

CHAPTER 3.

PREFERRED ALTERNATIVES: SUMMARY OF IMPACTS

3.1 INTRODUCTION

Chapter 3 summarizes the construction and operational impacts of the preferred alternatives for Guam and Tinian that were presented in previous volumes. Those impacts are compared to the existing trends in resources to determine whether the preferred alternatives would adversely impact the overall health of each resource.

This chapter also includes a section on potential secondary impacts due to the preferred alternatives and a section summarizing the Clean Water Act (CWA) Section 404 actions under all alternatives from previous volumes.

3.2 PREFERRED ALTERNATIVES' DEFINITION

The term preferred alternatives refers to all the components of preferred alternatives' described in previous volumes for the Marine Corps relocation, Navy transient aircraft carrier wharf and Army AMDTF, as a whole. The greatest impacts to resources would occur when all of the proposed actions occur concurrently. To assess a maximum potential adverse effect, it is assumed that proposed construction actions would occur during a compressed period. It is assumed that all operational activities would commence only upon completion of construction. In other words, there would be no overlap between construction and operation phases of the preferred alternatives.

The construction impacts would presumably peak in 2014, and that is the point of reference used for describing the construction impacts under the preferred alternatives for each resource. This is the point of maximum population and ground disturbance with maximum potential impact to resources and presents the starkest contrast. It is also assumed that the planned mitigation and best management practices (BMPs) that are proposed for construction impacts are completed prior to the operational phase. In other words, the construction impacts are reduced to less than significant once the operational phase begins.

The steady-state level of operations would begin at the conclusion of construction and continue unchanged for an undetermined amount of time into the future. It would represent the long-term impact of the preferred alternatives in isolation of reasonably foreseeable actions.

Relative to the construction phase, the operational phase would have less impact on the island resources, especially those resources that are sensitive to population levels.

3.3 PREFERRED ALTERNATIVES' IMPACTS COMPARED TO NO ACTION

3.3.1 Methodology

The methodology for comparing the preferred alternatives' impacts to no action consists of the following steps:

1. Summarize the preferred alternatives' impacts from Volumes 2 through 6:
 - a. Consolidate the findings of the preferred alternatives' impact analyses presented in previous volumes of the EIS/OEIS, by resource area. This is done for an anticipated construction peak in 2014 and the post-construction operational steady-state. It is assumed that all of the proposed construction actions would occur in a compressed time period, and that all operational activity

would commence upon completion of construction. A second assumption is the mitigation for construction impacts would be completed before the operational period commences.

- b. For Guam only: Review the preferred alternatives' findings from Step 1 for each resource criteria. Identify the highest level of adverse impact identified among the volumes for that criteria and designate that significance level as the summary of impacts for the specific criteria. This list represents the summary of the preferred alternatives impacts from Volumes 2 through 6 for all preferred alternatives for Guam. There are exceptions to this method based on the specific resource, as noted in the discussions by resource. This summary impact assessment is warranted for Guam's proposed actions because there may be additive impacts associated with the preferred alternatives as a whole that are not apparent in the project-specific analysis of previous volumes.

Tinian is geographically distant from Guam and is not expected to be influenced by Guam's summary impacts. There are far fewer proposed actions on Tinian and a separate summary of impacts as a whole is not warranted. The preferred alternatives' impacts in Volume 3 are essentially a summary of impacts for Tinian. These findings are reiterated.

2. Describe no action for each resource. Describe the island-wide (Tinian and Guam) trends in resource health for each resource in the absence of any of the preferred alternatives described in this EIS/OEIS. This is referred to as "no action". There are key natural and anthropogenic (human-influenced) stressors that are triggered by key events or repetitive practices/behaviors over time. A review of stressors often reveals trends in resource success or health that lead to the existing affected environment, as described in resource sections of Volume 2 through 6. Under no action, each resource is described in terms of its ability to accommodate additional effects or stress.

The time period designated for describing the resource trends begins at the conclusion of World War II (WWII). WWII was selected because it is the single most significant event in modern history and had profound environmental impacts. Volume 7, Chapter 1, provides an overview of key events. The resource descriptions are often qualitative and based on best available information. They are intended to provide insight on the current situation on each island that may be influenced by the preferred alternatives.

3. Compare the summary of preferred alternatives' operational impacts described in Steps 1 and 2 to no action, described in Step 3, to determine whether the preferred impacts would influence the trends in resource health.

The comparison of the preferred alternative impacts to no action meets, in part, Council on Environmental Quality (CEQ) guidance on cumulative impacts analysis as described in *Considering Cumulative Effects Under the National Environmental Policy Act (NEPA)* (CEQ 1997) and *Guidance on the Consideration of Past Actions in Cumulative Effects Analysis* (CEQ 2005). One principal in the guidance documents states that "cumulative effects analysis should be conducted within the context of resource, ecosystem, and community thresholds—levels of stress beyond which the desired condition degrades". Thus, "each resource, ecosystem, and human community must be analyzed in terms of its ability to accommodate additional effects, based on its own time and space parameters."

This methodology is applied to each resource and described in the following sections. The findings for Tinian and Guam are discussed together under each resource. A summary table summarizing the findings for all resources is presented after the resource discussions.

3.3.2 Geological and Soil Resources

3.3.2.1 Summary of Preferred Alternatives' Impacts

Most impacts on geological and soil resources are less than significant during construction and operation. The only significant impact identified is to topography at Finegayan because of the large amount of construction (approximately 1,093 ac [422 ha]) that would occur. When summarizing the total impact on geology and soils for Guam the significance is reduced to less than significance because the significant impact is localized and would not impact the entire island.

During site planning, sinkholes and karst caves were identified and avoided. A buffer zone of vegetation would remain around them through construction and operation to prevent further erosion or expansion on Tinian and Guam. Minimal impacts to sinkholes would occur.

Construction activities on Tinian and Guam would include clearing, grading, and grubbing, demolition of existing road pavement, earthwork, and landscaping. Temporary loss of vegetation would occur. The ground disturbance is much less on Tinian than on Guam. With the implementation of protective measures, including requirements for stormwater compliance, there would be no significant impacts from soil erosion during construction or operation. Soil types lost would not be agriculturally productive soils. Topographic or landscape features would not be changed substantively by the proposed actions and the preferred alternatives are not located in a seismically-active zone.

Construction on previously disturbed land such as Apra Harbor and South Finegayan is less likely to impact soil and geological resources. Liquefaction is a risk at Apra Harbor, but impacts to development would not be significant.

The preferred alternatives would have an overall less than significant impact on geology and soils during construction. Operational risks are limited to geologic hazards. There is a high risk of liquefaction at Apra Harbor and Naval Base Guam. Structures would be constructed to meet UFC 3-310-04 Seismic Design for Buildings criteria to reduce risk of damage to structures from seismic hazards. The risk cannot be reduced to zero; therefore, a less than significant impact remains.

Table 3.3-1. Summary of Preferred Alternatives Construction Impacts - Geology and Soils

Potential Impacts	Guam									Tinian
	Volume 2	Volume 4	Volume 5	Volume 6					Summary Impact	Volume 3
	Marine Corps	Navy Aircraft Carrier	Army AMDTF	Power	Potable Water	Waste water	Solid Waste	Road-ways		Training
Topography	LSI	LSI	LSI	LSI	LSI	LSI	LSI	LSI	LSI	LSI
Geology	LSI	NI	LSI	LSI	LSI	LSI	LSI	LSI	LSI	LSI
Soils	LSI	LSI	LSI	LSI	LSI	LSI	LSI	LSI	LSI	LSI
Geologic Hazards	LSI	LSI	LSI	LSI	LSI	LSI	LSI	LSI	LSI	LSI
Geology and Soils Construction Summary:									LSI	LSI

Legend: SI = Significant impact, SI-M = Significant impact mitigable to less than significant, LSI = Less than significant impact, NI = No impact

Table 3.3-2. Summary of Preferred Alternatives Operation Impacts - Geology and Soils

Potential Impacts	Guam									Tinian
	Volume 2	Volume 4	Volume 5	Volume 6					Summary Impact	Volume 3
	Marine Corps	Navy Aircraft Carrier	Army AMDTF	Power	Potable Water	Waste water	Solid Waste	Roadways		Training
Topography	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
Geology	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
Soils	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
Geologic Hazards	LSI	LSI	LSI	LSI	LSI	LSI	LSI	LSI	LSI	LSI
Geology and Soils Operation Summary									LSI	LSI

Legend: SI = Significant impact, SI-M = Significant impact mitigable to less than significant, LSI = Less than significant impact, NI = No impact

3.3.2.2 No Action

Impacts to geological and soil resources are a function of both naturally occurring and anthropogenic activities that result in land disturbance. Soil erosion and changes to topography can be caused by a number of factors including construction projects that did not employ BMPs, wildfires, and even wildlife such as ungulates. Guam has a history of wildfires set by hunters to attract game. The resulting reduction in groundcover from these wildfires increases soil run-off in stormwater and would continue to occur under no action. Stressors affecting geological and soil resources would occur without the preferred alternatives being implemented.

Soil erosion on Guam and Tinian has historically been a problem due to natural and anthropogenic influences. While the trend has improved with the adoption of federal non-point source regulation since WWII, the increase in erosion and the ongoing effects of historical influences is likely to continue into the near future. This adverse trend in soil erosion is considered a significant impact under no action, Future construction projects, would have less than significant impact because BMPs, outlined in an erosion Control Plan, would be required for erosion and stormwater management. There are other measures to address the ongoing problem such as ungulate control, planting exposed soils, enforcement of existing policies and laws, and passing new laws to reduce impacts.

Surface runoff and sediment losses from soil erosion are major contributors to reduction in surface water quality, especially in Southern Guam. A study of the Ugum watershed on Guam indicates that soil erosion from vegetated savanna grassland in the watershed is approximately 70 tons/ hectare/year, but can be as high as 547 tons/hectare/year in unvegetated sloping sites known as "badlands" (U.S. Geological Survey [USGS] 2001). Agricultural lands in the Ugum watershed were estimated to have an average soil erosion loss of 45 tons/hectare/year (USGS 2001). Additional problems associated with soil erosion island-wide include loss of soil productivity at the eroded site, reduced water storage capacity in streams and lakes, and loss of wildlife habitat.

Many geological phenomena, such as earthquakes, tsunamis, and volcanic eruptions, originate in areas where plates meet (USGS 2008). The Marianas are positioned where the Philippine and Pacific Plates converge. Earthquake activity is common on Guam and across the entire Mariana Island chain (Lander et al. 2002). Seismic activity can trigger landslides, tsunamis, and liquefaction. All of these events are

unpredictable and could occur anywhere on Tinian or Guam. Building codes mitigate future hazards that may result from seismic activity.

3.3.2.3 Comparison of Preferred Alternatives to No Action

The preferred alternatives would have a less than significant impact on geology and soils during construction and operation. This assumes adherence to BMPs and stormwater management principles. Under no action, the same principles would apply during construction and future development would result in less than significant impacts.

The other factors that contribute to island-wide soil erosion would continue, including ungulate removal of vegetation, and existing badlands and exposed soils. The island-wide no action trend in erosion due to pre-existing conditions would continue to increase with significant but mitigable impact.

The preferred alternatives for Tinian would not significantly impact topography at the specific site and there would be no significant effect on island-wide topography. Under no action there would potentially be localized impacts to topography from planned construction activities that would also be considered less than significant.

Guam and Tinian have a history of earthquake activity. Geologic hazards also include sinkholes and karst features that would always limit developable areas on both islands. Geological surveys would continue to ensure that construction is not planned in areas where geological hazards could lead to structural problems by creating buffer zones around sinkholes. There may be impacts in localized areas of construction, but island-wide there would be no operational impact. During preferred alternatives operation and no action, there would continue to be a risk with less than significant impacts.

3.3.3 Water Resources

3.3.3.1 Summary of Preferred Alternatives' Impacts

The following has been determined at all sites regarding impacts to water resources as a result of all of the preferred alternatives:

- Increases in stormwater would be managed by existing or new stormwater infrastructure and stormwater flow paths would continue to mimic area topography.
- Stormwater would continue to be managed in accordance with laws, regulations, and plans which would reduce potential impacts to groundwater and nearshore waters.
- Through the development and implementation of site-specific BMPs, Low Impact Development (LID) measures, and facility-specific plans and procedures, there would be no increased risk from environmental hazards or to human health.
- Roadway-specific BMPs, as identified in the CNMI and Guam Stormwater Management Manual (CNMI and Guam 2006), would be included in the planning, design, and construction for all road projects.
- While groundwater production rates would increase, implementation of sustainability practices would reduce the amount of groundwater needed per capita, which would help minimize impacts to groundwater availability.
- The resulting total annual groundwater production would be less than the sustainable yield. Monitoring of groundwater chemistry and overlying sediments would ensure no harm to existing or beneficial use, and no damage to structures, utilities, or other facilities due to potential soil settlement or saltwater intrusion.

- With the implementation of dredge-specific mitigation measures for the dredging of Apra Harbor, impacts to nearshore waters would be less than significant.
- Dredged material dewatering sites would not be located over areas with groundwater not used for groundwater production; dredge effluent that percolates into the underlying soils would not affect groundwater drinking quality or quantities.
- Increased groundwater production could potentially impact cave and pool water levels; potential impacts to the system could require review and/or permitting by the U.S. Army Corps of Engineers (USACE).
- Wastewater treatment plant effluent discharges would be of the same or higher quality than current discharges and would continue to meet discharge requirements in nearshore waters.
- With the implementation of mitigation measures to compensate for potential direct and indirect impacts to wetlands resulting in loss of wetland function, there would be no reduction in wetland area or functionality on Guam.
- All actions would be implemented in accordance with all applicable federal, Government of Guam (GovGuam), and military orders, laws, and regulations, including Commander Navy Region (COMNAV) Marianas Instruction 3500.4 (COMNAV Marianas 2000).

During construction, the preferred alternatives could result in temporary increases in stormwater runoff that would be reduced to less than significant levels through the use of BMPs. There may be less than significant indirect impacts to wetlands and nearshore waters due to sedimentation on Guam. There are planned dredging projects under the preferred alternatives in Apra Harbor that would temporarily impact the water quality of nearshore waters. BMPs would limit the impacts to the dredge area.

The same water quality impacts on Guam during construction are anticipated on Tinian, except 1) there may be direct impact (fill) of 0.3 ac (0.12 ha) of a potential jurisdictional wetland, and 2) no dredging is proposed. The wetland delineation on Tinian has not been verified and it is likely the final quantity of wetlands would decrease or the firing range would be modified to avoid wetlands, to the extent practical.

Table 3.3-3 lists impacts to water resources under all preferred alternatives are summarized in the following discussion. If there is a direct or indirect impact it is indicated in the table. If that impact can be quantified, an area of fill is listed.

Table 3.3-3. Summary of Construction Impacts to Jurisdictional Waters of the U.S. and Wetlands

Volume	Component Action	Jurisdictional		Impacted Feature
		Waters (Area ac/ha)	Wetlands	
2	Dredging	Direct impact	Indirect impact	Inner Apra Harbor
	In-Water Construction	Direct	-	Inner Apra Harbor
	Landing Ramps	0.02/0.01	-	Inner Apra Harbor
3	Platoon Battle Course	-	0.3/0.12	Palustrine wetland
4	Dredging	Direct	Indirect	Outer Apra Harbor
	Wharf Rip Rap	3.6/1.45	-	Outer Apra Harbor

Legend: - = no impact

Tables 3.3-4 and 3.3-5 summarize the preferred alternatives’ construction and operation impacts to water resources on Guam and Tinian. The findings from previous volumes are listed. For Guam, the greatest level of impact identified among all the volumes is listed in the last Guam column. The summary of impacts for Tinian’s preferred alternatives is listed in the far right column of the tables. It is assumed that

all of the proposed construction actions would occur during a compressed time period, and that all operational activity would commence upon completion of construction.

Table 3.3-4. Summary of Preferred Alternatives Construction Impacts – Water

Potential Impacts	Guam									Tinian
	Volume 2	Volume 4	Volume 5	Volume 6					Summary Impact	Volume 3
	Marine Corps	Navy Aircraft Carrier	Army AMDTF	Power	Potable Water	Waste water	Solid Waste	Road-ways		Training
Surface Water/ Stormwater	SI-M	LSI	LSI	NI	LSI	LSI	NA	LSI	SI-M	LSI
Groundwater	LSI	LSI	LSI	NI	LSI	LSI	NA	LSI	LSI	LSI
Nearshore Water	SI-M	SI-M	LSI	NI	LSI	LSI	NA	LSI	SI-M	LSI
Wetlands	LSI	LSI	NI	NI	LSI	NI	NA	NI	LSI	SI-M
Water Resources Construction Summary:									SI-M	SI-M

Legend: SI = Significant impact, SI-M = Significant impact mitigable to less than significant, LSI = Less than significant impact, NI = No impact

Table 3.3-5. Summary of Preferred Alternatives Operation Impacts – Water

Potential Impacts	Guam									Tinian
	Volume 2	Volume 4	Volume 5	Volume 6					Summary Impact	Volume 3
	Marine Corps	Navy Aircraft Carrier	Army AMDTF	Power	Potable Water	Waste water	Solid Waste	Road-ways		Training
Surface Water/ Stormwater	LSI	NI	LSI	NI	LSI	NI	NI	NI	LSI	LSI
Groundwater	LSI	NI	LSI	NI	LSI	NI	LSI	NI	LSI	LSI
Nearshore Water	LSI	NI	LSI	NI	LSI	BI	NI	NI	LSI	LSI
Wetlands	NI	NI	NI	NI	NI	NI	NI	NI	NI	LSI
Water Resources Operation Summary:									LSI	LSI

Legend: SI = Significant impact, SI-M = Significant impact mitigable to less than significant, LSI = Less than significant impact, NI = No impact

During operations, stormwater would be managed on-site. There is potential with the overall increases in developed areas and maneuver training that there would be less than significant impacts to groundwater, nearshore and wetland water quality. Wastewater improvements on Guam would result in a beneficial impact of improved water quality. There may be an issue associated with leachate impact on groundwater as a result of existing and continued Navy landfill operations. The leachate from the existing Navy sanitary landfill may impact the groundwater at a less than significant impact. However, the landfill is located over aquifers not used for supplying drinking water, thus any leachate that might percolate into the aquifer would not affect regional groundwater drinking quality or quantities.

3.3.3.2 No Action

Guam and Tinian

The stressors on water quality include construction-related discharge, sewage overflow, animal waste, sediment erosion, saltwater intrusion into aquifers, leaky septic systems, feral ungulates, human disturbance of soils, erosion, invasive plants.

Surface Water/Stormwater

The identified stressors impacting surface water availability and quality on Guam and Tinian (e.g., construction-related discharges, sewage overflows, animal waste, and sediment erosion) would continue to exist. These threats to surface water would continue to be monitored by federal and Guam/Tinian agencies, and appropriate regulatory action would continue to occur in order to maximize surface water quality and availability. In time, surface water quality is expected to slowly improve as point and non-point sources of pollution are identified and pollution loading to surface waters is reduced.

Groundwater

The identified stressors impacting groundwater availability and quality on Guam and Tinian (e.g., saltwater intrusion and leaky septic systems) would continue to exist. These threats to groundwater availability and quality would continue to be monitored by federal and Guam/Tinian agencies to minimize potential impacts, and appropriate regulatory action would continue to occur in order to protect groundwater resources. Monitoring for saltwater intrusion and coordination amongst water users, as well as potential designations for groundwater resources is expected to ensure there is a dependable, safe supply of groundwater for Guam/Tinian users. In time, groundwater quality is expected to slowly improve on Guam as point and non-point sources of pollution are identified and pollution loading to surface waters is reduced, all within the framework of increasing the understanding of the Northern Guam Lens Aquifer (NGLA).

Nearshore Waters

Numerous sources of pollutants are currently present on Guam and Tinian that stress surface water resources. These sources include municipal and industrial point sources; sewer system overflow and failure; agricultural runoff (e.g., animal wastes, fertilizers, and pesticides); urban runoff; erosion from stream beds, construction sites, and derelict land; leaks and spills; and landfill leachate. The identified nearshore water quality concerns for the marine waters of Guam include copper, aluminum, nickel, *enterococci* bacteria, total residual chlorine, biochemical oxygen demand, and total suspended solids. The identified nearshore water quality concerns for the marine waters of Tinian only include *enterococci* bacteria at one nearshore location (Unai Chulu). These contaminants can be attributed to one or more of the sources listed above and would continue to persist. Threats to nearshore water quality would continue to be monitored by federal and Guam/Tinian agencies to minimize potential impacts, and appropriate regulatory action would continue to occur to protect nearshore waters. In time, nearshore water quality is expected to slowly improve as point and non-point sources of pollution are identified and corrected.

Wetlands

The identified stressors impacting wetlands on Guam and Tinian (e.g., feral ungulates, human disturbance, invasive plants species, sedimentation, and erosion) would continue to occur. These threats to wetland area and function are of concern and are therefore monitored by federal and Guam/Tinian agencies to protect wetland areas. Appropriate regulatory action would continue to occur to protect wetland areas. In time, wetland quality is expected to slowly improve as point and non-point sources of pollution are identified;

however, the extent of wetlands (by acreage) is not expected to increase. The emphasis of agency efforts is to reduce future losses of wetlands.

3.3.3.3 Comparison of Preferred Alternatives to No Action

Under no action, the existing primary threats to surface water, groundwater, nearshore water, and wetlands would continue on Guam and Tinian. Over time, more development and ground disturbance would occur on federally-controlled and non-federally controlled lands. Local and federal regulations applicable to development projects would mitigate potential construction impacts on wetlands and water. Stormwater management during construction and operations would continue.

There would continue to be feral ungulates and invasive plant species and natural events that contribute to erosion on Tinian and Guam but the preferred alternatives would not exacerbate the ongoing impacts on water quality due to soil erosion. As compensation mitigation for coral community impacts under the preferred alternatives in Apra Harbor, watershed management projects are proposed that would address some of the erosion issues in specific watersheds on the southwest coast of Guam.

During operations, the preferred alternatives would not appreciably impact the existing trend in surface water, ground water, nearshore water or wetland health.

3.3.4 Air Quality

3.3.4.1 Summary of Preferred Alternatives’ Impacts

Tables 3.3-6 and 3.3-7 summarize the preferred alternatives’ construction and operation impacts to air quality on Guam and Tinian. The findings from previous volumes are listed. For Guam, the greatest level of impact identified among all the volumes is listed in the last Guam column. The summary of impacts for Tinian’s preferred alternatives is listed in the far right column of the tables. It is assumed that all of the proposed construction actions would occur during a compressed time period, and that all operational activity would commence upon completion of construction. For air quality, construction data is shown for a range of years and not just the peak construction year.

Table 3.3-6. Summary of Preferred Alternatives Construction Impacts - Air Quality

Potential Impacts	Guam									Tinian
	Volume 2	Volume 4	Volume 5	Volume 6					Summary Impact	Volume 3
	Marine Corps	Navy Aircraft Carrier	Army AMDTF	Power	Potable Water	Waste water	Solid Waste	Roadways		Training
Air Quality	LSI	LSI	LSI	LSI	LSI	LSI	LSI	LSI	LSI	LSI
Air Quality Construction Summary:									LSI	LSI

Legend: SI = Significant impact, SI-M = Significant impact mitigable to less than significant, LSI = Less than significant impact, NI = No impact

Table 3.3-7. Summary of Preferred Alternatives Operation Impacts - Air Quality

Potential Impacts	Guam								Tinian	
	Volume 2	Volume 4	Volume 5	Volume 6				Summary Impact	Volume 3	
	Marine Corps	Navy Aircraft Carrier	Army AMDTF	Power	Potable Water	Waste water	Solid Waste		Roadways	Training
Air Quality	LSI	LSI	LSI	LSI	LSI	LSI	LSI	LSI	LSI	LSI
Air Quality Operation Summary:									LSI	LSI

Legend: SI = Significant impact, SI-M = Significant impact mitigable to less than significant, LSI = Less than significant impact, NI = No impact

There would be less than significant adverse impacts to air quality under construction and operation for Guam and Tinian. Construction and operation emissions from the preferred alternatives would be below significance criteria of 250 tons per year (TPY) for air pollutants adopted in the EIS/OEIS with an exception for the operational carbon monoxide (CO) emission level primarily generated from on road vehicle operations.

As discussed in Volume 2, Chapter 5, Air Quality, the EIS/OEIS selected the “major stationary source” definition of 250 TPY or more of any air pollutant subject to regulations under the Clean Air Act [CAA] from the Prevention of Significant Deterioration (PSD) program. The PSD is used as the criteria for locations that are in attainment for determining the potential significance of air quality impacts from these sources. Neither the PSD permitting program nor the General Conformity Rule (GCR) are applicable to mobile sources and non-major stationary sources in attainment areas. Therefore, the analysis of construction and operational incremental emissions from these sources in attainment areas and the significance criteria selected (250 TPY) are solely for the purpose of informing the public and decision makers about the relative air quality impacts from the preferred alternative and the alternatives under NEPA. However, since the 250 TPY threshold is selected in the context of the *de minimis* threshold established in the GCR providing only an indication of potential significant impact, a further formal impact analysis should be conducted if such threshold is exceeded, where appropriate.

Based on a more refined CO concentration modeling analysis for on road vehicle operational impact described in Volume 6, no exceedances of the CO National Ambient Air Quality Standards (NAAQS) were predicted at the location of anticipated highest emissions. Therefore, the preferred alternatives would not result in a significant CO impact even though the island wide emissions would exceed 250 TPY. Sulfur dioxide (SO₂) emissions were also well below the 100 TPY *de minimis* level used as the threshold for emissions within the two non-attainment areas. Consequently, the preferred alternatives would result in a less than significant impact on air quality.

Greenhouse gas (GHG) emissions into the atmosphere are of concern because they contribute to global warming by trapping re-radiated energy. The total quantity of GHG emissions are expressed in terms of carbon dioxide (CO₂) emissions resulting under the preferred alternative. CO₂ is not a criteria pollutant and the 250 TPY significance threshold is not applicable to CO₂. GHGs are discussed for all regions of influence (ROI) on Guam and combined with CNMI GHGs at the end of this section because the entire geographic region is a more appropriate scale for evaluation of potential impacts.

The issues covered in this section respond to public concerns raised during scoping meetings including: increases in vehicle and vessel emissions (mobile sources), increases in emissions from existing power

sources, increase in construction-related emissions, and compliance with the GCR in siting project facilities, and project elements that would be major contributors to GHGs.

