# CHAPTER 4
# ENVIRONMENTAL CONSEQUENCES

This chapter presents a summary of the overall potential environmental impacts of the alternatives described in Chapter 2—No Action (no live-fire training at MMR), Alternative 1 (Reduced Capacity Use with Some Weapons Restrictions), Alternative 2 (Full Capacity Use with Some Weapons Restrictions), Alternative 3 (Full Capacity Use with Fewer Weapons Restrictions), and Alternative 4 (Full Capacity Use with Fewer Weapons Restrictions), Pōhakuloa Training Area. Together with the current conditions presented in Chapter 3, the conditions under No Action provide a baseline for analysis of the Proposed Action alternatives (Alternatives 1, 2, 3, and 4).

Alternatives 1, 2, 3, and 4 would involve 242 days of training per year. Alternative 1 involves conducting 10 to 19 company-level CALFEXs per year using modified live-fire (i.e., without the use of tracer ammunition, inert TOW missiles, or illumination munitions). Alternatives 2, 3, and 4 are maximum installation use alternatives that include up to 50 company-level CALFEXs per year. Alternative 2 includes the use of tracer ammunition, and training under Alternatives 3 and 4 uses tracer ammunition, inert TOW missiles, 2.75-inch rockets, and illumination munitions. These alternatives are described in detail in Section 2.4. Impacts have been assessed based on the assumptions presented in the Chapter 3 resource sections. Alternatives 1, 2, 3, and 4 also reflect units conducting convoy live-fire (CLF) training.

Each section in this chapter includes a discussion of impact methodology and factors used to determine the significance of direct and indirect impacts (40 CFR 1508.8) and proposed mitigation where appropriate. Direct impacts are those that are caused by implementing the proposed training activities and occur at the same time and place. Indirect impacts

are those caused by implementing the proposed training activities, but the impacts occur later in time or are farther removed in distance from those activities. While the impact analysis primarily addresses CALFEX training exercises, the impacts of convoy LFX and other exercises are identified and described where they are substantially different or greater in magnitude than those from the CALFEXs. Cumulative impacts are presented in Chapter 5, and other required NEPA analyses are addressed in Chapter 6.

As is common practice in NEPA documents, the word "would" is used in this EIS when discussing impacts, as in "noise impacts would result from the Proposed Action." It is used in conjunction with identified impacts, regardless of the probability of impact occurrence. There is never complete certainty that an expected impact would occur, and the use of "would" is not intended to make that implication. In some cases, a number of factors would have to be present for an impact to result.

To determine whether an impact is significant, CEQ regulations also require the consideration of context and intensity of potential impacts (40 CFR 1508.27). Context normally refers to the setting, whether local or regional, and intensity refers to the severity of the impact. Also, EISs should include a discussion of the possible conflicts between the Proposed Action and the objectives of federal, regional, state, and local land use plans and policies for the area concerned (40 CFR 1502.16).

Pursuant to the CEQ regulations, factors considered for determining significance of impacts have been established for each resource and are presented for each resource section. If any project activity would exceed one of those factors, the impact is considered significant.

Impacts are defined in the following categories:

- Significant impact;
- Significant impact mitigable to less than significant;
- Less than significant impact;
- No impact; and
- Beneficial impact.

Impacts in the first two categories (significant impact and significant impact mitigable to less than significant) are assigned an impact number in the text (e.g., Impact 1: Modification of the existing view) with a corresponding numbered mitigation. Impacts in the next two categories (less than significant or no impact) are not assigned an impact number

(e.g., consistency with visual resource policies). Beneficial impacts are also described when applicable.

Summary tables provide an overview of impacts by resource and by alternative. These tables show the highest level of impact for each resource by issue area. Text supporting these conclusions is presented and mitigation measures are listed for significant impacts and less than significant impacts, where mitigation is possible. There may be both adverse and beneficial impacts within a single resource category. Where there are both adverse and beneficial impacts, both are listed on the tables and in the text.

Mitigation is the reduction or elimination of the severity of an impact. The intention of mitigation is to reduce the effects of an action on the environment. CEQ defines mitigation as (1) *avoiding* an impact altogether by not taking a certain action or parts of an action; (2) *minimizing* impacts by limiting the degree or magnitude of an action; (3) *rectifying* the impact by repairing, rehabilitating, or restoring the environment; (4) *reducing or eliminating* an impact over time by using preservation and maintenance operations; and (5) *compensating* for an impact by replacing or providing substitute resources or environments (40 CFR 1508.20). Mitigation measures have been proposed that would reduce the impact of the proposed action. Mitigation, though, as defined the CEQ regulations (40 C.F.R. 1502.14[f]) must be appropriate. Therefore, as with alternatives, mitigation measures are proposed only if they would be technically feasible and if they would allow the proposed project to meet the project purpose and need.

Mitigation measures in this EIS are divided into two categories:

- Regulatory and administrative mitigation, which is required in compliance with federal environmental laws and regulations, that are existing SOPs or BMPs, or that are part of an ongoing program; and
- Additional mitigation, which is proposed by the Army, other agencies, or the public and which may be implemented. The Army has listed these additional mitigations to provide the public and regulatory agencies with information on all possible mitigations and to request input on which mitigations should be implemented. The Army will identify in the ROD which of these mitigations it will implement. Because the Army has determined that mitigation measures that modify its training exercises would not be feasible because they would affect its ability to adequately train its Soldiers, those types of measures have not been identified and would not be implemented.

## 4.1 LAND USE AND RECREATION

### 4.1.1 Impact Methodology

This section evaluates impacts on land use in the ROI, as described in Chapter 3, Affected Environment. Land use includes activities that are being carried out on the land in the ROI and the designation of land as determined in local, state, and federal land use policies. This section describes the methods and significance criteria used to assess the level of impact from project alternatives on land use, provides an overview of land use and recreation noise factors, and then describes the impacts from No Action and the four action alternatives.

Impacts on land use were assessed based on the consistency of project activities with state and local plans and on compatibility with land uses in the project area and surrounding area. Impacts on recreational resources were assessed by determining the types of recreational uses in and around the project area, then determining the sensitivity of those uses to the short-term and long-term project effects, such as noise and visual disturbance. Also considered was the consistency of project activities with the objectives and policies of state and local recreation plans.

The Army has coordinated with the State of Hawai‘i to meet CZM consistency requirements and submitted a CZM consistency determination to the State Department of Business, Economic Development & Tourism (DBEDT) for training activities at MMR. Appendix H-7 includes the CZM consistency concurrence received in 2008 from the DBEDT. This section also evaluates the compatibility of the project activities against the objectives and policies of the HCZMP.

General issues regarding training noise compatibility with surrounding land use designations are addressed primarily in Section 4.5, where long-term and averaged noise analysis is used. The effects of noise and other training-related disturbances on individuals and groups using recreation areas are addressed in this section; because analysis of recreational impacts is based on different evaluation factors, the impacts identified in this section may be different from those discussed in Section 4.5. Land use issues regarding Native Hawaiian cultural practices are discussed under Section 4.10.

#### *Noise/Recreation Overview*

Quiet or natural sound can be considered a natural resource by users of open space and remote recreation areas. Certain open space areas are regulated to manage noise and airplane and helicopter overflights (Ernenwein and Henry 1997).

As explained in Section 3.5, noise is considered unwanted or undesirable sound. One common response to noise is annoyance. A person's expectation of a sound/noise level associated with an activity has a direct bearing on the level of annoyance. Five factors used to estimate community complaints to noise are type of neighborhood, type of noise, amount of repetition, time of day, and amount of previous exposure.

For instance, while some beach users may not expect a quiet and peaceful recreation experience, others who travel to remote locations seek these specific conditions. Mākua Beach offers typical recreational beach opportunities in a remote area, making it an attractive alternative to beaches in other highly populated areas of O‘ahu. While background noise levels at Mākua Beach are higher than those monitored farther inland, the background sounds at Mākua Beach (e.g., breaking waves and wind) are generally natural and desirable. Similarly, many of those who use forests for recreation, including hiking, biking, and bird watching, expect quiet or natural sounds. Natural background noise, which is also desirable in forest recreation areas, exists in the natural areas adjacent to and near MMR: Keawa‘ula Bay Beach, Mokulē‘ia Forest Reserve, Wai‘anae Kai Forest Preserve, Pāhole Natural Area Reserve, and the Mākua Kea‘au Forest Reserve. This background noise is less prevalent than at Mākua Beach.

### 4.1.2 Factors Considered for Determining Significance of Impacts

As described in Section 4.5, the noise/land use criteria considered in determining land use conflicts include Army land use compatibility guidelines (US Army 1997a, 1998, 2002c) and US Army CHPPM guidelines for evaluating the significance of short-term blast noise events (US Army CHPPM 2001). An action is considered to have a significant land use and recreation impact if it would result in any of the following:

- Disrupt recreational use of the beach, ocean, or land-based resources, such as parks or recreational paths, or interfere with the public's right of access to the sea;
- Prevent long-term recreational use or use during peak season or impede or discourage existing recreational activities;
- Conflict with existing or planned land uses on or around the site;
- Conflict with HCZMP recreation policies; or
- Conflict with or be incompatible with the objectives, policies, or guidance of state and local land use plans.

### 4.1.3 Summary of Impacts

**Summary of Potential Land Use and Recreation Impacts**

| Impact Issues | No Action Alternative | Alternative 1 MMR (Reduced Capacity Use with Some Weapons Restrictions) | Alternative 2 MMR (Full Capacity Use with Some Weapons Restrictions) | Alternative 3 MMR (Full Capacity Use with Fewer Weapons Restrictions) | Alternative 4 PTA (Full Capacity Use with Fewer Weapons Restrictions) |
|---|---|---|---|---|---|
| Conflicts or incompatibilities with the objectives, policies, or guidance of state and local plans | ⊙ | ⊙ | ⊙ | ⊙ | ⊙ |
| Conflicts with existing or planned land uses | ⊙ | ⊗ | ⊗ | ⊗ | ⊙ |
| Impacts on recreational resources due to training | ⊙ | ⊗ | ⊗ | ⊗ | ○ |

LEGEND:
⊗ = Significant impact
⊘ = Significant impact mitigable to less than significant
⊙ = Less than significant impact
○ = No impact
+ = Beneficial impact

Below is a summary of impacts associated with land use and recreation. Significant impacts are expected for recreational resources under each alternative due to the effect of frequent helicopter activity and explosive noise levels on users of Mākua Beach. For Alternatives 1, 2, and 3 significant impacts also are expected to result from land use conflicts between the projected training noise levels and existing recreational land use. No significant impacts are expected to occur regarding compatibility with the objectives, policies, or guidance of state and local plans.

#### *No Action Alternative*

There would be no live-fire military training at MMR under No Action. CALFEXs or convoy LFXs would have to be conducted at other training installations, and Army maintenance and stewardship programs would continue at a reduced level, due to the absence of live-fire training at MMR.

### Less than Significant Impacts

*Conflicts or incompatibilities with the objectives, policies, or guidance of state and local plans.* As discussed in Section 4.14, there is a potential for wildfires, once initiated, to burn more intensely and to remain uncontrolled for longer periods of time under No Action than under existing conditions. This would be due to less fuel management and a potentially longer response time to fires when the MMR facility has a reduced level of management. Currently, necessary firefighting activities on land adjacent to MMR, but outside of the installation boundary, are coordinated between the Army and DLNR. Without this cooperation, DLNR is unlikely to manage a fire in the vicinity of MMR as terrain greatly limits vehicle and personnel access and water sources are few. A reduction in stewardship measures would increase the potential for a fire to damage sensitive terrestrial species and habitat outside of MMR. Additionally, nonnative plant species such as guinea grass are highly flammable. Reducing natural resource management at MMR would lead to an increase in the area's fuel load and increase the risk of fire. This adverse land use effect would be less than significant.

*Conflicts with existing or planned land uses.* The absence of live-fire training at MMR would reduce the potential for conflicts with nearby land uses and would increase the installation's compatibility with recreation areas. The reduced activities proposed under this alternative would be consistent with the site's military training designation in the Wai'anae Sustainable Communities Plan.

*Impacts on recreational resources due to training.* Under the No Action Alternative, there would be continued overflight of the Mākua Beach and UAV operations over MMR. This would decrease the quality of the recreational experience.

## Alternative 1 (Reduced Capacity Use with Some Weapons Restrictions)

### Significant Impacts

*Impact 1: Conflicts with existing or planned land uses (Mākua Beach).* Section 4.5 includes quantitative analysis of noise impacts. Projected noise contours under Alternative 1 indicate that Mākua Beach would be within Zone III (greater than 70 dB CDNL). In accordance with DA PAM 200-1, this noise zone is not compatible with recreational land use. This conflict with the existing recreational land use is a significant impact under Alternative 1.

Figures 4.5-1 and 4.5-2 in Section 4.5 represent the noise levels expected under Alternative 1, primarily from mortar and medium-heavy artillery use. The Zone III contour extends over the beach area. For land use

planning, this zone is not considered compatible with residential, school, hospital, and recreational land uses. No mitigation measures have been identified to reduce the magnitude of this impact.

*Impact 2: Impacts on recreational resources due to training (Mākua Beach).* The introduced noise at Mākua Beach caused by the proposed military training would result from helicopter overflights, mortars and artillery, demolitions training, and other ordnance use.

The loudest expected noise source would be shape and cratering charges used during demolitions training. This training would generate noise levels between 113 and 130 dB at Mākua Beach and is expected to occur four to five times each month. Other high decibel noises include the use of high explosive 105mm howitzers and 120mm mortars.

In addition, helicopter hovering and flyovers contribute potential adverse impacts on recreation. Army studies have found that approximately 27 percent of bystanders are highly annoyed by aircraft flyovers producing 85 dBA and approximately 60 percent of bystanders are highly annoyed by impulse levels over 85 dBA (see figures in Appendix F-1). Noise from helicopter flyovers and ordnance detonation is expected to exceed those levels at Mākua Beach (see figures in Appendix F-1). Impacts on recreation from Alternative 1 would be significant when beach goers are present during training activities.

*Regulatory and administrative mitigation 2.* No regulatory and administrative mitigation measures have been identified.

*Additional mitigation 2.* Potential mitigation measures for this impact include the Army notifying beach users at least one week in advance of planned training activities. Notices would be posted on the Mākua Beach access gates, in local newspapers, and on the DLNR Division of State Parks Web site or other such Web sites. This notification would provide beach users the opportunity to plan recreational activities around the hours that the Army would conduct training. Because these events are normally scheduled for weekday mornings, beach users who are notified would have the opportunity to change their visits to other weekday mornings, weekday afternoons, or weekends. Also, there are similar beaches just to the north and south of Mākua Beach that are not highly used on weekday mornings. Due to the intensity and frequency of this noise disturbance, this mitigation would not be sufficient to reduce this impact to less than significant.

### Less than Significant Impacts

*Conflicts or incompatibilities with the objectives, policies, or guidance of state and local plans.* The military training activities conducted at MMR would be consistent with the site's military training designation in the Wai'anae Sustainable Communities Plan. Section 3.12.2.2 of the Wai'anae Sustainable Communities Plan recognizes the importance of the military to the economy of the State of Hawai'i and of the continued use of these lands for military purposes for the foreseeable future.

Proposed Alternative 1 activities comply with HCZMP land use policies. The relevant Coastal Management Program land use policies aim to protect coastal access and streams, and Alternative 1 would not negatively affect coastal ecosystems or access or streams. The Army and State of Hawai'i follow a long-standing policy of permitting access to the Mākua Beach area. This policy would continue under Alternative 1. Regarding stream protection, Alternative 1 does not provide for development in or diversion of streams. Impacts on coastal resources are further discussed in Sections 4.7 and 4.9.

The State of Hawai'i has designated areas as SMAs or conservation subzones for purposes of controlling uses through permitting programs. Presently, use of MMR for military training does not conflict with surrounding Conservation District policies, and land use would not change under this alternative. Although state permits are not required, the Army would attempt to comply with Conservation District subzone policies for its activities at MMR. Similarly, the Army would attempt to comply with SMA policies. Environmental management activities described in Chapters 2 and 3 would foster protection of resources in the Mākua Valley consistent with long-term preservation of resources.

*Conflicts with existing or planned land uses (conservation areas and Keawa'ula Bay Beach).* Under Alternative 1, training exercises conducted at MMR would not be expected to cause any change or have any impact on land use resulting in conflicts with surrounding conservation area land uses.

Conservation areas within MMR and forest reserve and Natural Area Reserve trails in the areas adjacent to MMR have been temporarily closed in the past due to wildfires, including those caused by prescribed burns. Live-fire training could contribute to the number or scope of wildfires. However, the INRMP and the IWFMP would be implemented for 1 to address wildfire impacts (see Section 4.9 for a discussion of impacts on vegetation). The State of Hawai'i has designated areas as SMAs or conservation subzones to control uses through permitting programs. Because all proposed activities would be on federal land, such permitting

programs do not apply. However, proposed environmental management under Alternative 1 would foster protection of resources in the Mākua Valley, consistent with the long-term goal of preserving resources. Further, the designated 1,136-acre (460-hectare) training area is sufficiently buffered from the adjacent forest reserves to minimize potential land use incompatibilities due to possible fires. Alternative 1, therefore, would have a less than significant effect on land use within conservation areas.

Figures 4.5-1 and 4.5-2 show that the Zone III noise contours for Alternative 1 would not approach the boundary between MMR and the recreation areas in adjacent forest reserves. Unlike Mākua Beach, Keawaʻula Bay Beach is outside the Zone III noise contour. Therefore, according to DA PAM 200-1, the estimated noise levels at Keawaʻula Bay Beach would be compatible with recreational land use.

Impacts on recreational resources due to training (Mokulēʻia Forest Reserve, Waiʻanae Kai Forest Preserve, and Keawaʻula Bay Beach). Recreational use of nearby hiking trails in certain parts the Mokulēʻia Forest Reserve and limited areas of the Waiʻanae Kai Forest Preserve would be affected by noise disturbance from certain training activities. Because training at MMR would cause noise disturbances that could be heard by users of recreational resources in the ROI, trail users such as hikers and mountain bikers would be affected by the training activities. However, most users of these forest areas do not reach the rim of Mākua Valley and are therefore shielded from much of the noise. Mountain bikers reaching the Mākua Valley Lookout Point would clearly hear the explosions during training, particularly during a CALFEX (Kennedy 2003). The hikers or mountain bikers that do arrive at the edge of ridges above MMR would experience infrequent maximum noise levels of 70 to 75 dBA.

Live-fire training at MMR is normally conducted during the mornings. Squad section live-fire training, which uses only small arms and is limited to about one-half hour per day, would not create significant impacts on recreational resources. Platoon live-fire exercises would only range from an hour to three hours but could disturb recreational users depending on the weaponry used and the training scenario. Training activities having the greatest noise impact on recreational resources would be the company-level CALFEX, air support and air assault exercises, and demolitions training. While each company-level CALFEX is usually conducted over a five-day period, only the fourth day incorporates the use of live-fire for a time period of about four to five hours (see Chapter 2). The third day is used to calibrate weaponry. Nighttime CALFEXs would involve

helicopter activity and live-fire training during the evening of day four of the CALFEX for about four to five hours.

Mountain bike riders and hikers are aware of these conditions. Their travel up to the Mākua Lookout Point is not necessarily impeded and their recreation use is not significantly disturbed by noise from small arms and explosives and helicopter flights down in Mākua Valley.

Live-fire training is expected to increase the wildfire potential at MMR. Recreational land uses could be affected if wildfires required the trails in adjacent forest preserves to be closed. Such wildfires are expected to be infrequent and are not expected to affect most trails. These wildfires would not require trails to be closed for extended periods and therefore would not have the direct significant impact of limiting trail use in the adjacent forest reserves and preserves. Use of trails on adjacent lands for troop marches, including over the Kuaokalā Access Road and Trail and the Ka‘ena Point Trail, would be consistent with other uses of these trails. The potential impact on surrounding land uses would be less than significant.

Keawa‘ula Bay Beach, like Mākua Beach, is a relatively remote beach with a natural setting. Use of the beach, picnic areas, and coastal areas for fishing and swimming may be affected by noise disturbance from training activities. While training at MMR would not restrict public access to recreational resources in the ROI, beach users could be disturbed by training activities.

Compared to Mākua Beach, Keawa‘ula Bay Beach would experience a lower degree of noise disturbance because of the increased distance from MMR, because the beach is shielded by the northern ridge of MMR, and because helicopter training approaches typically would be carried out only over Mākua Beach. This level of disturbance is expected to be adverse due to the potential for discouraging recreational use of the beach.

Impacts on Keawa‘ula Bay Beach would be extensive due to the noises caused by live–fire training, including use of shape and cratering charges. Additional noise disturbance would result from use of other arms, including mortars and howitzers. However, these impacts would be less than significant due to the factors discussed above. Also, while some noise from demolition activities at MMR would be heard at Keawa‘ula Bay Beach, single event noise levels would not be as high as those at Mākua Beach.

*Regulatory and administrative mitigation.* No regulatory and administrative mitigation measures have been identified.

*Additional mitigation.* Similar to the mitigation provided under Impact 2, potential mitigation measures for this impact include the Army notifying trail users at least one week in advance of planned live-fire training activities.

### Alternative 2 (Full Capacity Use with Some Weapons Restrictions)

#### Significant Impacts

*Impact 1: Conflicts with existing or planned land uses (Mākua Beach).* Impacts under this alternative would be similar to but greater in magnitude than those described under Alternative 1. Figure 4.5-5 in Section 4.5 presents the projected noise levels from 50 CALFEXs under Alternative 2. Under this alternative, Zone III noise levels extend over Mākua Beach. In accordance with DA PAM 200-1, this noise zone is not compatible with recreational land use. No mitigation measures have been identified to reduce the magnitude of this impact.

*Impact 2: Impacts on recreational resources due to training (Mākua Beach).* Impacts would be similar to but greater in magnitude than those identified under Alternative 1 due to increasing the number of company-level CALFEXs to an annual maximum of 50. People using Mākua Beach when training activities are occurring would be subject to noise from ordnance use and helicopter flyovers during morning hours an average of once a week.

*Regulatory and administrative mitigation 2.* No regulatory and administrative mitigation measures have been identified.

*Additional mitigation 2.* The mitigation measures under this alternative would be the same as described under Alternative 1. While the mitigation would lessen the magnitude of the impact, it would not be sufficient to reduce the impact to less than significant.

#### Less than Significant Impacts

*Conflicts or incompatibilities with the objectives, policies, or guidance of state and local plans.* Training activities proposed under Alternative 2 would still be consistent with land uses on MMR and surrounding land uses and would not conflict with policies of the Wai‘anae Sustainable Communities Plan, as discussed under Alternative 1. The impacts associated with Alternative 2 would be similar to those described for Alternative 1 and would be less than significant. Impacts regarding compliance with HCZMP land use policies would be similar to those described under Alternative 1.

*Conflicts with existing or planned land uses (conservation areas and Keawa'ula Bay Beach).* Impacts on conservation areas and Keawa'ula Bay Beach would be similar to but greater in magnitude than those identified under Alternative 1 due to increasing the number of company-level CALFEXs to an annual maximum of 50.

Impacts on recreational resources due to training (Mokulē'ia Forest Reserve, Wai'anae Kai Forest Preserve, and Keawa'ula Bay Beach). Impacts would be similar to but greater in magnitude than those identified under Alternative 1 due to increasing the number of company-level CALFEXs to an annual maximum of 50.

Due to the increase in the number of CALFEXs, impacts on Keawa'ula Bay Beach recreational users due to noise caused by training activities would be similar to, though slightly more adverse, than those identified for Alternative 1.

*Regulatory and administrative mitigation.* No regulatory and administrative mitigation measures have been identified.

*Additional mitigation.* Additional mitigation would be the same as those described under Alternative 1

### Alternative 3 (Full Capacity Use with Fewer Weapons Restrictions)

#### Significant Impacts

*Impact 1: Conflicts with existing or planned land uses (Mākua Beach).* Noise generated from ordnance use under Alternative 3 is expected to be similar to Alternative 2. Figure 4.5-6 in Section 4.5 presents the projected noise levels from 50 CALFEXs under Alternative 3. The addition of inert TOW missiles, 2.75-inch rockets, and illumination munitions would not substantially change the noise contours generated for Alternative 2. Under Alternative 3, proposed training would not be compatible with adjacent recreational land use, resulting in a significant adverse impact. No mitigation measures have been identified to reduce the magnitude of this impact.

*Impact 2: Impacts on recreational resources due to training (Mākua Beach).* Impacts would be similar but slightly more adverse than those identified under Alternative 2 due to the use of additional weapon systems, which would slightly increase the level of disturbance and further discourage use of Mākua Beach.

*Regulatory and administrative mitigation 2.* No regulatory and administrative mitigation measures have been identified.

*Additional mitigation 2.* The mitigation measures under this alternative would be the same as described under Alternative 1. While the mitigation would lessen the magnitude of the impact, it would not be sufficient to reduce the impact to less than significant.

### Less than Significant Impacts

*Conflicts or incompatibilities with the objectives, policies, or guidance of state and local plans.* With the addition of inert TOW missiles, 2.75-inch rockets, and illumination munitions, the proposed training activities under this alternative would still be consistent with land use policies for MMR and surrounding lands. With impacts similar to those discussed under Alternatives 1 and 2, Alternative 3 would not conflict with policies of the Wai‘anae Sustainable Communities Plan. The impacts associated with Alternative 3 would be similar to those described for Alternative 2 and would be less than significant. Impacts regarding compliance with HCZMP land use policies are similar to those described under Alternative 1.

*Conflicts with existing or planned land uses (conservation areas and Keawa‘ula Bay Beach).* While fewer restrictions on training would allow use of inert TOW missiles, high explosive 2.75-inch rockets, and illumination munitions, the proposed training activities under Alternative 3 would not significantly conflict with surrounding conservation areas. Expected noise levels would also be compatible with recreational use of Keawa‘ula Bay Beach. The impacts associated with Alternative 3 would be similar to those described above for Alternative 2 and would be less than significant.

*Impacts on recreational resources due to training (Mokulē‘ia Forest Reserve, Wai‘anae Kai Forest Preserve, and Keawa‘ula Bay Beach).* Impacts would be similar but slightly more adverse than those identified under Alternative 2 due to the use of additional weapon systems, which would increase the level of disturbance on trails near MMR.

Due to the increase in the use of high explosive weapons, impacts on Keawa‘ula Bay Beach recreational users due to noise caused by training activities would be similar to, though slightly more adverse than those identified for Alternative 2. As with Alternative 2, the Army would conduct up to 50 company-level CALFEXs. However, under Alternative 3 the use of inert TOW missiles, 2.75-inch rockets, and illumination munitions would potentially increase the impact on recreation due to these additional noise sources.

*Regulatory and administrative mitigation.* No regulatory and administrative mitigation measures have been identified.

*Additional mitigation.* The mitigation measures under this alternative would be the same as those described under Alternative 1.

### Alternative 4 (Full Capacity Use with Fewer Weapons Restrictions), Pōhakuloa Training Area

Less Than Significant Impacts

*Impact 1: Conflicts with the objectives, policies, or guidance of state and local plans.* Basic land use would not change with this alternative. The area considered for a range replacement would continue to be used for ongoing military training operations, regardless. Some changes to localized use of training areas would occur as a result of implementing Alternative 4. Due to safety considerations, the new range would lead to minor restrictions or modifications to training on surrounding ranges when in use.

*Impact 2: Conflicts with existing or planned land uses.* Under this alternative, additional live-fire training would occur as a result of conducting CALFEX training at PTA instead of MMR. This would result in an increase in the number of rounds fired as well as vehicular traffic on PTA. Increased noise, dust, or other indirect effects associated with this alternative would not be expected to affect off-post land uses. The areas surrounding PTA are uninhabited, thus no residential areas, schools, hospitals, or businesses would be affected. Impacts would be localized to the vicinity around the ranges. Land to the north of PTA includes the Kaohe Game Management Area, Mauna Kea State Park, Mauna Kea Forest Reserve, and Mauna Kea National Natural Landmark. Mauna Kea and its associated recreational and natural areas would not be expected to experience any noticeable impacts from increased live-fire training at PTA. UXO would only occur within the impact areas, which would be posted as restricted to public access.

*Regulatory and administrative mitigation 2.* With continued implementation of current Army SOPs to minimize potential noise, and safety impacts, impacts would be expected to be less than significant. No additional mitigation would be required.

*Additional mitigation.* No additional mitigation would be required.

## 4.2 AIRSPACE

### 4.2.1 Impact Methodology

Impacts on airspace use were assessed by evaluating the potential effects of the proposed training activities on the principal attributes of airspace use, as described in Section 3.2. In the following paragraphs is a discussion of the impact categories and how they were assessed for this project:

- Impacts on controlled and uncontrolled airspace were assessed by determining if the project would reduce the amount of navigable airspace by creating new, or expanding existing, special use airspace or by introducing temporary flight restrictions or presenting an obstruction to air navigation.
- Impacts on special use airspace were assessed by determining the project's requirement either for new special use airspace or for modifying existing special use airspace.
- Impacts on military training routes were assessed by determining if the project would require a change to an existing or planned military training route.
- Impacts on en route airways were assessed by determining if the project would lead to a change in a regular flight course or altitude or instrument procedures.
- Impacts on airports and airfields were assessed by determining if the project would restrict access to or affect the use of airports/airfields available for public use or if it would affect airfield/airport arrival and departure traffic flows.
- Impacts on public health and safety were assessed based on the adequacy of federal and Army aviation flight regulations and the Army's aviation accident history in Hawai‘i.

### 4.2.2 Factors Considered for Determining Significance of Impacts

Based in part on FAA Order 7400.2E, *Procedures for Handling Airspace Matters*, an action is considered to have a significant airspace impact if it would result in any of the following:

- Reduce the amount of navigable airspace;
- Create an obstruction to air navigation;
- Assign new special use airspace (including prohibited areas, restricted areas, warning areas, and military operations areas) or require the modification of existing special use airspace;

- Change an existing or planned military training route or slow route;
- Change an existing or planned IFR minimum flight altitude, a published or special instrument procedure, or an IFR departure procedure or require a visual flight rules (VFR) operation to change from a regular flight course or altitude;
- Restrict access to or effects on the use of airports and airfields available for public use;
- Change commercial or private airfield or airport arrival and departure traffic flows; or
- Reduce public health and safety due to a change in aviation safety risk.

### 4.2.3 Summary of Impacts

None of the alternatives would have impacts on airspace within the ROI. No changes to use of airspace or to airspace designations are proposed. None of the alternatives would reduce navigable airspace or create an obstruction to air navigation. No new special use airspace, nor the modification of existing special use airspace, would be necessary to accommodate the increase in training.

There are no military training routes in the ROI, and the existing flight corridors used by participating aircraft would not change. There are no en route low-altitude airways in the ROI, and no IFR procedures would need to change. Access to and the approach and departure patterns associated with the airports and airfields in the ROI 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 special use airspace, coupled with the Army's excellent aviation safety record in Hawai‘i, make future adverse impacts on public health and safety extremely unlikely.

Other training activities, such as sniper and demolitions training, would have no impact on airspace use because none of the factors considered for the impact analysis apply to those activities. Below is a summary of impacts on airspace in the ROI. The potential for impacts on land use, air quality, and noise environments from aircraft activity are addressed in Sections 4.1, 4.4, and 4.5, respectively.

**Summary of Potential Airspace Impacts**

| Impact Issues | No Action Alternative | Alternative 1 MMR (Reduced Capacity Use with Some Weapons Restrictions) | Alternative 2 MMR (Full Capacity Use with Some Weapons Restrictions) | Alternative 3 MMR (Full Capacity Use with Fewer Weapons Restrictions) | Alternative 4 PTA (Full Capacity Use with Fewer Weapons Restrictions) |
|---|---|---|---|---|---|
| Reduction in navigable airspace | ○ | ○ | ○ | ○ | ○ |
| Creation of an air navigation obstruction | ○ | ○ | ○ | ○ | ○ |
| New/modified special use airspace | ○ | ○ | ○ | ○ | ○ |
| Change to a military training route | ○ | ○ | ○ | ○ | ○ |
| Change in en route airway or IFR procedure | ○ | ○ | ○ | ○ | ○ |
| Restriction of access to airports/airfields | ○ | ○ | ○ | ○ | ○ |
| Change in airport/airfield approach or departure patterns | ○ | ○ | ○ | ○ | ○ |
| Reduction in public health and safety due to change in aviation safety risk | ○ | ○ | ○ | ○ | ○ |

LEGEND:
⊗ = Significant impact
⊘ = Significant impact mitigable to less than significant
⊙ = Less than significant impact
○ = No impact
+ = Beneficial impact

### *No Action Alternative*

*No Impacts*

Under No Action, there would be no impacts on airspace use. For training involving staging for air assault and aviation command and control elements, there would be no reduction in the amount of navigable airspace, no assignment of new or modified special use airspace, and no change to an existing or planned military training route or slow route. Similarly, there would be no change to en route airways or instrument flight rules procedures. There would also be no restrictions on access to and no effect on the use of airports or airfields available for public use, nor would there be any effect on airport or airfield arrival and departure traffic flows. There would be no construction that could obstruct air navigation and no new air traffic that could affect aviation safety.

*New/modified special use airspace.* No new special use airspace or any modifications to the existing special use airspace would be required. The staging base command and control element air assault exercises, and blank ammunition training conducted at MMR are all contained within the R-3109/R-3110 restricted area complex or, in the case of the FARRP, at DMR, just outside the complex. Restricted areas are designed to contain precisely these kinds of activities. During the published hours of use (by notice to airmen [NOTAM]), the Army is responsible for controlling all military activity within the restricted areas and for determining that its perimeters are not violated. The pilots of nonparticipating aircraft understand that the penetration of restricted areas without the authorization from the using or controlling agency may be extremely hazardous to the aircraft and its occupants. The boundaries of the R-3109/R-3110 restricted area complex are clearly indicated on local aeronautical charts and are published in the *Federal Register*.

### Alternative 1 (Reduced Capacity Use with Some Weapons Restrictions)

*No Impacts*

*Reduction in navigable airspace.* The staging base air assault and aviation support exercises conducted under this alternative would not reduce the amount of navigable airspace in the MMR ROI. Those exercises would not lead to the assignment of new special use airspace or require existing special use airspace to be modified. Similarly, no flight restrictions or altitude reservations would be imposed.

*Creation of an air navigation obstruction.* Training activities under this alternative would not require the construction of towers or objects that might affect the line-of-sight view of all runways, taxiways, and traffic pattern areas from the air traffic control towers of the airports involved. Nor would training have a physical effect on airport approach lighting systems.

*New/modified special use airspace.* No new special use airspace or any modifications to the existing special use airspace would be required. The staging base air assault exercises and units using blank ammunition associated with CALFEX training are all contained within the R-3109/R-3110 restricted area complex or, in the case of the FARRP, at DMR, just outside the complex. Restricted areas are designed to contain precisely these kinds of activities. During the published hours of use (by NOTAM), the Army is responsible for controlling all military activity within the restricted areas and for determining that its perimeters are not violated. The pilots of nonparticipating aircraft understand that the penetration of restricted areas without the authorization from the using or controlling agency may be extremely hazardous to the aircraft and its occupants. The

boundaries of the R-3109/R-3110 restricted area complex are clearly indicated on local aeronautical charts and are published in the *Federal Register*.

*Change to a military training route.* While there are no published military training routes in the MMR ROI, Alternative 1 would require no change to the existing flight corridors between WAAF and MMR.

As identified in Chapter 2, aircraft leaving and arriving at WAAF would follow well-defined flight corridors, in accordance with the air traffic, general operating rules, and flight rules of FAR Part 91 and AR 95-1. WAAF lies in Class D airspace, so all aircraft departure and arrival operations would be subject to air traffic control clearances and instructions, thus avoiding any direct adverse impacts on general aviation air traffic. While the airspace over SBMR and WAAF is considered congested for general aviation aircraft, procedures are in place that, although not mandatory, allow general aviation to function satisfactorily. Moreover, the WAAF tower provides traffic advisories to general aviation pilots when it is open. On weekends, when the tower is closed, pilots tune into the common traffic advisory frequency to monitor other traffic and to broadcast their positions (Bruckner 2003).

Helicopters participating in exercises over MMR that may use the Dillingham FARRP located just outside the R-3110 special use airspace would follow the air traffic, general operating, and flight rules of FAR Part 91 and AR 95-1 and would not interfere with local general aviation flights.

*Change in en route airway or IFR procedure.* There are no low altitude en route airways in the MMR ROI. There would be no change to IFR minimum flight altitudes, no special instrument procedures would be required, and VFR operations would not be required to change from a regular flight course or altitude.

*Restriction of access to airports/airfields.* Access to airports and airfields in the ROI would not be restricted under Alternative 1.

*Change in airport/airfield approach or departure patterns.* No change to any of the approach and departure patterns associated with airports and airfields in the ROI would be necessary under this alternative.

*Reduction in public health and safety due to change in aviation safety risk.* Well-established and understood aviation procedures and rules governing flight operations in both controlled and uncontrolled navigable airspace and special use airspace, coupled with the Army's excellent aviation

safety record in Hawai‘i, make adverse impacts on public health and safety extremely unlikely.

Potential future UAV flights under Alternative 1 would normally be conducted within the R-3109 and R-3110 restricted area complex. Although the nature and intensity of utilization would vary over time and by individual special use airspace area, the UAV flights would represent precisely the kinds of activities for which the special use airspace was created. As such, the UAV flights would not represent a change in aviation safety risk or an adverse impact on public health and safety.

Operations for those UAV flights that could not be contained wholly within the restricted area complex would be conducted in accordance with well-defined FAA procedures for remotely operated aircraft. At least 60 days before UAV operations begin, a certificate of authorization would be sought from the FAA regional office in Honolulu. Approval would be contingent on the demonstration of a method that provides an equivalent level of safety, comparable to see-and-avoid requirements for piloted aircraft. Methods include, but are not limited to, radar observation, forward- or side-looking cameras, electronic detection systems, observation from one or more ground sites, monitoring by patrol or chase aircraft, or a combination thereof (FAA 2001). In addition, coordination, communications, route and altitude procedures, and lost link/mission abort procedures would all have to be identified. Consequently, authorized UAV flights would not present an adverse risk to aviation safety and thus to public health and safety in the ROI.

#### *Alternative 2 (Full Capacity Use with Some Weapons Restrictions)*

*No Impacts*

*Reduction in navigable airspace.* The staging base air assault exercises and the CALFEX exercises associated with Alternative 2 would not reduce the amount of navigable airspace in the MMR ROI and would have similar impacts on those described for Alternative 1.

*Creation of an air navigation obstruction.* Alternative 2 would have impacts similar to those described for Alternative 1.

*New/modified special use airspace.* The staging base air assaults and CALFEX exercises conducted over MMR, together with proposed weapons use, would all be contained within airspace previously used for training. Consequently, no new special use airspace or any modifications to the existing special use airspace would be required for Alternative 2, even though the number of CALFEXs would be greater. Impacts under this alternative are similar to those described for Alternative 1.

*Change to a military training route.* While there are no published military training routes in the ROI, Alternative 2 would not require a change to the existing flight corridors between WAAF and MMR. Impacts are similar to those described for Alternative 1.

*Change in en route airway or IFR procedure.* There are no low altitude en route airways in the MMR ROI. There would be no change to IFR minimum flight altitudes, no special instrument procedures would be required, and VFR operations would not be required to change from a regular flight course or altitude under Alternative 2.

*Restriction of access to airports/airfields.* Access to airports and airfields in the ROI would not be restricted under Alternative 2.

*Change in airport/airfield approach or departure patterns.* No change to any of the approach and departure patterns associated with airports and airfields in the ROI would be necessary under Alternative 2.

*Reduction in public health and safety due to change in aviation safety risk.* Impacts under this alternative are similar to those described for Alternative 1.

#### Alternative 3 (Full Capacity Use with Fewer Weapons Restrictions)

*No Impacts*

Alternative 3 would use a slightly expanded training area, compared to Alternative 2, and training activities similar to those in Alternative 2 would be conducted; therefore, the impacts on airspace under Alternative 3 would be similar to those described for Alternative 2. Aviation activities would be essentially the same as Alternative 2. Use of inert TOW missiles, 2.75-inch rockets, and illumination munitions would not affect use of airspace. No direct adverse impacts on navigable airspace, special use airspace, military training routes, en route airways, or airports and airfields are anticipated. Alternative 3 would not obstruct air navigation in the MMR airspace ROI or adversely affect aviation safety and, thus, public health and safety.

#### Alternative 4 (Full Capacity Use with Fewer Weapons Restrictions), Pōhakuloa Training Area

*No Impacts*

*Reduction in navigable airspace.* Flights in support of CALFEX training under this alternative would not reduce the amount of navigable airspace in the PTA ROI. It is unlikely that a company or brigade would travel to PTA solely to conduct CALFEX training. In most cases, the excessive time and costs associated with moving equipment would lead to

combining of various training requirements, and a longer stay at PTA. It is estimated that infantry companies would extend their time on island for an additional 12 to 15 days to accomplish CALFEX training requirements. As a result, it is expected that there would be no net increase in transportation requirements from O‘ahu to PTA. Troops would continue to be transported primarily via commercial aircraft, with a small percentage moving by military aircraft and marine vessel transportation. There would be an increase in helicopter air traffic within the PTA airspace, primarily between BAAF, which would serve as a staging area, and the CALFEX location.

*Creation of an air navigation obstruction.* Training activities under this alternative would require the construction of a small range control tower (approximately 25 feet [7.6 meters]), but it would not be to a height or at a location that might affect the line-of-sight view of any runways, taxiways, and traffic pattern areas from the air traffic control towers of the airports involved, nor would training have a physical effect on airport approach lighting systems.

*New/modified special use airspace.* No new special use airspace or any modifications to the existing special use airspace would be required under this alternative. All air assault exercises conducted over this training location would be contained within the existing R-3103 restricted area. Restricted areas are designed to contain precisely these kinds of activities.

Potential future UAV flights under Alternative 4 would normally be conducted within the R-3103 restricted area complex. Although the nature and intensity of utilization would vary over time and by individual special use airspace area, the UAV flights would represent precisely the kinds of activities for which the special use airspace was created. As such, the UAV flights would not represent a change in aviation safety risk or an adverse impact on public health and safety.

*Change to a military training route.* Since there are no published military training routes in the ROI, Alternative 4 would require no change to the existing flight corridors between BAAF and the CALFEX range.

*Change in en route airway or IFR procedure.* There would be no change to IFR minimum flight altitudes, no special instrument procedures would be required, and VFR operations would not be required to change from a regular flight course or altitude.

*Restriction of access to airports/airfields.* Access to airports and airfields in the ROI would not be restricted under Alternative 4.

*Change in airport/airfield approach or departure patterns.* No change to any of the approach and departure patterns associated with airports and airfields in the ROI would be necessary under this alternative.

*Reduction in public health and safety due to change in aviation safety risk.* Well-established and understood aviation procedures and rules governing flight operations in both controlled and uncontrolled navigable airspace and special use airspace, coupled with the Army's excellent aviation safety record in Hawai'i, make adverse impacts on public health and safety extremely unlikely.

## 4.3 VISUAL RESOURCES

### 4.3.1 Impact Methodology

This section identifies the method used to assess potential visual resources impacts that could result from implementing the project alternatives. The following methodology was used to determine visual impact assessment for the MMR alternatives. The PTA assessment generally followed this methodology.

The visual impact assessment methodology was based in part on the *Visual Resources Assessment Procedure for US Army Corps of Engineers* (USACE 1988), as well as on other visual resource-related documentation, such as general and specific plans. Visual impacts were assessed by estimating the amount of visual change to the basic visual resource components (water, landform, vegetation, and human-made elements) that could result from the project alternatives. Visual resource components typically are measured in terms of the amount of change in design elements, such as form, line, color, texture, and scale in the landscape. Within this context, the visual changes were evaluated in terms of the degree to which they could be visible to the viewer and the general sensitivity of the view to landscape alterations.

To accurately assess the potential impacts on visual resources at the project site, a standard method was established for evaluating existing conditions and potential visual impacts, and for formulating proposed mitigation measures. This method was composed of a multi-part visual impact assessment process and is outlined below.

Step One—Review visual resources-related documentation for the Islands of O‘ahu and Hawai‘i in general, as well as MMR and PTA in particular, and develop significance thresholds based on estimating the amount of visual change to the basic visual resource components, as a result of the project alternative. Critical viewing points were selected based on anticipated visual exposure from areas accessible to the general public.

Step Two—Conduct field reconnaissance at each of the designated viewing points identified in Step One. At each location, the view was observed and basic visual design components were noted. Also noted were any human-made objects considered unique to the surrounding area. A series of photographs, taken at each of the designated points, was shot from the most likely perspective to be experienced by the viewing public. A rating was applied to each view based on visual sensitivity, as follows:

- High sensitivity views are those that are rare, unique, or in other ways special, such as in remote or pristine areas. Examples of

areas that may have high visual sensitivity include national and state forests and parks, wilderness areas, wild and scenic rivers, and designated scenic trails and overlooks. Human-made environments with visual value and integrity, such as historic districts, can also be highly sensitive.

- Medium sensitivity views are those that are secondary in importance or that are similar to others in the region or locale. The visual character of these areas is likely to have been altered by roadways, vehicles, utility lines, and other structures that contrast with the surroundings. Examples of locations with medium sensitivity include undesignated but protected or popular areas of recreational or cultural significance.
- Low sensitivity views are those where the public can be expected to have little or no concern about changes in the landscape. Little value may be ascribed to the views, or they may be similar to many others in the area. For this EIS, visual sensitivity is considered low for all areas not identified as having medium or high sensitivity.

Step Three—Analyze each series of photographs to determine what was observed from each viewing point and to verify site features noted in Step Two. These panoramas were used to identify the foreground (0 to 0.25 to 0.5 mile [0 to 0.2 to 0.8 kilometer]), middle ground (0.25 to 0.5 to 3-5 miles [0.2to 0.8 to 5-8 kilometers]) and background (3 to 5 miles to infinity [5 to 8 kilometers to infinity]) of each of the views.

Step Four—Identify specific impacts at each site, based on existing and proposed conditions. A determination of severity was applied to each impact, based on the degree to which impacts exceeded the significance thresholds described below. For each of the significant impacts, a mitigation measure was developed. Each mitigation measure was designed to minimize impacts on visual resources during future operations at MMR.

### 4.3.2 Factors Considered for Determining Significance of Impacts

Factors considered in assessing potential impacts on visual resources were set largely by the technical procedures that were used. For this project, procedures were adapted in part from *Visual Resources Assessment Procedure for US Army Corps of Engineer*s (USACE 1988). These procedures outline the visual impact assessment process undertaken for this project. The evaluation of potential impacts was based on the project's potential to alter the visual character of the project area.

Factors considered in determining whether an alternative would have a significant impact on visual resources include the extent or degree to which its implementation would result in any of the following:

- Introduce physical features that are substantially out of character with adjacent developed areas;
- Alter a site so that a sensitive viewing point or vista is obstructed or adversely affected, or if the scale or degree of change appears as a substantial, obvious, or disharmonious modification of the overall view; or
- Be inconsistent with the visual resource policies of the Wai‘anae Sustainable Communities Plan of the General Plan for the City and County of Honolulu and the General Plan for the County of Hawai‘i.

### 4.3.3 Summary of Impacts

Visual impacts related to implementing the alternatives at MMR and PTA would be less than significant. Fugitive dust would cause no visual obstructions outside the installation boundaries. There would be an anticipated increase in fugitive dust at PTA due to range construction and training activities, but this would largely not be visible from surrounding sensitive views. A summary of potential impacts is presented below.

**Summary of Potential Visual Resources Impacts**

| Impact Issues | No Action Alternative | Alternative 1 MMR (Reduced Capacity Use with Some Weapons Restrictions) | Alternative 2 MMR (Full Capacity Use with Some Weapons Restrictions) | Alternative 3 MMR (Full Capacity Use with Fewer Weapons Restrictions) | Alternative 4 PTA (Full Capacity Use with Fewer Weapons Restrictions) |
|---|---|---|---|---|---|
| Modification of existing view, to include the presence/use of training assets | ⊙ | ⊙ | ⊙ | ⊙ | ⊙ |
| Consistency with visual resource policies | ⊙ | ⊙ | ⊙ | ⊙ | ⊙ |
| Alteration of the landscape character, to include construction | ⊙ | ⊙ | ⊙ | ⊙ | ⊙ |
| Impairment of view from visible fugitive dust | ⊙ | ⊙ | ⊙ | ⊙ | ⊙ |

LEGEND:

⊗ = Significant impact

⊘ = Significant impact mitigable to less than significant

⊙ = Less than significant impact

○ = No impact

\+ = Beneficial impact

### *No Action Alternative*

*Less Than Significant Impacts*

*Modification of the existing view.* Under the No Action Alternative, there would be reduced use of the training assets at MMR, some modification of the existing view, and some impacts on the existing view. Aircraft lasing, with semi-permanent structures and targets, and UAV flights would modify the existing view. Additional, less frequent activities that may modify the existing view include units utilizing MMR as a staging base for air and ground assault command and control elements, engineer units conducting road maintenance activities, and limited training using blank ammunition (upon authorization). Potential impacts on visual resources associated with this alternative would be less than significant because no sensitive viewpoints would be altered.

*Consistency with visual resource policies.* No Action would be basically consistent with visual resource policies. Areas within the viewshed of MMR are not listed as significant views and are substantially consistent with the visual preservation objectives stated in the Wai‘anae Sustainable Communities Plan. Training would occur in areas that would not significantly alter views from public roadways or sensitive view areas.

*Impairment of view from visible fugitive dust.* Under No Action, there would be reduced use of the training assets at MMR, very limited generation of visible fugitive dust from training activities, and minimal impacts on the existing view. These visual impacts would be less than significant.

*Alteration of the landscape character.* No Action would allow the vegetation in the training area to reestablish itself, except for parts of the CCAAC. Over time, the visual landscape at MMR would become more consistent with its surrounding areas and neighboring valleys. For aircraft lasing, there would be placement or construction of semi-permanent structures. The placement of these targets or other training features would not alter the nature of the visual landscape. Additionally, most of the training activities would not be visible from potentially sensitive viewing locations due to topography, or current access restrictions, or would occur at such distances as to not be discernable. The potential impact on the landscape character would not be significant.

