
CR-16	Indirect effects to Pagat (Sites 04-0021 and 04-0022) would be mitigated	V2.12.2.2.5

<i>Proposed Mitigation Measure</i>		<i>Reference</i>
	by allowing public access (e.g., recreational and tourism) to the sites when ranges are not in use. (NEPA mitigation)	V2.12.2.8 T2.12.2-6
CR-17	Access to Mt. Jumullong Manglo would be maintained through existing trail. (NEPA mitigation)	V2.12.2.2.4
CR-18	Eighth Avenue would remain open and driveable to allow access to the Tinian NHL.	V3.12.2.2.1 V3.12.2.3.1 V3.12.2.4.1
CR-19	Cumulative effects regarding the cultural heritage of Guam and CNMI would be mitigated through the establishment of a 5-year program to develop a historic preservation plan for Guam and CNMI. (NEPA mitigation)	V2.12 V3.12
<b>Visual Resources (VR)</b>		
VR-1	To maintain the existing visual appearance, land clearing and grading should be minimized to the extent possible on lands proposed for range uses.	V2.13.8 T2.13.2-6 V3.13.2.2.3 V3.13.2-7 T3.13.2-5
VR-2	Minimize impact by using native flora to create a natural-appearing “screen” around the cleared range areas, outside of the firebreaks/perimeter roads.	V2.13.8 T2.13.2-6 V3.13.2.2.3 V3.13.2-7 T3.13.2-5
VR-3	Prepare Installation Appearance Plan and implement design guidelines for all buildings.	V2.13.8 T2.13.2-6 V5.13.2.7 T5.13.2-4
VR-4	Develop and implement a landscape plan focused on retention of mature specimen trees during construction (where possible) and the establishment of a full suite of vegetation representing Guam’s native flora.	V2.13.8 T2.13.2-6 V5.13.2.7 T5.13.2-4
VR-7	Create a buffer area and screen development on NCTS between the Haputo Point Overlook and adjacent proposed development.	V5.13.2.2.1 V5.13.2.7 T5.13.2-4
VR-8	Provide an open railing to the extent possible to provide views from bridges out to the adjacent areas.	V6.15.2.6
VR-9	Hide utility crossings on bridges and in between bridge girders or use other methods of screening utilities on bridges to improve views from a bridge and to enhance the structures integration into the overall landscape.	V6.15.2.6
VR-10	Preserve existing trees or stands of vegetation by shifting the roadway alignment to the extent feasible where roadways are widened.	V6.15.2.6
<b>Transportation - Marine – No mitigation measures</b>		
<b>Transportation - Road (TR)</b>		
TR-1	Agana Bridge #1 is eligible for inclusion in NRHP. The historic stylized parapet design would be included in the replacement bridge.	V6.21.2.3
TR-2	Coordinate with utility improvements. Planning and continued coordination with utility providers during the preliminary engineering and final design and the construction stages of roadway projects would be necessary to minimize or eliminate interruption in utility service to customers. The Joint Region Marianas would coordinate with the affected service provider in each instance to ensure that work is conducted in accordance with the appropriate requirements and criteria. In addition, coordination efforts would lay out utility reroutes, identify potential conflicts, ensure that construction of the proposed project minimizes disruption to utility operations, and formulate strategies for overcoming	V6.3.2.6.1 V6.3.2.6.5

<i>Proposed Mitigation Measure</i>		<i>Reference</i>
	problems that may arise. If interruptions of utility service are required, they would be restricted in duration and geographic extent. Careful scheduling of these disruptions and advance notification to occupants of the adjacent properties that would be affected by temporary service interruptions would help to avoid any critical service periods. Where feasible, utility relocations would be undertaken in advance of roadway construction activities.	
TR-3	Implement remaining non-DAR funded off-base road projects. (17 roadways and 42 intersections that are DAR-certified or determined to be DAR-eligible and additional road projects currently being evaluated for DAR eligibility.) <b>(This measure falls within DoD and FHWA authority to implement)</b>	V6.4.2.3
TR-4	For off-base roadways: Create a detailed Traffic Management Plan which would identify and provide alternate traffic detour routes, construction materials hauling routes, bus stops, transit routes and operation hours, pedestrian routes, and residential and commercial access routes to be used during the construction period. Specific aspects of the Plan could include: <ul style="list-style-type: none"> <li>• Travel demand management.</li> <li>• Encourage moped and motorcycle use.</li> <li>• Develop transportation demand measures to discourage single-occupant vehicle use.</li> <li>• Stagger work hours.</li> <li>• Provide corporate shuttles for local circulation.</li> <li>• Better delivery system for purchases.</li> <li>• Flextime – compressed work weeks.</li> <li>• Promote trip reduction planning.</li> <li>• Traffic management would follow the Manual on Uniform Traffic Control Devices, as deemed necessary and applicable.</li> <li>• The Manual on Uniform Traffic Control Devices provides several examples on dealing with traffic through many different types of roadway construction activities.</li> <li>• Whenever possible, construction would be phased to allow two lanes of traffic to remain open.</li> <li>• If two lanes of traffic are not permissible, traffic would be reduced to one lane.</li> <li>• Should it be required for all lanes of traffic to be closed, a detour route would be clearly signed.</li> <li>• Appropriate measures would be taken to maintain access to businesses.</li> <li>• Should construction require a business access to be closed, the business owner would be given reasonable notice of the construction activities and the estimated duration of closure.</li> <li>• Pedestrian routes would remain open and clear of any debris</li> <li>• Should a pedestrian route be closed, a detour route would be clearly signed and maintained throughout construction to ensure pedestrian safety.</li> <li>• All emergency services would be given sufficient notice of construction activities and relative detour routes as to not affect their response times.</li> <li>• GovGuam DPW would develop a public outreach program about the project construction schedule, relocation plans and assistance programs, traffic-impacted areas and the Traffic Management Plan.</li> </ul>	V6.4.2.3

<i>Proposed Mitigation Measure</i>		<i>Reference</i>
	<b>(This measure falls within FHWA and GovGuam authority to implement)</b>	
T-5	To mitigate for land acquired at Chinese Park for roadway widening, replacement park land would be provided in accordance with policies outlined in Land and Water Conservation Fund State Assistance Program Manual. Location of land acquisition to be identified in final design phase.	V6.21.6.1
<b>Utilities and Infrastructure (UI)</b>		
Subcategories of Utilities: W = water, SW = solid waste, P = power, WW = wastewater		
UI/W-1	Arrange for DoD to transfer excess water production capacity to Guam Water Authority (GWA) at their request to mitigate Guam potable water supply impacts (if GWA has a water shortage). Set up additional physical interconnections in the transmission systems. <b>(This measure would be implemented cooperatively by DoD and GovGuam)</b>	V6.3.2.3.1
UI/W-2	Carefully monitor the chloride concentrations in the sub-basins and adjust well pumping rates to reduce localized impacts to the NGLA sub-basin if high chloride concentrations are detected in individual wells. <b>(This measure would be implemented cooperatively by DoD and GovGuam)</b>	V6.3.2.3.1 V5.4.2.2.2
UI/W-3	Set up a joint GWA, GEPA, CCU, and DoD Northern Guam Lens Aquifer (NGLA) advisory panel, with technical assistance from the University of Guam [UOG], Water Engineering Resource Institute [WERI], USGS, and others as appropriate.	V6.3.2.3.1
UI/W-4	GWA could implement improvements to reduce water losses associated with unaccounted for water (UFW) (i.e., leakage or theft). GWA current UFW reduction plan is 20%. <b>(This measure falls within GovGuam authority to implement)</b>	V6.3.2.3.1
UI/W-5	GovGuam could implement control measures such as accepting private consortiums infrastructure development, moratoriums, and measures through building permit approvals or other mechanisms to steer new development to areas with adequate water. <b>(This measure falls within GovGuam authority to implement)</b>	V6.3.2.3.1
UI/W-6	Through the workforce housing permit approval process, GovGuam could charge development impact fees that would go toward financing improvements to GWA water system. <b>(This measure falls within GovGuam authority to implement)</b>	V6.3.2.3.1
UI/W-7	If the GWA cannot meet the projected increase in demand resulting from induced civilian growth, GovGuam could implement measures to control the rate of induced growth through the building permit process and/or by restricting the number of water and sewer connection requests that are approved. <b>(This measure falls within GovGuam authority to implement)</b>	V6.3.2.3.1
UI/W-8	Accelerate development of new GWA supply wells and treatment and distribution (T&D) systems. <b>(This measure falls within GovGuam authority to implement)</b>	V6.3.2.3.1
UI/W-9	GWA could assess system development charges to contractors to generate funding for system upgrades to help meet anticipated demands. <b>(This measure falls within GovGuam authority to implement)</b>	V6.3.2.3.1
UI/W-10	Incentivize water conservation on Guam. <b>(This measure falls within GovGuam authority to implement)</b>	V6.3.2.3.1
UI/W-11	Provide sewer services to current users of septic tanks and leachfields to protect the quality of water in the NGLA. <b>(This measure falls within GovGuam authority to implement)</b>	V6.3.2.3.2

<i>Proposed Mitigation Measure</i>		<i>Reference</i>
UI/W-12	DoD would participate in a federal inter-agency effort to identify other federal programs and funding sources for GovGuam for the following: <ul style="list-style-type: none"> <li>• Reduce water losses associated with unaccounted for water (UFW) (i.e., leakage or theft). GWA current UFW reduction plan is 20%;</li> <li>• Development of new GWA supply wells and treatment and distribution (T&amp;D) systems;</li> <li>• Incentives for water conservation, and/or</li> <li>• Providing sewer services to eliminate individual wastewater treatment systems.</li> </ul>	V6.3.2.3.2
UI/WW-1	Government of Japan (GoJ) financing could be provided for the repairs and upgrades to the Hagatna WWTP. <b>(This measure falls within DoD and GovGuam authority to implement)</b>	V6.3.2.4.1
UI/WW-2	GWA could add chemical coagulants and/or increase the surface overflow rate (within the normal design range) of the clarifier to improve plant operations so that the primary clarifier would be able to treat the additional 0.1 million gallons per day (MGd) (0.5 mld) without adverse effects on the North District Wastewater Treatment Plant (NDWWTP). This could be applied to other WWTPs being impacted by the proposed action. This would be done with advance regulatory approval. <b>(This measure would be cooperatively implemented by DoD and GovGuam)</b>	V6.3.2.4.1
UI/WW-3	GoJ financing could be provided for the repairs and upgrades to the GWA northern and central wastewater collection systems. <b>(This measure falls within GovGuam authority to implement)</b>	V6.3.2.4.1
UI/WW-4	GWA could improve the southern WWTPs and the Hagatna WWTP and their associated collection systems or impose development moratoriums for areas served by those plants until appropriate upgrades have been made. <b>(This measure falls within GovGuam authority to implement)</b>	V6.3.2.4.1
UI/WW-5	GovGuam could implement control measures such as accepting private consortiums infrastructure development, moratoriums, and measures through building permit approvals or other mechanisms to steer new development to areas with adequate wastewater service. This could reduce the demand at NDWWTP by 1.4 MGd (5.3 mld). This one mitigation measure would reduce the peak flow to the NDWWTP to 10.7 MGd (40.5 mld) at the peak year (2014), within the design capacity of the NDWWTP <b>(This measure falls within GovGuam authority to implement)</b>	V6.3.2.4.1
UI/WW-6	Reduce on-island construction workforce requirements by using off-island prefabrication techniques.	V6.3.2.4.1
UI/WW-7	GWA could assess a system development charge to contractors and workforce housing developers that could be used to fund improvements to the wastewater systems. <b>(This measure falls within GovGuam authority to implement)</b>	V6.3.2.4.1
UI/WW-8	GovGuam could implement measures to control the rate of induced growth through the building permit process and/or by restricting the number of sewer connection requests that are approved. <b>(This measure falls within GovGuam authority to implement)</b>	V6.3.2.4.1
UI/WW-9	GovGuam could incentivize water conservation measures by offering rebates on upgrades to water saving devices in an effort to reduce wastewater flows. This is done periodically on the mainland. Upgrading current water devices to low-flow water saving models would reduce current demand.	V6.3.2.4.1