Detailed emissions analysis of the preferred alternative and its impact on air quality, evaluating for each individual ROI – North, Central, Apra Harbor, and South, is presented in Volume 9, Appendix I, Section 3.5 Regional Emissions under Preferred Alternatives.

Criteria Pollutants

Construction activities for the Marine Corps relocation would include 1) the development of airfield, waterfront, ground and other training sites; housing; quality of life facilities; and operational and administrative facilities (Volume 2, Alternative 2); 2) aircraft carrier berthing and dredging (Volume 4, Alternative 1 (Polaris Point), 3) the co-location of the Army AMDTF with the U.S. Marine Corps facilities (Volume 5, Alternative 1), and 4) the utilities and roadways in each Guam ROI (Volume 6, Alternative 1).

The annual construction emissions would likely be dominated by the Main Cantonment and roadway activities. The construction criteria pollutant emissions for Guam are summarized in Table 3.3-8 and they do not exceed 250 TPY of criteria pollutants in any single year.

Table 3.3-8. Guam Annual Emissions – Preferred Alternatives

	Year	Total Annual Pollutant Emissions (TPY)						
		SO ₂	CO	PM ₁₀	PM _{2.5}	NO _x	VOC	CO ₂
Construction	2011	59.3	85.0	17.3	13.5	86.6	21.9	16,490.5
	2012	74.6	111.1	21.3	16.8	109.5	29.4	20,317.8
	2013	116.1	156.4	32.4	36.7	167.4	37.8	31,464.8
	2014	63.6	116.0	26.0	16.1	99.2	38.1	18,467.9
	2015	19.6	53.5	23.2	8.0	35.3	22.1	6,326.9
Operation	2017 and on	120.1	2,997.7	76.2	53.2	205.2	221.1 –223.0	180,215.5 – 186,134.2

PM =particulate matter; PM₁₀= particle size of 10 micrometers or less; PM_{2.5} = particle size less than 2.5 micrometers; NO_x = nitrogen oxides; VOC= volatile organic compounds

Operational activities are limited to 1) airfield, vessel, and ground training and on base vehicle activities associated with the Marine Corps Guam (Volume 2, Alternative 2), 2) aircraft berthing (Volume 4, Alternative 1), and 3) utility and off base vehicle operations (Volume 6, Alternative 1).

The emissions associated with these operations in any year would be below 250 TPY of criteria pollutants, except for CO at a projected level of approximately 3,000 TPY, as shown in Table 3.3-8. The CO exceedances of 250 TPY would result primarily from off base vehicle operations and to a lesser extent, on base vehicle operations.

As discussed in Volume 6 for roadway projects, vehicular CO emissions are of local (microscale) concern with potential impacts concentrated around heavily congested intersections. Although the Guam-wide CO emissions are predicted to exceed 250 TPY under operational conditions, further microscale dispersion modeling performed at the intersections of highest anticipated level of emissions (Volume 6) indicated that no exceedances of the CO NAAQS would occur. Therefore, potential CO impacts would be less than significant under the preferred alternatives. Table 3.3-9 lists the intersections with highest level of emissions on Guam that were analyzed for CO concentration levels. Consequently, overall potential air quality impacts would be less than significant under the preferred alternative.

Table 3.3-9. Intersections Analyzed for CO Microscale Impact Analysis – Preferred Alternatives

<i>ROI</i>	<i>Intersections</i>
North	Route 1/25
	Route 9/Andersen AFB North Gate
Central	Route 1/8
	Route 4/7A
	Route 16/27
Apra Harbor	Route 1/2A
South	Route 5/2A

CAA General Conformity Applicability Analysis

The 1990 amendments to the CAA (CAAA) require federal agencies to ensure that their actions conform to the State Implementation Plan (SIP) in a nonattainment area. As the preferred alternative would potentially involve activities in Piti and Tanguisson SO₂ nonattainment areas, the GCR is applicable to those proposed activities within the nonattainment areas. Therefore, a subsequent general conformity applicability analysis is required.

The *de minimis* level established by USEPA is 100 TPY of SO₂, and it is applicable to the two non-attainment areas on Guam, Piti and Tanguisson. If the total direct and indirect emissions of a pollutant are above the *de minimis* level, a formal general conformity determination is required for that pollutant. The net increase in SO₂ emissions due to the components of the preferred alternatives located within the two SO₂ non-attainment areas was predicted for operational and construction activities. As summarized in Tables 3.3-10 and 3.3-11, annual SO₂ emissions under the preferred alternatives would not exceed the *de minimis* criterion of 100 TPY of SO₂ in either the Tanguisson or the Piti non-attainment areas and a formal conformity determination is not required. A Record of Non-applicability will be included in the Final EIS.

Table 3.3-10. Preferred Alternative Total Annual SO₂ Emissions – Tanguisson Non-attainment Area

	<i>Year</i>	<i>SO₂ (TPY)</i>
Construction	2011	8.6
	2012	12.6
	2013	15.5
	2014	15.5
	2015	18.2
	2016	12.9
Operation	2017 and on	8.3
	<i>de minimis level</i>	100

Table 3.3-11. Preferred Alternative Total Annual SO₂ Emissions – Piti Non-attainment Area

	<i>Year</i>	<i>SO₂ (TPY)</i>
Construction	2011	2.4
	2012	2.4
	2013	2.4
	2014	2.4
	2015	1.6
	2016	1.6
Operation	2017 and on	0.9
	<i>de minimis level</i>	100

Greenhouse Gases

The predicted construction CO₂ emissions range from about 16,490 to 31,464 TPY from 2011 to 2014 (see Table 3.3-8) and the predicted operational CO₂ emissions range from about 180,216 to 186,134 TPY from 2015 on (Table 3.3-8). The upper end of the range would primarily be due to vehicular emissions. In 2007, the U.S. generated about 7,879 million tons of CO₂ emissions (USEPA 2009). The operational CO₂ emissions from the preferred alternatives would result in a roughly 0.002% increase over the U.S. 2007 CO₂ emissions.

However, since the preferred alternatives would mostly involve the relocation of the military operations (i.e. training exercises) already occurring in the West Pacific region, energy consumption from activities in the region is unlikely to change significantly and the predicted net increase in CO₂ emissions (Table 3.3-8) is considered overly conservative and provided only for NEPA disclosure. Therefore, overall global GHG emissions are likely to remain near the current levels on a regional scale particularly applicable under the operational conditions, resulting in an insignificant impact to global climate change.

On Tinian, all air emissions would be well below the significance threshold of 250 TPY for air pollutants subject to regulations under the CAA for both construction and operation as shown on Table 3.3-12. Therefore, air quality impacts are considered less than significant for all areas under Alternative 1

Table 3.3-12. Tinian Training Activity Annual Emissions - Alternative 1

	<i>Pollutant (TPY)</i>						
	<i>SO₂</i>	<i>CO</i>	<i>PM₁₀</i>	<i>PM_{2.5}</i>	<i>NO_x</i>	<i>VOC</i>	<i>CO₂</i>
Construction	0.3	1.1	0.1	0.1	0.7	0.3	108.7
Operation	Barge						
	0.2	0.8	0.1	0.1	4.2	0.1	N/A
	Vehicle						
	0.0	0.0	0.1	0.0	0.0	0.0	2.0
Operation	Total						
	0.2	0.8	0.2	0.1	4.2	0.1	2.0

3.3.4.2 No Action

The future traffic growth would likely result in an increase in mobile source emissions at Guam. However, the improvement of mobile source engine emissions in the future as per CAA requirements would contribute a reduction of the overall mobile source emissions. Therefore, the air quality conditions affected by mobile source operations under no action would likely remain the same or improve slightly as compared to the existing conditions.

Under no action, there would be new construction of small-scale projects on-island that would not occur concurrently and continued operation of existing stationary sources. Air pollutant emissions would essentially remain the same as they are now, or improve slightly if, as the cleaner fuel becomes available at Guam in the future.

GovGuam has not collected ambient air quality data since 1991. Therefore, no existing ambient air quality data are available to represent current air quality conditions with respect to the criteria pollutants for which the NAAQS were established. Historical data are available from 1972 through 1991, when ambient air quality data were collected at a number of sites through a USEPA-sponsored monitoring program. The monitored pollutants were total suspended particles (TSP), SO₂, nitrogen dioxide (NO₂), and nitrogen monoxide (NO). In 1991, PM₁₀ was monitored in addition to TSP.

Prior to 1991, TSP was monitored at 20 sites, SO₂ at 14 sites, NO₂ at five sites, and NO at one site. In 1991, PM₁₀ was monitored at four sites. In addition to the historical monitoring identified above, the GPA established a network of five stations to measure SO₂ at locations that are not downwind or close to any major electrical generating units during normal trade wind conditions from the fall of 1999 through the summer of 2000. All of the observed SO₂ concentrations were below the 24-hour NAAQS.

Because there are no comprehensive ambient background air quality levels from recent monitoring available for Guam, the existing background air quality conditions around Guam can be defined based on the current ambient air quality attainment status condition applicable for Guam:

- Attainment for all criteria pollutants, except for SO₂.
- Two SO₂ nonattainment areas within a 2.1 mi (3.5 km) radius around Piti and Tanguisson power plants.

Except for power generating facilities, there are no significant sources of air emissions on Tinian. However, military training vessels, on-road vehicles, and open burnings are sources of emissions that contribute to the existing ambient air quality background conditions at Tinian. While there are no air monitoring stations on Tinian, it can be assumed that ambient air quality is good, has remained constant in recent years and is in compliance with air quality standards. These assumptions are based on the small number of emission sources on the island and the island is currently designated as an attainment area for all criteria pollutants. Air quality conditions under no action on Tinian would be expected to remain the same as compared to the existing condition.

3.3.4.3 Comparison of Preferred Alternatives to No Action

Under the Guam preferred alternative there would be less than significant effects on criteria pollutants including those in existing nonattainment areas from all construction and operation components. The GHGs effects would also be considered less than significant. Under no action, there would be essentially no impact since the air quality conditions would remain the same as the existing condition. The air quality impacts from construction and operation of the preferred alternative on Tinian would be less than significant and there would be no impact from no action

3.3.5 Noise

3.3.5.1 Summary of Preferred Alternatives' Impacts

Tables 3.3-13 and 3.3-14 summarize the preferred alternatives' construction and operation impacts to noise on Guam and Tinian as presented in previous volumes. For Guam, the greatest level of impact identified among all the volumes is listed in the last Guam column. The summary of impacts for Tinian's preferred alternatives is listed in the far right column of the tables. It is assumed that all of the proposed construction actions would occur during a compressed time period, and that all operational activity would commence upon completion of construction.

Table 3.3-13. Summary of Preferred Alternatives Construction Impacts - Noise

Potential Impacts	Guam									Tinian
	Volume 2	Volume 4	Volume 5	Volume 6					Summary Impact	Volume 3
	Marine Corps	Navy Aircraft Carrier	Army AMDTF	Power	Potable Water	Waste water	Solid Waste	Roadways		Training
Construction	LSI	LSI	LSI	LSI	LSI	LSI	NI	LSI	LSI	LSI
Noise Construction Summary:									LSI*	LSI

Legend: SI = Significant impact, SI-M = Significant impact mitigable to less than significant, LSI = Less than significant impact,; LSI* = Noise impacts are short-term and localized.

Table 3.3-14. Summary of Preferred Alternatives Operation Impacts – Noise

Potential Impacts	Guam									Tinian
	Volume 2	Volume 4	Volume 5	Volume 6					Summary Impact	Volume 3
	Marine Corps	Navy Aircraft Carrier	Army AMDTF	Power	Potable Water	Waste water	Solid Waste	Roadways		Training
Airfield Operations	LSI	NA	NA	NA	NA	NA	NA	NA	LSI	LSI
Aviation Training	LSI	NA	NA	NA	NA	NA	NA	NA	LSI	LSI
Ground-based Training	LSI	NA	NA	NA	NA	NA	NA	NA	LSI	LSI
Other Operations	NA	NA	NA	NI	NI	NI	NI	SI	SI	NA
Noise Operation Summary:									SI	LSI

Legend: SI = Significant impact, SI-M = Significant impact mitigable to less than significant, LSI = Less than significant impact, NI = No impact; NA = not applicable

There are adverse impacts associated with construction of the preferred alternatives on Guam and Tinian. The sensitive receptors are most likely impacted by roadway improvements because of proximity. These impacts would be temporary.

Noise levels associated with the preferred alternatives would increase locally by one or two decibels (dB) day-night noise level (DNL) around the Andersen AFB airfield. Aviation operations would raise noise levels locally, but only as the aircraft fly overhead. The Route 15 training ranges would result in noise levels that are considered incompatible with residential use. There are very few residences in the vicinity but community master plans may result in higher density residential. The most effective BMP would be constructing the berms and would reduce noise levels 10-15 dB. Using BMPs could reduce the noise levels to less than significant levels. The use of BMPs is assumed in the summary of impacts. The roadway noise is a significant impact in the north and central areas of Guam and mitigation has not been determined. Noise walls are potential mitigation, but they have adverse impacts on views.

The construction and operational impacts on Tinian are less than significant. Island-wide noise impacts would not occur for either construction or operation because noise is generated at a source, then diminishes the farther the receptor is away from the source. Receptors in the northern part of Guam would not hear noise generated in the south and vice versa, as a result there would be no island-wide noise impacts.

3.3.5.2 No Action

Unlike for some other potential impacts, most human activities generating noise impacts are localized and do not affect the entire islands of Guam or Tinian. Traffic could be considered an exception in that while individual vehicle noise is localized, island-wide population increases would be accompanied by increased numbers of motor vehicles on the roadway network, with some resulting island-wide increases in noise. Regionally, northern Guam would continue to experience noise from Andersen AFB aircraft, Northwest field training, small arms firing at NCTS Finegyn, traffic, and construction projects as they are undertaken. In central Guam, A. P. Won Pat Guam International Airport (IAP) operations, construction activities, and traffic would continue to create noise. Near Apra Harbor, industrial activities, construction and traffic would continue to be the major noise sources. In southern Guam, there are fewer noise sources than the rest of the island and the noise levels would likely continue at the same levels. The *Guam 2030 Transportation Plan* would improve roadways on Guam, but significant noise impacts are not anticipated once the construction is complete. Large population and traffic increases, and significant noise impacts are not anticipated.

On Tinian, the major noise generators would continue to be Tinian Airport operations, current military activities and minor traffic.

3.3.5.3 Comparison of Preferred Alternatives to No Action

The “peak” for noise impacts is construction-related direct impacts due to the preferred alternatives. Construction noise under the preferred alternatives or no-action would not likely be an issue because such activities are localized. Construction noise impacts would be short-term, ceasing when the construction project is completed. An adverse significant impact would only emerge when multiple construction activities occur in a compressed time period and immediately adjacent to one another and in proximity to sensitive receptors. Construction would be localized and occur predominately during daylight hours (except for Apra Harbor dredging, with no noise impact island-wide).

Long-term operation noise impacts would be related to the increased traffic on the Guam roadway network under the preferred alternatives. Traffic noise would be most evident in northern and central Guam and around Apra Harbor, and less so in southern Guam. Overall, the island would experience a significant increase in traffic noise due to the increased number of motor vehicles on the island. This impact would not be realized under no action.

3.3.6 Airspace

3.3.6.1 Summary of Preferred Alternatives’ Impacts

Tables 3.3-15 and 3.3-16 summarize the preferred alternatives’ construction and operation impacts to airspace above Guam and Tinian. The findings from previous volumes are listed. For Guam, the greatest level of impact identified among all the volumes is listed in the last Guam column. The summary of impacts for Tinian’s preferred alternatives is listed in the far right column of the tables. Airspace impacts would not occur during construction and are only applicable to operations.

Table 3.3-15. Summary of Preferred Alternatives Construction Impacts - Air Space

Potential Impacts	Guam									Tinian
	Volume 2	Volume 4	Volume 5	Volume 6					Summary Impact	Volume 3
	Marine Corps	Navy Aircraft Carrier	Army AMDTF	Power	Potable Water	Waste water	Solid Waste	Roadways		Training
Air Space	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Air Space Construction Summary:									NA	NA

Legend: NA= Not applicable

Table 3.3-16. Summary of Preferred Alternatives Operation Impacts - Air Space

Potential Impacts	Guam									Tinian
	Volume 2	Volume 4	Volume 5	Volume 6					Summary Impact	Volume 3
	Marine Corps	Navy Aircraft Carrier	Army AMDTF	Power	Potable Water	Waste water	Solid Waste	Roadways		Training
Airspace	LSI	LSI	LSI	NI	NI	NI	NI	NI	LSI	LSI
Air Space Operation Summary:									LSI	LSI

Legend: SI = Significant impact, SI-M = Significant impact mitigable to less than significant, LSI = Less than significant impact, NI = No impact

The preferred alternatives on Guam and Tinian would have less than significant impacts on airspace. There would be a 46% increase in airfield operations at Andersen AFB; however, there would be no resultant interference with local general aviation flights, no new airspace requirements, and no measureable change in airspace management procedures.

New Special Use Airspace (SUA) in the vicinity of Northwest Field is required for training, but would not require any changes to existing arrivals and departures from the commercial airport. There would be no en route low-altitude airways. The impact on this airspace action on air traffic control and airspace users is anticipated to be moderate, but less than significant, until new procedures have been in effect for a few months.

For the proposed ground firing range on the east coast of Guam that has .50 caliber machine gun training capability, SUA would have to be established to overlay the Surface Danger Zone (SDZ) footprint. It would require a slight reduction in airspace surrounding the commercial airport. There would be no significant reduction in the amount of navigable airspace available for the commercial airport and no change to en route airways. Additionally, there would be no restrictions on access to and no effect on the use of the airport or airfield available for public use, nor would there be any effect on airport or airfield arrival and departure traffic flows, due to the increase in military aircraft assigned to Guam.

On Tinian, there would be an increase in aircraft operations in the north and south portions of Tinian, but it would be within the capacity of existing airspace use. There would be no new SUA and no impacts to existing arrival and departure patterns from either the Tinian or Saipan airports. There are no en route low-altitude airways, and no Instrument Flight Rule procedures would need to change. Approach and departure patterns associated with the airports and airfields would not be restricted, nor would they be required to change.

Well-established and understood aviation procedures and rules governing flight operations in both controlled and uncontrolled navigable airspace and existing SUA make future adverse effects on public health and safety extremely unlikely. Aircrews for military participants and nonparticipating aircraft would be responsible for using see and avoid techniques to avoid hazards. There would be no difference in the effects identified individually for the preferred alternatives discussed in each volume.

3.3.6.2 No Action

Because there are multiple and sometimes competing demands, the Federal Aviation Administration (FAA) considers all aviation airspace requirements in relation to airport operations, federal airways, jet routes, military flight training activities, and other special needs to determine how the National Airspace System can best be structured to satisfy all user requirements. Significant impacts are avoided prior to FAA approval.

No additional military or civilian airspace requirements have been identified outside of the preferred alternatives. There is a periodic review of Mariana Island Range Complex (MIRC) airspace requirements that would address future airspace needs should the training mission requirements change in the future.

3.3.6.3 Comparison of Preferred Alternatives to No Action

Preferred alternatives and no action would both result in less than significant impacts to airspace. All future proposals would be subject to the same FAA approval process that is aimed at avoiding significant airspace impacts.

3.3.7 Land and Submerged Land Use

3.3.7.1 Summary of Preferred Alternatives’ Impacts

Tables 3.3-17 and 3.3-18 summarize the preferred alternatives’ construction and operation impacts to land ownership and use on Guam and Tinian. The findings from previous volumes are listed. For Guam, the greatest level of impact identified among all the volumes is listed in the last Guam column. The summary of impacts for Tinian’s preferred alternatives is listed in the far right column of the tables.

Table 3.3-17. Summary of Preferred Alternatives Construction Impacts - Land Ownership/Use

Potential Impacts	Guam									Tinian
	Volume 2	Volume 4	Volume 5	Volume 6					Summary Impact	Volume 3
	Marine Corps	Navy Aircraft Carrier	Army AMDTF	Power	Potable Water	Waste water	Solid Waste	Roadways		Training
Land Ownership	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Land Use	NA	NA	NA	NA	NA	NA	NA	SI-M	SI-M	NA
Land Ownership/Use Construction Summary:									*LSI	NA

Legend: SI = Significant impact, SI-M = Significant impact mitigable to less than significant, LSI = Less than significant impact, NI = No impact * LSI is assigned as overall summary impact instead of SI-M, because the SI is mitigable through TPM

Table 3.3-18. Summary of Preferred Alternatives Operation Impacts - Land Ownership/Use

Potential Impacts	Guam									Tinian
	Volume 2	Volume 4	Volume 5	Volume 6					Summary Impacts	Volume 3
	Marine Corps	Navy Aircraft Carrier	Army AMDTF	Power	Potable Water	Waste water	Solid Waste	Roadways		Training
Land Ownership										
Land	SI-M	NI	NI	NI	NI	LSI	NI	SI-M	SI-M	NI
Submerged Land	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
Land Use										
1. FPPA	NI	NI	NI	NI	NI	NI	NI	NI	NI	SI
2. Consistency with existing or proposed land use:										
DoD land	LSI	NI	NI	NI	NI	NI	NI	NI	LSI	LSI
DoD submerged lands	BI	NI	NI	NI	NI	NI	NI	NI	BI	NI
Non-DoD land	LSI	NI	NI	NI	NI	LSI	NI	LSI	LSI	NI
Non-DoD submerged lands	LSI	NI	NI	NI	NI	NI	NI	NI	LSI	NI
3. Public Access	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
Land Ownership Summary:									SI-M	NI
Land Use Summary:									LSI	SI

Legend: SI = Significant impact, SI-M = Significant impact mitigable to less than significant, LSI = Less than significant impact, NI = No impact; BI= beneficial impact; temp= temporary construction – related impact

The following findings were common to the preferred alternatives:

- No submerged lands would be acquired.
- Land use within Department of Defense (DoD) property boundaries is consistent or compatible with proposed land uses in the vicinity.
- No significant impact on agricultural productivity was identified on Guam.

Land ownership and use impacts are assumed to occur over the long-term or operational phase, except roadway construction on Guam would have a significant mitigable adverse impact on roadway and nearby properties. The Traffic Management Plan (TMP) prepared for the project shall 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. The TMP would mitigate construction phase impacts to less than significant.

There would be a significant mitigable impact due to forced sale of land to the federal government for main cantonment and firing ranges on Guam. As described in the approach to analysis in Volumes 2 through 6, it is assumed landowners are not interested in selling their land. Although there may be landowners who are interested in selling their land, the assumption of significant impact remains until negotiations are complete. This impact could be mitigated through long-term leases of the property instead of purchase; however, this may not be possible in all cases and the significant mitigable level of impact is retained in the summary of impact. There would also be relocations, and land acquisition or long-term

lease for roadway improvements. Utility distribution lines would generally be within existing rights-of-way, but new alignments would also require new easements.

A beneficial land use impact was identified under submerged land use because an existing firing range at NCTS Finegayan would no longer be used and the associated surface danger zone over submerged land would be eliminated. Less than significant land use consistency impacts were identified on federally controlled land due to increase area under noise contours on Andersen AFB. Less than significant impacts due to firing range land use being inconsistent with surrounding designated land use. Access to GovGuam submerged lands and the natural and cultural resources in the range areas would be restricted during training.

No change in land ownership or lease covenant is proposed on Tinian. On Tinian, many and possibly all of the agricultural/grazing permits within the Lease Back Area (LBA) would be terminated, causing significant impact on consistency with the Farmland Protection Policy Act (FPPA) of 1981. FPPA applies to designated prime and important farmlands, which do not include the lease areas. In keeping with the intent of the FPPA to protect agricultural land, the termination of permits is considered a significant impact. Current permits within LBA account for 2,552 ac (1,032 ha) of the 11,956 ac (4,838 ha) agricultural-designated land use on Tinian (including grazing land, crop land, plantation orchard and mixed agricultural) total that represents approximately 21% of total agricultural lands on the island. The leases are subject to termination at military discretion and no mitigation was identified.

The decrease in public access to the Military Lease Area (MLA) is an adverse impact, but considered less than significant because it is federally controlled land. There are other adverse impacts identified under socioeconomics.

3.3.7.2 No Action

DoD land control has decreased over the past three decades as a result of the Guam Excess Land Act of 1994, and Base Closure and Realignment (BRAC) recommendations. Figure 8.1-3 of Volume 2 shows the military land use in the 1960s compared to current landholdings. The former Naval Air Station Agana was closed in 1995, and the Navy transferred or released ownership of it to GovGuam and other government agencies as a result of BRAC. In 1997, BRAC realigned Naval Base Guam, which included the release of surplus/excess Navy military property determined to be excessive in the Guam Land Use Plan. Areas east of Route 15 in proximity to the proposed firing range complex were released. The previous Naval Facility, at Ritidian Point, was transferred to the U.S. Fish and Wildlife Service (USFWS). Other DoD parcels also have been, or are currently in the process of being, transferred to GovGuam. In addition, the Navy outleased the Former Navy Ship Repair Facility located within the Apra Harbor Naval Base to GovGuam for utilization as a commercial shipyard facility. The trend has been to release federal lands. Outside of the preferred alternatives, there are no other planned land acquisitions identified for military use on Guam. No change to submerged lands ownership is anticipated.

Community plans, and zoning and building codes direct land development and use on Guam and Tinian. Community plans do not accelerate development, but guide land development in accordance with community values. The *North and Central Guam Land Use Plan* (Bureau of Statistics and Plans 2009) has not been adopted by legislature. It addressed the EIS/OEIS alternatives based on preliminary notional plans, that identified most development in the northern/central Guam, including development of NCTS Finegayan area. The proposed military land use would be consistent with this plan. Once the EIS/OEIS record of decision is published the community plan may need to be revisited to capture the final development decisions.

The plan designates uses of lands that were once designated agricultural, but there are areas reserved for agricultural use. As development pressure increases and the interest in farming decreases, there is pressure to develop agricultural lands. Community plans help to retain sufficient lands for agricultural use.

There is a substantial amount of development identified in the *North and Central Guam Land Use Plan* for residential communities, village centers, and resort/hotel. The plan is a guidance document and does not specify when the growth would occur. The development would result in a loss of open space, but there is open space reserved in the *North and Central Guam Land Use Plan*.

Apra Harbor would continue to be an active Navy and commercial harbor requiring infrastructure improvements to address existing deficiencies, new missions, and increased efficiency. These improvements are consistent and compatible with existing facilities.