### *Alternative 1 (Reduced Capacity Use with Some Weapons Restrictions)*

*Less than Significant Impacts*

*Modification of the existing view.* Under Alternative 1, the use of the training assets at MMR would result in the presence of military personnel and equipment for most of the year. The visual impacts from the presence

of aircraft include temporarily adding features to the valley that are not consistent with the natural surroundings. The visual impact from the presence of aircraft would be limited because aircraft would be used at MMR primarily as part of the company-level CALFEXs. While in flight, aircraft would be visible from sensitive viewing locations, such as Mākua Beach, Farrington Highway, and adjacent trails. Although the increased presence of personnel and equipment would temporarily add features to the valley that are not visually consistent with the natural surroundings, most of these features and training activities would not be visible from potentially sensitive viewing locations due to topography or current access restrictions. Impacts on views from Farrington Highway resulting from training activities, such as bivouacking and convoy training, would also be less than significant because they would last only for the duration of each exercise. Nighttime training would not result in increased impacts on existing views, aside from the presence of military personnel and their equipment. Live-fire training with high explosive rounds under this alternative would increase the potential for wildfires and disturbance of soils and vegetated areas. Until vegetation was reestablished, areas burned or left bare as a result of a wildfire or soil and vegetation disturbance would temporarily detract from views (refer to Section 4.8, Geology and Soils, for discussion of soils impacts and Section 4.14, Wildfires, for discussion of wildfire impacts).

The temporary use of MMR for demolitions training under Alternative 1 also would result in additional military presence and its impacts on existing views. Potential impacts on visual resources associated with this alternative would still remain less than significant because no sensitive viewpoints would be altered.

*Consistency with visual resource policies.* Training would occur in areas that would not alter views from public roadways or sensitive view areas and would be substantially consistent with the visual preservation objectives stated in the Wai‘anae Sustainable Communities Plan.

*Alteration of the landscape character.* Implementing Alternative 1 would not involve construction or other substantial modifications in the Mākua Valley. The placement of targets or other training features would not alter the nature of the visual landscape and would be at such distances as to not be discernable; therefore, the potential impact on the landscape character would not be significant.

*Impairment of view from visible fugitive dust.* Under Alternative 1, the use of training assets would result in limited visible fugitive dust. Vehicles would generally travel on existing roads and trails. Helicopter landing areas have partial or full grass cover. Training events that would result in

fugitive dust would be of short duration, and fugitive dust impacts would cease following completion of the exercise. Exposed areas are limited in size at MMR, resulting in minor impacts from wind erosion from these disturbed areas. These visual impacts would be less than significant. Additionally, most of the training activities and resulting fugitive dust would not be visible from potentially sensitive viewing locations due to topography or current access restrictions.

### *Alternative 2 (Full Capacity Use with Some Weapons Restrictions)*

*Less than Significant Impacts*

*Modification of the existing view.* Impacts associated with Alternative 2 would be similar to those described above for Alternative 1. The increased presence of military personnel and their equipment to support up to 50 company-level CALFEXs would modify the existing view. Compared to Alternative 1, the use of tracers and the increased number of high explosive rounds would further increase the chance of wildfires and disturbance of soils and vegetated areas. Potential impacts on visual resources associated with this alternative would still remain less than significant because no sensitive viewpoints would be altered.

*Consistency with visual resource policies.* Impacts associated with Alternative 2 would be similar to those described above for Alternative 1. Training activities would be substantially consistent with the visual preservation objectives of local policies.

*Alternation of the landscape character.* Impacts associated with Alternative 2 would be similar to those described above for Alternative 1. The alteration of the landscape character would not be significant.

*Impairment of view from visible fugitive dust.* Impacts associated with Alternative 2 would be similar to those described above for Alternative 1. Potential impacts would be less than significant.

### *Alternative 3 (Full Capacity Use with Fewer Weapons Restrictions)*

*Less than Significant Impacts*

*Modification of the existing view.* Impacts associated with Alternative 3 would be similar to those described above for Alternative 2. The expanded training area and use of inert TOW missiles, 2.75-inch rocket, and illumination munitions would result in increased impacts on existing views because they would further increase the chance of wildfires and soil and vegetation disturbance as compared to Alternative 2.

*Consistency with visual resource policies.* Impacts associated with Alternative 3 would be similar to those described above for Alternative 2. Training activities conducted under Alternative 3 would be substantially consistent with the visual preservation objectives of local policies.

*Alteration of the landscape character.* Impacts associated with Alternative 3 would be similar to those described above for Alternative 2. The alteration of the landscape character would not be significant.

*Impairment of view from visible fugitive dust.* Impacts associated with Alternative 3 would be similar to those described above for Alternative 1. Potential impacts would be less than significant.

### Alternative 4 (Full Capacity Use with Fewer Weapons Restrictions), Pōhakuloa Training Area

#### Less than Significant Impacts

*Modification of the existing view.* The location of the CALFEX range is such that no change in visual quality is anticipated from implementation of this alternative. Training activities are visible from recreational areas on the higher slopes of Mauna Kea and Mauna Loa, although at such a distance any details are not discernable.

The view from Saddle Road as a traveler enters PTA from the west tends to be open, with little variation in landform, color, or texture. The two primary features of this view are the slopes of Mauna Kea on the left and Mauna Loa on the right, which frame the view. From Saddle Road near the entrance to PTA, from east or west, the CALFEX range would be near or beyond the horizon.

The view from Saddle Road near the cantonment area again is open with little variation of landform, color, or texture. Vegetation is more discernable in the foreground and middle ground areas of the view and tends to obscure human-made features. Several volcanic cones are visible and tend to serve as the dominant landform feature. The slopes of Mauna Loa are visible in the background. From this vantage point, the CALFEX range site would be screened from view from Saddle Road by the terrain.

The view from Saddle Road south and east of the cantonment area is open, although less so than views farther west. The landforms in this area are relatively flat, and color and texture are more varied. The dominant feature is the slope of Mauna Loa in the background. There is essentially no middle ground within this view. The CALFEX site, which lies to the west, would not be discernable.

The view from Saddle Road as the traveler enters PTA from the east is typically open due to the flat terrain, although the terrain is rolling in places due to the lava fields. The colors and textures in this area are dominated by the lava fields. Vegetation is absent or less noticeable. Several volcanic cones are prominent features in the middle ground, and, as in the approach from the west, the slopes of Mauna Kea and Mauna Loa frame the view. The CALFEX range would be beyond the horizon in this view.

The CALFEX range at PTA would be in the Twin Puʻu area. There would be no significant impact on an existing view or landscape. The range site is remote and would not be visible or would be at such a distance from public viewing points (off-post or along Saddle Road) that no significant change in the visual quality of the area would be discernable.

Implementation of this alternative would result in increased training use of nighttime lighting devices, such as flares. However, their use would not be expected to increase dramatically because night vision goggles would be used during nighttime operations in training areas. The increased use of lighting devices for training would mostly be in the WPAA and not in Army areas closest to astronomical facilities and observatories on Mauna Kea, which require dark surroundings during nighttime operations. The Army has not received complaints regarding nighttime light and glare from nearby observatories. Visual impacts would be less than significant with respect to altering nighttime light and glare.

Keʻāmuku *Parcel (also referred to as the West PTA Acquisition Area – WPAA).* The WPAA is in the Waikoloa area, at the western foot of Mauna Kea. It has visual characteristics similar to PTA because of its proximity. Under this alternative, visual impacts would be similar to those for PTA and would be less than significant.

*PTA Trail.* Until the Army could use the PTA Trail, troops and equipment would be transported via convoys on public roadways to access PTA from Kawaihae Harbor. Military trucks and/or Stryker vehicles would use state and county two-lane roads to and from PTA. A convoy would travel on Kawaihae-Waimea Road to Māmalahoa Highway and onto Saddle Road, or on Queen Kaʻahumanu to Waikoloa Road to Māmalahoa Highway onto Saddle Road.

With use of the PTA Trail, troops and equipment would be transported between Kawaihae Harbor and inland to PTA. Trail use by military units would increase and add inconsistent visual elements along the route. Visual impacts would be less than significant due to the intermittent and temporary nature of military vehicles on public highways or the PTA

Trail. Most views along the route would be obscured by vegetation or terrain, and would not be visible from any sensitive view points.

Segment 1 of the route would extend from Kawaihae Harbor adjacent to Highway 19 (also referred to as Queen Kaʻahumanu Highway) to the Highway 19 trail crossing. Military vehicles would use the public roadways in the area, bypassing the Puʻukoholā Heiau National Historic Site. This segment of the route would be visible from residential areas and to motorists on Highway 19 looking north, but would not be visible to visitors of the historic site. Highway 19 is not designated as a scenic route, but the road is highly traveled. This area, especially near Kawaihae Harbor, has been extensively altered.

Segment two of the route would be the PTA Trail and would extend from Highway 19 to the Hawaiʻi Belt Road. This segment of the trail would be visible from Highway 19 looking south, the Hawaiʻi Belt Road looking northwest and southeast, and the Māmalahoa Highway looking north. In addition, the trail alignment would be visible from Waikoloa Road and, in the middle ground, from the village of Waikoloa. The trail would follow existing utility corridors for a portion of this segment after crossing Highway 19. Most of this segment would be open land, consisting of grasses and shrubs, with periodic areas of lava. Much of the trail alignment would not be visible due to low viewing angles, resulting in the trail being screened by vegetation or topography. The views from these roadways are not designated as scenic but are highly traveled. This area is considered to be of high sensitivity due to the expansive views and the lack of cultural modification.

Segment three of the trail would extend from the Hawaiʻi Belt Road to PTA. This segment would be visible from the Hawaiʻi Belt Road looking northwest and southeast, although most of the trail alignment would not be visible because it would be screened by vegetation or topography. Most of this segment is open land, consisting of grasses and shrubs with areas of lava occurring throughout. The views from these roadways are not designated as scenic but are highly traveled. This area is considered to be of high sensitivity due to the expansive views and the lack of cultural modification.

*Consistency with visual resource policies.* Under this alternative, construction and training at PTA would occur in areas that would not alter views from public roadways or sensitive view areas and would be substantially consistent with the visual preservation objectives stated in the General Plan for the County of Hawaiʻi. Because the Army currently uses PTA for weapons qualification and maneuver training, there would

be no significant alteration of land use or requirement to significantly change landform or vegetative cover.

*Alteration of the landscape character.* Under this alternative, a CALFEX range would be constructed at PTA. This would introduce new structures and additional training maneuvers that could be visually incompatible with the surrounding natural features. These features would not be expected to significantly alter the landscape character because they would not involve large changes in land form, would largely be obscured by topography, lava flows, and vegetation, and would be at such distances from sensitive viewing locations that visual detail would be lost.

No construction in the WPAA is anticipated under this alternative. Visual impacts would be similar to those for PTA and would be less than significant.

Impacts from the PTA Trail construction are discussed in the 2004 SBCT EIS. Use of the PTA Trail for units training at the PTA CALFEX range would not significantly affect an existing view or landscape. The CALFEX range would not be visible from surrounding sensitive viewing areas.

*Impairment of view from visible fugitive dust.* As discussed in Sections 4.4, Air Quality, and 4.8, Geology and Soils, training at PTA would increase fugitive dust. Vehicles traveling on unpaved roads would be an ongoing intermittent source of fugitive dust emissions. Wind erosion from areas disturbed by vehicle maneuver activity would be an additional permanent source of fugitive dust emissions. Under this alternative, dismounted maneuver training would be conducted. Vehicles would be largely confined to existing roads and trails, minimizing visible fugitive dust. Although winds would create visible fugitive dust clouds, the concentration of dust would quickly diminish. Additionally, the training areas are largely outside the public viewshed. Implementation of the fugitive dust and soil mitigation measures identified in Sections 4.4, Air Quality, and 4.8, Geology and Soils, would minimize soil erosion and compaction. As a result, visual impacts from visible fugitive dust would be less than significant.

## 4.4 AIR QUALITY

### 4.4.1 Impact Methodology

This section is an analysis of the potential project impacts on air quality relative to criteria pollutants, and hazardous air pollutants (HAPs). Air quality impacts have been evaluated in terms of emissions associated with the project alternatives. Primary sources of emissions include ordnance use, aircraft use (mostly helicopters plus limited use of UAVs), and military vehicle use.

Emission estimates related to ordnance use are based on EPA and DoD studies of ordnance detonation and demolition activities, and are supplemented by available information on the chemical composition of ordnance items. Data obtained from air sampling programs during recent CALFEX events have been incorporated into the evaluation of air quality impacts from training exercises. Emissions associated with aircraft and helicopter operations have been estimated using methodologies developed by the Navy Aircraft Environmental Support Office. Generalized estimates of aircraft and helicopter activity associated with training exercises have been developed based on observations during CALFEX events. Exhaust emissions from military vehicle use have been estimated from EPA data for off-road vehicles and engines.

Because the number, size, duration, and intensity of accidental wildfires cannot be predicted with any accuracy, smoke from wildfires has been discussed in a qualitative manner. Data obtained from air quality sampling of a prescribed burn at MMR has been incorporated into the evaluation.

For regulatory purposes, EPA and states prefer that actual source testing of emissions be conducted. Recognizing the time and cost associated with such source testing, EPA recommends the following:

- Using EPA Report AP-42 for listed emission factors;
- Estimating emissions based on source testing of similar equipment; or
- Extrapolating factors provided for similar types of source categories.

The best available data were used in conjunction with the above-published sources for comparable equipment. For some emission sources, such as the Stryker and other typical off-road vehicles, emission factors were extrapolated from known emission factors for equipment of similar horsepower ratings, sizes, and activity categories.

Sources used for calculating air emission are as follows:

- Mobile Emissions, AP-42 (EPA 1998a);
- AP-42 Vol. II, Appendix H (EPA 1998b);
- Emission Factors for Turboshaft Engines (AESO 1999a);
- Summary Tables of Gaseous and Particulate Emissions from Aircraft Engines (AESO 1999b); and
- Construction Engineering Research Laboratory Report TR-01-50 (Construction Engineering Research Laboratory 2001).

Estimated criteria pollutant emissions have been evaluated by comparing them to the CAA conformity rule *de minimis* thresholds for maintenance areas (even though the rule is not applicable to federal agency actions in Hawai‘i because the island is in attainment for all criteria pollutants).

### 4.4.2 Factors Considered for Determining Significance of Impacts

Major factors considered in determining whether the project alternatives would have a significant impact on air quality include the following:

- Frequency of relatively high emissions;
- Likelihood of emissions to cause or contribute to a violation of federal or state ambient air quality standards;
- Potential for hazardous air pollutants to exceed state standards or other hazardous air pollutant exposure guidelines at locations accessible to the general public; and
- Potential for fugitive emissions to cause exceedances or visual obstructions outside the installation boundaries.

### 4.4.3 Summary of Impacts

None of the proposed alternatives would generate sufficient emissions of criteria pollutants to violate any of the NAAQS. However, all alternatives would result in minor adverse impacts on air quality that are unavoidable and irreversible.

Fugitive dust generated by training under all alternatives would generally be dispersed due to the winds in the area. Training activities conducted under these alternatives would not be expected to result in exceedances of fugitive dust standards outside the boundaries of the installation. Since off-road activity would be minimal under all alternatives, exceedances of fugitive dust standards would not be expected.

**Summary of Potential Air Quality Impacts**

| Impact Issues | No Action Alternative | Alternative 1 MMR (Reduced Capacity Use with Some Weapons Restrictions) | Alternative 2 MMR (Full Capacity Use with Some Weapons Restrictions) | Alternative 3 MMR (Full Capacity Use with Fewer Weapons Restrictions) | Alternative 4 PTA (Full Capacity Use with Fewer Weapons Restrictions) |
|---|---|---|---|---|---|
| Emissions from aircraft use | ⊙ | ⊙ | ⊙ | ⊙ | ⊙ |
| Emissions from ordnance use | ○ | ⊙ | ⊙ | ⊙ | ⊙ |
| Emissions from military vehicle use | ⊙ | ⊙ | ⊙ | ⊙ | ⊙ |
| Fugitive dust from military vehicle use | ⊙ | ⊙ | ⊙ | ⊙ | ⊙ |
| Fugitive dust from range construction activities | ○ | ○ | ○ | ○ | ⊘ |
| Wind erosion from disturbed areas | ○ | ⊙ | ⊙ | ⊙ | ⊘ |
| Emissions from wildfires | ○ | ⊙ | ⊙ | ⊙ | ⊙ |

LEGEND:
⊗ = Significant impact
⊘ = Significant impact mitigable to less than significant
⊙ = Less than significant impact
○ = No impact
+ = Beneficial impact

All proposed alternatives would generate small quantities of air pollutants that would not be significant.

### *No Action Alternative*

*Less than Significant Impacts*

Under No Action, there would be no live-fire training at MMR. Because there would be no use of ordnance and a reduced level of vehicles, there would be little increase in air emissions or fugitive dust above existing ambient conditions.

### *Alternative 1 (Reduced Capacity Use with Some Weapons Restrictions)*

*Less than Significant Impacts*

*Emissions from aircraft use.* Aircraft use associated with training exercises at MMR involves OH-58D helicopters, UH-60 helicopters, CH-47 Chinook helicopters, and the Shadow 200 UAV. The CH-47 helicopter

would transport troops and equipment into MMR for each CALFEX, resulting in 228 total sortie hours for Alternative 1. The OH-58D and UH-60 helicopters would perform assault attack and observation exercises, resulting in sortie flying time of 240 hours for the UH-60 and 270 hours for the OH-58 for 10 CALFEXs; and 456 hours for the UH-60 and 513 hours for the OH-58 for 19 CALFEXs. These hours represent total flying time to include overflights and hovering activities. The Shadow UAV is a 39-horsepower rotary engine aircraft that produces less than half of the emissions of a helicopter. The small size of MMR limits the numbers of helicopters that could participate at one time in any given exercise. As shown in Table 4.4-1, aircraft emissions associated with 19 CALFEXs would not have a significant adverse impact on air quality. These emissions would not violate NAAQS or other CAA standards, rules, or regulations.

*Emissions from ordnance use.* Under Alternative 1, squad, section, and platoon maneuver live-fire, demolitions training, sniper training, and staging base air assaults would occur in addition to the 10 or 19 CALFEXs. Ordnance use during live-fire training would vary with the type and design of the exercise. Emissions for the detonation and /or combustion of organic energetic compounds in Army munition items result in the bulk of emissions produced being carbon monoxide, carbon dioxide, and total suspended particulates (TSP).

**Table 4.4-1**
**Estimated Criteria Pollutants Emitted for 19 CALFEXs (tons/year)**

| Item | Number or Use | NOx | VOC | CO | $PM_{10}$ | SOx |
|---|---|---|---|---|---|---|
| HMWVV | 6,912 hours | 0.308 | 0.096 | 0.362 | 0.041 | 0.048 |
| Medium tactical vehicles/vans | 3,876 hours | 0.087 | 0.027 | 0.136 | 0.017 | 0.017 |
| Blackhawk | 456 sortie hours | 0.406 | 0.090 | 1.254 | 0.365 | 0.365 |
| Warrior | 513 sortie hours | 0.401 | 0.401 | 1.650 | 0.416 | 0.389 |
| Chinook | 228 sortie hours | 0.381 | 0.119 | 1.197 | 0.057 | 0.017 |
| Shadow UAV | 228 sortie hours | 0.114 | 0.399 | 0.399 | 0.046 | 0.026 |
| Small arms ammunition | 658,597 rounds | 0.005 | 0.001 | 0.002 | 0.003 | 0.000 |
| Grenades (frag/smoke) | 874 | 0.002 | 0.002 | 0.003 | 0.003 | 0.002 |
| 60mm inert mortar | 874 | 0.002 | 0.002 | 0.002 | 0.002 | 0.001 |
| 155mm HE howitzer | 3,564 | 0.031 | 0.031 | 0.032 | 0.042 | 0.003 |
| 120mm HE mortars | Unknown | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| HE mortars/howitzers (60mm, 81mm, 105mm) | 2,012 | 0.014 | 0.001 | 0.002 | 0.001 | 0.001 |
| Bangalore, claymore | 228 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 |
| Shape, crater, and C4 charges | 197 | 0.004 | 0.003 | 0.003 | 0.003 | 0.002 |
| Javelin AT-4 anti-tank rockets | 95 | 0.003 | 0.002 | 0.003 | 0.003 | 0.001 |
| **Totals** | | **1.828** | **1.194** | **5.122** | **1.040** | **0.884** |

Source: Tetra Tech
Note: Small arms weapons include M24, M249, M16A2, M4, M240, M2, MK19, and .50-caliber machine gun.

Based on the general nature of detonation processes and the very low emission rates that have been published in studies of munitions firing and open detonations, emissions associated with ordnance use at MMR are expected to pose very little risk of creating adverse air quality impacts. Table 4.4-1 shows the emissions of criteria pollutants from munitions used for 19 CALFEXs. Emissions from ordnance use would have a less than significant impact under Alternative 1.

*Emissions from military vehicle use.* Vehicle support of training activities at MMR is limited primarily to logistical and support vehicle traffic. Tactical vehicle operations are limited to established roads and trails. Vehicle travel between MMR and other installations would be along public roadways, in compliance with vehicle convoy restrictions. Small numbers of tactical vehicles and trucks would travel on unpaved roadways within MMR, but the volume of this traffic would be limited.

The emissions from military vehicle use at MMR are shown in Table 4.4-1 for mobile sources for 19 CALFEXs. Calculations show less than significant impacts on air quality under Alternative 1. Emissions are calculated based on hours of use rather than miles driven to capture the best estimate of vehicle use and to account for idling and stationary time in the field.

*Fugitive dust from military vehicle use.* Because vehicle activity on unpaved roads and other unpaved areas would be limited at MMR, fugitive dust generation from military vehicle activity would be a less than significant impact under Alternative 1. Vehicle travel on unpaved roads and in off-road areas is limited at MMR, and most helicopter landing areas have partial or full grass cover. Consequently, fugitive dust from vehicle and helicopter activity is a minor air quality issue. Off-road vehicle maneuvers do not occur at MMR, so wind erosion from disturbed areas also is a minor issue.

*Wind erosion from disturbed areas.* Large exposed soil areas are limited at MMR. While Alternative 1 would increase the disturbance of soils and vegetation, erosion of soils by wind is not considered to be a significant impact.

*Emissions from wildfires.* Alternative 1 would use artillery during day and night training, resulting in the potential to start wildfires. Army helicopters would be on-site as a dedicated fire fighting resource in case a fire should start. Current wildfire control programs at MMR would limit the size of any wildfires that do start, so emissions from wildfires are expected to have a less than significant impact under Alternative 1.

### *Alternative 2 (Full Capacity Use with Some Weapons Restrictions)*

*Less than Significant Impacts*

*Emissions from aircraft use.* Under Alternative 2, the frequency of aircraft use would increase relative to Alternative 1. Table 4.4-2 presents the expected air quality pollutant emissions from aircraft use for 50 CALFEXs. The emissions are approximately twice the amount of those estimated under Alternative 1. As in the case of Alternative 1, these emissions would not violate NAAQS or other CAA standards, rules, or regulations; thus, the impacts on air quality resulting from aircraft use would not be significant under Alternative 2.

*Emissions from ordnance use.* Impacts under Alternative 2 would be similar to those described for Alternative 1. The increase in the level of activity associated with 50 CALFEXs would approximately double the emissions generated under Alternative 1. These emissions are shown in Table 4.4-2. The resultant impacts from munitions use under Alternative 2 would still be less than significant because there would be no violation of NAAQS or other CAA standards, rules, or regulations.

*Emissions from military vehicle use.* Impacts under Alternative 2 would be similar to those described for Alternative 1. The emissions from military vehicle use at MMR under Alternative 2 are shown in Table 4.4-2. Although these emissions approximately double the emissions of Alternative 1, they would not violate any NAAQS or other CAA standards, rules, or regulations; thus, these emissions would still result in a less than significant impact on air quality under Alternative 2**.** The emissions for the Stryker are included in these tables. The Stryker is a 19-ton vehicle (combat weight) with a 350-horsepower heavy duty diesel engine. Estimates for Stryker emissions are based on comparable emission factors for heavy duty off-road diesel trucks from AP-42. Use of the Stryker at MMR would be limited.

*Fugitive dust from military vehicle use.* Impacts under Alternative 2 would be similar to those described for Alternative 1.

**Table 4.4-2**
**Estimated Criteria Pollutants Emitted for 50 CALFEXs (tons/year)**

| Item | Number and Use | NOx | VOC | CO | $PM_{10}$ | SOx |
|---|---|---|---|---|---|---|
| HMWVV | 18,189 hours | 0.409 | 0.127 | 0.482 | 0.055 | 0.064 |
| Stryker | 7,579 hours | 0.182 | 0.053 | 0.200 | 0.114 | 0.038 |
| Medium tactical vehicles/vans | 15,158 miles | 0.341 | 0.106 | 0.530 | 0.068 | 0.068 |
| Blackhawk | 1,200 sortie hours | 1.068 | 0.239 | 3.300 | 0.960 | 0.960 |
| Warrior | 1,200 sortie hours | 1.050 | 1.050 | 4.320 | 1.080 | 1.020 |
| Chinook | 600 sortie hours | 1.002 | 0.315 | 6.300 | 0.150 | 0.090 |
| Shadow | 600 sortie hours | 0.300 | 1.050 | 1.050 | 0.120 | 0.069 |
| Small arms ammunition | 1,733,150 rounds | 0.009 | 0.004 | 0.005 | 0.005 | 0.004 |
| Grenades (frag/smoke) | 2,300 | 0.008 | 0.008 | 0.019 | 0.019 | 0.012 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 60mm inert mortar | 2,300 | 0.006 | 0.006 | 0.006 | 0.005 | 0.002 |
| 155mm HE howitzer | 9,720 | 0.090 | 0.090 | 0.090 | 0.130 | 0.005 |
| 120mm HE mortar | 2,000 | 0.020 | 0.020 | 0.017 | 0.002 | 0.002 |
| HE mortars/howitzers (60mm, 81mm, 105mm) | 5,720 | 0.060 | 0.004 | 0.070 | 0.003 | 0.003 |
| Bangalore, claymore | 600 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 |
| Shape, crater, and C4 charges | 290 | 0.005 | 0.005 | 0.005 | 0.005 | 0.005 |
| Javelin, inert TOW missiles, AT-4 anti-tank rockets | 3,050 | 0.100 | 0.080 | 0.080 | 0.080 | 0.040 |
| **Totals** | | **4.653** | **3.160** | **16.477** | **2.799** | **2.385** |

Source: Tetra Tech
Note: Small arm ammunitions include M24, M249, M16A2, M4, M240, M2, MK19 and .50-caliber machine gun.

*Wind erosion from disturbed areas.* Impacts under Alternative 2 would be similar to those described for Alternative 1.

*Emissions from wildfires.* Alternative 2 would include the use of tracers, which are a potential source of wildfire ignition on training ranges. Helicopters would be on standby to suppress training-induced wildfires, and MMR's wildfire control programs are expected to limit the size of any wildfires that do start; therefore, emissions from wildfires at MMR would be expected to have a less than significant impact under Alternative Alternative 2.

### Alternative 3 (Full Capacity Use with Fewer Weapons Restrictions)

#### Less than Significant Impacts

*Emissions from aircraft use.* Impacts under Alternative 3 would be similar to those described for Alternative 2.

*Emissions from ordnance use.* Impacts under Alternative 3 would be similar to those described for Alternative 2. In addition to the emissions shown in Table 4.4-2, illumination munitions, 2.75-inch rockets, and inert TOW missiles would be used under this alternative. The quantities of these weapons used would still not violate any federal or state NAAQS standard, rule, or regulation; thus, the resultant impacts from all ordnance use under Alternative 3 would still be less than significant.

*Emissions from military vehicle use.* Impacts under Alternative 3 would be similar to those described for Alternative 2.

*Fugitive dust from military vehicle use.* Impacts under Alternative 3 would be similar to those described for Alternative 2.

*Wind erosion from disturbed areas.* Impacts under Alternative 3 would be similar to those described for Alternative 2.

*Emissions from wildfires.* Alternative 3 would include the use of tracers, inert TOW missiles, 2.75-inch rockets, and illumination munitions, which are potential sources of wildfire ignition on training ranges. Helicopters would be on standby to suppress wildfires, and MMR's wildfire control programs are expected to limit the size of any wildfires that do start; consequently, emissions from wildfires at MMR are expected to have a less than significant impact under Alternative 3.

### Alternative 4 (Full Capacity Use with Fewer Weapons Restrictions), Pōhakuloa Training Area

*Significant Impacts Mitigable to Less Than Significant*

Although the State is in a $PM_{10}$ attainment area under the CAA, the Island of Hawai'i and the surrounding land at PTA have experienced discrete events in which dust impacts have had adverse effects. Unlike MMR, which has partial or full vegetative cover, the alternative training area at PTA is much less vegetated and would be more susceptible to fugitive dust from range construction and wind erosion.

*Impact 1: Fugitive dust from construction activities.* Construction of a CALFEX range at PTA would temporarily increase fugitive dust emissions from activities near the range construction site. Construction contractors would comply with the provisions of Hawai'i Administrative Rules, Sec. 11-60.1-33 on Fugitive Dust as part of the requirements of construction contracts. Consequently, impacts from range construction at SBMR and PTA would be significant but mitigable to less than significant.

*Impact 2: Wind erosion from disturbed areas.* PTA soil substrates are primarily fine, volcanic ash prone to wind erosion and dust generation. Training activities would reduce or eliminate vegetative cover in some sections of the training area, resulting in increased susceptibility to emissions from vehicle travel and wind erosion. $PM_{10}$ would be generated by these actions from the affected area. These emissions could be significant if not mitigated.

*Mitigation 1:* The Army would develop and implement a DuSMMoP covering the affected training areas. The plan would address measures including, but not limited to, restrictions on the timing or type of training during high-risk conditions, vegetation monitoring, dust monitoring and control measures, soil monitoring, and buffer zones to minimize dust emissions in populated areas. The plan would determine how training would occur in order to minimize fugitive dust emissions below CAA standards for $PM_{10}$ and soil erosion and compaction. The Army would monitor the effects of training activities to ensure that emissions stay within the acceptable ranges as predicted and environmental problems do

not result from excessive soil erosion or compaction. The plan would also define contingency measures to mitigate the effects of training activities that exceed the acceptable ranges for dust emissions or soil compaction.

*Mitigation 2:* In addition to the DuSMMoP, the Garrison's ITAM program would substantially mitigate potential wind erosion problems by providing management tools that would help limit damage to vegetation as a result of training activities.

### Less than Significant Impacts

*Fugitive dust from military vehicle use.* On PTA, limited off-road driving is permitted or practical in areas with rugged terrain, lava flows, and limited trafficability. Dust is most problematic when traffic disturbs fine lava, which is often created by repeated military vehicular traffic on fine lava cinder roads. Dust increases vehicle maintenance costs, and it can create "brownout" conditions at helicopter landing zones.

Data from the January 2006 through June 2007 air-quality monitoring for particulate matter at PTA suggest maneuver training itself is unlikely to result in significant impacts. The data indicate that, even during maneuver training, concentrations of TSP and $PM_{10}$ along PTA's boundary are well below federal and state 24-hour and annual average standards (US Army and USACE 2004). Consequently, generation of fugitive dust during dismounted maneuver training is of less concern than fugitive dust generated from mounted maneuver training where many more vehicle miles are driven.

*Emissions from aircraft use.* Aircraft use and the associated emission impacts associated with Alternative 4 and CALFEX training exercises at PTA would be substantially similar those described for Alternatives 2 and 3.

*Emissions from ordnance use.* Impacts under Alternative 4 would be similar to those described for Alternatives 2 and 3. The quantities of these weapons used would not violate any federal or state NAAQS standard, rule, or regulation; thus, the resultant impacts from all ordnance use under Alternative 3 would still be less than significant.

*Emissions from wildfires.* Alternative 4 would include the use of tracers, inert TOW missiles, 2.75-inch rockets, and illumination munitions, which are potential sources of wildfire ignition on training ranges. The alternative CALFEX range at PTA would be oriented towards pre-existing ordnance impact areas. Increases in both live and nonlive-fire training would result in the potential to increase the frequency of wildfires. Current wildfire control programs at PTA (detailed in the IWFMP) would

limit the size of any wildfires that were to ignite. Because of its location far from most population centers, PTA has few sensitive receptors within a reasonable distance. Thus, emissions from wildfires would be expected to have a less than significant impact under Alternative 4.

# 4.5 NOISE

## 4.5.1 Impact Methodology

Noise impacts associated with project alternatives have been evaluated using available noise data for various weapons types, available monitoring data for actual live-fire training exercises, and modeling analyses for various types of noise sources. Major noise sources associated with the Proposed Action include ordnance firing and detonation, demolitions training, and helicopters supporting training exercises. This section is a discussion of noise impacts from aircraft, ordnance, and military vehicle use. The analysis in this section addresses both average noise levels and peak noise levels expected from individual sources. Sections 4.1 and 4.9 provide discussions of noise impacts related to recreation and biological resources.

US Army CHPPM has recently estimated annual average CDNL contours for heavy (or large caliber) weapons firing at MMR, using the computer model, BNOISE2. Analyses were based on the data provided in Table 2-5 and produced CDNL contours based on a representative level of training under each of the alternatives. The use of shape and cratering charges was included in the analysis. The type of cratering charge analyzed, 40 pounds (18 kilograms) of B4, which contains various mixtures of RDX and TNT, may differ from the type of cratering charge actually used. The Army may detonate cratering charges containing up to 150 pounds (68 kilograms) of ammonium nitrate. The maximum charge that the Army would detonate in a single explosion during training exercises is 300 pounds (136 kilograms) of ammonium nitrate. This variability in the type of cratering charge used does not affect the results of the CDNL contours, but it does determine the loudness of individual noises. The use of ammonium nitrate at the levels indicated would produce a louder noise level than the use of B4 at the amount analyzed.

Flyover measurements from studies conducted by the Air Force, Army, FAA, and Navy were used for noise modeling of helicopter operations.

## 4.5.2 Factors Considered for Determining Significance of Impacts

Results from noise monitoring, noise source modeling, and studies have been compared to various standards and guidelines in order to evaluate the significance of predicted noise levels. The noise criteria considered include State of Hawai‘i community noise standards (Hawai‘i Administrative Rules, Title 11, Chapter 46), Army land use compatibility guidelines (US Army 1997a; US Departments of the Air Force, the Army, and the Navy 1978), and Army CHPPM guidelines for evaluating the significance of short-term blast noises (US Army CHPPM 2001). The noise evaluations have considered both long-term average noise level

conditions and short-term noise levels associated with discrete noises. Other relevant noise exposure conditions (such as time of day, background noise levels, the repetition pattern of brief noises, and the duration of individual noises) have also been considered in evaluating noise impacts. Specific considerations used in evaluating the significance of noise impacts include the following:

- Whether or not land use compatibility problems would be created in terms of DoD guidelines, as outlined in DA PAM 200-1 (see Section 3.5); and
- Whether impulse or other short-term noise levels would be likely to cause significant annoyance to exposed individuals at locations accessible to the general public.

### 4.5.3 Summary of Impacts

Noise contour maps prepared for the alternatives demonstrate that Alternatives 1, 2, and 3 would result in Zone III noise contours (greater than 70 dBC) extending over Mākua Beach and the coastal waters. The Zone III contour would extend about 1 mile (1.6 kilometers) over the water for Alternative 2 and 1.25 miles (2 kilometers) for Alternatives 3. Based on the guidelines set forth for land use planning purposes in DA PAM 200-1, the projected noise levels from training under the three live-fire alternatives would not be compatible with recreational use of the beach. The noise generated from squad, section, platoon, and company-level troop training is mostly contained within the ridges that form the MMR boundaries.

The summary of potential noise impacts is based primarily on peak noise levels from different types of noise sources. Note that peak noise events from different types of noise sources would not occur simultaneously. Aircraft flights would not occur over MMR while artillery or mortars are being fired or while demolition charges are being detonated. Also, vehicle traffic to and from MMR occurs primarily before and after a live-fire training.

As described in Section 3.5.3, Hawai‘i’s community noise standards are not applicable to the Proposed Action because training activity noise is generated by mobile and not stationary sources. Impulse blast noise may occasionally range from 80 to 130 dBP on the beach, generating a startling short-term impact for humans and wildlife.

**Summary of Potential Noise Impacts**

| Impact Issues | No Action Alternative | Alternative 1 MMR (Reduced Capacity Use with Some Weapons Restrictions) | Alternative 2 MMR (Full Capacity Use with Some Weapons Restrictions) | Alternative 3 MMR (Full Capacity Use with Fewer Weapons Restrictions) | Alternative 4 PTA (Full Capacity Use with Fewer Weapons Restrictions) |
|---|---|---|---|---|---|
| Noise from rotary-wing aircraft | ⊙ | ⊙ | ⊙ | ⊙ | ⊙ |
| Noise from fixed-wing aircraft | ⊙ | ⊙ | ⊙ | ⊙ | ⊙ |
| Noise from military vehicle use | ⊙ | ⊙ | ⊙ | ⊙ | ⊙ |
| Noise from ordnance use | ○ | ⊗ | ⊗ | ⊗ | ⊙ |
| Noise from demolitions training | ○ | ⊙ | ⊙ | ⊙ | ⊙ |
| Noise from construction activities | ○ | ○ | ○ | ○ | ⊙ |

LEGEND:

⊗ = Significant impact

⊘ = Significant impact mitigable to less than significant

⊙ = Less than significant impact

○ = No impact

\+ = Beneficial impact

Appendix G-4 contains noise tables, with data from recently conducted CALFEXs, showing that there have been peak periods when impulse noise reached 100 dBP at the beach. However, these impulse noise levels do not account for the use of new training munitions, including shape and cratering charges used in demolitions training.

The peak impulse blast noise level at the beach resulting from cratering and shape charges would measure between 113 and 130 dBP. A 150-pound (68-kilogram) charge of ammonium nitrate buried 3.3 feet (one meter) in the ground at the MMR ordnance impact area would result in a noise level of 120 dBP at Mākua Beach (one mile [1.6 kilometers] from the impact site). A 40-pound (18-kilogram) shape charge exploding on the surface at the MMR ordnance impact area would result in a noise level at the beach (one mile [1.6 kilometers] from the ordnance impact site) of approximately 128 dBP. These data are summarized in Table 4.5-1.

**Table 4.5-1**
**Estimated Noise Levels (dBP) for Shape and Cratering Charges**

| Distance | 15-pound (6.8-kilogram) Shape Charge | 40-pound (18-kilogram) Shape Charge | 150-pound (68-kilogram) Cratering Charge | 300-pound (136-kilogram) Maximum Charge |
|---|---|---|---|---|
| | Surface detonation | Surface detonation | Buried 3.3 feet (1 meter) | Buried 6.6 feet (2 meters) |
| 1 mile (1,600 meters) | 127 | 128* | 120 | 125 |
| 2 miles (3,200 meters) | 120 | 124** | 113 | 118 |

*Distance of 1.2 miles (2,000 meters)
**Distance of 1.9 miles (3,000 meters)

The noise from munitions is momentary, while noise from helicopters and other mobile sources is more continuous due to the nature of their respective sound wave properties. With mobile sources, increasing noise from the approaching source provides a warning that allows one to prepare for the increase in noise. With munitions, there is no warning, as the noise is instantaneous. Loud blast noise startles people and causes more annoyance than mobile sources due to the fact that one cannot anticipate the impulse noise. Continuous exposure to long periods of blast noise with peak level exposures of 128 dB would approach the threshold of pain for many people. However, most of the high-level impulse noise from cratering charges and mines would occur during the early morning hours and late evening hours when the beach is less likely to be occupied.

The intermittent periods of approximately 113 dB to 130 dB impulse blast noise would be infrequent. Demolitions training is estimated to take place about 50 to 60 times per year. It may be conducted once a day during a CALFEX week or independent of a CALFEX. Public notification using available media before training exercises generating high noise levels would minimize this short-term adverse annoyance impact on beach goers. Additionally, if the training activity involving shape and cratering charges were to be conducted in the early morning or late evening, the beach population would be lower, resulting in fewer annoyance complaints from the beach goers.

Helicopters would fly directly over the beach during training. If training were to occur five days a week, this would result in 60 overflights per week. Beach goers would hear the helicopter noise for approximately one minute during each flyover, resulting in 60 minutes of overflight per

training week. This would average 12 overflights each training day of a training week. Each overflight would expose beach goers to an SEL noise level of 88 dB.

The helicopter hovering time would be approximately three to four half-hour periods during the estimated five to six hours for each training week. These short hovering periods would result in peak and average noise levels at Mākua Beach of approximately 65.3 dBA while the helicopter is hovering. This contribution to the change in ADNL would be less than one percent. During nighttime exercises (those exercises conducted from 10:01 PM to 6:59 AM), direct flyovers would result in less than one minute of an SEL of 99.9 dB at the beach; the representative ADNL would be approximately 56.3 dBA. The noise from this helicopter activity would not generate noise complaints greater than expected. Most of the exercises are estimated to occur on weekdays in the early morning when fewer beach goers would be present.

Table 4.5-2 indicates the calculated noise levels resulting from CALFEX helicopter operations for each alternative. The number of annoyance complaints is not expected to increase above what is expected historically since the noise exposure to beach goers would be infrequent (six hours per week) rather than periodic (25 hours per week) or continual. During the estimated six hours of weekly operations, the maximum flyover noise level of 88 dBA would be for 20 to 25 minutes.

**Table 4.5-2**
**Summary of Helicopter Noise Levels (dBA) at Mākua Beach for Each Alternative**

| Alternative | Number of CALFEXs | Number of Helicopter Overflights per Week | SEL for Each 1-Minute Flyover Measured at Mākua Beach |
|---|---|---|---|
| No Action | 0 | 10 | 88 dBA |
| Alternative 1 | 10 to 19 | 32 | 88 dBA |
| Alternatives 2 and 3 | Up to 50 | 32 | 88 dBA |

Hikers on the outside ridges surrounding MMR would experience infrequent impulse noise resulting from training. The infrequent periods of heavy artillery training and the small number of hikers would result in a less than significant impact on the hikers. Local area hikers could be forewarned of heavy artillery and military noise in the area by postings or notification at the check-in trail points. The noise hikers would experience would be impulse blast noise, and the receptors, in addition to humans, would be wildlife on and near MMR.

The Army studied the effects of military training noise on the red-cockaded woodpecker (USACE/ERDC 2001). Results indicated that the woodpeckers did not flush when large-caliber guns were fired at a distance greater than 1,000 feet (305 meters) or small caliber guns were fired at greater than 220 feet (67 meters) from their nests. The study concluded that helicopter overflights at 88 dBA did not cause the woodpeckers to flush, suggesting that the birds seem to have adjusted to the military training environment in which they live. The activities at MMR are similar to the activities in the study, so one could conclude that birds at MMR adjust similarly to the training activities. Additionally, the Army funded a study to determine the effects of artillery noise on the O‘ahu subspecies of the ‘elepaio (*Chasiempis sandwichensis*) (VanderWerf et al. 2000). The study conducted at SBMR investigated the effects of noise from the 155mm and 105mm howitzers, 81mm and 60mm mortars, and hand grenades. Results demonstrated that the ‘elepaio nesting behavior was not significantly affected and the population was not seriously disturbed by artillery training. Furthermore, nesting attendance and nestling provisioning rates during periods of firing at SBMR were similar to rates in Honouliuli, where there is no military training.

### No Action Alternative

#### Less than Significant Impacts

Under No Action, there would be less than significant noise impacts from aircraft and vehicles. The impacts would be similar to those described for “noise from rotary-wing aircraft,” and “noise from military vehicle use,” under Alternative 1.

### Alternative 1 (Reduced Capacity Use with Some Weapons Restrictions)

#### Significant Impacts

*Impact 1: Noise from ordnance use.* Alternative 1 would include squad, section, and platoon maneuver live-fire and sniper training, in addition to 10 to 19 CALFEXs per year. As shown in Figure 4.5-1, the noise generated by these activities would exceed the planning use guidelines established in DA PAM 200-1, resulting in a significant impact. No mitigation measures have been identified to reduce the magnitude of this impact.

Table 2-5 lists the expenditure of weapons planned for MMR. Based on the noise contours generated by the level of ordnance use under Alternative 1 for 10 to 19 CALFEXs, Mākua Beach and the coastal waters (out to approximately 0.5 mile [0.8 kilometer]) would be within Zone III. Zone III is considered incompatible with residential, school, and hospital noise sensitive receptors and with recreational use. While there are no schools, hospitals, or nursing homes within the Zone III contour for MMR, Mākua Beach, a recreational area, is within the zone.

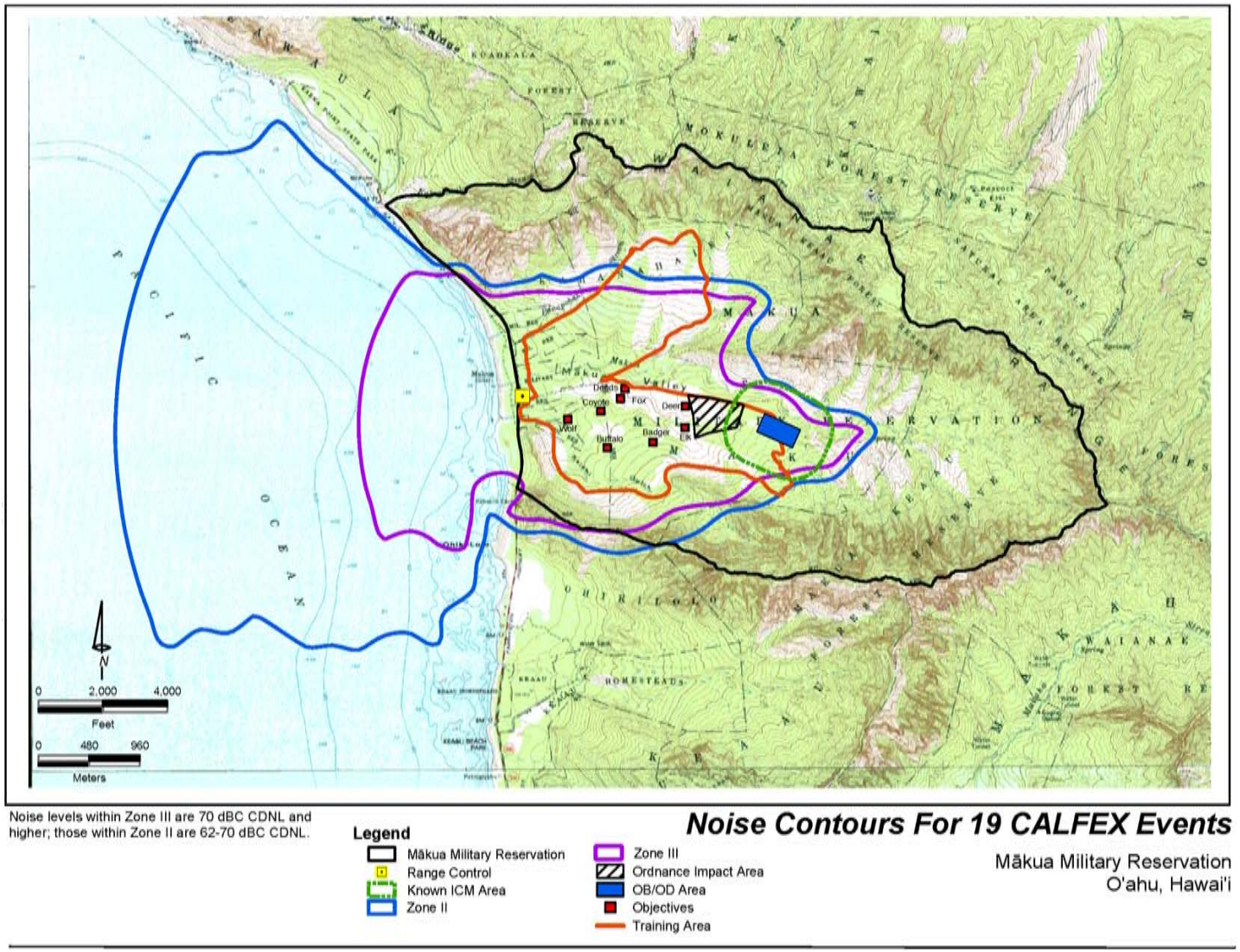



**Figure 4.5-1 Noise Contours for 19 CALFEX Events**

### Less than Significant Impacts

*Noise from rotary-wing aircraft.* Under Alternative 1, use of helicopters would be limited to CALFEX training. Helicopters would transport equipment and troops to and from MMR and would be used in air assault exercises. Most helicopter landing areas at MMR are close to the administrative trailer area at the western edge of the reservation, so helicopters cross Mākua Beach and Farrington Highway at low altitudes when arriving at or departing from MMR. In addition, helicopters can hover at low altitudes for various periods of time along the western side of MMR. The command and control helicopter also hovers over the water approximately 0.25 to 0.5 mile (0.4 to 0.8 kilometer) offshore, and at times 1 mile (1.6 kilometers) at 1,000 feet (305 meters) above sea level during training.

Periods of infrequent helicopter flights across Mākua Beach would occur for five to six hours each week for each of the 19 CALFEX weeks. During each CALFEX week, helicopters would make a total of 32 beach overflights, with 18 occurring during the live-fire day. Of the 32 overflights, only 23 would occur during the day. The busiest day would result in 18 beach overflights, which would result in an ADNL of 62.5 dB.

Although the direct flyover of the helicopters would result in less than one minute of an SEL of 99.9 dB, the representative ADNL would be approximately 62.3 dB. Noise levels from helicopters and UAVs are shown in Figure 4.5-2. The helicopter hovering time would be approximately three to four half-hour periods during the estimated five to six hours for each training week. These short hovering periods would result in noise levels at Mākua Beach of approximately 65.3 dB. This contribution to the change in ADNL would be less than 1 percent. Annoyance complaints are expected, but this is considered less than significant because the maximum noise levels from helicopters would occur in early morning and nighttime and would be of a very short duration. Noise from rotary-wing aircraft under Alternative 1 would be less than significant.