<i>Proposed Mitigation Measure</i>		<i>Reference</i>
	<b>(This measure falls within GovGuam authority to implement)</b>	
UI/SW-1	DoD would utilize transfer stations to allow consolidation of solid waste before it is hauled off base to the Layon Landfill in order to reduce the number and cost of hauling solid municipal waste and to allow screening of solid municipal waste prior to disposal at the Layon Landfill. <b>(This measure would be cooperatively implemented by DoD and GovGuam)</b>	V6.3.2.5
UI/SW-2	DoD would construct two recycling centers, one in Northern Guam and possibly one in Southern Guam to process recyclable materials collected by the source separation recycling program and to serve as a drop-off facility for recyclable materials generated by on-base residential, commercial, and industrial sectors. <b>(This measure would be cooperatively implemented by DoD and GovGuam)</b>	V6.3.2.5
UI/SW-3	DoD would implement programs to divert construction and demolition debris away from landfill disposal such as diverting concrete without lead-based paint, asphalt concrete, and scrap metal from construction and demolition projects.	V6.3.2.5
UI/SW-4	Construct at least one materials resource recovery facility (MRRF). A MRRF would recover and segregate recyclable materials from the solid waste stream thereby reducing the quantity of solid waste being disposed at the Layon or Navy Sanitary Landfill. <b>(This measure would be cooperatively implemented by DoD and GovGuam)</b>	V6.3.2.5
UI/SW-5	DoD would participate in a federal inter-agency effort to identify other federal programs and funding sources for GovGuam for the following: <ul style="list-style-type: none"> <li>• Providing municipal solid waste transfer stations;</li> <li>• Construct recycling center(s); and/or</li> <li>• Construct at least one materials resource recovery facility.</li> </ul>	V6.3.2.5
<b>Socioeconomics and General Services (SE)</b>		
Subcategories of SE: CI = Chamorro Issues / Community Cohesion, CR = Crime and Social Order, LA = Land Acquisition, PP = Population, PS = Public Service, Growth Permitting and Regulatory Agencies, T = Tinian, CNMI.		
<i>Socioeconomics and General Services: Chamorro Issues / Community Cohesion (SE/CI)</i>		
SE/CI-1	Implement a collaborative effort with construction worker contractors to implement an orientation course on Guam local culture, language and history, designed in conjunction with the Guam Department of Chamorro Affairs and Chamorro cultural specialists, to be attended by all arriving H2B workers.	V2.16.1.15 T2.16.2-69 V4.16.1.5 T4.16.2-24
SE/CI-2	Implement a mayoral outreach task force aimed at developing military-civilian relationships, to minimize local community perceptions of separations of military and civilian communities. The task force would work with each mayor and their staff to integrate military participation in existing cultural or recreational community events, expand on existing military outreach activities, and develop new civilian-military collaborative projects as determined by the task force and mayors.	V2.16.1.15 T2.16.2-69 V4.16.1.5 T4.16.2-24
SE/CI-3	Implement an orientation course on Guam local culture, language and history, designed in conjunction with the Guam Department of Chamorro Affairs and Chamorro cultural specialists, to be attended by all arriving active-duty DoD personnel their dependents, and military civilian workers	V2.16.1.15 T2.16.2-69 V4.16.1.5 T4.16.2-24

<i>Proposed Mitigation Measure</i>		<i>Reference</i>
	<i>This mitigation measure is also applicable to the cultural resources category (CR).</i>	
SE/CI-4	Develop a military-civilian cultural organization to promote tours, education, and volunteer opportunities.	V2.16.1.15 T2.16.2-69 V4.16.1.5 T4.16.2-24
SE/CI-5	Expand sister village programs to promote military civilian community interaction.	V2.16.1.15 T2.16.2-69 V4.16.1.5
SE/CI-6	Implement the use of UoG and GCC locations for DoD adult education classes, to promote community integration, consistent with DoD policies.	V2.16.1.15 T2.16.2-69 V4.16.1.5 T4.16.2-24
SE/CI-7	Implement an orientation course on Guam local laws and culture, language and history, designed in conjunction with GovGuam public safety agencies, the Guam Department of Chamorro Affairs and Chamorro cultural specialists, to be attended by all arriving service members prior to shore leave on the island of Guam. <i>This mitigation measure is also applicable to the CR category.</i>	V4.16.1.5 T4.16.2-24
SE/CI-8	DoD would assist by leading a federal inter-agency effort to identify other federal programs and funding sources for GovGuam addressing the following: <ul style="list-style-type: none"> <li>• Supporting the development of Chamorro cultural sites and activities, such as a museum and/or cultural center, Chamorro language immersion school, adult Chamorro language education, and cultural performance and arts organizations;</li> <li>• Job counseling assistance to be made available to low income families through the Guam Department of Labor (with US funds), which would include training sessions on how to fill out job applications, identify skills, and prepare resumes for job opportunities;</li> <li>• Before and/or after school programs for children on Guam including formal and informal education, while allowing their parent(s) the time to get a job.</li> <li>• Transportation to job sites made available for those without the means to travel to work.</li> </ul>	V2.16.1.15 T2.16.2-69 V4.16.1.5 T4.16.2-24
<i>Socioeconomics and General Services: Civilian Housing Demand (SE/CH)</i>		
SE/CH-1	DoD would assist by leading a federal inter-agency effort to identify other federal programs and funding sources for GovGuam addressing the following: <ul style="list-style-type: none"> <li>• Collaboration between federal housing agencies and GovGuam to examine currently existing caps on HUD vouchers and other housing allowances, and the appropriateness of these caps for Guam;</li> <li>• Development of support programs and transitional housing for homeless individuals and families on Guam;</li> <li>• Expansion of the stock of low- to moderate-income housing on Guam;</li> <li>• Support for GEDA efforts to obtain funding from HUD to provide community development projects and affordable housing programs.</li> </ul> <i>This mitigation measure is also applicable to the Public Health &amp; Safety category (PHS).</i>	V2.16.1.15 T2.16.2-69

<i>Proposed Mitigation Measure</i>		<i>Reference</i>
<i>Socioeconomics and General Services: Crime and Social Order (SE/CR)</i>		
SE/CR-1	DoD would increase collaborative programs with GovGuam public safety agencies to develop a comprehensive and regular shore patrol system, and maintain a regular visible preventative presence. <i>This mitigation measure is also applicable to the PHS category.</i>	V2.16.1.15 T2.16.2-69 V4.16.1.5 T4.16.2-24
SE/CR-2	DoD would continue to participate in CMTF to address community crime and social order concerns such as effective crime prevention strategies and information sharing. <i>This mitigation measure is also applicable to the PHS category.</i>	V2.16.1.15 T2.16.2-69 V4.16.1.5 T4.16.2-24
SE/CR-3	DoD would continue cross-training exercises with the GovGuam safety agencies. <i>This mitigation measure is also applicable to the PHS category.</i>	V2.16.1.15 T2.16.2-69 V4.16.1.5 T4.16.2-24
SE/CR-4	DoD would assist by leading a federal inter-agency effort to identify other federal programs and funding sources for collaborative efforts between the governments of Guam, CNMI and FAS to enhance cultural awareness. <i>This mitigation measure is also applicable to the PHS category.</i>	V2.16.1.15 T2.16.2-69 V4.16.1.5 T4.16.2-24
<i>Socioeconomics and General Services: Land Acquisition (SE/LA)</i>		
SE/LA-1	Mitigation for the increase in DoD controlled lands on Guam would include conducting new screenings on a periodic basis to identify additional excess DoD lands that could be returned.	V2.16.1.15 T2.16.2-69
SE/LA-2	Expedite the return of lands subject to the Guam Excess Lands Act to the extent possible.	V2.16.1.15 T2.16.2-69
SE/LA-3	Mitigation for the sociocultural impacts of the acquisition of property and the increase in DoD controlled lands on Guam may include: <ul style="list-style-type: none"> <li>• Land swap for land of similar value and similar cultural and recreational opportunities;</li> <li>• During the land acquisition process conduct socioeconomic surveys and census of affected landowners, users, ancestral claimants, early in the land acquisition process, in order to identify potential sociocultural impacts;</li> <li>• DoD collaboration with community, GovGuam and UoG and GCC representatives to implement a system of protected garden areas on public lands for the growth and collection of native plants, including medicinal plants;</li> <li>• Continued collaboration between DoD, GovGuam, the University of Guam, and cultural resource specialists to develop public education on the cultural and social value of land on Guam including cultural practices, such as the gathering of medicinal plants and the use of wood for carving, cultural tours, and place-based historical information, and/or</li> <li>• DoD collaboration with community, GovGuam and UoG and GCC representatives to implement guided cultural and historical tours and hikes of relevant locations on acquired land, for visitors and the civilian and military population of Guam.</li> </ul>	V2.16.1.15 T2.16.2-69
SE/LA-4	DoD would assist by leading a federal inter-agency effort to identify other federal programs and funding sources for GovGuam: <ul style="list-style-type: none"> <li>• Obtaining additional support for the UoG Tropical Agricultural Department, and other educational and community agricultural programs in the study of traditional plants, including medicinal plant use, and to develop native plant and seedling nurseries accessible to the public for study and use;</li> <li>• Obtaining additional support for educational and community</li> </ul>	V2.16.1.15 T2.16.2-69

