CHAPTER 5. AIR QUALITY

5.1 INTRODUCTION

This chapter contains the discussion of the potential environmental consequences associated with implementation of the alternatives for aircraft carrier berthing within the region of influence (ROI) – Apra Harbor – for air quality. A description of the air quality resources in the Apra Harbor ROI is provided in Section 5.1 of Volume 2 (Marine Corps Relocation – Guam), inclusive of a regulatory overview, stationary sources, mobile sources, ambient air quality modeling, climate, and greenhouse gas (GHG) emissions. GHGs are discussed cumulatively as carbon dioxide (CO_2) equivalent emissions at the global scale in Volume 7, Section 4.4, as the change in climate conditions caused by the burning of fossil fuels is a global effect, requiring that the air quality impact analysis be assessed on a global or regional scale, not at the local scale such as for an island.

5.2 ENVIRONMENTAL CONSEQUENCES

5.2.1 Approach to Analysis

5.2.1.1 Methodology

This section describes the analysis approach used to address potential impacts from the proposed increase in aircraft carrier berthing and construction of a wharf and associated shoreside facilities at Apra Harbor. Since some of the effects from this action would contribute to the aggregate effects in this ROI, the analysis results presented in this section are also considered in the aggregate impact analysis on Guam discussed in Volume 7 that combines the impacts from all applicable actions.

As described in Chapter 2, two alternative locations are being considered for a new wharf to provide aircraft carrier berthing capabilities for extended port calls, one at Alternative 1 and Alternative 2. The alternatives are largely equivalent based on the requirements for supporting an aircraft carrier, and the location of both alternatives would be on either side of the entrance to Inner Apra Harbor with similar wharf alignment. The differences between the two alternatives are mainly limited to the location-specific elements relative to each wharf alternative. The major components of the proposed project include shoreside structures, utilities, a new wharf, and dredging. Due to the general similarity of the alternatives as related to air quality and the associated construction and operation activities, they are not analyzed separately in this chapter. The assumptions made in developing the list of major construction items, the equipment necessary to complete construction, and construction productivity are presented in Volume 9, Appendix I, Section 3.4 Construction Activity Emissions.

Construction

Construction activities including the operation of construction equipment, trucks, and workers' commuting vehicles may have short-term air quality impacts. Although the emissions from construction workers' commuting vehicles are considered part of the overall construction emissions, it is anticipated that the majority of construction workers would be living in limited areas with appropriate consolidated transportation support. As such, the emission component from commuting vehicles is relatively small (see Chapter 7 in Volume 6 for details).

In estimating construction-related criteria pollutants and CO_2 emissions, the usage of equipment, the likely duration of each activity, and manpower estimates for the construction were based on the information provided in Chapter 2 for the future project-associated construction activities under each alternative.

Estimates of construction crew and equipment requirements and productivity were based on the data contained in 2003 *RSMeans Facilities Construction Cost Data* (RSMeans 2003) and 2006 *RSMeans Heavy Construction Cost Data* (RSMeans 2006). It is assumed for emissions estimate purposes that most construction activities would occur between 2011 through 2014 and then dredging would occur from 2014 to 2015.

Estimates of construction equipment operational emissions were based on estimated hours of equipment use and the emission factors for each type of equipment, as provided by the United States (U.S.) Environmental Protection Agency's (USEPA) NONROAD emission factor model and the national default model inputs for NONROAD engines, equipment, and vehicles of interest provided with the model (USEPA 2008). The average equipment horsepower values and equipment power load factors are also provided in association with the NONROAD emission factor model. Since the operational activity data presented in RSMeans' cost data books are generated based on the overall length of time equipment is present on site, an equipment actual running time factor (i.e., actual usage factor) was further employed to determine actual equipment usage hours for the purpose of estimating equipment emissions. The usage factor for each equipment type was obtained from Federal Highway Administration's (FHWA) Roadway Construction Noise Model User's Guide (FHWA 2006). Emission factors related to construction-associated delivery trucks were estimated using USEPA Mobile6 emission factor model (USEPA 2003), because it provides a specific emission factor database for various truck classifications. The workers' commuting vehicle emissions were also estimated using the Mobile6 model and assumed workers would travel approximately an average of 10 miles (mi) (16.1 kilometers [km]) per day to the site using shuttle buses or vans.