*Noise from fixed-wing aircraft.* The Shadow 200 UAV would be used for reconnaissance and photo observation for approximately three to six hours each week during training. The Shadow, a 38-horsepower rotary type combustion engine operating on mobile vehicle gasoline, generates a noise level similar to a lawnmower and is much less audible than helicopters. The noise generated by a Shadow flyover at 1,000 feet (305 meters) above ground level would be approximately 50 to 55 dB, which is considered less than significant.

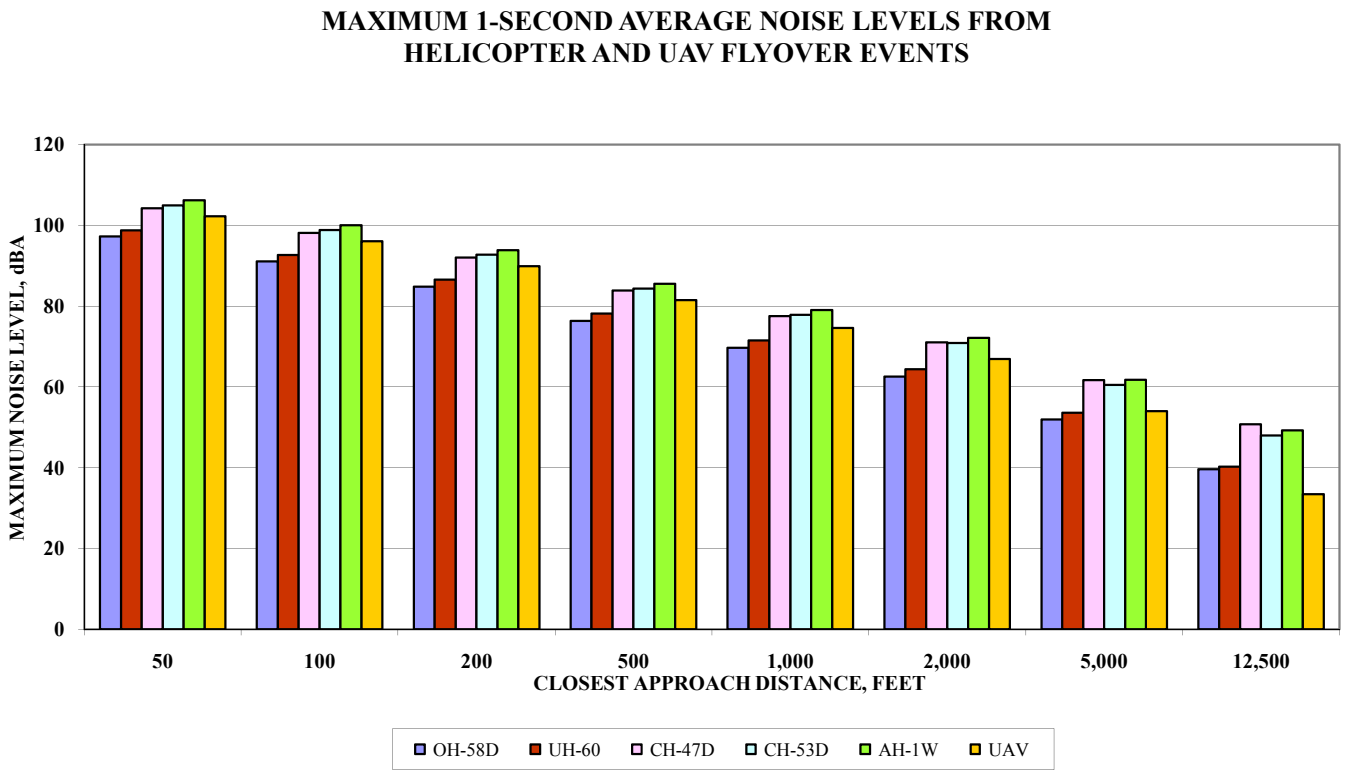



**Figure 4.5-2 Maximum 1-Second Average Noise Levels from Helicopters and UAV Flyover Events**

*Noise from military vehicle use.* Under this alternative, Strykers also would be used at MMR for firing at targets and would be restricted to designated firing points.

There would be vehicle activity associated with MMR training activities under Alternative 1. This activity would be restricted to the MMR property, and the noise generated by the vehicles would be mostly contained within the MMR boundaries, with the exception of the beach area. Figure 4.5-3 is a summary of maximum pass-by noise levels as a function of speed for various categories of vehicles. Noise levels for the three categories of multi-axle heavy trucks are quite similar at most vehicle speeds.

*Noise from demolitions training.* Noise levels at the beach resulting from the use of shape and cratering charges are expected to be between 113 and 130 dB. Demolitions training would occur an estimated 50 to 60 times a year. This training could be conducted concurrently with a CALFEX or independently. One to two shape charges would be detonated during the daytime for each demolitions exercise. Demolitions training using cratering charges would occur at an average of twice a month; only one cratering charge would be detonated per training session. Given this small period of time during the entire week of beach availability, a significant increase is not expected in the historical percentage of people annoyed by the noise. Noise from this activity also has been considered in the analysis under Impact 1.

### *Alternative 2 (Full Capacity Use with Some Weapons Restrictions)*

#### *Significant Impacts*

*Impact 1: Noise from ordnance use.* This impact would be similar to that described for Alternative 1. Figure 4.5-4 depicts results for the CDNL contours for 50 CALFEXs under Alternative 2. The Zone III contour extends over Mākua Beach and out over the water approximately one mile (1.6 kilometers). The Zone II contour extends approximately 1.5 miles (2.4 kilometers) offshore. The noise generated under this alternative would exceed the planning use guidelines established in DA PAM 200-1, resulting in significant noise impacts. No mitigation measures have been identified to reduce the magnitude of this impact.

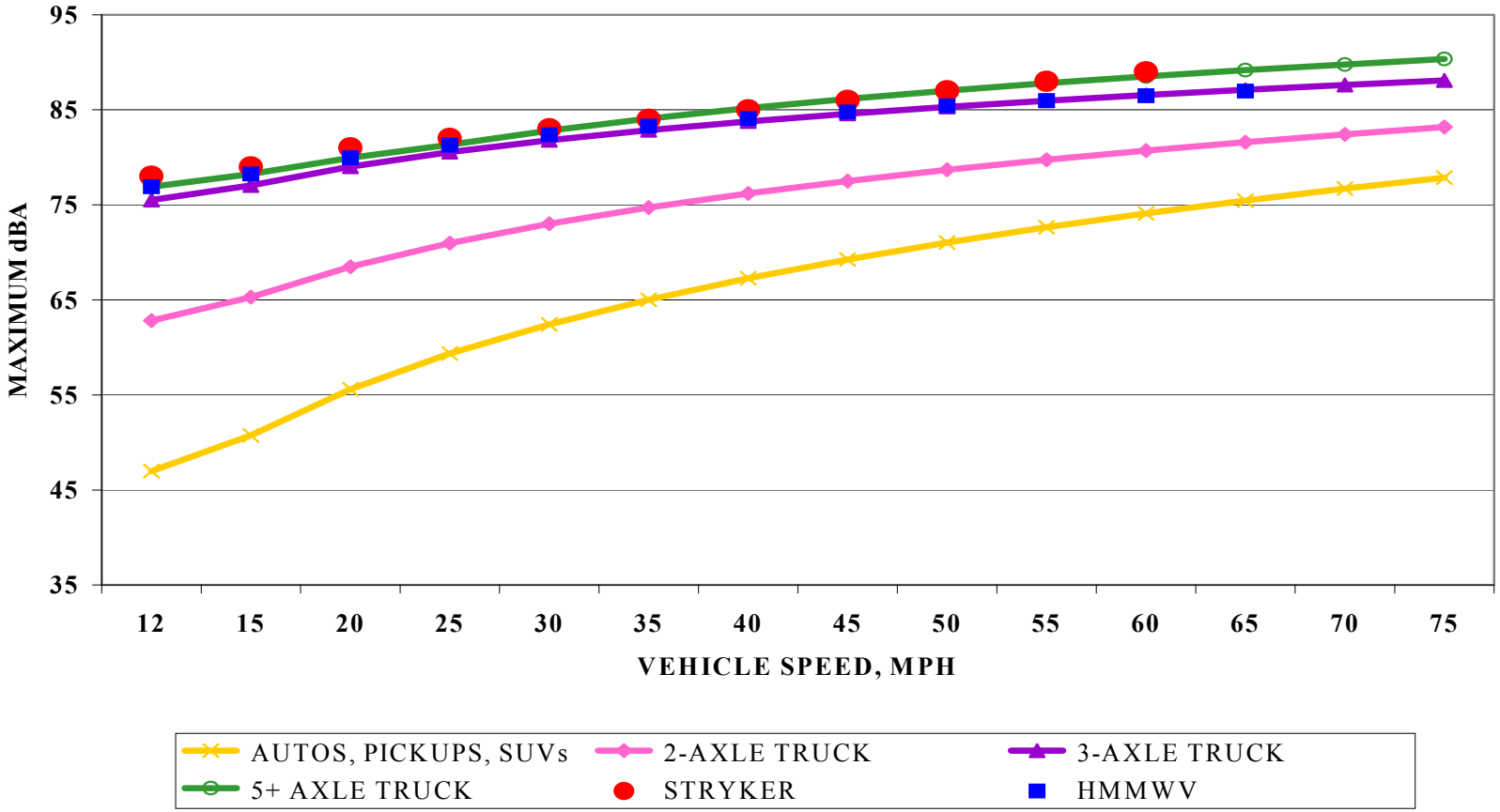



**Figure 4.5-3 Peak Pass-By Noise Levels at 50 Feet for Different Vehicles Types**

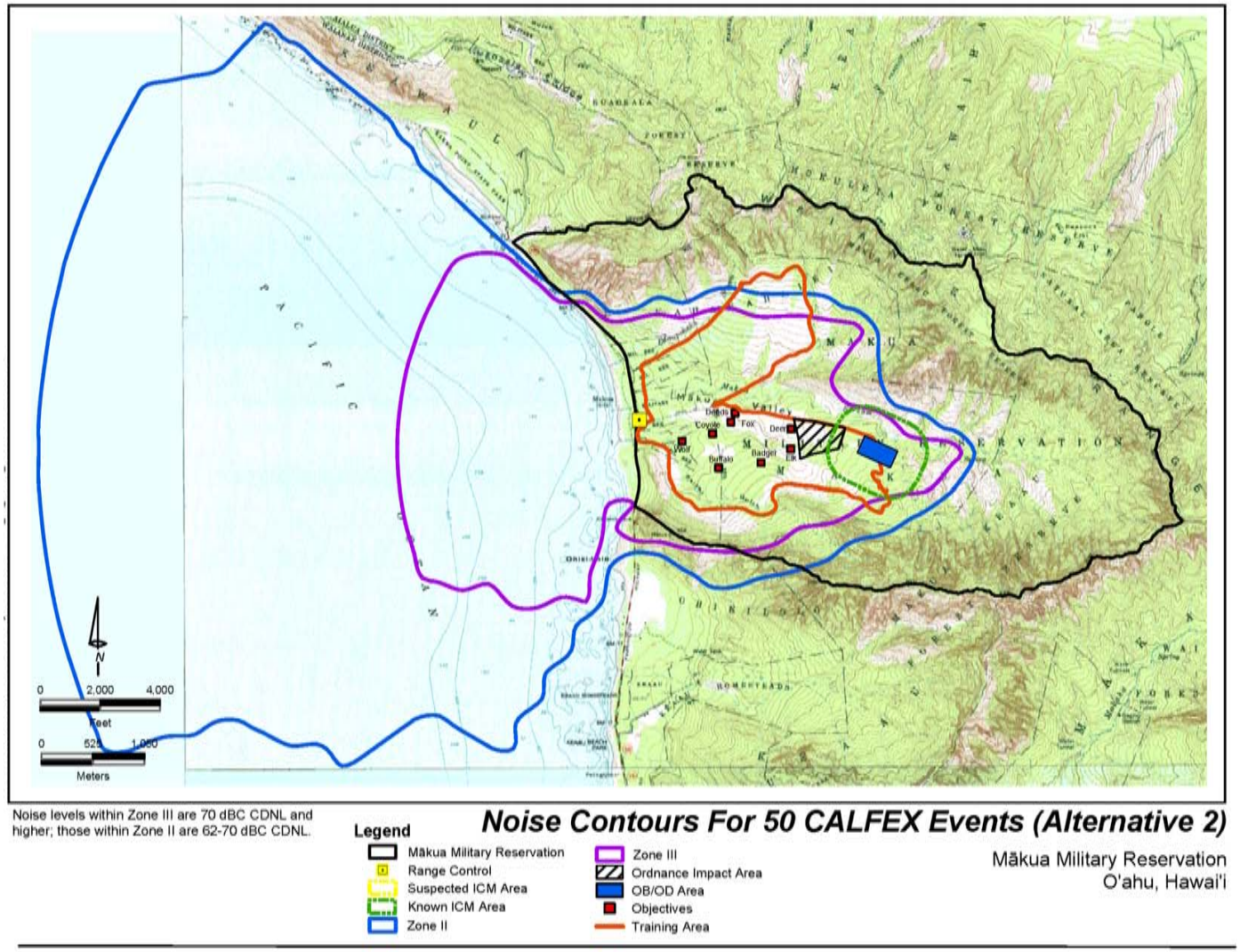



**Figure 4.5-4 Noise Contours for 50 CALFEX Events (Alternative 2)**

### Less than Significant Impacts

*Noise from rotary-wing aircraft.* Impacts would be similar to those described under Alternative 1. Helicopter flights across Mākua Beach would be infrequent during periods of three to six hours each week for 50 weeks during the year when CALFEX training would be scheduled.

Although the direct flyover of the helicopters would result in less than one minute of an SEL of 99.9 dB, the representative ADNL would remain at 62.3 dB. The noise generated from helicopters would be the same as that under Alternative 1, except the occurrence would be 50 weeks of the year rather than 28 weeks. These short periods would result in noise at the beach area of approximately 62.3 dB ADNL. Noise from helicopters under Alternative 2 would be less than significant.

*Noise from fixed-wing aircraft.* Impacts would be similar to those described for Alternative 1.

*Noise from military vehicle use.* Military vehicle use associated with Alternative 2 would involve transporting troops for up to 50 CALFEXs, which is nearly double the vehicle use under Alternative 1. Resulting noise impacts from military vehicle use under Alternative 2 would be similar but somewhat higher than that described for Alternative 1. The noise level of the Stryker vehicle is very similar to the HMMWV combat variant. The noise level of the Stryker in a stationary mode measured at 800 revolutions per minute (rpm) and 1,400 rpm was less than 85 dBA. The Stryker traveling at 25 miles (40 kilometers) per hour measured 81 dBA at 50 feet (15 meters). This is comparable to the HMMWV heavy variant at 25 miles (40 kilometers) per hour and 50 feet (15 meters) that measured 80 dBA.

The noise generated at the beach from a Stryker vehicle traveling 25 miles (40 kilometers) per hour at a distance of 1,600 feet (488 meters) is estimated to be 45 dB. Figure 4.5-3 is a summary of maximum pass-by noise levels as a function of speed for various categories of vehicles. Noise levels for the three categories of multi-axle heavy trucks are quite similar at most vehicle speeds.

*Noise from demolitions training.* Demolitions training would take place as described for Alternative 2. Due to the infrequent blast noise caused by this type of training, the impacts are not considered to be significant.

### *Alternative 3 (Full Capacity Use with Fewer Weapons Restrictions)*

#### Significant Impacts

*Impact 1: Noise from ordnance use.* Noise impacts from Alternative 3 are expected to be similar to those under Alternative 2. Figure 4.5-5 depicts the CDNL contours for 50 CALFEXs, including illumination munitions for the 81mm HE mortar and 105mm HE mortar. With the addition of illumination munitions, the Zone II and Zone III contours increase by a negligible amount compared to Alternative 2. The number of illumination munitions, 2.75-inch rockets, and inert TOW missiles used would be small and would not increase the project noise contour levels by more than one percent. Under Alternative 3, the noise impact on beach goers would be significant. No mitigation measures have been identified to reduce the magnitude of this impact.

#### Less than Significant Impacts

*Noise from rotary-wing aircraft.* Helicopter impacts under Alternative 3 are expected to be the same as those described under Alternative 2.

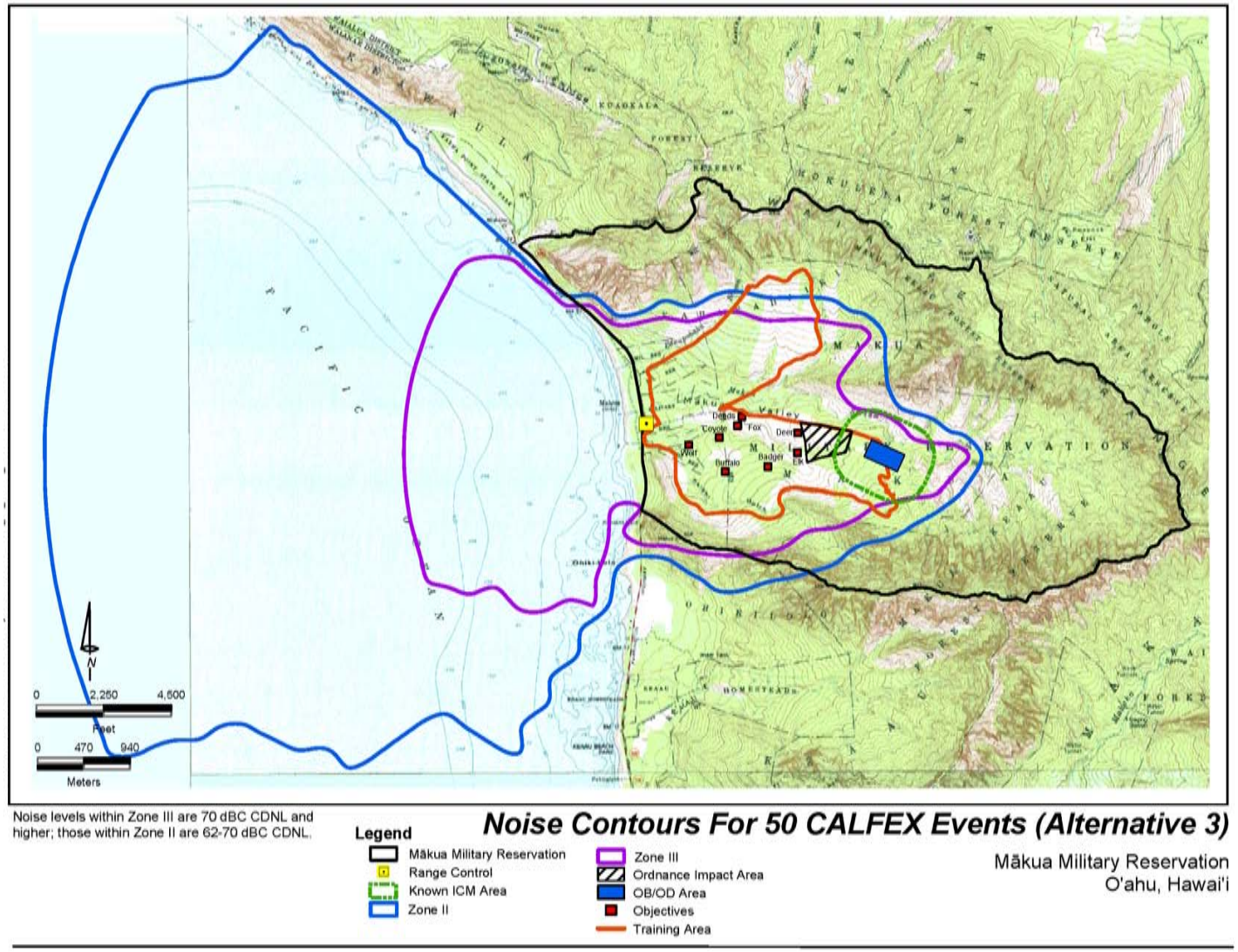



**Figure 4.5-5 Noise Contours for 50 CALFEX Events (Alternative 3)**

*Noise from fixed-wing aircraft.* Noise and impacts generated from the Shadow 200 under Alternative 3 would be the same as those described under Alternative 2.

*Noise from military vehicle use.* Military vehicle use and noise impacts associated with Alternative 3 would be similar to those described under Alternative 2.

*Noise from demolitions training.* Noise and impacts generated from demolitions training, including detonation of shape and cratering charges, are expected to be the same as those described under Alternatives 1 and 2.

### Alternative 4 (Full Capacity Use with Fewer Weapons Restrictions), Pōhakuloa Training Area

*Less than Significant Impacts*

*Noise from rotary-wing aircraft.* Overall aircraft activity at PTA would continue to be dominated by helicopter operations. Under Alternative 4, use of helicopters would be limited to CALFEX training. Helicopters may transport troops and equipment from a staging area at BAAF to the range location, a distance of approximately 4.9 miles (7.9 kilometers). They would also be used in air assault exercises. Helicopter landing areas at this range would be at the northwestern edge of the range boundary near the range control tower. This flight activity would occur entirely within the PTA installation boundary. Given this flight path, helicopter activities in the BAAF area associated with CALFEX training at PTA would be closest to sensitive receptors. The distance from BAAF to the closest noise sensitive receptors is listed below (US Army and USACE 2004).

- 2,890 feet (881 meters) – troop housing
- 8,270 feet (2,521 meters) – Mauna Kea State Park cabins
- 6.8 miles (11 kilometers) – Kilohana Girl Scout Camp
- 7.7 miles (12.4 kilometers) – Waiki‘i Ranch

Although residents of areas near PTA would continue to file occasional complaints about low flying aircraft and helicopters, the complaints would likely be about discrete flyover events rather than overall average noise levels. Consequently, noise from aircraft operations at PTA would have a less than significant impact under Alternative 4.

*Noise from fixed-wing aircraft.* UAV flight operations also would be increased at PTA under the Alternative 4, but would still be relatively small in comparison to continuing helicopter flight operations. The UAV would be used for up to nine hours each week, either during training exercises or independently. In most cases, UAVs would be expected to operate at relatively high altitudes to avoid conflict with other helicopter

and aircraft flight activity. Due to the location of the range in the existing impact area and away from sensitive noise receptors, as well as the relatively high flight patterns, noise from UAV operations at PTA would be less than significant under this alternative.

*Noise from military vehicle use.* It would be unlikely that a company would travel to PTA solely to conduct CALFEX training. Due to combining of training requirements, it would be expected that there would be no net increase in transportation requirements from O‘ahu to PTA. However, there would be an increase in vehicle traffic within the PTA boundaries. Tactical and support vehicles would travel primarily within the boundaries of PTA, to include some travel on Saddle Road. Convoys would travel approximately 7 miles (11 kilometers) entirely within the boundaries of the installation to the range area utilizing existing roads and/or trails. Beginning at the cantonment area, vehicles would travel in convoys northwest on Saddle Road; southwest on Ahi Road; east on Lava Road; and southwest on Solomon Road. Convoys of tactical and support vehicles typically are spaced about 165 to 330 feet (50.3 to 101 meters) apart and are timed at least 15 to 30 minutes apart. These convoy procedures prevent situations where convoy vehicles dominate local traffic flow for substantial periods. Instead of creating conditions where military vehicle traffic dominates traffic noise conditions for a noticeable amount of time, convoy procedures result in noise from convoy traffic occurring as a sequence of multiple individual vehicle pass-by events within a background of normal traffic noise conditions. Therefore, there would be less than significant impacts from traffic noise levels along public roads.

*Noise from ordnance use.* Noise impacts from Alternative 4 would be expected to be less than significant due to the fact that the proposed range is located entirely within an existing impact area. The caliber of weapons and size of munitions used for CALFEX training would not exceed those already used in the impact area. As shown in Figure 3.5-2, the estimated annual average noise contours from heavy weapons firing at PTA indicates that Zone III noise conditions are contained within the present boundaries of PTA. Zone II noise conditions affect BAAF and the western portion of the cantonment area. Implementing Alternative 4 would not be not expected to shift these noise contours beyond their present location.

*Noise from demolitions training.* Noise impacts generated from demolitions training, including detonation of shape and cratering charges, are expected to be the same as those described above for noise from ordnance use.

*Noise from construction activities.* Construction projects at PTA would be at a far enough distance from noise-sensitive areas to avoid significant noise impacts under this alternative.

## 4.6 TRAFFIC AND TRANSPORTATION

This section is an analysis of the potential impacts on traffic and transportation. For the MMR ROI, the affected roadway considered in this analysis is Farrington Highway, specifically those portions adjacent to MMR and within the Wai‘anae area. The PTA ROI is the travel corridor between Kawaihae Harbor and PTA.

### 4.6.1 Impact Methodology

The traffic impact analysis describes the potential impacts from construction traffic, from transporting troops on roads to training ranges, and from increased traffic due to the increased activity and number of military personnel at MMR or PTA.

Convoys would be restricted to non-peak hours. The analysis includes long-term traffic volumes and impacts on local intersections, local circulation, parking, access, and traffic safety.

The objectives of the traffic impact analysis are to quantify the impacts of the Proposed Action on traffic LOS and circulation, and to identify and evaluate potential roadway improvements and traffic demand management strategies to mitigate the traffic impacts of the proposed project. To accomplish these objectives, the following tasks were performed:

- *Task 1: Collect data.* Traffic volumes along the major streets and roadways within the study area were determined from traffic counts performed by Hawai‘i DOT and from traffic data contained in traffic studies for other area projects. Because intersections are typically the capacity constraints along a street or roadway, emphasis is placed on obtaining traffic data at key intersections within the study area. Other data collected include intersection configurations, traffic control devices, speed limits, and right-of-way controls. Adjacent land use constraints were also noted.

- *Task 2: Quantify project-generated traffic.* The number of peak hour trips that each project would generate was estimated using standard trip generation procedures described in the *Trip Generation Handbook* (Institute of Transportation Engineers 1998). The purpose of this task was to determine the level of analysis required. If the generation analysis determined an insignificant increase or resulted in fewer peak hour trips than for existing conditions, a traffic impact analysis would not be required.

- *Task 3: Analyze existing LOS.* Using the data collected for Task 1, traffic operating conditions in the project vicinity were determined.

The methodology for signalized and unsignalized intersections described in the 2000 HCM was used to determine the LOS at the study intersections (Institute of Transportation Engineers 1998).

- *Task 4: Determine future background traffic projections.* Future background traffic conditions are determined by estimating traffic conditions during the design year without the proposed project. The ITE provides guidelines for determining the design year for a traffic impact analysis. A project that generates less than 500 peak hour trips is designated a "small development." For a small development, the suggested study horizon, or design year, is the opening year. Since this project would be a small development, the design year would be 2005 (Institute of Transportation Engineers 1991).

- *Task 5: Distribute and assign project-generated trips.* Project-generated trips were distributed based on the available approach and departure routes. The project-related traffic was then superimposed on 2005 background traffic projections to estimate 2005 background plus project traffic projections.

- *Task 6: Quantify traffic impacts of the proposed project.* The HCM methodology was used to conduct an LOS analysis for background plus project conditions. The results of this analysis were compared to 2005 background (without project) conditions to determine the incremental impacts.

- *Task 7: Identify and evaluate potential mitigation measures.* The impact analysis identifies locations where the project would have a significant traffic impact. Improvements that would mitigate these impacts were identified and assessed. Improvements that would be most effective in mitigating the project's impacts and would be feasible were recommended.

For MMR, a more specific methodology to conduct the traffic impact assessment is described below. It has been adapted to include evaluation of the Army's convoy and hauling policies because the policies provide guidance about the transport of equipment and personnel to and from MMR. The methodology's components consist of the following:

- Establish existing traffic conditions by collecting and analyzing traffic count data and field observations. Identify the quantity and types of vehicles currently traveling to and from MMR for CALFEX activities. Evaluate existing convoy and ammunition hauling policies for consistency with Hawai'i DOT regulations

(this effort is documented in Section 3.6, Traffic and Transportation).

- Develop estimates of the number and types of vehicles traveling to and from MMR for No Action and for Alternatives 1, 2, and 3, and analyze the impact of project vehicles on roadway and intersection traffic conditions for each alternative. Identify possible traffic operational problems or conflicts with motorists or pedestrians using Farrington Highway in the Wai‘anae area.
- Compare the analytical results for each alternative with existing conditions to identify the potential traffic impact of an alternative. If there are any LOS F conditions, develop mitigation measures, where possible, to reduce the potential traffic impact of an alternative to LOS E or better.

While training may occasionally occur over a weekend, most CALFEXs and other training would be conducted on weekdays. For this reason, the analysis in this section is based on training exercises conducted Monday through Friday.

### 4.6.2 Factors Considered for Determining Significance of Impacts

Since there are no local standards, criteria established by the FHWA, ITE, and the AASHTO were used to prepare this analysis. Factors considered in determining whether an alternative would have a significant impact on traffic and transportation include the extent or degree to which implementing an alternative would:

- Result in inadequate movement of traffic volume;
- Result in traffic delays at an intersection or roadway segment;
- Result in increases in vehicle trips on local roads that would disrupt or alter local circulation patterns;
- Result in lane closures or impediments that would disrupt or alter local circulation patterns;
- Exceed the capacity of on- and off-ramps, cause LOS at intersections and freeway mainline segments to deteriorate from LOS A through D to LOS E or F, cause LOS to deteriorate from LOS E to LOS F, or increase congestion (to greater than 0.01 as shown in Table 4.6-1) at intersections currently operating at (or anticipated to operate at) LOS F;
- Result in activities that would create potential traffic safety hazards; and
- Result in an inconsistency of convoys and transportation of ammunition with state regulations and policies.

**Table 4.6-1**
**Mākua Military Reservation Baseline Transport Activities for the Five-Day CALFEX Schedule**

| Time | Monday | Tuesday | Wednesday | Thursday | Friday |
|---|---|---|---|---|---|
| 0500 | | At 0530, a convoy of 5 HMMWVs, 4 HMMWVs with trailers, and a PLS depart SBMR and travel to MMR. | At 0500, 2 fire trucks depart from Lualualei and an HMMWV departs from SBMR and travel to MMR. | At 0500, 2 fire trucks depart from Lualualei and a HMMWV departs from SBMR and travel to MMR. | |
| 0600 | | At 0600, a convoy of 6 HMMWVs, 3 HMMWVs with trailers, and a PLS depart SBMR for MMR. | At 0600, 3 HMMWVs with food and a HMMWV with water depart SBMR and arrive at MMR at 0700, then depart MMR at 0830 and return to SBMR. | At 0600, 3 HMMWVs with food and an HMMWV with water depart SBMR and arrive at MMR at 0700, then depart MMR at 0830 and return to SBMR. | |
| 0800 | | At 0800, 3 buses (or 6 PLSs) with Company A infantry depart SBMR for MMR. | | | |
| 0900 | | At 0900, 3 buses (or 6 PLSs) with Company B support infantry depart SBMR for MMR. | | | Between 0900 and 1100, three convoys depart MMR for SBMR about 15 to 30 minutes apart. First convoy has 6 HMMWVs, 3 HMMWVs with trailers, and a PLS. Second convoy has 6 buses or 12 PLSs to transport infantry. Third convoy has 5 HMMWVs, 4 HMMWVs with trailers, and a PLS. |
| 1300 | At 1300, 6 HMMWVs and a PLS depart from SBMR and travel to MMR to set up the TOC. | | | | At 1300, 6 HMMWVs and a PLS depart MMR and return to SBMR. |
| 1400 | | | At 1400, 2 fire trucks depart MMR and return to Lualualei, and an HMMWV departs MMR for SBMR. | At 1400, 2 fire trucks depart MMR and return to Lualualei, and an HMMWV departs MMR for SBMR. | |
| 1600 | | At 1630, 3 HMMWVs with food and an HMMWV with water depart SBMR and arrive at MMR about 1730, then depart MMR at 1900 to return to SBMR. | At 1630, 3 HMMWVs with food and an HMMWV with water depart SBMR and arrive at MMR about 1730, then depart MMR at 1900 to return to SBMR. | At 1630, 3 HMMWVs with food and an HMMWV with water depart SBMR and arrive at MMR about 1730, then depart MMR at 1900 to return to SBMR. | |

Notes: Battalion officers may visit MMR and observe field operations at any time during CALFEX; they may travel in military vehicles or POVs.

A contractor may deliver portable toilets at any time prior to the start of CALFEX. The contractor may pick up toilets anytime after end of CALFEX

Degradation of traffic conditions beyond LOS E is considered unacceptable and constitutes a significant impact. Consistency between Army convoy and ammunition hauling procedures and state regulations and policies reduces safety risks, minimizes traffic congestion, and avoids damage to transportation infrastructure.

In addition to the above factors, public concerns expressed during the EIS process were also considered in the impact analysis.

### 4.6.3 Summary of Impacts

As shown below in the impact summary table, the No-Action Alternative and MMR Alternatives 1, 2, and 3 would have less than significant impacts on traffic and transportation at intersections and along Farrington Highway. Alternative 4 would also have a similar less than significant impact on traffic between Kawaihae Harbor and PTA. Alternatives 1, 2, and 3 would not be consistent with state transportation regulations and polices, with impacts determined to be significant but mitigable to less than significant. The No-Action Alternative and Alternative 4 would be more consistent with state regulations and policies, with a less than significant impact.

**Summary of Potential Traffic and Transportation Impacts**

| Impact Issues | No Action Alternative | Alternative 1 MMR (Reduced Capacity Use with Some Weapons Restrictions) | Alternative 2 MMR (Full Capacity Use with Some Weapons Restrictions) | Alternative 3 MMR (Full Capacity Use with Fewer Weapons Restrictions) | Alternative 4 PTA (Full Capacity Use with Fewer Weapons Restrictions) |
|---|---|---|---|---|---|
| Consistency with state regulations and policies | ⊙ | ⊘ | ⊘ | ⊘ | ⊙ |
| Intersection operations | ⊙ | ⊙ | ⊙ | ⊙ | ⊙ |
| Roadway/highway segment operations | ⊙ | ⊙ | ⊙ | ⊙ | ⊙ |

LEGEND:
⊗ = Significant impact
⊘ = Significant impact mitigable to less than significant
⊙ = Less than significant impact
○ = No impact
+ = Beneficial impact

#### *Mākua Military Reservation Traffic Volumes*

The actual number of vehicles for each CALFEX could vary because each battalion commander has discretion when planning the activities and transport schedules; however, most CALFEX activities would occur over five days (Monday through Friday). Also, battalion staff may visit MMR

on any day and at any time to assess the training activities during the CALFEX. The hypothetical schedule of transport activities for a CALFEX is summarized in Table 4.6-1 and is used for the analysis in this EIS.

Most vehicles would arrive at MMR on Day 2 (Tuesdays from 6:00 AM to 7:00 AM), and most would depart on Day 5 (Fridays between 9:00 AM and 11:00 AM).

The No Action scenario assumed that no live-fire military training would take place at MMR. There would be almost no military vehicular traffic resulting from aircraft lasing and UAV training; and limited vehicular use associated with units using MMR as a staging base for command and control exercises, engineer road improvement measures (conducted once annually), and very limited blank ammunition training occurring only as authorized. Therefore, the traffic volumes for the No Action scenario represent the existing traffic counts with reductions for the CALFEX vehicles that were included in the traffic count.

For the mid-morning period, Farrington Highway traffic volumes tend to be higher from 10:00 AM to 11:00 AM, rather than from 9:00 AM to 10:00 AM. Thus, for this traffic impact analysis, the selected analysis periods for all live-fire alternatives are as follows:

- Tuesday early morning peak hour (6:00 AM to 7:00 AM) for MMR arrivals; and
- Friday mid-morning peak hour (10:00 AM to 11:00 AM) for MMR departures.

The estimated number of vehicles traveling to and from MMR for each alternative, is identified in Table 4.6-2 and Table 4.6-3 by vehicle type. The recent CALFEXs conducted under the Settlement Agreement and Alternatives 1 and 2 would have about the same number of vehicle trips per CALFEX during the peak arrival and departure hours. Alternatives 1 and 2 would require five fewer vehicle trips during each of the peak hours than Alternative 3.

For the intersection operations analysis, passenger car-equivalents (PCEs) were applied to the military vehicles because the analysis methodologies typically apply to passenger cars. The PCEs account for the differences in size and maneuverability of the military vehicles when compared to passenger cars. For the HMMWVs, a 1.2-PCE adjustment factor was applied, while 1.5 was applied to the HMMWVs with trailers and the sanitation truck. For the PLSs, a 2.0-PCE adjustment factor was applied.

If Stryker vehicles are used, they would replace HMMWVs, and the overall vehicle count would remain the same. For the intersection operations analysis, the Strykers were assumed to be comparable in size to the HMMWVs and would represent 1.2 PCEs.

**Table 4.6-2**
**Tuesday Early Morning Peak Hour (Arrivals)**

| Alternatives 1 and 2 | Alternative 3 |
|---|---|
| 16 HMMWVs | 21 HMMWVs |
| 7 HMMWVs with trailers | 7 HMMWVs with trailers |
| 2 PLSs | 2 PLSs |
| **Total: 25 vehicles** | **Total: 30 vehicles** |

**Table 4.6-3**
**Friday Mid-Morning Peak Hour (Departures)**

| Alternatives 1 and 2 | Alternative 3 |
|---|---|
| 16 HMMWVs | 21 HMMWVs |
| 7 HMMWVs with trailers | 7 HMMWVs with trailers |
| 2 PLSs | 2 PLSs |
| **Total: 25 vehicles** | **Total: 30 vehicles** |

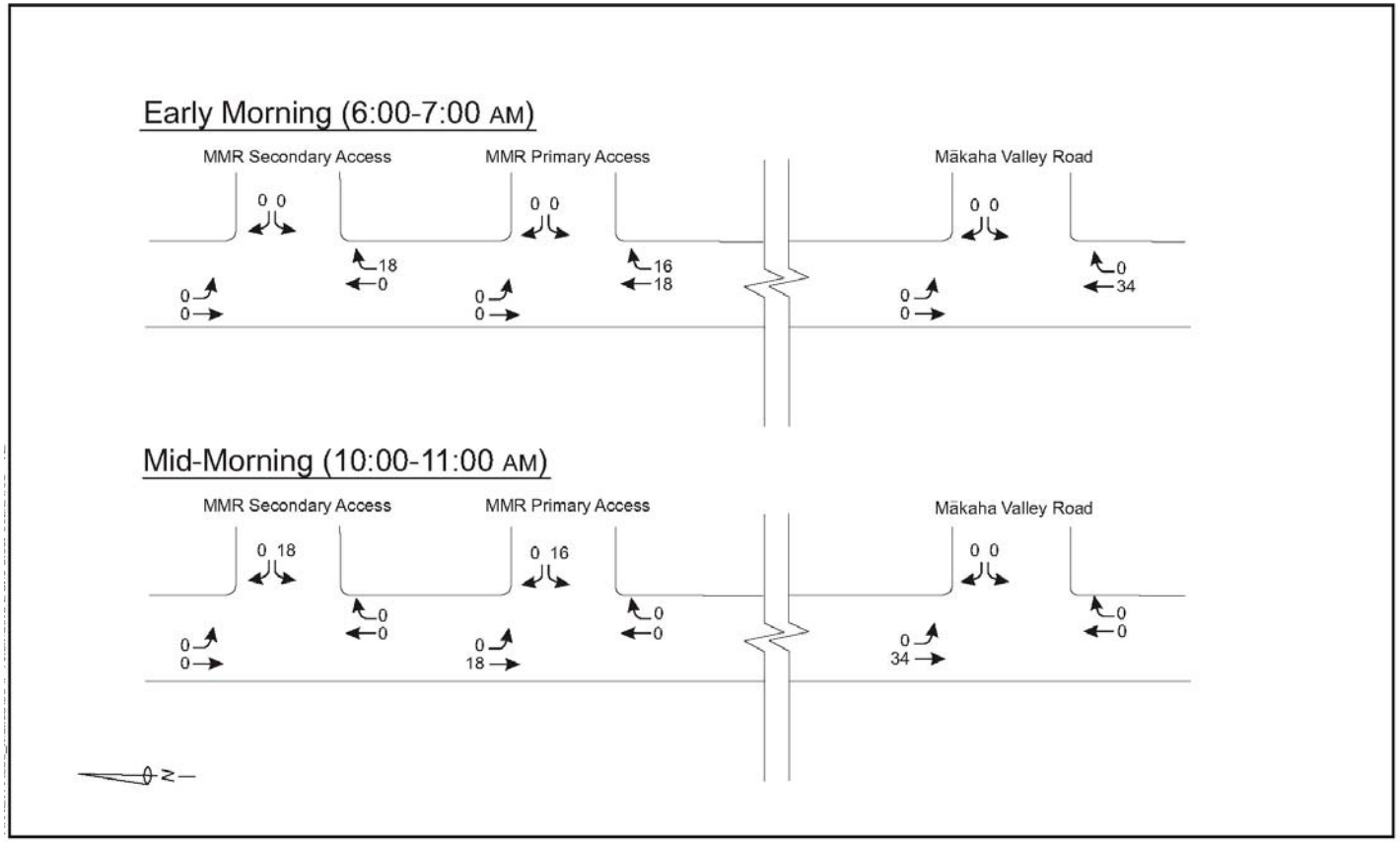
The MMR trips for Alternatives 1 and 2 at the Farrington Highway intersections at the primary MMR south access road, at the secondary MMR access road, and at Mākaha Valley Road are shown in Figure 4.6-1 Similarly, the MMR trips for Alternative 3 are presented in Figure 4.6-2. Existing Traffic Conditions with Alternative 1 or 2 are illustrated in Figure 4.6-3.

Figure 4.6-3 combines existing traffic volumes with the MMR trips for Alternatives 1 and 2. Figure 4.6-4 combines existing traffic conditions with added vehicle trips from Alternative 3. When the traffic counts were taken in April 2003, there were ongoing CALFEX activities at MMR; thus, the CALFEX-related trips were deducted from the April 2003 traffic counts so that the transport movements would not be double counted in this analysis.

### *State Transportation Policy Considerations*

The recently revised Army DTO instructions for convoy operations (25th ID[L] PAM 55-1) clarify previous inconsistent DTO convoy policies. The Army's proposed transportation scenario would not be consistent with Hawai‘i DOT convoy policies. Also, Army transportation of ammunition

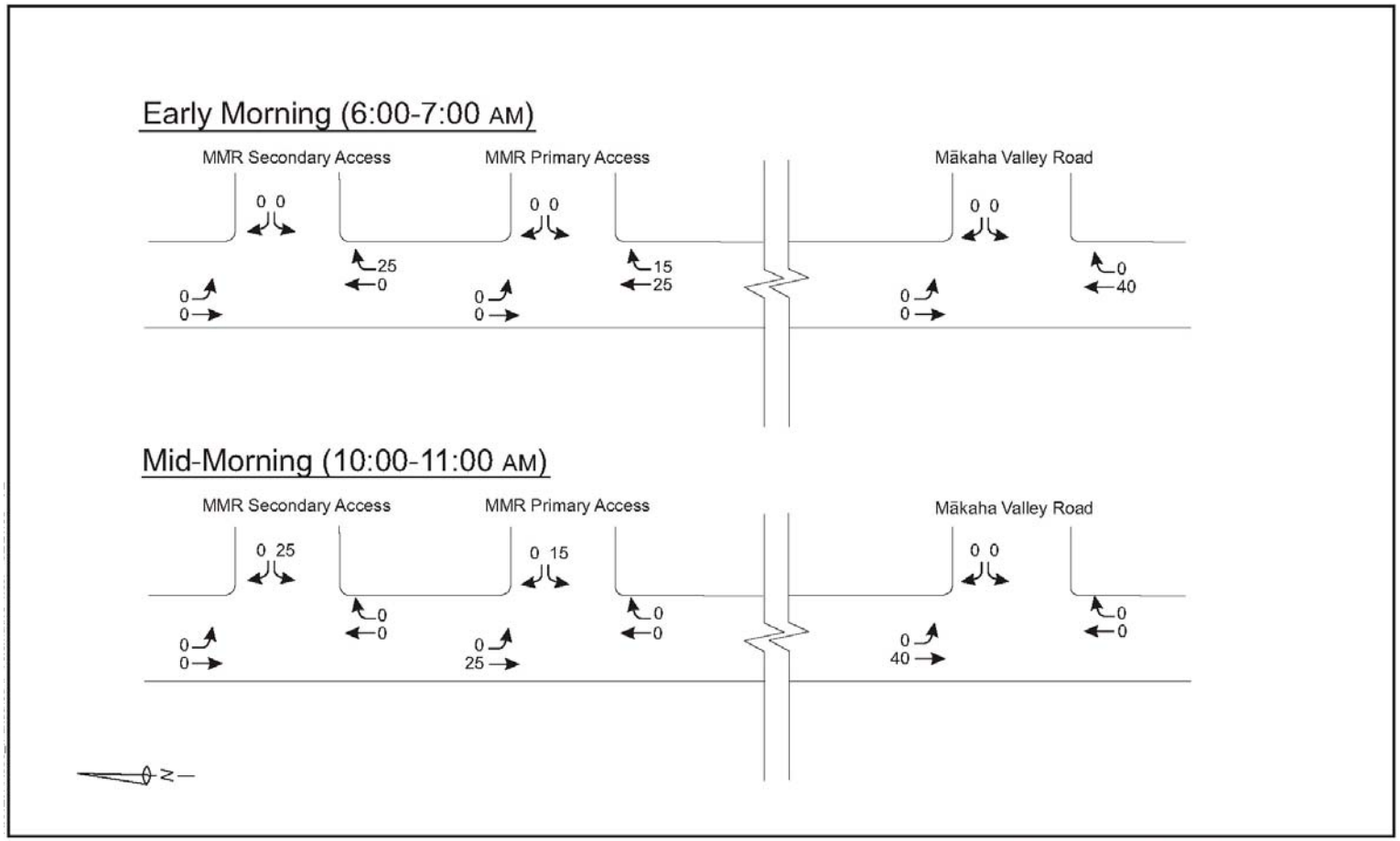
does not conform to the State of Hawai‘i requirement for 48-hour advance written notice.