The amount of MLA on Tinian has remained relatively constant in recent years and is likely to remain the same in the near future. There are federal submerged lands and no change is anticipated to submerged land ownership.

There are two resorts being planned for Tinian that would impact agricultural lands and the impacts could be significant. No other significant changes in land use are proposed. A master plan is being prepared for Tinian that would presumably ensure the planned land uses are consistent with community values and adjust zoning accordingly. The general trend on Guam is a decrease in agricultural land use as development increases. There is a trend of declining interest in farming by younger generations.

3.3.7.3 Comparison of Preferred Alternatives to No Action

The impact of the proposed increases in federal land reverses a recent trend established through BRAC to reduce DoD lands on Guam. The preferred alternatives would re-acquire a portion of the lands south of NCTS Finegayan and the areas east of Route 15. The comments received during the scoping period did not support an increase in federal land on island and the increase is considered an adverse impact. The impacts of the proposed island-wide increase in federal land are being addressed in the Land Acquisition Impact Study portion of the Socioeconomic Impact Assessment Study that is being developed and would be available as part of the Final EIS.

From the individual land owner and business owner perspective, the forced sale of property to the federal government would occur under the no action for roadway and utility improvements; but the number of landowners affected would be smaller than proposed under the preferred alternatives.

The removal of the SDZ on the west coast of NCTS Finegayan has a beneficial impact because there are popular SCUBA sites in the submerged lands. Under no action, the SDZ would remain and submerged land access would continue to be limited to non-training days. Under no action there would not be extensive areas of public access restrictions to submerged land and land restricted and access is restricted during training.

The preferred alternatives land uses are generally consistent and compatible with adjacent land uses and land use plans, with exceptions around the proposed firing ranges on the east coast. As the notional plans under the preferred alternative become more refined, the community land use plans could be revised to include a greater land use buffer from the federally-controlled boundaries.

There are gradual declines in agricultural land use on Guam under no action, but the preferred alternatives would not contribute to that decline on Guam, except for an agricultural lease at Andersen South. The preferred alternatives on Tinian would have an impact on agricultural/grazing permits that would not occur

under no action. However, no action does include large-scale development that could also affect agricultural uses.

3.3.8 Recreational Resources

3.3.8.1 Summary of Preferred Alternatives’ Impacts

Tables 3.3-19 and 3.3-20 summarize the preferred alternatives’ construction and operation impacts to recreational resources on Guam and Tinian. The impacts to recreation use are mostly long-term impacts, although there are short-term less than significant impacts during construction-related activities impeding access to recreational resources. The findings from previous volumes are listed. For Guam, the greatest level of impact identified among all the volumes is listed in the last Guam column. The summary of impacts for Tinian’s preferred alternatives is listed in the far right column of the tables.

Table 3.3-19. Summary of Preferred Alternatives Construction Impacts - Recreation

Potential Impacts	Guam									Tinian
	Volume 2	Volume 4	Volume 5	Volume 6					Summary Impact	Volume 3
	Marine Corps	Navy Aircraft Carrier	Army AMDTF	Power	Potable Water	Waste water	Solid Waste	Road-ways		Training
Access to recreational resource	NI	LSI	NI	NI	NI	NI	NI	NA	LSI	LSI
Recreational resource use: Reduction of recreational opportunities	NI	LSI	NI	NI	NI	NI	NI	NA	LSI	LSI
Recreational resource use: Conflicts between different recreational uses	NI	NI	NI	NI	NI	NI	NI	NI	NI	LSI
Recreational resource use: Substantial deterioration to recreational resources	NI	NI	NI	NI	NI	NI	NI	NI	NI	LSI
Recreation Construction Summary:									LSI	LSI

Legend: SI = Significant impact, SI-M = Significant impact mitigable to less than significant, LSI = Less than significant impact, NI = No impact

Table 3.3-20. Summary of Preferred Alternatives Operation Impacts - Recreation

Potential Impacts	Guam								Tinian	
	Volume 2	Volume 4	Volume 5	Volume 6					Volume 3	
	Marine Corps	Navy Aircraft Carrier	Army AMDTF	Power	Potable Water	Waste water	Solid Waste	Road-ways	Summary Impact	Training
Access to recreational resource	LSI	LSI	NI	NI	NI	NI	NI	NI	NI	LSI
Recreational resource use: Reduction of recreational opportunities	LSI	SI-M	LSI	NI	NI	NI	NI	NI	SI-M	LSI
Recreational resource use: Conflicts between different recreational uses	LSI	SI-M	LSI	NI	NI	NI	NI	NI	SI-M	LSI
Recreational resource use: Substantial deterioration to recreational resources	LSI	SI-M	LSI	NI	NI	NI	NI	NI	SI-M	LSI
Recreation Operation Summary:									*LSI	LSI

Legend: SI = Significant impact, SI-M = Significant impact mitigable to less than significant, LSI = Less than significant impact, NI = No impact; *LSI= Although there are significant impacts associated with the visiting aircraft carrier, the population is transient and the impacts could be mitigated to less than significant.

The implementation of the preferred alternatives would result in the presence of the new permanent population comprised of the Marines, Army personnel, civilian workers, and their dependents, and temporary population formed by construction personnel, on Guam. These persons would be potential users of Guam’s recreational resources and would contribute to an increase in the number of users to the existing DoD, Federal, and public recreational resources on Guam.

The increased number of users at the recreational resources (refer to Appendix G: EIS/OEIS Resource Technical Appendix, Recreational Resources for a list of resources assessed) would result in increased competition for the available opportunities at different recreational resources. Most of the popularly visited recreational resources attract a constant flow of off-island and resident (including military and dependents) users. The degree of impact on the recreational resources is likely to be higher on weekends and holidays, and during summer/winter vacation months from July through March (except for January), when the island receives a greater number of off-island visitors. To meet the quality of life (QOL) needs of relocating the Marines, their dependents, and civilian employees, a wide range of recreational facilities are proposed at the Main Cantonment site by the Marine Corps Community Service (MCCS). The planned QOL facilities are expected to relieve potential impacts to the existing recreational resources on DoD, federal, and public properties by providing viable recreational use options to the potential users. By providing comparable and

alternate recreational resources to the military, dependents, and civilian workers, impacts to recreational resources on Guam would be alleviated, benefitting the residents and off-island tourists as well. The implementation of the preferred alternatives would result in the loss of some recreational resources in the lands adjacent to Route 15, which would be acquired for the use for training activities and ranges. Currently, mitigation measures are suggested in Volume 2 Chapter 9 (Recreational Resources) to partially restore recreational resources that would otherwise be lost.

Impacts to marine recreational resources would likely be temporary during the proposed wharf construction at Polaris Point involving dredging work, which is anticipated to be eight to 12 months. The transient aircraft carrier wharf would cause notable impacts on the existing Morale, Welfare and Recreation (MWR) facilities and marine recreational activities within Apra Harbor. Other potentially affected areas include popular tourist regions such as Tumon/Tamuning villages and MWR facilities on other DoD installations. The surge in recreational users comprising of the visiting sailors would increase competition for the available opportunity at existing facilities (e.g., gym usage) and could potentially cause conflicts among recreational uses. Although there are significant impacts associated with the visiting aircraft carrier, the population is transient and the impacts could be mitigated to less than significant.

3.3.8.2 No Action

Since the completion of the 1990 Guam Comprehensive Outdoor Recreation Plan (GCORP) by GovGuam, Department of Parks and Recreation, some outdoor recreation activities have kept pace with population shifts while other activities have become more popular. The following outdoor recreation activities have become more popular since 1990 (GCORP 2006):

- Walking at the Paseo in Hagatna and along Tumon Beach
- Kayaking, particularly within Tumon Bay
- Baseball, particularly organized teams
- Basketball, particularly organized teams
- Football, particularly organized teams
- Soccer, particularly organized teams
- Swimming (pool), particularly organized teams
- Golf, particularly for youth
- Skateboarding

Even if the proposed relocation of the Marines to the island of Guam were not to occur, it is likely the effects described in Table 3.3-20 (Summary of Preferred Alternatives Operation Impacts - Recreation) would still occur on a smaller scale. This is due to the fact that Guam would continue to receive tourists. In addition, the local civilian and military population would use of the public recreational resources. The impacts to the public recreational resources would continue to be centered on the need for better facilities, more facilities, more funding, and better management (GCORP 2006). Seventeen organizations comprising of various sports associations, civic, and private organizations participated in a survey conducted by the GovGuam, Department of Park and Recreation, which is included in the 2006 GCORP. Specific comments included:

- Need for better facilities
 - Need for better maintenance and cleanliness of the facilities
 - “The bathrooms are disgusting”
 - Need to privatize facility maintenance

- Implement the Adopt-a-Park program
 - Need to air condition the Dededo Sports Complex
- Need for more facilities
 - Need for a lifeguard tower at Matapang Beach
 - Need for public track and field facilities
 - Need for more sports facilities in the South (Guam)
- Need for more funding
 - Need for more funding of events
 - Need for a deposit for use of facilities
 - Need for facility fees
 - Need to extend Guam Visitors Bureau (GVB) grants beyond just non-profit organizations
- Need for better management
 - Need for consistent government support of sports
 - “DPR (Department of Park and Recreation) is short-sighted.”
 - Need to empower lifeguards
 - Need to privatize lifeguards
 - Need for smarter management
 - Need for more sports partnership with federation
- Need for better communication
 - Need for a government sports liaison
 - Need to educate public about safety
 - Need for radio coordination with emergency personnel
 - Need for a flag system
 - Need for 911 emergency phone boxes
- Need for more access to facilities
 - Issue keys to organizations

3.3.8.3 Comparison of Preferred Alternatives to No Action

Under the preferred alternatives, impacts to the recreational resources would be largely long-term and singularly affecting the use aspect of each recreational resource. The new permanent population resulting from the implementation of the preferred alternatives would result in users competing for the available recreational opportunity (e.g., longer wait for service/enjoyment at recreational resource). Other impacts include conflicts between users (e.g., surfers and body boarders competing for waves; pedestrians and bicyclists, and equestrians competing for the use of trail), and increased deterioration of recreational resources resulting from frequent use by more persons. The preferred alternatives would not adversely affect the access aspect of recreational resources, short term or long term. An exception exists in the lands to be acquired along Route 15 for training purposes. Resources there (e.g., Pagat Trails and a series of trails linked to them, *suruhana* activities, offshore fishing and spelunking at Marbo Caves) would be inaccessible during training for health and safety reasons. This impact is mitigable through establishment of an ecological restoration area and permitting access when there is no live-fire training.

Under no action, the most notable difference from the preferred alternative would be that the aforementioned loss of use at Route 15 lands would not occur. Similar to the preferred alternative, there is no concern for loss of access to the existing recreational resources. It is likely future developments would limit recreational uses on Guam, but impacts to recreational resources would be more gradual than under the preferred alternatives. Impacts to the recreational resources would occur on lesser degree under no action. Nevertheless, it is recommended that a recreation carrying capacity study be conducted, and a recreational resource management plan completed, to decelerate deterioration to Guam’s recreational resources.

3.3.9 Terrestrial Biological Resources

3.3.9.1 Summary of Preferred Alternatives’ Impacts

Tables 3.3-21 and 3.3-22 summarize the preferred alternatives’ construction and operation impacts to terrestrial biological resources on Guam and Tinian. The findings from previous volumes are listed in the tables. For Guam, the greatest level of impact identified among all the volumes is listed in the last Guam column. The summary of impacts for Tinian’s preferred alternatives is listed in the far right column of the tables.

Table 3.3-21. Summary of Preferred Alternatives Construction Impacts - Terrestrial Biology

Potential Impacts	Guam									Tinian
	Volume 2	Volume 4	Volume 5	Volume 6					Summary Impact	Volume 3
	Marine Corps	Navy Aircraft Carrier	Army AMDTF	Power	Potable Water	Waste water	Solid Waste	Roadways		Training
Vegetation	SI	LSI	LSI	NI	LSI	LSI	NI	LSI	SI	LSI
Wildlife	LSI	SI-M	LSI	NI	LSI	LSI	NI	LSI	SI-M	LSI
Special Status Species	SI-M	SI-M	SI-M	NI	SI-M	NI	NI	SI-M	SI-M	SI-M
Terrestrial Biology Construction Summary:									SI	SI-M

Legend: SI = Significant impact, SI-M = Significant impact mitigable to less than significant, LSI = Less than significant impact, NI = No impact

Table 3.3-22. Summary of Preferred Alternatives Operation Impacts - Terrestrial Biology

Potential Impacts	Guam									Tinian
	Volume 2	Volume 4	Volume 5	Volume 6					Summary Impact	Volume 3
	Marine Corps	Navy Aircraft Carrier	Army AMDTF	Power	Potable Water	Waste water	Solid Waste	Roadways		Training
Vegetation	LSI	NI	NI	NI	NI	NI	NI	NI	LSI	LSI
Wildlife	LSI	SI-M	LSI	NI	NI	NI	NI	NI	SI-M	LSI
Special Status Species	SI-M	LSI	SI-M	NI	NI	NI	NI	NI	SI-M	SI-M
Terrestrial Biology Operation Summary:									SI-M	SI-M

Legend: SI = Significant impact, SI-M = Significant impact mitigable to less than significant, LSI = Less than significant impact, NI = No impact

A summary of direct impacts for all preferred alternatives in this EIS/OEIS for vegetation communities on Guam and Tinian is shown in Table 3.3-23. There are no reliable estimates for the amount of primary limestone vegetation remaining on Guam, the vegetation type that is the most threatened from historical losses and that is prime habitat for many of the threatened and endangered species. Other vegetation types are not rapidly being lost on Guam although ravine forest in most areas is being degraded by invasive plant species.

Table 3.3-23. Potential Impacts on Guam and Tinian Vegetation Communities

Island	Limestone Forest, Primary (ac)	Limestone Forest, Disturbed* (ac)	Scrub/Shrub/Tangan-tangan (ac)	Ravine (ac)	Savanna (ac)
Guam vegetation cleared due to preferred alternatives	28	1,549	482	4.3	20
Tinian vegetation cleared due to preferred alternatives	0	173	68	0	0

Note: *Tinian forest is classified as mixed introduced forest.

The preferred alternatives would significantly impact terrestrial biological resources on Guam and Tinian during construction activities due primarily to the removal of habitat. A determination of impact under NEPA and the Endangered Species Act (ESA) (in parentheses) is provided below for each species in the project area. Volumes where these species are evaluated are listed in brackets.

Guam

ESA- and Guam-Listed Species:

- Mariana fruit bat – significant impact, (may affect, is likely to adversely affect); the impact under NEPA would be mitigated to less than significant. [V2, V5 V6]
- Micronesian kingfisher - significant impact (may affect, is likely to adversely affect); the impacts under NEPA would be mitigated to less than significant. [V2, V5, V6]
- Mariana crow - significant impact (may affect, is likely to adversely affect); the impacts under NEPA would be mitigated to less than significant. [V2, V5, V6]
- Guam rail - less than significant impact (may affect but is not likely to adversely affect). [V2, V5, V6]

- Mariana common moorhen – less than significant impact (may affect but is not likely to adversely affect). [V4]
- Mariana swiftlet – less than significant impact (may affect but is not likely to adversely affect). [V2]
- Green sea turtle - significant impact (may affect but is not likely to adversely affect); the impacts under NEPA would be mitigated to less than significant. [V4]
- Hawksbill sea turtle - significant impact (may affect but is not likely to adversely affect); the impacts under NEPA would be mitigated to less than significant. [V4]
- Fire tree – no impact (no effect). [V2]

ESA Candidate and Guam-Listed Species:

- Guam tree snail - significant impacts mitigated to less than significant. [V2, V5, V6]
- Humped tree snail - significant impacts mitigated to less than significant. [V2]
- Fragile tree snail - significant impacts mitigated to less than significant. [V2]

ESA Candidate Species (not Guam-Listed):

- Mariana eight-spot butterfly - less than significant impacts. [V2]

Guam-Listed Only Species:

- Micronesian starling - less than significant impacts. [V2, V5, V6]
- Pacific slender-toed gecko –significant impacts mitigated to less than significant. [V2]
- Moth skink - less than significant impacts. [V2]
- *Heritiera longipetiolata* - significant impacts mitigated to less than significant. [V2]

Tinian

ESA- and CNMI-Listed Species:

- Mariana fruit bat – less than significant impact, (may affect, but is not likely to adversely affect).
- Micronesian megapode - less than significant impact (may affect, but is not likely to adversely affect).
- Mariana common moorhen - significant impact (may affect but is not likely to adversely affect); the impacts under NEPA would be mitigated to less than significant.
- Mariana swiftlet – no impact (no effect).
- Green sea turtle – no impact (no effect).
- Hawksbill sea turtle – no impact (no effect).

ESA Candidate Species:

- Humped tree snail – no impact.

CNMI-Listed Only Species

- Tinian Monarch – significant impacts mitigated to less than significant.
- Micronesian gecko – less than significant impacts.

A summary of direct impacts for all preferred alternatives for special-status species habitat is shown in Table 3.3-24. That table includes an estimate of island-wide acreages. The island-wide loss of special-status species habitat, due to clearing of vegetation required by the proposed construction projects, ranges from 1% to 6%. Because most species currently very restricted in range, such as the Mariana crow with only two individuals known left on Guam, and the Micronesian kingfisher and Guam rail exist only in captivity, only habitat would be affected and not individual species. An exception is the fruit bat which,

although the main colony on Andersen AFB is thought to number fewer than 50 individuals, disperses throughout forested areas on Andersen AFB to feed at night. All fruit bats throughout the Mariana Islands have been determined to be a single population and the best estimate of the total number of individuals remaining is several thousand. During operation, there are noise impacts from training that may significantly impact the endangered Mariana fruit bat, Micronesian kingfisher, and Mariana crow either at present or if they re-occupy or are re-introduced to essential habitat in the future.

Table 3.3-24. Potential Impacts on Special-Status Species Habitat - Preferred Alternative

	Guam				Tinian
	Overlay Refuge*	Essential Habitat – Bat and Kingfisher*	Essential Habitat – Crow*	Crow Recovery Zone*	Tinian Monarch Habitat
Island Total = no action <i>ac (ha)</i>	21,690 (8,778)	24,802 (10,037)	23,004 (9,309)	35,360 (14,310)	11,368 (4,600)
Loss due to Preferred Alternatives Construction <i>ac (ha)</i>	1,286 (520)	629 (255)	575 (233)	1,487 (602)	174 (70)
Percent loss on island due to preferred alternative	6%	2.5%	2.5%	4%	1.59%

Note: *Each habitat category is considered independently of others and are not additive.

**Habitat (MLA only) is considered to be native and mixed introduced forest, tangantangan, and Casuarina forrest.

In addition to loss of habitat from clearing, additional habitat would be impacted by noise and disturbance from operations including general facility operation and from aircraft takeoff and landings. The Mariana fruit bat would be directly affected at Andersen AFB because it is present or potentially present in operation areas. The amount of Overlay Refuge affected, using a 492 ft (150 m) distance would be 254 ac (103 ha). Other species and fruit bats at other locations would be indirectly affected because they are not present (or rarely present). The acreage just listed for Andersen AFB would also include all areas indirectly impacted. At Finegayan the Overlay Refuge affected would be greatest for the fruit bat at 254 ac (103 ha), again using the 492 ft (150 m) distance. At NMS, the Overlay Refuge affected would be greatest for the Mariana crow at 366 ac (148 ha), using a 984 ft (300 m) distance. Much of the Overlay Refuge affected within this distance is savanna.

On Tinian, the acreage affected would potentially remove habitat for 408 Tinian monarchs based on recent bird density estimates. There is limited information available regarding impact of training noise on the Tinian monarch, but there may be a significant impact to areas surrounding proposed ranges. To evaluate this potential, monitoring of the species in areas surrounding the ranges would be conducted to determine potential noise impacts. If this monitoring determined that the Tinian monarchs are being affected, techniques to reduce noise generation, such as noise barriers, would be employed.

Other potential direct impacts to the Guam-listed Pacific slender-toed gecko and *Heritiera longipetiolata* tree would be mitigated to less than significant. Indirect impacts that would be mitigated to less than significant include potential feral pig and deer damage, threats to listed species from uncontrolled pets, invasive species damage, and potential wildfires caused by training.

Of great concern is the potential unintentional introduction of the brown tree snake (BTS) to other islands throughout the Pacific from Guam. Preferred alternatives would vastly increase the movement of personnel, aircraft, equipment, and supplies from Guam to other locations, thereby increasing the likelihood of introducing this species if no precautions are taken. This concern would be addressed using various measures, as summarized in Section 7.2.

3.3.9.2 No Action

Under no action, existing stressors that degrade habitat quality would remain and the present declining trends for terrestrial biological resources would continue. These include non-native, invasive plants, animals and diseases, wildfires, and poaching. Introduction of some non-native species and diseases to Guam and Tinian has had a devastating effect on the native plants and animals. On Guam the introduction of the BTS has been the primary cause of the elimination of 9 of 12 native forest birds of Guam since invading Guam as a stowaway about 50 years ago. The BTS has also severely impacted native reptiles on the island. There is a high risk under both no action and the preferred alternative of the BTS being accidentally transported to other Pacific islands, but under no action there may be less attention and focus on the problem.

Under no action, limestone forest areas are being degraded by invasive plants, in particular the canopy tree *Vitex*, and this trend would continue. The BTS, ungulates, and other invasive plants and animals would continue to degrade and/or prevent the recovery of the natural flora and fauna in the project areas. Poaching, which presently occurs on military lands, would continue because many of the military lands, particularly the Navy lands, are not fenced.

On Tinian heavy disturbance of native forests began in the 18th century when the Spaniards used Tinian as a supply island for Guam and maintained large herds of cattle and other ungulates on the island (Fosberg 1960). In 1926, a Japanese company leased the entire island and cleared additional forested lands for sugarcane production. During WWII, the sugarcane plantations and most remaining native vegetation were destroyed by military campaigns and military construction. After the war, the DOD may have seeded the island with tangantangan, a rapidly growing tree that is not native to the Marianas, to slow erosion. Currently, the vegetation on Tinian is highly disturbed, with tangantangan thickets being an abundant habitat type. Based on the most recent vegetation mapping it is estimated that only 2.6% of the island is still dominated by native limestone vegetation.

Existing Plans and Procedures

There are existing DoD and non-DoD conservation measures that would continue under no action. Ongoing efforts to manage terrestrial resources on military lands would continue in accordance with Air Force and Navy Integrated Natural Resource Management Plans (INRMPs), which include measures mandated by Biological Opinions and voluntary DoD conservation measures that are not regulatory requirements. The INRMPs are updated every five years.

There are environmental restrictions and requirements for training operations that are included in the COMNAV Marianas Training Handbook (COMNAV Marianas Instruction 3500.4, June 2000). The instruction contains the following components: guidance for developing an Environmental Protection Annex in support of a major military exercise plan; training requirements; BTS control and interdiction; monitoring and monitoring reports; emergency procedures; environmental monitor checklists; and an environmental awareness pocket card. There are stand alone BTS Interdiction and Control Plans that are implemented by the military services.

USFWS has published recovery plans for the ESA-listed species present on Guam and in CNMI. As funds become available, local and federal agencies conduct projects to further the recovery of the listed species.

GovGuam agencies captive-breed endangered birds (Guam rail, Mariana crow and Micronesian kingfisher), control predators and invasive species (mainly snakes and cats) in support of released birds, and promote the recovery of habitat for other species of concern. Education programs are given to school and community groups encouraging the preservation of Guam's natural resources. The government works

to prevent the introduction of invasive species to Guam by providing technical assistance for import permits and aiding the development of policies and action groups to prevent the introduction of invasive species. Other work involves the monitoring of native species populations on Guam to provide information to guide management activities and review of development project plans.

A biosecurity plan is being prepared that covers basic principles that would be applicable even under no action. The GovGuam would decide whether to implement the plan if there were no Marine Corps relocation.

Threatened and Endangered Species Population Trends

The threatened Mariana fruit Bat (*fanihi*), a subspecies of a bat found in other areas of Micronesia, once occurred throughout the Mariana Islands including in Guam in forested areas that formerly occupied most of the island. Mariana fruit bat populations have declined over the years, especially in the southern islands. In 1958, a maximum of 3,000 bats were believed to be on Guam. Fewer than 1,000 bats were believed to exist in 1972, with less than 100 bats from 1974 to 1977. During an intensive island-wide survey in 1978, it was concluded that fewer than 50 fruit bats survived. The most recent counts indicate that fewer than 50 bats remain on Guam.

The Mariana fruit bat was first listed as endangered on Guam only, in the belief that bats on Guam formed a separate population from those in CNMI. Recent studies have indicated that the bats move from one island to another, linking these colonies as a single population. In 2005, the Mariana fruit bat was listed as threatened throughout its range.

Mariana fruit bats have been used as food since humans first arrived on the islands, and consumption of bats represents a significant cultural tradition. Although hunting of bats has been illegal under local law in both Guam and the CNMI since the 1970s, hunting remains a chronic threat.

The kingfisher population on Guam was federally listed as an endangered species in 1984, but by 1988, was close to becoming extinct, along with the majority of Guam's other avifauna. a direct result of predation by the introduced BTS. Kingfishers were last reported in southern Guam in the 1970s. A USFWS survey conducted in 1981 estimated the total population remaining in northern Guam to be 3,023. Surveys in 1984/1985 indicated the kingfisher population probably numbered fewer than 50 individuals. The remaining kingfishers were brought into captivity with plans for their eventual reintroduction back into the forests of Guam. The captive population reached 100 individuals in 2008. Research and management efforts continue to reestablish a wild population.

On Guam, the endangered Mariana crow historically been found throughout forested areas and were considered common, even into the early 1960s. A USFWS survey estimated only 357 crows in 1981, mostly in the northern cliffline forests. The last born Guam crow was observed in 2000. Currently, 2 crows translocated from Rota as eggs and/or chicks, are found in Guam. Although predation by introduced BTS is now widely accepted as being responsible for this dramatic decline, other factors such as infertility, predation by rats and monitor lizards, and mobbing by introduced drongos may cumulatively be preventing recovery.

The endangered Guam rail is a flightless bird found more frequently in scrubby second growth or mixed forest than in uniform tracts of mature forest. Before the 1970s, the Guam rail occurred island-wide and distributed in all habitats except wetlands. The population declined severely from 1969-1973, and the rail disappeared from southern Guam in the mid 1970s. In an attempt to save the species, 21 birds were caught in the wild in the mid-1980s and placed in captive breeding both in the continental U.S. and on Guam.

