# CHAPTER 5. AIR QUALITY

## 5.1 INTRODUCTION

This chapter describes the potential environmental consequences associated with implementation of the alternatives within the regions of influence (ROI) – North and Central – where air quality resources may be impacted by the Army Air and Missile Defense Task Force (AMDTF) component of the proposed action. A description of the air quality resources in the North and Central ROIs is provided in Section 5.1 of Volume 2 (Marine Corps Relocation – Guam), including 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

This section describes the analytical approach used to address potential air quality impacts from the development of infrastructure and facilities to support the proposed Army AMDTF on Guam.

#### 5.2.1.1 Methodology

The Army AMDTF alternatives include construction of the administration and maintenance facilities, bachelor housing, family housing, and roads associated with facilities at the proposed sites, as described in Chapter 2. 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.

In estimating construction-related criteria pollutant and $CO_2$ emissions, the usage of equipment, the likely duration of each activity, and manpower estimates for construction are based on information provided in this Environmental Impact Statement (EIS) for the future project-associated construction activities under each alternative.

Estimates of construction crew and equipment requirements and productivity are based on data contained in 2003 *RS Facilities Construction Cost Data* (RSMeans 2003) and 2006 *RSMeans Heavy Construction Cost Data* (RSMeans 2006).

Estimates of construction equipment operational emissions are based on estimated hours of use and the emission factors for each equipment type, as provided by the United States Environmental Protection Agency (USEPA) using the NONROAD emission factor model (USEPA 2008). National default model inputs for non-road engines, equipment, and vehicles of interest are also taken from USEPA (2008), as were average equipment horsepower values and equipment power load factors. The operational activity data presented in RSMeans cost data books are generated based on the overall length of equipment presence on site. Therefore, an equipment actual running time factor (i.e., actual usage factor) was used to determine actual equipment usage hours for estimating equipment emissions. The usage factor for each equipment type was obtained from Federal Highways Administration's (FHWA) Roadway Construction

Noise Model User's Guide (FHWA 2006). Emission factors related to construction-associated delivery trucks were estimated using the USEPA Mobile6 emission factor model (USEPA 2003), which provides a specific emission factor database for various truck classifications. The workers' commuting vehicle emissions were estimated using the same Mobile6 model (USEPA 2003) and assumed workers would travel an average of 10 miles (16 kilometers) per day to the site using shuttle buses or vans. The detailed methodology used to calculate these emissions is presented in Volume 9, Appendix I, Section 3.4 Construction Activity Emissions.

A maximum sulfur content of 0.5% was conservatively used to predict sulfur dioxide ($SO_2$) and particulate matter (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 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 Code of Federal Regulations 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 parts per million. 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). Department of Defense (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. Operational activities produce potential air quality impacts from the operation of stationary and non-stationary sources. Vehicle operational impacts are addressed in Volume 6 through evaluation of the overall on-road vehicular traffic air quality impacts on Guam. Vehicle trips generated from all proposed activities, including the action described here, are covered in Volume 6. Therefore, only construction activity emissions are analyzed here.

#### 5.2.1.2 Determination of Significance

Under the Clean Air Act (CAA), motor vehicles and construction equipment are exempt from air permitting requirements. Emissions from sources associated with the construction of the proposed Army AMDTF facilities and housing occur in attainment areas that meet the National Ambient Air Quality Standards (NAAQS) for all criteria pollutants; therefore, 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 GCR applicable non-attainment areas, USEPA uses the "major stationary source" definition under the New Source Review program as the *de minimis* level to separate presumably exempt actions from those requiring a positive conformity determination. As the proposed action and alternatives would typically occur in areas which have always been in attainment, the EIS applies 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 as the criteria for determining the potential significance of air quality impacts from these sources. $CO_2$ is not a criteria pollutant and the 250 TPY significance criterion 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 summary of impacts for Alternative 1 in Volume 7.

As noted above, neither the PSD permitting program nor the GCR are applicable to mobile sources or 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 intended to inform the public and decision makers of the relative air quality impacts from the proposed action, and the other alternatives under NEPA requirements.

It should be noted that the above thresholds established for emissions comparison purposes must be used for all relevant emissions from the entire proposed action. The emissions quantification described in this section is for disclosure purposes only and addresses individual action component air quality impacts using the same thresholds. However, the overall air quality impacts are addressed for Alternative 1 in Volume 7 through a comparison with these thresholds. Volume 7 addresses the summary of effects from all project components under the proposed action.