**Alternatives 1 and 2**
**Project Traffic Volumes**

Mākua Military Reservation
O'ahu, Hawai'i

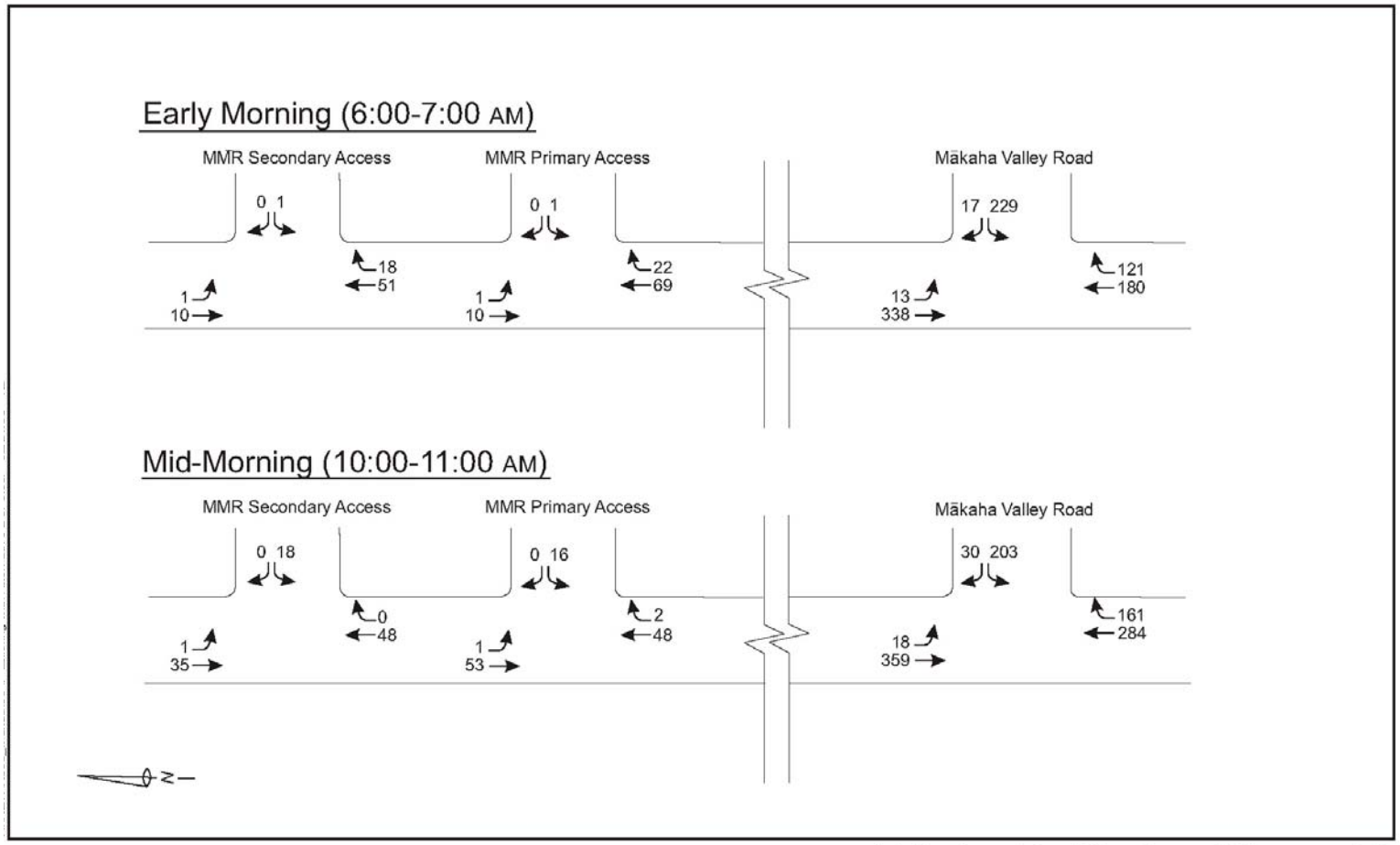
**Figure 4.6-1 Alternatives 1 and 2 Project Traffic Volumes**




**Alternative 3 Project Traffic Volumes**

Mākua Military Reservation
O'ahu, Hawai'i

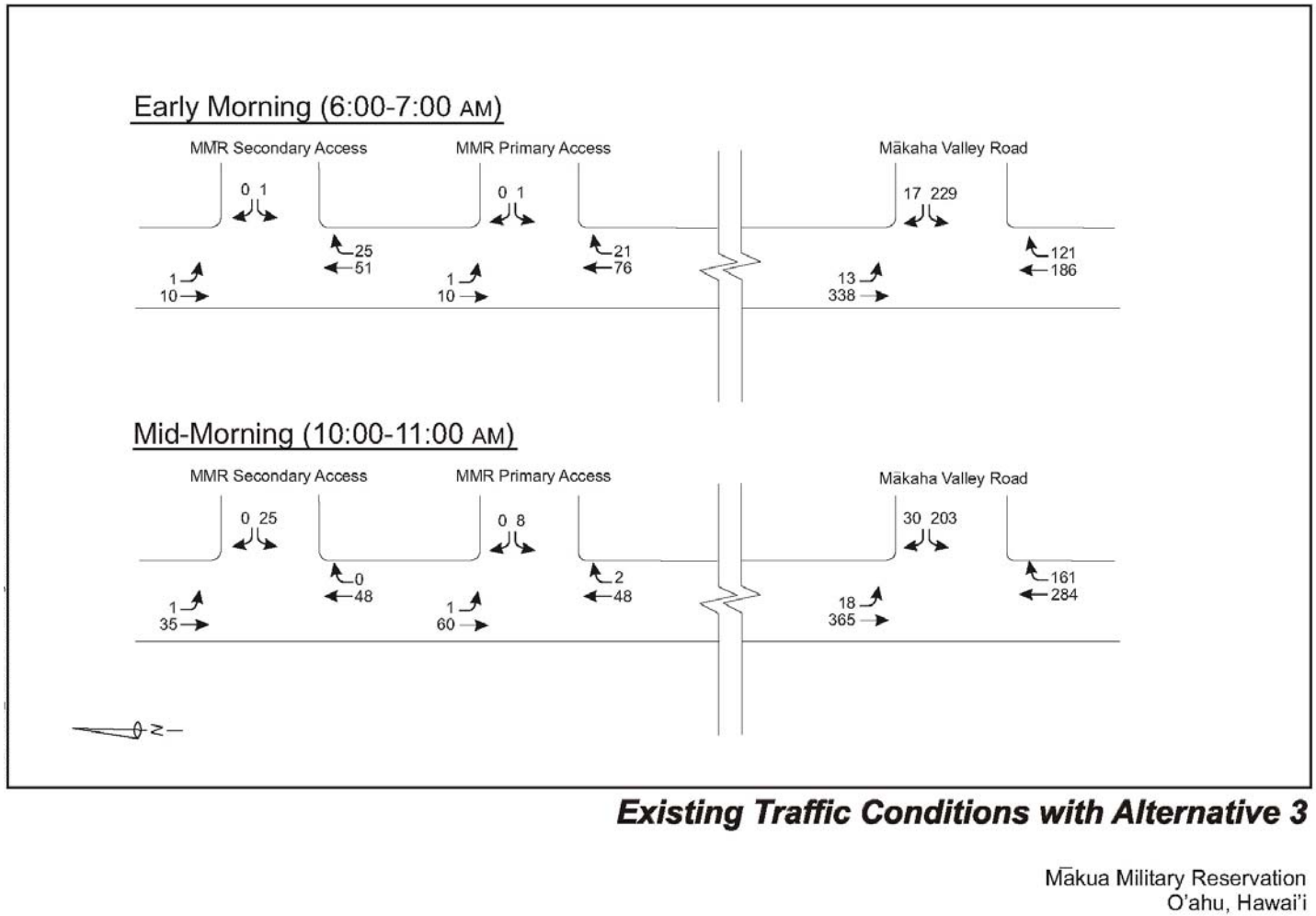
**Figure 4.6-2 Alternative 3 Project Traffic Volumes**




**Existing Traffic Conditions with Alternative 1 or 2**

Mākua Military Reservation
O'ahu, Hawai'i

**Figure 4.6-3 Existing Traffic Conditions with Alternative 1 or 2**




**Existing Traffic Conditions with Alternative 3**

Mākua Military Reservation
O'ahu, Hawai'i

**Figure 4.6-4 Existing Traffic Conditions with Alternative 3**

### *Unsignalized Intersection Analysis Results*

The HCM 2000 unsignalized intersection methodology is used to analyze the MMR primary and secondary driveway connections to Farrington Highway. The analytical results for the various alternatives are given in Table 4.6-4. Since side street traffic is controlled by stop signs and Farrington Highway is not, only the delays for traffic entering and exiting the two MMR access roads are shown. These unsignalized intersections would operate at LOS A with all of the alternatives, and the results would be the same as the existing LOS conditions.

While no motorists were observed making the southbound left turn from Farrington Highway into either the primary MMR south access road or the secondary MMR north access road, the delays shown in Table 4.6-4 for this movement represent the average delay if a motorist were to make such a move. Table 4.6-6 presents Farrington Highway Two-way Traffic Counts.

### *Signalized Intersection Analysis Results*

The intersection of Farrington Highway and Mākaha Valley Road was analyzed according to the HCM 2000 signalized intersection methodology, and the results are given in Table 4.6-5. Although delays may differ slightly from the existing conditions, the LOS conditions remain the same. The average delay at the intersection results in LOS B conditions under all alternatives. A comparison of the analytical results for the unsignalized and signalized intersections indicates that No Action, Alternative 1, Alternative 2, and Alternative 3 would create LOS conditions similar to the existing traffic conditions, indicating there would be little impact from MMR trips at these locations.

**Table 4.6-4**
**Unsignalized Intersection Analysis Results**

| | Existing Conditions (Traffic Counts) | | No Action | | Alternative 1 | | Alternative 2 and Alternative 3 | |
|---|---|---|---|---|---|---|---|---|
| | Delay (seconds) | LOS | Delay (seconds) | LOS | Delay (seconds) | LOS | Delay (seconds) | LOS |
| Farrington Highway at Primary MMR South Access Road | | | | | | | | |
| Southbound Left Turn | 7.3 | A | 7.3 | A | 7.4 | A | 7.4 | A |
| Primary MMR Access Road | 8.8 | A | 8.8 | A | 8.9 | A | 9.0 | A |
| Farrington Highway at Secondary MMR North Access Road | | | | | | | | |
| Southbound Left Turn | 7.3 | A | 7.3 | A | 7.3 | A | 7.3 | A |
| Primary MMR Access Road | 8.8 | A | 8.8 | A | 8.8 | A | 8.9 | A |
| **Mid-Morning AM Peak Hour (10:00-11:00 am)** | | | | | | | | |
| | Existing Conditions (Traffic Counts) | | No Action | | Alternative 1 | | Alternative 2 and Alternative 3 | |
| | Delay (seconds) | LOS | Delay (seconds) | LOS | Delay (seconds) | LOS | Delay (seconds) | LOS |
| Farrington Highway at Primary MMR South Access Road | | | | | | | | |
| Southbound Left Turn | 7.3 | A | 7.3 | A | 7.3 | A | 7.3 | A |
| Primary MMR Access Road | 9.0 | A | 8.9 | A | 9.1 | A | 9.1 | A |
| Farrington Highway at Secondary MMR North Access Road | | | | | | | | |
| Southbound Left Turn | 7.3 | A | 7.3 | A | 7.3 | A | 7.3 | A |
| Primary MMR Access Road | 9.0 | A | 8.9 | A | 9.0 | A | 9.0 | A |

**Table 4.6-5**
**Signalized Intersection Analysis Results**

| | Early AM Peak Hour (6:00-7:00 am) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Existing Conditions (Traffic Counts) | | No Action | | Alternative 1 and Alternative 2 | | Alternative 3 | |
| | Delay (seconds) | LOS | Delay (seconds) | LOS | Delay (seconds) | LOS | Delay (seconds) | LOS |
| Farrington Highway at Makaha Valley Road | | | | | | | | |
| Northbound Approach | 9.3 | A | 9.3 | A | 9.4 | A | 9.4 | A |
| Southbound Approach | 6.4 | A | 6.3 | A | 6.3 | A | 6.3 | A |
| Left Turn | 36.0 | D | 36 | D | 36.0 | D | 36.0 | D |
| Through Movement | 5.3 | A | 5.2 | A | 5.2 | A | 5.2 | A |
| Makaha Valley Road Approach | 32.4 | C | 32.4 | C | 32.4 | C | 32.4 | C |
| Overall Intersection | 14.6 | B | 14.7 | B | 14.6 | B | 14.5 | B |

| | Mid-Morning AM Peak Hour (10:00-11:00 am) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Existing Conditions (Traffic Counts) | | No Action | | Alternative 1 and Alternative 2 | | Alternative 3 | |
| | Delay (seconds) | LOS | Delay (seconds) | LOS | Delay (seconds) | LOS | Delay (seconds) | LOS |
| Farrington Highway at Makaha Valley Road | | | | | | | | |
| Northbound Approach | 9.3 | A | 9.2 | A | 9.2 | A | 9.2 | A |
| Southbound Approach | 6.8 | A | 6.9 | A | 6.8 | A | 6.7 | A |
| Left Turn | 31.5 | C | 31.5 | C | 31.5 | C | 31.5 | C |
| Through Movement | 5.5 | A | 5.5 | A | 5.5 | A | 5.5 | A |
| Makaha Valley Road Approach | 26.1 | C | 26.1 | C | 26.2 | C | 26.2 | C |
| Overall Intersection | 12.3 | B | 12.3 | B | 12.1 | B | 12.1 | B |

**Table 4.6-6**
**Farrington Highway Two-way Traffic Counts**

| | | | Early Morning Peak Hour (6:00 am - 7:00 am) | | | | | Mid-Morning Peak Hour (10:00 am - 11:00 am) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Hawai'i DOT Traffic Counts | | | Percentage Increase Due to | Percentage Increase Due to | Hawai'i DOT Traffic Counts | | | Percentage Increase Due to | Percentage Increase Due to |
| Station | Location | Date | Northbound | Southbound | Total | Alternatives 1 & 2 | Alternative 3 | Northbound | Southbound | Total | Alternatives 1 & 2 | Alternative 3 |
| A | Mākaha Bridge #5A ʻŌhikilolo Stream Bridge | January 17-18, 2002 | 35 | 7 | 42 | 59.5% | 71.4% | 47 | 45 | 92 | 27.2% | 32.6% |
| B | South of Water Street | January 29-30, 2002 | 77 | 28 | 105 | 23.8% | 28.6% | 88 | 113 | 201 | 12.4% | 14.9% |
| C | Approximately 420 Feet Northwest of Māiʻuʻu Road | February 5, 2002 | 300 | 557 | 857 | 2.9% | 3.5% | 480 | 538 | 1,018 | 2.5% | 2.9% |
| D | Mailiʻiliʻi Stream Bridge | January 17-18, 2002 | 511 | 940 | 1,451 | 1.7% | 2.1% | 944 | 972 | 1,916 | 1.3% | 1.6% |
| E | South of Hakimo Road | October 29-30, 2002 | 604 | 1,640 | 2,244 | 1.1% | 1.3% | 703 | 909 | 1,612 | 1.6% | 1.9% |
| F | South of Lualualei Naval Road | January 17-18, 2002 | 596 | 1,586 | 2,182 | 1.1% | 1.4% | 842 | 1,179 | 2,021 | 1.2% | 1.5% |
| G | South of Haleakalā Avenue | October 29-30, 2002 | 771 | 1,830 | 2,601 | 1.0% | 1.2% | 698 | 937 | 1,635 | 1.5% | 1.8% |
| H | South of Nānākuli Avenue | October 29-30, 2002 | 864 | 1,948 | 2,812 | 0.9% | 1.1% | 761 | 1,037 | 1,798 | 1.4% | 1.7% |
| I | Keananoio Bridge | January 17-18, 2002 | 624 | 1,733 | 2,357 | 1.1% | 1.3% | 753 | 1,077 | 1,830 | 1.4% | 1.6% |
| -- | Volume Increase Due to Existing Condition Alternative 1 and Alternative 2 | | 25 | 0 | 25 | -- | -- | 0 | 25 | 25 | -- | -- |
| -- | Volume Increase Due to Alternative 3 | | 30 | 0 | 30 | -- | -- | 0 | 30 | 30 | -- | -- |

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The Hawai‘i DOT Farrington Highway two-way traffic counts are presented in Table 4.6-6, which is a comparison of the traffic volumes and percentage increase for the additional traffic volumes due to the various alternatives. As noted previously, Mākaha Valley Road is the first signalized intersection south of MMR. Station A and Station B are between MMR and Mākaha Valley Road. Stations C through I are south of Mākaha Valley Road. Since Farrington Highway traffic volumes are low at Station A and Station B (below 210 vehicles per hour in both directions), the percentage increase for the traffic volumes due to the MMR alternatives ranges from 12.4 percent to 71.4 percent. However, the net percentage difference for the increase in traffic volumes attributable to the various alternatives for the town of Wai‘anae and beyond (Stations C to Stations I) would be less than 3.5 percent.

School-related vehicles and pedestrians on Farrington Highway in the Wai‘anae area result in higher traffic volumes and traffic congestion during the peak school transport periods (7:00 AM to 8:30 AM and 12:30 PM to 3:00 PM); however, these time periods do not correspond to the peak times when MMR transport activity is scheduled during a five-day CALFEX.

### *Pōhakuloa Training Area Traffic Volumes*

Under this alternative, there would be no additional units deployed to PTA per year to conduct CALFEX and convoy exercises. Soldiers would continue to be transported via aircraft or marine vessel from SBMR to PTA. Soldiers would be transported by trucks and other military vehicles from Kawaihae Harbor to PTA via convoys on public roadways (Figure 4.6-5). There would be up to 30 trucks and military vehicles per convoy. The Army would use the PTA Trail to access PTA from Kawaihae Harbor upon trail construction completion and approvals. Until then, the Army would use public highways and roadways.

Vehicle convoys move personnel and equipment between installations. A convoy is normally defined as six or more military vehicles moving simultaneously from one point to another under a single commander, ten or more vehicles per hour going to the same destination over the same route, or any one vehicle requiring a special haul permit. Per command guidance, USARHAW convoys normally maintain a gap of at least 30 minutes between serials (a group of military vehicles moving together), 330 feet (100 meters) between vehicles on highways, and 7.5 to 15 feet (25 to 50 meters) while in town traffic. Per state regulation, military convoys are not authorized movement on state highways between 6:00 AM and 8:30 AM and 3:00 PM and 6:00 PM, Monday through Friday. Movements on Saturday, Sunday, and holidays are by special request only.

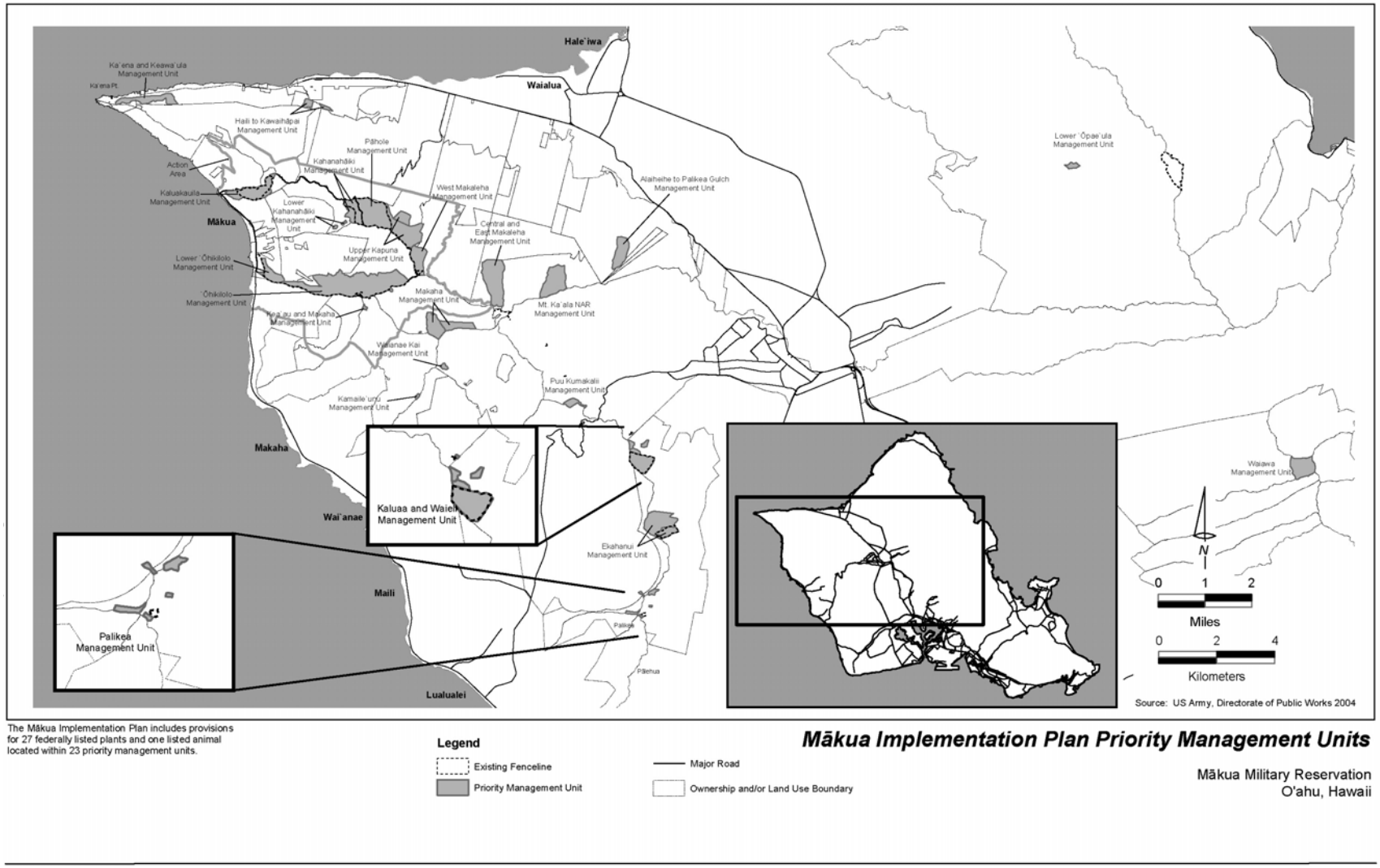



**Figure 4.6-5 Mākua Implementation Plan Management Units**

Convoys traveling from Kawaihae Harbor to PTA must get clearance, and vehicles operating on Saddle Road within the boundaries of PTA must not exceed 25 miles (40 kilometers) per hour. PTA Trail use would cross state highways at three locations: Kawaihae Road north of Queen Ka‘ahumanu Highway, at Kawaihae Road east of Queen Ka‘ahumanu Highway, and at Māmalahoa Highway south of Saddle Road. Convoy traffic would yield to public traffic at crossings to minimize impacts on traffic operations. Advance notification to the public would be provided in the event of large-scale convoy transport. Convoy traffic impacts would normally be light congestion, occasional backups on critical approaches.

All trail crossings would be signed in compliance with federal, state, and local standards. All signs and the installation of these signs would have to be approved by appropriate agencies. Additional warning signs and safety measures may be required by the local agencies during periods of intensified trail use. The trails would be signed and gated to prohibit public access, to prevent conflicts between military traffic and public traffic, and to avoid safety problems.

Although the public would normally not use the PTA Trail or other military vehicle trails, these trails would be made available for public use during state and national emergencies.

### *No Action Alternative*

#### *Less than Significant Impacts*

*Consistency with state regulations and policies.* Under this alternative, there would be very limited military vehicle traffic to and from MMR. There would be no live ammunition transport. This alternative would be substantially consistent with State of Hawai‘i regulations and policies. The Army would coordinate, as appropriate, with Hawai‘i DOT to avoid or minimize traffic impacts.

*Farrington Highway/primary MMR south access road intersection.* Under No Action, the roadway traffic conditions at the Farrington Highway/MMR primary access road intersection would be LOS A; because very limited military vehicle trips would be added under this alternative, traffic impacts would be less than significant at this location.

*Farrington Highway/secondary MMR north access road intersection.* The No Action LOS conditions at the Farrington Highway/MMR secondary access road intersection are at LOS A. Because very limited military vehicle trips would be added under this alternative, there would be less than significant traffic impacts at this location.

*Farrington Highway/Mākaha Valley Road intersection.* The No Action LOS conditions at the Farrington Highway/Mākaha Valley Road intersection are at LOS D or better for all approaches. Because very limited military vehicle trips would be added under this alternative, there would be less than significant impacts at this location.

*Farrington Highway and Town of Wai'anae.* Farrington Highway traffic volumes would in general remain the same between MMR and Mākaha Valley Road under No Action conditions.

### Alternative 1 (Reduced Capacity Use with Some Weapons Restrictions)

#### Significant Impacts Mitigable to Less than Significant

*Impact 1: Consistency with state regulations and policies.* The Army's military convoys and ammunition transportation would not be consistent with the Hawai'i DOT policies and state regulations. For ammunition transported through the Wai'anae area, there would be no advance notification to allow the police and fire departments to undertake preventative measures to protect the public in event of an accidental explosion.

If convoys contain a PLS that exceeds the limit for an overweight vehicle, they would not be consistent with Hawai'i DOT policies, which limit such convoys to an oversize or overweight vehicle and an escort.

*Regulatory and administrative mitigation 1.* No regulatory and administrative mitigation measures have been identified.

*Additional mitigation 1a*. The Army would limit convoys containing oversize or overweight vehicles to two vehicles. The Army would coordinate with Hawai'i DOT to establish the number of allowable vehicles in each convoy.

*Additional mitigation 1b*. The Army would notify police and fire departments in writing at least 48 hours in advance of any ammunition transport, as required by Hawai'i DOT regulations. The notice would identify the amount and type of explosives to be transported, as well as travel route and time of delivery. Also, notifying Hawai'i DOT would provide the Army with information about travel lane closures for construction, maintenance, or other activities that could hamper ammunition delivery. If Farrington Highway needs to be closed in an emergency, the proposed Wai'anae Coast Emergency Access Road, while not contiguous, is an alternative route in selected areas along the Wai'anae coast.

#### Less than Significant Impacts

*Farrington Highway/primary MMR south access road intersection.* Under Alternative 1, vehicle trips would increase, but the roadway traffic conditions at the Farrington Highway/MMR primary access road intersection would be LOS A; therefore, no significant traffic impacts would occur at this location.

*Farrington Highway/secondary MMR north access road intersection.* Because the increased vehicle trips under this alternative would result in LOS A conditions at the Farrington Highway/MMR secondary access road intersection, there would be no significant traffic impacts at this location.

*Farrington Highway/Mākaha Valley Road intersection.* Under Alternative 1, increased vehicle trips would result in conditions at the Farrington Highway/Mākaha Valley Road intersection of LOS D or better for all approaches; therefore, no significant impacts would occur at this location.

*Farrington Highway and Town of Wai'anae.* The increase in Farrington Highway traffic volumes due to MMR trips would range from 12.4 percent to 59.5 percent between MMR and Mākaha Valley Road under Alternative 1 conditions. However, MMR trips under Alternative 1 would account for less than 2.9 percent of the traffic volumes in the town of Wai'anae and the other communities along the Wai'anae coast, which would be within normal daily fluctuations in hourly traffic volumes.

### Alternative 2 (Full Capacity Use with Some Weapons Restrictions)

#### Significant Impacts Mitigable to Less than Significant

*Impact 1: Consistency with state regulations and policies.* Impacts and mitigation measures would be similar to those described for Alternative 1.

#### Less than Significant Impacts

*Farrington Highway/primary MMR south access road intersection.* Alternative 2 would have impacts similar to those described for Alternative 1. For Alternative 2, the LOS conditions at the Farrington Highway/MMR primary access road intersection would be LOS A, and there would be no significant traffic impacts at this location.

*Farrington Highway/secondary MMR north access road intersection.* Alternative 2 would have impacts similar to those described for Alternative 1. For Alternative 2, the LOS conditions at the Farrington Highway/MMR secondary access road intersection would be LOS A, and there would be no significant traffic impacts at this location.

*Farrington Highway/Mākaha Valley Road intersection.* Alternative 2 would have impacts similar to those described for Alternative 1. For Alternative 2, the LOS conditions at the Farrington Highway/Mākaha Valley Road intersection would be LOS D or better for all approaches, and there would be no significant traffic impacts at this location.

*Farrington Highway and Town of Wai'anae.* Alternative 2 would have impacts similar to those described for Alternative 1. The increase in Farrington Highway traffic volumes due to MMR trips would range from 12.4 percent to 59.5 percent between MMR and Mākaha Valley Road for Alternative 2. However, MMR trips under Alternative 2 would account for less than 2.9 percent of the traffic volume in the town of Wai'anae and other communities along the Wai'anae coast, which would be within normal daily fluctuations in hourly traffic volumes.

#### Alternative 3 (Full Capacity Use with Fewer Weapons Restrictions)

Alternative 3 would require five additional HMMWVs to transport inert TOW missiles to and from MMR, but the impacts on intersections are similar to those of Alternatives 1 and 2.

##### Significant Impacts Mitigable to Less than Significant

*Impact 1: Consistency with state regulations and policies.* Impacts and mitigation measures would be similar to those described for Alternative 1.

##### Less than Significant Impacts

*Farrington Highway/primary MMR south access road intersection.* Alternative 3 would have impacts similar to those described for Alternative 1. For Alternative 3, the LOS conditions at the Farrington Highway/MMR primary access road intersection would be LOS A, and there would be no significant traffic impact at this location.

*Farrington Highway/secondary MMR north access road intersection.* Alternative 3 would have impacts similar to those described for Alternative 1. For Alternative 3, the LOS conditions at the Farrington Highway/MMR secondary access road intersection would be LOS A, and there would be no significant traffic impacts at this location.

*Farrington Highway/Mākaha Valley Road intersection.* Alternative 3 would have impacts similar to those described for Alternative 1. For Alternative 3, the LOS conditions at the Farrington Highway/Mākaha Valley Road intersection would be LOS D or better for all approaches, and there would be no significant traffic impacts at this location.

*Farrington Highway and Town of Waiʻanae.* Alternative 3 would have impacts similar to those described for Alternative 1. The increase in Farrington Highway traffic volumes due to MMR trips would range from 14.9 percent to 71.4 percent between MMR and Mākaha Valley Road for Alternative 3. However, MMR trips under Alternative 3 would account for less than 3.5 percent of the traffic volumes in the town of Waiʻanae and other communities along the Waiʻanae coast, which would be within normal daily fluctuations in hourly traffic volumes.

### Alternative 4 (Full Capacity Use with Fewer Weapons Restrictions), Pōhakuloa Training Area

Under this alternative, movement of Army units to PTA from SBMR is described in Section 2.4.3. The 2004 SBCT EIS provides a comprehensive discussion and evaluation based on traffic impacts from SBCT Transformation in Hawaiʻi.

#### Less than Significant Impacts

*Consistency with state regulations and policies.* The Army's military convoys and ammunition transportation are, to a great degree, consistent with the Hawaiʻi DOT policies and state regulations, especially for future highway improvement projects. As such, impacts would be less than significant.

*Intersection operations.* Until the Army could use the PTA Trail, troops and equipment would be transported via convoys on public roadways to access PTA from Kawaihae Harbor. Military trucks and/or Stryker vehicles would use state and county two-lane roads to and from PTA. Convoys would include no more than 30 vehicles at one time. If multiple convoys would be required, they would be spaced out in 15-minute intervals.

With use of the PTA Trail, military vehicles would cross state highways at Kawaihae Road north of Queen Kaʻahumanu Highway, at Kawaihae Road east of Queen Kaʻahumanu Highway, and at Māmalahoa Highway north of Saddle Road. PTA Trail would continue through WPAA to PTA. The portion of Saddle Road that passes through PTA would be realigned to a location north of the installation. Under Alternative 4, the Army would coordinate with Hawaiʻi DOT to minimize impacts on traffic crossings on the new Saddle Road from the PTA military vehicle trail.

Using recent traffic counts taken in May 2000 from Hawaiʻi DOT, an LOS analysis was performed for the crossings using the following assumptions:

- The number of vehicles used for calculations was less than maximum (four convoys of 24 vehicles sequenced at 15-minute intervals);
- The convoys would stop for traffic along the state highways, so there would be a two-way stop sign-controlled intersection; and
- The convoys would be scheduled for non-peak hours; however, analysis was calculated for convoy approach of the state highways during the peak hour of traffic.

According to the LOS analysis, the state highway crossings would operate at LOS C under "worst-case" conditions (Figure 4.6-6). Table 4.6-7 summarizes the LOS analysis. Very few delays would be experienced by highway traffic. This is because the convoys would yield to traffic along the state highways, so there would be no impact on the LOS on public highways, and no mitigation would be required.

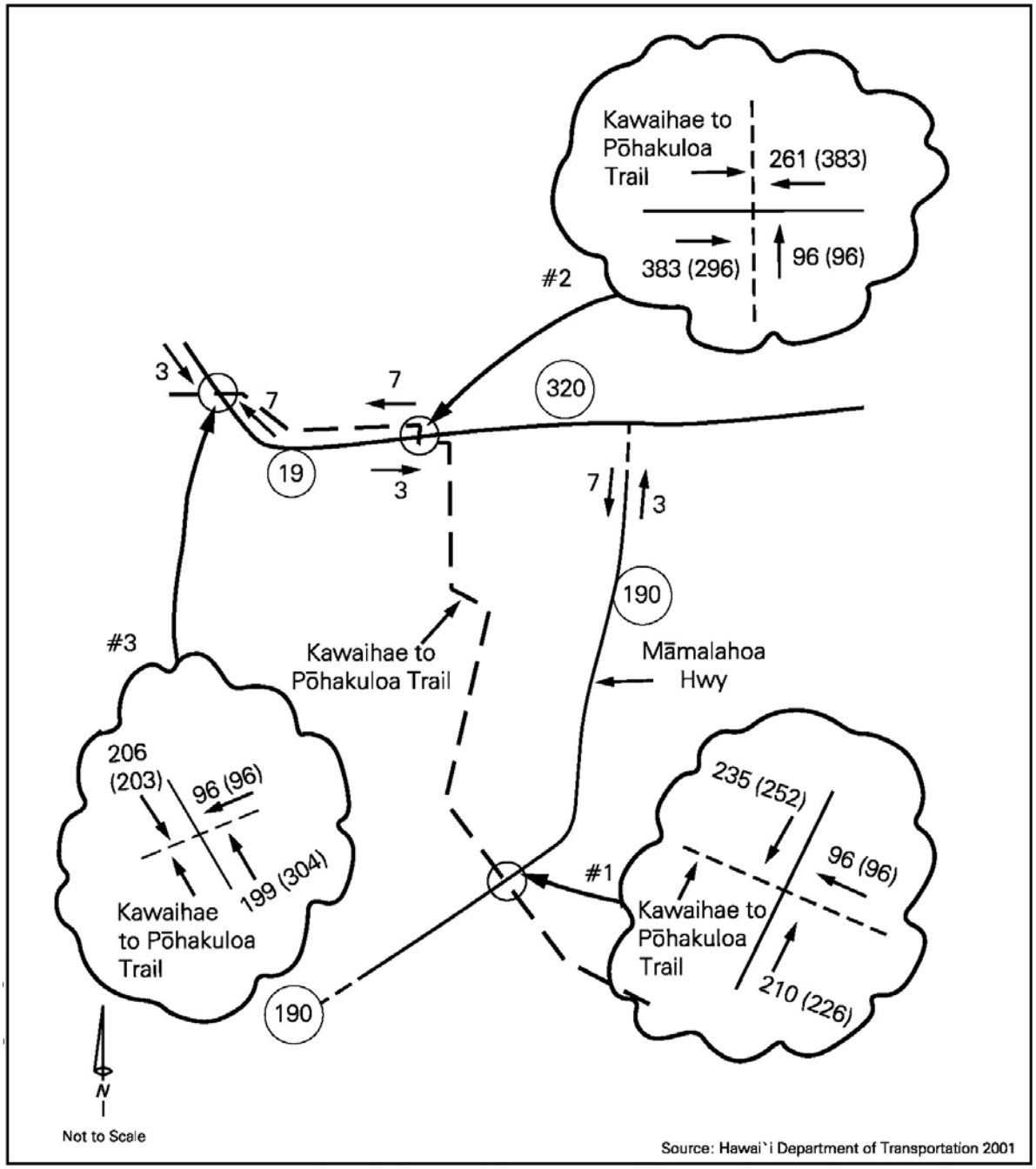
**Table 4.6-7**
**Levels-of-Service Analysis for PTA**

| | AM Peak Hour | | PM PeakHour | |
|---|---|---|---|---|
| | **Delay[1]** | **LOS[2]** | **Delay[1]** | **LOS[2]** |
| Trail at Kawaihae Road, North of Queen Ka'ahumanu Highway | 15.2 | C | 17.6 | C |
| Trail at Kawaihae Road, East of Queen Ka'ahumanu Highway | 22.8 | C | 24.1 | C |
| Trail at Māmalahoa Highway | 16.1 | C | 16.9 | C |

[1]Delay is in seconds per vehicle.
[2]LOS calculated using the operations method described in the *Highway Capacity Manual* (Transportation Research Board 2002); LOS is based on delay.

Based on the LOS results for existing two-lane highway crossings, the LRLTP (HDOT 1998) recommended the following:

- Widen Waikoloa Road and Queen Ka'ahumanu Highway from two to four lanes;
- Realign the western section of Saddle Road to the intersection with Māmalahoa Highway at Waikoloa Road; and
- Construct a new roadway parallel to and east of Queen Ka'ahumanu Highway, between Waikoloa Road and Kawaihae Road.




The State Highway Crossing would operate at LDSC (average traffic delays 25.1 to 35.0 seconds). Convoys would yield to traffic along state highways.

**Peak Hour Volumes Worst Case Scenario on Pōhakuloa Training Area**

Island of Hawai'i, Hawai'i

**Figure 4.6-6 Peak Hour Volumes Worst Case Scenario on PTA**

All of these improvements may affect operations of the military vehicle trail crossing by creating a wider roadway to be crossed and a new crossing. The proposed schedule for these improvements is not available, but the Saddle Road improvement was designated as "critical."

*Roadway segment operations.* Until the Army could use the PTA Trail, military vehicles would use public roadways to access PTA. Because convoys would operate with a maximum of 30 vehicles per convoy, with each convoy spaced at 15- to 30-minute intervals, the short-term elevated use of the roadways would operate at LOS C under "worst-case" conditions. While there would be noticeable delays, the traffic impacts would be less than significant.

Under this alternative, there would be no additional units deployed to PTA per year to conduct CALFEX and convoy exercises. Use of the PTA Trail would result in Army traffic having almost no impact on public roadway traffic and no mitigation being required.

Use of the PTA Trail would also have beneficial impacts on roadway segment and intersection operations, with fewer military vehicles on public roadways.

*Construction traffic.* The construction of the proposed CALFEX and convoy range would generate additional traffic from worker vehicles and trucks, but the construction traffic would be temporary and less than significant. No mitigation would be required.

## 4.7 WATER RESOURCES

### 4.7.1 Impact Methodology

The impact analysis in this section is a discussion of the effects of No Action and Project Alternatives. The nature of existing conditions on the Islands of O‘ahu and Hawai‘i is interpreted from available literature and the results of MMR hydrogeologic investigation.

The hydrogeologic investigation objectives at MMR included evaluating the potential for contaminants to be transported beyond the boundaries of MMR and better understanding the role of surface water and groundwater in transporting contaminants resulting from past MMR activities. The water resources investigation included the following actions:

- Installing and sampling groundwater monitoring wells;
- Measuring groundwater elevations;
- Measuring rainfall;
- Measuring stream flow; and
- Sampling surface water from streams and *muliwai.*

Data obtained from these investigations are presented in the affected environment discussion and have greatly increased the volume of available information from which to evaluate the impacts of the MMR alternatives. These data are evaluated in combination with other sources of information, including the results of previous local or regional hydrogeologic investigations. Semiquantitative models of surface water and groundwater contaminant transport were developed based on the results of the hydrogeologic investigations and provide an additional tool for assessing impacts on water quality.

### 4.7.2 Factors Considered for Determining Significance of Impacts

A project alternative’s impact on water resources is considered to be significant if the alternative would result in any of the following:

- Degrade water quality in a manner that would reduce the existing or future beneficial uses of the water;
- Substantially increase risks associated with human health or environmental hazards;
- Reduce the availability of, or accessibility to, one or more of the beneficial uses of a water resource;
- Alter water movement patterns in a manner that would adversely affect the uses of the water within or outside the project region;

- Be out of compliance with existing or proposed water quality standards or require an exemption from permit requirements in order for the project to proceed; or
- Increase the hazard of flooding or the amount of damage that could result from flooding, including from runoff or from tsunami or seiche run-up.

Regulatory standards against which water resources impacts are evaluated include, but are not limited to, the following:

- Federal and state primary and secondary drinking water standards under the SDWA;
- EPA Region IX Tap Water PRGs;
- Point and nonpoint source discharge permit requirements under the CWA;
- CZMA; and
- State and local plans and policies protecting surface water and groundwater resources.

### 4.7.3 Summary of Impacts

The project alternatives are not expected to have significant impacts on surface water or groundwater quality at MMR or PTA. Current conditions do not indicate that past practices have had a significant impact on groundwater.

At MMR, some uncertainty exists regarding the potential for the tap water PRG for RDX to be exceeded in surface water in Koʻiahi Gulch (also known as Kaiahi Gulch) under certain conditions. The tap water PRG is not a regulatory criterion and is not considered an appropriate threshold criterion for determining significance of impacts because surface water is not used as a drinking water source.

However, in the absence of other criteria, the Army has adopted a conservative approach to evaluating this impact and will monitor surface water for selected contaminants of concern to continue evaluating surface water quality. If monitoring identifies significant impacts, such as indications that chemicals of concern may exceed regulatory standards, reduce beneficial uses, result in adverse human or environmental health effects, or conflict with state or federal anti-degradation policy, then additional action would be taken to address these impacts.

**Summary of Potential Water Resources Impacts**

| Impact Issues | No Action Alternative | Alternative 1 MMR (Reduced Capacity Use with Some Weapons Restrictions) | Alternative 2 MMR (Full Capacity Use with Some Weapons Restrictions) | Alternative 3 MMR (Full Capacity Use with Fewer Weapons Restrictions) | Alternative 4 PTA (Full Capacity Use with Fewer Weapons Restrictions) |
|---|---|---|---|---|---|
| Flooding | ⊙ | ⊘ | ⊘ | ⊘ | ⊙ |
| Impacts on surface water quality from chemical contaminants | ⊙ | ⊙ | ⊙ | ⊙ | ⊙ |
| Impacts on surface water quality from soil erosion | ⊙ | ⊙ | ⊘ | ⊘ | ⊙ |
| Alter stream channel or groundwater flow patterns | ⊙ | ○ | ○ | ○ | ○ |
| Groundwater quality | ○ | ⊙ | ⊙ | ⊙ | ⊙ |
| Reduce water supply | ○ | ○ | ○ | ○ | ○ |

LEGEND:
⊗ = Significant impact
⊘ = Significant impact mitigable to less than significant
⊙ = Less than significant impact
○ = No impact
+ = Beneficial impact

Groundwater quality at MMR is not expected to be affected by the project alternatives because current conditions do not indicate that past practices have had a significant impact on groundwater and because the preliminary results of the hydrogeologic investigation suggest that contaminants would not travel through the vadose zone in the training area and reach groundwater.

Trace levels of fuel constituents observed in MMR groundwater samples suggest that impacts could occur from fuel spills, but these impacts are not considered significant. The Army has adopted a conservative approach to addressing the potential for impacts on groundwater and will continue to perform groundwater monitoring to document that the impacts remain less than significant. The protocol for this monitoring would be developed with input from the public. If significant impacts are observed, then appropriate actions would be taken to mitigate the impacts, such as those described above for surface water. Depending on the nature of the impacts, such actions might include source control measures or groundwater capture and

treatment. Based on available data, it is not expected that these measures would be required.

Under Alternative 4, it is expected that impacts to water resources would not be significant. There would be less than significant impacts on surface water quality at Kawaihae Harbor and on surface water and groundwater quality at PTA. Training would continue to disturb soils and result in residues of explosives in soils. However, due to lack of permanent surface water resources, and the great depth to groundwater, water quality impacts, if any, are not expected to be significant. Additionally, impacts on surface water and/or groundwater from maneuver training in the Ke'āmuku Parcel (also referred to as the West PTA Acquisition Area - WPAA) would be less than significant.

For MMR, the potential for flooding to damage property or to inundate areas where pollutants may be stored is considered a potentially significant but mitigable impact. At PTA, flooding impacts would be less than significant.

Anticipated increased water demand associated with the alternatives is expected to have a negligible impact on groundwater or surface water supply in Mākua Valley or PTA. The alternatives would not require a stream channel to be altered and would not adversely alter groundwater elevations or flow patterns.

### *No Action Alternative*

*Less than Significant Impacts*

*Flooding.* Under No Action, the potential for floods at MMR would remain. However, with the level of non live-fire training occurring at MMR, the results of any flooding are not expected to be significant because limited quantities of materials with a potential to affect water quality would be stored at the installation. Although flooding might damage structures, roads, or other improvements within the flood zone, the potential effects on water resources are considered less than significant.

*Impacts on surface water quality from chemical contaminants.* Dispersed (nonpoint source) pollutants may affect stream water quality if they are transported from surface soils on the ranges to intermittent stream channels by runoff. Dissolved chemicals or soil particles may be transported to stream channels with contaminants bound to them, depending on the solubility of the contaminants. Once mobilized, stream water may transport the chemicals downstream, where they may be deposited in the stream channel, on the floodplain (if the stream overflows its channel), in the *muliwai,* or in the ocean.

As discussed in Section 3.7, stream water samples collected during a period of high stream flow in February 2003 provided some information about the potential for contaminants to be transported to each of the three streams that drain MMR. Because of the low frequency of storms and the length of time since significant runoff has occurred in the lower part of the valley, samples collected at the beginning of the February 2003 and January and February 2004 flows likely represent the high end of the range of contaminant concentrations that might occur under existing conditions at MMR. If the storm had been larger, then more runoff might have carried more soils to the stream channels, but concentrations might also have been diluted by the additional runoff. Because the samples were collected early in the runoff, they probably contained higher concentrations of contaminants than would have been observed if the concentrations were averaged over the entire volume of water that discharged from the streams as a result of the storm.

More recent surface water sampling included sampling on Koiahi Gulch Stream, Mākua Stream, and Punapohaku Stream during three (3) small storms and one very large rain-storm in Mākua Valley. This occurred from January 2007 through December 2008. Groundwater samples were collected from the 10 monitoring wells at MMR. For soil samples, 9 locations were analyzed for metals, with four (4) of the locations analyzed for explosives. Results are further summarized in Chapter 3.7.

A review of the results of the soil, surface-water, and groundwater sampling conducted during 2006-2008 (ERDC, 2009) showed similar levels of metal and explosive concentration as the sampling outlined as part of the February 2006 Hydrogeologic Investigation Report (Appendix G-1 of the EIS). The levels of potential compounds of concern found in soil, surface-water, or groundwater are of insufficient magnitude to classify MMR as contributing significantly to the detection of off-site substances. This is because if there were significant contamination at MMR, many more of the samples would have contained higher levels of compounds related to military training.

Because no live-fire exercises occurred at MMR from 1999 to 2001, and from 2004 until now, residue concentrations in soils may be somewhat lower than they would have been if the sampling had been performed several years earlier. This is because natural degradation and dispersion processes tend to reduce concentrations in soils over time. Without any remediation activities, the concentration of energetics within the OB/OD unit appears to have declined by roughly an order of magnitude over levels measured in the mid-1980s, when the OB/OD area was in full operation. Based upon the observed trends, it has been theorized that the energetic materials generated by range activity at the Mākua soils undergoes some

form of natural degradation, with a half-life (time required to reduce the concentration by half) on a time frame of between two and five years (Environet 2004).

In addition, RDX has a relatively low solubility, it can go into solution at concentrations of approximately up to 5 mg/l, which is the concentration that RDX was reported by the analytical laboratory in the shallow pore water samples at the OB/OD area. Therefore, RDX does not migrate quickly. It should be noted that many environmental factors influence a substance's migration rate, these include but are not limited to geology or soil composition, and the presence of water.

Several pesticides were observed in stream water samples at concentrations above tap water PRGs, as were dioxins and furans. These chemicals are very persistent in environmental media and resist natural degradation. They tend to be bound to soil particles. The pesticides are likely the result of past practices because they are no longer used. A possible explanation is that they were used as a treatment against termites on wood or wooden pallets at the site. The source of the dioxins is not known, although they may have resulted from past disposal of waste in the OB/OD area, from wildfires or prescribed burning, or even from atmospheric deposition from distant sources. Off-site background soil samples, for example, contained concentrations of dioxins similar to those observed in on-site soils, suggesting that the dioxins are widespread in the area. The observed concentrations of these chemicals in surface water samples were close to the PRGs for tap water, but the human health risks associated with the observed concentrations are within EPA's acceptable risk range. In addition, surface water is not used as a source of drinking water.

Contaminated suspended sediments would ultimately be deposited either in the *muliwai* or in the ocean. Some of these chemicals (such as dioxins, furans, and chlorinated pesticides) are bioaccumulative (they can accumulate in the tissues of fish and marine mammals), and this makes them a general concern in the environment. The total mass of the chemicals transported per year to ocean water is extremely low and would not add measurably or significantly to background levels of the same compounds already present from other widespread sources. A small difference in the concentrations and associated human health risks of some chemicals were observed in fish specimens collected in *muliwai* or in nearshore waters adjacent to MMR compared to similar fish collected from other locations, suggesting that under current conditions there is little evidence of impacts from recent or past activities on uptake of chemicals by fish.

Under No Action, surface runoff would continue to mobilize residual chemical contaminants in soils. Over time, residual chemical concentrations would be reduced through natural degradation processes, further reducing the potential for impacts on water quality; therefore, residual chemicals are not expected to result in significant impacts on downstream surface water quality in streams, the *muliwai,* or the ocean.

*Regulatory and administrative mitigation.* No regulatory and administrative mitigation measures have been identified.

*Additional mitigation.* Potential mitigation measures for this impact include conducting remedial actions at the OB/OD area. These actions could include soil removal and phytoremediation. The Army will develop a long-term program to monitor potential contamination. The protocol for this monitoring will be developed with input from the public.

*Impacts on surface water quality from soil erosion.* Soil erosion can reduce stream water and ocean water quality by increasing suspended sediment concentrations and turbidity. Because the streams at MMR are intermittent, effects of suspended sediment on stream water quality are not expected to be significant. However, suspended sediment may temporarily reduce water clarity. If soils are contaminated or contain organic nutrients, the contaminants may be transported to a stream through surface runoff, affecting stream, *muliwai,* or ocean water quality. Excessive suspended sediment loads can affect marine species, such as corals, if deposited in large quantities over a short period of time.

As discussed in Section 4.14, there is a potential for wildfires, once initiated, to burn more intensely and to remain uncontrolled for longer periods of time under No Action than under existing conditions. This would be due to less fuel management and a potentially longer response time to fires when the facility is no longer used for live-fire training. This would have an indirect impact on surface water quality because soil could erode from extensive loss of vegetative cover during a major wildfire. Soil erosion can reduce stream water and ocean water quality by increasing suspended sediment concentrations and turbidity. The potential for this impact and the degree of impact depends on the condition of the vegetation cover at the time of a major rainfall. Grasses recover quickly with moderate rainfall, and large runoff-producing storms are infrequent. Therefore, the potential for a major erosion-producing event following a major wildfire is low. If such an event occurred, the principal effect on surface water quality would be on ocean water quality, where there would be a short-term increase in turbidity, nutrient loading to the water column, and deposition of fine-grained sediment on the ocean bottom offshore from the mouths of the streams that drain Mākua Valley. The sediment

would contain low concentrations of the residual chemicals present in soils at MMR. The impacts from this scenario on ocean water quality are expected to be less than significant because they would be temporary, and chemical constituent concentrations would be negligible.

*Alter stream channel or groundwater flow patterns.* No significant impacts are expected under No Action because there would be no alteration of stream channels and no pumping of groundwater. If substantial soil erosion were to occur as a result of heavy runoff following a major wildfire, large volumes of sediment might be deposited in the channel and floodplain of Mākua Stream or the other streams that drain Mākua Valley, and such sediment deposition could alter the existing stream flow pattern. Such an occurrence is not considered significant because it would not be the result of activities requiring a permit under Section 404 of the CWA.

*No Impacts*

*Groundwater quality.* Groundwater sample results have generally been below EPA MCLs and would meet drinking water standards. Thallium was detected above MCLs in two samples during initial groundwater monitoring but has not been detected above MCLs in later samples. Thallium is naturally present in soils and sediments but may also be present in munitions components. The tap water PRG for dioxins was exceeded in one sample from ERDC-MW-5. The source of the dioxins is not clear, but because of the extremely low water solubility of dioxins, it is likely that the dioxins detected in the samples were chemically bound to sediment particles. Sediment and soils in many areas of Hawai‘i and elsewhere in the world are known to be contaminated with trace concentrations of dioxins from many sources (see Section 3.8 for further discussion of this issue). It is possible that the trace levels of dioxins were introduced from cross-contamination during drilling and construction of the monitoring wells or that dioxins have been transported in groundwater from recharge areas within Mākua Valley. Overall, the groundwater data suggest that groundwater has not been significantly affected by contaminants resulting from military activities or past disposal practices.

The hydrogeologic investigation results suggest that the groundwater beneath the ordnance impact area and the OB/OD area is confined within a permeable bed that occurs nearly 100 feet (30.5 meters) below sea level and that the overlying sediments act as an aquitard (a low permeability barrier to vertical groundwater flow).

The relatively low concentrations of contaminants observed in groundwater are consistent with there being little recharge from contaminants in surface soils. Furthermore, soil moisture collected in lysimeters installed in the OB/OD area and at the so-called junk car pit

also indicate that vertical migration of soil moisture to the underlying groundwater aquifer is slow or negligible in these areas. Based on information presented in the hydrogeologic investigation report (Appendix G-1), it appears unlikely that substantial recharge to the aquifer occurs directly beneath the training area.

Under No Action, there would be no additional chemicals introduced to the environment.

