CHAPTER 6. NOISE

6.1 INTRODUCTION

This chapter contains a discussion of the potential environmental consequences of noise associated with implementation of the alternatives within the region of influence (ROI). For a description of the affected environment, refer to the respective chapter of Volume 2 (Marine Corps Relocation – Guam). The locations described in that Volume include the ROI for the aircraft carrier berthing component of the proposed action (Apra Harbor), and the chapters are presented in the same order as the resource areas contained in this Volume.

6.2 ENVIRONMENTAL CONSEQUENCES

6.2.1 Approach to Analysis

Potential sound-generating events associated with the proposed action were identified and the potential sound levels from these activities were estimated on the basis of published military sound sources of information. These estimated sound levels were reviewed to determine: if they would represent a significant increase in the current ambient sound level, would have an adverse impact on a substantial population of sensitive receptors, or would be inconsistent with any relevant and applicable standards. This chapter focuses on potential impacts to human receptors (see Chapter 10, Terrestrial Biological Resources and Chapter 11, Marine Biological Resources in this Volume for potential noise impacts to wildlife).

6.2.1.1 Methodology

Construction

Construction noise is generated by the use of heavy equipment on job sites. Table 6.2-1 provides a list of representative examples of construction equipment and their associated noise levels. Impact devices typically generate more noise than non-impact devices. Acoustical Usage Factor refers to the percentage of time the equipment is running at full power on the job site. The Federal Highway Administration (FHWA) published a Roadway Construction Noise Model to predict noise levels adjusted from empirical data for construction operation to the actual distance of a receptor.

The decibel (dB) level of a sound decreases (or attenuates) exponentially as the distance from the source increases. For a single point source like a construction bulldozer, the sound level decreases by approximately 6 dBs for each doubling of distance from the source. Sound that originates from a linear, or 'line' source, such as a passing aircraft, attenuates by about 3 dBs for each doubling of distance where no other features such as vegetation, topography, or walls absorb or deflect the sound. Depending upon their nature, such features can range from having minimal to substantial noise level reduction capabilities.

Table 6.2-1. Examples of Construction Noise Equipment

Equipment Description	*Impact Device[1]*	*Acoustical Usage Factor[2] (%)*	*Actual Measured Lmax @ 50 feet[3] (dBA, slow) (Samples Averaged)*	*Number of Actual Data Samples[4] (Count)*
All Other Equipment > 5 HP	No	50	NA	0
Backhoe	No	40	78	372
Clam Shovel (dropping)	Yes	20	87	4
Compactor (ground)	No	20	83	57
Compressor (air)	No	40	78	18
Concrete Mixer Truck	No	40	79	40
Concrete Saw	No	20	90	55
Crane	No	16	81	405
Dozer	No	40	82	55
Dump Truck	No	40	76	31
Excavator	No	40	81	170
Front End Loader	No	40	79	96
Generator	No	50	81	19
Grader	No	40	NA	0
Impact Pile Driver	Yes	20	101	11
Jackhammer	Yes	20	89	133
Pavement Scarifier	No	20	90	2
Paver	No	50	77	9
Roller	No	20	80	16
Scraper	No	40	84	12
Tractor	No	40	NA	0
Vibratory Pile Driver	No	20	101	44

Notes:
[1]Indication whether or not the equipment is an impact device
[2]The acoustical usage factor to assume for modeling purposes
[3]The measured "Actual" emission level at 50 feet (15 meters) for each piece of equipment based on hundreds of emission measurements performed on Central Artery/Tunnel, Boston MA work sites
[4]The number of samples that were averaged together to compute the "Actual" emission level
Source: USDOT 2006

Operation

Operational noise associated with a visiting aircraft carrier would be primarily due to increased traffic on the roadways. FHWA has prepared a traffic study and potential road traffic noise is described in Section 6.2 of Volume 2.

6.2.1.2 Determination of Significance

Noise impacts result from perceptible changes in the overall noise environment that increase annoyance or affect human health. Annoyance is a subjective impression of noise and is subject to various physical and emotional variables. Annoyance levels generally increase when the cumulative noise energy also increases. Human health effects such as hearing loss and noise-related awakenings can result from noise.