The Tinian monarch is an endemic species that nests in limestone forest, secondary forest, and tangantangan forest habitats. It was federally delisted in 2004 (USFWS 2004) but is still listed as threatened/endangered by the CNMI government. Although the Tinian monarch is no longer ESA-listed, the species is currently being monitored. Native tree species are preferred monarch nesting sites. The population of this species has been in decline recently. The monarch currently inhabits approximately 62% of the land area on Tinian of which approximately 70% is secondary and tangantangan vegetation and less than 3% is native limestone forest.

Habitat Trends

The USFWS (2008) has estimated essential or suitable habitat available in 2004 on Guam and habitat loss for endangered species from past actions at Andersen AFB from 2004 to 2008. These losses are:

- Mariana fruit bat – 5.5 % removed from a 2004 baseline habitat available of 12,026 ac (4,867 ha).
- Micronesian kingfisher – 5.6 % removed from a 2004 baseline habitat available of 12,026 ac (4,867 ha).
- Mariana crow – 6.5 % removed from a 2004 baseline habitat available of 10,774 ac (4,360 ha).
- Guam rail – 2.1 % removed from a 2004 baseline habitat available of 12,172 ac (4,926 ha).

3.3.9.3 Comparison of Preferred Alternatives to No Action

The preferred alternatives would contribute to the trend in degradation of terrestrial biological resources, primarily through a loss of habitat. There are many acres of suitable habitat available on non-federally controlled land, but land is not the limiting factor. Unless other stressors are controlled, the listed species will not recover. Mitigation for preferred alternatives' impacts to the ESA listed species, as summarized in the volumes of this EIS/OEIS, would be described in detail in the Biological Opinion and incorporated into future INRMP updates. The non-DoD efforts to halt or reverse the trend would continue under no action but would increase under preferred alternatives. While there have been successes, it is unlikely under no action conditions and funding level that the trend in resource health would be halted or reversed in the near future.

3.3.10 Marine Biological Resources

3.3.10.1 Summary of Preferred Alternatives' Impacts

Tables 3.3-25 and 3.3-26 summarize the preferred alternatives' construction and operation impacts to marine biological resources on Guam and Tinian. The findings from previous volumes are listed in the tables. For Guam, the greatest level of impact identified among all the volumes is listed in the last Guam column. The summary of impacts for Tinian's preferred alternatives is listed in the far right column of the tables.

Table 3.3-25. Summary of Preferred Alternatives Construction Impacts - Marine Biology

Potential Impacts	GUAM									TINIAN
	Volume 2	Volume 4	Volume 5	Volume 6					Summary	Volume 3
	Marine Corps	Navy Aircraft Carrier	Army AMDTF	Power	Potable Water	Waste-water	Solid-Waste	Road-ways		Training
Marine Flora and Invertebrates	LSI	LSI	NI	NI	NI	LSI	NI	LSI	LSI	LSI
Fish and EFH	LSI	SI-M	NI	NI	NI	SI*	NI	LSI	SI-M	LSI
Special-Status Species	LSI	LSI	NI	NI	NI	NI	NI	LSI	LSI	LSI
Non-Native Species	LSI	LSI	NI	NI	NI	NI	NI	LSI	LSI	LSI
Marine Biology Construction Summary:									SI-M	NA

Legend: SI = Significant impact, SI-M = Significant impact mitigable to less than significant, LSI = Less than significant impact, NI = No impact; SI* Preferred Alternatives would result in a significant localized impact near the wastewater discharge because there would be exceedances of Guam Water Quality Criteria (GWQC) standards for multiple constituents, specifically Ammonia Nitrogen. The summary impacts to marine biological resources would be less than significant.

Table 3.3-26. Summary of Preferred Alternatives Operational Impacts - Marine Biology

Potential Impacts	GUAM									TINIAN
	Volume 2	Volume 4	Volume 5	Volume 6					Summary Impacts	Volume 3
	Marine Corps	Navy Aircraft Carrier	Army AMDTF	Power	Potable Water	Waste-water	Solid-Waste	Road-ways		Training
Marine Flora and Invertebrates	LSI	LSI	NI	NI	NI	NI	NI	NI	LSI	LSI
Fish and EFH	LSI	LSI	NI	NI	NI	NI	NI	NI	LSI	LSI
Special-Status Species	LSI	LSI	NI	NI	NI	NI	NI	NI	LSI	LSI
Non-Native Species	LSI	LSI	NI	NI	NI	NI	NI	NI	LSI	LSI
Marine Biology Operation Summary									LSI	LSI

Legend: SI = Significant impact, SI-M = Significant impact mitigable to less than significant, LSI = Less than significant impact, NI = No impact

Construction Impacts

Under the preferred alternatives, in-water and land-based construction related to proposed Marine Corps actions would result in less than significant adverse impacts on marine resources in Inner and Outer Apra Harbor . The impacts would be short-term and localized, assuming implementation of BMPs summarized in Chapter 2. Impacts in Apra Harbor are due to increased sediment in the water column and noise, and increased frequency of construction-related tug and barge traffic.

Land-based construction in other parts of Guam has potential to impact coastal water quality, but BMPs would reduce impacts to less than significant. Impacts to fish, sea turtles and infaunal or epifaunal organisms in the soft sediment would be short-term and localized. The impacts would be less than significant.

The construction for the Navy's new aircraft carrier berthing in Outer Apra Harbor would result in significant direct impacts to marine biological resources. After all efforts to minimize and avoid the impacts of the aircraft carrier project, there remain unavoidable adverse impacts associated with dredging coral reef ecosystems in Outer Apra Harbor. Sessile reef species, some crustacean management unit species (MUS) and site-attached reef fish. Pelagic egg/larval stages of bottomfish and pelagic MUS may also be affected.

Various compensatory mitigation proposals are being considered, including watershed management projects and artificial reef construction. Impacts to fish, sea turtles and organisms in the soft sediment would be short-term and localized and impacts would be less than significant. There are BMPs and mitigation measures proposed for in-water and land-based construction that are listed in Chapter 2.

Operation Impacts

Less than significant impacts from direct and indirect effects associated with an increase in Apra Harbor ship traffic. Marine flora, invertebrates and associated essential fish habitat (EFH) would experience long-term, localized and infrequent minor impacts from increased noise and resuspension of sediment during vessel movements, and the potential for increased discharges of pollutants into the water column. No significant long-term population-level impacts or reduction in the quality and/or quantity of EFH was identified.

There would be short-term, periodic and localized minimal impacts on sea turtle behavior during increased operation activities and vessel movements in Apra Harbor that would be less than significant with implementation of BMPs, mitigation measures, and Navy vessel policies.

Less than significant impacts from introduction of non-native species are expected since vessels operating within Apra Harbor would comply with U.S. Coast Guard (USCG) and Navy requirements for ballast water and hull management policies. The Navy is funding a *Regional Biosecurity Plan with Risk Analysis* and will implement components of the plan relevant to Navy actions.

With successful compensatory mitigation for direct dredging removal of coral and coral reef habitat associated with the aircraft carrier, the significant adverse affects to fish and EFH (coral and coral reef ecosystems MUS) would be mitigated to less than significant.

Wastewater improvements not related to the preferred alternatives, namely upgrades to secondary treatment, could result in long-term, reduction of significant impacts to fish and EFH from improved water quality. Existing Guam water quality criteria (GWQC) standards are exceeded for multiple constituents, specifically ammonia nitrogen. These preferred alternatives would increase the discharge and impacts are considered to be additive to existing conditions and significant. The impacts are mitigable through wastewater treatment upgrades. There may be a beneficial increase in herbivore foraging area from nutrient loading. Long-term, less than significant impacts on marine flora and invertebrates may result from decreased water quality and siltation. Increased nutrients may improve flora production.

Roadways construction around Apra Harbor has potential to indirectly impact biological resources through runoff or pollutant carried downstream. Implementation of BMPs would reduce the impact to less than significant.

The preferred alternatives would result in a significant localized impact near the wastewater discharge exceeds GWQC standards for multiple constituents, specifically ammonia nitrogen. When considered in conjunction with all other preferred alternatives, the overall operational impacts to marine biological

resources are considered less than significant. The summary impacts to marine biological resources would be less than significant.

Tinian

Less than significant impacts could result from runoff causing turbidity in coastal waters from construction and operation activities and increased supply barge traffic in Tinian Harbor supporting construction activities. BMPs would be implemented during construction to provide additional protection of coastal waters. Positive impacts to sea turtles and EFH may be seen from restricted access to coastal areas (specifically nesting beaches and coral areas of special significance) on Tinian.

3.3.10.2 No Action

Guam

Stressors on marine biology include anthropogenic (human-induced) and natural events like storms and bleaching. The health of the resources is typically a function of an increase population and associated industrial and commercial operations, which affects the natural environment. Examples of stressors include overfishing, increased pollutants released directly to the marine environment or indirectly from land, point and non-point source discharges of stormwater and wastewater treatment plant outfalls(mentioned in Section 3.3.10.1), invasive species, recreational activities, diseases, coral bleaching, and storms.

There are construction proposals on Guam and Tinian under no action that may impact marine resources. The land use plan for North and Central Guam designates areas for resort and high density development that would require utility upgrades. Under no action, there would be marine biological impacts, but the impacts would extend over a longer period of time.

Reefs

The *State of Coral Reef Systems in Guam* (Burdick et al, 2008) is the source of information provided below on coral reef health and trends, unless stated otherwise. The article provides background on resource trends and stressors data from 2004 to 2007.

Under no action, the present trends would most likely continue. The vitality of many of Guam's reefs has declined over the past 40 years. The average live coral cover on the fore reef slopes was approximately 50% in the 1960s, but by the 1990s had dwindled to less than 25% live coral cover, with only a few sites having over 50% live cover. The health of Guam's coral reefs varies significantly across the island. In general, reefs in the northern part of the island and southern reefs at sufficient distances from rivers are relatively healthy, while large sections of reef in the south, particularly those near river mouths, are in poor to fair condition. Currently harvested fish taxa greater than 10 inches (>25 cm) are uncommon to rare on Guam, and while their numbers are slightly higher on northern reefs, medium and large fish abundance is still very low compared to other islands in the Mariana Archipelago. The ability of some reefs on Guam to recover from their current degraded state and from acute disturbance events such as COTS outbreaks, storms and bleaching events is likely hindered by poor water quality, low target herbivorous fish abundance and low coral recruitment.

In the past, Guam's reefs have recovered after drastic declines. However, continued degradation of water quality, crown-of-thorns (invasive species) outbreaks, low abundance of target fish species and other persistent stressors currently affecting Guam's reefs make the reefs less resilient.

The reefs of Guam have been spared from severe and widespread coral mortality associated with large-scale bleaching events, but observations in 2006 and 2007 suggest that bleaching events in Guam's reefs

may become more frequent and severe in the coming decades. There were bleaching events in 1994 and 1996, 2006 and 2007 that appear to have coincided with elevations in sea surface temperature. The impact of the recent bleaching events is difficult to assess.

It appears from baseline surveys in 2006 and 2007 that disease may be causing at least partial mortality in a significant number of colonies in Guam's reefs. White syndrome appears to be the most prevalent disease and the source of greatest tissue mortality.

Large offshore waves associated with storm-driven winds can cause physical damage to the reef. Storm surge and wave inundation can increase local sea levels by over 40% of the offshore significant wave height. Stormwater laden with sediments, nutrients, debris and other anthropogenic inputs can be detrimental to coral reef ecosystems.

Sedimentation of nearshore habitats, primarily a result of severe upland erosion, is one of the most significant threats to Guam's reefs. It is most prevalent in southern Guam, where steep slopes, underlying volcanic rock, barren areas and areas with compromised vegetation contribute large quantities of the mostly lateritic, clay-like soils to coastal waters. The excess sediment flows into coastal waters, where it combines with organic matter in sea water to form "marine snow," falling to the seafloor and smothering corals and other sessile organisms.

The southern reefs are subjected to more anthropogenic activities than the northern reefs. In the south, there has been an increase in wildland arson, clearing and grading of forested land, inappropriate road construction methods and recreational off-road vehicle use, as well as grazing by feral ungulates, have accelerated rates of sedimentation and appear to have exceeded the sediment tolerance of coral communities in these areas, resulting in highly degraded reef systems.

SCUBA diving, snorkeling and related activities continue to be very popular for both tourists and residents and some of the more popular sites have exceeded their annual threshold above which coral cover loss and coral colony damage levels may increase rapidly. Popular dive sites are often adversely impacted when numerous inexperienced divers visit the site within a short period. Broken pieces of coral and colonies damaged by kicking, grabbing and standing are often observed in these areas. Other impacts, such as trampling of coral and other benthic organisms, increased turbidity and alterations of fish behavior from fish feeding are also regularly observed. These behaviors and associated damage are also routinely observed at popular boat diving sites, such as Blue Hole, Hap's Reef, Finger Reef and Western Shoals.

Guam's coral reef fisheries are both economically and culturally important and target a large number of reef fishes and invertebrates. Reef-related fishing methods currently used on Guam include hook and line, cast net (talaya), spear fishing with snorkel and SCUBA, gill net (tekken), surround net, trolling, drag net (chenchulu), hooks and gaffs, jigging, spincasting and bottom fishing. Despite improvement in gear and technology, Guam's fishery catches have declined over the last few decades. A recent re-estimation of small-scale fishery catches for Guam suggests that catches have declined by up to 86% since 1950.

Two fishing methods used on Guam have raised particular concern: the use of SCUBA and artificial light for spear fishing and the use of monofilament gill nets. These methods have been banned or heavily restricted in most of the region, including the CNMI. Abandoned gill nets also cause physical damage to the reef and DAWR regularly removes nets from nearshore reefs.

Ship groundings on Guam's reefs are inevitable due to the frequency of typhoons affecting the island. For example, the October 2004 grounding of a foreign longliner at Western Shoals, a popular dive site, caused substantial damage to an area of high coral cover.

While not a major threat, marine debris continues to impact Guam's reefs. Several monitoring, assessment, and research activities have been conducted on Guam since 2004. These activities measure several aspects of Guam's reef community that are important to coral reef management, including benthic habitat, water quality, biological communities associated with coral reefs (e.g., fishes and macroinvertebrates) and socio-economic information (Burdick et al, 2008).

Soil Erosion/Sediment in Nearshore waters

Wildfires set by poachers are believed to be the main cause of soil erosion. Despite being illegal, intentionally-set fires continue to burn vast areas of southern Guam. An average of over 700 fires have been reported annually between 1979 and 2006, burning over 115,000 ac (46,558 ha) during this period. The devastating effects of illegally-set wildfires in southern Guam are exacerbated by the drought-like conditions associated with El Niño events.

Coastal pollution contributes to the decline of the reefs. Three of the island's sewage treatment outfall pipes continue to discharge within 660 ft (200 m) of the shallow reef crest, in depths of 66-83 ft (20-25 m) and in areas where corals are found. Stormwater leakage into aging sewer lines during heavy rains forces the sewage treatment plants to divert untreated wastewater directly into the ocean outfall pipes. Additionally, since Super Typhoon Pongsona impacted Guam in 2003, effluent from the Hagåtña sewage treatment plant has been partly discharging into a shallow coral reef area due to a break in the outfall line.

Nonpoint source pollutants in the north often infiltrates basal groundwater, which discharges into springs along the sea-shore and subtidally on the reefs. Pollutants include nutrients from septic tank systems, sewage spills, and livestock and agricultural areas, as well as chemical discharge from urban runoff, farms and illegal dumping. The U.S. Navy has recently completed restoration of five sites contaminated with toxic chemicals from operations dating to WWII on Guam and continues to assess and restore another 15 sites. Most of these sites are on or near shorelines. Algal blooms in Tumon Bay are attributed to fertilizers applied to landscaping.

Dredging

Maintenance and construction dredging occurs infrequently in Outer Apra Harbor. The shipping channel is at sufficient depth and has not been subject to dredging. Historically, Guam has served as a port of call since the 16th century, first catering to the ships of Spain and after the Spanish-American War, to American interests. By the beginning of the 20th century, the US had established the island as its western Pacific coaling and shipping station. Except for the two year occupation of Guam by the Japanese during World War II, the US Naval Administration ran the port until 1951, when command was transferred to the Department of Commerce.

As described in Volume 2, Chapter 2, Section 11, Glass Breakwater was constructed in 1944 of 2 million cubic yards (1.5 million cubic meters [m³]) of soil and coral extracted from adjacent Cabras Island. This totally altered the barrier reef system by restricting the exchange of water between Apra Harbor and the open ocean. With an average height of approximately 15 ft (4.6 m) above mean sea level, it is the largest artificial substrate in the Marianas.

Table 3.3-27 lists key dredging events in Outer Apra Harbor that impacted coral reefs. Maintenance dredging events in Outer Apra Harbor have not been identified. Maintenance dredge events occur periodically in Inner Apra Harbor. The combined area of coral reef and lagoon in nearshore waters estimated at 26,685 ac (10,800 ha) and a similar area offshore beyond the territorial boundary (Burdick et al. 2008).

Table 3.3-27. Outer Apra Harbor Construction Dredge Events

<i>Year</i>	<i>Owner</i>	<i>Location</i>	<i>Dredge Depth (ft)</i>	<i>Coral Loss Area (acres estimate)</i>
1945	Navy	Creation of Inner Apra Harbor, Glass Breakwater and navigation channel ¹	ND	> 50
ND	PAG	Pier 3,4,5,6 ²	34-38	ND
1966	PAG	Hotel ²	34	12
ND	PAG	Fuel Pier -Golf ²	50	ND
ND	PAG	Fuel Pier -F-1 ²	70	ND
1989	Navy	Kilo Wharf ⁵	45	7.4
2009	Navy	Kilo Wharf ³	47	5
2008	Navy	Alpha/Bravo Wharf ⁴	40	7
2010-2012	PAG	Commercial Port Modernization: F-6 and F-7 (new) ²	51	ND
2012	Navy	Navy aircraft carrier (Proposed Action)	51.5	25

Sources: ¹ HEA and Supporting Studies (Volume 9, Appendix E of this EIS); ² Port Authority of Guam 2009;

³ NAVFAC Pacific 2007; ⁴ NAVFAC Pacific 2006; ⁵ NAVFAC Pacific 1983

In spite of the alterations to the harbor since the liberation of Guam during WWII, the outer harbor "...holds a vibrant and thriving marine community, including well-developed reefs with some of the highest coral cover on Guam, and a diverse biota of algae, invertebrates and fish. In this regard, the harbor is unlike most other major ports which tend to become greatly degraded for marine life (Paulay et al. 1997). In addition, the outer harbor supports diverse populations of macro-invertebrates, finfish and moderate numbers of the threatened green sea turtle.

Tinian

The stressors described for Guam would be similar to Tinian, including natural events like storms and bleaching. Stressors on the marine environment are typically a function of an increase population and associated industrial and commercial operations on the natural environment and therefore, although anthropogenic stressors are applicable on Tinian, there is less pressure on the reefs due to relatively less population and land development. Stressors may include overfishing, increased pollutants, point and non-point source discharges from stormwater and wastewater treatment plants outfalls, invasive species, recreational activities, diseases, coral bleaching, and storms, which all have contributed to the degradation of marine biological resources. There are two resort development proposals for Tinian that could potentially impact marine biological resources.

Existing Plans and Procedures

There are existing DoD and non-DoD conservation measures that would continue under no action. Ongoing efforts to manage marine resources on military submerged lands would continue in accordance with Air Force and Navy INRMPs, which include measures mandated by Biological Opinions and permit conditions, and voluntary DoD conservation measures that are not regulatory requirements. The INRMPs are updated every five years.

There are GovGuam marine preserves and DoD coastal reserves including the Haputo and Orote ecological reserve areas. Guam and Tinian both have government agencies responsible for coastal management that draft and implement plans and programs to address the historical impacts and prevent future impacts. Federal agencies such as the National Oceanic and Atmospheric Administration (NOAA) and National Marine Fisheries Service (NMFS) fund a variety of projects including reef assessments. These projects are implemented as funding becomes available.

There are environmental restrictions and requirements for training operations included in the COMNAV Marianas Training Handbook (COMNAV Marianas Instruction 3500.4, June 2000). The instruction contains the following components: guidance for developing an Environmental Protection Annex in support of a major military exercise plan; training requirements; BTS control and interdiction; monitoring and monitoring reports; emergency procedures; environmental monitor checklists; and an environmental awareness pocket card.

Erosion control measures are required for construction and are regulated by federal and local laws. These measures, if enforced, reduce the sediment and pollutant discharge into coastal waters.

A *Micronesian Biosecurity Plan* is being prepared that covers basic principles that would be applicable even if the preferred alternatives were not implemented. GovGuam would decide whether to implement the plan if there were no preferred alternatives constructed.

Special-status Species

USFWS ESA-listed and candidate species, and marine mammals not listed under ESA are considered special status species. The species relevant to the EIS/OEIS are green and hawksbill sea turtles, common bottle nose dolphin and spinner dolphin. The baseline condition of these resources is described in Volume 2, Chapter 2, Section 11.

Green sea turtle threats include direct harvesting of eggs or adults, beach cleaning, replenishment, and recreational activities, debris, incidental take from fishing, and seagrass degradation. Fewer than 10 turtles nest in CNMI each year and less than 10 observed on Guam. The survival status in the Pacific Region continues to decline, except for populations in the Hawaiian Islands.

The hawksbill sea turtle is subject to the same threats as the green sea turtle. The population on Guam is almost extirpated. There was one sighting in 1991. No nesting turtles have been recorded in CNMI.

There is no occurrence records for this species in the Marianas, but the preferred alternatives are within the known distribution range for the species.

The spinner dolphin is expected to regularly occur all around Guam, except Apra Harbor, where there are few occurrences of this species. Spinner dolphins are behaviorally sensitive and avoid areas with much anthropogenic usage.

3.3.10.3 Comparison of Preferred Alternatives to No Action

There is no appreciable difference in the preferred alternatives and no action with respect to marine biological resources during operation. There would be additional military transient and commercial ship traffic under preferred alternatives but standard operating procedures would minimize the impact to special status species.

A key assumption is the construction BMPs and compensatory mitigation measures are implemented, with less than significant impacts during operation phase. The habitat equivalency analysis (Volume 9, Appendix E) prepared for the aircraft carrier berthing estimates that if artificial reefs are the compensatory mitigation, there would be a replacement of 85% of natural reef functions and services within 10 years of deployment (on average - some specific areas may recover faster, others more slowly). There would also be a delay for the recovery under watershed management compensatory mitigation projects. The operation phase impact assumes 100% restoration. There will likely be future dredging projects that result in coral loss, but none have been identified that are of the magnitude described for the preferred alternatives. These impacts would require compensatory mitigation too.

During operation, the preferred alternatives would have a less than significant impact on marine biological resources. The preferred alternatives would not add to the degradation of marine resources, assuming upgrades to secondary treatment at the northern district wastewater treatment plant. There would continue to be anthropogenic and natural impacts that degrade the marine environment and impacts from historical events that are unrelated to the preferred alternatives. Conservation measures and plans for federally-controlled and GovGuam submerged lands and would continue to minimize and reverse the impacts on marine biology, as funding becomes available.

3.3.11 Cultural Resources

3.3.11.1 Summary of Preferred Alternatives’ Impacts

Tables 3.3-28 and 3.3-29 summarize the preferred alternatives’ construction and operation impacts to cultural resources on Guam and Tinian. The findings from previous volumes are listed. For Guam, the greatest level of impact identified among all the volumes is listed in the last Guam column. The summary of impacts for Tinian’s preferred alternatives is listed in the far right column of the tables. The overall summary of impacts during peak construction is significant but mitigable for both islands. During operation, the overall cultural impact of the preferred alternatives is less than significant for both islands.

It is assumed that all of the proposed construction actions would occur in a compressed time period, and that all operational activity would commence upon completion of construction.

Table 3.3-28. Summary of Preferred Alternatives Construction Impacts - Cultural

Potential Impacts	GUAM									TINIAN
	Volume 2	Volume 4	Volume 5	Volume 6					Summary Impact	Volume 3
	Marine Corps	Navy Aircraft Carrier	Army AMDTF	Power	Potable Water	Waste water	Solid Waste	Roadways		Training
Archaeological Resources	SI-M	NI	SI-M	SI-M	SI-M	SI-M	NA	NI	SI-M	SI-M
Architectural Resources	SI-M	NI	NI	NI	NI	NI	NA	NI	SI-M	NI
Submerged Resources or Objects	NI	NI	NI	NI	NI	NI	NA	NI	NI	NI
Traditional Cultural Properties	SI-M	NI	SI-M	NI	SI-M	NI	NA	NI	SI-M	SI-M
Cultural Construction Summary:									SI-M	SI-M

Legend: SI = Significant impact, SI-M = Significant impact mitigable to less than significant, LSI = Less than significant impact, NI = No impact

Table 3.3-29. Summary of Preferred Alternatives Operation Impacts - Cultural

Potential Impacts	GUAM									TINIAN
	Volume 2	Volume 4	Volume 5	Volume 6					Summary Impact	Volume 3
	Marine Corps	Navy Aircraft Carrier	Army AMDTF	Power	Potable Water	Waste water	Solid Waste	Road -ways		Training
Archaeological Resources	LSI	NI	LSI	NI	NI	NI	NA	NI	LSI	LSI
Architectural Resources	NI	NI	NI	NI	NI	NI	NA	NI	NI	NI
Submerged Resources or Objects	NI	NI	NI	NI	NI	NI	NA	NI	NI	NI
Traditional Cultural Properties	LSI	NI	LSI	NI	NI	NI	NA	NI	LSI	LSI
Cultural Operation Summary:									LSI	LSI

Legend: SI = Significant impact, SI-M = Significant impact mitigable to less than significant, LSI = Less than significant impact, NI = No impact

During construction on Guam there are potential significant adverse direct impacts to approximately 34 NRHP-eligible or listed archaeological resources on Guam and 10 on Tinian, all of which would be mitigated to less than significant through mitigation. Six architectural resources sites would be impacted. The mitigation would be conducted in accordance with Programmatic Agreement with State Historic Preservation Office (SHPO) that would require avoidance, survey, monitoring during construction, data recovery, building documentation, public education, and training of military personnel.

There would be significant adverse impacts to four traditional cultural properties all mitigated to less than significant through public education and implementation of a preservation plan. Traditional resources such as the dukduk tree, ifit tree, and da'ok tree, are recognized by the DoD and would be made available to local people prior to their removal for construction of the preferred alternative.