Existing chemicals in soils and groundwater would continue to migrate, as described in Section 3.7. However, no effects on groundwater quality are expected to result from the existing chemical concentrations, based on available groundwater sampling data and projections from groundwater modeling.

*Reduce water supply.* No impacts on water supply are expected under No Action because no additional surface or groundwater would be diverted or extracted.

### Alternative 1 (Reduced Capacity Use with Some Weapons Restrictions)

Significant Impacts Mitigable to Less than Significant

*Impact 1: Flooding.* The 100-year flood zone has not been determined, but as discussed in Section 3.7, the elevation of Mākua Stream in the vicinity of the former USGS gauge in a 100-year flood is expected to be in the range of about 17 feet (5 meters) msl. A flood of this magnitude might therefore affect some of the structures in the vicinity of the MMR Range Division office and the installation main gate. Flooding could damage structures, including temporary structures and equipment stored at bivouacs during training events, in the flood zone or release any chemicals or hazardous materials that happen to be stored in the flood zone. Floodwater could carry debris from the upper watershed down to the box culverts and block them, resulting in higher flood levels than otherwise. This would be a significant impact but is not likely to occur during training exercises, which are conducted during reasonably good weather.

Alternative 1 would not alter flooding potential either from runoff or from tsunamis, relative to No Action.

*Regulatory and administrative mitigation 1.* No regulatory and administrative mitigation measures have been identified.

*Additional mitigation 1.* Potential mitigation measures for this impact include preparing a flood contingency plan to identify potential flood hazards associated with temporary training facilities and permanent

facilities and measures to protect them from flood damage. If appropriate, a flood alert procedure would be developed, along with evacuation procedures for materials and equipment staged in the bivouac area. Hazardous materials storage procedures may be modified to address flooding potential and to ensure that hazardous materials are not stored within the suspected 100-year flood zone and that materials could be moved out of the area susceptible to flooding, if necessary.

### *Less than Significant Impacts*

*Impacts on surface water quality from chemical contaminants.* Under Alternative 1, the Army would conduct live-fire training during 10 to 19 CALFEXs per year. The lack of information about the rates of degradation of explosives chemicals in soils at MMR makes it difficult to estimate the effects of an increase in training. The Army studies discussed in Section 3.8.5 suggest that unburned explosives residues tend to be deposited in surface soil where live munitions are used. The soil sampling results from the hydrogeologic data (Appendix G-2 of the EIS, and supplemented and supported by 2006 to 2008 hydrogeologic data at Appendix O) suggest that relatively low residual concentrations of explosives are present. As discussed below, very low concentrations of explosives residues are expected in soils as a result of future live-fire exercises, as current and future military munitions are designed to detonate more efficiently than are older munitions.

Residual explosives or metals concentrations in soils resulting from detonation of munitions would be the primary source of surface water contaminants under Alternative 1. An increase in these residual concentrations in surface soils over time could lead to additional impacts on surface water above current levels. As described in Section 3.8.5, RDX is considered a conservative indicator of the environmental impacts on water quality associated with explosive compounds. Using the assumptions presented in Section 3.8.5 regarding potential residual quantities of RDX resulting from a typical CALFEX, a total of about 0.84 ounces (24 grams) of RDX residue would be deposited per year in the training area under Alternative 1 (up to 19 CALFEXs and 100 Convoy LFXs). The RDX residue would be distributed broadly over the training area. In addition, as described in Section 4.8 (Geology and Soils), about 5.6 ounces (160 grams) of RDX per year may be deposited in soils as a result of demolition exercises. Some of the RDX residue could be washed downslope and into the stream of Ko‘iahi Gulch (also known as Kaiahi Gulch) by runoff from a large storm. A number of possible scenarios could be postulated, and it seems feasible that under some conditions, concentrations of RDX in the stream could exceed the tap water PRG of 0.61 microgram per liter (µg/L).

Surface water is not used as a source of drinking water at MMR, but the contaminants could be carried downstream and discharged to the *muliwai* or to the ocean. This would occur infrequently, depending on precipitation. Therefore, the total mass of RDX that would be discharged to the ocean (the total loading) would be very small. RDX is expected to be the most abundant explosives contaminant to result from future training exercises. As discussed in Section 3.8.5, other explosives compounds, such as TNT and HMX, are much less prevalent. RDX also has a relatively low tap water PRG, meaning that its health effects occur at relatively low concentrations. In addition, RDX is relatively stable in the environment, meaning that it doesn't degrade rapidly, and, as discussed previously in this chapter, energetic materials generated by range activity at the Mākua soils seem to undergo some form of natural degradation, have a relatively low solubility, and does not migrate quickly. Therefore, because RDX concentrations are not expected to have a significant impact on human health or the environment, concentrations of other munitions-related substances also are expected to have less than significant impacts.

Perchlorate (an anion that results when explosive salts, such as potassium, sodium, or ammonium perchlorate, dissolve in water) has been detected at very low concentrations in some soil, surface water, and groundwater samples collected at MMR. Perchlorate is used in the propellant and the high explosive charges of some munitions (e.g., the shoulder-launched multipurpose assault weapon [SMAW] and the AT-4 anti-tank rocket). About 2 ounces (57 grams) of potassium perchlorate and aluminum powder are used in the explosive charge of the 2.75-inch training rocket (M274) to provide an explosive flash and smoke. Perchlorate is highly soluble in water and resists degradation. It has received much scientific scrutiny recently because it has been identified in groundwater at a number of sites where rocket fuel is manufactured or used. The EPA has not established a primary drinking water standard for perchlorate, but provisional health effects thresholds have been established for drinking water concentrations, ranging between about 1 and 18 µg/L. The EPA Region IX tap water PRG is 3.6 µg/L.

In considering the significance of perchlorate as an environmental contaminant at MMR, it is important to take into account the way in which it might be released into the environment. Like RDX and other explosives, most of the perchlorate would be consumed in the explosive reaction following detonation. In addition, unlike RDX or TNT, which are used in relatively large amounts in many high explosive munitions (charges of one-half pound or more are typical), less than an ounce to several ounces of perchlorate are used in only a few munitions. Also, because of its high solubility, it is not expected to accumulate in soils. Therefore, although an increase in the use of perchlorate-containing munitions may result in an

increase in the concentrations of perchlorate in surface water and groundwater compared to current conditions, the increases are not expected to be substantial. Finally, the greatest risk associated with perchlorate is from ingestion, primarily through long-term consumption of contaminated drinking water. There is not a significant exposure route at MMR because MMR's groundwater is not a source of drinking water. In addition, it is highly unlikely for MMR's groundwater to impact other sources of drinking water on O'ahu, as there is no known hydraulic connection between the groundwater at MMR through the Wai'anae mountains to other drinking water supplies. For these reasons, perchlorate would have less than significant impacts on surface water quality. Also, RDX is considered a more appropriate and conservative indicator of the environmental effects of munitions use on water quality at MMR.

Concentrations of pesticides or dioxins in surface or groundwater are not expected to increase relative to existing conditions as a result of Alternative 1. The presence of chlorinated pesticides detected in surface water during the current hydrogeologic investigation may be related to past disposal or pesticide application practices or to deposition of atmospheric dust contaminated by sources outside Mākua Valley and carried to Mākua Valley by wind. The source of the dioxins is unknown, but they also may result from atmospheric deposition of dust or from soot from wildfires. Therefore, dioxin levels would also be unchanged by activities proposed in Alternative 1.

The Army would continue to monitor surface water quality for selected contaminants of concern to ensure there is no significant increase in explosive residues from live-fire training. A surface water monitoring plan would be developed to specify monitoring methods and procedures and analytes of concern. The protocol for this monitoring would be developed with input from the public. If significant concentrations of contaminants are detected, then mitigation could include measures to direct runoff away from areas of contaminated soils and to reduce or intercept runoff from areas of contaminated soils.

*Regulatory and administrative mitigation.* No regulatory and administrative mitigation measures have been identified.

*Additional mitigation.* Potential mitigation measures for this impact include conducting remedial actions at the OB/OD area. The Army is preparing a long-term monitoring plan that will be available for the public to review. If a substance were identified during monitoring, the Army would conduct further analysis to verify the detection. If the identified substance were detected above the USEPA acceptable risk level, then the Army would take appropriate action to correct the situation and prevent or

minimize the potential for the substance to be released into the muliwai or nearshore areas of Mākua. In accordance with the requirements of the 2001 Settlement Agreement, before finalizing a long-term program to monitor detected contaminants, the Army would provide a 60-day public comment period on the scope of and protocol for such monitoring.

*Impacts on surface water quality from soil erosion.* Enhanced soil erosion could occur in areas with reduced vegetation cover or disturbed soils, along roads, or in areas with steep slopes. Wildfires have the potential to cause large amounts of vegetation loss. Soil erosion can reduce stream water and ocean water quality by increasing suspended sediment concentrations and turbidity. Because the streams at MMR are intermittent, effects of suspended sediment on stream water quality are not expected to be significant. However, suspended sediment may temporarily reduce water clarity. If soils are contaminated or contain organic nutrients, the contaminants may be transported to a stream through surface runoff, affecting stream water, *muliwai,* or ocean water quality. Excessive suspended sediment loads can affect marine species, such as corals, if deposited in large quantities over a short period of time.

The potential for wildfires to occur would be greater under Alternative 1 than under No Action because of the use of live ammunition; however, fire suppression equipment and personnel would be maintained at the installation and would be mobilized sooner in the event that live-fire exercises caused a fire. The wildland fire management program would continue to control fuel and to suppress any natural or human-made fires should they occur.

*Regulatory and administrative mitigation.* Damage to soils from wildfires and specific mitigation measures needed to address that damage would be evaluated within the Army's ITAM program, which is described in Chapter 2. Actions initiated under the ITAM program, such as reseeding, redirecting runoff, and avoiding damaged land areas, are expected to be effective in reducing soil erosion impacts if they occur.

Implementing these measures is expected to reduce the long-term impacts on surface water quality from erosion related to wildfires and increased training intensity to less than significant levels.

*Groundwater quality.* As for No Action, groundwater directly beneath the live-fire training area is not expected to be affected by surface contamination due to the presence of a fine-grained deposits above the aquifer. Subsurface data from monitoring wells drilled during the hydrogeologic investigation described in Appendix G-1 also suggest that shallow groundwater would not be affected by recharge of stream water

through channel deposits at lower elevations on the coastal floodplain because very little recharge occurs there.

As discussed in the section for surface water above, the greatest risk associated with perchlorate is from ingestion, primarily through long-term consumption of contaminated drinking water. There is not a significant exposure route at MMR because MMR's groundwater is not a source of drinking water. In addition, there is no possible way for MMR's groundwater to impact other sources of drinking water on O'ahu. There is no known hydraulic connection between the groundwater at MMR through the Wai'anae mountains to other drinking water supplies.

The Army would perform long-term monitoring of water quality using the existing network of monitoring wells. A monitoring program will be developed, identifying the frequency of monitoring and the analytes to be evaluated, which would likely include fuel constituents and selected metals and energetic compounds. If significant concentrations of indicator chemicals were observed, then appropriate additional action would be initiated depending on the nature of the contaminants observed. Among the measures that would be considered are restrictions on groundwater use, source control measures, groundwater capture, and point of use filters. Mitigation measures that would be considered to address gasoline constituents would include further efforts to identify the sources of gasoline contamination (such as spills or leaks from grass-cutting equipment or vehicles) and review of the spill prevention and control program to ensure that it is as effective as possible in preventing impacts on water resources.

#### No Impacts

*Alter stream channel or groundwater flow patterns.* Stream channels and groundwater flow patterns would not be altered under Alternative 1.

*Reduce water supply.* The Army has considered using groundwater to replenish the fire water ponds. Due to the relatively small volume of water required, if this plan were implemented, it would not be expected to significantly affect groundwater levels.

### Alternative 2 (Full Capacity Use with Some Weapons Restrictions)

The impacts of implementing Alternative 2 would be similar to those discussed for Alternative 1, but because Alternative 2 would involve an additional increase in the intensity of CALFEXs, from 10 to 19 per year up to 50 CALFEXs per year and the use of tracers, the magnitude of the surface water quality impacts would be greater than for Alternative 1. For example, using the assumptions presented in Section 3.8.5 regarding

potential residual quantities of RDX resulting from live-fire exercises, a total of about 1.76 ounces (50 grams) of RDX would be deposited per year under Alternatives 2 (up to 50 CALFEXs and 200 Convoy LFXs). In addition, as described in Section 4.8 (Geology and Soils), about 5.6 ounces (160 grams) of RDX per year may be deposited in soils as a result of demolition exercises.

### Significant Impacts Mitigable to Less than Significant

*Impact 1: Flooding.* The impacts would be similar to those described for Alternative 1.

*Regulatory and administrative mitigation 1.* No regulatory and administrative mitigation measures have been identified.

*Additional mitigation 1.* Mitigation measures would be the same as those described under Alternative 1.

*Impact 2: Impacts on surface water quality from soil erosion.* Impacts on surface water quality from erosion caused by wildfires would be similar to those described for Alternative 1, except that the use of tracer ammunition during day and night training would greatly increase the potential for wildfires to occur. Furthermore, increased intensity of land use because of the increased number of live-fire training exercises under Alternative 2 could result in greater damage to vegetation cover and soil disturbance, resulting in greater potential for soil erosion.

*Regulatory and administrative mitigation 2.* While the wildfire risk would increase, training would be conducted only after the Army had completed ESA Section 7 consultation and had updated the IWFMP to address the increased fire risk.

Damage to soils and specific mitigation measures needed to address that damage would be evaluated within the Army's ITAM program, which is described in Chapter 2. Actions initiated under the ITAM program, such as reseeding, redirecting runoff, and avoiding damaged land areas, are expected to be effective in reducing soil erosion impacts if they occur.

Implementing these measures is expected to reduce the long-term impacts on surface water quality from erosion related to wildfires and increased training intensity to less than significant levels under Alternative 2.

*Additional mitigation 2.* No additional mitigation measures have been identified.

### Less than Significant Impacts

*Impacts on surface water quality from chemical contaminants.* As described for Alternative 1, explosives residues, metals, and other pollutants generated by training activities may affect surface water. The increased intensity of live-fire training would result in increased deposition of explosives and metals residues on soils. The potential for more of these residues to be transported by runoff to stream channels and ultimately to the *muliwai* and the ocean would be increased. As discussed in Section 3.8 and above for Alternative 1, the total amount of explosive residue generated in a CALFEX is small and, when dispersed, would probably not be detectable. Doubling the number of CALFEXs under Alternative 2 would double this amount, but the resulting quantity of residue is still not expected to result in a significant impact on surface water quality. The use of tracers would not introduce significant amounts of additional chemical contaminants. Tracers contain small quantities of magnesium powder, barium, strontium, calcium, or polyvinyl chloride (PVC), which produce different colors of light when they burn. Using these compounds is not expected to deposit sufficient quantities of residues to have a measurable effect on water quality.

Surface water would be monitored, as described for Alternative 1.

*Regulatory and administrative mitigation.* No regulatory and administrative mitigation measures have been identified.

Additional mitigation. Potential mitigation measures for this impact include conducting remedial actions at the OB/OD area. These actions could include soil removal and phytoremediation. The Army will develop a long-term program to monitor potential contamination. The protocol for this monitoring will be developed with input from the public.

*Groundwater quality.* There is negligible direct groundwater recharge in the training area because the geologic deposits beneath the training area are of very low permeability and are relatively thick. Therefore, there would be negligible increased potential for groundwater impacts under Alternative 2, even though residues of explosives in surface soils would increase. The impacts would be essentially the same as those described for Alternative 1.

The groundwater would be monitored, as described for Alternative 1.

### No Impacts

*Alter stream channel or groundwater flow patterns.* No impact is expected, as discussed under Alternative 1.

*Reduce water supply.* No impact is expected, as discussed under Alternative 1.

### Alternative 3 (Full Capacity Use with Fewer Weapons Restrictions)

In general, the same types of effects would occur for this alternative as for Alternative 2, except that the impacts would be greater in magnitude because of the addition of inert TOW missiles, 2.75-inch rockets, and illumination munitions. The inert TOW missiles would be training rounds, using propellants and a relatively small quantity of explosive intended primarily to make noise. The 2.75-inch rockets would contain both propellant to drive the rocket motor and a high explosive charge that detonates on impact. Illumination munitions, which are similar to fireworks, are designed to burst at the high point in their trajectory, releasing chemicals that ignite and burn as the munitions fall to the ground. The chemicals used in these munitions are typically of the type that ignite spontaneously when exposed to air, such as phosphorous or metallic sodium or magnesium. Chemicals that are not completely consumed before they reach the ground may continue to burn or be ignited on the ground.

#### Significant Impacts Mitigable to Less than Significant

*Impact 1: Flooding.* The impacts are approximately the same as those described for Alternatives 1 and 2.

*Regulatory and administrative mitigation 1.* No regulatory and administrative mitigation measures have been identified.

*Additional mitigation 1.* Mitigation measures would be the same as those described under Alternative 1.

*Impact 2: Impacts on surface water quality from soil erosion.* The impacts on surface water quality from erosion caused by wildfires would be similar to those described for Alternative 2, except that the use of inert TOW missiles, 2.75-inch rockets, and illumination munitions would further increase the risk of wildfires (this is described in greater detail in Section 4.14). Although the likelihood is small that heavy rainfall would follow an extensive fire, that combination of events could result in significant soil erosion and significant impacts on surface water quality of streams, the *muliwai,* and the ocean. The effects on soil erosion, and therefore on water quality, of soil disturbance and disturbance of vegetation in training areas would be similar to those of Alternative 2.

*Regulatory and administrative mitigation 2.* As discussed for Alternative 2, the Army would update its fire prevention and control procedures

through ESA Section 7 consultation and revision of the IWFMP. As described for Alternative 2, this and implementation of the ITAM program are expected to reduce the impacts to less than significant levels.

*Additional mitigation 2.* No additional mitigation measures have been identified.

### Less than Significant Impacts

*Impacts on surface water quality from chemical contaminants.* The impacts described for Alternative 2 also would occur under Alternative 3. No significant increase in the potential for surface water contamination is expected from using inert TOW missiles and 2.75-inch rockets, because their flammable and explosive compounds are expected to be consumed during use.

The use of illumination munitions could introduce additional chemical compounds to the environment. The colors in some flares are caused by small amounts of powdered metals contained in an ignitable matrix. The metals produce a characteristic color at high temperatures. Most of the chemicals in the flares are expected to be consumed as the flares burn. The small quantities of chemicals that are not consumed are not expected to result in significant concentrations in receiving waters.

Long-term periodic surface water monitoring would be conducted to document the degree of impact on surface water, as described for Alternative 1.

*Regulatory and administrative mitigation.* No regulatory and administrative mitigation measures have been identified.

*Additional mitigation.* Potential mitigation measures for this impact include conducting remedial actions at the OB/OD area. These actions could include soil removal and phytoremediation. The Army will develop a long-term program to monitor potential contamination. The protocol for this monitoring will be developed with input from the public.

*Groundwater quality.* Impacts on groundwater are the same as those described for Alternative 2.

Groundwater would be monitored, as described for Alternative 1.

### No Impacts

*Alter stream channel or groundwater flow patterns.* No impact is expected, as discussed under Alternative 1.

*Reduce water supply.* No impact is expected, as discussed under Alternative 1.

### Alternative 4 (Full Capacity Use with Fewer Weapons Restrictions), Pōhakuloa Training Area

*Less than Significant Impacts*

*Flooding.* As discussed in Section 3.7, Water Resources, under some circumstances the runoff from the south slope of Mauna Kea could exceed the drainage capacity of the area cantonment and airfield areas of PTA, north of Saddle Road, resulting in temporary flooding or localized ponding. However, the soils in the area are permeable, and the underlying lava flows contain sufficient secondary permeability for rapid infiltration to the subsurface. Flooding impacts would be less than significant.

*Impacts on surface water quality from chemical contaminants and soil erosion.*

*PTA and WPAA.* Under Alternative 4, training activities may increase the amount of explosives residues in soils, as well as dispersion of these residues by wind and water erosion. However, due to lack of any permanent streams or water bodies, impacts on surface water would be of short duration, if they occurred, and would not be expected to be significant. Maneuver training activities in the WPAA may introduce explosives residues in the soils. However, as for the rest of PTA, no significant impacts on surface water would be expected.

*PTA Trail.* Impacts from trail construction are discussed in the 2004 SBCT EIS. Therefore, the analysis here focuses on impacts from the use of the trail.

The loading and unloading activities at Kawaihae Harbor under Alternative 4 would be similar to the activities that currently take place as part of the force training or that would occur under SBCT. The Army and the harbor operator would be responsible for preventing spills and for cleaning them up if they occur, according to standard spill prevention and response procedures. Therefore, these activities are not expected to result in any significant impacts on the water quality in Kawaihae Harbor.

Similarly, construction and use of the PTA Trail are not expected to result in significant impacts on surface water quality. Soils along the PTA Trail could be exposed to stormwater runoff, which could enhance erosion. However, BMPs for construction of the trail would control runoff and minimize erosion. There are no perennial streams along the route. Under natural conditions, the intermittent streams carry large amounts of sediment. Trail use would only result in a small amount of additional

sediment. Therefore, impacts would not be significant on surface water quality.

The construction of the PTA Trail could potentially impact waters of the US. As discussed in the 2004 SBCT EIS, there could be potential impacts at stream crossings, such as at Waikoloa Stream near the rock wall, about 6 miles (9.7 kilometers) east of Kawaihae Harbor, and about 0.5 mile (0.8 kilometer) south of Highway 19. The Army would design PTA Trail stream crossings to minimize any dredge or fill impacts on streams to the fullest extent practicable and in compliance with appropriate CWA (Section 404) regulations and permit/certification processes administered by the USACE and State of Hawai‘i. Impacts would be less than significant.

*Groundwater quality.*

*PTA and WPAA.* Due to the depth of groundwater beneath PTA and the relatively low concentrations of explosives residues in soils, groundwater quality beneath PTA would not be expected to be affected. Maneuver training activities in the WPAA could introduce explosives residues in these soils. However, as described for the rest of PTA, no significant impacts on groundwater quality would be expected.

*PTA Trail.* The PTA Trail would approach potable wells at lower elevations. Spills of fuels or other chemicals could occur. The impacts on groundwater quality would be expected to be less than significant because bulk fuel would be transported on the paved state and county roads, not the PTA Trail.

As discussed in the 2004 SBCT EIS, for the construction and use of the PTA Trail, the Army would implement spill prevention and response plans. All convoys using the PTA Trail would carry spill response equipment and personnel trained in the use of the equipment. In addition, the Army would place bollards around the wellheads in coordination with the utility and property owners to protect the structures from potential damage.

### No Impacts

*Alter stream channel or groundwater flow patterns.* No impacts would be expected. There are no permanent streams or water bodies at PTA. If present, groundwater beneath PTA would only be found at great depths.

*Reduce water supply.* No impacts would be expected. Potable water used at PTA is currently trucked in.

## 4.8 GEOLOGY AND SOILS

### 4.8.1 Impact Methodology

Geologic impacts include all of the effects that result from the interaction between the project and the geologic environment. For example, project impacts may include changes in erosion rates or changes in the level of exposure of people and structures to earthquakes or unstable slopes.

Identifying project impacts relied heavily on the use of available geologic studies, reports, observations, and engineering judgment to make reasonable inferences about the potential effects of the project, given the interpretation of the geologic setting described in Section 3.8, Geology and Soils. In addition, some geologic impacts were evaluated in the context relative to regulatory requirements or guidelines. Regulatory requirements include state and local building codes, grading ordinances, and restrictions on development in protected areas or in areas subject to specific geologic hazards.

For MMR, the geologic impacts discussion relies in large part on results of the current hydrogeologic investigation being conducted by the Army to characterize the existing surface and shallow subsurface geological conditions at MMR (USACE 2006); the investigation report is included as Appendix G-1.

The objectives of the current hydrogeologic investigation include gaining a better understanding how soils retain, degrade, and transport contaminants resulting from past activities at MMR and the implications for future live-fire training exercises. The investigation provides information about contaminant concentrations and distribution in soils and sediments and also provides information about the physical geologic environment, including stratigraphic relations and physical and chemical properties of soils and sediments. These data have been used to construct a model of the chemical transport pathways and migration rates for chemicals of concern at MMR. The model results are used as a predictive tool in analyzing potential impacts of project alternatives.

The impact analysis compares the effects of MMR alternatives to existing conditions. As discussed in the introduction to Chapter 3, the average number of annual live-fire training days from 1988 to 1998 was 72. The average number of live-fire training days from 1994 to 1998 was about 60 days per year. Each of the historic live-fire days is assumed to be the rough equivalent of a CALFEX. From 1998 to October 2001, no CALFEXs were conducted at MMR. Thirteen CALFEXs were conducted in fiscal year 2002, and eight were conducted in fiscal year 2003. The surface soil data reported in the current hydrogeologic investigation report

(Appendix G-1) reflect the effects of past use and may help predict future effects, but there is no simple correlation between those past effects and future effects.

The Army performed a soil investigation of training ranges at PTA to obtain information about existing concentrations of chemical constituents in the soils, identify potential chemicals of concern, and determine if exposure to these chemicals might impact human health. The Army also evaluated the impacts of training on land condition, including effects such as soil erosion and compaction and damage to vegetation.

The concentrations of chemicals observed or anticipated in soils at MMR and PTA are compared to EPA Region IX PRGs, which are conservative cleanup goals designed to be used as a screening tool for determining whether additional, more detailed site-specific analysis of risk is needed. The assumptions on which the PRGs are based are therefore not intended to be representative of all sites. The EPA has assigned PRGs for two basic scenarios: residential exposures and industrial workplace exposures. Residential exposures are lifetime exposures, beginning from childhood and continuing for 70 years. Industrial soil PRGs are based on standard assumptions about worker exposures to soils over 30 years. Both of these standard scenarios probably overestimate the risks to military personnel, most of whom would be exposed only for brief periods to site contaminants; however, the industrial exposure scenario more closely approximates the exposures of military personnel and has been used as a basis for comparison in the analysis presented in this report.

The impact analysis attempts to reasonably and conservatively account for the effects of the alternatives on future conditions, based on information from a variety of sources, including data on existing conditions. However, a degree of uncertainty is inherent in the analysis. To provide additional assurance that unforeseen impacts do not go undetected, continued monitoring studies have been proposed as part of the mitigation of significant impacts.

### 4.8.2 Factors Considered for Determining Significance of Impacts

The significance of the project impacts is defined in both relative and absolute terms. Relative criteria are based on context and tend to be subjective, while absolute criteria are defined in terms of objective standards.

Factors considered in determining whether an alternative would have a significant geologic impact include the extent or degree to which its implementation would:

- Result in substantial soil loss (e.g., through increased erosion) or terrain modification (e.g., altering drainage patterns through large-scale excavation, filling, or leveling);
- Result in soil or sediment contamination exceeding regulatory standards or other applicable or relevant human health or environmental effects thresholds; and
- Increase the exposure of people or structures to geologic hazards (e.g., ground shaking, liquefaction, volcanism, slope failure, expansive soils, hazardous constituents of soils) that could result in injury, acute or chronic health problems, loss of life, or major economic loss.

- Adversely alter existing geologic conditions or processes such that the existing or potential benefits of the geologic resource are reduced (e.g., construction of a jetty that would interfere with sand transport processes and beach formation or would increase shore erosion);

- Permanently damage or alter a unique or recognized geologic feature or landmark; or

- Disturb or alter unique, rare, or otherwise important paleontological resources such that the potential to derive benefits from those resources is reduced.

Regulatory standards against which potential soil and sediment contamination impacts have been evaluated include the following:

- EPA Region IX Preliminary Remediation Goals (PRGs) for exposures in industrial settings;
- EPA Generic Soil Screening Levels (included in the Region IX PRG tables);
- EPA Region V Ecological Data Quality Levels for surface soils and sediments (also known as Ecological Screening Levels); and
- Hawai‘i Administrative Rules, Title 11.

In addition to the above factors, public concerns expressed during the scoping process were also considered in the impact analysis.

### 4.8.3 Summary of Impacts

As shown below in the impact summary table, No Action and Alternatives 1, 2, and 3 are expected to result in significant and unmitigable soil

erosion impacts. Alternative 4 would have less than significant impacts on soil erosion. Potential soil effects would be mitigated through the implementation of standard management practices.

**Summary of Potential Geology and Soils Impacts**

| Impact Issues | No Action Alternative | Alternative 1 MMR (Reduced Capacity Use with Some Weapons Restrictions) | Alternative 2 MMR (Full Capacity Use with Some Weapons Restrictions) | Alternative 3 MMR (Full Capacity Use with Fewer Weapons Restrictions) | Alternative 4 PTA (Full Capacity Use with Fewer Weapons Restrictions) |
|---|---|---|---|---|---|
| Soil erosion | ⊗ | ⊗ | ⊗ | ⊗ | ⊙ |
| Soil contamination | ○ | ⊙ | ⊙ | ⊙ | ⊙ |
| Geologic hazards | ○ | ⊙ | ⊙ | ⊙ | ⊙ |

LEGEND:
⊗ = Significant impact
⊘ = Significant impact mitigable to less than significant
⊙ = Less than significant impact
○ = No impact
+ = Beneficial impact

Under Alternative 1, the impacts would result primarily from ground disturbance from detonation of munitions and from troop activities. The impacts would include potential erosion on the DMR to MMR inland trail. On lands within MMR, these effects would be managed through implementation of the ITAM program, including monitoring the effects on vegetation and implementing measures such as reseeding, mulching, controlling run-on and runoff, and rotating land uses. On lands managed by the State of Hawai‘i (for example, portions of the DMR to MMR inland trail), the state would be responsible for addressing erosion impacts. This would be accomplished by issuing permits to use the trail and through normal trail maintenance procedures. There would also be continued risks of erosion from heavy rainfall in areas that may be affected by wildland fires. These effects would be reduced by continuing to implement the IWFMP.

Alternative 2 would increase the potential for soil disturbance and resulting erosion due to the increased intensity and frequency of live-fire training. In addition, erosion resulting from wildland fires would increase due to the use of tracer ammunition. Use of tracers would increase the potential for fires to be initiated, and nighttime use of tracers would increase the difficulty of responding to fires once initiated. The impacts

would be minimized by implementing the mitigation measures described in Section 4.14, Wildfires.

Alternative 3 would further increase the risk of wildland fires because of the use of inert TOW missiles, 2.75-inch rockets, and illumination munitions that contain chemical compounds capable of initiating fires when either burning chemicals or hot pieces of the munitions reach the ground. The unburned chemicals in illumination munitions present an additional fire threat because any unburned chemical can be spontaneously ignited by exposure to air after munitions fall to the ground.

Impacts of chemical contaminants in soils on on-site and off-site receptors are not considered significant due to the low concentrations of chemical residues that would result from live-fire training exercises. This conclusion is supported by soil sampling data in the current hydrogeologic investigation being conducted by the Army at MMR and the soil investigation conducted at PTA in 2002, as well as by data on residues of high explosive munitions from tests conducted elsewhere by the Army and discussed in Section 3.8, Geology and Soils.

Geologic hazards, such as slope failure and seismic hazards, are expected to be less than significant at MMR. At PTA, volcanic and seismic hazards, while potentially significant in this area, would not be expected to be significant. Based on distribution of past lava flows, there is a low probability that erupted lava could flow onto PTA. Also, most Hawaiian eruptions would provide some warning and adequate time for evacuation, if necessary. Seismic hazards are not expected to result in significant impacts because seismic energy is not amplified in the geologic materials beneath PTA and because new structures would be designed to resist the lateral forces expected from most earthquakes generated in the region.

### *No Action Alternative*

#### *Significant Impacts*

*Impact 1: Soil erosion.* Under No Action, there may be the potential for removing vegetation cover over a large area of Mākua Valley by both an increase in fuel and by delayed response to a wildfire once initiated. The increase in fuel (vegetation growth) would result from reduced fuel control measures currently being implemented at MMR. Response to a fire would be delayed because the installation would have reduced staffing, fires would not be reported as quickly, and equipment and personnel needed to respond may not be on-site.

The potential for fires to begin might be lower under No Action than under existing conditions because military training activities would be

non-live fire. However, wildfires resulting from other causes, such as arson or accidents, could be more damaging to vegetation once started.

The significance of soil erosion would depend on how much land area was burned and on the amount and timing of rainfall following a fire. Overall, the potential for significant erosion is low because fires and storms are independent, and the likelihood that a major fire would be followed by a large runoff-producing storm before vegetation cover was reestablished is probably very low. However, the impact from such a combination of events is considered significant because it would likely result in a large amount of soil erosion, given the nature of the soils and the steep slopes present in Mākua Valley.

If a major fire were followed by substantial rainfall, the loss of vegetation cover could increase runoff, causing significant erosion and soil loss from hill slopes and increasing sediment deposition on the valley floor or in stream channels. Increased runoff could create gullies and damage roads and trails. Sediment deposition could clog stream channels, divert streams, lead to increased flooding, alter vegetation patterns, and have other indirect impacts. Because the substantial soil erosion effects from a major fire cannot be entirely prevented, even with mitigation measures, this impact would remain significant.

*Regulatory and administrative mitigation 1.* No regulatory and administrative mitigation measures have been identified for this impact. The existing measures available to address these impacts (for example, fire prevention and control and the ITAM program) would not be implemented under No Action because the Army would not actively maintain the current programs at MMR.

*Additional mitigation 1.* The Army would implement post-wildfire erosion control measures that may include native plant reseeding and selective planting of burned areas or engineering controls to redirect or control runoff.

#### No Impacts

*Soil contamination.* Under No Action, there would be no further deposition of explosives residues or other chemicals associated with live-fire military activities. Over time, the existing residual concentrations of many chemicals would decrease through chemical degradation and dispersion processes.

*Geologic hazards.* Under No Action, the potential for ground shaking, slope failure, and other geologic events would be the same as that under existing conditions, but because MMR would not be occupied, there

would be no human exposure to these events and therefore no hazard to humans.

### *Alternative 1 (Reduced Capacity Use with Some Weapons Restrictions)*

*Significant Impacts*

*Impact 1: Soil erosion.* Alternative 1 is expected to result in disturbance of soils and vegetation, primarily from wildfires, resulting in potential for erosion. Wildfires remove protective vegetation and expose soils to erosion. Although vegetation cover may return within weeks of a burn, erosion can occur during this revegetation period. In some cases, erosion may delay or prohibit portions of the revegetation process in areas. Severe erosion can create gulleys, reduce vegetation growth, and slow land recovery. Erosion also moves sediments from ridges and hill slopes to toes of slopes and channels and can affect drainage or create landslide hazards.

In addition, explosions and troop training (e.g., use of roads, troop movement, digging) disturb soils. The greatest soil disturbance would probably result from detonation of bangalore torpedoes, which contain an equivalent of up to about 80 pounds (36 kilograms) of TNT, and demolition training charges, including cratering charges containing up to 150 pounds (68 kilograms) of ammonium nitrate. Detonating the demolition charges would create craters and would throw soil into the air. Disturbed soils tend to be more easily eroded, and removing protective vegetation exposes soils to wind and water erosion. Wind erosion is not expected to be a major concern because soil moisture is relatively high in the Mākua Valley, the clayey soils on valley side slopes retain moisture well. But wind erosion could become an issue during lengthy dry periods and because windblown dust may disperse chemical residues and therefore increase chemical exposures of military personnel. Most erosion occurs during infrequent, extreme runoff-producing events. Areas particularly susceptible to erosion include moderate to steep slopes traversed by unpaved roads, drainage ditches, and areas with sparse vegetation. Over time, extreme runoff events capable of causing substantial erosion in these areas are expected to occur. This is considered a significant impact, based on observed evidence of soil erosion and susceptibility of soils in range areas to erosion.

In addition, use of the DMR to MMR inland trail for marches by approximately 150 troops several times per month could result in localized enhanced soil erosion on trails both inside MMR and on state-owned lands north of MMR. The principal effects would probably be widening of existing trails, loss of vegetation, enhanced gullying, and slow recovery of affected areas.

*Regulatory and administrative mitigation 1.* No regulatory and administrative mitigation measures have been identified.

*Additional mitigation 1a.* Mitigation to address the hazard of wildfires is primarily through prevention and fire suppression. Prevention measures include reducing fuel by mowing grass and maintaining fire breaks, carefully targeting munitions, being alert for signs of fire, scheduling during appropriate weather conditions, and educating staff through awareness training. Fire suppression includes having appropriately trained personnel and adequate and effective fire control equipment and procedures in place so that fires can be identified and put out as soon as possible before they spread. Past experience has demonstrated that fires can quickly burn out of control in Mākua Valley and that weather conditions can change rapidly. No amount of planning can preclude the risk of wildfires, but the risks can be greatly reduced through proper planning; therefore, mitigation may not be fully effective in reducing soil loss to less than significant levels.

*Additional mitigation 1b.* The Army addresses erosion problems caused by ground disturbance from training activities primarily through the ITAM program (Section 2.5.5). In addition, the Army could prepare and implement an erosion control plan for MMR. This plan would include provisions for periodic monitoring, methods for identifying erosion problems, and management practices for addressing erosion problems. Management practices could include reseeding slopes or planting vegetation buffers, installing/constructing run-on and runoff controls, recontouring or filling damaged areas, or avoiding damaged areas.

*Additional mitigation 1c.* The Army would obtain a permit from the state prior to using trails within state-owned lands. The state would issue the permit only if it determined that the trail was in good condition. The state would maintain the trail to prevent significant erosion and would improve the trail to address any effects from erosion.

### Less than Significant Impacts

*Soil contamination.* Contaminants in soils can have health effects when humans ingest, inhale, or come into direct contact with contaminated soil. The significance of soil contamination varies, depending on the contaminants present, the potential receptors involved, and the magnitude and duration of exposure. Contaminants in soils can also be transported via wind or water to other media or locations, resulting in additional pathways of exposure. These are discussed in Section 4.7, Water Resources, and Section 4.4, Air Quality.

Evaluation of the results of the current hydrogeologic investigation shows that low concentrations of metals, explosives, pesticides, VOCs, and dioxins are present in surface soils in some of the areas investigated and that some of these concentrations exceed the EPA Region IX industrial PRGs for soils, as described in Section 3.8, Geology and Soils.

Under Alternative 1, explosive chemicals (such as RDX, TNT, and HMX), certain metals (such as lead), and other chemicals (the combustion products of explosives, plastics, and other inert components) would be released to the environment and would be deposited on surface soils. Alternative 1 would involve up to 19 CALFEXs annually. This is more than the number of CALFEXs that were conducted in the last two years (13 CALFEXs in fiscal year 2002 and 8 CALFEXs in fiscal year 2003).

Some of the chemicals would undergo chemical reactions because of contact with moisture, oxygen, and sunlight (chemical degradation), or the chemicals would be degraded by microbes (biodegradation). Therefore, even though there would be an increase in chemical deposition, there would not necessarily be a substantial accumulation of chemicals in soils. Because of dispersion and degradation of explosives compounds, it is likely that concentrations of explosives detected in soils during the current hydrogeologic investigation of MMR reflect the effects of the CALFEXs that were conducted recently, during 2002 and 2003. The residual contaminants from 1998 and before would be less prominent in surface soils, although some accumulation may occur, particularly because the last recorded large runoff-producing storm was in 1996, prior to the period in which the hydrogeologic investigation was performed; thus, the soil sampling results reflect conditions following an extended period of low rainfall and runoff. The recent CALFEXs were similar, in terms of types and quantities of explosives used, to the CALFEXs proposed under Alternative 1.

Chemical residues of high explosives tend to be greatest in ordnance impact areas and to decrease with distance from these areas. As discussed in Section 3.8, Geology and Soils, concentrations of explosives residues are not expected to exceed PRGs, except in highly localized areas, because the amount of unburned chemical residues that result from detonation of high explosives represents a very small percentage of the initial mass of explosive. Under the assumptions described in Section 3.8, Geology and Soils, about 0.15 ounces (4.5 grams) of RDX are expected to be produced per year from 19 CALFEXs. The residue would be distributed unevenly throughout the ordnance impact area. Most of the RDX generated during CALFEXs would result from low-order detonations and the use of C-4 explosive to detonate unexploded ordnance in place, rather than from high-order detonations. Based on the discussion in Section 3.8, Geology

and Soils, the average concentration of RDX in the upper 6 inches (15 centimeters) of soils resulting from detonation of munitions during live-fire exercises for one year over an area of about 35 acres (14 hectares) would be on the order of less than 1.2 micrograms per kilogram (µg/kg).

In addition to the high explosives used in CALFEXs, about 2,640 pounds (1,197 kilograms) of C-4 explosive per year would be used in demolition training in the ordnance impact area, involving detonation of 15-pound (6.8-kilogram) and 40-pound (18-kilogram) shape charges. Assuming that the detonation of the shape charges produces about the same proportion of RDX residues per pound of initial charge as the C-4 charges used for demolition of unexploded ordnance (about 0.013 percent based on work done by the USACE), the 2,640 pounds (1,200 kilograms) of C-4 would produce approximately 5.6 ounces (160 grams) of RDX residue per year, which is about 35 times the amount of RDX residue that would be produced by the CALFEXs.

The concentrations of residue would be highest in the vicinity of the detonations, although it is not known where or how spread out the demolition charges would be placed. The average concentration of RDX in this surface soil would be about 170 µg/kg, which is just under the method detection limit of 200 µg/kg and is less, by a factor of nearly one hundred, than the EPA Region IX industrial soil PRG for RDX of 16,000 µg/kg. This assumes that this training occurred within a relatively small area, that the contamination from the demolition training was contained within an area of about 1 acre (0.4 hectare), and that the RDX was evenly mixed with the upper 6 inches (15 centimeters) of soil in this area (a little less than 1 million kilograms [2.2 million pounds]). Nevertheless, because of the likely uneven distribution of the RDX in surface soils and the potential for accumulation of RDX in the soils over years, it is possible that concentrations above the industrial soil PRG would occur as a result of the demolition training. This is not considered significant because the industrial soil PRGs are based on conservative estimates of long-term exposure that would not occur at MMR.

Metallic lead, in the form of bullets, represents a low environmental hazard because the lead is not in a form that can be ingested, inhaled, or absorbed by the skin. Over time, lead bullets gradually degrade, both mechanically and chemically, enabling the lead to become dispersed in soils in forms that may be more mobile (for example in water-soluble compounds, or as fine particles subject to dispersion with wind-blown dust). The rate at which lead bullets degrade under environmental conditions depends on chemical conditions in the soil and atmosphere and on the amount of surface area exposed to these conditions. This is a relatively slow process, but over time it could result in lead concentrations

in soils in excess of PRGs in areas where lead bullets accumulate, such as near pop-up targets. Other sources of lead include lead-containing chemicals used in the primers of some munitions.

Existing soil contamination from past disposal practices would continue to disperse and would continue to present a low hazard of exposure to military personnel using the range. Comparison to industrial PRGs provides an indication of the risks if personnel were exposed to these concentrations in a typical workplace environment. The exposure assumptions of the PRGs are not representative of the actual exposures expected for military personnel. Although the daily exposures to dust and soil might be greater than assumed in the PRGs, military personnel would be exposed for periods of several days or weeks rather than over the 30-year period assumed in the PRGs, making their total lifetime exposures to these chemicals much lower than assumed in the PRGs.

As discussed in Section 3.8, Geology and Soils, the 95 percent upper confidence limits (UCLs) of the average concentrations of individual chemicals in soils are generally below EPA Region IX industrial soil PRGs. If aluminum, iron, and manganese are ignored, the cumulative noncancer risk level is also below the noncancer risk threshold. The PRGs for aluminum, iron, and manganese are not based entirely on health risk levels (the actual risk levels are much higher than the PRGs) but on the desire of EPA to use PRGs as general indicators of possible waste disposal requirements. However, as discussed in Section 3.8, Geology and Soils, the high concentrations of these metals in soils at MMR are typical of Hawaiian soils generally and so are not the result of human activities; therefore, it is appropriate to ignore the fact that the PRGs for these metals are exceeded in soils at MMR. Individual cancer risk levels for arsenic and chromium exceed EPA's one-in-one-million lower threshold for cancer risk. However, the observed concentrations are likely due to naturally occurring minerals in the volcanic rock from which the soils are derived, rather than being the result of training activities or past disposal practices. Continued training under Alternative 1 is not expected to increase these concentrations. Although existing concentrations of dinitrotoluene (DNT) appear to slightly exceed the one-in-one-million cancer threshold, these concentrations are likely the result of past disposal practices, and therefore, would not increase because of Alternative 1. As discussed in Section 3.8, Geology and Soils, TNT and DNT are present in much lower quantities in explosives used in live-fire exercises at MMR than is RDX, and RDX is not expected to accumulate in concentrations that would be significant to health. Based on the results of the current hydrogeologic investigation, the risks associated with existing DNT concentrations in soils are well within the acceptable cancer risk range of one in one million to one in ten thousand. Therefore, because future live-fire training is not

expected to significantly add to these concentrations, the risks to military personnel associated with future exposures to existing or future concentrations of chemicals in soils is expected to be less than significant.

*Geologic hazards.* Hazards related to seismicity, including ground shaking, ground rupture, slope failure, and liquefaction, are considered less than significant due to the relatively low probability of large earthquakes at the site. Also, because of the low level of development and occupation of the site, geologic hazards are expected to have minor potential for affecting safety or damaging structures.

### Alternative 2 (Full Capacity Use with Some Weapons Restrictions)

Under Alternative 2, the use of MMR would increase, compared to Alternative 1. The types of impacts discussed for Alternative 2 would also occur under Alternative 1, except the magnitude of the impacts would be greater with use of tracer ammunition and up to 50 CALFEXs per year, compared to 19 under Alternative 1.

#### Significant Impacts

*Impact 1: Soil erosion.* Under Alternative 2, soil erosion effects would be similar to but greater in magnitude than those described for Alternative 1. Ground disturbance, road use, and vegetation cover disturbance would be greater under Alternative 2 because of more frequent CALFEXs. The more intense training activity under Alternative 2 would probably reduce the effectiveness of some of the available mitigation measures, such as revegetation, resulting in greater vulnerability to erosion from extreme runoff events.

The use of tracer ammunition during nighttime training would greatly increase the risk of wildland fires. Tracer ammunition contains small quantities of materials, such as magnesium metal, that burn to produce intense heat and light. Use of tracers was previously curtailed because it resulted in wildfires, so the high potential for use of this ammunition to result in wildfires in the future would increase the soil erosion potential from loss of vegetative cover.

*Regulatory and administrative mitigation 1.* No regulatory and administrative mitigation measures have been identified.

*Additional mitigation 1a.* The mitigation measures for this impact would be similar to those described for Alternative 1.

*Additional mitigation 1b.* As discussed under Section 4.14, Wildfires, the Army would revise the IWFMP protocols to address fire prevention and

control for the use of tracer ammunition, including addressing the challenges of fighting fires at night, before implementing this alternative. Implementing these protocols would require USFWS approval.

#### Less than Significant Impacts

*Soil contamination.* Although the frequency of CALFEX exercises would nearly double under Alternative 2 from the frequency under Alternative 1, the quantity of explosives residue from detonating munitions used in an individual CALFEX is expected to be so low that the potential impacts would be the same as those described under Alternative 1. As discussed for Alternative 1, the highest concentrations of explosives residues would probably result from demolition training. RDX would be the largest component of these explosives residues because C-4 explosive is more than 80 percent RDX, with about 10 percent HMX as an impurity. The amount of RDX residue from demolition training would be the same as described under Alternative 1.

In addition to the munitions used in Alternative 1, tracer ammunition would be used in Alternative 2. Tracer ammunition contains materials that burn to produce different colors of light when exposed to the atmosphere. Among the metals commonly contained in tracer ammunition are barium, calcium, magnesium, and strontium. Except for strontium, these metals are common in background soil samples. Use of tracers containing strontium could measurably increase concentrations of strontium in soils compared to background levels. However, the EPA industrial soil PRG for strontium is very high, similar to that for iron. Therefore, because no toxic effects are expected to result from the use of these tracers, the impact would be less than significant.

*Geologic hazards.* As described for Alternative 1, seismic hazards and slope failure are not expected to be significant impacts under Alternative 2.

### Alternative 3 (Full Capacity Use with Fewer Weapons Restrictions)

Under Alternative 3, range use and training intensity would be comparable to Alternative 2 with the addition of inert TOW missiles, 2.75-inch rockets, and illumination munitions. Training would also occur over a larger area within the Mākua Valley.

#### Significant Impacts

*Impact 1: Soil erosion.* The potential for soil erosion in the training area at MMR would be the same as that described for Alternative 2. However, the overall potential for soil erosion would be greater under Alternative 3 than Alternative 2 because of the increased wildfire threat from illumination

munitions, 2.75-inch rockets, and inert TOW missiles. Not all wildfires would necessarily result in severe soil erosion. The degree of the effect would depend on the size of the burned areas and on the timing, relative to large storms. Such storms are infrequent, so vegetation in burned areas may be reestablished before an erosion-causing storm occurs.

*Regulatory and administrative mitigation 1.* No regulatory and administrative mitigation measures have been identified.

*Additional mitigation 1.* The mitigation measures to address damage to soils and vegetation would be the same as those described for Alternative 2. Measures to prevent and control wildfires would be described in a revised IWFMP that addresses the specific hazards associated with the use of inert TOW missiles, 2.75-inch rockets, and illumination munitions; the USFWS would approve this plan, as described under Alternative 2.

#### Less than Significant Impacts

Soil contamination. The quantity of explosives used under Alternative 3 would be about the same as that described under Alternative 2. The use of inert TOW missiles and 2.75-inch rockets would not significantly increase the total mass of high explosives used. The amount of explosives used in demolition training would also be the same as that described under Alternative 2, so no increase in the rate of deposition of explosive residues in soils is expected. The inert TOW missiles contain propellants and only a small quantity of high explosive sufficient to make a loud noise. The 2.75-inch rocket contains a small charge, nearly all of which is consumed upon detonation.

The products of the chemical reactions during use of the illumination munitions would mainly be small quantities of metal oxides, phosphates, and other compounds that would have relatively minor environmental impacts.

Geologic hazards. As described for Alternative 1, seismic hazards and slope failure are not expected to be significant impacts under Alternative 3.