<i>Proposed Mitigation Measure</i>		<i>Reference</i>
	<p>programs focused on traditional fishing and shellfishing, and related activities;</p> <ul style="list-style-type: none"> <li>• To improve recreational and cultural activities for the community on GovGuam lands;</li> <li>• Funding of conservation efforts on Guam, and/or</li> <li>• Special projects to improve local agricultural production.</li> </ul>	
SE/LA-5	<p>Mitigation for the restriction and/or loss of access to recreational and cultural sites could include:</p> <ul style="list-style-type: none"> <li>• Implementation of a public access program including set access hours, improved access to sites, that locations would be made safe for entry and use, and maintenance efforts and regular condition assessments of the impact areas,</li> <li>• DoD could collaborate with GovGuam to improve recreational and cultural activities for the community on GovGuam lands</li> <li>• DoD assistance with the identification of potential locations for the relocation of the Guam International Raceway.</li> </ul>	V2.16.1.15 T2.16.2-69
SE/LA-6	<p>DoD would assist by leading a federal inter-agency effort to identify other federal programs and funding sources for GovGuam addressing the following:</p> <ul style="list-style-type: none"> <li>• Assistance for opening public garden spaces on GovGuam land.</li> <li>• Assistance for CLTC to develop a land use plan, written fees collection policies and procedures for commercial licenses</li> <li>• Assistance for GALC to establish rules and regulations for Land Bank properties, written fees collection system and policies and rules and regulations for issuing licenses.</li> <li>• Support for the CLTC agricultural program to address the issues identified in the Chamorro Land Trust Commission Multi-Agency Compliance and Needs Assessment Team First Inspection Report (July - September 2009)</li> <li>• Support for CLTC to provide water lines, roads, sewer lines, power, and land management building on CLTC land.</li> <li>• Support for CLTC and GALC in establishing property boundaries in the subdivisions where the agencies have active leases.</li> <li>• Support and implementation of automation systems to manage CLTC and GALC land inventories, finances, and other data.</li> <li>• Provision of or funding for equipment, training and long-term support for agricultural activities, possibly in a cooperative framework.</li> <li>• Support for the UoG Tropical Agricultural Department, and other educational and community agricultural programs in the study of traditional plants, including medicinal plant use, and to develop native plant and seedling nurseries accessible to the public for study and use;</li> <li>• Support for educational and community programs focused on traditional fishing and shellfishing, and related activities;</li> <li>• Improvement of recreational and cultural activities for the community on GovGuam lands;</li> <li>• Conservation efforts on Guam, and/or</li> <li>• Special projects to improve local agricultural production.</li> </ul>	V2.16.1.15 T2.16.2-69
<i>Socioeconomics and General Services: Population (SE/PP)</i>		
SE/PP-1	DoD would decrease the rapid population increase associated with the operations phase by implementing force flow and adaptive program	V2.16.1.15 T2.16.2-69

<i>Proposed Mitigation Measure</i>		<i>Reference</i>
	management. <i>See mitigation measures in General [G] category. This mitigation measure is also applicable to the PHS category.</i>	V6.17.2.2.7
<i>Socioeconomics and General Services: Public Service and Growth Permitting and Regulatory Agencies (SE/PS)</i>		
SE/PS-1**	<p>DoD would assist by leading a federal inter-agency effort to identify other federal programs and funding sources for GovGuam addressing the following:</p> <ul style="list-style-type: none"> <li>• Enhancement of GovGuam Tax Revenue Collection efficacy. For example, improved revenue could be used to enhance recruitment and retention of GovGuam workforce and contractual support;</li> <li>• Examination of currently existing caps on benefits such as Medicaid and Medicare, and the non-provision of benefits such as Supplemental Security Income benefits, and the appropriateness of these caps and limits for Guam;</li> <li>• Increase the number of Guam-based offices for the distribution of federal social service support, and to support the work of GovGuam public service agencies;</li> <li>• Review and implementation of programs to assist GovGuam's public agencies in adapting to peaks in service population growth;</li> <li>• Provision of technical assistance for the development and implementation of a system of interpreters and translators available for the interpreting and translating needs of GovGuam public service agencies, to facilitate timely and appropriate provision of services for the English as a Second Language service population;</li> <li>• The development of AmeriCorps, Teach for America, National Health Service Corps programs, and other similar programs on Guam;</li> <li>• Improving the grant-writing capabilities within GovGuam agencies to improve possibilities of attracting federal support programs;</li> <li>• Support for the recruitment of professionals during the construction phases of the proposed action for GovGuam public agency positions;</li> <li>• Support for the use of the Interagency Personnel Act to support identified GovGuam agency personnel requirements, and/or</li> <li>• Provision to GovGuam of technical assistance for, and development and implementation of, comprehensive data collection systems focused on the following topics: <ul style="list-style-type: none"> <li>○ GovGuam public services provided to FAS citizens, in order to facilitate GovGuam access to Compact Impact and other related funding.</li> <li>○ GovGuam agency services provided to military individuals, in order to facilitate GovGuam access of TRICARE and other related funding</li> <li>○ GovGuam public health agency patient information, records, and services accessed, in order to facilitate appropriate care administered in a timely manner</li> <li>○ GovGuam public agency billing systems, in order to facilitate GovGuam collection of payment for services</li> </ul> </li> </ul> <p><i>This mitigation measure is also applicable to the PHS category.</i></p>	V2.16.1.15 T2.16.2-69 V5.16.2.5

<i>Proposed Mitigation Measure</i>		<i>Reference</i>
SE/PS-2	Continue to support existing DoD programs that contribute and/or donate excess equipment to local agencies. <i>This mitigation measure is also applicable to the PHS category.</i>	V2.16.1.15 T2.16.2-69 V5.16.2.5 V6.17.2.2.7
SE/PS-3	DoD would continue to participate in CMTF to address community health needs such as facilitating information sharing between military and civilian health agencies, including health service needs data and health services utilization rates. <i>This mitigation measure is also applicable to the PHS category.</i>	V2.16.1.15 T2.16.2-69 V5.16.2.5 V6.17.2.2.7
SE/PS-4	DoD would coordinate with the Governor's Office of Community Affairs to facilitate volunteer opportunities at Guam public service agencies for military personnel and their dependents. <i>This mitigation measure is also applicable to the PHS category.</i>	V2.16.1.15 T2.16.2-69 V5.16.2.5 V6.17.2.2.7
<i>Socioeconomics and General Services: Tinian, CNMI (SE/T)</i>		
SE/T-1	DoD would assist by leading a federal inter-agency effort to identify other federal programs and funding sources for the CNMI to: <ul style="list-style-type: none"> <li>• Develop a small museum dedicated to Tinian's history; to support Tinian's tourism industry would further minimize economic impacts on the Tinian tourism industry;</li> <li>• Train public safety, emergency response and health personnel in the CNMI;</li> <li>• Enhance the agricultural productivity of land, and/or</li> <li>• Develop a Tinian agricultural and conservation Park.</li> </ul>	V3.16.2.5
SE/T-2	To the extent possible, grant liberty to service personnel at the end of training missions.	V3.16.2.5
SE/T-3	DoD would assist with small business outreach and training on Tinian	V3.16.2.5
SE/T-4	DoD would participate in Military Integration Management Committee and Civilian Military Task Force for the purposes of addressing individuals that are displaced if leases on the LBA do require termination.	V3.16.2.5
SE/T-5	DoD would work in collaboration with CNMI officials to ensure that access to tourism, cultural and economic activities are clearly communicated and made as easy as possible. <i>This mitigation measure is also applicable to the PHS category.</i>	V3.16.2.5
<b>Public Health and Safety (PHS)</b> <i>Note: Additional mitigation measures applicable to PHS are identified in the Socioeconomic (SE) and General Services (GS) categories.</i>		
PHS-1	DoD would lead a federal inter-agency effort to identify other federal programs and funding sources that could benefit the people of Guam and Tinian in regards to health care, social services, disease control and/or other assistance to help Guam and Tinian upgrade their capacity to care for and help prevent increased incidence of illnesses. <b>(This measure falls within DoD, GovGuam and/or CNMI Government authority to implement)</b>	V3.18.2.2.1 V4.2.18.2.8 V18.2.2.10 V4.18.2.2.8 V4.18.2.6 V5.19.2.7 T5.18.2-4 V5.18.2.2.1
<b>Hazardous Materials and Waste</b> – No mitigation measures. See Table of BMPs.		
<b>Environmental Justice and Protection of Children – (EJ).</b>		
EJ-1	Potential impacts to low-income people due to the proposed land acquisition of the Route 15 lands could be reduced by implementation of applicable mitigation measures listed in the Land Use category (LU).	V2.19.2.8
EJ-2	Potential impacts to low-income could be reduced by implementation of applicable mitigation measures listed in the Socioeconomic category (SE).	V2.19.2.8

<i>Proposed Mitigation Measure</i>		<i>Reference</i>
EJ-3	Implementation of applicable mitigation measures listed in the Socioeconomic category could reduce the strain on GDPHSS and GDMHSA health services for the poor and uninsured.	V2.19.2.8
EJ-4	DoD would lead a federal inter-agency effort to identify other federal programs and funding sources that could benefit the people of Guam and Tinian in regards to health care, social services, disease control and/or other assistance to help Guam and Tinian upgrade their capacity to care for and help prevent increased incidence of illnesses. <i>This mitigation measure is also applicable to the PHS category.</i>	V3.19.2.2.3 V3.19.2.7 T3.19.2-5 V2.19.2.8 V2.19.2.2.5
<b>Workforce Housing (WH).</b> See also Utilities and Infrastructure (UI), and General (G) mitigation measures)		
WH-1	<i>General Conditions: Workforce Housing and Logistics Evaluation Factor and Contract Provision.</i> During the acquisition process for construction projects, DoD would give preference to potential contractor(s) (“Offerors”) who: <ul style="list-style-type: none"> <li>• submit a comprehensive plan to address housing requirements,</li> <li>• explain methods to minimize impacts to local community,</li> <li>• provide maps and number of living quarters at each location,</li> <li>• provide discussion of how the housing facility meets GovGuam regulations/policies (including any necessary permits),</li> <li>• provide adequate housing to workers in accordance with 29 CFR 1910.142 (and other federal and GovGuam statutes as applicable),</li> <li>• obtain all permits, licenses or other authority required by federal and GovGuam statutes and regulations.</li> </ul>	V1.4.15.3.1
WH-2	<i>Medical Care: Workforce Housing and Logistics Evaluation Factor and Contract Provision.</i> During acquisition process for construction projects, DoD would give preference to potential contractor(s) (“Offerors”) who submit a comprehensive narrative plan to address medical services requirements.	V1.4.15.3.2
WH-3	<i>Orientation Programs: Workforce Housing and Logistics Evaluation Factor and Contract Provision.</i> During acquisition process for construction projects, DoD would give preference to potential contractor(s) (“Offerors”) who ensure personnel receive orientation training on safety, security, anti-terrorism, cultural awareness, environmental protection, and invasive species.	V1.4.15.3.3
WH-4	<i>Lodging and Food: Workforce Housing and Logistics Evaluation Factor and Contract Provision.</i> During acquisition process for construction projects, DoD would give preference to potential contractor(s) (“Offerors”) who ensure they would comply with Guam lodging, food, and hygiene regulations.	V1.4.15.3.4
WH-5	<i>Transportation: Workforce Housing and Logistics Evaluation Factor and Contract Provision.</i> During acquisition process for construction projects, DoD would give preference to potential contractor(s) (“Offerors”) who submit a comprehensive plan to address transportation requirements, including Guam regulations requiring employer provision of transportation to/from the worksite.	V1.4.15.3.5

<i>Proposed Mitigation Measure</i>		<i>Reference</i>
WH-6	<i>Water and Wastewater: Workforce Housing and Logistics Evaluation Factor and Contract Provision.</i> DoD would give preference to construction contract proposals that identify sufficient available water allocation from GWA for workers for that specific construction contract.	V7.2.4.2
WH-7	Avoid known sinkholes and place a buffer zone of vegetation around them to prevent further erosion or expansion. Erect educational signs and/or fencing where appropriate. Any sinkholes discovered would be evaluated to determine significant impacts and projects would be designed in consideration of these sinkholes as appropriate. <b>(This measure would be implemented by the developer of the workforce housing facility/facilities)</b>	V1.4.15.5.1
WH-8	Using a minimum number of equipment at a given time near residences to reduce noise impacts. <b>(This measure would be implemented by the developer of the workforce housing facility/facilities)</b>	V1.4.15.5.4
WH-9	Guam Synthesis and Cultural Landscape Report. <b>(This measure would be implemented by the developer of the workforce housing facility/facilities)</b>	V1.4.15.5.9
WH-10	Bus workers to/from worksite(s). (See also WH-5 above) <b>(This measure would be implemented by the DoD construction contractor)</b>	V1.4.15.5.12
WH-11	Identification and removal of any potential unexploded ordinance (UXO) prior to ground disturbing activities. <b>(This measure would be implemented by the developer of the workforce housing facility/facilities)</b>	V1.4.15.5.14
<b>General</b>		
G-1	Force flow reduction. <i>This mitigation measure is applicable to many of the resource categories (See Section 2.3).</i>	V 2, 4, 5, 6 & 7
G-2	Adaptive program management. <i>This mitigation measure is applicable to many of the resource categories (See Volume 7 Section 2.4).</i>	V 2, 4, 5, 6 & 7