There would be no adverse impacts to listed submerged resources or objects during construction or operation for either island. On Tinian, there would be no impacts to architectural resources during operation.

The operations period assumes potential mitigation for impacts was implemented in the construction period and that the significant impacts have been reduced to less than significant. Impacts during operation would include deterioration of archaeological resources due to weather exposure. Overall, recognized sites on DoD-managed lands are better protected from vandalism than sites on non-DoD managed lands because resources on DoD-managed lands are protected by cultural resource management plans and various DoD laws and regulations. Land acquisition by DoD brings more sites under the higher level of protection. There is the potential for impact on resources remaining after construction, but it is less than significant due to DoD management.

Direct impacts within the surface danger zones of the new firing ranges (Guam and Tinian) are unlikely since it is estimated that only 1 in 10,000 rounds would fall outside of the target impact area. On the other hand, land acquisition during the construction phase restricts public access to some cultural sites during operations. There would be indirect impacts to those sites that are within SDZs on Guam and Tinian.

Initially, the preferred alternatives would have a greater burden on the SHPO than the no action due to the number of DoD management plans that would require consultation. However, in the long run there would be a far lessened burden on SHPO with the preferred alternatives as the DoD would continue to manage large tracts of land on Guam and afford the culture resources on those lands a higher level of protection than if they were not under DoD protection.

3.3.11.2 No Action

The stressors on cultural resources include vandalism, intentional and inadvertent disturbance from construction activities, and deterioration due to weather exposure. Many WWII cultural sites were established on Guam and Tinian, but the war itself resulted in the loss of cultural sites. The trend over time since WWII conclusion is a decline in cultural resources due to the stressors listed.

Currently, there are over a 1,000 archaeological sites identified on Guam. Many archaeological sites on Guam are still relatively intact and there may be others, yet to be identified. Past construction on Guam has resulted in the destruction of archaeological sites, but when data was recovered through the excavation of these sites, their information value remains accessible to the public. Likewise, future intentional removal of archaeological sites (construction) can be mitigated through data recovery. Removal of National Register of Historic Places-eligible buildings can also be mitigated through detailed recordation. These potential impacts to cultural sites would be significant and mitigable in the future.

There are local and federal laws and regulations to protect cultural resources. For example, there are fines for vandalism under no action. There are challenges to enforcement due to the large number of sites to manage island-wide. These potential impacts continue to be significant but mitigable into the future.

In the absence of the preferred alternative, there is a potential for significant but mitigable impact on cultural resources. The cultural resources would continue to decline in the future.

3.3.11.3 Comparison of Preferred Alternatives to No Action

Cultural sites would be lost during construction of the preferred alternatives, contributing to the ongoing trend in declining number of cultural sites. Once the mitigation is implemented for this loss, cultural impacts would be reduced to a less than significant level. During operation, there would continue to be some vandalism and deterioration by weather, but overall the impact to cultural resources on DoD land would be less than significant due to a high level of protection and site management. Some conditions of the Programmatic Agreement, such as education would continue into the operational phase, but the assessment assumes the mitigation concludes with the construction phase.

Under no-action, in the absence of any aspect of the preferred alternatives, there would continue to be potential for direct significant impacts to cultural resources due to construction activities, vandalism and weather to resources on non-DoD land. The direct impacts would be significant but mitigable, if mitigation measures similar to those in the Programmatic Agreement are applied.

3.3.12 Visual Resources

3.3.12.1 Summary of Preferred Alternatives' Impacts

Tables 3.3-30 and 3.3-31 summarize the preferred alternatives' operation impacts to visual resources on Guam and Tinian. The visual impacts are considered long-term impacts; therefore, the short-term construction phase impacts are not applicable. The findings from previous volumes are listed. For Guam, the greatest level of impact identified among all the volumes is listed in the last Guam column. The summary of impacts for Tinian's preferred alternatives is listed in the far right column of the tables.

During operation, the overall impact to the visual resources under the preferred alternatives is less than significant for both islands.

Table 3.3-30. Summary of Preferred Alternatives Construction Impacts - Visual

Potential Impacts	GUAM									TINIAN
	Volume 2	Volume 4	Volume 5	Volume 6					Summary Impacts	Volume 3
	Marine Corps	Navy Aircraft Carrier	Army AMDTF	Power	Potable Water	Waste water	Solid Waste	Roadways		Training
Visual	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Visual Construction Summary:									NA	NA

Legend: SI = Significant impact, SI-M = Significant impact mitigable to less than significant, LSI = Less than significant impact, NI = No impact; NA= Not applicable

Table 3.3-31. Summary of Preferred Alternatives Operation Impacts - Visual

Potential Impacts	GUAM									Tinian
	Volume 2	Volume 4	Volume 5	Volume 6					Summary Impacts	Volume 3
	Marine Corps	Navy Aircraft Carrier	Army AMDTF	Power	Potable Water	Waste water	Solid Waste	Roadways		Training
Andersen AFB	LSI	NA	LSI	NA	NA	NA	NA	NA	LSI	NA
NCTS Finegayan	LSI	NA	LSI (with mitigation)	NA	NA	NA	NA	NA	LSI	NA
Non-DoD lands (North)	SI-M	NA	NA	NA	NA	NA	NA	NA	LSI	NA
Andersen South	SI	NA	NA	NA	NA	NA	NA	NA	LSI	NA
Non-DoD lands (Central)	SI-M	NA	NA	NA	NA	NA	NA	NA	LSI	NA
Barrigada	LSI	NA	LSI	NA	NA	NA	NA	NA	LSI	NA
Apra Harbor	LSI	NI	NA	NA	NA	NA	NA	NA	LSI	NA
Naval Base Guam	LSI	NA	NA	NA	NA	NA	NA	NA	LSI	NA
South	LSI	NA	NA	NA	NA	NA	NA	NA	LSI	NA
Views toward upgraded GPA facilities, Cabras Piti, and Potts Junction	NA	NA	NA	LSI	NA	NA	NA	NA	LSI	NA
Views along Highway 3 adjacent to/near Finegayan	NA	NA	NA	NA	LSI	NI	NA	NA	LSI	NA
Views from Route 2, Route 2a, and nearby Afilieje Beach Park	NA	NA	NA	NA	NA	NA	SI-M	NA	LSI	NA
Existing visual quality changes to a more urban visual character	-	-	-	-	-	-	-	SI-M	LSI	NA

Potential Impacts	GUAM									Tinian
	Volume 2	Volume 4	Volume 5	Volume 6					Summary Impacts	Volume 3
	Marine Corps	Navy Aircraft Carrier	Army AMDTF	Power	Potable Water	Waste water	Solid Waste	Roadways		Training
Removal of vegetation in residential areas, changing the visual character	-	-	-	-	-	-	-	LSI	LSI	NA
Views from Mount Lasso	NA	NA	NA	NA	NA	NA	NA	NA	NA	SI-M
Views along Broadway	NA	NA	NA	NA	NA	NA	NA	NA	NA	SI-M
Views along 8 th Avenue	NA	NA	NA	NA	NA	NA	NA	NA	NA	SI-M
Visual Operation Summary:									LSI	SI-M

Legend: SI = Significant impact, SI-M = Significant impact mitigable to less than significant, LSI = Less than significant impact, NI = No impact; NA= Not applicable

It is assumed that all of the proposed construction actions would occur in a compressed time period, and that all operational activity would commence upon completion of construction.

Impacts to visual resources would result from altering the views or scenic quality associated with particularly significant and/or publicly recognized vistas, viewsheds, overlooks, or features; substantially changing the light, glare, or shadows within a given area; and substantially affecting sensitive receptors. The preferred alternatives would result in different levels of impacts in different areas.

The military buildup would result in substantial changes to the visual environment at specific locations in Guam. For instance, roadways and intersections widened by the Guam Roadway Network (GRN) projects would add an increased urban character to the views of the roadways. Those traveling on the roadway would likely find the wider pavement sections very noticeable. Pedestrians and those living or working adjacent to the roadway or intersection would likely find the changes very noticeable as well; however, it is not anticipated that these viewers would be highly sensitive to the individual changes given the cumulative nature of the roadway visual quality changes. Potable water supply, storage, and treatment would introduce new features into the landscape. The height of the current DoD landfill at Apra Harbor would be nearly doubled under the preferred alternative for solid waste, causing significant effects to nearby and distant public viewpoints and sensitive receptors. These effects would be reduced to a level of less than significant with implementation of appropriate mitigation measures, including notable grading and re-vegetation.

Impacts to the visual environment from the preferred alternatives would primarily be considered less than significant and in cases where impacts were deemed to be significant, mitigation measures would reduce their impacts to less than significant. Mitigation measures would include compliance with design guidelines for all buildings, in keeping with the Guam archetype, by implementing a landscape plan focused on retention of mature specimen trees during construction; establishing a full suite of vegetation in keeping with Guam’s native flora; and using native flora to create a natural-appearing “screen” between public roadways and buildup areas.

3.3.12.2 No Action

Urban development is likely the most notable cause for change in visual environments: the degree and the nature of the proposed development, as well as where proposed, correspond with the resulting visual environment. For example, a single-family subdivision proposed on a hillside where the view of the hillside was enjoyed from the existing scenic points or designated viewing areas, the resulting visual environment may mean that the existing views would be altered as seen from the existing viewing points. As such, even if the proposed relocation of the Marines and their dependents would not occur, there is likelihood that changes to the existing visual environments may occur throughout the island of Guam.

Of all DoD properties on Guam, Andersen AFB would likely experience some change in its visual environment with the implementation of the planned ISR/Strike Town and other associated structures. There are no developments proposed on NCTS Finegayan, Former FAA parcel, Andersen South, Navy/Air Force Barrigada; as the result the existing conditions would remain under this Alternative. Under no action, a notable change at Apra Harbor would be that the proposed build-up of the existing landfill - up to 100 ft (30 m) - would no longer occur, thereby eliminating an adverse impact to the existing visual resource. No changes are expected at the NMS in South Guam.

There are several medium- (approximately 150 units) to large-scale single-family subdivision (approximately 400 units) and construction proposed on private properties in Yigo and Central Guam, as well as condominium and resort developments in Tumon/Tamuning that would presumably result in altered visual environment, from semi-rural to urban and/or suburban to urban. Over time, the visual environment in these areas would become less natural in appearance. There are no developments proposed in South Guam: no change to the existing visual condition is expected.

Tinian

There are new resorts planned for Tinian, and preliminary plans suggest the resorts would add urban attributes to the existing semi-rural environment on Tinian in the form of tall and/or large structures. Without the preferred alternatives on Tinian, the viewshed from the overlook at Mount Lasso, which would have been affected the most from the preferred alternative developments, would maintain the existing condition.

3.3.12.3 Comparison of Preferred Alternatives to No Action

Under no action for both islands, there is potential for development of large massive facilities in areas that are currently open space. The same is true on Guam under the preferred alternative. These effects are additive across each island. The impacts are considered less than significant, because valued viewsheds would not be lost. In addition, development on non-federal land would occur in accordance with master plans and zoning codes, and presumably would be consistent with community development goals that set aside areas for open space. Although there would be some changes to the landscape, the preferred alternative would have no island-wide impact on the visual environment. With the implementation of mitigation measures as previously identified, summary impacts would be less than significant.

3.3.13 Marine Transportation

3.3.13.1 Summary of Preferred Alternatives' Impacts

Tables 3.3-32 and 3.3-33 summarize the preferred alternatives' construction and operation impacts to marine transportation resources on Guam and Tinian. The findings from previous volumes are listed. For Guam, the greatest level of impact identified among all the volumes is listed in the last Guam column. The summary of impacts for Tinian's preferred alternatives is listed in the far right column of the tables. The

overall summary of impacts during peak construction is less than significant for both islands. During operation, the overall cultural impact of the preferred alternatives is less than significant for both islands.

It is assumed that all of the proposed construction actions would occur in a compressed time period, and that all operational activity would commence upon completion of construction.

Table 3.3-32. Summary of Preferred Alternatives Construction Impacts - Marine Transportation

Potential Impacts	GUAM									TINIAN
	Volume 2	Volume 4	Volume 5	Volume 6					Summary Impact	Volume 3
	Marine Corps	Navy Aircraft Carrier	Army AMDTF	Power	Potable Water	Waste water	Solid Waste	Roadways		Training
Marine Transportation	LSI	LSI	NI	NI	NI	NI	NI	NI	LSI	LSI
Marine Transportation Construction Summary:									LSI	LSI

Legend: SI = Significant impact, SI-M = Significant impact mitigable to less than significant, LSI = Less than significant impact, NI = No impact

Table 3.3-33. Summary of Preferred Alternatives Operation Impacts - Marine Transportation

Potential Impacts	GUAM									TINIAN
	Volume 2	Volume 4	Volume 5	Volume 6					Summary Impact	Volume 3
	Marine Corps	Navy Aircraft Carrier	Army AMDTF	Power	Potable Water	Waste water	Solid Waste	Roadways		Training
Marine Transportation	LSI	LSI	NI	NI	NI	NI	NI	NI	LSI	LSI
Marine Transportation Operation Summary:									LSI	LSI

Legend: SI = Significant impact, SI-M = Significant impact mitigable to less than significant, LSI = Less than significant impact, NI = No impact

Marine transportation summary impacts would be at Apra Harbor. The preferred alternatives would result in an increased number of vessels visiting the harbor during the construction that would have a less than significant impact on marine transportation. There are dredging activities proposed and if ocean disposal is included there may be one to two barge trips per day to the ocean site for a year, depending on construction tempo. Land placement of dredged material would likely require trips to Inner Apra Harbor, Uniform Wharf, where the material would be offloaded and would not impact the Outer Harbor transportation.

The projected average number of containers to be handled each year during the construction period of 2008 through 2018 is 153,636. This quantity is about twice the average number of containers handled during the period of 1995 through 2008 (86,558). The average number of container ships that visited the Port of Guam each year over the period of 1995 through 2008 is 124. The maximum number of containers to be handled during the period of 2008 through 2018 is 190,000 (in the year 2015). If the number of containers per ship remains the same as during the period of 1995 through 2008 (average of 706 containers per ship), there would be approximately 269 container ships visiting the Port of Guam during 2015. The increased traffic is within the commercial port capacity that is being modernized to support the construction.

The proposed activities that would have an impact on navigation are: 1) the relocation of the buoys, 2) the relocation of the range lights for Outer Apra Harbor, 3) the security barrier installed around the aircraft carrier, and 4) restrictions on navigation during aircraft carrier transits into and out of Apra Harbor in accordance with security requirements. This activity would result in less than significant impacts to marine transportation. The security barrier would only impact Inner Apra Harbor Navy traffic and not impact the commercial transportation. The restriction on transportation during aircraft carrier movement is a temporary short-term (less than 1 day) impact. None of the four actions would have a significant impact on marine transport during operations.

Preferred alternatives on Guam would have less than significant effects because the annual number of vessels visiting the Port of Guam has decreased by 1,902 vessels over the period of 1995 to 2008, it is expected that the addition of up to 269 container vessels (2015) and 277 trips to the ocean disposal site to transport the dredged material from Sierra Wharf and the new wharf at Polaris Point above the average visiting the Port of Guam over a one year period would result in less than a significant impact on marine transportation in Apra Harbor. The number of military vessels visiting Guam may change if military missions and ships change. These increases are assumed to be less than significant.

A Notice to Mariners would be published prior to the start of the dredging to identify the location and duration of dredging and temporary navigational aids may be deployed. The impacts on Navy ship traffic would be addressed through scheduling and communications between Port Operations and the contractors.

In regard to Tinian Harbor, there is no proposed construction or modification of existing facilities as part of the proposed relocation of the Marines. If equipment is moved by barge, one single barge would be able to carry the equipment necessary to support the estimated 200 to 400 Marines training evolution. The movement of this barge would result in no impact to marine transportation in Tinian Harbor.

The Tinian Harbor is in need of repair and the planned resorts and future changes in military mission on Tinian may provide incentive for the improvements. It is assumed that the increase in tourism and potentially military operations would increase the marine traffic to/from Tinian. The impact is assumed to be less than significant.

3.3.13.2 No Action

Under the no action, the number of military vessels visiting Guam may not change from current conditions; however, the number of ships is subject to change based on military mission. The aircraft carrier would continue to visit Apra Harbor at Kilo Wharf with great adverse impacts to ordnance operations. There would be security restrictions, including security barriers, at Kilo Wharf that would restrict navigation at the entrance to the Outer Apra Harbor. As new ships and military missions change, there is potential for an increase in military marine traffic. The number of non-military vessels visiting the Port of Guam would continue to decline or remain at about the current level. Therefore, the no action would result in no impact on marine transportation in Apra Harbor. There have been plans to improve the commercial port prior to the discussions on the military build-up. Improvements are being funded prior to the build-up construction and these improvements would have occurred without the build-up. The timing of the improvements may have been delayed without the preferred alternatives.

There are two large-scale planned resorts for Tinian. Construction of these projects may increase ship traffic at the port. There may be an increase in ferry traffic due the additional tourists drawn to the island to visit these two new resorts. There may be an increase in military use of Tinian in the future that would contribute to the marine traffic. The port needs improvements; they may be provided as part of the projects that propose an increase in use.

3.3.13.3 Comparison of Preferred Alternatives to No Action

The total number of commercial (non-fishing) vessels visiting the Port of Guam has decreased substantially from 1995 (763 vessels) to 2008 (436 vessels). Assuming a channel occupancy time of one hour for passage of a vessel into and out of the harbor, channel occupancy has declined from 17% to 9.7%. Even after allowing for military vessels (including priority vessels such as aircraft carriers) and weather interruptions, the harbor's navigation channels appear to have a substantial capacity for additional vessels. Because the annual number of vessels visiting the Port of Guam has decreased by 1,902 vessels over the period of 1995 to 2008, it is expected that the addition of up to 269 container vessels (2015) and 277 trips to the ocean disposal site to transport the dredged material from Sierra Wharf and the new wharf at Polaris Point above the average visiting the Port of Guam over a one year period would result in less than a significant impact on marine transportation in Apra Harbor. Under the preferred alternatives, after construction it is anticipated that the number of commercial vessels visiting the Port of Guam would be greater than under no action to support the additional on-island population. The impact would be less than significant because the harbor has capacity to handle the additional traffic.

No significant impacts on Tinian marine traffic are anticipated under the preferred alternatives. No action may include new resort construction and operations that could result in an increase in harbor traffic.

3.3.14 Related Actions (Utilities and Traffic)

For purposes of this EIS/OEIS, the utilities actions and roadway projects are considered "related actions," in that they would be implemented as a result of the overall preferred alternatives.

3.3.14.1 Summary of Preferred Alternatives' Impacts

Tables 3.3-34 and 3.3-35 summarize the preferred alternatives' construction and operation impacts to related actions on Guam and Tinian. The findings from previous volumes are listed. For Guam, the greatest level of impact identified among all the volumes is listed in the last Guam column. The summary of impacts for Tinian's preferred alternatives is listed in the far right column of the tables. The overall summary of impacts during peak construction is significant but mitigable for both islands. During operations, the overall cultural impact of the preferred alternatives is less than significant for both islands.

It is assumed that all of the proposed construction actions would occur in a compressed time period, and that all operational activity would commence upon completion of construction.

Table 3.3-34. Summary of Preferred Alternatives Construction Impacts - Related Actions

Resource	GUAM									TINIAN
	Volume 2	Volume 4	Volume 5	Volume 6					Summary Impacts	Volume 3
	Marine Corps	Navy Aircraft Carrier	Army AMDTF	Power	Potable Water	Waste water	Solid Waste	Roadways		Training
Power	SI-M	LSI	LSI	NA	NA	NA	NA	NA	SI-M	LSI
Water	SI-M	LSI	LSI	NA	NA	NA	NA	NA	SI-M	LSI
Wastewater	SI-M	LSI	LSI	NA	NA	NA	NA	NA	SI-M	LSI
Solid Waste	SI-M	LSI	LSI	NA	NA	NA	NA	NA	SI-M	LSI
Roadways	SI-M	NI	LSI	NA	NA	NA	NA	NA	SI-M	LSI
Related Actions Construction Summary:									SI-M	LSI

Legend: SI = Significant impact, SI-M = Significant impact mitigable to less than significant, LSI = Less than significant impact, NI = No impact; BI= beneficial impact; NA = not applicable

Table 3.3-35. Summary of Preferred Alternatives Operational Impacts - Related Actions

Resource	GUAM									TINIAN
	Volume 2	Volume 4	Volume 5	Volume 6					Summary Impacts	Volume 3
	Marine Corps	Navy Aircraft Carrier	Army AMDTF	Power	Potable Water	Waste water	Solid Waste	Roadways		Training
Power	SI-M	LSI	LSI	NA	NA	NA	NA	NA	SI-M	NI
Water	SI-M	LSI	LSI	NA	NA	NA	NA	NA	SI-M	LSI
Wastewater	SI-M	LSI	LSI	NA	NA	NA	NA	NA	SI-M	LSI
Solid Waste	LSI	LSI	LSI	NA	NA	NA	NA	NA	LSI	NI
Roadways	LSI	LSI	LSI	NA	NA	NA	NA	NA	LSI	NI
Related Actions Operation Summary:									SI-M	LSI

Legend: SI = Significant impact, SI-M = Significant impact mitigable to less than significant, LSI = Less than significant impact, NI = No impact; BI= beneficial impact; NA = not applicable

The utilities and off-base roadway impacts analysis in this EIS/OEIS are island-wide and based on the total proposed population increases on Guam to meet the purpose and need for the Marine Corps, Navy and Army. Therefore, the utility analysis in Volume 6 is in essence a summary impact analysis. The utility and roadway project-specific impacts are addressed in the resource sections of Volume 6 and the summary impacts of the specific projects are described under the resource sections of Volume 7. This Volume 7 section differs from the other discussions of utilities and roadways in that it focuses on the overall capacity of existing infrastructure and relative to the new demand under the preferred alternatives instead of focusing on the individual projects proposed to meet the additional demand.

The peak construction period population would have a greater demand on utilities than the steady-state operations. Interim solutions and long-term solutions are described in Volume 6, Chapter 2. These solutions are the mitigation for the significant impacts that the population increases would have on utilities and roadways. The population increases during construction and operation are largely due to the Marine Corps preferred alternatives. The impact of other services on related actions is considered less than significant. The potential impacts are significant and mitigable on all related actions for construction and operation, with a few exceptions. Once the roadway improvements are constructed there would be no

operational impacts. Use of existing or soon to be constructed sanitary landfill reduces the solid waste operational impact to less than significant.

The Tinian data was presented in Volume 3 and utilities' impacts are summarized as follows:

- No supporting utility infrastructure facilities are proposed for the Tinian firing ranges. All training would be considered "expeditionary," in that the Marines would bring all necessary equipment to the ranges; bivouac on-site; and remove all equipment following completion of the training activities. The only proposed use of on-island utilities would be for wastewater and use of municipal water supply.
- Potable water usage would be restricted to what could be delivered in trucks from the municipal water supply. It is not expected to exceed the available capacity of the municipal water system. Bottled potable water would be delivered to the construction workers. Range fire fighting would be performed by local fire fighting services, as augmented for a range fire fighting role. Portable generators or solar-battery systems would be used to operate any equipment needed at the bivouac site. Water service would be provided via a water truck. Estimated potable water consumption would be 1 gallon per person per day for drinking; additional water would be consumed for cleaning, bathing, etc.
- A contract portable toilet service would be used for human waste. Portable toilets would be contracted from a local company and the wastewater disposed in accordance with all applicable laws and regulations as a requirement of the contract. Potential disposal methods that the contractor could utilize include (1) taking the wastewater to the existing DoD septic tank/leach field system, (2) taking the wastewater to the Dynasty Casino and injecting into their tertiary treatment system, (3) taking the wastewater to the IBB facility and adding it to their septic/leach field system, (4) constructing a new leach field to handle the wastewater, and (5) finding other existing septic tank/leach field systems on Tinian with the capacity to accept this wastewater and with an owner willing to accept it. The preferred approach would be Option 1. Septage from the port-a-potties would be emptied by the on-island portable toilet rental company into and treated at the existing DoD septic tank/leach field.
- Solid waste would be collected and returned with the using unit, pending establishment of a certified landfill on Tinian. Solid waste would be back-hauled to Guam, and the DoD would not dispose of solid waste at the open dump operated by the CNMI Department of Public Works.

On Tinian, there are no impacts to utilities or roadways and no mitigation (improvements) are proposed.

The proposals (mitigation) to address power and solid waste are Guam-wide solutions.

Power

The current power supply and transmission and distribution (T&D) system for the island-wide power system (IWPS) is adequate to meet demand through 2016. Guam Power Authority's (GPA) demand forecast indicates that the reserve capacity would be exceeded in 2016, based on the GPA load projections for the IWPS without the DoD proposed buildup. GPA's demand forecast is based on an installed generation capacity of 550 megawatts (MW). A review of one year of GPA's actual generation capacity indicates an average daily generation capacity of 490 MW, or nearly 15% less than its stated capacity. This appears to be largely related to units out of service for extended periods of time and units simply not available to be scheduled into the generation capacity for the daily report. The daily-capacity report is a document produced by GPA that was evaluated over a one-year period to determine what GPA's typical

unavailable capacity is on a regular basis. In this report, the existing combustion turbines (CTs) had been out of service with no specific return-to-service date identified. Thus to maintain reliability targets for the power system performance, GPA would be faced with increasing their generation capacity by 2016 even without the DoD buildup.

The existing SO_x non-attainment areas for air quality at Cabras-Piti and Tanguisson would continue unless GPA makes some changes to their operations or enhances their monitoring system in order to demonstrate compliance. GPA already automatically switches to low sulphur fuel oil when the winds are blowing onshore to limit SO_x emissions, however they have not been able to show compliance due to an apparent deficiency in monitoring stations. This situation may continue until GPA initiates adequate monitoring and undertakes collection of the required information to demonstrate compliance with current air standards. Another potential approach would be for GPA to switch fuel to liquid natural gas (LNG), but that may cause issues in their power supply as LNG has lower energy content than fuel oil and would reduce power output of current generating units. There currently seems to be no effort to resolve this non-compliance condition, thus the effects of no action would be essentially no impact and no change to the status quo.

Potable Water

The current capacities of the DoD water systems are adequate to meet current DoD demands for the foreseeable future under the no-action scenario.