#### 5.2.1.3 Issues Identified During Public Scoping Process

The following analysis quantifies potential air quality impacts within each applicable ROI from the proposed action. As part of the analysis, concerns related to air quality that were mentioned by the public, including regulatory stakeholders during the public scoping meetings were addressed. These include increases in construction-related emissions and impacts including emissions estimates of criteria pollutants and diesel particulate matter.

### 5.2.2 Headquarters/Housing Alternatives

This description of environmental consequences addresses all components of the proposed actions for the Army AMDTF. This includes the headquarters/housing component and the munitions storage component, each of which has three alternatives. A full analysis of each alternative is presented beneath the individual headings of this chapter. The weapons emplacement component has four alternatives. Detailed information on the weapons emplacements is contained in a Classified Appendix (Appendix L). A summary of impacts specific to each set of alternatives (including an unclassified summary of weapons emplacement impacts) is presented at the end of this chapter.

#### 5.2.2.1 Headquarters/Housing Alternative 1 (Preferred Alternative)

Under Alternative 1, the Army administration/headquarters (HQ) and maintenance facility would be co-located with the Marine Corps in the northern portion of Naval Computer and Telecommunications Station (NCTS) Finegayan. Unaccompanied personnel housing facilities would also be located within NCTS Finegayan. Accompanied personnel housing facilities would be co-located with the Main Cantonment housing areas in South Finegayan. Recreational and quality of life (QOL) facilities would be co-located within and adjacent to the housing areas.

North

*NCTS Finegayan*

*Construction.* Assumptions were made to develop a list of major construction items, necessary equipment, and productivity levels necessary for the completed installation of the Army AMDTF within the Marine Corps site at Finegayan. This list includes prototype structures for administration and

maintenance components, and prototypes including unique elements for munitions storage and the weapons emplacement components.

Construction emissions at both NCTS and South Finegayan were considered together and added with the emissions from construction of earth-covered magazines (ECMs) for the munitions storage component. The emissions presented in Table 5.2-1 represent the total construction emissions for Headquarters/Housing Alternative 1 and Munitions Storage Alternative 1. The calculated total construction emissions from equipment and trucks with potential to occur between 2011 and 2014 are assumed to be evenly distributed among those years in TPY (Table 5.2-1). These emissions are further considered in Volume 7 in determining the potential air emissions impact significance of all project components.

**Table 5.2-1. Total Annual Construction Emissions – Headquarters/Housing and Munitions Storage Alternative 1**

| *Construction Activity* | *Pollutant* | | | | | | |
|---|---|---|---|---|---|---|---|
| | $SO_2$ | *CO* | $PM_{10}$ | $PM_{2.5}$ | $NO_x$ | *VOC* | $CO_2$ |
| Total Annual Emissions (TPY) | 1.3 | 4.2 | 0.2 | 0.2 | 2.5 | 0.9 | 453.7 |

The construction emissions shown in Table 5.2-1 are all well below the significance criteria of 250 TPY for air pollutants subject to regulations under the CAA, indicating that there would be less than significant impacts for this action. As discussed in Section 5.2.1.2, $CO_2$ is not a criteria pollutant and the 250 TPY significance criterion is not applicable to it.

*Operation.* As described in the methodology (Section 5.2.1.1), only construction emissions are analyzed here. Information on operational emissions is considered in Volume 6 that discusses utility and roadway project impacts.

*South Finegayan*

*Construction.* Construction at both NCTS and South Finegayan were considered together and the emissions presented in Table 5.2-1 represent the total for both areas. The calculated total construction emissions from equipment and trucks with potential to occur between 2011 and 2014 are assumed to be evenly distributed among those years in TPY (Table 5.2-1). These emissions are further considered in Volume 7 in determining the combined air emissions impact significance of all project components.

*Operation.* As described in the methodology (Section 5.2.1.1), only construction emissions are analyzed here. Information on operational emissions is considered in Volume 6 that discusses utility and roadway project impacts.

Central

*Navy Barrigada*

*Construction.* No new construction would occur at Navy Barrigada under Alternative 1; therefore, there would be no impact to air quality.