A maximum sulfur content of 0.5% was conservatively used to predict SO_2 and PM emissions for diesel-powered equipment and vehicles based on USEPA's Heavy-Duty Standards/Diesel Fuel Regulatory Impact Analysis (RIA) (USEPA 2000). Based on the RIA, data observed in 1992 shows that No. 2 diesel fuel imports actually had sulfur content ranging from 0.39% to 0.5%. Therefore, using the actual highest sulfur content observed in 1992 (0.5%) for vehicles in this analysis is considered appropriate and conservative and is also coincident with the highest sulfur content fuel input available in available both in the NONROAD and Mobile6 models. It should also be noted that with the introduction of the Heavy-Duty Engine and Vehicle Standards and Highway Diesel Fuel Sulfur Control Requirements (40 CFR Parts 69, 80, and 86) in 2006, refiners were required to start producing diesel fuel for use in highway vehicles with a sulfur content of no more than 15 ppm. Therefore, the sulfur content of fuels since 1992 has decreased in general although Guam has been granted an exemption from using low sulfur fuel (see Volume 6, Section 7.2). DoD is currently examining the potential use of ultra low sulfur fuel for construction activities and highway diesel vehicles on Guam, so that the actual sulfur content used may be far lower than the results provided here. The detailed methodology used to calculate these emissions is presented in Volume 9, Appendix I, Section 3.4 Construction Activity Emission.

Operation

Operational activities are common to both of the alternatives. The operational elements that have potential to have air quality impact during aircraft carrier berthing include:

- Aircraft carrier on-board diesel generator operations

- Aircraft carrier routine maintenance
- Transient aircraft
- Escort vessels
- Tugboats that assist in navigating the aircraft carrier through the harbor
- On-road vehicles transporting the aircraft carrier crew
- On-road trucks for transporting materials to and from aircraft carriers.

In 1999, the Navy published a Final Environmental Impact Statement (EIS) for *Developing Home Port Facilities for Three Nimitz Class Aircraft Carriers in Support of the U.S. Pacific Fleet* (Navy 1999). In the FINAL EIS, an emissions inventory for one aircraft carrier homeporting for half a year was developed. This inventory was used to prorate the aircraft carrier emissions based on an increase in aircraft carrier berthing days at Apra Harbor of 47 days.

The emissions from aircraft taking off from the aircraft carrier, parking at Andersen Air Force Base (AFB), and ultimately flying back were estimated using the methods, emission factors, and numbers of new sorties obtained from the following references:

- The Procedures of Emission Inventory Preparation, Volume IV: Mobile Sources (USEPA 1992)
- Aircraft engine emission factors developed by the Navy's Aircraft Environmental Support Office (AESO 1999a, 1999b, 1999c; 2000a, 2000b, 2001)
- The Aircraft Noise Study for Guam Joint Military Master Plan at Andersen AFB (Wyle 2008).

Accompanying vessel and tugboat emissions during each air carrier escort were not considered in the analysis because the number of aircraft carrier visits on an annual basis would not increase although the number of berthing days would increase. The operations of vessels and tugboats are expected to increase during the training when the aircraft carrier stays longer at the Apra Harbor and such training-related increased activities from vessels and tugboats are considered in Volume 2.

As described in Chapter 2, the radioactive material operation on Guam would be limited to minor emergency unscheduled repairs and emergency response, and no radioactive waste would be brought ashore. Scheduled maintenance and repair of the Naval Nuclear Propulsion Program (NNPP) would be conducted at the ship's homeport; therefore, there would be no radioactive air emissions from the proposed action.

The aircraft carrier berthing-related vehicle operation would be increased due to an increase in berthing days. However, since air emissions resulting from an increase in on-road vehicular trips are considered in the traffic-related air quality impact analysis contained in Volume 6, vehicular emissions are not discussed in this Volume.

5.2.1.2 Determination of Significance

Under the Clean Air Act (CAA), ships, motor vehicles, and construction equipment are exempt from air permitting requirements. Since the emissions from these sources associated with the proposed project would occur in areas that are in attainment of the National Ambient Air Quality Standards (NAAQS) for all criteria pollutants except sulfur dioxide (SO_2), the General Conformity Rule (GCR) is not applicable. Nonetheless, the National Environmental Policy Act (NEPA) and its implementing regulations require analysis of the significance of air quality impacts from these sources as well as non-major stationary sources. However, neither NEPA nor its implementing regulations have established criteria for determining the significance of air quality impacts from such sources in CAA attainment areas.