For this EIS, noise is evaluated for both construction and operational activities. It is not anticipated that maintenance activities would noticeably contribute to the noise environment due to their intermittent nature and short duration. The threshold level of significant impacts for noise is:

- The increase of any incompatible noise contours where there are sensitive noise receptors (residences, hospitals, libraries, and etc.) due to operation. This threshold is intended to identify areas where there would be “high annoyance” effects associated with operational noise as well as identifying potential health effects and complaints.

- Construction noise resulting in an hourly equivalent sound level of 75 A-weighted decibels (dBA) (based on United States Environmental Protection Agency data for construction noise) at a sensitive receptor (such noise exposure would be equivalent to noise Zone III) or consistent exposure to noise levels at 85 dBA, over an 8-hour period, which is the National Institute for Occupational Safety and Health (NIOSH) recommended exposure limit (NIOSH 1998).
- The significance criteria expressed in this section apply to human receptors, but noise could also affect biological resources, land use, and cultural resources. Please refer to specific applicable resource sections for details about potential noise impacts to biological and other resources.

6.2.1.3 Issues Identified during Public Scoping Process

Comments received during the scoping process from the public, including regulatory stakeholders, do not specifically mention concerns about increased noise pollution due to the proposed action for the aircraft carrier berthing. Consequently, no related public scoping issues were identified.

6.2.2 Alternative 1 Polaris Point (Preferred Alternative)

Alternative 1, Polaris Point (referred to as Alternative 1), consists of the construction of a wharf and supporting infrastructure in Outer Apra Harbor that would result in increases in berthing visits from Nimitz and/or Ford Class nuclear powered aircraft carriers. Siting for these facilities would be along the northern shore of Apra Harbor at the Polaris Point site. Construction and construction-related noise may be divided into the two major construction phases: namely onshore facilities construction and offshore construction. Once construction is completed, noise impacts from daily operation of these facilities would begin. Potential noise impacts and their possible environmental consequences are described below.

6.2.2.1 Onshore

Onshore noise generating activities from Alternative 1 are divided into construction and operation phases. Construction is simply the activities that would generate noise during the building of facilities; operation would be the noise load generated from the day-to-day use of these newly constructed facilities.

Construction

Noise impacts during the construction phase of this alternative would include noise generated by the use of heavy equipment for:

- Grubbing, clearing, and grading of a construction staging area
- Demolition and replacement in-kind of three minor buildings totaling approximately 700 square feet (ft^2) (65 square meters [m^2])
- Minor roadway and pavement removal
- Realignment of utility lines along a portion of the adjacent roadway
- Filling of the marine revetment area—possibly with suitable dredged material
- Transportation of dredged material
- Pile driving for wharf construction

During facilities construction, use of heavy equipment generally occurs during daytime hours and would occur in industrial areas that have generally higher ambient noise levels. Heavy equipment would generate the highest noise levels throughout the construction phase, and would diminish the farther sensitive noise receptors are from the construction site. Use of heavy equipment would depend on the construction schedule, and would not be permanent. Temporary increases in truck traffic used to transport

dredged material, as well as to bring materials on- and off-site would also produce greater noise disturbance within and near the construction corridors. Volume 6 contains a discussion of impacts from roadway noise. The method for disposing of dredged materials would be transporting to a beneficial reuse site, an upland placement site, or an Ocean Dredged Material Disposal Site. The latter would remain offshore as is discussed in the following section.

Transportation to a beneficial reuse site or an upland placement site would require truck transportation to the ultimate location. This would produce temporary, localized noise for brief periods, but it would not create any permanent, adverse noise impacts to human health or the local environment. Therefore, noise impacts would be less than significant.

Construction of the pile-supported dock would involve the use of an impact pile hammer to drive steel piles into the sediment, as well as a vibratory hammer for driving sheet piles for wharf construction. Associated noise and vibration impacts would be minor and temporary, for the duration of the wharf construction. Generally, both impact and vibratory pile driving operations produce airborne noise levels of 101 dBA 50 ft (15 m) from the source; however, as the distance from the pile driving operation increases, the level of disturbance from the noise decreases. By 400 ft (122 m) away the noise level would drop to approximately 83 dBA. Only construction workers with appropriate hearing protection would be allowed within the area where noise reaches this level. Maximum airborne construction noise from pile driving would be 61 dBA at the nearest residence located 1 mile (mi) (1,609 m) away on the east side of Route 1. For pile driving operations, equipment with noise attenuating features could potentially be used to minimize disturbances to the surrounding environment. Consequently, noise impacts would be less than significant. Construction workers would be required to utilize hearing protection.