### Alternative 4 (Full Capacity Use with Fewer Weapons Restrictions), Pōhakuloa Training Area

The SBCT EIS contains a comprehensive discussion and evaluation of geologic and soil contamination impacts at PTA. The discussion in this section focuses on potential impacts from implementation of this alternative at PTA, Keʻāmuku Parcel (WPAA), and PTA Trail.

### Less than Significant Impacts

*Soil loss.* The SBCT EIS evaluated impacts of training and construction activities at PTA, WPAA, and the PTA Trail. Soil impacts from SBCT activities and construction were considered significant or significant but mitigable to less than significant at PTA, WPAA, and the PTA Trail. These significant soil loss, erosion, and compaction impacts are, to a great degree, based on mounted maneuver training with substantial off-road vehicle (Stryker) use.

Under Alternative 4, training at PTA and WPAA would be limited in unit size and be dismounted maneuver training. Vehicle use would be generally limited to existing trails or roads.

Site clearing and grading for construction of the proposed CALFEX range and new facilities would expose soils to enhanced erosion by water or wind. This impact would be expected to be less than significant because the new facilities would be constructed on relatively level land using standard erosion control practices and because the construction impacts would be temporary.

There would be potential dust and surface runoff erosion from use of the PTA Trail. The impacts would not be considered to be significant relative to long term soil loss or erosion because the trail occupies a relatively small amount of acreage. Use of the trail would not significantly alter the rate of erosion. The Army would follow BMPs in maintaining the trail.

The Army would develop and implement a management plan for PTA. The plan would address measures such as, but not limited to, restrictions on the timing or type of training during high risk conditions, vegetation monitoring, soil monitoring, and buffer zones to minimize dust emissions in populated areas. The Army would monitor the impacts of training activities to ensure that fugitive dust emissions stay within the acceptable ranges as predicted and environmental problems do not result from excessive soil erosion or compaction. The plan would also define contingency measures to mitigate the impacts of training activities that exceed the acceptable ranges for dust emissions or soil compaction.

The Army would implement ITAM land management practices and procedures. Currently, these measures include implementing TRI and SRA programs, developing and enforcing range regulations, implementing an Erosion and Sediment Control Management Plan, and continuing to implement land rehabilitation projects, as needed, within the LRAM program.

The Army would fully implement the IWFMP for PTA for all existing and new training areas to reduce the impacts associated with wildland fires.

*Soil contamination.* Exposure to chemical contaminants in soils at a training area could occur through several pathways, including direct contact with contaminated soils, ingestion of soils, or through inhalation of windblown dust. Exposure estimates are based on assumptions about the amount of soil that might be ingested by a person who works in an area soils. It is a generally accepted principle of risk assessment that not all exposures result in unacceptable health risks and that there are certain thresholds of exposure below which the health risks are so low that they cannot be distinguished from background risks.

The composite soil sampling conducted by the USACE at selected ranges within PTA revealed the presence of metals, explosives, and semi-volatile organic compounds. The observed concentrations were generally less than industrial PRGs. One explosive compound, RDX, was detected in samples from Ranges 5 and 9 at concentrations above the industrial PRG while Training Area 12 was below. The risks from multiple chemical exposures are additive, and similar calculations can be done for each of the contaminants to which people may be exposed at PTA. The risks from HMX, nitroglycerin, and TNT are very small compared to the risk from RDX, and the sum of their risks is less than $0.74 \times 10^{-6}$. The risks associated with each of the metals can be calculated similarly, and the results would be similar. The highest risks are associated with the iron and aluminum in the soil, both of which occur naturally at high concentrations.

Overall, the sum of the carcinogenic and non-carcinogenic risks, based on the available soil sampling data and using the PRGs to estimate risk, is less than the EPA threshold for worker exposure. It is unlikely that troop exposures to RDX or other chemicals on the ranges would be similar to worker exposures in an industrial setting. For example, workers are assumed to ingest 100 milligrams of soil per day, 250 days per year for 25 years. This assumption over-estimates troop exposures, because troops are likely to be exposed only temporarily, and only for short durations. No public contact with these soils will occur. Based on the analysis described above, this would represent a less than significant impact.

In general, the risk due to exposure to contaminated soils at PTA would be low. However, the construction of the CALFEX and convoy live-fire ranges would require the conversion of a portion of the range impact area. In this converted training area, Soldiers could be exposed to contaminated soils. However, their exposure would be limited to training for a period of days or weeks. The level of chemical compounds present would be below their respective PRGs. Considered together, the potential duration of

exposure to the chemical concentrations on the training ranges at PTA would represent a low risk to personnel.

Maneuver training conducted in the WPAA would not result in significant exposures to high explosives residues in soils, either from past or proposed activities, because the training there under the Proposed Action would involve simulated rather than live artillery fire

*Seismic hazards.* Earthquakes are common on the Island of Hawai‘i, but most are relatively small. Some earthquakes are the result of movement of molten rock (magma) deep in the earth's crust as it rises along openings in the crust. Others are the result of shifts in the crust along large fractures. In both cases, either as a result of expansion of the surface or as a result of settling, surface ruptures, cracks, or depressions may appear in the ground surface. These disruptions of the surface could create hazards by damaging roads, utility lines, and buildings.

PTA is in an area that has about a 10 percent chance of experiencing horizontal ground acceleration greater than 40 percent of gravity in the next 50 years. The Island of Hawai‘i is in Zone 4 of the Uniform Building Code.

Implementation of standard procedures and engineering practices would be expected to reduce the volcanic and seismic hazards to acceptable levels, although these measures cannot eliminate the hazards. Most of the measures to address hazards involve implementing timely warning systems, appropriate planning and training, and appropriate engineering design. The proposed structures at PTA would be designed to meet all federal, state, and local building code requirements. The Hawaiian Volcano Observatory provides warnings to local officials and the public of volcanic hazard conditions. The Army prepares and implements volcanic and seismic hazard plans and training, including evacuation plans for personnel and munitions in the event of an emergency.

*Slope failure.* Although there are many steep slopes within PTA and the WPAA, most slopes are underlain by shallow bedrock or exposed rock outcrops. There would be little potential for slope failure.

*Volcanic eruptive hazards.* The following discussion focuses on the effects of implementing Alternative 4 in the volcanic and seismic environment that exists at PTA, and the potential for hazards to personnel or structures and facilities because of this environment.

PTA lies on the edge of the northeast rift zone, which last erupted in 1984. At that time, lava flowed northeastward, in the direction of Hilo. Since

lava flows by gravity, its path would be determined by the location of the vent, which cannot be predicted. Eruptions from Mauna Loa tend to be voluminous, and the lava can move quickly (up to about 5 miles [8 kilometers] per hour).

Although PTA is subject to periodic eruptions of lava from the Mauna Loa volcano, the risk of any particular site being inundated by a lava flow is small because flows tend to be narrow and occur relatively infrequently. If a lava flow were initiated an area upslope from PTA, it is likely that PTA would be affected. Quick evacuation would be needed. Potential hazards would include hazards to human safety, loss of property, detonation of stored munitions, and loss of useable land and facilities for training.

As with seismic hazards above, implementation of standard procedures and engineering practices would be expected to reduce the volcanic and seismic hazards to acceptable levels, although these measures would not eliminate the hazards.

## 4.9 BIOLOGICAL RESOURCES

The methods and significance criteria used to determine the level of impact from proposed project scenarios on biological resources are described in this section. The analysis of the intensity and extent of impacts on listed or sensitive species that would result from routine training activities incorporates the results of past and present Section 7 ESA consultations with USFWS (USFWS 1999d, 2001a, 2003c, 2004, 2007b, and 2008). The Army consulted with NOAA Fisheries under Section 7 ESA on the potential effects of routine training activities on marine species protected by the ESA and MMPA, and the movement of troops to PTA for SBCT training. The Army has received concurrence letters from NOAA Fisheries stating that the actions were not likely to adversely affect biological resources at MMR (NOAA Fisheries 2006, Appendix H-3) and during transport to PTA (NOAA Fisheries 2003). The Army has also completed Section 7 consultation with the USFWS on the effects of the preferred alternative on listed species and critical habitat. The USFWS concluded that implementing the preferred alternative, with some restrictions, was not likely to jeopardize the continued existence of any species or to adversely modify or destroy designated critical habitat covered in the BOs (USFWS 2007b and 2008, Appendix H-1, and Appendix H-2). Due to the potential need to use Ka'ena Point, C-Ridge (the ridge between the north and south lobes of the training area), and illumination munitions in the future, the Army assessed the environmental impacts associated with these actions. The Army would initiate and fulfill separate ESA Section 7 consultation prior to using illumination munitions, Ka'ena Point, or C-Ridge.

This section evaluates impacts on the biological resources within the ROIs of MMR and PTA, as described in Chapter 3, Affected Environment. These resources include vegetation communities and vegetation, marine and terrestrial wildlife, sensitive vegetation species, critical habitat, sensitive wildlife species, sensitive habitats, and BSAs.

Terms used in this document to describe vegetation and wildlife species that have been introduced to Hawai'i include nonnative and invasive. Invasive species are typically nonnative (introduced) species with biological characteristics that cause them to be particularly detrimental to native species and habitats.

A discussion of wildfires and wildfire impacts and an overview of the IWFMP are provided in Section 4.14.

### 4.9.1 Impact Methodology

Potential direct and indirect impacts on biological resources were analyzed for terrestrial and aquatic ecosystems within the ROIs. Biological resources include general vegetation and wildlife resources, along with sensitive species, biologically sensitive areas, designated critical habitat, and regulated habitats, such as the Hawai‘i Natural Area Reserve System and forest reserves.

Direct impacts on biological resources result when biological resources or critical habitats are altered, destroyed, or removed during the project. Indirect impacts may occur when project-related activities result in environmental changes that indirectly influence the survival, distribution, or abundance of protected or native species (or increase the abundance of undesirable nonnative species). Examples of indirect impacts may include effects of noise, presence of chemical contamination, or incidence of human activity levels that may disturb or harm wildlife. It is also possible to have beneficial impacts. Potential impacts on biological resources were addressed by the following methods:

- Examining the types of training proposed in each location to determine the potential for impacts on these resources;
- Comparing biological resource locations to the physical locations of the proposed training to determine potential direct and indirect impacts on these resources; and
- Addressing existing biological resource management plans and practices and their relation to the proposed training activities.

The sensitivity of biological resources is a factor in impact analyses and significance evaluations. Sensitivity of a resource can be based first on its designation by federal and state resource agencies, such as USACE (designation of jurisdictional wetlands), USFWS, or NOAA Fisheries. It can also be based on any known or presumed regional sensitivity of the resource or on any known or presumed local significance of the resource (see Section 4.10 for a discussion of cultural significance). Sensitivity for certain bird species is also based on EO 13186 (66 FR 3853, January 10, 2001), which requires that all federal agencies taking actions that have or are likely to have a “measurable negative effect on migratory bird populations” to develop a memorandum of understanding with the USFWS to “promote the conservation of migratory bird populations.” The memorandum of understanding between the Army and the USFWS became effective on July 31, 2006.

Specific potential impacts on biological resources were based on the following considerations:

- Relative importance or value of the resource affected, such as its legal, commercial, recreational, ecological, or scientific value;
- Proportion of the resource that would be affected relative to its occurrence in the region;
- Sensitivity of the resource to the proposed training activities;
- Anticipated physical extent of the potential impact; and
- Anticipated duration of the ecological ramifications of the potential impact.

Analysis of potential impacts on marine wildlife in this section involved assessing acoustic and visual disturbance impacts on marine species in the MMR ROI and was based on scientific studies (where available), consultation, and results from a noise modeling study initiated by the Army (Marine Acoustics 2005). This study is found in Appendix G-5 of the EIS. It models MMR live-fire training and CALFEXs and assessed acoustic impacts on marine wildlife. The modeling study includes specific information on received noise levels of all the ordnance to be used at MMR. The modeling study was undertaken because it is known that marine animals react to additional noise in their environment, including impulse noise that may result from motorized aircraft engines (Richardson et al. 1995). Various studies have assessed (and some have quantified) the impact of nonlethal human-induced disturbance, such as that caused by acoustic noise, on the behavior and reproductive success of animals (Frid and Dill 2002).

Marine wildlife are also known to react adversely to visual intrusions from aircraft (Patenaude et al. 2002; Mullin et al. 1991, as cited in Richardson et al. 1995). Marine mammal species tend to startle at shadows, especially those from above (Mullin et al. 1991, as cited in Richardson et al. 1995). Hawaiian spinner dolphins are known to be more sensitive to aerial disturbance than other species (Norris 1991) and have been known to dive abruptly when aircraft are overhead (Wursig, as cited in Richardson et al. 1995).

The MMR modeling study quantifies site-specific received noise levels at various sites adjacent to MMR. The offshore sites were chosen to represent likely locations of spinner dolphins and other marine mammals. The noise levels were evaluated to determine the effects of discrete noise sources on marine wildlife. The noise sources considered were explosive detonations, explosive weapon firing, and helicopter overflights. As detailed at length in Appendix G-5 of the EIS, the study compared the received noise levels from these various sources to criteria established to represent Level A and Level B harassment, which is defined by the

MMPA. Appendix G-5 includes a discussion and explanation of the thresholds used to define harassment and provides additional details on the analysis. The impact assessments in this EIS are based also on the information provided in this addendum.

The acoustic modeling study found that marine wildlife in the project area would not be subject to Level A or Level B harassment from noise generated by project actions. Neither the in-water explosive nor the in-air harassment threshold for pinnipeds used by NOAA Fisheries was ever approached by the modeled noise levels that would be generated during military training. Additionally, the model found that all helicopter activity would generate noise only slightly above ambient levels, whether the receptors were on the beach or in the water.

The in-water noise levels for each of the three major sources assessed had the following maximum dB levels: 143 dB from explosive detonations, 129 dB from weapon firing, and 88 dB from helicopter overflights (Marine Acoustics 2005). The Army plans to conduct a hydrophonic noise study during a future CALFEX. These findings will be reassessed and compared to the results of the direct hydrophonic noise study when it is completed.

The Army conducted a study (MRS) (US Army 2007c, US Army 2009) at MMR in 2006/2007 and 2008. The study results are as follows:

1) Fish, shellfish, limu, [and the report assumes that other marine resources] near Mākua Beach and in the muliwai, on which area residents rely on for subsistence, are contaminated by substances that are known to be associated with the proposed training at Mākua. The study shows that there are potential chemical migration pathways between MMR and the muliwai and nearshore areas. It also confirms that several substances in the nearshore and muliwai marine resources are associated with military munitions.

2) There is a potential that activities at MMR have contributed or will contribute to contamination in fish, shellfish, limu and other marine resources. And;

3) The proposed training activities at MMR have the potential to contribute substances to the marine resources, and pose a possible human health risk to area residents who rely on marine resources for subsistence.

It is important to note that while substances detected in marine resources at Mākua Beach are associated with military activities, it is also highly likely that these substances originated with other natural and

anthropogenic sources. This conclusion is supported by the fact that detection levels of these substances are generally homogeneous to background levels of these same substances found in other nearshore and muliwai environments around O‘ahu. It should also be noted that none of the substances detected are unique to military activities. These conclusions, however, are subject to questions about background levels as discussed below.

As part of the MRS, the Army conducted a screening-level ecological risk assessment to evaluate the potential for adverse effects on ecological receptors that may be exposed to chemicals in muliwai and nearshore waters. Researchers used 2003, 2006, and 2008 data from the fish, shellfish, and limu samples to conduct the assessment. Data is presented so that the reviewer may conceptually construct a comparative profile of the cumulative risk to marine resources in the Mākua area.

Researchers evaluated two sets of marine life receptors, these are benthic invertebrates exposed to chemicals of potential ecological concern in sediments, and fish exposed to chemicals from multiple pathways, represented by measured, potentially bioaccumulative, concentrations in fish tissues.

The results from the screening level ecological risk assessment indicated that there were no hazards to fish in the north muliwai, the south muliwai and the nearshore Mākua area; but that there is a potential hazard to benthic invertebrates from 2,3,7,8-tetrachlorodibenzo-p-dioxin in sediments in the south muliwai.

Hazards to shellfish in the north and south muliwai did not exceed those at the Nānākuli background muliwai. For the nearshore habitat at Mākua, the hazard index is somewhat greater for Kona crabs than that at the Sandy Beach background site. The hazard index for helmet urchins, however, was less than background. The hazard index seen for Kona crabs is predominantly due to cadmium, copper, and zinc detected in tissues. The potential hazard to crabs from copper is uncertain because tissue concentrations in crabs could be compared only to those in sea urchins, which are expected to have lower body burdens of copper than crabs due to their physiology.

In view of the data collected and lines of evidence considered, the potential for risks to organisms in the Mākua muliwai and nearshore waters are fully characterized in Section 5 of the MRS, but is summarized below:

- North muliwai—No hazards to benthic invertebrates, shellfish, or fish;

- South muliwai—Potential hazard to benthic invertebrates from dioxins/furans in sediments; no hazards to shellfish or fish; and

- Nearshore waters—Potential hazards to Kona crabs from cadmium, copper, and zinc but no hazards to sea urchins; no hazards to fish.

The Army was presented with responsible scientific opposition to both the methods and conclusions of the Marine Resources Study. The crux of public concern essentially comes down to the following categories: the selection of background sites and inclusion of testing a "pristine" background site; disclosure of the "absolute" risk of consuming the marine resources at Mākua without subtracting "background" contamination; the lack of statistical planning in the Army's collection plan; the location and quantity of samples collected; the speciation of arsenic detected in samples; and some commentors indicated that the samples collected could have been more closely tied to the marine resources most commonly eaten. The original MRS and comment responses are included in the 2008 Supplemental Draft EIS at Appendix G-8. The final revised MRS and 2009 comments are included in the Final EIS at Appendix G-8. Greater discussion of the study results and Army responses to public concern are found in Section 3.7.2 of this EIS.

The marine portion of the PTA ROI involves the nearshore and offshore Pacific waters between O‘ahu and the Island of Hawai‘i, the Pearl Harbor area of O‘ahu, the Kawaihae Harbor area of the Island of Hawai‘i, and adjacent coastlines to the harbors (US Army and USACE 2004). Marine habitat was considered because there would be a small increase in vessel transport of troops back and forth from O‘ahu and the Island of Hawai‘i that would be specifically for CALFEX training and not in conjunction with SBCT training. Portions of this route are within the Hawaiian Islands Humpback Whale National Marine Sanctuary waters.

In 2003, informal ESA consultation was initiated with NOAA Fisheries regarding the transformation of one of the two Legacy brigades of the 25th ID(L) to a SBCT. NOAA Fisheries concurred with the Army that slow speeds (less than 11 knots) of the LSV would make collisions with protected species unlikely, and therefore, not likely to adversely impact such species. Based on their assessment, a small increase in LSV requirements would not pose a risk to protected species as long as vessels adhere to the slow speeds.

### 4.9.2 Conservation Programs

The management of natural resources on MMR and PTA is mainly based on the MIP and PIP and the requirements of the existing BOs. These implementation plans have been developed in cooperation with the USFWS and others. These plans are discussed in further detail below. detail below.

The INRMP, IWFMP, MIP, and PIP establish measures reducing the magnitude of impacts on biological resources from training activities and operations. Under the No Action Alternative, the INRMP, IWFMP, and MIP would be implemented at reduced levels.

#### *Mākua Implementation Plan*

The MIP is a comprehensive species and habitat conservation plan for species relative to military training activities in Mākua Valley. The goal was to develop a biologically based plan for stabilizing specific species that occur at MMR. The plan outlines protective measures so that these species are not jeopardized by military training following USFWS consultation. The recently completed Section 7 consultation with the USFWS included an analysis of the MIP, which prioritizes the management of habitat and populations with the greatest likelihood of success for achieving stabilization. The completed 2007 ESA Section 7 consultation with the USFWS included an analysis of the MIP, with which the USFWS concurred. The MIP includes provisions for 28 federally listed plants and one listed land snail, *Achatinella mustelina*. The Mākua Implementation Team (MIT) is in charge of writing and overseeing implementation of the plan using an adaptive management strategy, which allows the plan to be modified based on monitoring results on an ongoing basis.

The objectives for species stabilization are as follows:

- Establishing three (or in a few cases, four) wild on- and/or off-site populations of each species with an adequate number of mature reproducing individuals and juvenile age classes, sustained over time;
- Achieving expedited stabilization of 12 plant taxa that are at greatest risk from training impacts;
- Controlling major threats to the populations; and
- Collecting viable and genetically diverse off-site backup storage for select species.

The MIP contains the following:

- Summary of the current distribution and status of the target species;
- Identity of population units that can be successfully stabilized;
- Strategies to reduce or eliminate impacts of nonnative species and other threats on target species and their habitats;
- Methods to stabilize species;
- Step-down narrative of process to decide when and how to supplement target species and populations through outplanting (relocating propagated plants to native-dominated or natural habitat);
- Protocols to eliminate the introduction of pathogens or pest species when outplanting;
- Measures to evaluate short-term, medium-term, and long-term success of the stabilization efforts; and
- Schedule for completion of implementation actions and a cost estimate for implementation of each identified action.

The Army is in the process of developing and implementing a comprehensive monitoring program to assess the biological and compliance goals of the MIP.

The MIP focuses its action on groupings of species called population units (PUs) and priority management units (MUs). Population units are individuals of a target species that occur at a discrete site and are believed to function as a single biological population. Priority MUs contain at least one PU and are designated for active management of habitat. MUs are sites of intensive management and include management strategies to minimize harmful effects of human activity. Most MUs (21) are in the Wai‘anae Mountains, and two are in the Ko‘olau Mountains. These MUs are on land held by the state, the federal government, and various corporations or individuals. The total area proposed for priority management is 2,307 acres (933.6 hectares). Within these MUs, at least 92 populations will be stabilized. Included in the management approach are actions such as fencing for ungulate control, weed control, fuel management, seed or cutting collection, management of pest species (rats, cats, slugs), outplanting, and monitoring.

The MUs themselves are diverse areas of high-quality habitat. Each MU is designed to provide sufficient area for stabilizing all in situ and reintroduced PUs within the MU. Some of the MUs are large (‘Ōhikilolo, Mount Ka‘ala, Central and East Makaleha) and contain numerous species

for stabilization, while others are small units (Kea‘au) that contain only one or two target species. The larger MUs were designated to include the following:

- Relatively high densities of in situ PUs of target species;
- Large areas of relatively intact native-dominated vegetation as habitat for both *in situ* populations and reintroductions; and
- Locations in areas accessible for management.

The largest MUs are divided into subunits for easier monitoring, and the smaller MUs were designated to assist more isolated PUs or to provide reintroduction sites that meet the distance and habitat criteria outlined in the MIP.

Many of the MUs occur at elevations below 2,500 feet (762 meters), where most native ecosystem loss has occurred, and so include some areas of nonnative-dominated habitat that will require selective habitat restoration. Some of the MUs are geographically discrete and border land not included in the management actions, while others are immediately adjacent to each other and separated by boundary fences (Figure 4.9-1). These MUs provide a large contiguous landscape of habitat for the endangered species, but each MU is managed independently.

MU management strategies include actions to eliminate threats and to encourage regeneration of target species. While each species has specific habitat needs and threats, the threats often apply to all or most of the species requiring stabilization; for example, browsing by feral pigs, goats, and cattle (large feral mammals), competition with nonnative weeds, seed predation by rats, and nonnative insect infestation. Initial MU management includes surveys and assessment of threats to determine the level of management actions to be applied. The Army must develop, and the MIT and USFWS must approve, separate management plans for each type of threat in each MU. The MIP outlines a series of actions to control weeds and to remove feral mammals in the MUs. Weeds generally are controlled or removed; large feral mammals often are removed by fencing and eradication. This applies to all levels of PU management, except the lowest baseline management. PUs with the lowest baseline management are managed as collection sites for genetic storage. Baseline management includes monitoring, ungulate management (as needed), weed management (as needed), control of other threats (as needed), and collection of genetic material for storage. The highest level of PU management designation determines the level of weed control in an MU or MU subunit.

In addition to large feral mammals and weeds, other threats are small mammals, snail predators, other nonnative invertebrates, human impacts, fire, and erosion. Small mammals are usually controlled with toxicants and trapping. This type of threat management will be concentrated in the PU

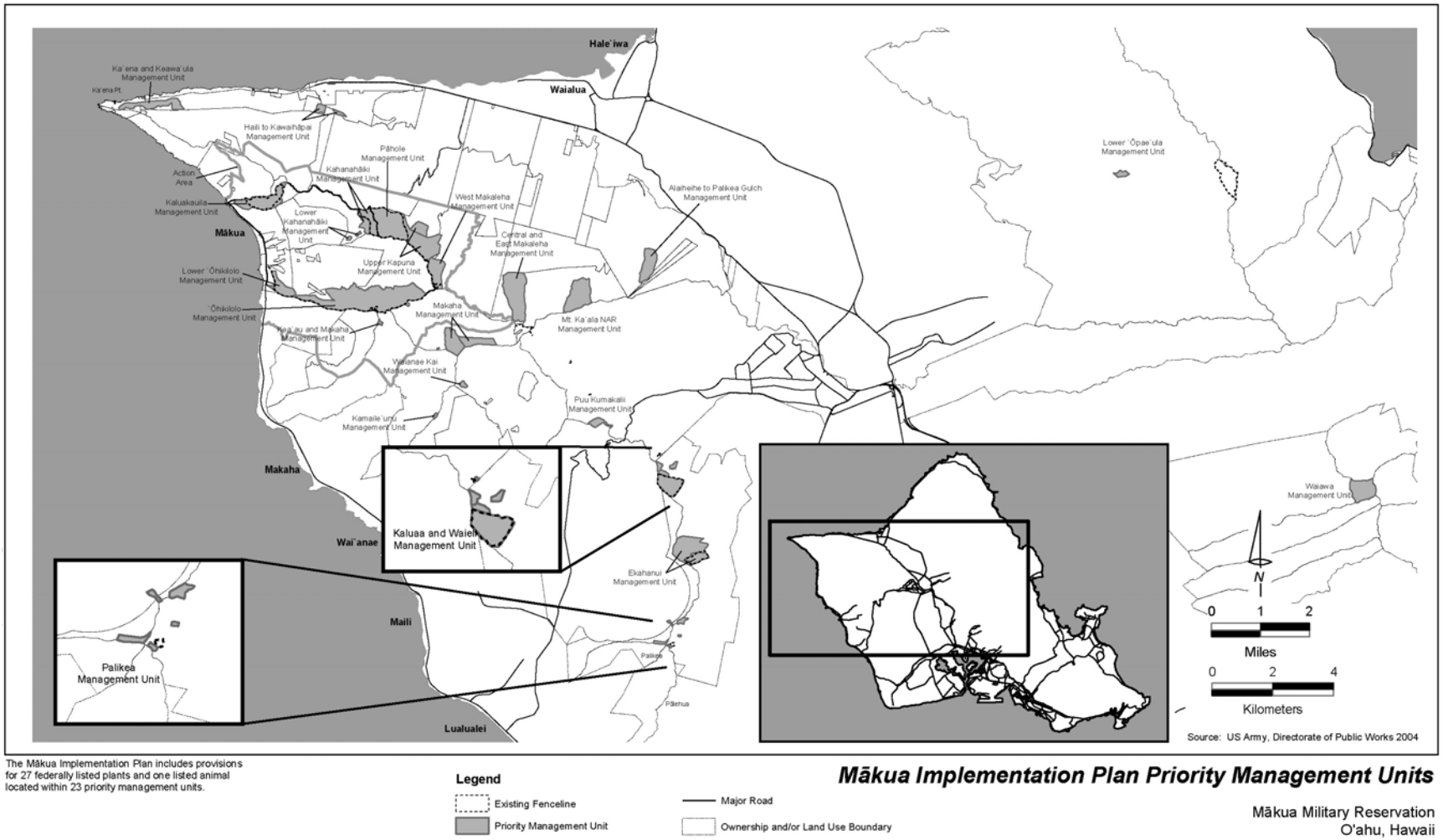



**Figure 4.9-1 Mākua Implementation Plan Management Units**

areas and in reintroduction sites where the species has displayed sensitivity to small mammal predation. *Euglandina rosea* is the primary threat to the native snail (*Achatinella mustelina*), and monitoring and controlling this pest is important wherever it is found. Similar monitoring and control protocols are proposed for slugs and a nonnative predatory flatworm. Specific management tools are not yet determined for insect pests that are particularly damaging to native plant species. These pests include the two- spotted leafhopper (*Sophonia rufofascia*), black twig borer (*Xylosandruscompactus*), and Chinese rose beetle (*Adoretus sinicus*). Control methods may include applying a systemic pesticide to individual plants, but more research is needed to determine the effects of these pesticides on native invertebrates. The MUs must tolerate some level of human presence, but signs will be used to identify the locations of in situ and reintroduced populations, and some areas will be restricted.

Fire is the most devastating of the threats facing the MUs and target species (MIT et al. 2003). The goal of fire control is to reduce the threat to zero or to minimize the threat in fire-prone areas. For those MUs designated as high risk, fire planning and management programs are crucial to ensure the success of the stabilization efforts. A comprehensive fire management plan (similar to the IWFMP) will be developed to cover issues common to all MUs, although separate supplements will be included to address issues specific to the high-risk units. These wildfire management supplements are separate from the IWFMP, which concerns only fire management activities on Army training lands.

Erosion control options are limited and will be carried out only when target species are imminently threatened. Removing the large feral mammals will significantly reduce erosion.

Negotiations for managing and reintroducing the target species on private, federal, and state property are ongoing. Landowner responsibility includes allowing access to Army personnel to conduct stabilization actions. Landowners would not be responsible for maintaining any of the fences or exclosures on their properties. In return, the Army is responsible for funding and undertaking all actions outlined in the MIP, including preparing all appropriate legal documents, honoring lease or land agreements between the landowner and lessees, and assuming liability for actions associated with management actions.

Creation of the MIP has been achieved only through cooperation among federal and state agencies and landowners. Implementing this plan would comply with the USFWS directives established in the 2007/2008 BOs 1999 BO and would lead to stabilization of the affected species.

### *Pōhakuloa Implementation Plan*

The draft PIP, which was completed in May 2008, outlines the management actions necessary to ensure the long-term survival of endangered species at PTA and is designed to assure proper conservation of species as construction and use of ranges and facilities occur. The PIP was prepared to guide conservation efforts that will result in the conservation of federally listed threatened and endangered plant and animal species and Palila Critical Habitat that could be affected by military training activities at PTA on the Island of Hawai‘i. In addition, monitoring protocols were developed for each species to evaluate success of these management actions. Major management actions identified in the PIP include propagation and outplanting, weed control, survey protocols for flora and fauna, rodent control, ungulate control, large-scale fencing, invasive invertebrate control, and an incipient weed program. The majority of actions are planned on Army lands.

Objectives and tasks of the PIP include:

- Management and monitoring protocols for the conservation, augmentation, and reintroduction of listed plant species on PTA;
- Invasive plant, rodent, and invertebrate management to reduce and control the threats from nonnative species and enhance habitat quality;
- Survey methodology for the three endangered bird species that occur at PTA including the ‘io, nēnē, and the Hawaiian dark-rumped petrel;
- Hawaiian hoary bat conservation plan to include survey and monitoring methodology, and enhancement and restoration of habitat; and
- Feral ungulate removal and establishment and maintenance of ungulate-proof fencing.

### *Integrated Training Area Management*

The ITAM program is the Army’s formal strategy for ensuring the sustainable use of training and testing lands. The intent of the ITAM program is to systematically provide uniform training land management capability across USARHAW and to ensure that the carrying capacity of the training lands is maintained over time. The Army manages its lands to minimize loss of training capabilities in order to support current and future training and mission requirements. The integration of stewardship principles into training land and conservation management practices

ensures that the Army's lands remain viable to support future training and mission requirements. ITAM integrates elements of operational, environmental, master planning, and other programs that identify and assess land use alternatives.

The ITAM program also supports sound natural and cultural resources management practices and stewardship of its land assets, while sustaining land attributes to support training, testing, and other installation missions. These management requirements are as follows:

- Integrate training requirements with training land management;
- Annually monitor and analyze resources and ranges;
- Repair and maintain training land;
- Enhance mobility, maneuverability, access, and availability in training areas; and
- Train Soldiers in sustainable range awareness to minimize training land damage.

These requirements apply to all training areas.

#### *Integrated Natural Resource Management Plan*

Guidance on biological resources includes conservation and restoration measures. The USARHAW Natural Resource Environmental Management Program fosters responsible management of Army lands to ensure long-term natural resource productivity, helping the Army achieve its mission. The program is described in the INRMP (USARHAW and 25th ID[L] 2001b & 2001c). These documents outline the steps the Army has taken and continues to take to fulfill its obligation as a federal agency to help in the management of natural resources, and recovery of ESA species and other species and habitat recognized by federal regulations.

#### *Integrated Wildland Fire Management Plan*

An IWFMP has been developed for O'ahu and PTA that would greatly reduce the likelihood of fire outbreak as a result of training. For PTA, the IWFMP SOPs include, but are not limited to the following actions: establishment and maintenance of fuel breaks, fire breaks, and fuel management corridors; dip tanks; suppression measures; and implementation of a Fire Danger Rating System. Implementation of the IWFMP is a requirement per PTAs 2003 BO. The MMR and PTA SOPs of the IWFMP is being revised and will outline the Fire Danger Rating System, revised weapons restrictions, new NWCG qualifications standards and helicopter staffing requirements, fire equipment requirements, new firebreak and fuelbreak installation and maintenance standards, fire

reporting responsibilities, and fire prevention, detection, and suppression standards. This will minimize the risk of resource damage from training-related wildland fires at MMR, as outlined in the project description of the 2007/2008 BOs. According to the requirements of the 2007 BO, the Army would coordinate with the USFWS if a fire due to military activities or actions occurs outside of any of the firebreak roads established at MMR.

#### *Army Compatible Use Buffers*

Another program that is applicable to all alternatives is the continued use of the ACUB program to support the acquisition and protection of lands and resources throughout Hawai‘i.

The conservation of natural resources associated with the purchase of properties may contribute significantly to offsetting cumulative impacts on natural resources. The development of a management plan and implementation of conservation and management measures to benefit listed species and other native species and critical habitat provide an unprecedented contribution to the recovery of listed species and the sustainability of natural resources to support all native wildlife and plant species.

The areas purchased on O‘ahu to date include Waimea Valley, Moanalua Valley, and Pupukea Paumalu. The Army may continue to fund the ACUB program and to conserve additional significant natural resources. For example, Waimea Valley will be used for offsite storage of rare tree species found at MMR and Moanalua Valley will be used for management of the O‘ahu ‘elepaio.

### 4.9.3 Factors Considered for Determining Significance of Impacts

Most impacts on highly sensitive resources are considered significant by definition, while determining significance for impacts on resources of moderate and low sensitivity depends more on site-specific factors (such as the habitat quality and population size), as well as the nature, local significance, and extent of the anticipated impact. For example, impacts on moderately sensitive resources may be considered significant if the anticipated impact were to reduce the population or distribution of a species of special concern.

Factors considered in determining whether an alternative would have a significant impact on biological resources for plants, terrestrial wildlife, and ESA-listed marine wildlife species include the extent or degree to which its implementation would result in the following:

- Cause the “take” of a highly sensitive resource, such as a threatened and endangered or special status species, where take of

an ESA-listed species is defined under the ESA as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct" (50 CFR 17.3). The term "harass" is defined as an "intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering" (50 CFR 17.3). "Harm" is defined as an act "which actually kills or injures wildlife. Such act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering" (50 CFR 17.3);

- Result in a jeopardy BO by the USFWS or NOAA Fisheries;
- Reduce the population of a sensitive species, as designated by federal and state agencies, or a species with regional and local significance. This can happen with a reduction in numbers, alteration in behavior, reproduction, or survival, or by loss of or disturbance to habitat;
- Have an adverse effect on a wetland or riparian habitat regulated by the local, state, or federal government, or on another sensitive habitat (such as designated critical habitat) identified in local or regional plans, policies, or regulations or by the USFWS or NOAA Fisheries;
- Interfere with the movement of any native resident or migratory wildlife species (including aquatic species) or with established native resident or migratory wildlife corridors;
- Alter or destroy highly valuable to moderately valuable habitat and prevent biological communities in the area from reestablishing themselves after habitat is disturbed;
- Introduce or increase the prevalence of undesirable nonnative species; or
- Cause long-term loss or impairment of a substantial portion of local species-dependent habitat.

Factors considered in determining whether an alternative would have a significant impact on marine mammal species protected under the MMPA but not the ESA include the extent or degree to which its implementation would result in the following:

Cause a take of an MMPA-protected species as defined under the FY 2004 Defense Authorization Act (HR 1588), where an animal is taken if it is harassed, and where harassment is defined as "(i) any act that injures or

has the significant potential to injure a marine mammal or marine mammal stock in the wild or (ii) any act that disturbs or is likely to disturb a marine mammal or marine mammal stock in the wild by causing disruption of natural behavioral patterns, including, but not limited to, migration, surfacing, nursing, breeding, feeding, or sheltering, to a point where such behavioral patterns are abandoned or significantly altered" (section 315(f) PL 107–314; 16 USC 703 note);

- Reduce the population of an MMPA species, which can happen with a reduction in numbers, abandonment of the habitat, alteration in behavior, reproduction, or survival, or loss of or disturbance to habitat;
- Interfere with the movement of any native resident or migratory marine wildlife species or with migratory marine wildlife corridors;
- Alter or destroy highly valuable to moderately valuable habitat and prevent marine biological communities utilizing this habitat from reestablishing themselves after the habitat is disturbed; or
- Cause long-term loss or impairment of a substantial portion of local marine species-dependent habitat.

An impact is considered significant but mitigable if the result of the proposed project would have a significant impact on biological resources, but mitigation measures associated with the project would reduce the level of impact to below significant levels.

### 4.9.4 Summary of Impacts

Military training at MMR would have an overall adverse impact on biological resources. Impacts would include the spread of nonnative species and the degradation of habitat as a result of fire, as well as direct and indirect impacts from training.

Generally, as the level and frequency of training increases across the four MMR alternatives so does the magnitude of impacts on biological resources. The proposals progress from no live-fire training under the No Action to training at reduced capacities under Alternative 1 to training at full capacity under Alternatives 2 and 3, and from some live-fire restrictions under Alternatives 1 and 2 to fewer restrictions under Alternative 3. Under the No Action and Alternatives 1, 2, and 3, the significant impacts on sensitive species and habitat are mitigable, except for those resulting from wildfires and from the spread of nonnative species. Noise, runoff, and disturbance to sensitive terrestrial and marine species from activities conducted under the No Action would be less then significant or have no effect. As the frequency of wildfires and the

potential for wildfire increases, ranging from Alternative 1 through Alternative 3, so does the potential for wildfire-related impacts on biological resources and sensitive species. Impacts on sensitive terrestrial species and habitat from aircraft remain less than significant. Also significant and mitigable under Alternatives 1, 2 and 3 are impacts on sensitive terrestrial species and habitat from ground training. Less than significant impacts are expected to marine wildlife and coral ecosystems from runoff under Alternatives 1 through 3. Based on the acoustic modeling conducted (see Appendix G-5 of this Final EIS) and based on the use of the most current thresholds (as discussed with and approved by NOAA Fisheries), there would be no noise-related impacts on any marine species, either ESA-listed or MMPA-protected, from the proposed activities analyzed in this EIS. Impacts on marine wildlife from aircraft and from ground training are less than significant under Alternatives 1 through 3.

Alternative 4 at PTA is a unique situation regarding potential impacts. The impact analyses for the SBCT at PTA were addressed in NEPA documents and ESA Section 7 formal consultation. The ROI for the SBCT encompasses the ROI for the Alternative 4. However, the additional impacts on the land that would result from CALFEX training pose threats to sensitive resources that were not addressed and separate ESA Section 7 analysis would be required.

Under NEPA, the Army would employ the following mitigation measures for PTA to minimize the impacts of the SBCT, which would also prove beneficial within the ROI of Alternative 4:

- Prevent any weeds brought in from becoming established by rigorously monitoring using transects, roadside surveys, and eradicating new weeds using the most effective means for each specific invasive species;
- Provide USFWS-approved education regarding cleaning vehicles and field gear;
- Wash vehicles in wash rack facilities prior to returning from the training areas, to minimize the spread of weeds (e.g., fountain grass); and
- Train and require Soldiers to clean their gear and vehicles when first arriving in Hawai‘i and prior to moving from installation to installation, as well as when moving from island to island.

These measures, coupled with the requirements for invasive plant and animal control pursuant to the PIP and BO, would significantly reduce the potential impacts of invasive species that could result from mission

activities within the Twin Pu‘u range and associated SDZ. The greatest threat for enhancing the spread of invasive plant species within the PTA ROI is fire.

Fire control and prevention measures are thoroughly discussed in the IWFMP and the PTA SOP of the IWFMP. Implementation of the IWFMP and associated PTA SOP are requirements of the 2003 USFWS BO. Fire prevention, suppression and control, and potential impacts on ESA listed species have been addressed for the SBCT ROI, which encompasses the PTA Alternative ROI. However, implementation of the action within the proposed Twin Pu’u area on PTA would increase the potential for fire ignition within the western portion of PTA, but more specifically, the Kīpuka Kālawamauna Endangered Plants Habitat. Additional ESA Section 7 consultation with the USFWS would likely result in additional conservation measures for this area. The Kīpuka Kālawamauna is rich in listed plants and is part of the PTA ROI because of the potential for a fire within the SDZ to spread into the area.

In its 2003 PTA BO, the USFWS concluded that implementation of the Proposed Action (SBCT) was not likely to jeopardize the continued existence of any species covered in the BO or adversely modify or destroy PCH. The USFWS recognized that because the impact area is unsafe for human activity, surveys for listed species cannot be conducted, and the magnitude of habitat loss for the Hawaiian hoary bat cannot be accurately determined. They concluded that over time, all treeland habitat within the impact area would be lost, and impacts to the Hawaiian hoary bat and a number of species of listed plants would occur. The construction of the Twin Pu‘u range and the SDZ for the range all fall within the impact area; therefore, potential impacts on listed species are unknown. In addition, all potential impacts within the PTA impact area have been addressed in the SBCT consultation and EIS.

In summary, invasive plant species pose a threat to listed species and habitat. Movement of troops and equipment, construction, and fires would all be expected to promote the introduction and spread of invasive species. These impacts would be significant, and not mitigable to less than significant. Fire poses the greatest risk to sensitive species and habitat. Live-fire exercises within the proposed Twin Pu‘u would increase the risk of fires in the Kīpuka Kālawamauna Endangered Plants Habitat and other areas containing listed plants. Implementation of the IWFMP would considerably reduce wildfire risk, but the impacts from a wildfire would not be reduced to a less than significant level.

The USAG-HI would initiate ESA Section 7 consultation with the USFWS prior to any actions associated with the implementation of Alternative 4.

## Summary of Potential Biological Resources Impacts

| Impact Issues | No Action Alternative | Alternative 1 MMR (Reduced Capacity Use with Some Weapons Restrictions) | Alternative 2 MMR (Full Capacity Use with Some Weapons Restrictions) | Alternative 3 MMR (Full Capacity Use with Fewer Weapons Restrictions) | Alternative 4 PTA (Full Capacity Use with Fewer Weapons Restrictions) |
|---|---|---|---|---|---|
| Impacts from fire on sensitive terrestrial species and sensitive habitat | ⊗ | ⊗ | ⊗ | ⊗ | ⊗ |
| Impacts on sensitive terrestrial species and habitat resulting from the spread of nonnative species | ⊗ | ⊗ | ⊗ | ⊗ | ⊗ |
| Impacts on marine wildlife and coral ecosystems from runoff | ⊙ | ⊙ | ⊙ | ⊙ | ○ |
| Disturbance to marine wildlife from aircraft* | ⊙ | ⊙ | ⊙ | ⊙ | ⊙ |
| Disturbance to marine wildlife from ground training* | ○ | ⊙ | ⊙ | ⊙ | ○ |
| Disturbance to sensitive terrestrial species and habitat from ground training | ○ | ⊘ | ⊘ | ⊘ | ⊘ |
| Disturbance to sensitive terrestrial species and habitat from aircraft | ⊙ | ⊙ | ⊙ | ⊙ | ⊙ |

LEGEND:

⊗ = Significant impact ⊘ = Significant impact mitigable to less than significant

⊙ = Less than significant impact ○ = No impact + = Beneficial impact

* = The Army plans to conduct a hydrophonic noise study during a future CALFEX.

### *No Action Alternative*

*Significant Impacts*

*Impact 1: Impacts on sensitive terrestrial species and habitat resulting from the spread of nonnative species.* Under No Action, there would be no live-fire training at MMR. Implementing the No Action Alternative would increase the presence of nonnative species in both the short term and long term in the ROI, which would have a significant impact. In general, nonnative plant and animal species pose a threat to Hawaiian native ecosystems.

The introduction of new or the spread of existing aggressive, nonnative plant species would alter native plant habitat and create competition with native and sensitive plants for space, nutrients, and light (Wagner et al. 1999). Invasive plants have an advantage in becoming established in an environment that is stressed and can often out-compete native species that are not adapted to the novel environment created through human activity (Wagner et al. 1999). The continued use of MMR would mean nonnative species would continue to be introduced to the ROI. Soldiers would come to MMR from military installations on O‘ahu and other more distant locations, such as Japan and Thailand. Soldiers are likely to carry seeds from nonnative plants on their clothing or possessions.

The increase in nonnative plants would alter vegetative type and cover amount, particularly if invasive plants are introduced into the ROI, leading to habitat-level modification. This change in vegetation would adversely affect native wildlife that have evolved alongside native plants and habitats by removing food sources, shelter, and breeding areas. Native wildlife would also be threatened by the introduction of nonnative wildlife, which prey on native species, compete for resources, and carry diseases.

In conclusion, No Action would significantly impact sensitive species at MMR through spread of invasive species because of the following: causing long-term loss or impairment of a substantial portion of local species-dependent habitat; introducing or increasing the prevalence of undesirable nonnative species; and reducing the population of a sensitive species, as designated by federal and state agencies. Any loss of valuable habitat or listed species increases the threat to Hawai‘i’s biological diversity. Due to the limited effectiveness of controlling invasive species once a habitat has been severely disturbed, along with the potentially large area directly and indirectly affected, mitigation measures, including revegetation efforts, may not be sufficient to reduce this impact to less than significant.

*Regulatory and administrative mitigation 1.* Continue with invasive species control and prevention measures as outlined in the INRMP and USFWS biological opinions. Such efforts would include surveying for weeds along roads to evaluate the degree of threat and to prioritize control efforts and implement manual, mechanical, and chemical treatment programs; construct fencing to exclude ungulates from priority management units; and control non-native predators of the Achatinella snails.

*Additional mitigation 2.* Potential mitigation measures considered include requiring Soldiers to clean their boots and other equipment directly prior to utilization of MMR to minimize the potential introduction of nonnative species.

*Impact 2: Impacts from fire on sensitive terrestrial species and sensitive habitat.* Under No Action, there would be significant impacts from fire on sensitive terrestrial species and sensitive habitat. Under this alternative, there would be no live-fire training at MMR, and therefore fewer training-related ignition sources. Based on this significant decrease in potential fire hazards, there would be reduced fire prevention and control actions and activities on MMR.

Aircraft participating in nonlive-fire training activities could crash within the MMR ROI, resulting in fire ignition. With respect to unmanned aerial vehicles (UAVs), as stated in the 2007 MMR BO (USFWS 2007), UAVs may take off at Mākua and fly over the MMR ROI without on-site or standby wildland fire suppression staffing. The size of the UAV, amount of fuel contained within it, and the low likelihood of a crash poses little potential for a fire event. Because of the lack of fire suppression staffing, fire ignition at MMR could mean a minor fire could go out of control and have devastating impacts on sensitive species within the MMR ROI. Under this alternative, there would be reduced fire-fighting capabilities onsite to extinguish any resulting fire.

Under this alternative, fuel and fire breaks would continue to be managed at MMR. The likelihood of fire under the No Action Alternative would be much lower than under Alternative 1 through 3, and would be less then if no military training occurred on MMR.

With no training at MMR, there would be a reduction in vegetation management that would actually increase the fuel load of the grasses, increasing the potential damage from an accidental wildfire. A fire that starts outside of the installation could quickly and easily spread through MMR if the fuel load was not regularly managed. Even under ideal management conditions, fires have been known to spread outside the

installation boundary. A reduction in stewardship measures would increase the potential for a fire to damage sensitive terrestrial species and habitat at MMR.

Wildland fire and invasive species management will continue to occur on MMR and the proposed training under this alternative has low fire ignition potential. However, the Army has made a conservative determination that even with the implementation of these measures, a wildfire could result in an irretrievable loss of individuals of a sensitive species. Therefore, implementation of the No Action Alternative could have significant impacts related to wildland fire that could not be mitigable to less than significant.

*Regulatory and administrative mitigation 2*. The Army would continue to implement the INRMP and fire prevention measures contained within the IWFMP.

*Additional mitigation 2*. Potential mitigation measures for this impact include having standby wildland fire suppression staffing available for the non live-fire events.

### Less than Significant Impacts

*Impact 3: Impacts on marine wildlife and coral ecosystems from runoff.* Under No Action, there would primarily be lasing and UAV activity occurring on MMR. Other forms of nonlive-fire training activities that are currently authorized at MMR include using the installation as a staging base for air and ground assault command and control elements, engineer road improvement measures, and limited blank ammunition training (with special authorization). Preparation and implementation of these activities would cause only negligible impacts to the soil and have no impacts on marine wildlife or coral ecosystems. There are few ignition sources associated with these training activities, so there would be a reduction of onsite fire fighting forces. However, with minimal fire control capabilities, there could be substantial consequences if a fire were to ignite on or adjacent to MMR. Runoff following any large-scale fire event could result in sediment being transported to the ocean and harming coral ecosystems. Sedimentation and turbidity would obstruct respiration, lower photosynthesis of symbiotic organisms, and impede the filter feeding of coral polyps. Coral is adapted to changes in water clarity and sediment deposition that occurs during storms and would survive but would suffer a period of decreased productivity.