In the GCR applicable to nonattainment areas, USEPA uses the "major stationary source" definition under the New Source Review program as the *de minimis* levels to separate presumably exempt actions from those requiring a positive conformity determination. Since the proposed action and alternatives would occur mostly in areas that have always been in attainment, this Environmental Impact Statement (EIS) selected the "major stationary source" definition (250 tons per year [TPY] or more of any air pollutant subject to regulations under the CAA) from the Prevention of Significant Deterioration (PSD) program. The PSD source threshold is used as the threshold for locations that are in attainment for determining the potential significance of air quality impacts from these sources. CO_2 is not a criteria pollutant and the 250 TPY significance threshold is not applicable to it. The potential effects of CO_2 and other greenhouse gas emissions are by nature global and are based on cumulative impacts. Individual sources are not large enough to have an appreciable effect on climate change. Hence, the impact of proposed CO_2 and other greenhouse gas emissions is discussed in the context of cumulative impacts in Volume 7 in terms of CO_2 equivalency.

As noted above, neither the PSD permitting program nor the GCR are applicable to these 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 proposed action and other alternatives under NEPA requirements.

Parts of Apra Harbor, including the area proposed for the aircraft carrier berthing, are within a SO_2 nonattainment area due to emissions associated with the operation of the Piti Power Plant (see Figure 5.1-1 of Volume 2). Under the GCR, emissions associated with all operational and construction activities from a proposed federal action, both direct and indirect, must be quantified and compared to annual *de minimis* (threshold) levels for pollutants that occur within the applicable nonattainment area. Direct emissions are emissions of a criteria pollutant or its precursors that are caused or initiated by a federal action and occur at the same time and place as the action. Indirect emissions are emissions occurring later in time and/or further removed in distance from the action itself. Indirect emissions must be included in the determination, if both of the following apply:

- The federal agency proposing the action can practicably control the emissions and has continuing program responsibility to maintain control.
- The emissions caused by the federal action are reasonably foreseeable.

Both of these situations apply and therefore indirect emissions were included in the determination. The SO_2 emissions estimated for the activities associated with the proposed aircraft carrier berthing from both stationary and mobile sources are compared with the 100 TPY *de minimis* level to determine the impact significance of the increase in SO_2 emissions. The overall air quality impacts, including the general conformity applicability requirements, are discussed for Alternative 1 in Volume 7, which addresses the combined effects from all project components under the proposed action and presents an overall aggregate effect.

5.2.1.3 Issues Identified during Public Scoping Process

The following analyses focus on addressing potential air quality impacts onshore and offshore from implementation of the proposed action. As part of the analysis, concerns relating to air quality effects that were raised by the public, including regulatory stakeholders, during scoping meetings were addressed, if sufficient project data and available impact criteria were available. These include:

- Increases in vehicle and vessel emissions and disclosure of available information of health risks associated with vehicle emissions and mobile source air toxics.
- Increases in construction-related emissions and impacts including emissions estimates of criteria pollutants and diesel particulate matter (PM) from construction of alternatives.
- Compliance with the GCR in siting project facilities.

5.2.2 Alternative 1 Polaris Point (Preferred Alternative)

5.2.2.1 Onshore

Construction

Under Alternative 1 the Navy proposes to construct a new deep-draft wharf along the northern coastline of Polaris Point, which is the preferred location for a new aircraft carrier wharf. The design and construction of a new wharf at Polaris Point supports the Navy's need to berth transient aircraft carriers for extended port calls and durations increasing from 16 to 63 days annually; an increase of 47 days. The proposed Polaris Point wharf would be aligned parallel to the coast with reduced clearance on the eastern edge.

Estimates on construction activities were calculated to identify equipment, material, and manpower requirements for the construction associated with the proposed aircraft carrier berthing project at Polaris Point. Assumptions were made to develop a list of major construction items, necessary equipment, and productivity levels necessary for the completed construction of Polaris Point including, but not limited to: shoreside structure prototypes, a bermed fuel tank, an electric substation, stormwater management, the Morale, Welfare and Recreation (MWR) area, a sewer pump station, a Bilge and Oily Wastewater Treatment System (BOWTS) pump station, a BOWTS pump station prototype, and the wharf and related dredging activities.

The emissions produced from potential construction, vehicle and paving activities that would occur from 2011 to 2014 form the basis from which the total air pollutant emissions in TPY were calculated. The calculated total emissions are summarized in Table 5.2-1 and detailed in Volume 9, Appendix I, Section 3.4.3 Construction Emissions: Marine Corps Relocation – Aircraft Carrier Berthing. Estimates of the emissions associated with dredging activities and dredged material disposal were conducted for both 100% disposal in the Ocean Dredged Material Disposal Site (ODMDS) and 100% disposal at the upland site(s) (Table 5.2-1). Logistics and air quality impacts for beneficial reuse of dredged material were covered as part of estimates of movements of aggregates for construction projects, which is discussed in Volume 6.