Operation

Sources of noise pollution during daily onshore operations are common to both alternatives. These sources would include:

- An increase in the number of people arriving or waiting to depart the wharf area by bus or car
- Personnel congregating around the wharf's temporary Morale, Welfare and Recreation facilities
- Increased shoreside security patrols
- Periodic truck traffic to the wharf to re-supply the ship
- Cargo movement likely requiring mobile cranes and/or forklifts

Noise impacts associated with day-to-day operations from Alternative 1 would likely produce no adverse impacts to the surrounding environment. Periodic and temporary impacts would be associated with truck traffic and cargo movement, resulting in impacts that would be similar to those experienced during the construction phase. There would be an increase in general traffic during times when the wharf and facilities were in use; however, it is unlikely that this would create an unacceptable noise environment. In summary, potential operational noise impacts would be less than significant.

6.2.2.2 Offshore

Construction

Mechanical or hydraulic dredging would be necessary for either alternative. Noise pollution due to dredging activities would be caused by the dredging equipment, watercraft (tugboats and barges), and human activity. No blasting would be required. Noise levels would be comparable to those that currently occur during periodic maintenance dredging of the turning basin and entrance channel. Operations for the

proposed dredging could take place up to 24 hours a day, 7 days a week, for approximately 8 to 18 months. Noise levels from dredging would be 87.3 dBA at 50 ft (15 m) dropping to 61.2 dBA at 1000 ft (305 m) and to 55.2 dBA at 2000 ft (610 m) from the source. Chapter 11 of this Volume contains a discussion of in-water noise impacts.

Wharf construction would occur under the proposed action. Along with the construction of a new wharf, all necessary utility infrastructure would be added to the sites. This construction has the potential to temporarily create adverse noise impacts to the offshore environment.

During pier construction, pile driving operations would create both waterborne and airborne noise. This method of construction would produce the most adverse noise impact to the project area. Waterborne noise created by vibratory pile driving at an average of approximately 160 dB re 1 µPa (Betke et al. 2004) and a peak of 192 dB re 1 µPa at 30 ft (9 m) could increase underwater noise levels to an average of 165 dB re 1 µPa and a peak of 192 dB re 1 µPa. Noise impacts to humans would be less than significant. Impacts to biological resources are discussed in the biological resources chapters (Chapters 10 and 11) of this Volume.

Operation

Sources of noise pollution during offshore operations would occur with both alternatives. These sources would include:

- Port calls by aircraft carriers estimated to be up to 21 days or combination thereof, for a total of approximately 63 days in port per year.
- Associated harbor craft, tugboats, security, and maintenance boats associated with navigation and support of an aircraft carrier within the harbor.
- Up to 59 aircraft flying from the aircraft carrier to beddown at Andersen AFB on a space-available basis. [*Note: Aircraft from visiting aircraft carriers would be flown off of the carrier while outside of port. Volume 2 discusses noise associated with current and proposed aircraft activities. This includes increased operations associated with aircraft from visiting aircraft carriers. The combined noise analyses of these aircraft and all other project-related aircraft are discussed in Volume 2.]

6.2.2.3 Summary of Alternative 1 Impacts

Alternative 1 noise impacts would be caused by construction and operations occurring both onshore and offshore. All of the activities would produce less than significant impacts (Table 6.2-2).

6.2.2.4 Alternative 1 Proposed Mitigation Measures

Noise impacts due to the aircraft carrier berthing would be less than significant. Although pile driving activities would generate high noise levels at the source, the noise level at the nearest human receptor is well within acceptable limits. Therefore, no noise mitigation measures have been determined to be necessary for Alternative 1 for the proposed aircraft carrier berthing at Apra Harbor.