The Marine Resources Study conducted by the Army found substances in marine resources at both Mākua and background sites that are known to be associated with past and proposed training at MMR, but none were unique

to military training; therefore, proposed military activities are anticipated to have little influence on contaminant levels within marine resources in the Mākua nearshore or *muliwai* areas. It needs to be reemphasized that there are numerous other natural and anthropogenic sources that contribute substances to the Mākua and background areas.

*Disturbance to marine wildlife from aircraft*. Under Alternative 1, there would be daytime and nighttime helicopter support and assault activities. Some helicopter operations could be conducted at very low altitudes over the water surface. Night flying may take place during these exercises.

Impacts from aircraft disturbance (visual or auditory disturbance from helicopters) were assessed specifically for ESA-listed marine wildlife considered to be "identified species of concern" for this EIS (see Appendix G-5 of this EIS for more detail). These species are either known to occur with regular frequency in the ROI and are ESA-listed, or their ESA status, combined with their low population numbers or overall threats to the species, warrant special attention, even if they are known to occur only rarely. Impacts were also assessed for spinner dolphins (which are MMPA-protected) because they are known to occur regularly in the ROI. The only ESA-listed marine mammal species that regularly occurs in the ROI is the humpback whale, which is found regularly in the ROI between January and April. The ESA-listed Hawaiian monk seal and various ESA-listed sea turtle species would rarely be found due to habitat conditions in the ROI and the species' natural history requirements; however, impacts from aircraft disturbance on these species were also assessed.

Under the FY 2004 Defense Authorization Act, take or harassment of MMPA-protected marine mammals from helicopter or UAV overflights would only occur if the animals were disturbed to a point where they abandoned or significantly altered their natural behavioral patterns.

Although the modeling study determined that helicopter noise would not reach the thresholds necessary to be considered harassment, the Army recognizes that there could be a direct visual impact from helicopters. The Army will be flying helicopters from Dillingham and Wheeler Army Airfields around the coastline and entering Mākua Valley from Mākua Bay. These flights will take place all year long at both nighttime and during the day. During these flights, the helicopters often fly below 1,000 feet (305 meters) elevation.

Aircraft activities and overflights discussed above are expected to have less than significant impacts on any marine wildlife in the ROI, including humpback whales. Whales are in the area only seasonally, predominantly

January through April, and regulations forbid any aircraft from passing within 1,000 feet (305 meters) of a humpback whale in Hawaiian waters (60 FR 3775). Humpback whales in the ROI are expected to be few in number and would be able to move to another area if disturbed by aircraft; any disturbance would be short term. However, altering an animal's behavior could be considered a take via harassment under the ESA. Since humpbacks are protected under the ESA there is a potential for an animal to have a take if aircraft were within 1,000 feet (305 meters) of the species. Mitigations and regulations are in place to ensure that there are no flights within 1,000 feet (305 meters) or any humpback whale.

Helicopters at low altitudes are not expected to have significant noise impacts on marine wildlife, including the identified species of concern, because modeled noise levels at in-water locations would not exceed assumed MMPA Level B harassment criteria (Marine Acoustics 2005). Note that there is no specific harassment criterion for a broadband signal, like the noise generated by a helicopter. However, for this document, a maximum received level of 160 dB re 1 μPa is assumed as a conservative threshold for Level B harassment for this type of broadband signal. This is consistent with the 160 dB root-mean-squared (rms) received level threshold that the seismic community to measure airgun operations. Airguns also produce a broadband signal that can be transmitted every ten seconds or so for days at a time. The airgun signal is impulsive in nature, so it does not have the duration of a continuously operating helicopter, but the helicopter's noise only affects animals that are almost directly beneath it. Beyond this limited area, noise levels of helicopters in the water are greatly reduced.

Spinner dolphins are known to rest regularly in the ROI (Lammers 2003a, 2003b), including in a portion of the helicopter overflight pathways. Therefore, the potential for helicopters to have impacts on the residential spinner dolphin population is greater than the potential for overflights to affect whales (humpback whales, or other rarely occurring whale species), monk seals, or sea turtles that may occur in the ROI. Spinner dolphins could be affected either by visual or acoustic disturbance from helicopters. However, while the potential for impacts on spinner dolphins exists, most helicopter noise occurs at frequencies below 400 Hz, where spinner dolphins have reduced hearing sensitivity. A take on spinner dolphins includes a change in the animals to a point where, when disturbed, they abandon or significantly alter their natural behavioral pattern of resting, which they are known to do in this area.

Spinner dolphins may be adversely affected by visual impacts from helicopter overflights. If animals are at the surface during a flight, they may be affected by the shadows caused by the helicopter or UAV

overflights. However, less than significant impacts are expected from visual disturbance because the animals are not expected to be disturbed by flights to the point where they abandon or significantly alter their natural behavioral patterns in the area. If affected, they would most likely undergo only a short-term change in behavioral pattern, not a change that would cause them to abandon or significantly alter their natural behavioral pattern of resting; that is, they might be affected but it would not meet the definition of a take under FY 2004 Defense Authorization Act criteria.

In a meeting on June 28, 2006, the Army and NOAA Fisheries agreed that the standard methods used for previously published FEISs (DoN 1998, 2001) were applicable for use in this EIS, even though all of the explosions covered in this MMR EIS occur on or over land, rather than over water. This decision was based on the fact that the received signals are expected to have the characteristics of the acoustic signals generated by underwater explosions as in the above examples. This decision also relied on the noise study report (Appendix G-5), which essentially predicted that only approximately two to six (or fewer) of the explosions in any CALFEX event were of sufficient magnitude to be heard by marine mammals in the water. Effectively, the conservative modeling performed predicted that only two types of explosives that occur in the CALFEX exercises slightly exceeded in-water received sound pressure levels of 140 dB. Therefore, only a few of the explosions that take place on land would probably be heard offshore of MMR. This is in keeping with the intent of the previous FEISs (DoN 1998, 2001), where only one explosion would occur during a 24-hour period, and Level B harassment levels are based on temporary threshold shift, not behavior.

#### *In-Water Helicopter Levels*

For helicopter activities over Site C (see Appendix G-5), it was determined that the maximum received level at the two in-water sample sites was within 5 dB of the expected in-water ambient noise. Therefore, there would be no impacts on any Hawaiian monk seals, humpback whales, and spinner dolphins at the in-water sites from helicopter activities. In addition, because of their less-sensitive hearing, there would be no impact on any sea turtle species from helicopter activities. No auditory impacts from helicopter overflights are expected on spinner dolphins, as the MMR modeling study determined that the noise levels produced would be below the thresholds that are expected to cause auditory impacts on dolphins (Marine Acoustics 2005). The results of the study indicate that the in-water noise levels from helicopter overflights would be a maximum of 90 dB, which is far below the level (160 dB) discussed above for MMPA Level B harassment (Marine Acoustics 2005).

#### *In-Air Helicopter Levels*

For helicopter activities over Site C (see Appendix G-5 of the EIS), it was also determined that the maximum received level at the two beach sites was within 5 dB of the expected local ambient noise. Therefore, there would be no impact on any of the Hawaiian monk seals on the beach from helicopter activities. Again, because of their less-sensitive hearing, there would also be no impact on any sea turtle species on the beach from helicopter activities.

Note that all levels that have been set as standards or criteria for harassment are under consideration, NOAA Fisheries is expected to redefine them using results from current scientific studies. New criteria or thresholds were expected in Fall 2005, when a draft EIS was to be issued delineating more detailed acoustic thresholds for marine mammals (FR Vol. 70, No. 7 January 11, 2005). To date, release of the new thresholds has been delayed.

Presently, the modeled data indicate it is unlikely that there would be any noise impacts on marine wildlife (Marine Acoustics 2005). There is not sufficient direct information to make a scientifically defensible case for the likely short-term or long-term effects of military exercises on spinner dolphins from impacts occurring near Mākua Valley (Lammers 2003b).

The potential of flights daily on up to 242 training days a year is expected to cause less than significant adverse impacts on spinner dolphins, although the intensity of these impacts could vary if flights repeatedly took place at low altitudes and if the dolphins were consistently present at these times.

*Regulatory and administrative mitigation 3*. The Army would continue to observe and implement the following measures:

- Use a second "command and control" aircraft to monitor the training aircraft. This aircraft flies at altitudes of 300 to 400 feet (91 to 121 meters) to monitor the training aircraft. Personnel observe the ocean surface from this command and control aircraft for signs of marine wildlife. During nighttime training, night vision equipment is used to observe marine mammals. In all cases, this second aircraft is used during training operations to observe for whales and to inform training aircraft of the need to move should a whale be spotted.
- Observe USARHAW SOPs to protect marine wildlife when pilots or other aircraft personnel spot the animals. Among these SOPs, the Local Flying Rules (see letter from February 11, 2003, Appendix H-3) prohibit flying within 1,000 feet (305 meters) of

whales, monk seals, and dolphins. The SOPs also require altering flight paths once wildlife is observed. These SOPs are followed when marine life is present within the exercise ROI.

*Additional mitigation 3a*. Potential mitigation measures for this impact include the following Army actions:

- Emphasize to all personnel that the mobile nature of marine wildlife mandates constant observation because marine wildlife can and do appear suddenly and may surface in an area or at the ocean surface at any time;
- Limit low-altitude flying (200 feet [61 meters] or less) over areas likely to harbor marine mammals;
- Practice "search and avoid" techniques during the day by performing a pass-by flight at 1,000 feet (305 meters) before training to assess the presence of marine wildlife. NOAA Fisheries recommendations include conducting overflights of the beach before training operations begin to search for monk seals on the beach;
- NOAA Fisheries requirements include if a seal is hauled out, training operations would be altered and flights directly over the beach would be prohibited. In addition, munitions use would be limited in order to avoid affecting the seal(s). These training restrictions would also be implemented immediately anytime a seal is observed during training. The training would be altered to allow the animal to leave the beach;
- Stop training near and over sea turtles if they are present on the beach. The Army would inspect Mākua Beach immediately before a training exercise, either from the ground or by air or both, and would not begin a CALFEX or other training if sea turtles were present. In addition, the Army would periodically check the beach for sea turtles during training. If a sea turtle <u>was</u> spotted, there would be no direct flights over the sea turtle, and munitions use would be limited that day. The training would continue to be altered until the sea turtle leaves the beach;
- Limit low flying at night when visibility is limited;
- Use night vision goggles on nighttime flights to enhance spotting and avoiding humpback whales or other identified species of concern. Include practice and training in use of night vision goggles for all spotters to increase the likelihood that they would be able to observe marine mammals in low light or darkness;

- NOAA Fisheries requirements include use of OH-58D Kiowa Warrior thermal imaging scans during nighttime operations before training. These scans should occur over the ocean, a quarter mile (0.4 kilometer) offshore before training begins. These scans are to be completed every two hours during training;
- NOAA Fisheries requirements include avoiding overflights of humpback whales by requiring pilots to use search and avoid techniques. To mitigate direct visual or noise impacts from helicopters, helicopter pilots would practice these techniques, which would further ensure they maintain the required 1,000-foot (305-meter) distance required for humpback whales. These techniques involve moving horizontally and vertically away from an observed whale to ensure that the 1,000-foot (305-meter) buffer is maintained and attained as quickly as possible, once a whale is spotted;
- As part of ESA Section 7 consultation with NOAA Fisheries (NOAA Fisheries 2006, Appendix H-3), the Army would develop and implement a comprehensive reporting and monitoring program. The Army would submit annual reports to NOAA Fisheries documenting sightings of ESA- or MMPA-listed animals in the action area during training. The Army would report to NOAA Fisheries in a timely manner the location information for any animals sighted, particularly if it is an ESA-listed species. Monk seal sightings would be reported immediately. The report would detail the Army's mitigation measures in accordance with the commitments made during ESA Section 7 consultation with NOAA Fisheries; and
- The Army would continue informal consultation with NOAA Fisheries.
- The Army will undertake a long-term monitoring program. The plan for this monitoring program will be developed along with input from the public, including a 60-day review and comment period.

*Disturbance to sensitive terrestrial species and habitat from aircraft.* Under the No Action, aircraft activity would have a less than significant impact on sensitive terrestrial species and habitat. Increased noise and visual disturbance from the aircraft could affect bird species. The impact of aircraft on sensitive species would be less than significant because the distance between aircraft and these species would be sufficient enough to avoid visual impacts and to minimize noise effects. Records indicate that seabird activity offshore of the Ka'ena Point Natural Area Reserve has not resulted in bird strikes with Army helicopters in this area of the ROI since

1990, the earliest date such records were kept. Under the proposed training, there would be no change to flight altitudes or flight patterns in this area, so there would be no increase in the likelihood of bird and aircraft strikes. Current flight patterns include take-offs and landings from shore, and the aircraft fly out to generally one quarter of a nautical mile (.46 kilometer) offshore and back, at a general altitude of 1,000 feet (304 meters). Seabirds known to occur in the ROI do occur both at this altitude and distance offshore.

The military has ongoing bird aircraft strike hazard programs in place to reduce the risk of bird and wildlife strikes. If a strike were to occur, the event would be recorded and the US Army Pacific, Federal Aviation Administration, and USFWS would be notified, as part of existing procedures. The Waiʻanae Mountains that separate MMR from SBMR support many sensitive terrestrial wildlife species and the coastal region of Kaʻena Point NAR supports Laysan albatross and wedge-tailed shearwaters. Noise produced by human activity is known to have an adverse effect on various wildlife resources, although habituation can occur with certain species. Many studies have documented the effects of noise on numerous terrestrial species (Bleich et al. 1990; MacArthur et al. 1982; Foster and Rahs 1983; Cassirer et al. 1992). Aircraft-generated noise could disturb bird species in the ROI, especially early in the breeding season when individuals may be more easily deterred from starting a nest in the area or may be flushed from an existing nest. Aircraft disturbance also could interfere with calling and mating behaviors between individuals of the same species.

These impacts would be largely avoided as a result of the aircraft flight patterns. Around Kaʻena Point, aircraft would fly at least 1,000 feet (305 meters) offshore. In addition, aircraft remain a minimum of 700 feet (213 meters) above ground and 300 feet (91 meters) above the ocean. Because noise levels and wind velocity attenuate with distance, noise and wind generated by aircraft at this distance would be relatively minor at ground or canopy level. As discussed in Section 4.5, helicopters at these distances are not likely to flush bird species from a roost. In addition, no aircraft landing zones are located near sensitive habitat or in immediate proximity to areas known to support sensitive species, such as the ʻelepaio, Laysan albatross, and Oʻahu tree snails, so there is little concern regarding the wind and noise generated as a result of helicopter landing and take-off.

None of the factors discussed in Section 4.9.3 would be exceeded as a result of aircraft impacts on sensitive terrestrial species and habitat. This impact is therefore considered less than significant.

### No Impact

*Disturbance to marine wildlife from ground training.* Under the No Action, there would be minimal ground training and no live-fire weapons training at MMR with no anticipated impacts on marine wildlife. There would be no noise or concussive impacts on marine wildlife.

*Disturbance to sensitive terrestrial species and habitat from ground training.* Under No Action, based on the proposed non-live fire training that would occur, there would be no noise from land-based weapons firing and explosions or concussive (impulse/shock) waves that originate on land from ordnance detonation live-fire training at MMR and therefore no impacts on sensitive terrestrial species and habitat. The sensitive species and habitat would be under no greater threat than they are under the baseline, and so there is essentially no impact from the proposed level of ground training.

## Alternative 1 (Reduced Capacity Use with Some Weapons Restrictions)

### Significant Impacts

*Impact 1: Impacts from fire on sensitive terrestrial species and sensitive habitat.* Under Alternative 1, impacts from training-related fire on sensitive species and habitat at MMR are considered significant. Live-fire training could start wildfires outside the firebreak road and would increase from no training under baseline conditions to 242 days per year under Alternative 1. Live-fire training increases the threat of wildfires within the ROI. Fires could result from training or from associated management activities (fire sources are discussed in detail in Section 3.14). The likelihood of a training-related fire is moderate to high during live-fire activities. The main factor in determining the significance of this threat is the ever-present potential that a single wildfire could escape control and destroy sensitive species or habitat.

Wildfire poses a major threat to the Hawaiian ecosystem because native plants and animals are not well adapted to fire (USARHAW and 25th ID[L] 2000). Fires could destroy native plants and slow-moving animals, such as snails, and could displace other animals. The area known as Lower ʻŌhikilolo has populations of endangered plant species, including *Hibiscus brackenridgei* ssp. *mokuleianus*, *Chamaesyce celastroides* var. *kaenana*, and *Spermolepis hawaiensis*. Individuals of these species narrowly escaped perishing in the July 2003 fire at MMR. A population of *Chamaesyce celastroides* var. *kaenana* was also found on the left-hand side of MMR; these were lost in the July 2003 fire. Army Natural Resource Center (NRC) personnel are controlling weeds around this population of plants, resulting in the recruitment of natives, such as ʻilima

and ‘a‘ali‘i, and the reduction of guinea grass in the immediate vicinity (Kawelo 2003).

Wildfires that burn into native communities or sensitive habitats could destroy listed plant and animal species and sensitive habitats. BSAs within the ROI that could be affected by a wildfire are discussed in Section 3.9; threatened and endangered species known to occur or that could occur within the ROI are listed in Tables 3.9-3 through 3.9-5. In addition, the following sensitive habitats are found within the ROI:

- Ka‘ena Point Natural Area Reserve;
- State Forest Reserve;
- Federally designated critical habitat for O‘ahu ‘elepaio; and
- Critical habitat for plants and habitat used by numerous species of native Hawaiian land and tree snails.

Wildfires that burn into native communities or sensitive habitats could destroy listed plant and animal species and sensitive habitats. Fires started as the consequence of proposed training activities could reach populations of listed species within the ROI.

The Hawaiian hoary bats are not known on O‘ahu, though they have been documented historically. No impacts are expected because none are considered to occur in the ROI. No hoary bats have been sighted on O‘ahu since 1998. In addition, the USFWS determined that the Army was not required to consult on the Hawaiian hoary bat because the presence of that species as a resident species was determined to be historical and not current.

‘Elepaio are also recorded in the ROI and would be adversely affected by the loss of trees, which would mean a loss of potential roosting and nesting sites. Should a fire start or spread outside the firebreak road during the breeding season (January to June), it would be particularly harmful to this species.

Pueo foraging grounds and roosting and nesting trees could be affected by an outbreak of fire. Although no nesting areas have been confirmed in the ROI, protective behaviors exhibited in ‘Ōhikilolo and the presence of a fledgling along C-Ridge (the ridge between the north and south lobes of the training area) have led NRS personnel to believe it is likely present (PCSU 2002). The loss of a nesting tree would be particularly damaging to pueos and could result in the immediate or eventual loss of a nestling.

The impact of wildfire on listed species and habitat would be greatly reduced by implementing the MIP, INRMP, IWFMP, ITAM, and ACUB programs, which would greatly diminish the overall significance of fire and invasive species impacts on the natural resources at MMR. However, because there is a risk that a wildfire could result in an irretrievable loss of individuals of a sensitive species, the Army has made a conservative determination that although the mitigation will considerably reduce the impacts on sensitive terrestrial species and habitat, the impacts may not be reduced to a less than significant level.

*Regulatory and administrative mitigation 1*. USARHAW protocols have been designed to minimize the potential for training-induced fires and their impacts. Army wildland fire fighting activities are guided by the 25th ID and USARHAW IWFMP. Implementing the MMR IWFMP would greatly reduce the probability of fire and increase the Army's fire containment capability. Using the O'ahu Training Areas IWFMP management directives would avoid and minimize fire impacts on sensitive species (USARHAW and 25th ID[L] 2001b) by limiting training to times of low fire risk. Army personnel would continue to use BMPs during operations. The INRMP and MIP would ensure that sensitive species and conservation and restoration projects are monitored as long as training occurs at MMR. The Army would also follow measures outlined in the MIP to monitor for introduced species and to eradicate any newly introduced ones.

*Additional mitigation 1a*. Potential mitigation measures include habitat restoration following a fire. Efforts would be focused on the native forest edges to ensure that the area does not recede after each fire. Revegetation efforts would be implemented in any sensitive habitat destroyed by fire to ensure no net loss of sensitive species or habitat.

*Additional mitigation 1b*. Potential mitigation measures include replacing the 5,577 feet of fencing that have been burned. Replacing this fencing, which had been constructed to keep out feral pigs and goats, would reduce impacts on native plants.

*Additional mitigation 1c*. Potential mitigation measures include installing a new radio repeater within range of Mākua Valley to facilitate communications between Mākua and wildland firefighters and cooperators stationed outside Mākua valley.

*Additional mitigation 1d*. Potential mitigation measures include adding GPS locations of individual plants to USAG-HI's GIS database to facilitate reintroduction and fire suppression planning.

*Additional mitigation 1e*. Potential mitigation measures include establishing protocols for hydro-mulching or other large-scale native plant seeding to be used in native habitat restoration efforts.

*Impact 2: Impact on sensitive terrestrial species and habitat resulting from the spread of nonnative species*. These impacts are the same as those fully described under the No Action Alternative but are more likely to occur because of an increase in the number of training days and corresponding increase in human presence. Implementing Alternative 1 would further increase the presence of nonnative species in both the short term and long term in the ROI, which would have a significant impact. Compared to the baseline of the No Action Alternative at MMR, an increase in the number of troops and training days would also increase the frequency of transporting people to and from the range, which increases the potential for nonnative species to be brought in from outside locations.

Activities at MMR are expected to have the following effects on the introduction and spread of nonnative species (CEMML no date):

- Troops and equipment moving into Hawai‘i from other countries, states, or islands and between subinstallations within Hawai‘i could increase the likelihood of introducing nonnative plants;
- Training in and marching through sensitive habitat could increase the spread of invasive species; and
- The use of various types of ammunition and weapons systems during military training could increase the risk of wildland fire.

The use of various types of ammunition and weapons systems during military training could increase the risk of wildland fire. Sensitive species potentially occurring within the MMR ROI that could be affected under this impact are listed in Tables 3.9-3 and 3.9-4; confirmed sensitive species within the ROI are identified in Figures 3.9-5 and 3.9-7.

The activities above would have a significant impact on vegetation and wildlife species and habitats for several reasons.

The introduction of new or the spread of existing aggressive, nonnative plant species would alter native plant habitat and create competition with native and sensitive plants for space, nutrients, and light (Wagner et al. 1999). Invasive plants have an advantage in becoming established in an environment that is stressed and can often out-compete native species that are not adapted to the novel environment created through human activity (Wagner et al. 1999). The continued use of MMR would mean nonnative species would continue to be introduced to the ROI. Soldiers would come

to MMR from military installations on O‘ahu and other more distant locations, such as Japan and Thailand. Soldiers are likely to carry seeds from nonnative plants on their clothing or possessions.

The increase in nonnative plants would alter vegetative type and cover amount, particularly if invasive plants are introduced into the ROI, leading to habitat-level modification. This change in vegetation would adversely affect native wildlife that have evolved alongside native plants and habitats by removing food sources, shelter, and breeding areas. Native wildlife would also be threatened by the introduction of nonnative wildlife, which prey on native species, compete for resources, and carry diseases.

Wildlife expected to be affected by the spread of nonnative species include federally listed species, such as the O‘ahu tree snail and O‘ahu ‘elepaio. Other nonlisted species that could be affected by this impact are Amastrid land snails, Achatinellid land snails, the Endodontid land snail, pueo, O‘ahu creeper, wedge-tailed shearwater, and Laysan albatross. These wildlife species are threatened by loss and alteration of their habitat due to an increase in nonnative wildlife species.

In addition, 3,930 acres (1,590 hectares) of federally designated ‘elepaio critical habitat and 2,128 acres (861 hectares) of plant critical habitat within the ROI would be further threatened by encroaching nonnative organisms. BSAs within the ROI that may be affected by the spread of nonnative species are presented in Figure 3.9-12.

The use of various types of ammunition and weapons systems during military training could increase the risk of wildfire. Fire-related disturbance to terrestrial habitats and species could create a situation in which nonnative species adapted to fire ecology and human disturbance would have a distinct advantage over native species and would ultimately displace many of those species. This could result in the irretrievable loss of individuals of a sensitive species. Due to the limited effectiveness of controlling invasive species once a habitat has been severely disturbed, along with the potentially large area directly and indirectly affected, mitigation measures, including revegetation efforts, may not be sufficient to reduce this impact to less than significant.

*Regulatory and administrative mitigation 2*. INRMP activities would continue to be implemented under Alternative 1. These include surveying for weeds along roads and landing zones to evaluate the degree of threat and to prioritize control efforts and regularly implementing manual, mechanical, and chemical treatment programs. The Army is following guidance from the USFWS to manage and protect listed species and

habitat. Certain urgent action items have already been implemented or are in progress (outlined in Section 3.9). The IWFMP would further reduce the impact of nonnative species by using fuel management techniques. Implementing the MIP would also control and minimize introduction and spread of nonnative species. The ACUB program has provided, and would continue to provide, conservation benefits to a number of the listed plant and animal species on MMR, which would help mitigate the impacts of this alternative.

These training-related environmental management actions would mitigate the overall impacts from spread of nonnative species, but not to less than significant.

*Additional mitigation 2a*. Potential mitigation measures considered include requiring Soldiers to clean their boots and equipment directly prior to troop marches to eliminate nonnative species.

*Additional mitigation 2b*. Potential mitigation measures considered include pursuing acquisition and transfer of title to a public or private conservation organization, of the Pu‘ulu to Ala‘ihe‘ihe Gulch and Haili to Kawaiu areas to better ensure access for long-term Army stabilization actions.

### Significant Impacts Mitigable to Less Than Significant

*Impact 3: Disturbance to sensitive terrestrial species and habitat from ground training*. Routine military ground training, as proposed under Alternative 1, would have significant impacts on sensitive terrestrial species. Ground training would disturb sensitive terrestrial species and habitats identified in Tables 3.9-4 and 3.9-5 as occurring or potentially occurring within the ROI. Ground training would adversely affect biological resources by the following actions:

- Introduction of noise into the terrestrial environment;
- Direct trampling and disturbance to sensitive habitat in the Ka‘ena Point and Kuaokalā Trail areas from military personnel;
- Troop marches; and
- Increased erosion.

Wildlife species use portions of the ROI for foraging, shelter (resting), and nesting and would be disturbed by increased erosion, contamination, trampling, noise, and other effects of the proposed training.

Noise impacts from this alternative could deter some species or individuals from using the ROI. Noise produced by humans is known to have an adverse effect on various wildlife resources, although habituation can occur with certain species. Many studies have documented the effects of noise on numerous terrestrial species (Bleich et al. 1990; MacArthur et al. 1982; Foster and Rahs 1983; Cassirer et al. 1992). While the authors of a study done at Schofield Barracks concluded that "artillery noise was judged to have a negligible effect on the behavior of 'elepaio" (VanderWerf et al. 2000), they note that previous research found conflicting results. Delaney and Pater et al. in 1999 (as cited in VanderWerf et al. 2000) determined that louder and closer noises resulted in more intense responses from terrestrial wildlife. Although research on this issue is not conclusive at this point, it is possible that louder artillery noises or the closer proximity of 'elepaio to artillery could result in more intensive disruption (VanderWerf et al. 2000). Training under Alternative 1 would generate training-related noise in the ROI and is expected to disturb 'elepaio that occur in close proximity to training exercises. For example, 'elepaio situated by the side of a trail may be flushed from their roosts by the sound of approaching soldiers marching and by their cadence. This disturbance to 'elepaio is expected to be low due to the low level of noise produced and its short duration. Artillery noise within the range expected for this alternative is not expected to affect nesting behavior, affect the health of individuals, or cause population level effects based on a 2000 study of similar actions and noise levels (VanderWerf et al. 2000). Artillery could deter potential nesting in the ROI and cause non-nesting individuals to flush their roosts, but this potential has not yet been studied for this species.

The northern ridgeline of MMR, Ka'ena Point, and portions of Kuaokalā Access Road and Trail are included in the critical habitat for plants on O'ahu (Figure 3.9-9) (USFWS 2003b). Portions of these areas are also part of NARS on O'ahu. NARS are first and foremost areas of refuge and not recreation, so their use is restricted by the State of Hawai'i. Kuaokalā Access Road is a steep paved road that leads to an old Nike missile site now used as an endangered plant nursery and hardening facility. Other plant critical habitat areas exist outside the MMR boundary to the south, but because no maneuvers are designated to take place there, they were not analyzed for this EIS.

The surrounding area supports a variety of common native plants and habitats, as well as nonnative vegetation communities. Public use of these areas is conditional, and permits are awarded by the state DLNR on a case-by-case basis (Lowe 2003). Trails and access roads are already established in these locations, and Army troop marches would increase the human impacts by increasing the level of activity on trails and the

disturbance of surrounding vegetation. The State of Hawai‘i does not have estimates of the public use of Ka‘ena Point or Kuaokalā Access Road and Trail (Lowe 2003).

The Army estimates that a maximum 150-Soldier company would march once a month on Kuaokalā Trail and twice a month on Ka‘ena Point Trail. This is an additional maximum of 1,800 people per year using Kuaokalā Trail and 3,600 people per year hiking around Ka‘ena Point. While the Army conducts occasional troop marches around Ka‘ena Point, increasing use of Ka‘ena Point Trail to this extent is expected to result in a significant impact. The Army would conduct troop marches any time of day or night. The state DLNR restricts public access to Ka‘ena Point to reduce the amount of human impact on the surrounding natural areas.

The Laysan albatross, a bird of conservation concern, and the wedge-tailed shearwater, both MBTA-protected species, would be adversely affected by increased use of Ka‘ena Point Trail for military marches. The Laysan albatross breeding site at Ka‘ena Point is close to the trail, and more than 1,000 burrows used by the shearwaters for nesting are in the same vicinity (Liesemeyer 2003). The breeding season is a sensitive portion of these species’ life cycles, and disturbance due to noise or visual presence could alter the behavior of individuals, even causing them to abandon their nests. Troop marches on Ka‘ena Point Trail could also crush shearwaters, which are known to nest in burrows directly under the trail. These activities would lessen reproductive success and would likely result in a take of an MBTA species, conflicting with the provisions of EO 13186. However, the rule on the Take of Migratory Birds by the Armed Forces authorizes the Armed Forces to incidentally take migratory birds during military readiness activities (USFWS 2007a). If the Armed Forces action proponent determines that a proposed or ongoing action may result in a significant adverse effect on a population of migratory bird species, then it must confer and cooperate with the USFWS to develop conservation measures to minimize or mitigate the significant effect. For this proposed action, the Army has determined that direct take of any migratory bird species would not be to the degree of a significant impact on a population level.

Also, along the trail within the Ka‘ena Point NAR are several populations of the federally listed endangered plant species ‘akoko (*Chamaesyce celastroides kaenana*) and ‘ohai (*Sesbania tomentosa*) that could easily be affected by any off-trail movement. If Soldiers were to stray off the trail in certain sensitive areas, they would be likely to trample and possibly kill individuals of these species.

Training would have long-term impacts on sensitive terrestrial wildlife, such as the ‘elepaio, and sensitive habitat, such as ‘elepaio federally designated critical habitat. Troop marches proposed on trails through Mākua Valley would increase human presence and noise in this area, deterring reclusive species such as the ‘elepaio.

Troop marches also would cause increased erosion along Kuaokalā Trail and Ka‘ena Point Trail. This could have an adverse effect on ‘elepaio critical habitat and plant critical habitat in the NAR.

The estimated level of use along Kuaokalā Trail (particularly in portions where the trail narrows) would lead to a decrease in vegetation and ultimately to a reduction in suitable habitat for sensitive species, such as the ‘elepaio (VanderWerf 2003).

Sensitive native snails, such as the federally listed O‘ahu tree snail and Amastrid land snail (*Leptachatina* spp., *Amastra rubens*) and the Achatinellid land snails, which are federal species of concern, inhabit portions of the Wai‘anae Mountains where marches are proposed. Snails would be threatened directly by trampling during marches and indirectly by habitat degradation and decline of their food source if Soldiers were to stray off the trails.

Visual disturbance from night training is not expected to affect night-flying birds, such as the wedge-tailed shearwater. Shearwater species are known to fly at night, and fledglings are easily disoriented by light sources when they fly from their nests out to sea (Kubota 1998; TenBruggencate 2003). The known shearwater nesting area in the ROI is outside the training area and along the coast, so night training would be less likely to affect their night flying activities unless illumination is used for activities within the NAR.

*Regulatory and administrative mitigation 3*. The Army committed in an agreement with USFWS to manage specific species and habitat at MMR for stabilization. Certain urgent actions have already been implemented or are in progress, as discussed in Section 3.9.

The INRMP and the IWFMP would continue to be applied as long as training occurs at MMR. Programs in the INRMP that would help to mitigate this impact include managing, protecting, and monitoring existing sensitive species communities (both flora and fauna), as well as surveying potential habitat for new occurrences of sensitive species. USARHAW would continue its strict adherence to the Division of Forestry and Wildlife/DLNR/NARS regulations outlined in the special use permit (Appendix H-4 of the EIS). Permit conditions may change depending on

management issues, time of proposed training, and frequency of use. These measures would help avoid effects and compensate for impacts on listed species that would result directly and indirectly from implementing Alternative 1.

MIP actions included as stewardship measures include controlling large feral mammals, selected weeds, predators, insect pests, and diseases and managing habitat quality levels. Some of these measures are already underway. The main threat determining level of management is the risk to species from training-related fire; the MIP was prepared to address the fire threat from tracers, which would not be used under this alternative. The Laysan albatross, wedge-tailed shearwater, and ‘ohai are not included in the current MIP; separate conservation measures for these species are being coordinated with USFWS.

The Army would reinitiate ESA Section 7 consultation with the USFWS for training activities on the Ka‘ena Point Trail. The Army would implement this alternative only after receiving a no jeopardy biological opinion from the USFWS.

*Additional mitigation 3a*. Potential mitigation measures for this impact include the Army limiting marches at Ka‘ena Point during the Laysan Albatross breeding season (November to July) to at most one march per month and conducting monitoring at the beginning of the wedge-tailed shearwater breeding season (April to June) to determine whether burrows are present along the trail. If burrows are found in close proximity to the trails, then measures would be taken to avoid impacts on these nests. Measures considered include keeping a minimum distance from the nest as approved by USFWS, DLNR, and DPW biologists and monitoring to ensure that noise vibrations and erosion do not hamper reproductive success within these nests. Additional measures may be taken pending results of monitoring and consultation with USFWS.

*Additional mitigation 3b*. Potential mitigation measures for this impact include the following Army measures:

- BMPs, such as no lights or cadence, would be observed within the marked areas of the trails; and
- Soldiers would be briefed on the state permit regulations before the march.

### Less than Significant Impacts

*Impacts on marine wildlife and coral ecosystems from runoff.* Less than significant impacts from potential runoff are expected for marine

biological resources at MMR, which is on the leeward side of the island, where precipitation is low and storm runoff is minimal. The Army's 7th Dive Detachment found no evidence of any contamination on the ocean bottom just off Mākua Beach (Figure 3.11-2). Divers looked for metal globules reportedly covering the ocean floor in the area but found nothing resembling that description (see related scoping comment in Appendix B-2, Public Meeting Summaries). Thus, there is no evidence of any unexploded ordnance on the ocean bottom just off Mākua Beach (see Chapter 3, Section 3.11, and Figure 3.11-2).

Training could erode soil because the activities reduce vegetation and disturb the soil, which might increase sediment loading to the sea from streams during periods of high runoff. However, these periods of high runoff are usually short in duration and infrequent. The expected increase in erosion from current training activities, described in Section 4.8, would be within the natural range due to rainfall and runoff variation and is not expected to be significant. Conducting live-fire activities would increase the likelihood of toxins or sediment entering the marine habitat. There is potential for runoff following a large-scale fire if followed by a rainstorm. This scenario would result in a large increase in soil erosion and sediment being transported to the ocean.

A 2009 Marine Resources Study found substances in marine resources at Mākua that are known to be associated with the proposed training at MMR. Although none of the substances detected were unique to military training, the Army conducted a screening-level ecological risk assessment and human health risk assessment (to determine the potential health risks to those who rely on the *muliwai* and Makua nearshore area for subsistence). The study found that there is a potential chemical migration pathway between MMR and the *muliwai* and nearshore area; and therefore, live-fire activities at MMR have the potential to contribute substances to the marine resources there. Greater discussion on the results of the Marine Resources Study can be found in Sections 3.7.2 and 3.9.5. The 2009 Marine Resources Study is also available as Appendix G-8 to this EIS.

Subsequent to reviewing the Army's *January 2009 Marine Resources Study, the* Hawai'i Department of Health issued a comment stating, "Overall, the DOH believes that the data support the conclusion that proposed military activities are anticipated to have little influence on contaminant levels in marine resources in the Mākua nearshore and muliwai areas. A number of health protective assumptions were used to conduct the assessment including assuming: a) that fishers only eat whole fish, b) using a 95th percentile fish consumption rate of 100.3 g/day and c)

assuming that subsistence fisherman could rely only on the muliwai for fish, which is very conservative given their limited size."

Sediment loading could harm coral ecosystems by blanketing them in sediment and causing turbidity in the water column. Sedimentation and turbidity would obstruct respiration, lower photosynthesis of symbiotic organisms, and impede the filter feeding of coral polyps. Coral is adapted to changes in water clarity and sediment deposition that occurs during storms and would likely survive but would suffer a period of decreased productivity.

*Regulatory and administrative mitigation*. USARHAW would continue to implement land management practices and procedures in the ITAM work plan to reduce erosion impacts on soils from live-fire training to less than significant.

*Additional mitigation*. No additional mitigation measures have been proposed.

*Disturbance to marine wildlife from aircraft*. Impacts are expected to be less than significant and similar to those described under the No Action Alternative. Mitigation measures are the same as those described for the No Action Alternative, except for the inclusion of an additional mitigation measure.

*Regulatory and administrative mitigation*. Additional NOAA Fisheries requirement include having the Army conduct an underwater noise study using hydrophones (underwater microphones) during the next CALFEX. This would provide direct quantitative noise levels generated by the exercise and provide additional data to more accurately assess impacts. The Army has committed to reviewing these noise levels and to reinitiating consultation with NOAA Fisheries should the noise levels exceed the local NOAA Fisheries standards or levels that would exceed MMPA or ESA harassment standards;

*Disturbance to marine wildlife from ground training.* Noise from land-based weapons firing and explosions or concussive (impulse/shock) waves that originate on land from ordnance detonation could have short-term adverse significant impacts on either sea turtles or seals if they are on the beach, or on marine mammals such as spinner dolphins and possibly humpback whales if impulse waves penetrate the marine habitat. The possibility of this type of sound transmission into marine habitat is not known. If they reach a sufficient level, noise or concussive waves could cause a take of marine wildlife directly through harassment or by affecting habitat.

While no scientific data measuring noise or concussive levels in the marine environment exist for ground training at MMR, results from noise modeling conducted by the Army found that noise levels from military training sources do not approach the criteria for Level A or Level B harassment of marine mammals at locations where they are likely to be present, even for the largest noise sources (Marine Acoustics 2005, 2006). Neither type of harassment is expected under project actions at MMR, according to the modeling study. Many of the modeled received levels were less than the background (ambient) natural noise level estimates for the MMR area (actual ambient noise levels will be recorded during the hydrophonic study when it occurs). Therefore, it is considered highly unlikely that marine mammals potentially present offshore of MMR would be affected by noise sources from military training activities (Marine Acoustics 2005). The modeling study supports finding that there would be less than significant impacts on marine wildlife from ground training.

It is known that parameters relating to transmission of sound in coastal areas vary considerably from location to location, and thus it is generally not considered sufficient to extrapolate data collected from one location and apply it to another (National Research Council of the National Academies 2003). Therefore, a direct measurement of sound and noise in the MMR area is expected to be undertaken at the next CALFEX.

Available scientific research shows that marine mammals are susceptible to disturbance and may react to explosions, either from the sudden increases in noise, or from the shock or concussive impulse waves that explosions transmit under certain conditions (Richardson et al. 1995). Most often the latter occurs from in-water detonations or from seismic activity or construction work on land. Studies on captive animals have shown that animals react to impulsive underwater sounds (Finneran et al. 2000). Exposure to intense sound may produce an elevated hearing threshold (a threshold shift [TS]) following cessation of the intense sound. If the threshold returns to the pre-exposure level after a period of time, the TS is known as a temporary threshold shift (TTS).

Few studies have been done on TTS in marine mammals. Results of these studies are not necessarily comparable to the type of noise sources that would be present at MMR, but they do provide a reference, as they are the only available literature on the subject. These studies have shown that animals can experience a TTS in hearing as a result of being exposed to loud or impulsive sounds (Au et al. 2000; Schlundt et al. 2000; Finneran et al. 2002; Nachtigall et al. 2001); or, they can show alterations in behavior as a result of exposure (Finneran et al. 2000).

Au et al. (2000) and Nachtigall et al. (2001) have measured TTS in bottlenose dolphins exposed to noise; Schlundt et al. (2000) measured temporary shifts in bottlenose dolphins and belugas exposed to certain tones. A study done on the California sea lion (Finneran et al. 2003) showed behavioral reactions to underwater impulses, primarily consisting of attempts to avoid the site where exposure to impulse had previously occurred. Hearing abilities of wild animals are not always known. Audiograms have been done for some species. Among these are the striped dolphin (Kastelein et al. 2003) and the bottlenose dolphin (Johnson 1967; Nachtigall et al. in press), but none have been done for the spinner dolphin. Striped dolphins can hear between 500 Hz and 160 kHz, although the range of most sensitive hearing is between 30 and 120 kHz (Kastelein et al. 2003). Dolphins are not likely to hear low frequencies produced by explosions some distance away (Nachtigall et al. 2000).

In-water detonations in proximity to marine wildlife can cause impacts ranging from severe (mortality or injury) to less acute (TTS) (Richardson et al. 1995). No in-water detonations would occur as part of this alternative. Explosions occurring adjacent to beach habitat where seals and sea turtles are located can have impacts ranging from severe (mortality or injury) to acute (TTS, flushing the animals, flight alarm reactions) (Richardson et al. 1995).

Impacts from blasts as a result of concussive energy may or may not transmit from the detonation locations at MMR to the beach. Noise energy from blasts would not transfer into the water habitat due to the impedance of the air-water interface and the fact that the explosions take place on land. The transmission of concussive energy depends on a variety of factors, some of which are variable. Concussive energy transmission depends on ambient conditions caused by wind and sea conditions. It also depends on geologic factors, the intensity, proximity, and number of explosions, and the rate of recurrence of the explosions. Impacts from concussive energy depend on the level of transmission, which varies, as shown above, and by the behavior of the animals; for example, animals reproducing or resting would be more likely to be disturbed than animals feeding or traveling. Thus, without empirical data, it is difficult to assess sound levels or in-air shock wave levels at MMR accurately. However, it is possible to state that if animals were present during noise or concussive events, and if they were able to hear or feel the sounds, and if the sounds were close enough to the animals, impacts could occur.

Blast noise in natural conditions is known to elicit a startle response from animals (Richardson et al. 1995), and a startle or alarm reaction would disturb dolphins at rest. Pressure pulses from explosions have higher peak noise levels than those from any other human-made source (Richardson et

al. 1995). Noise does not easily penetrate below the air-water interface, so most likely, noise transmission from land to water is not an issue. This is supported by the results of the recent noise modeling study (Marine Acoustics 2005). Additionally, no underwater shock wave, such as underwater explosion energy traveling at supersonic speeds, would be generated by the proposed training. That is, explosive detonations in this project action occur either on or over land, so in-water shock waves are not a concern.

*In-Water Explosive Levels*

The maximum predicted in-water received level for any explosive used at MMR was assessed at 142.6 dB re 1 μPa (Marine Acoustics 2005), which is equivalent to 0.002 psi. These values and the equivalent/appropriate energy levels are significantly below any of the in-water explosive Level A or B criteria for marine mammals (see Appendix G-5 for more info on Level A or B harassment). Therefore, there would be no impact on ESA-listed humpback whales and Hawaiian monk seals or MMPA-protected spinner dolphins from the use of explosives. Additionally, because sea turtle hearing is less sensitive than that of marine mammals, there would be no impact on any ESA-listed sea turtle species, which are also identified species of concern.

*In-Air Explosive Levels*

As stated in Appendix G-5, the maximum received level at Site 4 (Mākua Beach), which is the only likely haul-out spot for Hawaiian monk seals, is 90.2 dB re 20 μPa. This value is approximately 10 dB below the thresholds identified and detailed at length in Appendix G-5 for the criteria established to represent Level A and Level B harassment. Therefore, there would be no impact on ESA-listed monk seals, if any were on the beach. In addition, as with the in-water analysis above, any sea turtles that could be on the beach would have hearing which is less-sensitive than the Hawaiian monk seal, so there would be no impact on any sea turtles species.

While no empirical data exist on current stress levels and on noise levels at the dolphin resting site, the modeling study calculated received noise levels for all of the explosive sources at levels significantly below the MMPA Level B criteria for harassment. Additionally, many of the less powerful sources are below ambient noise levels and probably cannot be heard by the animals in situ (Marine Acoustics 2005). The Army plans to conduct a direct hydrophonic noise study at a future CALFEX (if permissible) to collect empirical data for analysis of noise levels above and below the water surface (see the Chapter 3 introduction for a description of this study). Monitoring data are to be collected at two locations offshore of Mākua Beach in marine mammal habitat areas, and

at one beach location that also serves as marine mammal and sea turtle habitat. The impact analysis will be revised, if warranted, based on the results of this study. If the study cannot be conducted prior to completion of this EIS, the EIS would be supplemented, if appropriate or necessary, after the hydrophonic data is collected and the results are analyzed.

The likelihood of impacts from sound or pressure waves on either sea turtles or seals is considered negligible under this alternative. The chance of these species being collocated with training activities is minimal. Additionally, sea turtles are less-sensitive to acoustic signals than marine mammals, and if marine mammals are expected to have no significant impact, then turtles are even less at risk.

An individual humpback whale or pod could not be considered to have a take, even if they were in the nearshore environment when an explosion occurred, based on the definitions of Level B harassment detailed for the USS *Seawolf* and USS *Churchill* FEISs (DoN 1998, 2001). Humpback whales are in the nearshore environment only seasonally and prefer depths of 100 fathoms (Mobley 2001b). Spinner dolphins are expected to be consistently present in the ROI, but for the reasons described above, impacts from noise on dolphins are not considered likely. However, note that if one dolphin reacts, because of the social nature of the animals, the entire group could be affected by this alarm reaction (Norris 1991, 2003).

The potential addition of noise and blast impacts from 19 CALFEX exercises, if transmitted into the marine habitat, could cause stress in marine mammals. However, impacts are expected to be less than significant, and the modeled and predicted low received noise levels support this conclusion. Training activities are not expected to cause significant behavioral changes, and the conclusions of the modeling study support the finding that noise levels would be below the USS *Seawolf* and USS *Churchill* FEISs thresholds cited as causing harassment of marine wildlife (DoN 1998, 2001).

*Regulatory and administrative mitigation*. The Army would continue to observe and/or implement the following measures:

- Use a second command and control aircraft to monitor the training aircraft. This aircraft flies at altitudes of 300 to 400 feet (91 to 121 meters) to monitor the training aircraft. In addition to having personnel observe the ocean surface from this command and control aircraft for signs of marine wildlife, they would observe the beach as well. During nighttime training, night vision equipment is used to observe marine mammals.

- As required per consultation with NOAA Fisheries, complete a hydrophonic noise study in Mākua Bay during the first full CALFEX exercise to validate the noise model.

*Additional mitigation*. Potential mitigation measures for this impact include the following Army actions:

- Emphasize to all personnel that the mobile nature of marine wildlife mandates constant observation because marine wildlife can and do appear suddenly and may occur on Mākua Beach;
- Stop training if sea turtles or Hawaiian monk seals are present on Mākua Beach. The Army would inspect Mākua Beach just before a training exercise, either from the ground or by air or both, and would not begin a CALFEX or other training activity if monk seals or sea turtles were present. In addition, the Army would periodically check the beach for seals and sea turtles during training. If any were spotted, training would stop until the seals or sea turtles were no longer present; and
- Continue informal consultation with NOAA Fisheries.

*Disturbance to sensitive terrestrial species and habitat from aircraft.* Impacts are expected to be less than significant and similar to those described under the No Action Alternative.

### Alternative 2 (Full Capacity Use with Some Weapons Restrictions)

#### Significant Impacts

*Impact 1: Impacts from fire on sensitive terrestrial species and sensitive habitat.* Military training, particularly live-fire training and use of tracer ammunition, could start wildfires, which is considered a significant impact under this alternative. Both live-fire and nonlive-fire training increase the threat of wildfires within the ROI. Although live-fire training is considered the greatest fire risk under Alternative 2, fires could also result from training or associated management activities. Because there is a risk that a wildfire could result in an irretrievable loss of individuals of a sensitive species, the Army has made a conservative determination that, although the mitigation will considerably reduce the impacts on sensitive terrestrial species and habitat, the impacts may not be reduced to a less than significant level.

*Regulatory and administrative mitigation 1*. The INRMP, the MIP, and the IWFMP would be implemented for Alternative 2. These program actions would involve monitoring sensitive species and conducting conservation and restoration projects as long as training occurs at MMR. The Army has

undergone Section 7 consultation for training at MMR (USARHAW and 25th ID[L] 1998; USFWS 1999d, 2001a, 2007b, 2008), and USFWS-approved conservation actions would be implemented. The Army is working to increase the baseline number of individuals according to the criteria stipulated in the MIP for 29 species. Actions to be taken include stabilizing populations of listed plant species and snails, controlling feral ungulates, rats, selected weeds, predators, insect pests, and diseases, and managing and restoring habitat. The Army would also follow measures outlined in the MIP and 2007 BO 1998 BA to monitor for introduced species and to eradicate any newly introduced ones. The conservation and mitigation benefits of the ACUB program would also apply to this alternative.

*Additional mitigation 1a*. Revegetation efforts would occur in any sensitive habitat areas affected by fires, especially along edges of sensitive habitat to ensure no net loss of sensitive habitat acreage or species.

*Additional mitigation 1b*. Potential mitigation measures include replacing the 5,577 feet (1,700 meters) of fencing that have been burned. Replacing this fencing, which had been constructed to keep out feral pigs and goats, would reduce impacts on native plants.