The projected water demand for the Guam civilian population throughout 2010-2019, not including the effects of the military buildup, exceeds the current Guam Water Authority (GWA) water system capacity. Some of the currently planned improvements and expansion to the GWA water system would be required even under no action. GWA is apparently pursuing the *Water Resources Master Plan* (WRMP) and making improvements to their potable water system to address the deficiencies.

Should GWUDI treatment become a future requirement, GWA would be faced with compliance.

Wastewater

The current NDWWTP needs some upgrades and deferred maintenance that would be required under no action. Also it appears that EPA would not grant the waiver from secondary treatment for the NDWWTP or the Hagatna WWTP. Thus, in the near future, GWA would very possibly face the requirement to upgrade these treatment plants to secondary treatment.

Solid Waste

The new GovGuam solid waste landfill is currently in construction and funded. It is scheduled to be completed and operational by July 2011. DoD would switch its use from their current landfills at Apra Harbor and Andersen AFB when this new landfill is completed. This new landfill would be fully compliant with current solid waste regulations and have a significant life span to accommodate all of Guam for the foreseeable future. Thus no action would have no impact on the solid waste facilities on Guam.

Roadways

The roadways improvements are distributed throughout the island and described in Volume 6. The implementation of these projects would be an impact to Guam-wide roadway conditions. The improvements would meet (mitigate) the potential significant impact on roadways due to the construction and the operation of the preferred alternative requirements.

3.3.14.2 No Action

The following is a brief summary of information provided in Volume 6, Section 3.1, Affected Environment section.

Power

GPA's demand forecast has indicated that the reserve capacity (or excess capacity to ensure reliability) would be exceeded in 2017, based on GPA's load projections for the IWPS without the DoD proposed buildup.

Water

The baseline condition of the GWA water system is described in GWA's WRMP. The overall condition of the water system's equipment is identified as poor in the WRMP with substantial corrosion in all infrastructure. The water system has a 50% Unaccounted for Water (UFW) rate compared to an acceptable rate of 15% or less. Problems with the GWA infrastructure result from the effects of natural disasters, poor maintenance, and vandalism. According to the WRMP, the water system infrastructure does not meet the basic flow and pressure requirements for all customers. The water system did not consistently comply with regulatory requirements.

Wastewater

GWA's wastewater infrastructure (treatment plants, collection piping, and pump stations) has slowly deteriorated over the years. This, coupled with natural disasters such as typhoons and flooding, has resulted in frequent sewage spills at pump stations and collection piping, collapse of collection piping, and failure of treatment plant equipment. Lack of GWA resources, particularly restrictions on fees that can be collected from the public for sewer services, has severely limited GWA's ability to adequately maintain and update their wastewater treatment system. As a result, GWA has experienced frequent violations of its National Pollution Discharge Elimination System (NPDES) permit conditions, including inability to adequately treat wastewater and exceedances of the allowed pollutant levels in plant discharges. These are outlined in Volume 6, Section

Many of the wastewater and power improvements required under no action are described in the previous section on preferred alternatives. Improvements to the GovGuam infrastructure would be made as funds became available. The new GovGuam landfill would be constructed without the preferred alternatives. There would be no anticipated population increase on the scale of the increase proposed under the preferred alternatives; therefore, there is less pressure to improve facilities in the near term.

A new landfill and WWTP would be constructed on Tinian without the preferred alternatives. No roadway improvements are proposed under the preferred alternatives on Tinian. Periodically, roadways are repaired. The repairs may lag due to insufficient funds resulting in a less than significant summary impact.

Solid Waste

Solid waste from DoD lands is presently disposed of at the Navy sanitary landfill or the Air Force landfill at Andersen AFB. Solid waste from non-DoD sources is disposed of at GovGuam facilities. The GovGuam Ordot landfill will be closed and a new landfill will be constructed.

Roadways

The *2030 Guam Transportation Plan* (GovGuam 2008) identified roadway improvement projects that would be required to address the roadway deficiencies on Guam and did not address all of the roadway improvements proposed in this EIS/OEIS. Some of the projects identified in the plan are accelerated by the

military build-up. The rate of planned improvements identified in the plan is tied to the availability of funding. The condition of roadways on Guam has deteriorated, but they are operational. The summary impact on roadway condition is considered less than significant, assuming the improvements would be implemented in the future. If they are not implemented the impacts would be significant.

3.3.14.3 Comparison of Preferred Alternatives to No Action

The preferred alternatives would add to the overburdened utility infrastructure. While many of the improvements required to existing systems are required under no action, the increased population related to the preferred alternatives adds to the significant impact on utilities. Under no action and preferred alternatives, there are viable solutions to meet (mitigate) anticipated short (construction) and long-term (operation) deficiencies.

Roadway improvements are required under the preferred alternative and no action. The improvements are considered less than significant for both scenarios. If either alternative implemented all the Guam roadway improvements in the near future, the summary impact would be beneficial. If roadways under either alternative would be allowed to deteriorate to the point of being closed in the near-term the effect would be significant but mitigable. Mitigation would be the restoration of the roadway.

The preferred alternative would have no impact on utilities and roadways on Tinian. No action includes planned resort developments south of the MLA and the potential for future increases in military use, which would have significant impact on existing facilities and improvements would be required. It is assumed this construction would occur in the long-term. No short term (peak) events were identified on Tinian. There is a landfill planned that presumably would have capacity for the planned resort use. The planned developments on Tinian would dramatically increase the utility demand on-island. The developers may construct their own utilities or use existing public systems. It is assumed that capacity could be provided to meet the new demand.

There is no appreciable difference impact on related actions between the no action and the preferred alternatives on Tinian.

3.3.15 Socioeconomics

3.3.15.1 Summary of Preferred Alternatives' Impacts

Overall, socioeconomic impacts of preferred alternatives would be island-wide in nature, with little difference in effects among the various alternatives. Implementation of the proposed actions of the Marine Corps, Navy and Army would result in impacts of sudden activity (and thus both positive and negative impacts) that peak during the 2013-2015 timeframe. Impact significance is increased because of the overlap in the construction and operation phases of the preferred alternatives. The peak growth period would be followed by a period of relatively less significant impact when construction ends and a large part of the population influx (due to construction work) would likely leave the island. While quality of life might improve and public service agencies may be more equipped to handle this more manageable post construction population "steady state", the ensuing dip in economic impact could result in an island-wide economic slowdown given the peak spending during the build-up period.

The information provided in the table below provides a summary of the significance, of implementing all of the proposed actions addressed in Volumes 2, 4, 5 and 6 concerning Guam and Volume 3 concerning Tinian. While the relocation of the Marines to Guam and the related facilities and infrastructure would be the largest of the proposed actions, there are incremental contributions to the various socioeconomic factors made to the total impacts from the transient aircraft carrier visits and Army proposed actions on

Guam. The socioeconomic and general services impacts on Tinian would be anticipated to be independent and distinct from those summary impacts on Guam.

Table 3.3-36. Summary of Preferred Alternatives Construction Impacts - Socioeconomics

Potential Impact Components	GUAM						TINIAN
	Volume 2	Volume 4	Volume 5	Volume 6		Summary Impacts	Volume 3
	Marine Corps	Navy Aircraft Carrier	Army AMDT F	Utilities	Roadways		Training
Population	SI-M	LSI	SI-M	SI-M	SI-M	SI-M	NI
Economic	BI	BI	BI	BI	BI	BI	LSI
Civilian Housing	SI-M	LSI	LSI	LSI	LSI	SI-M	NI
Tourism	BI	BI	NI	NI	NI	BI	SI-M
Public Services	SI-M	LSI	SI-M	SI-M	SI-M	SI-M	LSI
Crime and Social Order	SI-M	SI-M	NI	NI	NI	SI-M	NI
Chamorro Community	SI-M	NI	NI	NI	NI	SI-M	NI
Community Cohesion	SI-M	SI-M	NI	NI	NI	SI-M	NI
Socioeconomics Construction Summary:						SI-M	SI-M

Legend: SI = Significant impact, SI-M = Significant impact mitigable to less than significant, LSI = Less than significant impact, NI = No impact, BI = Beneficial impact

Table 3.3-37. Summary of Preferred Alternatives Operation Impacts - Socioeconomics

Potential Impact Components	GUAM						TINIAN
	Volume 2	Volume 4	Volume 5	Volume 6		Summary Impacts	Volume 3
	Marine Corps	Navy Aircraft Carrier	Army AMDTF	Utilities	Roadways		Training
Population	SI-M	LSI	LSI	NI	NI	SI-M	NI
Economic	BI	BI	BI	NI	NI	BI	LSI
Civilian Housing	SI-M	LSI	LSI	NI	NI	SI-M	NI
Tourism	BI	BI	NI	NI	NI	BI	SI-M
Public Services	SI-M	LSI	LSI	NI	NI	SI-M	LSI
Crime and Social Order	SI-M	SI-M	NI	NI	NI	SI-M	NI
Chamorro Community	SI-M	NI	NI	NI	NI	SI-M	NI
Community Cohesion	SI-M	SI-M	NI	NI	NI	SI-M	NI
Socioeconomics Operation Summary:						SI-M	SI-M

Legend: SI = Significant impact, SI-M = Significant impact mitigable to less than significant, LSI = Less than significant impact, NI = No impact, BI = Beneficial impact

3.3.15.2 No Action

Guam

Unlike physical resources, socioeconomic systems do not remain completely at baseline conditions if preferred alternatives are not implemented. Economies and population levels change due to other reasons. Furthermore, the announcement of the intended project has already had socioeconomic consequences, such that a 2010 decision not to follow through on the military buildup would have short-term effects associated with a reversal of those consequences.

Population Impacts

Project related population would not occur, nor would the associated demographic and household characteristic impacts. Overall Guam's population could be expected to increase according to baseline trends that are not substantial.

Economic Impacts

In the short term, a decision not to implement the preferred alternatives would deflate any current speculative activity attributable to the preferred alternatives. Real estate values in particular would likely drop, hurting investors but increasing the affordability of housing. The contrast between the business community's expectations and no action would likely produce a period of pessimism about Guam's economic future, especially if the current national and international economic crisis has not yet abated. These effects, though, would be attributable to an unstable world economic landscape and poor decision making by investors – not to the preferred alternatives.

Long term, the island's prospects would remain linked to international economic conditions and the health of its tourism industry. Conceivably, a smaller military profile might remove some barriers to growing the potential Chinese tourism market. Growth would resume, though probably with the same volatility experienced in recent decades.

Public Service Impacts

The public service agencies would not face pressures to expand professional staffing, and agencies involved in planning and regulating growth would not experience such a sharp increase in workload. Agencies that are required to implement major infrastructure developments – such as the ports and highways – would have substantially more time to implement long-term plans rather than having to achieve much of their objectives over the next few years.

However, at the broader level, no action and the elimination of prospective long-term revenues expected from the preferred alternatives would still leave GovGuam agencies in the difficult financial condition they have faced in recent years. At least for the foreseeable future, this would negatively impact the various service agencies because of budget cuts, and would probably represent the most important overall consequence for the GovGuam.

Sociocultural Impacts

Crime rates would likely rise in the short term to the extent that Guam experiences an economic slowdown without the benefit of DoD increased spending. The political importance of some Chamorro issues would likely recede as the “militarization” of Guam is stabilized at something close to present levels. Military-civilian relations would likely remain at the current generally positive level.

The incentive for increased in-migration from the various Freely Associated States of Micronesia would decrease, reducing sociocultural issues associated with assimilating that population. However, the current incentives for providing those populations – both on Guam and the Micronesian states themselves – would also be lessened, with detrimental implications for those populations.

Utility Impacts

No action would not result in greater contributions from DoD funding share for needed upgrades in wastewater treatment systems on Guam. The lack of increased demand for water under no action would not put pressure on tapping the sole source aquifer in northern Guam. Similarly, no action would not increase demand for power. Existing Guam power plants would not benefit from any expansion in the rate

payer base to help finance the maintenance, refurbishing or improvement of air quality aspects that currently exist.

Roadway Construction Impacts

Under no action, only roadway projects needed for organic growth on Guam would be constructed. No action would not result in intensive construction activities; therefore, there would be no potential for effects on neighborhoods and businesses. No action may result in impacts from property acquisition and relocation associated with the GovGuam planned projects. Mitigation by GovGuam can be identified and implemented to reduce possible impacts to a less than significant level.

Tinian

Tinian-wide analysis for this section is provided in Chapter 16 of Volume 3. There would likely be significant mitigable impacts associated with the construction and operation phase, specifically impacts to tourism. There is likely to be restricted public access to primary tourist points of interest during training and possibly during construction.

3.3.15.3 Comparison of Preferred Alternatives to No Action

The proposed military relocation represents a large infusion of people, spending and capital improvement projects within a short time period and in a small place. The summary socioeconomic impacts would impact the whole island and its people. The military spending for its facilities and infrastructure would generate substantial economic and social consequences that would peak in the middle of next decade. The summary impacts over the longer term would return basically to current conditions with the exception of a larger presence of the permanent military than has existed on Guam in recent years.

The following provides an analysis of the impacts on the various socioeconomic sub-categories introduced above.

Population Impacts

Table 3.3-38 presents the estimated annual population increase from off-island that would result from the preferred alternatives.

The initial influx of military, military related, construction and indirect/induced total population in 2010 is estimated to be approximately 11,000 people. This annual amount would be expected to grow substantially through the mid-decade and peak at approximately 79,000 people. Following the completion of the majority of the relocation construction program, the population would decline from this peak but would result in an increase over the current presence of DoD population on Guam by approximately 33,000 total people.

This rapid and substantial increase in population on Guam would create both opportunities and problems. In the short term, there could be significant impacts caused by rapid population growth that would need to be managed by the government as well as by responses from the private market sector. Over the longer term, it is probable that the larger “steady state” of DoD population would be accommodated on Guam and that there would be beneficial effects from the stable presence of the military, their families and related population.

Table 3.3-38. Estimated Total Population Increase on Guam from Off-Island (Direct, Indirect and Induced)

	<i>Construction</i>	<i>Operation</i>
Direct DoD Population¹		
Active Duty Marine Corps	10,552	10,552
Marine Corps Dependents	9,000	9,000
Active Duty Navy ²	0	0
Navy Dependents	0	0
Active Duty Army	50	630
Army Dependents	0	950
Civilian Military Workers	1,720	1,836
Civilian Military Worker Dependents	1,634	1,745
Off-Island Construction Workers (DoD Projects) ³	18,374	0
Dependents of Off-Island Construction Workers (DoD Projects)	4,721	0
Direct DoD Subtotal	46,052	24,713
Indirect and Induced Population		
Off-Island Workers for Indirect/Induced Jobs ³	16,988	4,482
Dependents of Off-Island Workers for Indirect/Induced Jobs	16,138	4,413
Indirect/Induced Subtotal	33,126	8,895
Total Population	79,178	33,608

Economic Impacts

Civilian Labor Force Demand

Labor force demand refers to the jobs and workers needed to fill them. This analysis includes civilian jobs only, including federal civilian workers and other jobs from spin-off economic growth.

Table 3.3-39 demonstrates that the preferred alternatives would generate the summary impacts of 43,278 workers at the 2014 peak that would decline to about 6,930 after construction abates by 2017. This number of jobs would be considered a significant beneficial impact on Guam. However, this rapid swing in the amount of civilian jobs suggests a sudden decline in economic activity. For many people on Guam, the end of construction would be a welcome return to normalcy, but some businesses would need to cut back, and many workers would have to out-migrate due to job loss.

Table 3.3-39. Impact on Civilian Labor Force Demand – Summary Impacts

<i>Impact</i>	<i>Construction</i>	<i>Operation</i>
Direct	33,871	5,355
Indirect	9,407	1,576
Total	43,278	6,930

Additional analysis suggests Guam residents would capture up to 2,700 of the direct on-site construction jobs plus about 3,200 of all other types of jobs during the construction peak of 2012 - 2014. In the later post-construction period, it is estimated that Guam residents would capture about 2,660 of the permanent jobs. These jobs do not currently exist on Guam and represent a beneficial value added effect as a result of the preferred alternatives.

Civilian Labor Force Income

Civilian labor force income refers to the cumulative gross (before deductions for taxes) wages and salaries earned by the civilian labor force. Table 3.3-40 demonstrates that the peak year figure would exceed \$1.5 billion, falling back to about \$278 million after construction ends in 2017. This clearly would represent a positive impact on Guam.

Table 3.3-40. Impact on Civilian Labor Force Income (Millions of 2008 \$) – Summary Impacts

<i>Impacts</i>	<i>Construction</i>	<i>Operation</i>
Direct	\$1,095	\$217
Indirect	\$416	\$60
Total	\$1,510	\$278

Civilian Housing Demand and Supply

Demand

The housing unit demand (required number of homes) in this section represents an approximate estimate of the number of units that would be required for the in-migrating Guam civilian population. It excludes temporary foreign construction workers entering on an H-2B work visa, assumed to live in the barracks-style dormitory housing provided by contractors (as required by law), and active-duty military personnel, who are assumed all to be housed on base (or on board ship for the Navy action).

Table 3.3-41 indicates the summary impacts on housing demand of the preferred alternatives would be a demand for 11,893 new units in the peak year of 2014, falling to just 3,205 after construction ends in 2017.

Table 3.3-41. Demand for New Civilian Housing Units – Summary Effects

<i>Impacts</i>	<i>Construction</i>	<i>Operation</i>
Direct	7,856	1,720
Indirect	4,037	1,485
Total	11,893	3,205

Supply

Guam has excess vacant available housing (about 2,800 units) to absorb the estimated housing demand. This housing is likely to accommodate private-sector housing demands in 2010.

However, the excess capacity is projected to be less than demand in 2011; therefore, new private-market housing supply must be available in 2011, and new housing would have to be built through 2014.

Once the construction period is past its peak in 2015, and if this new housing is provided, the need for new housing construction would diminish to zero, and excess capacity would grow to approximately 8,688. These estimates are shown in Table 3.3-42.

Table 3.3-42. Demand and Supply Needed for New Civilian Housing Units – Summary Impacts

	<i>Construction</i>	<i>Operation</i>
Combined Action Total Impact	11,893	3,205
Annual Change in Demand	2,452	0
Available Housing Supply (vacant, likely available)	2,787	2,787
Annual Construction Needed to Eliminate	2,452	0

	<i>Construction</i>	<i>Operation</i>
Housing Deficit		
Over-Supply Future: Surplus Units if Supply Increases to Eliminate Deficit	0	8,688

The housing unit numbers reflected in Table 3.3-42 shows the estimated housing surplus in subsequent years, if the market were to provide all the needed construction-period housing, and assuming that no alternative uses (such as conversion to commercial use) are found for them.

The estimates in Table 3.3-42 are theoretical and meant to suggest the amount of housing construction needed to satisfy increased demand. The numbers in the table are not meant to imply that construction of new housing would fully respond to the demand and eliminate a housing deficit. If it did, the result would be an over-supply of housing following the construction period. This sort of over-supply would drive housing prices down for residents, but would likely mean substantial losses for developers and landlords, as well as problems associated with maintenance of large numbers of unoccupied units.

The most likely outcome is a partial response of housing construction to demand. Nevertheless, this substantial increase in demand for housing and the probable response in supply of houses and then decline in demand would be significant summary impacts of implementing the preferred alternatives.

Effects on Tourism

Summary impacts on the island's primary private-sector industry would likely be mixed. Hotels should benefit considerably due to prospective increases in occupancy associated with more military-related business travel, visiting friends and family, construction supervisors, etc. Nonetheless, the general service sector could undergo a period of difficulty due to loss of labor to higher-paying jobs and pressure for increased wages; thereby, impairing competition with inexpensive Asian destinations. Ocean-oriented tourism activities would be affected by increased use by others, and population expansion would increase competition for limited marine resources.

Selected Local GovGuam Revenues

Table 3.3-43 demonstrates that the approximate combined revenues accruing to GovGuam from its three primary sources – 1) gross receipts taxes; 2) corporate income taxes; and 3) personal income taxes could be as high as \$423 million in 2014, declining to a stable figure of \$104 million after construction ends in 2017.

Table 3.3-43. Impact on Selected GovGuam Tax Receipts (Millions of 2008 \$) - Summary Impacts

<i>Impacts</i>	<i>Construction</i>	<i>Operation</i>
Direct	\$312.6	\$69.4
Indirect	\$110.7	\$34.8
Summary Total	\$423.3	\$104.3

These taxes are collected quarterly or annually and there may be a time lag between when government revenues from these sources are available and when they are needed to pay for services and infrastructure.

Infrastructure costs would be heavily front-loaded in the timeframe. Revenue impacts would be significant and beneficial to GovGuam, and subject to the issues of timing and the peaks and valleys associated with construction ramp-up and decline.

Gross Island Product (GIP)

GIP for Guam represents the total market value of all final goods and services produced in a given year. It is equal to total consumer, investment and government spending, plus the value of exports, minus the value of imports.

Table 3.3-44 shows the total effects could be as high as \$1,080 million (nearly \$1.1 billion) in 2014, declining to a stable figure of \$187 million in 2017.

Table 3.3-44. Impact on Gross Island Product (Millions of 2008 \$) – Summary Impacts

<i>Impacts</i>	<i>Construction</i>	<i>Operation</i>
Direct	\$544	\$100
Indirect	\$536	\$87
Summary Total	\$1,080	\$187

Public Service Impacts

Public Education Service Impacts

The focus of public service analysis is to calculate the required number of key professional staff based on service population impacts derived from analysis, as determined by surveys of all the GovGuam agencies discussed here and below (refer to Appendix F SIAS). For public education services – the Guam Public School System (GPSS) elementary, intermediate, and high schools, as well as the UOG and Guam Community College (GCC) – this refers to teachers or non-adjunct faculty members.

Table 3.3-45 summarizes the combined requirements for these five educational programs due to the preferred alternatives. It indicates a requirement for 619 teachers/faculty at the 2014 construction peak, and a more stable 148 total teacher/faculty for the steady-state operational phase.

Table 3.3-45. Additional Combined Public Education Professional Staff Required - Summary Impacts

<i>Impacts</i>	<i>Construction</i>	<i>Operation</i>
Direct	448	118
Indirect	172	30
Total	619	148

Additional analysis indicates that the construction and operational phase requirements for the individual agencies are as follows (Table 3.3-46).

Table 3.3-46. Professional Staff Requirements for Individual Public Education Service Agencies

<i>Agency</i>	<i>Construction Additional Staff Requirement</i>	<i>Steady-State(Operation) Additional Staff Requirement</i>
GPSS Elementary	290	67
GPSS Intermediate	123	29
GPSS High School	119	28
GCC	31	9
UOG	56	15

Public Health and Social Service Impacts

Based on estimated increases in service population, key professional staff requirements attributable to the preferred alternatives were calculated for Guam Memorial Hospital Authority (GMHA) – both physicians

and “nurses and allied health professionals,” the Department of Public Health and Social Services’ Bureau of Primary Care (DPHSS BPC) medical providers and nursing staff, Bureau of Communicable Disease Control (CDC) communicable disease prevention specialists, Bureau of Family Health and Nursing Services (BFHNS) nursing personnel, the Department of Mental Health and Substance Abuse (DMHSA) mental health professionals, and the Department of Integrated Services for Individuals with Disabilities (DISID) social workers and counselors.

Table 3.3-47 summarizes the impacts on all of these agencies due to the preferred alternatives. It indicates the requirement for 245 professionals at the 2014 construction peak, and a more stable 56 total professionals for the steady-state operational phase.

Table 3.3-47. Additional Combined Public Health and Social Service Professional Staff Required – Summary Impacts

<i>Impacts</i>	<i>Construction</i>	<i>Operation</i>
Direct	190	44
Indirect	55	13
Total	245	56

Additional analysis indicates that the construction peak and post-construction steady-state operational phase requirements for the individual agencies are as follows (Table 3.3-48).

Table 3.3-48. Total Additional Professional Staff Requirements for Individual Public Health and Social Service Agencies

<i>Agency</i>	<i>Construction</i>	<i>Operation Additional Staff Requirement</i>
GMHA Physicians	19	2
GMHA Nurses, Allied Health Professionals	121	13
DPHSS BPC	19	7
DPHSS CDC	14	6
DPHSS BFHNS	10	4
DMHSA	56	22
DISID	6	2

Public Safety Service Impacts

Based on estimated increases in service population, key professional staff requirements attributable to the preferred alternative were calculated for the Guam Police Department (GPD) sworn police officers, Guam Fire Department (GFD) uniformed personnel, Department of Corrections (DoC) custody and security personnel, and the Department of Youth Affairs (DYA) youth service professionals.

Table 3.3-49 summarizes the combined requirements for all such agencies due to the total preferred alternatives action. It indicates the requirement for 307 professionals at the 2014 construction peak, and a more stable 109 total professionals for the steady-state operational phase.

Table 3.3-49. Additional Combined Public Safety Professional Staff Required – Summary Impacts

<i>Impacts</i>	<i>2014</i>	<i>2020</i>
Direct	246	93
Indirect	61	16
Total	307	109

Additional analysis indicates that the construction and operational phase requirements for the individual agencies are as follows (Table 3.3-50).

Table 3.3-50. Professional Staff Requirements for Individual Public Safety Service Agencies

<i>Agency</i>	<i>Construction staff Requirement</i>	<i>Operational Additional Staff Requirement</i>
GPD	141	60
GFD	77	12
DoC	54	16
DYA	33	20

Other Selected General Services Impacts

The other services selected for analysis were the Guam Department of Parks and Recreation (GDPR), the Guam Public Library System (GPLS), and the Guam Judiciary.

Table 3.3-51 summarizes the combined requirements for these agencies due to the preferred alternatives. It indicates the requirement for 56 professionals at the 2014 construction peak, and a more stable 23 total professionals for the steady-state operational phase.

Table 3.3-51. Combined Additional Professional Staff Required for Other Selected General Service Agencies – Summary Impacts

<i>Impacts</i>	<i>2014</i>	<i>2020</i>
Direct	44	19
Indirect	12	4
Total	56	23

Additional analysis indicates that the construction and operational phase requirements for the individual agencies are as follows (Table 3.3-52).

Table 3.3-52. Additional Professional Staff Requirements for Other Selected General Service Agencies

<i>Agency</i>	<i>Construction Staff Requirement</i>	<i>Operation Additional Staff Requirement</i>
GDPR	41	17
GPLS	13	5
Judiciary	3	1

Growth Permitting and Regulatory Agency Impacts

These agencies are driven by permit requests, generally in advance of actual population growth, as well as by associated monitoring and enforcement actions.