*Operation.* Operations would not increase at Navy Barrigada under Alternative 1; therefore, impacts to air quality would be less than significant.

*Air Force Barrigada*

*Construction.* No new construction would occur at Air Force Barrigada under Alternative 1; therefore, there would be no impacts to air quality.

*Operation.* Operations would not increase at Air Force Barrigada under Alternative 1; therefore, impacts to air quality would be less than significant.

Alternative 1 Proposed Mitigation Measures

No mitigation measures are proposed for this action, as emissions are below criteria levels. Mitigation measures proposed for summary of impacts of all components considered in this EIS are discussed in Volume 7.

5.2.2.2 Headquarters/Housing Alternative 2

Under Alternative 2, the administration/HQ and maintenance facilities would be located within Navy Barrigada adjacent to the NCTS antenna farms. Accompanied and unaccompanied personnel housing facilities would be located within Navy Barrigada, with recreational and QOL facilities included in the housing areas.

North

*NCTS Finegayan*

*Construction.* No new construction would occur at NCTS Finegayan under Alternative 2; therefore, therefore, there would be no impact to air quality.

*Operation.* Operations would not increase at NCTS Finegayan under Alternative 2; therefore, impacts to air quality would be less than significant.

*South Finegayan*

*Construction.* No new construction would occur at South Finegayan under Alternative 2; therefore, therefore, there would be no impact to air quality.

*Operation.* Operations would not increase at South Finegayan under Alternative 2; therefore, impacts to air quality would be less than significant.

Central

*Navy Barrigada*

*Construction.* Total annual construction emissions under Alternative 2 are estimated as described in Section 5.2.1.1 and are summarized in Table 5.2-2. The detailed emissions calculation can be found in Volume 9, Appendix I, Section 3.4.4 Construction Emissions: Marine Corps Relocation – Army Air and Missile Defense Task. The predicted emissions are slightly less than Alternative 1 and are all well below the significance criteria of 250 TPY for air pollutant subject to regulations under the CAA, indicating that there would be less than significant impacts for this action.

**Table 5.2-2. Total Annual Construction Emissions – Headquarters/Housing Alternative 2**

| *Construction Activity* | *Pollutant* | | | | | | |
|---|---|---|---|---|---|---|---|
| | $SO_2$ | $CO$ | $PM_{10}$ | $PM_{2.5}$ | $NO_x$ | $VOC$ | $CO_2$ |
| Total Annual Emissions (TPY) | 1.3 | 4.1 | 0.2 | 0.2 | 2.4 | 0.8 | 445.4 |

*Operation.* As described in the methodology (Section 5.2.1.1), only construction emissions are analyzed here. Information on operational emissions is presented in Volume 6.

*Air Force Barrigada*

*Construction.* No new construction would occur at Air Force Barrigada under Alternative 2; therefore, there would be no impacts to air quality.

*Operation.* Operations would not increase at Air Force Barrigada under Alternative 2; therefore, impacts to air quality would be less than significant.

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 no emissions mitigation measures are proposed.

5.2.2.3 Headquarters/Housing Alternative 3

Under Alternative 3, Army administrative and maintenance facilities and part of the housing facilities would be placed at NCTS Finegayan. The remainder of the housing facilities would be co-located within Marine Corps housing at Navy Barrigada and Air Force Barrigada.

North

*NCTS Finegayan*

*Construction.* The calculated total construction emissions for components proposed for NCTS Finegayan are summarized in Table 5.2-3. The combined emission levels under Alternative 3 (Table 5.2-3) are similar to the levels predicted under both Alternatives 1 and 2 (Table 5.2-1 and Table 5.2-2) and are detailed in Volume 9, Appendix I, Section 3.4.4 Construction Emissions: Marine Corps Relocation – Army Air and Missile Defense Task, given the similarity of the proposed activities. Total annual construction emissions at NCTS Finegayan are all well below the significance criteria of 250 TPY for criteria pollutants.