*Note:* All proposed mitigation measures are considered within DoD control and would be implemented by DoD unless otherwise noted in **Bold** text. Reference Mitigation Driver (V=Volume, Chapter, and Section or T=Table)

## 2.3 FORCE FLOW REDUCTION

Force flow is the rate at which the military population, including military personnel, their dependents, and civilian workers for the military, would arrive on Guam. Relocation of military units from Okinawa would be synchronized with the construction schedule for facilities needed to support those units. Force flow would be managed to ensure that military populations would not be relocated to Guam until the requisite facilities were constructed. Managing force flow is a mitigation measure that will be implemented by DoD to reduce or avoid impacts associated with construction related peak population and overall population changes on Guam. There would be no permanently stationed personnel on Tinian; therefore, the force flow reduction mitigation measure does not apply to Tinian. The force flow in Table 2.3-1 below shows the arrival of the military population between the proposed start of construction in 2010 and the targeted completion date of 2014 as discussed in the DEIS. Managing the force flow so that the military population would arrive only after the construction necessary to support them is completed would delay arrival of a majority of the military population beyond 2014. Tying force flow to construction completion would both lower the peak population currently associated with 2014 and decrease the growth rate of short-term population change associated with the proposed action. Table 2.3-1

also presents the estimated annual off-island population increase on Guam that would result from implementation of the proposed action and its 2014 targeted completion date. This same population table is included in Volume 1 of this EIS.

**Table 2.3-1. Estimated Total Population Increase on Guam from Off-Island (Direct, Indirect, and Induced)**

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
<b>Direct DoD Population<sup>1</sup></b>											
Active Duty Marine Corps	510	1,570	1,570	1,570	10,552	10,552	10,552	10,552	10,552	10,552	10,552
Marine Corps Dependents	537	1,231	1,231	1,231	9,000	9,000	9,000	9,000	9,000	9,000	9,000
Active Duty Navy <sup>2</sup>	0	0	0	0	0	0	0	0	0	0	0
Navy Dependents	0	0	0	0	0	0	0	0	0	0	0
Active Duty Army	0	50	50	50	50	630	630	630	630	630	630
Army Dependents	0	0	0	0	0	950	950	950	950	950	950
Civilian Military Workers	102	244	244	244	1,720	1,836	1,836	1,836	1,836	1,836	1,836
Civilian Military Worker Dependents	97	232	232	232	1,634	1,745	1,745	1,745	1,745	1,745	1,745
Off-Island Construction Workers (DoD Projects) <sup>3</sup>	3,238	8,202	14,217	17,834	18,374	12,140	3,785	0	0	0	0
Dependents of Off-Island Construction Workers (DoD Projects)	1,162	2,583	3,800	3,964	4,721	2,832	1,047	0	0	0	0
<b>Direct DoD Subtotal</b>	<b>5,646</b>	<b>14,112</b>	<b>21,344</b>	<b>25,125</b>	<b>46,052</b>	<b>39,685</b>	<b>29,545</b>	<b>24,713</b>	<b>24,713</b>	<b>24,713</b>	<b>24,713</b>
<b>Indirect and Induced Population</b>											
Off-Island Workers for Indirect/Induced Jobs <sup>4</sup>	2,766	7,038	11,773	14,077	16,988	12,940	6,346	4,346	4,346	4,482	4,482
Dependents of Off-Island Workers for Indirect/Induced Jobs	2,627	6,685	11,184	13,373	16,138	12,293	6,028	4,372	4,372	4,413	4,413
<b>Indirect/Induced Subtotal</b>	<b>5,393</b>	<b>13,723</b>	<b>22,957</b>	<b>27,450</b>	<b>33,126</b>	<b>25,233</b>	<b>12,374</b>	<b>8,718</b>	<b>8,718</b>	<b>8,895</b>	<b>8,895</b>
<b>Total Population</b>	<b>11,038</b>	<b>27,835</b>	<b>44,301</b>	<b>52,575</b>	<b>79,178</b>	<b>64,918</b>	<b>41,919</b>	<b>33,431</b>	<b>33,431</b>	<b>33,608</b>	<b>33,608</b>

*Legend:*

<sup>1</sup> DoD population includes military personnel, DoD civilian workers, and dependents from off-island.

<sup>2</sup> The Navy rows do not include increases from the transient presence of aircraft carrier crew with its carrier strike group.

<sup>3,4</sup> Population figures do not include Guam residents who obtain employment as a result of the proposed actions.

\* Background on how estimated population numbers were derived is at Vol.1 Page 2-5.

Table 2.3-1 illustrates how the estimated population numbers are linked to the proposed arrival of the military population and/or the construction schedule. Table 2.3-1 reflects the analysis presented in the Draft EIS. It indicates that project-related construction work is expected to begin in 2010, reach its peak in 2014, and end in 2016. It is assumed in this table that arrival of the military population on Guam would be complete by 2014. Since the peak in construction activities and expenditures would coincide

with the completed arrival of Marines and their families, 2014 represents the peak year for population increase. At this peak, the total increase in Guam population from off-island would be an estimated 79,178 people, representing a temporary increase of the total island population by approximately 44%. After the 2014 peak, project-related construction expenditures and the associated construction workforce would decline rapidly as contracts awarded in 2014 are completed in 2015 and 2016. At the completion of construction, and implementation of full military operational capabilities, the population increase from off-island is projected to level off to an estimated 33,608 persons, approximately 19% above the current island population.

During the temporary construction period of the proposed action the population would rapidly increase to a peak, exert maximum stress on Guam's resources and infrastructure, and then afterward would quickly decline. Immediate impacts resulting from the sudden population changes, such as increased demands on existing infrastructure systems and other resources would drop after the off-island construction workers leave the island. However, there would be a requirement to increase infrastructure capacity to respond to the projected long term growth of approximately 33,608 persons. If utility systems were upgraded to meet peak loading demands associated with the construction effort of the proposed action, the level of improvements would far exceed the demand needed to supply the long term estimated population growth noted above. Over-building utility infrastructure to deal with short-term peak needs would result in unnecessary spending, increased rate hikes, and an inefficiency of the utility operation itself as water and wastewater treatment plants are carefully designed to operate at optimum efficiency at a realistic projected flow.

### **2.3.1 Decreasing Peak Population and Population Change**

Some of the impacts listed above could be lessened by delaying or reducing the rate at which the Marines, their dependents, and associated civilian workforce arrive. Extending the arrival of the military population over a greater period of time (e.g. beyond 2014) would lessen the need for various infrastructure upgrades to meet peak loading demands in 2014. Using force flow reduction as a mitigation measure would both lower the overall peak population and decrease the rate of short-term population increase resulting from the proposed action, thereby reducing demands on utilities and many island services.

There are numerous scenarios that could be developed for adjusting force flow. Table 2.3-2 provides one notional example of how the force flow could be reduced. Table 2.3-2 does not represent a current DoN proposal regarding force flow reduction nor should it be viewed as the only possible manner in which Marine Corps force flow to Guam could be managed. The notional scenario is presented only to show the possible mitigative effects on impacts arising out of population growth, and thus likely mitigative effects on impacts to infrastructure and resources, that could occur. Other scenarios, with differing assumptions regarding arrival rates and the ultimate completion of the arrival of the Marine Corps military population would certainly lead to different results. Any actual force flow reduction would be decided in the future and would be dependent upon a number of factors including, but not limited to funding for necessary construction, mutual defense treaty obligations with the Government of Japan, ongoing military operations worldwide, and Congressional direction.

The scenario presented Table 2.3-2 assumes that, consistent with the proposed action, construction of facilities and infrastructure to support the relocation of Marine Corps forces would be largely completed by 2014 and that substantial numbers of the military population would not arrive on Guam until some time thereafter. The purpose of Table 2.3-2 is to highlight the impacts of force flow reduction as a mitigation measure in and of itself. As discussed later in this section, the application of an adaptive program management (APM) process would further mitigate significant impacts by ensuring that the demands on infrastructure created by construction tempo and sequencing did not exceed the existing

infrastructure capacities. If the projected construction tempo were revised, the associated force flow would be adjusted to match the revised construction schedule. The yellow-shaded areas in Table 2.3-2 depict lowered projections of population growth in the years beyond 2014 from those shown in Table 2.3-1. Force flow reductions associated with delaying the complete arrival of the military population beyond 2014 would lower the rate of arrival per year of the entire operations-related population. Force flow reduction in the notional scenario presented below would decrease the current total peak population from 79,187 to 57,593 in 2014. Overall projected population change for this force flow reduction scenario and the projected population change for the proposed action without force flow reduction are illustrated in Figure 2.4-1 in Section 2.2.2.

**Table 2.3-2. Notional Force Flow Mitigation Scenario: Estimated Total Population Increase on Guam from Off-Island (Direct, Indirect, and Induced)**

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
<b>Direct DoD Population<sup>1</sup></b>											
Active Duty Marine Corps	510	1,570	1,570	1,570	2,468	4,265	6,959	10,552	10,552	10,552	10,552
Marine Corps Dependents	537	1,231	1,231	1,231	2,008	3,562	5,893	9,000	9,000	9,000	9,000
Active Duty Navy <sup>1</sup>	0	0	0	0	0	0	0	0	0	0	0
Navy Dependents	0	0	0	0	0	0	0	0	0	0	0
Active Duty Army	0	50	50	50	50	630	630	630	630	630	630
Army Dependents	0	0	0	0	0	950	950	950	950	950	950
Civilian Military Workers	102	244	244	244	401	820	1,260	1,836	1,836	1,836	1,836
Civilian Military Worker Dependents	97	232	232	232	381	779	1,197	1,745	1,745	1,745	1,745
Off-Island Construction Workers (DoD Projects) <sup>3</sup>	252	4,000	8,079	17,020	17,674	18,983	11,783	0	0	0	0
Dependents of Off-Island Construction Workers (DoD Projects)	50	800	1,616	3,783	4,542	4,428	3,258	0	0	0	0
<b>Direct DoD Subtotal</b>	<b>1,548</b>	<b>8,127</b>	<b>13,021</b>	<b>24,130</b>	<b>27,523</b>	<b>34,416</b>	<b>31,929</b>	<b>24,713</b>	<b>24,713</b>	<b>24,713</b>	<b>24,713</b>
<b>Indirect and Induced Population</b>											
Off-Island Workers for Indirect/Induced Jobs <sup>4</sup>	110	3,472	6,615	13,519	15,421	12,696	10,411	4,346	4,346	4,482	4,482
Dependents of Off-Island Workers for Indirect/Induced Jobs	85	2,981	5,625	12,843	14,649	12,061	9,890	4,372	4,372	4,413	4,413

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
<b>Indirect/Induced Subtotal</b>	195	6,453	12,240	26,363	30,070	24,757	20,301	8,718	8,718	8,895	8,895
<b>Total Population</b>	<u>1,742</u>	<u>14,580</u>	<u>25,262</u>	<u>50,492</u>	<u>57,593</u>	<u>59,173</u>	<u>52,230</u>	33,431	33,431	33,608	33,608

*Legend:*

<sup>1</sup> DoD population includes military personnel, DoD civilian workers, and dependents from off-island.