Table 5.2-1. Total Increased Annual Emissions - Alternatives 1 and 2

Activity	*Pollutant (TPY)*						
	SO_2	*CO*	*PM_{10}*	*$PM_{2.5}$*	*NO_x*	*VOC*	*CO_2*
Construction (2011 – 2014)	0.4	1.4	0.1	0.1	0.7	0.2	118.9
Dredging and Disposal, ODMDS Option (2014 – 2015)	0.1	8.0	1.0	0.3	0.4	9.9	540.3
Dredging and Disposal, Upland Site Option (2014 – 2015)	0.2	4.1	0.5	0.1	0.4	5.0	307.0
Operation (2015 and after)							
Aircraft Carrier	0.1	0.2	0.1	NA	1.1	1.3	NA
Transient Aircraft	0.4	91.1	4.6	8.4	26.2	0.4	NA
Total Operation	0.5	91.3	4.7	8.4	27.3	1.7	NA

Legend: VOC = volatile organic compound

Operation

The operational emissions from the extended aircraft carrier berthing were predicted based on Navy-provided aircraft carrier emission inventory data for half-year berthing (U.S. Navy 1999). The increase in emissions from the additional 47 days per year aircraft carrier berthing schedule was prorated using the emissions inventory established by the Navy (U.S. Navy 1999).

Given the lack of sortie data for aircraft flight operation originated from the aircraft carrier during the additional 47-day berthing schedule, the air emissions that would result from aircraft operations initiated from the aircraft carrier were estimated using the operational forecasts described in the Aircraft Noise Study for Guam Joint Military Master Plan at Andersen AFB (Wyle 2008). The net increase in the sortie level for each applicable aircraft type in additional 47-day berthing, input parameters, and the methodologies used to calculate them are described in Volume 9, Appendix I, Section 3.3.2 Aircraft Operational Emissions from Aircraft Carrier Berthing. The estimated emissions of the aircraft operations at the aircraft carrier berthing site are shown in Table 5.2-1.

In Volume 7, predicted construction emissions (2011 through 2015) and operational emissions (2015 and after) are combined with the emissions from other components of the proposed action to determine the overall potential air emissions impact significance using the impact thresholds described in Section

5.2.2.2 Onshore

The construction and operation emissions shown in Table 5.2-1 are all below the significance criteria of 250 TPY for air pollutants subject to regulations under the CAA, as described in Section 5.2.1.2. The SO_2 emissions were also all below the 100 TPY *de minimis* level, indicating that there would be no significant impact from SO_2 emissions.

5.2.2.3 Offshore

As discussed previously, offshore aircraft carrier, accompanying vessels, and tugboat emissions would not change from current levels, as these operations are associated with number of aircraft carrier visits, rather than the number of berthing days. Therefore, existing air quality conditions offshore would remain unchanged under Alternative 1. Offshore aircraft carrier presence, including accompanying vessels and air operation, is associated with continued operations in surrounding waters. Limited near shore activity

within territorial waters of the United States would be associated with the limited port calls to Guam and would not result in a significant increase in emissions over present activities.

Construction

Existing air quality conditions offshore would remain unchanged under Alternative 1.

Operation

Existing air quality conditions offshore would remain unchanged under Alternative 1.

5.2.2.4 Summary of Alternative 1 Impacts

As summarized in Table 5.2-2, air emissions associated with both construction and operational components of Alternative 1 would be well below the significance criteria of 250 TPY for air pollutants subject to regulations under the CAA. The predicted SO_2 emissions would be below the 100 TPY *de minimis* level within the nonattainment area. Therefore, all project-specific air quality impacts are considered less than significant for all areas for this action. The overall air quality impacts, including the general conformity applicability requirements, are discussed in Volume 7, which addresses the combined effects from all project components under the proposed action and presents an overall aggregate effects determination.

5.2.2.5 Alternative 1 Proposed Mitigation Measures

No mitigation measures would be required for this action, as emissions are below criteria levels. However, the use of low sulfur fuels for construction vehicles could be used to minimize emissions. Proposed mitigation measures for combined effects of all components considered in this EIS are discussed in Volume 7.

Volume 7, Chapter 2 describes two additional mitigation measures; force flow reduction and adaptive program management of construction. Implementing either of these mitigation measures could further reduce impacts to air quality by lowering peak population levels during construction.

Table 5.2-2. Summary of Alternative 1 Impacts

Area	*Project Activities*	*Project Air Quality Impacts*
Onshore	Construction	Less than significant adverse impacts to air quality. Construction emissions from all components would be well below significance criteria.
	Operation	Less than significant adverse impacts to air quality. Operational emissions from all components would be well below significance criteria.
Offshore	Construction	No impacts to air quality.
	Operation	No impacts to air quality.