The agencies analyzed were the Department of Public Works (DPW) building permits and inspection function, Department of Land Management (DLM), Guam Environmental Protection Agency (GEPA), the Bureau of Statistics and Plans' (BSP) Coastal Management Program (CMP), GPA, GWA, GFD, GDPR's Historic Preservation Office (HPO), and the DPHSS Division of Environmental Health (DPHSS DEH). In addition, staffing implications for the Guam Department of Labor's (DoL) Alien Labor Processing and Certification Division (ALPCD) were calculated based on the estimated number of temporary foreign worker H-2B visa petitions to be processed.

Table 3.3-53 summarizes the combined requirements for all growth permitting agencies, due to the preferred alternatives. It indicates the peak construction year for increased number of required FTEs is 2012. At 2012, the requirement for permitting related FTEs will be 104; this requirement will decline to a more stable 23 total FTEs for the steady-state operational phase.

Table 3.3-53. Additional Combined Professional Staff (FTE) Required for Development Permitting Agencies

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Preferred Alternatives	78	95	104	94	73	45	37	23	23	23	23

Note: This table does not distinguish between "direct" and "indirect" impacts as shown in previous tables, because that distinction is less appropriate for this analysis, as growth-related permit reviews occur in advance of the expected actual growth.

Additional analysis indicates that the construction and operational phase requirements for the individual agencies are as follows (Table 3.3-54).

Table 3.3-54. Additional Professional Staff Requirements for Permitting Agencies

Agency	Construction Years	Construction Additional Staff Requirement	Steady-State(Operation) Additional Staff Requirement
DPW	2011	11	1
DLM	2012	14	8
GEPA	2012	29	4
BSP CMP	2013	10	4
GPA	2010-2012	4	1
GWA	2011-2012	7	1
GDPR HPO	2010-2012	4	1
DPHSS DEH	2014	5	2
GDoL ALPCD	2012	16	0

Note: Totals may differ slightly from table above due to rounding.

Sociocultural Impacts

Crime and Serious Social Disorder

While there is particular concern on Guam because of media reports about Marine Corps personnel accused of rapes and other crimes in Okinawa, the available evidence suggests that military crime rates have been generally low. Isolated incidents have tapped a deeper vein of issues related to "foreign" military occupation, noise, accidents, and a disproportionate presence of all American forces in Japan, particularly in Okinawa.

However, military forces in general do appear to have high rates of alcohol/substance abuse (though some of this may be related to youth) and family-related offenses against women and children. Older Guam residents remember violent military-civilian conflicts when the military presence was greater during the Vietnam War era. Construction "booms" are often associated with a sense of disorder and sometimes

actual crime. Although the exact extent of in-migration from the Freely Associated States (FAS) of Micronesia (in response to expanded economic opportunity) can be neither predicted nor controlled, Guam police data indicate disproportionate arrests from that in-migrant group, reflecting issues of adjustment to different cultural norms. To the extent that the non-Chamorro Micronesians become a greater percentage of the population, crime rates would probably rise to some extent until acculturation progresses.

Chamorro Issues

Guam's indigenous Chamorro population has strong concerns about whether incoming military populations would recognize them as both American by nationality and also as a unique ethnic culture worthy of respect and preservation. This could be mitigated by orientation programs designed in cooperation with the Department of Chamorro Affairs. However, an expansion in non-Chamorro voting population could eventually affect the proportion of Chamorro office-holders and government workers; thereby affecting the current government budgets and activities dedicated to cultural issues and practices. It could also affect outcomes of any future plebiscites about Guam's political status.

Community Cohesion

"Community cohesion" refers to positive or negative interactions between individuals or groups. Community cohesion allows people to maintain connections to, and a sense of identification with, their communities. The negative interactions related to the incoming new population discussed here do not rise to the level of major issues previously discussed under "Crime and Disorder", but are more likely to be irritants that may undermine a sense of mutual respect among groups. However, the arrival of new populations can also bring positive benefits that infuse communities with opportunities for more meaningful interactions.

Issues involving relationships between longtime residents and in-migrant Micronesians from the FAS would probably be the most critical side effect of the military-related economic and population expansion on the island. Military-civilian relationships always bear monitoring, and some period of adjustment would be likely to require the attention of both military and civilian leaders. However, well-established and successful military outreach programs to the local community would likely lead to stable relationships in the long run.

Roadway Construction Impacts

Roadway Construction Effects on Neighborhoods and Businesses

At a neighborhood level, roadway construction can also affect local community cohesion. Because most of the roadway improvements would occur within the existing right of way (ROW), they would not constitute any new physical or psychological barriers that would divide, disrupt, or isolate neighborhoods, individuals, or community focal points in the corridor. At certain locations, roadway improvements would require the acquisition of additional ROW; however, these would primarily occur adjacent to the existing ROW. Therefore, community cohesion effects would be minimal.

Roadway Construction Effects on Property Acquisition and Relocation

Acquisition of residential, nonresidential, and military property would be required. Residential and nonresidential units would require relocation. Federal and state laws require consistent and fair treatment of owners of property to be acquired, including just compensation for their property. The Uniform Relocation Assistance and Real Property Acquisition Act of 1970, as amended would be followed.

Roadway Construction Effects on Specific Public Services and Facilities

No adverse effects on public services and facilities are anticipated at the site-specific level.

3.3.15.4 Comparison of Preferred Alternatives' Impacts to No Action

As has been illustrated in the above text and tables, the socioeconomic impacts of the preferred alternatives would be felt on an island-wide basis and would be characterized by a sharp increase in activity and impacts (both positive and negative) in the 2012-2015 timeframe. Overall, the socioeconomic quality of life on Guam would be substantially impacted for several years. Eventually however, a large part of the population that came in for construction work would leave the island.

Summary impacts would include those associated with rapid population influx due to job opportunities (including large populations from the FAS of Micronesia). These include: shortages in housing and working facilities, public services, and qualified workers, as well as increases in cost of living.

The Marine Corps component of the action would produce the largest and most significant impacts, due to its relatively greater magnitude.

The other components of this action, when combined with the Marine Corps component, would produce an overall impact greater than its separate pieces. Particularly important examples include:

- The decline in overall economic activity following the various components' construction periods.
- The challenges in providing housing for the potential growth in private-sector employees. For example, the housing market would have little problem accommodating the Army action alone; however, the Marine Corps action would strain capacity during the boom period.

While differing in magnitude, each component's construction phase would produce the same types of impacts, summing to significant summary impacts. These would include an increase in economic activity, jobs, GIP, and tax revenue.

During the operational phase, the summary impacts would be characterized by a larger Guam population than now exists, although not so large as would have to be accommodated during the 2012-2015 boom period. Economic growth, job numbers, tax revenue, requirements for housing, and public services would all follow this trend. Each action component would contribute to these impacts relative to its size.

In addition the different characteristics of each action component would have different types of impacts, combining in unique ways during the operation phase.

- The Marine Corps component would continue to impact the island most significantly, increasing the island's permanent military population, and creating potential for more crime and social disorder, as well as concern about loss of Chamorro and local political autonomy.
- The Aircraft Carrier Berthing component, on the other hand, would increase the military presence on the island in a less permanent, more cyclical manner – producing surges of sailors arriving on Guam for periods of shore leave. Thus, this component would influence civilian-military relations in a slightly different manner, especially as periods of shore leave would produce surges of populations on Guam that would be unfamiliar with the local culture.
- The increase in different branches of the military on Guam, as a result of the Carrier Berthing, as well as the Army AMDTF component would increase the potential for fighting between different branches of the military.

Over the long term, Guam's economy and quality of life should be significantly enhanced by the preferred alternatives.

Table 3.3-55 summarizes the impacts on socioeconomics and general services of all components of the preferred alternatives on Guam and Tinian. However, because socioeconomic impacts are island-wide in nature, the discussion is primarily generic rather than specific to alternatives.

Table 3.3-55. Summary of Preferred Alternatives Impacts, Guam

Resource	Guam		Tinian	
	Preferred Alternatives	No Action	Preferred Alternatives	No Action
Population Impact				
Population	SI/BI	NI	NI	NI
Economic Impact				
Labor Force	BI	NI	NI	NI
Labor Force Income	BI	NI	NI	NI
Cost of Living	SI	NI	NI	NI
Housing	SI	NI	NI	NI
Local Government Revenue	BI	NI	NI	NI
Local Business Opportunities	BI	NI	NI	NI
Tourism	SI/BI	NI	SI/BI	NI
Gross Island Product	BI	NI	NI	NI
Public Service Impact				
Public Education Services	SI	NI	NI	NI
Public Health and Social Services	SI	NI	NI	NI
Public Safety Services	SI	NI	NI	NI
Other Selected General Services	SI	NI	NI	NI
Growth Permitting and Regulatory Agencies	SI	NI	NI	NI
Sociocultural Impact				
Crime and Social Order	SI	NI	NI	NI
Chamorro Issues	SI	NI	NI	NI
Community Cohesion	SI/BI	NI	NI	NI
Roadway Construction Impacts				
Effects on Neighborhoods and Businesses	SI-M	NI	NI	NI
Property Acquisition and Relocation	SI-M	NI	LSI	NI
Site-Specific Public Services and Facilities Impacts	LSI	NI	NI	NI

Legend: SI = Significant impact, SI-M = Significant impact mitigable to less than significant, LSI = Less than significant impact, NI = No impact, BI = Beneficial impact

3.3.16 Hazardous Materials and Waste

3.3.16.1 Summary of Preferred Alternatives' Impacts

Tables 3.3-56 and 3.3-57 summarize the preferred alternatives' construction and operation potential impacts to soils, water, air, and biota that hazardous materials and hazardous waste would have on Guam and Tinian. The findings from previous volumes are listed. It is assumed that all of the proposed construction actions would occur during a compressed time period, and that all operational activity would commence upon completion of construction.

Table 3.3-56. Summary of Preferred Alternatives Construction Impacts - Hazardous Materials and Waste

Potential Impacts	Guam									Tinian
	Volume 2	Volume 4	Volume 5	Volume 6					Summary Impact	Volume 3
	Marine Corps	Navy Aircraft Carrier	Army AMDTF	Power	Potable Water	Waste water	Solid Waste	Roadways		Training
Soils	LSI	LSI	LSI	LSI	LSI	LSI	LSI	LSI	LSI	LSI
Waters (Ground & Surface)	LSI	NI	LSI	LSI	LSI	LSI	LSI	LSI	LSI	LSI
Air	LSI	LSI	LSI	LSI	LSI	LSI	LSI	LSI	LSI	LSI
Biota	LSI	LSI	LSI	LSI	LSI	LSI	LSI	LSI	LSI	LSI
Hazardous Materials and Waste Construction Summary:									LSI	LSI

Legend: SI = Significant impact, SI-M = Significant impact mitigable to less than significant, LSI = Less than significant impact, NI = No impact on the entire island.

Table 3.3-57. Summary of Preferred Alternatives Operation Impacts - Hazardous Materials and Waste

Potential Impacts	Guam									Tinian
	Volume 2	Volume 4	Volume 5	Volume 6					Summary Impact	Volume 3
	Marine Corps	Navy Aircraft Carrier	Army AMDTF	Power	Potable Water	Waste water	Solid Waste	Roadways		Training
Soils	LSI	LSI	LSI	LSI	LSI	LSI	LSI	LSI	LSI	LSI
Waters (Ground & Surface)	LSI	NI	LSI	LSI	LSI	LSI	LSI	LSI	LSI	LSI
Air	LSI	LSI	LSI	LSI	LSI	LSI	LSI	LSI	LSI	LSI
Biota	LSI	LSI	LSI	LSI	LSI	LSI	LSI	LSI	LSI	LSI
Hazardous Materials and Waste Operation Summary:									LSI	LSI

Legend: SI = Significant impact, SI-M = Significant impact mitigable to less than significant, LSI = Less than significant impact, NI = No impact

Guam

The preferred alternative for Guam includes the transport of all necessary supplies, materials, equipment, and expendable and non-expendable resources necessary to perform the Marine Corps, Navy, and AMDTF missions. Without any proposed DoD mission expansion, currently the Defense Reutilization and Marketing Office (DRMO) successfully arranges for the disposal of approximately 594,494 pounds (lbs) (269,658 kilograms [kg]) of hazardous waste annually from DoD Guam operations.

The DRMO through its contractors manages, stores, ships, and disposes of hazardous substances (i.e., hazardous materials, toxic substances, and hazardous waste) associated with all DoD installations and operations in Guam. DRMO maintains all required hazardous substances documentation. Furthermore, DRMO contracts with licensed firms for the disposal of these hazardous substances at permitted facilities, typically off-island. However, in the case of asbestos-containing materials (ACM), these materials are disposed of at federal facilities in Guam.

It is expected that the DoD preferred alternatives would result in increased transportation, handling, use, and disposal of hazardous materials and hazardous waste (i.e., an estimated increase of 50% for both).

Potential DoD-related impacts (i.e., soils, waters, air, and biota) as a result of increases of the use of these substances on Guam from the preferred alternative would be less than significant.

It is anticipated that the largest increases of hazardous materials would occur primarily from the use of petroleum, oil, and lubricants (POL). Potential hazardous waste increases would include herbicides, pesticides, solvents, corrosive or toxic liquids, paints, and aerosols. Despite expected DoD-related increases in hazardous materials and hazardous wastes, less than significant summary impacts would occur. This conclusion is predicated on the assumption that BMPs and standard operating procedures (SOPs) as discussed in Volumes 2 through 7 would be implemented and that related plans, procedures, protocol, and permits are updated as necessary. These updates would occur in response to increased demands upon DRMO regarding hazardous substance transportation, handling, storage, usage, and disposal.

The various controls (i.e., BMPs and SOPs) in place to prevent unintended spills, leaks, or releases of these substances (see Volume 7, Chapter 2 include, but are not limited to:

- Spill prevention control and countermeasures plans
- Waste management plans
- Facility response plans
- Stormwater pollution prevention plans
- Hazardous material management plans (e.g., asbestos management plans and lead-based paint management plans, etc.)
- Mandatory personnel hazardous material and hazardous waste training
- Waste minimization plans
- Waste labeling, storage, packaging, staging, and transportation procedures
- DoD waste regulations

Furthermore, the preferred alternative's potential increase in hazardous substances would produce less than significant secondary or external effects on Guam's hazardous substance management issues,

Tinian

The CNMI Department of Environmental Quality (DEQ) Hazardous and Solid Waste Management Branch regulates hazardous waste generated within the CNMI. In 1984, the CNMI DEQ adopted the federal hazardous waste regulations under RCRA and the hazardous and solid waste amendments. The CNMI does not have any hazardous waste regulations that are more stringent than USEPA regulations.

When DoD hazardous waste is generated, it is transported to Guam in accordance with DOT regulations to DRMO facilities. Once on Guam, the DRMO arranges for the subsequent transfer and disposal of the hazardous waste off-island at licensed hazardous waste facilities. In the case of ACM, these materials are disposed of at federal facilities in Guam.

For similar reasons as described for Guam above, the Tinian preferred alternative would result in less than significant summary impacts.

3.3.16.2 No Action

Generally speaking, the trend in hazardous material use is associated with increases in population and industrial activity.

Guam

From 2000 to 2008, the population of Guam rose approximately 1.6% on an average annual basis. This growth in population and subsequent commercial development resulted in an increased demand for the transportation, handling, use, and disposal of hazardous substances. The types of Guam businesses that require hazardous substance management and disposal include: ports, airports, hotels, power generation facilities, hospitals, automobile repair facilities, automobile junkyards, gas stations/fueling facilities, underground storage tanks (USTs), dry cleaners, industrial/commercial operations, etc.

These non-DoD generated hazardous substances would be managed in a similar fashion to DoD-generated hazardous substances (i.e., generally disposed of at permitted off-island facilities except for ACM). In December 1998, the GEPA created its Hazardous Waste Management Program. This Program specifies requirements regarding hazardous substance permitting, collection and treatment, storage, and disposal. In addition, the program requires various inspection, compliance monitoring, enforcement, and corrective actions for hazardous waste-related activities and sites. Furthermore, Guam's *Hasso Guam! Household Hazardous Waste Collection Program*, a component of the Hazardous Waste Management Program, has been successful in collecting and disposing of various hazardous substances. For example, thousands of lead acid car batteries and thousands of gallons of used paint have been collected for safe disposal. In addition, under GEPA's Hazardous Waste Management Program, generators of hazardous waste are required to submit annual reports to the GEPA that document the generated hazardous substance quantities, waste codes, disposal facility information, and other pertinent information.

Under no action, the DoD proposed mission expansion on Guam would not occur. However, DoD-related hazardous substance management activities would continue. Because of the growth in Guam's population, and the subsequent growth in commercialization, increased quantities of hazardous substances would be required to be managed, even absent the preferred alternatives. The current non-DoD Guam hazardous substance infrastructure is subject to similar hazardous substance management requirements as implemented by the DoD. Consequently, no action would result in less than significant hazardous substance impacts.

Tinian

For similar reasons as described for Guam, the Tinian no action would result in less than significant impacts.

3.3.16.3 Comparison of Preferred Alternatives to No Action

No action and the preferred alternatives for both Guam and Tinian would result in less than significant impacts to soils, surface water, groundwater, air, or biota with respect to hazardous materials and hazardous waste. Neither of the scenarios can be classified as having "no impact" because as with all operations using hazardous substances, there is a possibility for inadvertent leaks, spills, or releases. Therefore, all the alternatives discussed for Guam and Tinian have been assigned a less than significant summary impacts. Most of these controls, except the DoD-specific regulations, are also applicable to civilian actions. Prior to the enactment of hazardous waste regulations in Guam or Tinian, wastes were not always managed responsibly, resulting in impacts to the environment. Subsequently adopted regulations have served to control the number of unauthorized spills, leaks, or release occurrences in Guam and Tinian.

Despite expected increases in hazardous substances, less than significant summary impacts would occur, if the controls discussed above are appropriately implemented. In summary, less than significant impacts

(i.e., primary or secondary/external effects) are expected in Guam or Tinian related to DoD or non-DoD operations relative to the hazardous substances management and disposal.

3.3.17 Public Health and Safety

3.3.17.1 Summary of Preferred Alternatives’ Impacts

Tables 3.3-58 and 3.3-59 summarize the preferred alternatives’ construction and operation impacts to public health and safety on Guam and Tinian. The findings from previous volumes are listed. For Guam, the greatest level of impact identified among all the volumes is listed in the last Guam column. The summary of impacts for Tinian’s preferred alternatives is listed in the far right column of the tables. It is assumed that all of the proposed construction actions would occur during a compressed time period, and that all operational activity would commence upon completion of construction.

There are very few health and safety issues that would be adversely impacted by the preferred alternatives on Guam or Tinian. Any ground disturbance has potential to disturb unexploded ordnance (UXO); however, there are established SOPs that are implemented prior to and during construction that would mitigate the impact to less than significant at the project sites. Increases in Guam population result in proportionate increases in incidence of traffic incidents and notifiable diseases. The population increase would also have a potential effect on health care service providers and public services (i.e., police and fire service); however, anticipated personnel increases for these services would allow current service levels to be maintained. The proposed Marine Corps and Army actions would increase the island population. There is no population increase proposed for Tinian.

Table 3.3-58. Summary of Preferred Alternatives Construction Impacts - Public Health and Safety

Potential Impacts	Guam									Tinian
	Volume 2	Volume 4	Volume 5	Volume 6					Summary Impact	Volume 3
	Marine Corps	Navy Aircraft Carrier	Army AMDTF	Power	Potable Water	Waste water	Solid Waste	Road-ways		Training
Operational Safety	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
Aircraft Mishaps	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
Explosive Safety	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
Electromagnetic Safety	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
Noise	LSI	NI	NI	NI	NI	NI	NI	NI	LSI	NI
Water Quality	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
Air Quality	LSI	NI	NI	LSI	NI	NI	NI	NI	LSI	NI
Health Care Services	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
Notifiable Diseases	LSI	NI	NI	NI	NI	NI	NI	NI	LSI	NI
Mental Illness	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
Hazardous Substances	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
Traffic Incidents	LSI	NI	NI	NI	NI	NI	NI	NI	LSI	NI
UXO	LSI	LSI	LSI	LSI	LSI	LSI	NI	LSI	LSI	LSI
Radiological	NI	LSI	NI	NI	NI	NI	NI	NI	LSI	NI

Potential Impacts	Guam									Tinian
	Volume 2	Volume 4	Volume 5	Volume 6					Summary Impact	Volume 3
	Marine Corps	Navy Aircraft Carrier	Army AMDTF	Power	Potable Water	Waste water	Solid Waste	Roadways		Training
Substances										
Public Services	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
Public Health and Safety Construction Summary:									LSI	LSI

Legend: SI = Significant impact, SI-M = Significant impact mitigable to less than significant, LSI = Less than significant impact, NI = No impact on the entire island.

Table 3.3-59. Summary of Preferred Alternatives Operation Impacts - Public Health and Safety

Potential Impacts	Guam									Tinian
	Volume 2	Volume 4	Volume 5	Volume 6					Summary Impact	Volume 3
	Marine Corps	Navy Aircraft Carrier	Army AMDTF	Power	Potable Water	Waste water	Solid Waste	Roadways		Training
Operational Safety	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
Aircraft Mishaps	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
Explosive Safety	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
Electromagnetic Safety	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
Noise	LSI	NI	NI	NI	NI	NI	NI	NI	LSI	NI
Water Quality	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
Air Quality	LSI	NI	NI	LSI	NI	NI	NI	NI	LSI	NI
Health Care Services	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
Notifiable Diseases	LSI	NI	NI	NI	NI	NI	NI	NI	LSI	NI
Mental Illness	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
Hazardous Substances	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
Traffic Incidents	LSI	NI	NI	NI	NI	NI	NI	NI	LSI	NI
UXO	LSI	NI	NI	NI	NI	NI	NI	NI	LSI	LSI
Radiological Substances	NI	LSI	NI	NI	NI	NI	NI	NI	LSI	NI
Public Services	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
Public Health and Safety Operation Summary:									LSI	LSI

Legend: SI = Significant impact, SI-M = Significant impact mitigable to less than significant, LSI = Less than significant impact, NI = No impact

3.3.17.2 No Action

The trends in public health and safety are a function of changes in population and operation, or industries that involve dangerous materials (e.g., hazardous substances, live ammunition, electromagnetic energy, radiological substances). The socioeconomics section describes changes in population over time. As of the most recent U.S. Census of 2000, Guam’s population was 154,805. In 2008, the U.S. Census Bureau

provided a more recent estimate of Guam's population of 175,877. The island's population has grown significantly since becoming a U.S. Territory. From 1950 to 2000 Guam's population grew at an average rate of 21% per decade (about 2.1% annually). However, the Census Bureau projects that this growth would taper off, possibly due to outmigration rates observed around 2002, when the estimates in this table were made.

From 1970 to 2000 the population on Tinian increased, but declined in subsequent years. The two new planned resorts would provide construction and operation employment that may lead to increases in the Tinian population. But in the near-term, population is expected to continue to decline. With the declining population there would be an anticipated decrease in traffic accidents and notifiable disease incidents. There would be no increased electromagnetic energy, radiological risks or aircraft mishaps.

Operational Safety. There are industries and operations in the civilian community on Guam and Tinian with inherent risks of accidents (e.g., law enforcement, heavy equipment operations and repair, manufacturing). The accident trends are expected to remain constant.

Aircraft Mishaps. On Guam and Tinian, no action would continue to include a risk of aircraft mishaps at the commercial and military airfields. The risk would increase with increased air traffic. Tourism and the economy would continue to go through cycles of prosperity.

Explosive Safety. Ammunition is used by the civilian population either for recreation (e.g., target practice, hunting) or law enforcement on both islands and the trend in use is expected to remain the same. The military would continue to use ammunition on both islands, but only Guam has storage facilities that generate explosive safety arcs. The quantity of ammunition stored is driven by mission requirements. The quantity of ammunition used by the civilian population is small relative to the military and is likely to slowly increase with population growth.

Notifiable Diseases, Mental Health, Traffic Incidents. The increase in population growth on Guam would result in a proportionate increase in notifiable diseases, mental health issues, and traffic incidents.

UXO. There is UXO on non-federal lands in Guam as a result of WWII. The amount of UXO would not change appreciably overtime. Earthmoving activities could disturb the UXO. Excavation for building foundations, roads, underground utilities, and other infrastructure could encounter unexploded military munitions. Construction on Guam requires a health and safety plan and response to inadvertent discovery of UXO would be included. The appropriate response would be to cease construction, clear the area, and call the police and DoD explosive safety personnel. If UXO is uncovered during any other activity, the appropriate response would be to call the police.

Tinian was an active battlefield during WWII. As a result of the invasion, occupation, and defense of the island by Japanese forces and the assault by Allied/American forces to retake the island, unexploded military munitions remain. The risks are as described for Guam.

Radiological Substances. Hospitals and medical clinics use radiology as a diagnostic tool. The transport handling and disposal is heavily regulated. Presumably, changes in population would result in the proportional changes in the medical use of radiological substances.

3.3.17.3 Comparison of Preferred Alternatives to No Action

On Guam, the potential increase in disease occurrences, mental illness and traffic incidents would be very low relative to no action, as shown in Tables 3.3-60 and 3.3-61.

Table 3.3-60. Potential Disease Occurrence Increase, Guam

<i>Disease</i>	<i>Average Rate</i>	<i>Annual Average 1997-2006</i>	<i>Preferred Alternative</i>	<i>No Action Increase(b)</i>	<i>Difference (a)</i>
AIDS	1/32,678	5	7	6	1
Cholera	1/163,389	1	1	1	0
Dengue	1/163,389	1	1	1	0
Hepatitis C	1/52,706	3.1	4	4	0
Malaria	1/163,389	1	1	1	0
Measles	1/90,772	1.8	2	2	0
Rubella	1/2,768,033	0.2	<1	<1	0
Typhoid Fever	1/233,412	0.7	<1	<1	0
STDs	1/243	671	915	838	77

Notes: AIDS= Acquired Immune Deficiency Syndrome, STD= Sexually Transmitted Disease (a) Difference between preferred alternative increase in average number of diseases per year and the no-action alternative increase. (b) Based on natural increase in population.

Table 3.3-61. Potential Traffic Accident Increase, Guam

	<i>Average Rate</i>	<i>Annual Average 2001-2005</i>	<i>Preferred Alternative Increase</i>	<i>No Action Increase(b)</i>	<i>Difference(a)</i>
Accidents	1/26	6,651	8,894	8,044	850
Fatalities	1/9,717	18	24	22	2

Notes: (a) Difference between Alternative 2, increase in average number of traffic accidents and fatalities per year and the No Action increase. (b) Based on natural increase in population.