<sup>2</sup> The Navy rows do not include increases from the transient presence of aircraft carrier crew with its carrier strike group.

<sup>3,4</sup> Population figures do not include Guam residents who obtain employment as a result of the proposed actions.

**Shading:** Delay force flow population changes from population projections that are the basis for EIS impact analysis (Table 2.3-1).

**Shading:** This notional force flow scenario also reflects programmed construction spending for years 2010, 2011 and 2012, as of May 2010. The programmed military construction budget is lower than projections used as basis for EIS impact analysis of Table 2.3-1 in the early years. The construction funding impact is projected over subsequent years..

Under the notional scenario presented in Table 2.3-2, the overall population increases more gradually while the construction population grows and shrinks at similar rates exhibited in Table 2.3-1. Table 2.3-2 reflects the projected construction workforce based on programmed construction budgets for years 2010, 2011 and 2012 as of May 2010 (see gray-shaded cells in Table 2.3.2). Unrelated to changes in force flow, the construction would have a slower start than projected in Table 2.3-1 with impacts to subsequent construction years. As presented in the notional scenario, force flow reduction in and of itself does not affect the proposed action's construction schedule. Instead, force flow reduction is a product of the proposed construction schedule. If the construction supporting the relocation of Marine Corps forces is delayed, the implementation of force flow reduction would be stretched further into the future as well. Finally, the estimated population growth and shrinkage rate of off-island construction workers and their dependents on Guam would be unaffected by implementation of the force flow reduction mitigation measure.

### 2.3.2 Impact Reduction Through Force Flow Management

Some existing infrastructure and/or resources are more sensitive to population level increases than others. Implementation of the force flow mitigation measure would reduce impacts to the following infrastructure limited and population sensitive resources:

- **Port Capacity** - The force flow mitigation measure would alleviate some of the proposed action's adverse impacts at the port by delaying 1) the need for operations related cargo handling, 2) the need for handling of military population household goods, and 3) the handling of associated cargo to support the military population (i.e., arrival of additional food shipments for the military commissary). The force flow reduction would also have the benefit of freeing up the port's capabilities to accommodate the increase in container ship traffic for construction. Without the demand on port facilities to accommodate construction and operations cargo concurrently, port cargo handling efficiency would increase during the construction phase.
- **Wastewater Treatment** - Reductions in peak population would reduce demands and burdens on Guam's wastewater treatment capability, which would approach or potentially exceed system design capacities. For example, the NDWWTP's wastewater flow is projected to reach approximately 12.13 MGd during peak population as projected in the Draft EIS. This flow would exceed the plant's design capacity of 12.00 MGd. However, in the notional scenario for force flow reduction mitigation measures presented above, the maximum flow to NDWWTP in 2014 would be reduced to 10.09 MGd, substantially less than the NDWWTP's design capacity.

- Drinking Water Production, Treatment and Distribution – Arrival of Marines could be managed such that demand for potable water associated with peak population would be lowered, thus reducing the demand for potable water production, treatment and distribution. Reducing the peak water demand during construction could relieve stresses on potable water production, particularly with regard to rates of pumping wells or the establishment of new wells. Under the proposed action, DoD would establish new wells to meet projected demand, including peak demand when off-island construction and military populations would overlap. If peak future demand associated with the proposed action is reduced through reductions in force flow, the immediate need for new wells would likewise be lessened.
- Roadways - Impacts to off-base roadways are directly related to population increases. Reducing the total peak population associated with the proposed action by implementing force flow reduction is expected to reduce stresses on Guam's currently deficient roadway system. With implementation of force flow mitigation measures the additive impacts of construction and military operations traffic would be lessened with related reductions in adverse impacts to off-base roadways during the peak population period.
- Water Resources (surface water, stormwater, wetlands) – Force flow may reduce the impacts on surface and nearshore water by reducing the wastewater effluent discharged into the ocean. This measure may also reduce the projected peak demand for and stresses on water-related resources and infrastructure (see discussion above). The stormwater levels and wetlands impacts during construction would not be affected.
- Air Quality – The proposed action involves construction activities that would occur concurrently with operations; both activities would result in increased releases of air pollutants. Reducing force flow would reduce air quality impacts by lowering the amount of air pollutants that would be released at any one time. Specifically, reducing force flow would delay operations and reduce the amount of air emissions from operations that would occur concurrently with construction emissions.
- Noise – In general, it should be noted that noise impacts are often location specific. It is anticipated that with implementation of the force flow mitigation measure there would be no measurable reduction in noise impacts due to construction activities. However, the noise related to airfield or training range operations would be delayed in its initiation. There would also be a less adverse temporary spike in noise impacts associated with reduced on-island peak population traffic.
- Recreational Resources – A reduction in force flow would reduce impacts to recreational resources by lessening the demand for such recreation resources associated with the peak population of the proposed action. Impacts to recreational resources, both within DoD-controlled property and within the civilian community, would be lowered and spread out further until steady state levels took hold because there would be less peak level crowding at parking lots, picnic shelters, restrooms, showers, boat mooring facilities, golf courses, dive spots, etc., due to lowering the estimated peak population.
- Terrestrial and Marine Biological Resources – A reduction in force flow would reduce impacts to terrestrial and marine biological resources associated with decreased recreational use and noise generated (described above). The same amount of habitat would be disturbed by construction activities, and changes in force flow would not have an impact on the construction impacts to terrestrial and marine biological resources.
- Cultural Resources – A reduction in force flow would reduce impacts to cultural resources by reducing the population on-island and associated potential for inadvertent or unauthorized

damage to historic properties. Force flow would not impact the construction impacts to cultural sites.

- Socioeconomics and General Services – The force flow mitigation measure would lessen the severity of the socioeconomic impacts, such as the need for increased public services, social services, and housing. Further, delaying population level increases and lowering the rate of population increase would likely lessen potential increases in the cost of living often associated with temporary construction activity spikes in population. This is especially true for the period between 2013 and 2015 under the notional scenario presented. A reduction in the population growth rate could provide GovGuam and the private sector a longer period of time in which to increase available public services for the temporary construction effort, which may also help alleviate possible shortfalls for the projected long-term population increase.
- Public Health and Safety – The force flow mitigation measure would further reduce any projected disease and traffic incidents because of the lowered peak population. The various procedures and safeguards that are part of BMPs and standard operating procedures would be more effective on the reduced population numbers.
- Environmental Justice and Protection of Children – With force flow reduction as a mitigation measure, impacts to low income or children populations could be reduced due to a reduction in peak population associated with the proposed action. The reduced population numbers would decrease the impacts directly related to public health and safety services, potable water, wastewater, and socioeconomics.

For those resources where there would be minimal additive adverse impact from construction and military operations populations, there would be minimal impact from force flow reduction. Resources that would be minimally affected by the force flow reduction mitigation measure are as follows:

- Land and Submerged Land Use,
- Airspace,
- Visual Resources, and
- Hazardous Material/Waste.

## **2.4 ADAPTIVE PROGRAM MANAGEMENT**

The proposed mitigation measures identified in this EIS would avoid or minimize anticipated impacts associated with the proposed action. However, with a proposed action of this scale the potential exists for a more broad-based adverse impact on infrastructure and resources, particularly during the construction component of the proposed action when populations would peak and exert maximum stress. As stated previously in this chapter, proposed mitigation measures identified in this EIS and selected for implementation in the ROD would be monitored in the post-ROD Mitigation Monitoring Plan. Applying an APM process to the proposed DoD construction is an additional mitigation measure that will be implemented by DoD and would reduce and/or avoid the significant environmental impacts identified in the Final EIS.

### **2.4.1 Traditional Adaptive Management (Terrestrial/Marine Resources)**

The concept of adaptive management has existed since the early 1900s and is rooted in scientific management approaches, pioneered by Frederick Taylor. In its purest form, adaptive management can be thought of as linking learning with policy and implementation. Although the idea of learning from experience and modifying subsequent behavior in light of that experience has long been reported in the literature, the specific idea of adaptive management as a strategy for dealing with environmental impacts can be traced back to the late 1970s.

Traditionally, adaptive management has been associated with implementation of natural resources management actions and/or decisions that affect natural resources. Adaptive management has historically focused on learning and adapting, through partnerships of managers, scientists, and other stakeholders who learn together how to create and maintain sustainable resource systems. Examples of actions historically associated with adaptive management include the control of water releases from a dam, direct manipulation of plant or animal populations through harvesting, stocking or transplanting, and manipulation of ecosystems through physical changes to habitats. Adaptive management recognizes that even with sound assumptions and science, there is always uncertainty with regard to predictions about how resources respond to actions. In the context of natural resources, adaptive management involves decision-making characterized by multiple (often competing) objectives, constrained management authorities and capabilities, dynamic ecological and physical systems, and uncertain responses to management actions. Natural resource managers have been able to successfully use adaptive management over the last three decades to make better resource-based decisions by:

- Exploring ways to meet management objectives.
- Predicting the outcomes of alternatives based on the current state of knowledge.
- Implementing one or more of these alternatives.
- Monitoring impacts of those alternatives.
- Using the results to update knowledge and adjust management actions.

There are many definitions of adaptive management, but the same basic principle applies to all of them: adaptive management is a management approach that involves monitoring outcomes of managed activities and improving the management of those activities based on the monitoring results. The Department of the Interior describes adaptive management as follows (DOI 2009):

“Adaptive management [is a decision process that] promotes flexible decision making that can be adjusted in the face of uncertainties as outcomes from management actions and other events become better understood. Careful monitoring of these outcomes both advances scientific understanding and helps adjust policies or operations as part of an iterative learning process. Adaptive management also recognizes the importance of natural variability in contributing to ecological resilience and productivity. It is not a ‘trial and error’ process, but rather emphasizes learning while doing. Adaptive management does not represent an end in itself, but rather a means to more effective decisions and enhanced benefits. Its true measure is in how well it helps meet environmental, social, and economic goals, increases scientific knowledge, and reduces tensions between stakeholders.”

#### **2.4.2 Implementing an Adaptive Program Management Process**

The APM process would be implemented through creation of a Civil-Military Coordination Council (Council). The Council would monitor environmental impacts, and infrastructure capacities, coordinate discussion among DoD, the Government of Guam, and federal agencies, and provide advice and recommendations to DoD, other federal agencies, and the Government of Guam, on the construction tempo and sequencing, infrastructure improvements, and other related actions in order to avoid and/or reduce significant environmental impacts or overstressing Guam's infrastructure. The APM process would allow DoD to revise construction tempo and adjust sequencing of construction activities to directly influence workforce population levels and indirectly influence induced population growth before significant environmental impacts occurred or infrastructure capabilities were exceeded. The APM process would not be applied to Tinian as there would be no permanently stationed personnel and the scale of construction would be much smaller than on Guam.

An initial operating charter for the Council, establishing its membership, basic structure and function, and schedule to finalize and approve the charter, will be developed cooperatively by DoD, other federal agencies, and the Government of Guam and will be incorporated into the mitigation discussion in the ROD for this proposed action.