Table 6.2-2 Summary of Alternative 1 Impacts

Area	*Project Activities*	*Project Specific Impacts*
Onshore	Construction	LSI – Onshore construction noise would be typical of standard construction activities, but would include pile-driving for the wharf project. All of the activities would occur sufficiently far away from sensitive receptors to be considered less than significant.
	Operation	LSI – Noise emanating from onshore operations would be due to increased traffic. The lack of sensitive receptors in the Apra Harbor area makes the impacts less than significant.
Offshore	Construction	LSI – Underwater noise from pile-driving would be the dominate source of offshore noise impacts. Human receptors would not be impacted by these potential noises above acceptable levels. See the biological resource chapters for impacts to biological resources (Chapters 10 and 11).
	Operation	LSI – Noise from offshore operations would be from tugboats and other smaller vessels operating in the harbor. The operations would be concentrated during the periods when the aircraft carrier is in port, would be short-term, and are considered less than significant.

6.2.3 Alternative 2 Former Ship Repair Facility (SRF)

6.2.3.1 Onshore

Construction

Noise impacts during the construction phase of Alternative 2, Former SRF (referred to as Alternative 2), would be identical to those of Alternative 1 except the nearest residence is located in on base housing approximately 4,300 ft (1,311 m) away. Noise levels at that location would be 62 dBA and would be well below acceptable limits. The nearest school is the Commander William C. McCool Elementary/Middle School approximately 3,900 ft (1,189 m) away on Naval Base Guam. Noise levels at the school would be approximately 65 dBA which is also within acceptable levels. Therefore, the construction noise impacts associated with Alternative 2 would be less than significant.

Operation

Sources of noise pollution during daily onshore operations are common to both alternatives and are discussed as part of Alternative 1.

6.2.3.2 Offshore

Construction

Construction sources of noise pollution due to offshore construction are common to both alternatives and are described as part of Alternative 1.

Operation

Sources of noise pollution due to offshore operations are common to both alternatives and are described as part of Alternative 1.

6.2.3.3 Summary of Alternative 2 Impacts

Noise impacts associated with Alternative 2 would be the same as for Alternative 1 (Table 6.2-3).

Table 6.2-3. Summary of Alternative 2 Impacts

Area	*Project Activities*	*Project Specific Impacts*
Onshore	Construction	LSI – Same as Alternative 1
	Operation	LSI – Same as Alternative 1
Offshore	Construction	LSI – Same as Alternative 1
	Operation	LSI – Same as Alternative 1

6.2.3.4 Alternative 2 Proposed Mitigation Measures

Noise impacts for Alternative 2 would be the same as for Alternative 1 and less than significant. Therefore, no noise mitigation measures have been determined to be necessary for Alternative 2.

6.2.4 No-Action Alternative

Under the no-action alternative, there would be no wharf construction to support the aircraft carrier extended visits to Apra Harbor. As a result, there would be no construction-related noise impacts and noise impacts due to operations would not increase. However, under this alternative, the objective, needs, and treaty commitments of DoD would not be met.

6.2.5 Summary of Impacts

Table 6.2-4 summarizes the potential impacts of each action alternative and the no-action alternative. A text summary is provided below.

Table 6.2-4. Summary of Impacts

Alternative 1	*Alternative 2*	*No-Action Alternative*
LSI • Onshore construction noise impacts would be due to heavy equipment operation including pile-driving but are located away from sensitive receptors • Offshore construction noise impacts would be due to dredging and pile driving but are located away from sensitive human receptors (see biological chapters (Chapters 10 and 11) for impacts to biological resources) • Operational noise impacts would only occur while the ship is in port and no sensitive human receptors would be significantly affected.	LSI • Same as Alternative 1	NI

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

Noise sources related to the proposed aircraft carrier berthing at Apra Harbor would include construction noise, both onshore and offshore, and noise associated with normal operations. Onshore construction noise would occur due to heavy construction equipment operation and truck traffic during construction. Dredging and pile driving would be major sources of the offshore noise, last for 8 to 18 months, and possibly be conducted for up to 24 hours per day. Other construction noise would mainly occur during daylight hours. As construction noise ceases once construction ends, potential impacts would be short-term and localized.

Operational noise would primarily be due to increased traffic while the ship is in port. As the aircraft carrier is expected to be in port for a cumulative total of up to 63 days per year with approximately 21 days per visit, the noise impacts would be limited to these times.

6.2.6 Summary of Proposed Mitigation Measures

Because impacts from noise would be less than significant, there would be no required mitigation measures. However, Volume 7, Chapter 2 describes two additional mitigation measures; force flow reduction and adaptive program management of construction. Implementing either of these proposed mitigation measures could further reduce noise impacts by lowering peak population levels during construction.