**Table 5.2-3. Total Annual Construction Emissions – Headquarters/Housing Alternative 3**

| *Location* | *Pollutant (TPY)* | | | | | | |
|---|---|---|---|---|---|---|---|
| | *$SO_2$* | *CO* | *$PM_{10}$* | *$PM_{2.5}$* | *$NO_x$* | *VOC* | $CO_2$ |
| **NORTH** | | | | | | | |
| Andersen AFB | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 3.9 |
| NCTS Finegayan | 0.9 | 2.5 | 0.1 | 0.1 | 1.5 | 0.6 | 289.3 |
| **CENTRAL** | | | | | | | |
| Navy Barrigada and Air Force Barrigada | 0.5 | 1.6 | 0.1 | 0.1 | 1.0 | 0.1 | 157.4 |
| **Total** | 1.4 | 4.2 | 0.2 | 0.2 | 2.5 | 0.7 | 450.6 |

*Operation.* As described in the methodology (Section 5.2.1.1), only construction emissions are analyzed here. Information on operational emissions is presented in Volume 6.

*South Finegayan*

*Construction.* No new construction would occur at South Finegayan under Alternative 3; therefore, there would be no impacts to air quality.

*Operation.* Operations would not increase at South Finegayan under Alternative 3; therefore, impacts to air quality would be less than significant.

Central

*Navy Barrigada*

*Construction.* The combined Navy Barrigada and Air Force Barrigada construction emissions shown in Table 5.2-3 are well below the significance criteria of 250 TPY for criteria pollutants, indicating that there would be less than significant impacts for this action.

*Operation.* As described in the methodology (Section 5.2.1.1), only construction emissions are analyzed here. Information on operational emissions is presented in Volume 6.

*Air Force Barrigada*

*Construction.* The combined Navy Barrigada and Air Force Barrigada construction emissions shown in Table 5.2-3 are well below the significance criteria of 250 TPY for criteria pollutants, indicating that there would be less than significant impacts for this action.

*Operation.* As described in the methodology (Section 5.2.1.1), only construction emissions are analyzed here. Information on operational emissions is presented in Volume 6.

Alternative 3 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 3 are considered less than significant and no emissions mitigation measures are proposed.

### 5.2.3 Munitions Storage Alternatives

#### 5.2.3.1 Munitions Storage Alternative 1 (Preferred Alternative)

Eight ECMs are proposed within Munitions Storage Area (MSA) 1 to store Army missiles and provide safe storage of the system launchers during inclement weather. The new earth–covered magazines would be located in the eastern area of Andersen Air Force Base (AFB) near the intersection of Routes 3, 3A and 9. This location is remote from most of the existing ECMs in MSA 1. A typical munitions storage module would have 2,000 square feet (186 square meters) of physical capacity and dimensions of 80 feet (ft) (24 meters [m]) in length and a maximum width of 30 ft (9.1 m). Each ECM would be covered with a minimum of 2 ft (0.6 m) of earth.

In accordance with established ammunitions storage requirements, native grassy vegetation would be established on and around the magazines and would be maintained (e.g., periodically mowed) to minimize a potential fire hazard.

Construction

The emissions from construction of eight ECMs and/or modular storage magazines (MSMs) described in Chapter 2, Section 2.3.2.2 were estimated together with the construction emissions for both NCTS and South Finegayan. The emissions presented in Table 5.2-1 represent the total for all three areas and the detailed emissions calculation can be found in Volume 9, Appendix I, Section 3.4.4 Construction Emissions: Marine Corps Relocation –Army Air and Missile Defense Task. The calculated total construction emissions from equipment and trucks with potential to occur between 2011 and 2014 are assumed to be evenly distributed among those years in TPY (Table 5.2-1). These emissions are further considered in Volume 7 in determining the potential air emissions impact significance of all project components. Construction emissions resulting from Munitions Storage Alternative 1 would be below the

significance criterion of 250 tons per year (TPY) for air pollutants adopted in the EIS. Therefore, air quality impacts due to construction would be less than significant.

Operation

As described in the methodology (Section 5.2.1.1), only construction emissions are analyzed here. Information on operation emissions is considered in Volume 6, which discusses utility and roadway project impacts, and Volume 2, which discusses the on base commuting vehicle emissions component.

#### 5.2.3.2 Munitions Storage Alternative 2

Existing conditions do not vary between the three munitions storage alternatives at MSA 1. Therefore, impacts for Munitions Storage Alternative 2 are identical those described for Munitions Storage Alternative 1.

#### 5.2.3.3 Munitions Storage Alternative 3

Existing conditions do not vary between the three munitions storage alternatives at MSA 1. Therefore, impacts for Munitions Storage Alternative 3 are identical those described for Munitions Storage Alternative 1.