Subsequent to the ROD, Council members will meet as necessary to coordinate regarding DoD realignment construction activities and to finalize and approve its operating charter, establishing processes, procedures, and functions necessary for the operation of the Council. DoD is committed to timely completion of the final operating charter and during the development of the charter DoD will not implement its realignment construction program in a manner that causes significant environmental impacts or exceeds existing infrastructure limitations on Guam.

The following discussion provides an introduction to the concept of APM, describes the formation and responsibilities of the proposed Council, and specifies how the Council would apply APM to the proposed action. This section also provides new information regarding the effects of APM resulting from DoD coordination with the above listed agencies following the publication of the Draft EIS in November 2009.

The Council's fundamental function would be to: (1) gather, share, and analyze data; (2) coordinate discussion among DoD, Guam agencies, and federal agencies regarding resources and infrastructure on Guam affected by the military realignment actions; and (3) develop advice and recommendation on how to manage future DoD construction activity and other actions undertaken by Guam or federal agencies associated with the military realignment. The goal in applying an APM process is to mitigate significant environmental impacts by ensuring that existing infrastructure capacities are not exceeded. The use of an APM process and creation of the Council would not create any new authorities or establish limitations on existing authorities. Each participating organization would retain its individual decision making and/or regulatory authority.

Although the proposed framework still is under development, the Council will have participation by DoD, the Government of Guam, and federal agencies, including, but not limited to, DOI (OIA), EPA, NMFS, USDA, USFWS, NPS and DOT. It is envisioned that the Council would have an executive level leadership group and a larger working group to support the Council's functions. It is further envisioned that the Council could establish sub working groups related to specific issues such as wastewater management, roadways, or port management. The larger working group and subgroups would monitor the appropriate indicators, gather the necessary data, and provide recommendations to the Council executive leadership regarding construction tempo, construction sequencing, or other recommend actions. The Council executive leadership would then determine which recommendations would be provided to DoD or other decision makers for consideration.

Should disputes or disagreements arise regarding particular recommendations advanced by the executive level leadership group, it is envisioned that Council members would elevate the matter within their own organization for further coordination and discussion. Efforts to resolve disagreements would start at the local level and then escalate to regional/departmental level and then headquarters level decision makers. Time limits may be set for each level of dispute resolution, allowing for expedited resolution of issues. Efforts to resolve disagreements would not affect underlying agency jurisdiction or regulatory authority.

As members of the Council, the resource agencies will retain their existing processes for elevating disputes. In particular if, during the implementation of the project, EPA anticipates that the pace of the movement of construction workers and military personnel and families, and project related induced

growth will exceed the availability of needed wastewater and/or water supply infrastructure such that unsatisfactory environmental or public health impacts may occur, EPA retains the authority to exercise its responsibility under Section 309 of the Clean Air Act to refer the matter to an appropriate agency in the Executive Office of the President.

In developing advice or recommendations for decision makers, the Council would first focus on known infrastructure limitations and related impacts to resources. Key to these efforts would be identification of action/tipping points, development of data forecasts, implementation of appropriate trend analyses, and identification of appropriate response measures. It is anticipated the larger Council working group would meet quarterly to review/discuss data and trends, and develop recommendations regarding construction tempo and sequencing. The executive level leadership group would meet semi-annually or more frequently if needed. Each agency/department participating in the Council would be expected to fund its own participation.

### **2.4.3 Slowing Construction Tempo and Altering Construction Sequencing**

Adaptive management techniques can be applied to situations other than the management of natural resources. The military construction program proposed on Guam lends itself to an APM approach because of the potential to avoid and reduce impacts to infrastructure and resources.

Existing utilities infrastructure systems on Guam, especially those that affect ground and surface water resources for drinking water and ocean waters for discharge of wastewater, have known limitations and would be most sensitive to the short-term peak increases in population during construction. There is a direct relationship between the amount of construction, the number of people who would be on Guam to support the proposed construction, and demand on utilities, all of which would peak in 2014 under the proposed action. Given the current poor state of the utilities infrastructure on Guam, their non-compliance with existing environmental laws, the long history of compliance waivers, and underlying consent/stipulated orders that govern many existing utility systems, DoD is committed to implementing its construction program to support the proposed military realignment actions on Guam in a manner that would not cause significant environmental impacts or exceed existing infrastructure limitations.

Adaptive program management of the pace and sequencing of construction is a proposed mitigation measure consisting of adjusting program implementation in response to known infrastructure limitations and monitoring and forecasting of impacts on selected resources during construction. With implementation of APM, DoD would slow construction tempo and adjust sequencing of construction activities to directly influence workforce population levels and indirectly influence induced population growth associated with the proposed action before significant environmental impacts took place or infrastructure capabilities were exceeded:

*Slowing construction tempo.* Construction tempo refers to the overall pace of proposed DoD construction on Guam and regions of Guam (i.e., Apra Harbor, Andersen AFB, and Finegayan). DoD would slow the timing and execution of short term (0 to 3 months), mid-term (3 to 12 months), or long-term (12 to 24 months) construction contract awards in response to known infrastructure limitations and monitoring of data on impacted resources to reduce construction-related population increases and avoid or lessen impacts to environmental resources served by utilities systems (i.e., ground water, surface waters, and ocean waters).

*Adjusting construction sequencing.* Construction sequencing involves redirecting the sequence of construction to projects that require fewer construction workers (e.g., re-sequencing from horizontal to vertical projects that require fewer workers), thus controlling the workforce population rate of increase. Construction sequencing would also include the regional re-

distribution of construction projects to avoid the concentration of construction activities with the potential to overburden local utilities systems at a particular location.

There are numerous scenarios that could be developed for implementation of APM to construction tempo and sequencing. Table 2.4-1 provides one notional example of how APM could be applied in the context of construction tempo. This notional scenario reflects the application of both an APM process that slows the construction schedule and force flow management. Managing the force flow so that the military population would arrive only after the construction necessary to support them is completed would delay arrival of a majority of the military population beyond 2014. Table 2.4-1 does not represent a current DoN proposal regarding use of APM relative to construction tempo nor should it be viewed as the only possible manner in which military construction tempo on Guam could be managed. The APM notional scenario is presented below only to show the possible mitigative impacts to population growth, and thus likely mitigative impacts to infrastructure and resources, that could occur should adaptive program management be implemented. Other scenarios, with differing assumptions regarding factors that affect construction tempo, would lead to different results. Any actual implementation of APM relative to construction tempo would be decided in the future and would be dependent upon a number of factors including, but not limited to, funding for necessary construction; the implementation of improvements to the Port of Guam; utility systems upgrades for water, wastewater, and power; labor availability on Guam and in the region; material and supply prices; occurrences of natural disasters; Congressional direction; and the monitoring of affected resources. For instance, Table 2.4-1 provides an example of how a decrease in funding for construction in FY10 and FY11 could lower the population numbers compared to current projections noted in Table 2.3-1, with its associated 2014 targeted completion date. As recently identified, the FY10 military construction appropriation and the FY11 military construction budget submission were both lower than initially proposed, likely resulting in a smaller rise of population for those fiscal years, as indicated by the gray shading in Table 2.4-1.

**Table 2.4-1. Adaptive Program Management Measure: Slow Construction Tempo. Estimated Total Population Increase on Guam from Off-Island (Direct, Indirect and Induced)**

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
<b>Direct DoD Population<sup>1</sup></b>											
Active Duty Marine Corps	510	1,570	1,570	1,570	2,019	2,917	5,163	7,408	9,384	10,027	10,552
Marine Corps Dependents	537	1,231	1,231	1,231	1,620	2,397	4,339	6,281	7,990	8,546	9,000
Active Duty Navy <sup>1</sup>	0	0	0	0	0	0	0	0	0	0	0
Navy Dependents	0	0	0	0	0	0	0	0	0	0	0
Active Duty Army	0	50	50	50	50	630	630	630	630	630	630
Army Dependents	0	0	0	0	0	950	950	950	950	950	950
Civilian Military Workers	102	244	244	244	327	600	966	1,333	1,655	1,751	1,836
Civilian Military Worker Dependents	97	232	232	232	311	570	918	1,266	1,573	1,663	1,745
Off-Island Construction Workers (DoD Projects) <sup>3</sup>	252	4,000	8,079	12,394	12,770	11,330	9,753	8,069	6,340	4,803	0
Dependents of Off-Island Construction Workers (DoD Projects)	50	800	1,616	2,755	3,281	2,643	2,589	2,060	1,518	1,165	0
<b>Direct DoD Subtotal</b>	<b>1,548</b>	<b>8,127</b>	<b>13,021</b>	<b>18,476</b>	<b>20,379</b>	<b>22,036</b>	<b>25,309</b>	<b>27,997</b>	<b>30,040</b>	<b>29,534</b>	<b>24,713</b>
<b>Indirect and Induced Population</b>											
Off-Island Workers for Indirect/Induced Jobs <sup>4</sup>	110	3,472	6,615	10,352	10,666	9,463	8,146	6,739	5,295	4,012	4,482
Dependents of Off-Island Workers for Indirect/Induced Jobs	85	2,981	5,625	9,834	10,133	8,990	7,739	6,403	5,031	3,811	4,413
<b>Indirect/Induced Subtotal</b>	<b>195</b>	<b>6,453</b>	<b>12,240</b>	<b>20,186</b>	<b>20,799</b>	<b>18,453</b>	<b>15,885</b>	<b>13,142</b>	<b>10,326</b>	<b>7,823</b>	<b>8,895</b>
<b>Total Population</b>	<b><u>1,742</u></b>	<b><u>14,580</u></b>	<b><u>25,262</u></b>	<b><u>38,662</u></b>	<b><u>41,178</u></b>	<b><u>40,490</u></b>	<b><u>41,194</u></b>	<b><u>41,139</u></b>	<b><u>40,366</u></b>	<b><u>37,357</u></b>	<b><u>33,608</u></b>

Legend:

<sup>1</sup> DoD population includes military personnel, dependents, and DoD civilian workers from off island.

<sup>2</sup> The Navy rows do not include increases from the transient presence of aircraft carrier crew with its carrier strike group (CSG).