5.2.3 Alternative 2 Former Ship Repair Facility (SRF)

5.2.3.1 Onshore

Construction

The construction of a new deep-draft wharf at Alternative 2 would angle the structure through the finger piers at the site. As described in Section 2.3, Alternatives 1 and 2 share many of the same components. The construction, inclusive of dredging, and operation elements would be similar for Alternatives 1 and 2. Therefore, construction air emissions associated with Alternative 2 are the same as under Alternative 1, as presented in Section 5.2.

Operation

The operational emissions from the extended aircraft carrier berthing for Alternative 2 are considered to be the same as under Alternative 1. These emissions are summarized in Table 5.2-1.

5.2.3.2 Offshore

Air quality conditions under Alternative 2 would be the same as those described under Alternative 1. Therefore, potential air quality impacts would not result in a significant increase in emissions over present activities under Alternative 2.

Construction

Air quality conditions under Alternative 2 would be the same as those described under Alternative 1.

Operation

Air quality conditions under Alternative 2 would be the same as those described under Alternative 1.

5.2.3.3 Summary of Alternative 2 Impacts

As summarized in Table 5.2-3, air emissions associated with both construction and operational components of Alternative 2 would be well below the significance criteria of 250 TPY for air pollutants subject to regulations under the CAA. The predicted SO_2 emissions would be below the 100 TPY *de minimis* level within the nonattainment area. Therefore, all project-specific air quality impacts are considered less than significant for all areas for this action.

Table 5.2-3. Summary of Alternative 2 Impacts

Area	*Project Activities*	*Project Air Quality Impacts*
Onshore	Construction	Less than significant adverse impacts to air quality. Construction emissions from all components would be well below significance criteria.
	Operation	Less than significant adverse impacts to air quality. Operational emissions from all components would be well below significance criteria.
Offshore	Construction	No impacts to air quality.
	Operation	No impacts to air quality.

5.2.3.4 Alternative 2 Proposed Mitigation Measures

The predicted construction emissions (2011 to 2014) and operational emissions (2015 and after) for criteria pollutants within each ROI are all below the 250 TPY threshold or 100 TPY SO_2 threshold applicable for SO_2 nonattainment areas. Therefore, potential air quality impacts under Alternative 2 are considered less than significant and emissions mitigation measures are not warranted. As identified for Alternative 1, low sulfur fuels for construction vehicles could be used to minimize emissions.

Volume 7, Chapter 2 describes two mitigation measures; force flow reduction and adaptive program management of construction that could further reduce air emissions by lowering peak population levels during construction.

5.2.4 No-Action Alternative

Existing air quality conditions would remain unchanged under the no-action alternative. Under the no-action alternative there would be no wharf or associated facility construction to support the aircraft carrier extended visits in Apra Harbor and no dredging would be required.

5.2.5 Summary of Impacts

Table 5.2-4 provides a summary of the potential impacts of the two action alternatives and the no-action alternative. None of the alternatives associated with construction and operational activities would result in significant adverse air quality impacts when compared to the significance criteria of 250 TPY for air pollutants subject to regulations under the CAA. SO_2 emissions were also well below the 100 TPY *de minimis* level used as the threshold for emissions within a nonattainment area. Air quality impacts associated with vehicle trips generated from all proposed activities, including the action described in this Volume, are covered in Volume 6. It should be noted that emissions thresholds must be applied to all relevant emissions from the entire proposed action to determine potential impact significance. Overall, air quality impacts for Alternative 1 are addressed in Volume 7 through a detailed comparison of such thresholds. Volume 7 also addresses the combined effects of all project components, inclusive of GHG emissions, under the proposed action.

Table 5.2-4. Summary of Impacts

Alternative 1	*Alternative 2*	*No-Action Alternative*
Potentially Impacted Resource: Onshore		
• LSI	• LSI	• NI
Potentially Impacted Resource: Offshore		
• LSI	• LSI	• NI

Legend: LSI = Less than significant impact, NI = No impact

5.2.6 Summary of Proposed Mitigation Measures

As the predicted air emissions would result in less than significant impacts for all alternatives for both construction and operation components of the proposed action, no mitigation measures are warranted, as summarized in Table 5.2-5.

Table 5.2-5. Summary of Proposed Mitigation Measures

	Onshore Alternatives	*Offshore Alternatives*
Construction		
	• No Mitigation Required	• No Mitigation Required
Operation		
	• No Mitigation Required	• No Mitigation Required

Volume 7, Chapter 2 describes two mitigation measures; force flow reduction and adaptive program management of construction that could reduce air emissions by lowering peak population levels during construction.

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