### 5.2.4 Weapons Emplacement Alternatives

Detailed information on the weapons emplacements is contained in a Classified Appendix (Appendix L). An unclassified summary of impacts specific to each set of alternatives is presented at the end of this chapter.

### 5.2.5 No-Action Alternative

Under the no-action alternative, the Army AMDTF relocation would not occur and there would be no associated construction or operations. Therefore, no air quality impacts would result under the no-action alternative.

### 5.2.6 Summary of Impacts

Tables 5.2-4, 5.2-5, 5.2-6 summarize the potential impacts of each major component – headquarters/housing, munitions storage, and weapons emplacement, respectively. A text summary is provided below.

**Table 5.2-4. Summary of Headquarters/Housing Alternative Alternatives 1, 2, and 3**

| *Alternatives 1 ,2 and 3* |
|---|
| **Construction** |
| LSI<br>• Less than significant adverse impacts to air quality. Construction emissions from all components would be well below significance criteria |
| **Operation** |
| LSI<br>• Less than significant adverse impacts to air quality. Operations emissions from all components would be well below significance criteria |

*Legend:* LSI = Less than significant impact

**Table 5.2-5. Summary of Munitions Storage Alternatives 1, 2 and 3**

| *Alternatives 1, 2, and 3* |
|---|
| **Construction** |
| LSI<br>• Less than significant adverse impacts to air quality. Construction emissions from all components would be well below significance criteria |
| **Operation** |
| LSI<br>• Less than significant adverse impacts to air quality. Operations emissions from all components would be well below significance criteria |

*Legend:* LSI = Less than significant impact

**Table 5.2-6. Summary of Weapons Emplacement Alternatives 1, 2, 3, and 4**

| *Alternatives 1, 2, 3, and 4* |
|---|
| **Construction** |
| LSI<br>• Less than significant adverse impacts to air quality. Construction emissions from all components would be well below significance criteria |
| **Operation** |
| LSI<br>• Less than significant adverse impacts to air quality. Operations emissions from all components would be well below significance criteria |

*Legend:* LSI = Less than significant impact

The air emissions predicted for Alternatives 1, 2, and 3 associated with construction and operation activities required for the relocation of the Army AMDTF to Guam are all well below the significance criterion of 250 TPY. This criterion is used in the PSD program for determining the potential significance of air quality impacts. All calculated emissions for regulated pollutants subject to this criterion, criteria pollutants in this instance (see Volume 2 for further discussion), are well below 250 TPY. $CO_2$ is not a criteria pollutant and the 250 TPY significance criterion 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, as detailed in Volume 7, Chapter 3. Therefore, Alternatives 1, 2, and 3 from this action would result in less than significant impacts to air quality resources. The no-action alternative would result in no impacts to air quality resources.

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 however, that emissions thresholds must be applied to all relevant emissions from the entire proposed action to determine potential impact significance. Overall air quality impacts are addressed for Alternative 1 in Volume 7 through a detailed comparison of such thresholds. Volume 7 also addresses the aggregate effects of all project components including greenhouse gas emissions, under the proposed action.

### 5.2.7 Summary of Proposed Mitigation Measures

The predicted air emissions would result in less than significant impacts for all three alternatives for both construction and operation components of the proposed action. Thus no mitigation measures are proposed, as summarized in Table 5.2-7.

**Table 5.2-7. Summary of Proposed Mitigation Measures**

| *Headquarters/Housing Alternatives* | *Munitions Storage Alternatives* | *Weapons Emplacement Alternatives* |
|---|---|---|
| **Construction** | | |
| • No mitigation measures proposed | • No mitigation measures proposed | • No mitigation measures proposed |
| **Operation** | | |
| • No mitigation measures proposed | • No mitigation measures proposed | • No mitigation measures proposed |

Force flow reduction and adaptive program management of construction are two mitigation measures intended for implementation by DoD to potentially reduce and avoid environmental impacts associated with the proposed expansion of the military mission on Guam overall. Force flow reduction (delaying the date at which military personnel arrive on Guam until the peak construction period has passed) would delay military operations. This would reduce the amount of air emissions from military operations that would be generated at the same time as emissions from construction activities. Adaptive program management of construction (reducing the construction tempo) would reduce air quality impacts by lowering the amount of air emissions generated at any given time.