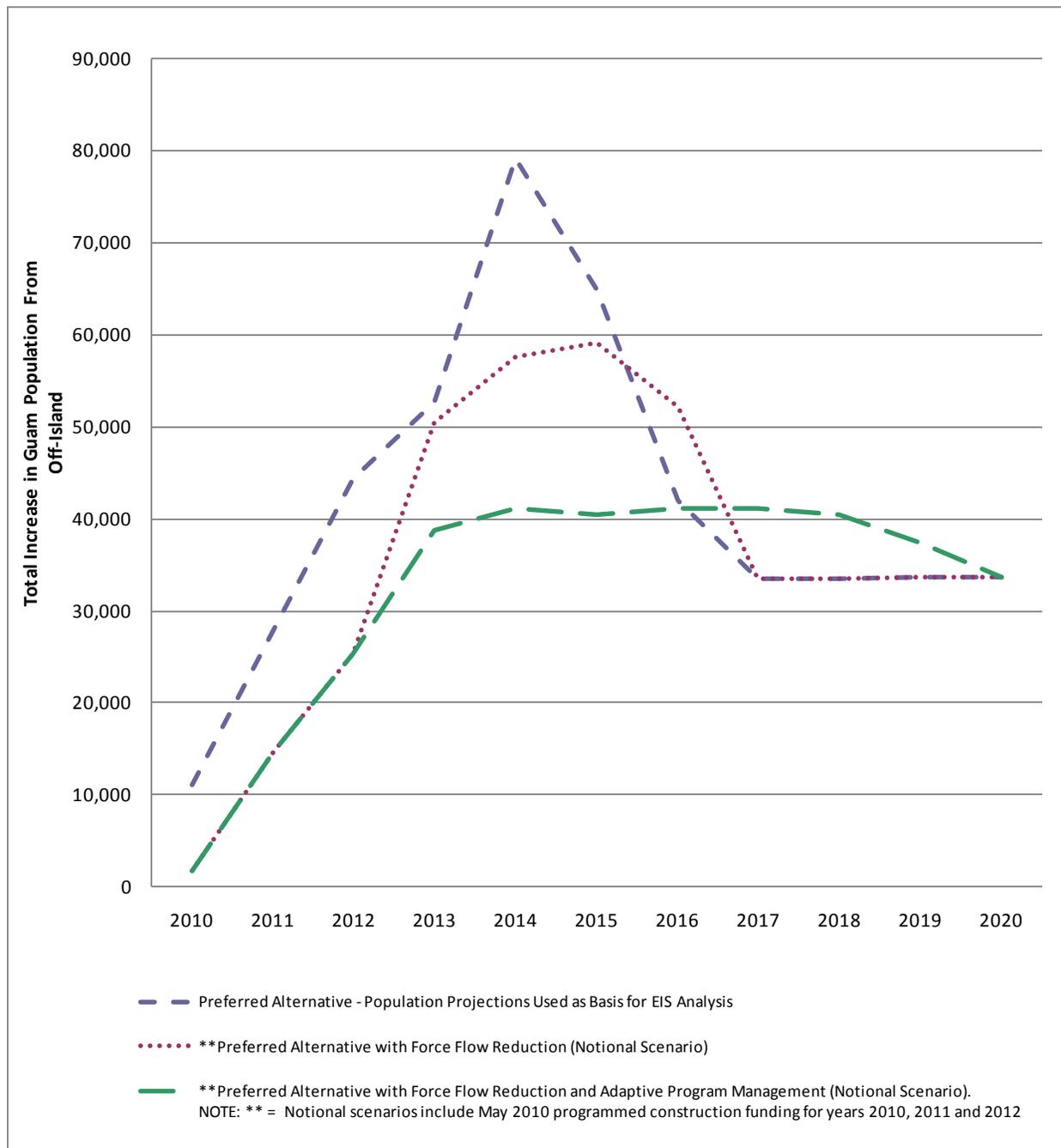
<sup>3,4</sup> Population figures do not include Guam residents who obtain employment as a result of the proposed action.

**Shading:** Construction tempo modification population changes.

**Shading:** This notional scenario also reflects May 2010 programmed construction spending for years 2010, 2011 and 2012. The programmed military construction budget is lower than projections used as basis for EIS impact analysis of Table 2.3-1 and effects subsequent years' construction budget requests.

Figure 2.4-1 identifies the proposed action, with its target completion date of 2014 and no force flow reduction, as well as the notional scenario in which the APM mitigation measure for construction tempo is implemented along with the corresponding force flow reduction mitigation measure, and the previously addressed force flow reduction notional scenario (without APM). As displayed in the figure, the estimated population of off-island construction workers and their dependents that arrive on Guam is modified and spread out over a period beyond 2014. The result of implementing both the proposed force flow reduction mitigation measure and the use of APM of construction tempo would be that peak population would be reduced from 79,187 to 41,178 in 2014. This reduction associated with slowing construction tempo shows additional population reduction from the peak 57,593 population described for the notional force flow mitigation measure in Section 2.3. Under the notional APM scenario presented below, the full complement of DoD population would not be relocated to Guam until after 2014.

**Figure 2.4-1. Population Comparison – Preferred Alternative Projections vs. Force Flow Reduction vs. Adaptive Program Management**



Effective APM would require coordinated efforts of multiple agencies, acting through the Council, to advise DoD on measures such as adjusting the construction pace and sequencing. DoD is currently coordinating with these agencies to address utilities concerns following publication of the Draft EIS in November 2009. As a result, updates have been made to the power, water, and wastewater discussions provided in Volume 6 of this EIS and the air quality discussion in Volume 2 of this EIS. In particular, DoD has determined that potential infrastructure limitations associated with a possible shortage of electrical power do not exist and that there is sufficient existing power supply to support the proposed

action (see Volume 6, Chapter 3). Further, DoD has determined that adjusting the construction program based on short-term air quality monitoring data is not feasible. DoD instead proposes the establishment of an air quality monitoring station in northern Guam (see Volume 2, Chapter 5). Consistent with its coordination efforts, DoD and GovGuam have developed two draft memoranda of understanding (MOUs) to provide the framework to address impacts to the GWA water and wastewater systems, co-manage the Northern Guam Lens Aquifer, and address impacts to the Island Wide Power System (see Volume 6, Chapter 3). The MOUs are the basis for establishment of a Utilities Oversight Committee (UOC).

DoD has also agreed to transfer water to meet the off-base water demand associated with the proposed action. DoD would continue to transfer up to 4 MGd (15 mld) to GWA under the current MOU. Under an agreement to be negotiated, DoD would also transfer up to 1.7 MGd (6.4 mld). DoD could implement a number of initiatives to make water available to GWA either by upgrading or improving the condition of existing wells under DoD control or by establishing new wells on DoD lands (see Volume 6, Chapter 6). Through modifications to construction sequencing, DoD would install wells earlier than needed and make the excess water available for transfer to GWA. Approximately 4.7 MGd (17.8 mld) would be required from the Marine Corps water system. Water distribution and transmission lines would be constructed to collect water from the new DoD wells and deliver it to a new pumping station. The pumping station would send water through a new transmission line to the water storage tank that would be constructed at the Marine Corps installation.

Both GWA and DoD have independent island-wide water distribution systems that are capable of moving water throughout the main areas of Guam. This is how water from Fena Reservoir is transferred today from the central Guam transfer point to other areas of the GWA system requiring water. Additional interconnections between these two systems would be constructed to provide enhanced capability for water exchange between the two systems. Where and how these interconnections would be made would be a cooperative effort between DoD and GWA as new wells are sited. This would allow for DoD water that is needed to meet GWA shortfalls during the military relocation to be transferred through the DoD distribution system to the closest interconnection to the GWA system where the water is needed. Maximizing the use of the DoD island-wide water distribution system would minimize the negative impacts that may occur from using the substandard GWA distribution system. Additionally, DoD water storage facilities, including elevated tanks and reservoirs, can be kept at maximum capacity at given times of the year in anticipation of drought conditions and water shortfalls in the GWA system.

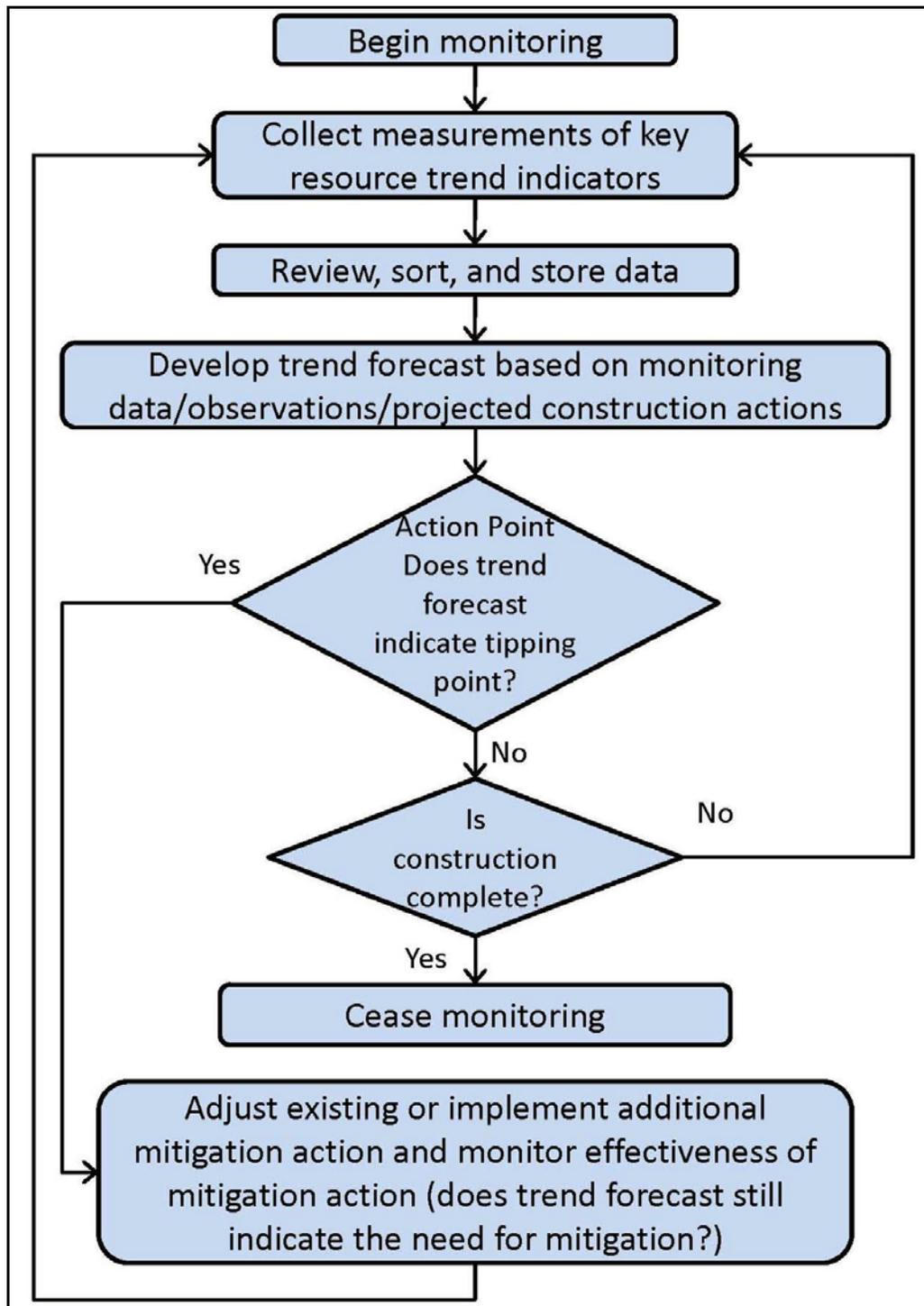
As indicated above, an MOU is being developed between DoD and GWA that establishes a framework of cooperation and information and resource sharing with the goal of providing utility service solutions to meet the projected additional water demand associated with the military relocation. This joint planning and cooperation would ensure that the requirements of both the DoD and civilian community can be met in a manner that is mutually beneficial and maximizes the effectiveness of the overall utility systems. Exchange of water between the DoD and GWA systems would be accomplished through this MOU.