There are no other notable increases in health and safety risk anticipated on Guam in the absence of the preferred alternative. Under no action, there would be a minor increase in population and associated increases in disease and traffic incidents. The increases in population on Guam would also result in an increased need for public services (i.e., health care professionals, police, firefighters); anticipated personnel increases for these services would allow current service levels to be maintained. The trend would be the same as it has been in recent history.

On Tinian, There is no appreciable difference in the preferred alternatives and no action with respect to Health and Safety issues. The increase in population due to the planned resorts may have a less than significant impact on the Tinian population, but the preferred alternatives would not.

The risk of a radiological and aircraft incident would be higher under the preferred alternative on Guam as a result of aircraft carrier berthing on the island and because more military aircraft would be in operation. Under no action on Tinian, there would be no aircraft carrier berthing actions and the number of aircraft operations would be smaller (limited to minimal civilian and military aircraft operations).

The preferred alternative on both Guam and Tinian would result in construction and there would be an increased risk of uncovering UXO, but with appropriate health and safety plans, the risks would be less than significant. Although there is no significant construction planned under no action, there is always a risk on Guam and Tinian of discovering UXO; therefore, UXO would continue to be a risk resulting in a less than significant impact.

Construction and operational activities associated with the preferred alternative would have the potential to increase noise levels and pollutant emissions which could result in health impacts to individuals on Guam. The measured increases in noise and pollutants are considered less than significant. Because Guam clinics and hospital will increase staffing to meet current health care service ratios and will be capable of handling

a potential increase in air quality- and noise-related illnesses, less than significant impacts would be anticipated from construction and operational activities. The potential impacts of increased noise and pollution on Tinian would be less due to less construction and fewer operational activities proposed on the island.

3.3.18 Environmental Justice and the Protection of Children

3.3.18.1 Summary of Preferred Alternatives’ Impacts

Most of the anticipated impacts in terms of Environmental Justice relate to cultural resources, noise, traffic, recreational resources, and socioeconomics (particularly availability of public health and social services). The populations of interest are low income, racial minority and children.

Construction impacts may affect the unique historic and cultural resources of a racial minority group, and would affect access to these valued resources. With implementation of mitigation measures summarized the anticipated impacts to cultural resources would be reduced to less than significant.

Construction-related traffic and noise can be mitigated with implementation of noise and traffic reduction BMPs as described in the noise and traffic chapters of each volume and summarized in Volume 7 Chapter 2.

Table 3.3-62. Summary of Preferred Alternatives Construction Impacts - Environmental Justice

Potential Impacts	Guam									Tinian
	Volume 2	Volume 4	Volume 5	Volume 6					Summary Impact	Volume 3
	Marine Corps	Navy Aircraft Carrier	Army AMDTF	Power	Potable Water	Waste water	Solid Waste	Roadways		Training
Cultural Resources	SI-M (RM) NI (LI, C)	NI (ALL)	SI-M (RM) NI (LI, C)	NI (ALL)	NI (ALL)	NI (ALL)	NI (ALL)	NI (ALL)	SI-M (RM)	NI (ALL)
Traffic	SI-M (RM) NI (LI, C)	LSI (RM, LI) NI (C)	SI-M (RM, LI) NI (C)	NI (ALL)	SI-M (RM, LI) NI (C)	NI (ALL)	NI (ALL)	SI-M (RM, LI) NI (C)	SI-M (RM, LI)	NI (ALL)
Noise	SI-M (RM) NI (LI, C)	LSI (RM, LI) NI (C)	SI-M (RM, LI) NI (C)	NI (ALL)	SI-M (RM, LI) NI (C)	NI (ALL)	NI (ALL)	LSI (RM, LI) NI (C)	SI-M (RM, LI)	NI (ALL)
Environmental Justice Construction Summary:									SI-M	NI

Legend: SI = Significant impact, SI-M = Significant impact mitigable to less than significant, LSI = Less than significant impact, NI = No impact on the entire island, RM = Racial Minorities, LI = Low-Income, C = Children, ALL = All 3 disadvantaged groups, N/A = Not Applicable;

Operational noise related to the training in Volume 2 could also have a significant impact that could be mitigated with implementation of the noise reduction measures described in the noise chapter of Volume 2 and summarized in Volume 7 Chapter 2.

Loss of access to and use of recreational resources, such as the Guam International Raceway, Marbo Cave, Pagat Trail and associated trails in the vicinity, cultural gathering activities (*suruhana*), and off-shore fishing near Marbo Cave, would have a disproportionate effect on minority groups that would be significant and unmitigable.

Population growth associated with the preferred alternatives would increase the number of uninsured and underinsured people attempting to access the free services of public health and social services agencies. Without a substantial increase in staff and other resources, this increase in demand for GDPHSS and GDMHSA would strain existing services and therefore have a significant but mitigable disproportionate impact to the low-income population of Guam.

The proposed action would have disproportionate impacts to racial minorities on the island of Tinian in terms of recreational and cultural resources, socioeconomics, and terrestrial biology. People with low incomes are likely to be adversely affected by restricted access to historic and cultural sites in the currently leased areas of the island. Further, Tinian ranchers and locals who pick and sell wild chili-peppers from the leased land would be restricted from accessing the land needed to perform their work.

Table 3.3-63. Summary of Preferred Alternatives Operation Impacts - Environmental Justice

Potential Impacts	Guam									Tinian
	Volume 2	Volume 4	Volume 5	Volume 6					Summary Impact	Volume 3
	Marine Corps	Navy Aircraft Carrier	Army AMDTF	Power	Potable Water	Waste water	Solid Waste	Roadways		Training
Cultural Resources	SI-M (RM) NI (LI) NI (C)	N/A	SI-M (RM) NI (LI) NI (C)	N/A	N/A	N/A	N/A	N/A	SI-M (RM)	SI-M
Traffic	N/A	N/A	SI-M (RM, LI) NI (C)	N/A	N/A	N/A	N/A	BI	SI-M (RM, LI)	N/A
Noise	SI-M (RM, LI) NI (C)	N/A	N/A	N/A	N/A	N/A	N/A	NI (ALL)	SI-M (RM, LI)	N/A
Recreational Resources	SI (RM) NI (LI, C)	LSI (RM, LI) NI (C)	N/A	N/A	N/A	N/A	N/A	N/A	SI-M (RM)	SI (RM, LI) NI (C)
Socio-economics	SI-M (RM, LI) NI (C)	SI-M (RM, LI) NI (C)	N/A	N/A	N/A	N/A	N/A	NI (ALL)	SI-M (RM, LI)	SI (RM, LI)
Environmental Justice Operation Summary:									SI-M	SI

Legend: SI = Significant impact, SI-M = Significant impact mitigable to less than significant, LSI = Less than significant impact, NI = No impact on the entire island, RM = Racial Minorities, LI = Low-Income, C = Children, ALL = All 3 disadvantaged groups, N/A = Not Applicable.

3.3.18.2 No Action

As discussed in Volume 2, U.S. Census (2000) statistics indicate that overall, the population on Guam has a higher percentage of racial minorities, low-income populations, and children than the continental U.S. While Guam’s demographic, social, and economic profile generally contrasts with that of the continental U.S., it is similar to that of other islands in the Pacific. The island has been occupied by foreign nations throughout its history and its economic struggle has been a historical trend. If the preferred alternatives are not implemented, the potential impacts associated with them would not occur. Much of the island’s population would likely continue to struggle with poverty and access to basic quality community services.

The island-wide population would not experience the long-term benefits from roadway infrastructure improvements. Existing inadequate roads and utilities would likely continue to deteriorate, having an adverse and disproportionate impact on disadvantaged residents of Guam.

No land would be acquired by the federal government and those cultural resources that would have had restricted access under the preferred alternative would remain accessible to Chamorros. Recreational resources such as the Guam International Raceway and Pagat Trail would remain accessible to the public. So no action would facilitate the continued existence and accessibility of several cultural and historic resources valued by residents of Guam.

3.3.18.3 Comparison of Preferred Alternatives to No Action

The summary impacts of the preferred alternatives would be both beneficial and adverse. The majority of residents on Guam are Chamorros, who were the first known cultural group to inhabit the island. Even though Guam has been occupied by several western nations throughout history, the Chamorros have a long and rich cultural history on the island that continues to exist today. Chamorro cultural and historical resources can be found throughout the land, and are valued by the Chamorros as part of their culture and heritage. The preferred alternative would affect several Chamorro archaeological sites and access to some cultural sites that are currently accessible to the public. This would adversely affect Chamorros island-wide. On the other hand, recognized sites on DoD-managed lands are often better protected than sites on non-DoD managed lands because these resources are protected by DoD cultural resource management plans and various DoD laws and regulations.

The current roadway infrastructure on Guam is in poor condition. Under no action, roadway infrastructure may improve but probably over a much longer period of time. Roadway improvements as part of the preferred alternatives would have a beneficial impact to all residents of Guam. No action would include some of the roadway improvements described under the preferred alternatives, but the project schedule would be gradual and extend beyond 2014. The island residents would benefit from roadway improvements island-wide in the long-term.

3.3.19 Summary of Preferred Alternatives' Impacts

Table 3.3-64 summarizes the post-construction operational impacts for each of the resources as described in sections 3.3.2 to 3.3.18. These findings are used in the cumulative impact assessment of Chapter 4. The preferred alternatives have potential to significantly impact five resource areas on Guam and three on Tinian (as indicated by bold typeface in the table).

Table 3.3-64. Summary of Operational Impacts of Preferred Alternatives

<i>Resource</i>	<i>Guam</i>	<i>Tinian</i>
Geology and Soils	LSI	LSI
Water Resources	LSI	SI-M
Air Quality	LSI	LSI
Noise	SI	LSI
Airspace	LSI	LSI
Land/Submerged Land Ownership	SI-M	NI
Land/Submerged Land Use	LSI	SI
Recreational Resources	LSI	LSI
Terrestrial Biology	SI-M	SI-M
Marine Biology	LSI	LSI
Cultural	LSI	LSI
Visual	LSI	SI-M
Transportation-Marine	LSI	LSI

<i>Resource</i>	<i>Guam</i>	<i>Tinian</i>
Related Actions (Utilities and Roadways)	SI-M	LSI
Socioeconomics	SI-M	SI-M
Hazardous Materials and Waste	LSI	LSI
Public Health and Safety	LSI	LSI
Environmental Justice and the Protection of Children	SI-M	SI

Legend: SI = Significant impact, SI-M = Significant impact mitigable to less than significant, LSI = Less than significant impact, NI = No impact

3.4 SECONDARY EFFECTS

The Guam military relocation and buildup would have direct, indirect and cumulative effects on the natural and built environment of the islands of Guam and Tinian. This section addresses indirect effects that are also referred to “secondary effects”. CEQ regulations and guidelines define secondary effects as follows:

“Secondary (Indirect) Effects: Effects which are caused by the action and later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate and related effects on air and water on other natural systems, including ecosystems” (40 CFR 1508.8 [b]).

It is reasonable to envision that the military buildup including short term construction related and longer term expanded facilities and military activities would have consequences beyond the immediate footprints of the proposed construction projects and extend in time beyond the buildup program period.

The secondary effects on Tinian are not as great as those anticipated for Guam. Key resources areas that are likely to be affected by secondary effects are described. The following discussion focuses on Guam, but may be applicable to Tinian as well.

A Compatibility Sustainability Study (CSS) is being prepared as a joint effort between GovGuam and the military. The program is managed by the Office of the Governor and funded through a grant provided by DoD and Office of Economic Adjustment. The CSS would likely address many of the secondary impacts anticipated under the preferred alternatives. The primary goal of the CSS is to reduce potential conflicts that could occur between military installations and the Guam community while sustaining economic vitality, accommodating a targeted job development, protecting public health and safety and maintaining the military mission. The CSS will examine existing land use, growth trends, and development potential. Recommendations and strategies will be developed to promote compatible land use planning. A series of community meeting will be held to collect public input into the process. More information is available online at the following address: <http://www.one.guam.gov/>.

3.4.1 Socioeconomics

Forecasts of economic activities prepared for this EIS/OEIS include estimates of direct and indirect (secondary) population and employment growth as a consequence of the proposed military buildup. Estimates of indirect employment growth provide a reasonable indicator of secondary effects as new employment opportunities would also create wealth and disposable income that would stimulate spending on new business establishments, employee and family housing as well as the continuing of the purchasing of other goods and services. This spending and potential development would, in turn, have consequences on land use and potentially other natural and built environmental systems.

The demand for civilian labor is projected to total between 7,000 to 7,500 workers in 2010. At the peak of the construction and buildup, total civilian labor is projected to range between 43,000 to 44,000 in 2014. Following this peak, the demand for civilian labor related to the preferred alternatives would return to about 7,000 or so workers into the foreseeable future. Of this total civilian labor force, approximately 25 to 30% would be consisted indirect or secondary jobs. Thus, over 1,500 jobs would be the normal secondary effect of the buildup program and up to over 9,000 jobs would be considered an indirect consequence of the buildup program during the peak of the construction period.

The socioeconomic growth in the civilian sector may require additional education, medical care, police and fire facilities. These are elements that are likely to be addressed in the CSS.

3.4.2 Land Use Planning

A secondary impact of the preferred alternatives would be the need for additional land use planning and zone changes on Guam to reflect the increase in federal land area and changes in land use on federally-controlled land. These plans may need to include a buffer of open space outside the perimeter of federally-controlled lands to avoid impacts on civilian land use. GovGuam's BSP and DLM may need to hire more staff and fund additional land use planning documents.

Most of the secondary growth caused by the military expansion would likely occur in the northern and central part of Guam. The BSP anticipated these secondary effects and in March 2009 completed the "North and Central Land Use Plan" (Plan). The Plan has not been adopted by legislature. Once adopted it would likely lead to changes in zoning codes. It was prepared through a public and stakeholder involvement program that intended to capture the vision of the community for future land use development. Implementation of the Plan would promote the quality of life that makes north and central Guam a desirable place to work, live, and visit. While the Plan considered the impacts of the Marine Corps relocation and other proposed actions on Guam, it did not have the advantage of the most current site plans that are presented in this EIS/OEIS. The ongoing CSS planning effort will address these secondary impacts.

The zoning code and building code may need to be updated to include design and building height, and mass criteria to ensure the new civilian development is compatible with surrounding uses and does not block important scenic views.

3.4.3 Natural Resources

Guam has a fragile natural environment that has been substantially altered overtime by natural and man-made events. The natural systems that would be potentially impacted by secondary growth provide functionally viable and valuable forest, coastal and marine ecosystems. A secondary impact of the buildup on federal lands is the increased pressure to restore, protect and preserve natural resources on non-federal lands. Local legislation may need to be more aggressive in providing environmental protection and enforcement. Local and federal agencies may need to be more aggressive in applying for and obtaining grants, and discretionary funds to support the local natural resource managers. Additional funds could be required for watershed management studies, managing geographic information system (GIS) databases, pilot studies, natural resource monitoring, and public education. Labor and facilities would be required to support the biosecurity plan (described in Chapter 2) that is being developed. Insufficient budget and staff to enforce environmental management programs could be an adverse secondary impact.

3.4.4 Water Quality

The preferred alternatives would implement stormwater management and erosion control BMPs (Chapter 2) and meet regulatory requirements. The potential impacts of the preferred alternatives' construction and operation to surface water are described throughout this EIS/OEIS. The increase in development on non-federal lands that may result from the increased military presence would require additional oversight by local agencies to ensure that BMPs are implemented, and violations are reported and corrected in a timely manner. Additional staffing may be required for reviewing permits, inspections, collecting/testing water quality samples and reporting of violations and corrective actions. This may be considered an adverse secondary impact on the agencies, but no long-term secondary impact to water resource health was identified.

3.4.5 Utilities

Assuming increases in civilian populations and development on Guam, there would be additional demand on utilities. Legislation may be warranted to set renewable energy programs and goals for the island and provide incentives. This may require additional staffing and budget or increase in user fees resulting in adverse secondary impacts.

Protection of groundwater is a major priority and would be managed to avoid any adverse effects from secondary growth. The Guam Northern Lens Aquifer provides approximately 80% of the island's potable water supply. As much of the development created by secondary growth would be focused in this region, protection of groundwater resources in the Sole Source Aquifer area would be paramount. Demand-side programs may need to be developed to encourage water conservation, similar to the BMPs proposed for the preferred alternatives on federally controlled land.

3.4.6 Emergency Preparedness

Disaster and emergency preparedness plans would need to be updated. Plans for providing emergency utilities, shelter, and food based on the anticipated increases in the civilian population would need to be updated. The secondary impacts can be mitigated to less than significant through planning.

3.4.7 Transportation

Commercial airports and harbors would benefit economically due to the secondary impact of increases in traffic. Policies and procedures may need to be revisited to ensure maximum efficiency and safety. Traffic flow patterns of people or goods through the facilities may require planning updates and additional staffing, but income-generating enterprises are accustomed to responding to economic cycles. The secondary impact would not be adverse.

3.4.8 Recreation, Cultural and Tourist Activities

The anticipated increase in civilians and tourists on Guam could put additional pressure on the use of recreational sites and visits to cultural sites, both of which are typical tourist and local population activities. The GDPR would need staffing and budget to prepare and implement a recreation plan. Additional dive/snorkeling sites and other recreational facilities may need to be constructed and maintained.

Secondary impacts associated with a larger population on Guam might include increased vandalism of recreational and cultural sites, not necessarily from the military and their dependents.

3.5 SUMMARY OF CLEAN WATER ACT SECTION 404 ACTIONS - ALL PROPOSED ACTIONS AND ALTERNATIVES

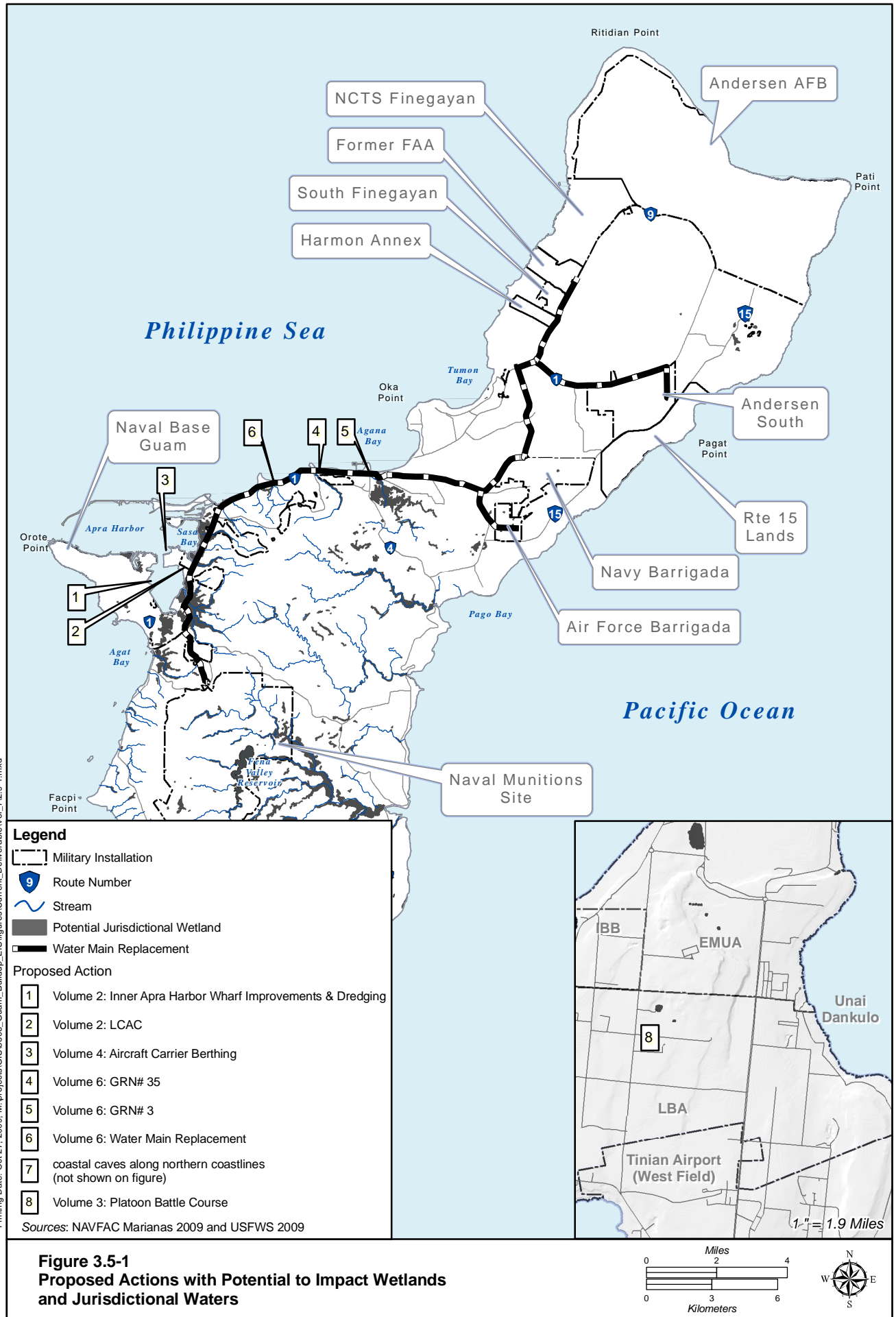
The summary impacts on wetlands and jurisdictional waters of the U.S. for the preferred alternatives are described in the Water Resources sections in Volume 2 through 6 of this EIS/OEIS by geographic locations and action proponent. A summary of all potential impacts to wetlands jurisdictional waters of the U.S. is summarized in this section. There are no anticipated secondary effects such as the (1) degradation of natural conveyance functions of waters of the U.S., (2) alteration of sediment mobilization, transport, and deposition processes, and (3) habitat fragmentation and degradation of ecosystem processes. There are potential direct effects under some alternatives due to fill of wetlands and potential for increased turbidity from nearby construction. Most of the land-based construction is proposed in the north and central areas of Guam, which have far fewer wetlands and streams than the Apra Harbor and south areas. BMPs and mitigation measures to minimize and avoid impacts are summarized in Volume 7, Chapter 2. Table 3.5-1 summarizes the potential impacts for all alternatives and the preferred alternatives are indicated by **bold** typeface. Figure 3.5-1 identifies the locations of these potential impacts for the preferred alternative only. Three actions would occur at Apra Harbor: 1) Inner Apra Harbor wharf improvements and dredging, 2) Inner Apra Harbor ramps for the Landing Craft Air Cushion (LCAC) laydown area, and 3) new berthing for a transient aircraft carrier at the entrance to Inner Apra Harbor. Indirect temporary impacts to wetlands are anticipated during construction of GRN projects numbered 3 and 35 and a replacement water main. Potential impacts to coastal caves due to the fresh water level fluctuations in the aquifer were identified as potential impacts to jurisdictional waters, but there is insufficient data to assess potential impacts. The impact would be associated with all alternatives. On Tinian, the preferred alternative may impact wetlands and additional studies are planned to verify location of the wetlands.

Table 3.5-1. Summary of Potential Impacts for All Alternatives

	Alternative	Component (Figure 3.5-1 ID#)	Type and Area (ac/ha) of Impact				Impacted Feature
			Direct	Indirect	Temp.	Perm.	
Volume	All	LCAC Ramps (2)	0.02 ac (<0.01 ha) fill			•	Inner Apra Harbor
	All	Dredging –Sierra Wharf (1)	509,000 cy (386,000 m ³)	ND		• -	Inner Apra Harbor
	Option A (improved)	NMS Access Road	No impacts				
	Option B (unimproved)	NMS Access Road Option B	No impacts				
	3, 8	AF Barrigada	0.4/0.16	-	-	•	sink hole wetland
Tinian-Training (Vol. 3)	1	Platoon Battle Course (8)	0.3/0.12	-	-	•	Palustrine wetland
	2	No impacts					
	3	No impacts					
Navy Wharf (Vol. 4)	1	Dredging (3)	608,000 cy (466,000 m ³)	-	-	25 ac (10 ha) coral loss-	Outer Apra Harbor
	1	Wharf Pilings & Riprap (3)	3.6 ac (1.4 ha) fill	-	-	•	Outer Apra Harbor
	2	Dredging	479,000 cy (366,000 m ³)	•	•	24 ac (10 ha) coral loss	Outer Apra Harbor
Army (Vol. 5)	1	No impacts					
	2	No impacts					
	3	No impacts					
Related Actions (Vol. 6)	Power Interim 1	No impacts					
	Power Interim 2	No Impacts					
	Power, Interim 3	No impacts					
	Water Basic Alt. 1	Water main line (6)	-	ND	-	-	Palustrine wetlands

Volume	Alternative	Component (Figure 3.5-1 ID#)	Type and Area (ac/ha) of Impact				Impacted Feature
			Direct	Indirect	Temp.	Perm.	
	Water Basic Alt. 2	Water main line	-	ND	•	-	Palustrine wetlands
	Wastewater Basic Alt. 1a	No impacts					
	Wastewater Basic Alt. 1b	No impacts					
	Solid Waste	No impacts					
	Roads 1-3, 8	Agana Bridge-GRN # 3 (5)	0.13/ 0.05	ND	•	•	Agana River between Agana Bridge and the river terminus (260-ft stream length) at West Hagatna Beach.
		Antantano Bridge - GRN # 35 (4)	0.12/ 0.05	ND	•	•	Antantano River between Antantano Bridge and river terminus (1,600-ft streambed length) at Inner Apra Harbor.
		Fonte Bridge-GRN # 35 (4)	0.27/ 0.11	ND	•	•	Fonte River between Anantano Bridge and river terminus (290-ft streambed length) at East Hagatna Beach.
		Laguas Bridge -GRN # 35 (4)	0.13/ 0.05	ND	•	•	Laguas River between Laguas Bridge and river terminus (800-ft streambed length) at Sasa Bay / Sasa Bay Marine Preserve.
		Sasa Bridge-GRN # 35(4)	0.14/ 0.06	ND	•	•	Sasa River between Sasa Bridge and river terminus (1,600-ft streambed length) at Sasa Bay / Sasa Bay Marine Preserve.

Legend: **bold** = preferred alternatives; ND = not determined; temporary impacts not quantified; - = no impact; • = impact; (2) = Figure 3.5-1 Location number.



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