#### 2.4.4 Decision Points in the APM Process

The tipping points developed through the APM process would represent established infrastructure limitations and resource indicator levels that if exceeded, would result in unacceptable impacts on utilities systems and resources. For example, the NDWWTP is currently permitted to 6 MGd for primary treatment. Thus, the tipping point for wastewater infrastructure would be established to flag the point at which construction tempo would be adjusted to prevent exceeding the 6 MGd permit limit or to allow improvements to the primary treatment capacity at the NDWWTP for increased flows in accordance with new permits and consent/orders between the U.S. Government and GWA. The action points would serve as warning level indicators associated with each infrastructure system limitation or resource that would signal the initiation of appropriate actions to avoid unacceptable impacts. The action points would factor appropriate reserves or buffer conditions to ensure that action is taken in sufficient time to prevent adverse impacts associated with tipping points. For example, in the case of the NDWWTP and its current permitted limit of 6 MGd for primary treatment, the NDWWTP currently operates at a daily average of 5.7 MGd. In June 9, 2010 comments to DoD from USEPA, USEPA indicates that the daily averages for the previous six months ranged from 5.59 to 8.24 MGd. An appropriate tipping point would be established by the CMCC. By monitoring data on a regular basis, such as current work force levels and wastewater flows, and by using trend analysis, the CMCC would be able to assess actual per capita usage rates correlated to population, construction work in place, and projected construction awards. When trend analysis forecasted that an action point was being approached or exceeded, DoD, in conjunction with guidance and planning provide by the CMCC, would implement response measures, such as delay of construction awards or changing the sequence of construction, and continue to monitor the effectiveness of the response measures (see Figure 2.4-1).

Another example of how APM could function involves the use of wastewater systems for the construction workforce. As indicated above, the supply of water could be expedited to meet projected workforce demand through modifications to construction sequencing. However, increased use of potable water would increase the generation of wastewater and thereby increase stress on Guam's wastewater infrastructure. The water provided by DoD could therefore be provided on the condition that water supplied to workforce housing developments would meet certain allocation criteria that GWA would control. Water allocations purchased by housing developments in advance would be made available incrementally to workforce housing developments by GWA (e.g., in 2,000-person equivalent increments) and only upon GWA determination that 1) sufficient supply of potable water is available, and 2) sufficient wastewater capacity is available at the impacted wastewater treatment plant. DoD could then make the availability of water allocations at workforce housing one of the requirements for construction contract awards in one of two ways: 1) As a worker requirement provision in requests for proposals, i.e., DoD would only select construction contract proposals that identify sufficient available water allocation from GWA for workers for that specific construction contract; or 2) In the event that GWA communicates a deficiency in its infrastructure identified via regular system monitoring, DoD would delay, or possibly preclude, construction contract award(s) until there is adequate infrastructure capacity. In this way, construction contracts would only be awarded by DoD when sufficient water supply and wastewater capacity are available.

Figure 2.4-2. Monitoring Plan Flow Chart



### 2.4.5 Impact Reduction by Infrastructure Capacity Area and/or Resource

Some infrastructure capacity and/or resources are more sensitive to population level increases than others and thus more capable of being mitigated by the use of APM techniques focusing on construction tempo and sequencing. Those resources that are sensitive to changes in population increases and mitigation through construction tempo would experience less severe impacts if the construction tempo, and resultant force flow, was slowed (Figure 2.4-1). Slowing construction tempo would reduce the population increase and thus the severity of impacts during construction. Implementation of APM would reduce impacts to the following infrastructure limited and population sensitive resources:

- Port Capacity – APM would alleviate some of the proposed action’s adverse impacts at the port by delaying 1) the need for operations related cargo handling, 2) the need for handling of military population household goods, and 3) the handling of associated cargo to support the military population (i.e., arrival of additional food shipments for the military commissary). Adaptive program management would also have the benefit of freeing up the port’s capabilities to accommodate the increase in container ship traffic for construction. Without the demand on port facilities to accommodate construction and operations cargo concurrently, port cargo handling efficiency would increase during the construction phase.
- Wastewater Treatment - As indicated above, controlling the peak population associated with the use of APM would reduce demands and burdens on Guam’s wastewater treatment capability, which would otherwise approach or potentially exceed system design capacities. For example, under the proposed action the NDWWTP’s wastewater flow is projected to reach approximately 12.13 MGd during peak population. This flow would exceed the plant’s design capacity of 12.00 MGd. However, in the notional scenario for APM presented above, the maximum flow to NDWWTP in 2014 would be substantially less than the NDWWTP’s design capacity.
- Drinking Water Production, Treatment and Distribution – Through implementation of APM, construction tempo would be managed such that demand for potable water associated with peak population would be lowered, thus reducing the demand for potable water production, treatment and distribution. Additionally, as indicated above, through modification of construction sequencing DoD would expedite a number of initiatives to make water available to GWA in advance of need, either by upgrading or improving the condition of existing wells currently under DoD control or by establishing new wells on DoD lands. Coordination of the exchange of water between DoD and GWA would maximize the effectiveness of existing and proposed distribution systems to the mutual benefit of DoD and civilian communities on Guam.
- Roadways - Impacts to off-base roadways are directly related to population increases. Reducing the total peak population associated with the proposed action by implementing APM is expected to reduce stresses on Guam’s currently deficient roadway system. With implementation of APM the additive impacts of construction and military operations traffic would be lessened with related reductions in adverse impacts to off-base roadways during the peak population period.
- Geological and Soil Resources – The proposed action involves construction that would result in some degree of erosion. A reduction in the number of concurrent construction projects through APM would reduce concurrent disturbance of soil and topography and therefore lessen the amount of erosion resulting from construction at a given time.

- Water Resources (surface water, stormwater, wetlands) – The proposed action involves construction that would result in erosion and potential for stormwater runoff. The proposed action includes implementation of erosion and stormwater BMPs that would control erosion and runoff before and after construction activities. Slowing the construction tempo would decrease the amount of grading and ground disturbance occurring at one time and further reduce the potential for erosion and stormwater runoff. This measure may also reduce the projected peak demand for and stresses on water-related resources and infrastructure (see utilities discussion below).
- Air Quality – The proposed action involves construction activities that would result in releases of air pollutants. Slowing construction tempo would reduce air quality impacts by lowering the amount of air pollutants that would be released at any one time.
- Noise – There are two potential noise issues associated with the proposed action: noise associated with construction activities and noise associated with long-term operations after construction is complete. Construction noise is directly related to the intensity of construction. The use of heavy equipment at a construction site has a noise impact on nearby citizens and wildlife. Slowing the construction tempo could possibly change the amount of noise experienced at any given time depending on the clustering of construction and relative location of receptors, but could have an undesired effect of prolonging local exposure to that construction-related noise. Likewise, changes in construction tempo would also have a corresponding change in intensity and duration of noise impacts along roadways used by construction vehicles. Operational noise is not directly related to construction tempo or associated short-term population increases; therefore, slowing the construction tempo would not affect operational noise impacts.
- Recreational Resources – Recreational resources both within DoD-controlled property and within the civilian community would be significantly impacted by implementation of the proposed action. Foreseeable impacts from population increases include crowding at parking lots, picnic shelters, restrooms, showers, boat mooring facilities, golf courses, dive spots, etc. Adverse impacts would result from both construction and operations populations; however, impacts would be most pronounced during peak population when these two populations would be additive. Slowing construction tempo would reduce impacts to recreational resources by lessening the peak population associated with the proposed action.
- Terrestrial and Marine Biological Resources – Adjusting the construction pace would not reduce the direct impacts on terrestrial and marine biological resources. However, there may be a reduction in indirect impacts on nearby biological resources if construction is slowed. There may be less construction noise generated in the same location. However, a slower construction schedule could result in noise generated over a longer period of time. The reduced peak population associated with construction could reduce the impacts of recreational use on marine and terrestrial resources.
- Cultural Resources – Adjusting the construction pace would not reduce the direct impacts on historic properties.
- Socioeconomics and General Services– The impacts from the proposed action would peak in the years 2013 to 2015 timeframe and are made significant in large part due to the overlap in the construction and operation phases of the proposed action. Impacts would result from rapid population influx, housing and public service shortages, and cost of living increases, among other factors. Slowing the construction tempo and associated construction workforce and induced population generally would lessen the adverse socioeconomic impacts already

- discussed in this EIS. Slowing construction tempo would provide GovGuam and the private sector a longer period of time to increase available public services for the short-term population increase, which may also help alleviate initial shortfalls for the projected long-term population increase.
- **Public Health and Safety** – Impacts to public health and safety are related to population. The reduced population would likely result in reduced cases of disease, mental illness, and traffic incidents because of the lowered peak population. Slowing the construction tempo would provide GovGuam and the private sector more time to increase available public services (i.e., health care services, social services, and protective services) for the short-term population increase, which may also help alleviate initial shortfalls for the projected long-term population increase. However, because existing Guam public services are considered sub-standard, it is anticipated that Guam public services would still not be able to increase staffing to meet current service ratios and would not be capable of adequately handling potential increases in services (e.g., air quality-related illnesses, water-related illnesses, notifiable diseases, mental illness, and emergency response). Reducing the total peak population associated with the proposed action would reduce the potential for traffic incidents on Guam’s roadways. Aircraft mishaps, bird airstrike hazards, explosive safety, and electromagnetic safety are not directly related to construction tempo or associated short-term population increases; therefore, slowing the construction tempo would not affect these potential operational impacts. The proposed action involves construction that would result in the potential to encounter UXO. BMPs would be implemented prior to and during construction activities to ensure that potential impacts from UXO would be minimized. Slowing the construction tempo would decrease the amount of grading and ground disturbance occurring at one time and further reduce the potential for encountering UXO.
  - **Environmental Justice and Protection of Children** – With implementation of APM of construction, disproportionate impacts to low income populations and children could be reduced due to slowing the construction tempo and associated construction workforce resulting in a reduction in peak population associated with the proposed action. Reductions in peak population would reduce demand and burdens on Guam’s infrastructure and public health and safety services. The reduced population numbers and monitoring to avoid unacceptable impacts would decrease the significant disproportionate impacts related to socioeconomics, public health and safety, potable water, and wastewater.

For those resources where there would be minimal adverse impact from construction tempo and sequencing, and associated population levels, there would be minimal impact from the APM of construction. Resources that would be minimally affected by the APM of construction mitigation measure are as follows:

- Land and Submerged Land Use
- Airspace
- Visual Resources
- Hazardous Material/Waste.

## **2.5 LIMITATIONS TO THE ADAPTIVE PROGRAM MANAGEMENT APPROACH FOR THIS ACTION**

DoD acknowledges that there are limits on applying APM to construction projects as mitigation. There are well-documented existing infrastructure deficiencies on Guam that make it difficult to differentiate the effects of DoD actions. Adaptive Program Management is not a substitute for identifying and establishing

mitigation measures for particular impacts. A comprehensive list of mitigation measures, other than APM, proposed in this EIS to avoid or reduce impacts associated with the proposed action are summarized in Volume 7, Section 2.2.

Consistent with draft CEQ guidance on mitigation measures issued February 18, 2010, adaptive management should be included as part of any mitigation measure proposal. As highlighted by the draft CEQ guidance, adopting an adaptive management approach is important to mitigation measures “to minimize the possibility of mitigation failure.” Establishing effective mitigation measures during the NEPA environmental review and environmental planning process lessens the potential for significant impacts and minimizes the likelihood of having to respond to unexpected significant impacts later. Following publication of the Draft EIS and receipt of public and agency comments, DoD has identified additional mitigation measures for air quality, natural resources, marine resources, stormwater, potable water, and wastewater. These additional mitigation measures are described in Volumes 2 through 6 and identified in Table 2.2-1 of this volume. As stated earlier in this section, the proposed mitigation measures identified in this EIS and selected for implementation in the ROD would be monitored in the post-ROD Monitoring Plan.