*Impact 2: Impact on sensitive terrestrial species and habitat resulting from the spread of nonnative species.* Implementing Alternative 2 would increase the presence of nonnative species in both the short term and long term in the ROI. In general, nonnative plant and animal species threaten Hawaiian native ecosystems. These impacts are the same as those fully described under Alternative 1 but are more likely to occur because of an increase in the number of training days and corresponding increase in human presence. Alternative 2 would also have a greater potential for large-scale fires than Alternative 1 due to the use of tracers and an increase in the number of CALFEXs.

*Regulatory and administrative mitigation 2*. Regulatory and administrative mitigations are the same as those described for Alternative 1.

*Additional mitigation 2*. Additional mitigations are the same as those described for Alternative 1.

### Significant Impacts Mitigable to Less Than Significant

*Impact 3: Disturbance to sensitive terrestrial species and habitat from ground training.* Routine military ground training as proposed under Alternative 2 would have significant impacts mitigable to less than significant. The use of Ka‘ena Point NAR as a location for troop marches would have a significant but mitigable impact on the Laysan albatross,

wedge-tailed shearwater, ‘akoko, and ‘ohai. Additionally, portions of Kuaokalā Trail overlap with designated plant and ‘elepaio critical habitat and Amastrid land snail habitat. This disturbance is discussed fully under Alternative 1.

Impacts on sensitive terrestrial species and habitat from ground training would be similar to those under Alternative 1, but under Alternative 2, training would be conducted with the use of tracer ammunition. The Army has completed consultation with the USFWS and received a BO concluding that use of these weapons systems would not jeopardize listed species or adversely modify critical habitat (see Section 3.9.2). Operating the range at full capacity use with up to 50 company-level CALFEXs per year would adversely affect biological resources within the ROI.

During these training events, Stryker vehicles would be used to fire 120mm mortars and MK 19 and .50-caliber machine guns from the road into the CCAAC and the ordnance impact area. Cratering and shape charges would also be used during demolitions training, as described under Alternative 1.

Nighttime ground training is unlikely to interrupt or adversely affect the activities of wildlife.

The increased noise and nighttime illumination that would occur as a result of implementing Alternative 2 are not expected to affect the O‘ahu ‘elepaio substantially. This determination is based on the ‘elepaio’s demonstrated tolerance of ammunition and training-induced noises (VanderWerf 2000), as well as a discussion with ‘elepaio expert Eric VanderWerf (VanderWerf 2003). Shearwaters nesting along the coast are unlikely to be affected by illumination and noise coming from the training areas within Mākua Valley, so night training would be unlikely to affect their night-flying activities unless the training is carried out within the Ka‘ena Point NAR.

*Regulatory and administrative mitigation 3*. The IWFMP, INRMP, and MIP would be implemented for Alternative 2. These plans ensure monitoring of sensitive species and conducting conservation and restoration projects as long as training occurs at MMR. USFWS-approved actions include controlling feral ungulates, selected weeds, predators, insect pests, and diseases and managing habitat levels. The 1998 BA also outlines the Army’s plan to monitor for introduced species and to eradicate any newly introduced ones. The Laysan albatross, wedge-tailed shearwater, and ‘ohai are not included in the current stabilization activities, and separate mitigations to account for impacts on these species

would be coordinated with the USFWS. Impacts are fully detailed under Alternative 1.

The Army would reinitiate Section 7 consultation with the USFWS for training activities on the Ka'ena Point Trail. The Army would implement this alternative only after receiving a no jeopardy biological opinion from the USFWS.

*Additional mitigation 3*. The additional mitigation measures for this impact would be the same as those discussed under Alternative 1.

### Less than Significant Impacts

*Impacts on marine wildlife and coral ecosystems from runoff.* Impacts would be the same as those described for Alternative 1, but would occur at a higher level due to a greater level of training. These impacts would remain less than significant.

*Regulatory and administrative mitigation*. USARHAW would continue to implement land management practices and procedures in the ITAM work plan to reduce erosion impacts on soils from live-fire training to less than significant.

*Additional mitigation*. No additional mitigation measures have been identified for this impact.

*Disturbance to marine wildlife from aircraft.* Impacts are expected to be less than significant and similar to those described under Alternative 1. Mitigation measures are the same as those described for Alternative 1..

*Disturbance to marine wildlife from ground training.* This impact would be similar to that discussed under Alternative 1, with the potential of a greater magnitude of impacts due to increased training events. An increase in the number of CALFEX events would potentially increase the frequency of disturbance, and operating the range at full use (with up to 50 company-level CALFEXs per year) would increase the severity of adverse impacts on marine wildlife resources if they occur. When it is complete, data from the hydrophonic noise study will be evaluated and included in this EIS. Impact levels will be revised if warranted by the results of this study. If the study cannot be conducted prior to completion of this EIS, the EIS would be supplemented, if appropriate or necessary, after the hydrophonic data is collected and the results are analyzed. The findings of the noise modeling study support the fact that in-water noise levels are expected to be below those known to cause impacts on marine wildlife (Marine Acoustics 2005). Through informal consultation between the

Army and NOAA Fisheries, new mitigation measures, in addition to those previously proposed, may be included.

*Disturbance to sensitive terrestrial species and habitat from aircraft.* Under Alternative 2, impacts would be the same as those described under the No Action Alternative.

### Alternative 3 (Full Capacity Use with Fewer Weapons Restrictions)

#### Significant Impacts

*Impact 1: Impacts from fire on sensitive terrestrial species and habitat.* Impacts under this alternative would be higher in intensity and magnitude than the impacts described under Alternatives 1 or 2. The same fire impacts discussed under Alternative 2 would occur as a result of this alternative. However, the intensity of the impacts would be greater due to use of inert TOW missiles, 2.75-inch rockets, and illumination munitions. Use of these devices would create a greater risk of a wildfire compared to Alternatives 1 and 2. The 2.75-inch rockets would be deployed from airborne aircraft and could land outside the ordnance impact area in the event of problems, such as pilot error or air turbulence. The increase in fire potential and probability of outbreak of fire in high-value habitat would increase the likelihood for loss of sensitive terrestrial species, including federally listed species confirmed within the ROI (Section 3.9, Figures 3.9-5 and 3.9-7), critical habitat (Section 3.9, Figures 3.9-9 and 3.9-11), and BSAs and sensitive snail habitat (Section 3.9, Figure 3.9-12).

There would be an increase in impacts from fire on sensitive terrestrial species and habitat as a result of increased training with fewer restrictions, and the potential for the irretrievable loss of these species and habitats. Impacts under this alternative are expected to be significant and could not be mitigated to less than significant.

*Regulatory and administrative mitigation 1.*
Although this impact under Alternative 3 is not considered mitigable, mitigation measures described under Alternative 2 would be incorporated to reduce the severity of impacts. Incorporated into this proposed training action are measures to control, minimize, and mitigate impacts from mission-related wildfires. The Army is working on increasing the baseline number of individuals according to the criteria stipulated in the MIP for 29 species to minimize the severity of any catastrophic fire.

The protection and conservation of listed plants and critical habitat within ACUB lands would help minimize and mitigate the impacts of any fire outbreaks in areas where similar species and critical habitat occur. Further

implementation of the ACUB program could mitigate for the loss of listed species on MMR and support the recovery of these species.

The Army would reinitiate Section 7 consultation with the USFWS on the following:

- Addition of illumination munitions; and
- Additional training acreage.

The Army would implement this alternative only after receiving a no jeopardy biological opinion from the USFWS.

*Additional mitigation 1a*. Potential mitigation measures would involve Army revegetation efforts in any sensitive habitat areas affected by fires, especially along edges of sensitive habitat, to ensure no net loss of acreage or species.

*Additional mitigation 1b*. Potential mitigation measures include replacing the 5,577 feet (1,700 meters) of fencing that have been burned. Replacing this fencing, which had been constructed to keep out feral pigs and goats, would reduce impacts on native plants.

*Impact 2: Impacts on sensitive terrestrial species and habitat resulting from the spread of nonnative species*. Impacts from the spread of nonnative species would be similar to those described under Alternatives 1 and 2. Alternative 3 would further increase the intensity and magnitude of the impacts described under Alternative 1 or 2 because it increases the potential for large-scale fires due to the use of inert TOW missiles, 2.75-inch rockets, and illumination munitions.

*Regulatory and administrative mitigation 2*. Mitigation measures described under the previous alternatives would be incorporated to reduce the severity of the impacts. The INRMP, IWFMP, and MIP would also be implemented for Alternative 3. The Army would monitor for introduced species and eradicate any newly introduced ones as outlined in the 1998 BA. These minimization and mitigation efforts would greatly reduce the impact but not to less than significant. Federally listed species likely would be injured or destroyed as a result of Alternative 3. ACUB parcels could provide sites for augmenting/reintroducing listed plants or animals if efforts to control nonnative species are not successful.

*Additional mitigation 2*. Additional mitigations are the same as those described for Alternative 1.

### Significant Impacts Mitigable to Less than Significant

*Impact 3: Disturbance to sensitive terrestrial species and habitat from ground training.* Impacts from ground training would be similar to those described under Alternative 1 and are considered significant mitigable to less than significant. Alternative 3 would increase the intensity and magnitude of the impacts already described due to fewer weapons restrictions. Stryker vehicles would be used to fire MK 19 grenade launchers and .50-caliber machine guns into the CCAAC and the ordnance impact area but would be limited to designated firing points. The Stryker vehicle also would be used as a firing platform for the 120mm mortar.

In the 2007 BO, the USFWS stated that it does not expect permanent hearing loss in O‘ahu ‘elepaio to result from the proposed action. Should monitoring identify impacts from noise associated with training, the Army would reinitiate consultation with the USFWS. Nighttime ground training is unlikely to interrupt and adversely affect the activities of wildlife.

Additional land area on C-Ridge (the ridge between the north and south lobes of the training area) (see Figure 2-2) is proposed for use under this alternative. This area is not currently used for training. Its use as a training area would expose vegetation to damage from trampling and invasive species competition. It would also create an additional pathway for invasive species to take hold and modify habitat.

Troop marches around Ka‘ena Point NAR and on Kuaokalā Trail would have significant but mitigable to less than significant impacts on the Laysan albatross, ‘elepaio, ‘elepaio designated critical habitat, wedge-tailed shearwater, ‘ohai and ‘akoko, and Amastrid land snail habitat, as detailed under Alternative 1.

*Regulatory and administrative mitigation 3*. Mitigation measures under Alternative 2 would be incorporated to reduce the severity of the impacts under this alternative. The IWFMP and the INRMP would be applied for Alternative 3.

Federally listed species and their habitat could still be destroyed as a result of training-induced fires, depending on the location and severity of the fire.

*Additional mitigation 3*. The additional mitigation measures for this impact would be the same as those discussed under Alternative 1.

#### Less than Significant Impacts

*Impacts on marine wildlife and coral ecosystems from runoff.* Impacts would be the same as those described for Alternative 1 but would occur at a higher level due to a greater level of training. Changes in sedimentation or toxins from any increase in erosion from training would be within the natural range that exists due to rainfall and runoff variation. This impact is not expected to be significant.

*Regulatory and administrative mitigation*. USARHAW would continue to implement land management practices and procedures in the ITAM work plan to reduce erosion impacts on soils from live-fire training to less than significant.

*Additional mitigation*. No additional mitigation measures have been proposed.

*Disturbance to marine wildlife from aircraft.* Impacts are expected to be less than significant and similar to those described under Alternative 1. Mitigation measures are the same as those described for Alternative 1..

*Disturbance to marine wildlife from ground training*. Impacts from ground training would be similar to those described under Alternative 1, with the potential of a greater magnitude of impacts due to increased training events. If available, data from the hydrophonic noise study will be evaluated and included in this EIS. Impact levels will be revised if warranted by the results of this study. If the study cannot be conducted prior to completion of this EIS, the EIS would be supplemented, if appropriate or necessary, after the hydrophonic data is collected and the results are analyzed. The findings of the noise modeling study support the fact that in-water noise levels are expected to be below those known to cause impacts on marine wildlife (Marine Acoustics 2005). Through informal consultation between the Army and NOAA Fisheries, new mitigation measures, in addition to those previously proposed, may be included.

*Disturbance to sensitive terrestrial species and habitat from aircraft.* Under Alternative 3, impacts would be the same as those described under the No Action Alternative.

### Alternative 4 (Full Capacity Use with Fewer Weapons Restrictions), Pōhakuloa Training Area

#### Significant Impacts

*Impact 1: Impacts from fire on sensitive terrestrial species and sensitive habitat.* Under Alternative 4, impacts from training-related fire on sensitive species and habitat at PTA would be considered significant. The

addition of a CALFEX range at the PTA Twin Pu‘u location would increase the use of larger caliber munitions in an area where there are currently no established ranges, thus requiring the construction of a new range. The surface area of the Twin Pu‘u range area is quite rough and covered primarily by invasive fountain grass. In establishing a range within the Twin Pu‘u area, UXO would need to be cleared. This process includes conducting prescribed burns to expose the UXO. If a prescribed burn were to go out of prescription it could impact the adjacent Kīpuka Kālawamauna Endangered Plants Habitat to the west of the Twin Pu’u area. Wildland fires could also result from management activities to support military or other activities on the range (i.e., prescribed burning), and a prescribed burn could go out of control and pose a threat to sensitive plants adjacent to the proposed range footprint. Live-fire training at the Twin Pu‘u could start wildfires in high fire spread rate areas that could move into sensitive plant areas within the ROI. The likelihood of a training-related fire is moderate to high during live-fire activities depending on weather and moisture conditions. The main factor in determining the significance of this threat is the ever-present potential that a single wildfire could escape control and destroy sensitive species and/or their habitat.

Wildfire poses a major threat to the Hawaiian ecosystem because native plants and animals are not well adapted to fire. Fires could destroy native plants and slow-moving animals, such as snails, and could destroy habitat of the endangered Hawaiian hoary bat and other animal species. The Kīpuka Kālawamauna Endangered Plants Habitat is to the west of the proposed Twin Pu‘u range footprint. This area contains seven endangered and one threatened plants. Of greatest concern is the *Tetramolopium arenarium* ssp. *arenarium*, which is located in close proximity to the proposed Twin Pu‘u range site and is the last remaining population of the species. This area is fenced to protect the plant from ungulate browsing and trampling.

Wildfires that burn into native communities or sensitive habitats could destroy listed plant and animal species and sensitive habitats. Threatened and endangered species known to occur or that could occur within the ROI are listed in Tables 3.9-4 and 3.9-5.

The Hawaiian hoary bat is known to occur within the ROI. Per the requirements of the USFWS 2003 PTA BO, PTA must implement the terms and conditions of the Incidental Take Statement to minimize the impacts of SBCT on the bat. CALFEX activities at the proposed Twin Pu‘u range would put a portion of bat foraging and potential roosting habitat at greater risk of fire impacts.

The impact of wildfire on listed species and habitat would be reduced by implementing the BO, PIP, INRMP, IWFMP, and ITAM programs, which would diminish the overall significance of fire and invasive species impacts on the natural resources at PTA. However, because there is a risk that a wildfire could result in an irretrievable loss of individuals of a sensitive species, the Army has made a conservative determination that although mitigation would reduce the impacts on sensitive terrestrial species and habitat, the impacts may not be reduced to a less than significant level.

*Regulatory and administrative mitigation 1*. USARHAW protocols have been designed to minimize the potential for training-induced fires and their impacts. Implementing the IWFMP would greatly reduce the probability of fire and increase the Army's fire containment capability. Implementation of PTA's IWFMP SOP would avoid and minimize the potential for fire ignition by limiting training to times of lower fire risk. Army personnel would continue to use BMPs during operations. PTA would ensure that sensitive species and conservation and restoration projects are monitored as long as training occurs at PTA. The Army would reinitiate consultation with the USFWS if the PTA Alternative is selected since the SBCT ESA consultation did not address the actions and increase of fire and invasive species threats within and around the Twin Puʻu area. The Army would also follow measures outlined in the 2003 BO to monitor for introduced species and to eradicate any newly introduced ones.

*Additional mitigation 1a*. Within the PTA ROI, certain prevention measures would greatly reduce the potential spread of wildland fires. However, the existing fire 15-foot (4.5–meter) fire break along the MPRC access road bordering the Twin Puʻu area and Kīpuka Kālawamauna, may not be sufficient to control the spread of wildland fires. The 2003 PTA BO identified research that found that "Fast spreading grass fire fanned by strong winds" can be stopped by a firebreak only if the firebreak is at least 98 feet (30 meters) wide. Research in Australian grasslands found that a 33-foot (10–meter) fire break would be breached only 1 percent of the time under the most severe conditions observed and where trees were absent. The 2007 MMR BO states, "[164 feet] 60 meters of mown grass inside the perimeter of the south lobe of the firebreak road is expected to prevent all fires from slopping over the firebreak road and prevent most short-range spot fires from igniting fires outside the impact area." Therefore, potential mitigation for activities at the proposed Twin Puʻu training range area would include establishing the maximum fire break (30 feet [9 meters]) and fuel break (82 feet [25 meters] through grass fuels and 148 feet [45 meters] through shrub or forest fuels) dimensions, as identified in the IWFMP, along the MPRC access road. These measures would greatly reduce the potential for fires to reach the Kīpuka

Kālawamauna Endangered Plants Habitat area and protect the *Tetramolopium arenarium* ssp. *arenarium* and other listed plants.

*Additional mitigation 1b*. Potential mitigation measures include habitat restoration following a fire. Efforts would be focused on the native forest edges to ensure that the area does not recede after each fire. Revegetation efforts would be implemented in any sensitive habitat destroyed by fire to ensure no net loss of sensitive species or habitat.

*Additional mitigation 1c*. Potential mitigation measures include the eradication of fountain grass, a major fire ignition source, in and around the fire break and fuel break areas and within the Kīpuka Kālawamauna area.

*Impact 2: Impact on sensitive terrestrial species and habitat resulting from the spread of nonnative species.* Implementing Alternative 4 would increase the presence of nonnative species in both the short term and long term in the ROI, which would have a significant impact on sensitive species. In general, nonnative plant and animal species pose a threat to Hawaiian native ecosystems. An expansion in the amount of area available for training increases the potential for nonnative species to be introduced onto the installation.

Activities at PTA would be expected to have the following effects on the introduction and spread of nonnative species:

- Troops and equipment moving into Hawai‘i from other countries, states, or islands and between subinstallations within Hawai‘i, could increase the likelihood of introducing nonnative plants;
- Training in and marching through sensitive habitat could increase the spread of invasive species;
- The use of various types of ammunition and weapons systems during military training could increase the risk of wildland fire, thereby creating more habitat vulnerable to invasive species; and
- Construction of facilities and training support structures within the Twin Pu‘u range footprint could increase the spread of invasive species.

The use of various types of ammunition and weapons systems during military training could increase the risk of wildland fire. Fires open areas to the spread of nonnative and invasive plant species. Invasive plants have an advantage in becoming established in an environment that is stressed and can often outcompete native species that are not adapted to the novel

environment created through human activity. The introduction of new or the spread of existing aggressive, nonnative plant species would alter native plant habitat and create competition with native and sensitive plants for space, nutrients, and light. Invasive plants such as fountain grass also alter the fire regime, thus increasing the potential for ignition and spread of wildland fires. The use of the Twin Pu‘u area would increase the potential for nonnative species to be introduced into the ROI.

The increase in nonnative plants would alter vegetative type and cover, leading to habitat-level modification, as well as alter the fire regime. This change in vegetation would adversely affect native wildlife that have evolved alongside native plants and habitats by removing food sources, shelter, and breeding areas. Native wildlife would also be threatened by the introduction of nonnative wildlife, which prey on native species, compete for resources, and carry diseases. Due to the sensitivity of the area to wildland fires and invasive species, the impacts may not be reduced to a less than significant level.

*Regulatory and administrative mitigation 2*. As discussed in Section 4.9.4, the mitigation measures identified in the SBCT EIS ROD and the 2003 PTA BO would help reduce the spread and impact of nonnative/invasive species caused by training and construction. However, because the impacts of invasive species could be significant to sensitive species and habitats, the identified measures would not mitigate the overall impact from spread of nonnative species to less than significant level.

*Additional mitigation 2a*. Additional potential mitigation measures considered include requiring Soldiers to clean their boots and equipment directly after ground training exercises to eliminate the potential to spread nonnative species in the Kīpuka Kālawamauna area adjacent to the range.

### Significant Impacts Mitigable to Less Than Significant

*Impact 3: Disturbance to sensitive terrestrial species and habitat from construction and ground training.* As proposed under Alternative 4, there would be less than significant impacts on sensitive terrestrial species caused by routine military ground training in the PTA ROI. The footprint of the Twin Pu‘u range is all contained within the impact area. Due to UXO hazards, very limited surveys have been conducted within the impact area. Construction and ground training could disturb currently unknown sensitive terrestrial species and habitats within the Twin Pu‘u range footprint. Construction and ground training would adversely affect biological resources by the following actions:

- Introduction of noise into the terrestrial environment;
- Increased erosion;
- Ground disturbance from construction, vehicles, and trampling; and
- Increased wildland fire potential as a result of prescribed burns for exposing UXO and the potential for fire when clearing UXO.

Wildlife species use portions of the ROI for foraging, shelter (resting), and nesting and could be disturbed by erosion, contamination, noise, and other effects of the proposed training. Grading during construction would involve turning up the ground, moving topsoil and vegetation, and staging the heavy machinery area, which would cause intensive short-term disturbance to vegetation. Although a moderate to large portion of vegetation within the range footprint would be affected during construction, the impacts would be minimal because the Twin Pu‘u area is mainly comprised of fountain grass, an invasive species. However, prescribed burning would be required to expose UXO for removal prior to any construction activities in the area. This action poses a significant risk of fire spreading to sensitive areas and impacting listed species. However, this action is covered under the Wildfire VEC.

Native mammals and birds capable of escaping the area would be expected to vacate during construction and less mobile creatures, such as small mammals (nonnative) and invertebrates, could be killed during or as a result of construction, ground training, and/or fire.

Noise impacts from this alternative could deter some species or individuals from using the ROI. Noise produced by humans is known to have an adverse effect on various wildlife resources, although habituation can occur with certain species. Because no listed vertebrate species other than the Hawaiian hoary bat are known to be residents on PTA, the effect of noise on these species would not be significant.

The bats at PTA are already exposed to noise from Legacy Force training, which would increase with SBCT training. However, due to the distribution of the Hawaiian hoary bat on PTA, noise generated by CALFEX training in the proposed Twin Pu‘u range could affect the bats. The 2003 PTA BO states that, “Noise may startle bats from their roosts, disrupting sleep patterns or torpor. Lethargic or torpid bats may not be able to respond rapidly to the need to abandon the roost, increasing the risk they would be injured or killed by heat, flames, and smoke. Bats also could be crushed in falling trees or struck by branches and foliage broken or blown by helicopter downdrafts. Bats dislodged from their roosts may

not be able to fly due to injury or depleted energy reserves, and grounded bats would be vulnerable to fire, vehicle strikes, trampling, and predators… Nothing is known about the response of Hawaiian hoary bats to noise generated by different intensities and durations of military activities, or the extent to which bats may become habituated to noise disturbances. Bats possibly would be deterred from using daytime roosting or nighttime foraging areas because of intense levels of noise associated with human activity." In the BO, the USFWS cited research where a maternity roost of Indiana bats in close proximity to an airport tolerated noise from aircraft and highway traffic. The USFWS also stated that they consider habitat loss, and not noise, to be the major factor affecting bats on PTA.

Construction and CALFEX training within the Alternative 4 could lessen reproductive success and result in impacts to MBTA species. A number of the resident native birds on PTA are not MBTA species such as the ʻapapane, ʻelepaio, and ʻiʻiwi. Other species that are MBTA species are not native to the Hawaiian Islands, such as Northern Cardinal, Mourning Dove, and House Finch. Given the wide spread occurrence of these and other nonnative MBTA species on the Island of Hawaiʻi, the limited unintentional take that could result from activities within the proposed Twin Puʻu range Alternative would have minimal impacts on populations of these birds. Of greatest concern are those native species that could be impacted by Alternative 4, such as the Hawaiian Short-eared Owl (pueo), Hawaiian Solitaire (ʻomaʻo), and Pacific Golden-Plover (kōlea). The habitat of the proposed PTA Alternative site may be suitable for the pueo (open habitats such as grasslands and shrublands), and kōlea (winters in varied habitats including grassy fields and roadsides). The occurrence of these species within the Twin Puʻu range footprint is unknown. The MOU between DoD and the USFWS, established per the requirements of EO 13186, promotes, in part, the conservation of migratory birds through efforts to minimize and/or mitigate the direct and indirect impacts of military non-readiness activities on migratory birds. During range construction activities, birds would most likely abandon the area if disturbed. Therefore, the potential for unintentional take of adult and fledged birds would be minimal. However, active nests could be destroyed thus resulting in unintentional take. Any take of the kōlea would not be anticipated because they are only winter residents on PTA. Habitat loss or modification would be the most significant impact from range construction, and this type of indirect impact does not constitute "take" under the MBTA.

Although take may occur during authorized military readiness activities, the Army has determined that such take would not occur to the degree of a significant impact on a population of any migratory bird species. The

most significant impact of training to migratory birds would be the ignition and spread of fire that alters or destroys preferred habitats.

Visual disturbance from night training is not expected to affect night-flying birds, such as the endangered Hawaiian Dark-rumped Petrel. No petrels are known to use or nest within the proposed Twin Pu‘u range area, but they are known to have used, and may still be using, PTA for nesting. Night training is not anticipated to affect petrel night flying activities. If petrel activity is discovered in or around the PTA ROI, the Army would initiate consultation with the USFWS.

The loss of habitat and sensitive species within the impact area have been mitigated and/or minimized through NEPA and ESA consultation for the SBCT action. The impact area is off limits to unauthorized personnel because of the UXO hazards, so surveys for sensitive species could not be conducted. In the USFWS 2003 BO, the USFWS stated that they consider that all potential available bat roosting and foraging habitat in the impact area eventually would be impacted over time, and that these impacts could result in a cumulative loss of all available roosting habitat in this area. However, separate consultation will still be required for Alternative 4, if selected. Although the INRMP, IWFMP, SBCT EIS ROD, and terms and conditions of the 2003 PTA BO are applicable to the ROI for Alternative 4, they would not prevent potential impacts associated with CALFEX training within the proposed ROI. ESA Section 7 consultation would be required before this alternative could be implemented. The INRMP helps to mitigate impact through managing, protecting, and monitoring existing sensitive species communities (both flora and fauna), as well as surveying potential habitat for new occurrences of sensitive species.

PIP actions include/will include controlling large feral mammals, selected weeds, predators, insect pests, and diseases and managing habitat quality levels. The main threat that determines the level of management is the risk to species from training-related fire; the PIP and IWFMP address fire threats from mission activities occurring on PTA. Implementation of the PIP, 2003 PTA BO, SBCT EIS mitigation measures, along with the mitigation measures proposed for this alternative, reduces the impacts of this action to a less then significant level.

*Regulatory and administrative mitigation 3*. The conservation measures identified in the 2003 PTA BO for SBCT activities could be used as potential mitigation to minimize and avoid impacts of construction and maintenance projects associated with Alternative 4. These measures include the following:

- All construction vehicles and earth-moving equipment would be thoroughly cleaned and inspected (to remove all soil and seeds) before moving on to PTA construction sites.
- All construction equipment would be confined to the PTA area or subject to subsequent cleaning and inspection if moved offsite during construction.
- Construction employees would be educated on the need to wear clean clothes and maintain clean vehicles.
- If a construction site were within 246 feet (75 meters) of a listed plant occurrence, then construction grading or earth moving operations would be sprayed with water to reduce airborne dust.
- Natural Resources personnel would be consulted and approve all auxiliary construction support sites. Natural Resources personnel would inspect construction and auxiliary sites quarterly for alien species. If alien species are found, then appropriate eradication measures would be immediately implemented.
- Night-time construction activities would be coordinated with the USFWS.
- The construction crews would follow the established Army protocols for proper use and disposal of petroleum, oils, and lubricants when refueling or working on any construction equipment or vehicles.

*Additional mitigation 3a*. Potential mitigation for construction and military activities could include conducting limited surveys of the range footprint area, if safe and practicable, for listed plant species. If such a survey discovered listed species, the following conservation measures could be proposed during the required ESA Section 7 consultation:

- Seeds would be collected from plants prior to construction. Plants would be propagated in greenhouses and would be transplanted to other sites containing the same listed species to possibly enhance genetic mixing.
- Listed plants would be removed from site and translocated to other sites with species to supplement populations.
- Enough material would be collected, grown, and established to adequately replace all of the plants lost from the construction and military activities.
- Construction activities would be timed to avoid periods when listed species are utilizing the area.

*Additional mitigation 3b*. Potential mitigation measures to reduce impacts on migratory birds during range construction and maintenance, would include avoiding activities near active nest sites of native bird species until birds have fledged. If active nests cannot be avoided, then the eggs and/or chicks would be transferred to a permitted migratory bird rehabilitator. Independent juvenile birds could be released back on PTA. PTA would initiate consultation with the USFWS if any listed bird species were found to be nesting or foraging within the proposed Twin Pu‘u range area.

### Less than Significant Impacts

*Impact 4. Disturbance to marine wildlife from aircraft*. Less than significant impacts on marine wildlife would be expected from CALFEX helicopter activity between O‘ahu and the Island of Hawai‘i. Over the ocean, the aircraft normally fly at least 1,000 feet (305 meters) above sea level. There is no change in helicopter activity expected from existing conditions at PTA. The Aviation Brigade of the 25th ID has local flying rules SOPs that include a 1,000-foot (305-meter) vertical limit over marine mammals. The February 11, 2003 addition to the local flying rules (Appendix H of the EIS) states that forthcoming changes would prohibit flights within 1,000 feet (305 meters), vertically or laterally, of any marine mammal.

*Regulatory and administrative mitigation 6*. The Army would continue to implement SOP flying rules.

*Impact 5. Disturbance to sensitive terrestrial species and habitat from aircraft*. Increased noise and visual disturbance from the aircraft could affect bird species and the Hawaiian hoary bat. However, under Alternative 4, aircraft activity would be anticipated to have a less than significant impact on sensitive terrestrial species and habitat. The impacts associated with noise from aircraft would be similar to those discussed under Impact 3 of this alternative.

Fixed-wing aircraft and helicopter activity would occur in and around the proposed Twin Pu‘u range site. This would include nighttime training, which would involve about 45 percent of the ongoing basic training of new pilots. Such activities could have an impact on foraging and commuting bats, the Hawaiian Dark-rumped Petrel and other birds.

In the 2003 PTA BO, USFWS acknowledged that helicopters are more likely to affect both bird and bat behavior than fixed-wing aircraft, and that low-flying, fixed-wing aircraft are more likely to impact birds and bats than those at high flight altitudes. Bat occurrence within the proposed range footprint is unknown, but they have been recorded along the MPRC

access road and within the Kīpuka Kālawamauna Endangered Plant Habitat. In the PTA BO, the USFWS cites research that foraging Hawaiian hoary bats often fly 100 feet (30 meters) and more above tree canopy height and commuting bats fly 495 feet (150 meters) or more above the ground. Other research cited claims that the mean flight altitude for Hawaiian hoary bats observed at PTA ranges from 33 to 495 feet (10 to 150 meters), with an overall mean of 103±96 feet (31±29 meters) (n=37 bats).

The USFWS stated that the efforts identified by the Army to minimize impacts of aircraft on listed species were the only practical measures available to avoid or minimize the incidence of aircraft strikes on Hawaiian hoary bats (USFWS 2003c). These measures include using dedicated landing and pickup zones at pre-approved firing points and ranges or requesting alternate sites from the Army Natural Resources Office (no helicopter insertion points in the Kīpuka Kālawamauna ), reporting all bird or bat strikes to the Natural Resources Office, and reinitiating consultation for any unauthorized take.

Little is known about the occurrence of petrels within or around PTA. PTA is exploring methods to adequately survey for the petrel throughout the installation.

Military readiness activities are exempt from take of migratory birds under MBTA, unless the Army determines that such take may have a significant adverse impact on a population of migratory bird species (see Section 3.9.5 for further information). A number of birds are known to occur within the proposed Twin Pu‘u range area, but the numbers of native migratory birds in the area have not been assessed. However, it is not anticipated that any aircraft training within the proposed Twin Pu‘u range would take many birds, especially not to the degree of significant impact on a population level.

No birds or bat strikes have been reported at PTA. The USFWS stated in the 2003 PTA BO that the likelihood of such strikes by Army training would be low.

*Regulatory and administrative mitigation 7*. PTA will continue to implement it’s BASH program that records all bird/bat/wildlife related strike data

*Regulatory and administrative mitigation 7a*. PTA would continue to implement the provisions of its INRMP that benefit migratory birds, other wildlife, and their habitat.

*Additional mitigation 7b*. A minimization measure that could be implemented is the use of bat detectors to determine bat activity in and around the training site. For aircraft activity, efforts would be made to avoid areas where bats are active.

### No Impacts

*Impact 6. Impacts on marine wildlife and coral ecosystems from runoff.* There would no impacts on marine wildlife and coral ecosystems in the PTA ROI. No significant impacts from potential runoff are expected for marine wildlife resources or coral ecosystems. This Alternative can be accomplished in conjunction with SBCT training. Therefore, no additional LSV trips would be required to implement this alternative. The SBCT EIS (US Army and USAEC 2008) fully analyzed the impacts of LSV travel on marine wildlife and coral ecosystems. NOAA Fisheries consultation has already been completed. No further analysis is required for implementation of this alternative with regards to LSV and road vehicle travel to PTA.

The proposed Twin Pu‘u range under Alternative 4 is located quite a distance from the coastline. Due to lack of any permanent streams or water bodies, impacts from soil erosion caused by construction and training activities could only occur during periods of high runoff. However, these periods of high runoff on surface water are usually short in duration and infrequent and not expected to be significant. Due to the depth of groundwater beneath the PTA, activities within the proposed range site would not be expected to impact the groundwater. Therefore, the potential for soil and contaminant runoff to impact marine wildlife and coral ecosystems would be minimal and less than significant.

*Regulatory and administrative mitigation 4*. PTA would continue to implement land management practices and procedures in the ITAM work plan to reduce erosion impacts on soils from live-fire training.

*Impact 7. Vessel impacts on marine wildlife.* The Army PTA addressed the potential impacts from LSV trips between O‘ahu and the Island of Hawai‘i in the SBCT EIS and through consultation with NOAA Fisheries. As stated in Section 4.9.1 of this document, NOAA Fisheries concurred with the Army that slow speeds (less than 11 knots) of the LSV would make collisions with protected species unlikely, and therefore, not likely to adversely impact such species. With no additional LSV trips required to implement this alternative, implementation of this proposed Alternative would have no impacts on marine wildlife.

*Impact 8. Disturbance to marine wildlife from ground training.* Due to the substantial distance of the proposed Alternative 4 training site to the

marine environment, noise and other disturbances associated with land-based weapons firing and explosions would not have an impact on marine wildlife.

# 4.10 CULTURAL RESOURCES

## 4.10.1 Impact Methodology

AR 200-1 defines the term cultural resource as any of the following:

A building, structure, site, district, or object eligible for or included in the NRHP maintained under Section 101(a) of the NHPA (16 USC 470a[a]);

Cultural items, as that term is defined in Section 2(3) of NAGPRA (25 USC 3001[3]). These include human remains, associated and unassociated funerary remains, sacred objects, and cultural patrimony objects;

American Indian, Eskimo, Aleut, or Native Hawaiian sacred sites for which access is protected under AIRFA (42 USC Section 1996);

Archeological resources, as that term is defined in Section 3(1) of the ARPA of 1979 (16 USC 470bb[1]). These include any material remains of human activities that are of archeological interest, as determined under ARPA regulations; and,

Archeological artifact collections and associated records, as defined under 36 CFR Part 79: Curation of Federally Owned and Administered Archeological Collections. Under these guidelines, collections include material remains, such as artifacts, objects, specimens, and other physical evidence, that are excavated or removed during a survey, excavation, or other study of a prehistoric or historic resource. Associated records include original records (or copies thereof) that document efforts to locate, evaluate, record, study, preserve, or recover a prehistoric or historic resource.

In addition to cultural resources defined by federal statute, regulation, and executive order for consideration and protection, additional sites and areas important to Native Hawaiian culture and religion may exist on Army lands. These ATI are described in detail in Section 3.10.4.

To identify cultural resources in the ROI, historic and current maps, aerial photographs, cultural resources reports, public meetings, oral history interviews, and archival records were used. In addition, the NRHP and state and local inventories of historic places were reviewed for prehistoric and historic resources within the ROI. Native Hawaiian organizations and individuals were consulted, and public meetings were held (see Section 1.7) to identify and locate ATI. Surveys were also conducted in the field.

Cultural resources that are determined NRHP-eligible are subject to protection under the NHPA; however, additional protection for cultural

resources is provided under ARPA, AIRFA, and NAGPRA. ATI and cultural landscapes at MMR and PTA have not yet been formally evaluated. Resources that are pending evaluations for NRHP eligibility are treated as eligible until formal determinations are made. Testing for NRHP eligibility and collecting additional information on the location of culturally important places are done in consultation with the Hawai‘i SHPO and other agencies, Native Hawaiian organizations and individuals, in compliance with Section 106 of the NHPA of 1966.

The various types and levels of training discussed in Chapter 2 and the locations of these proposed exercises were used to evaluate impacts on each site or group of sites. Impacts were assessed by identifying the nature and locations of the proposed training activities in relation to the locations of sensitive cultural resources.

The method for assessing potential impacts on cultural resources involves identifying sensitive cultural resources in the ROI for all alternatives, identifying project activities that could affect those resources, and determining the type and magnitude of potential direct and indirect impacts on those resources.

Mitigation measures presented for the impacts identified below would avoid all known resources and would provide protection for sites in their present condition, including making sensitive areas off-limits during training, creating buffer zones around sites, and constraining certain activities during training exercises in particular areas.

### 4.10.2 Factors Considered for Determining Significance of Impacts

#### *Cultural Resources*

Section 106 of the NHPA requires federal agencies to consider the effects of their undertakings on properties listed in- or eligible for listing in the NRHP. These properties also include ATI that have been evaluated and determined eligible. Pending formal evaluations, the Army is treating all cultural resources as eligible to the NRHP.

An adverse effect on a historic property, as defined by the NHPA, is not necessarily a significant impact under NEPA. While mitigation under the NHPA does not necessarily negate the adverse nature of an effect, mitigation measures under NEPA can reduce the significance of an impact. NHPA and NEPA compliance are separate and parallel processes, and the standards and thresholds of the two acts are not precisely the same.

Section 106 and its implementing regulations, 36 CFR 800, state that an undertaking has an effect on a historic property (i.e., NRHP-eligible

resource) when it could alter those characteristics of the property that qualify it for inclusion in the NRHP. An undertaking is considered to have an adverse effect on a historic property when it diminishes the integrity of the property's location, design, setting, materials, workmanship, feeling, or association. Section 106 adverse effects include, but are not limited to, the following:

- Physical destruction, damage, or alteration of all or part of the property;
- Isolation of the property or alteration of the character of the property's setting when that character contributes to the property's qualifications for the NRHP;
- Introduction of visual, audible, or atmospheric elements that are out of character with the property or changes that may alter its setting;
- Neglect of a property, resulting in its deterioration or destruction; and
- Transfer, lease, or sale of a property without adequate provisions to protect its historic integrity.

Native Hawaiian sites, including sacred sites, burials, and cultural items, whether or not they are considered eligible for the NRHP, may also be protected under AIRFA, ARPA, or NAGPRA. Factors considered in determining whether an action would have a significant impact on cultural resources include the extent to which its implementation would result in an adverse effect on a historic property, including a property of traditional religious and cultural importance (PTRCI), as referenced in Section 101(d)(6)(A) of the NHPA, or Native Hawaiian ATI, and the extent to which it would violate the provisions of AIRFA, ARPA, or NAGPRA.

Also, NEPA mitigation measures for other resource areas, such as cultivating land, clearing UXO, or revegetating a plant species, may involve undertakings that could create adverse effects on cultural resources under the NHPA. Before being implemented, these actions would also undergo review to determine if they would require additional Section 106 review.

In addition, archeological historic properties would be adversely affected if they cannot be avoided or protected, requiring mitigation through data recovery, such as archeological excavation..

ATI could incur significant impacts if they were damaged or destroyed. Access to ATI by Native Hawaiian groups and individuals could be

significantly affected if training reduced the number of available visitation days below current levels.

### *Paleontological Resources*

Paleontological sensitivity or potential is a qualitative measure of the density and scientific value of a site's fossils. It also gauges the probability that site development would directly or indirectly destroy a unique scientifically significant paleontological resource. Such a resource is generally considered to consist of vertebrate remains; unusual, useful, or exceptionally well-preserved trace fossils or invertebrate/plant remains; or exceptionally rich or diverse fossil assemblages. A three-part classification of paleontological sensitivity is outlined by the Society of Vertebrate Paleontology (1995) and is used by many paleontologists. It includes high sensitivity, low sensitivity, and undetermined sensitivity rankings. Within this classification scheme, a high sensitivity site is one that has one of the following characteristics:

- It is underlain by or contains exposures of sedimentary rocks or some types of volcanic rocks that are of the right age, origin, and location to *potentially* contain significant fossils;
- It is underlain by or contains exposures of sedimentary rock or some types of volcanic rocks that are *known* to contain significant fossils; or
- It contains potentially datable remains older than the historic period, including nests and middens (a deposit of shells, bones, and other artifacts that suggest previous human settlement).

Paleontological resources would incur significant impacts if important fossil resources were damaged or destroyed.

As discussed in Section 3.10.7, no fossil resources are expected to be present in Mākua and Kahanahāiki or at PTA, and because the area does not exhibit the characteristics listed above, MMR and PTA are not considered paleontologically sensitive. Given the above, no impacts are expected.

## 4.10.3 Mitigation Common to All Alternatives

Much of the mitigation discussed below references additional consultation. To the extent that archeological sites, ATI, or other cultural resources are determined to be eligible for listing in the NRHP, such consultation would be completed in accordance with the PA found in Appendix L of this EIS. The 2009 PA was developed to resolve or mitigate the potential adverse impacts caused by proposed training at MMR. The requirements of the PA are summarized in Chapter 3.10.8, and include continuing to identify and evaluate resources for eligibility;

protect known sites; resume consultation with Native Hawaiian Organizations and the SHPO as a result of placing new targets or modifying the scope of training; update awareness programs; maintain a record of any artillery and mortar rounds that land outside the designated impact area; monitor historic properties in accordance with the PA; provide annual reporting; identify activities exempt from further consultation; and amend, terminate, or resolve disputes pertaining to the PA. The foregoing mitigation would be applicable to all alternatives with the exception of Alternative 4.

### 4.10.4 Summary of Impacts

**Summary of Potential Cultural Resources Impacts**

| Impact Issues | No Action Alternative | Alternative 1 MMR (Reduced Capacity Use with Some Weapons Restrictions) | Alternative 2 MMR (Full Capacity Use with Some Weapons Restrictions) | Alternative 3 MMR (Full Capacity Use with Fewer Weapons Restrictions) | Alternative 4 PTA (Full Capacity Use with Fewer Weapons Restrictions) |
|---|---|---|---|---|---|
| Impacts on archeological resources | ⊘ | ⊗ | ⊗ | ⊗ | ⊗ |
| Impacts on cultural resources from vehicles | ⊙ | ⊙ | ⊙ | ⊙ | ⊙ |
| Impacts on paleontological resources | ○ | ○ | ○ | ○ | ○ |
| Impacts on Areas of Traditional Importance | ⊘ | ⊗ | ⊗ | ⊗ | ⊗ |
| Access to Areas of Traditional Importance and archeological sites | ⊗ | ⊗ | ⊗ | ⊗ | ⊗ |

LEGEND:
⊗ = Significant impact ⊘ = Significant impact mitigable to less than significant ⊙ = Less than significant impact
○ = No impact + = Beneficial impact

#### *Cultural Resources*

Mākua Military Reservation

There are 121 identified archeological within or bordering the MMR training area. Presently, one site is determined eligible to the NRHP. The remaining have not been evaluated, but are treated as eligible until determined otherwise. In addition, there are two historic pipelines within MMR that run from springs in the mountains into the valley. Records indicate that there are also 29 LCAs and two land grants within or near MMR (see Figure 3.10-1). Because these LCAs are locations where families engaged in subsistence farming and other activities for a number of generations, they are culturally and historically important and may be eligible to the NRHP. As required by the 2001 Settlement Agreement,

specific research was conducted to identify traditional cultural places, such as potential PTRCIs, and impacts on these properties from continued military use of MMR. Data gathering methods included a survey (distributed to Wai‘anae coast residents) and oral interviews with a number of interested local community members. Based on the responses from the survey, there appears to be a general lack of knowledge of specific traditional cultural places or PTRCIs within MMR boundaries, although informants describe the area in general as culturally important.

### *Pōhakuloa Training Area*

In general, archeological resources at PTA consist of modified natural features, such as lava tubes, lava shelters, and lava blisters. A 1998 review of previous archeological studies concluded that lava tubes made up 70 percent of all recorded sites at PTA (Eidsness et al. 1998), and they remain one of the most common site types found in more recent surveys. Other site types include cairn sites, trails, volcanic glass quarries, excavated pits, and lithic workshops. Within these sites, material remains include grinding tools, charred wooden torches, gourds, cordage and matting, woven ti leaf sandals, kukui nuts, ‘opihi shells, and other faunal remains. Surface features include stone-lined hearths, cupboards, rock-paved areas, low walls and platforms, rock-filled crevices, ramps, cairns, shrines, open-air shelters, and trails. The region has much value for archeological research and has produced important information concerning bird hunting, trail systems, and short-term living conditions at higher elevations. Figure 3.10-4 shows archeological sensitivity areas at PTA.

Reinman et al. (1998a) claim the cultural resources at PTA are important for addressing issues about Hawaiian prehistory and history in the uplands region, as well as the development of Native Hawaiian society.

The existence of approximately seven stone shrines attest to the likely ritual activity that went on at PTA. With prayers and ritual permeating traditional Hawaiian life, some of the structures at PTA may be occupational shrines (Buck 1957, cited in McEldowney 1982). Cairns (ahu) have been recorded at various terrains, either associated with trail systems or boundary markers, or as just isolated features. There appears to be no pattern to the distribution of cairns across the PTA landscape, and they have been quantified as representing between 10 and 15 percent of known sites. Cairns have also been constructed for military purposes, although the trained eye can usually differentiate military cairns from prehistoric ones. It is also possible that some cairns were constructed for rituals.

### Archeological Resources

There have been over 350 archeological sites reported at PTA, including both prehistoric and historic Native Hawaiian sites (see Tables 8-24 and 8-25 of the 2004 SBCT EIS). The only site listed in the NRHP is the Bobcat Trail Habitation Cave (Site 50-10-30-5004), which is located in Training Area 22.

Most relevant to the Proposed Action are the archeological sites found along the MPRC Access Road, those located to the west of the Red Leg Trail within the impact area, those within Training Areas 17, 18, 19, 20, and the northeastern part of Training Area 22 (see Figure 3.10-5).

There are lava tube systems, or caves, located along Red Leg Road on the eastern perimeter of the impact area that may be impacted by the Proposed Action associated with Alternative 4. Caves, including the Bobcat Trail Habitation Cave on the northwestern section of the ROI, may also be impacted by wildfires.

### Impacts

In general, training components and activities that could disturb or damage cultural resources include foot traffic, machine gun fire, ordnance projectiles, explosions, UXO demilitarization, and wildfires. Direct impacts, such as the physical disturbance of sites, may lessen the integrity of the sites. Impacts may also include reduced access to cultural sites due to mission schedules and public safety.

The primary difference between the alternatives with regard to impacts is the greater intensity and destructive force of live-fire weapons and the increased frequency of training exercises. High explosive weapons have greater potential to cause unintentional damage if a weapon is misfired, or to ignite wildfires from a ricochet or off-target impact. Increased frequency of CALFEXs would increase the number of troops and equipment, and potentially cause foot traffic damage and increased vandalism.

### No Action Alternative

#### Significant Impacts

*Access to Areas of Traditional Importance and archeological sites.* Nonlive-fire training at MMR would limit and significantly reduce the number of days when ATI and archeological sites could be accessed. This would be a significant impact because restricting the days sites can be visited may not accommodate the Native Hawaiians' need to visit sacred or traditional areas during specific Native Hawaiian traditional periods. Because the Ukanipō *Heiau* is geographically removed from the training

area, the proposed training would not affect access to the *heiau* or conflict with the provisions of the Ukanipō *Heiau* PA.

*Regulatory and administrative mitigation 1.* The Army would continue to provide cultural access to ATI and archeological sites. Under the PA for the Ukanipō *Heiau*, access is coordinated through cultural representatives on an advisory council.

The Ukanipō *Heiau* PA has provisions for access based on military activities, site safety, and advance notification. In accordance with the Ukanipō *Heiau* PA, members of the Native Hawaiian community can access Ukanipō *Heiau* for appropriate uses.

The impact of decreased number of access days due to training may be lessened through consultation, which would include Native Hawaiian groups. Consultation results may include developing long-term scheduling goals that could facilitate access and traditional use of resources during non-training periods and provide access to additional ATI. However, consultation may not reduce the impacts below the significance threshold, so the No Action alternative would result in a significant impact.

#### *Significant Impacts Mitigable to Less than Significant*

*Impacts on archeological resources.* The use of MMR for non-live-fire training including aviation lasing, unmanned aerial vehicle (UAV) training, training with blank ammunition, Engineer training, and as a staging base for command and control elements could result in damage to archeological sites including the potential for damage through crashes and potentially associated fire. The placements of targets and foot traffic could also result in damage to archeological sites.

*Regulatory and administrative mitigation.* The Army designs training exercises to avoid archeological sites and ATI. Measures to protect cultural resources during training include cultural resource avoidance training and site protection, including but not limited to installing fencing or other types of buffering. Any UXO detonation that could damage unprotected historic properties would be subject to further Section 106 consultation.

*Additional mitigation.* Potential mitigation measures for this impact include the Army relocating any targets or training activities that could adversely disturb or adversely damage known historic properties. Other protective measures that would be used to protect sites include sand bagging, which has proven effective in site preservation. In addition, pathways would continue to be aligned to avoid damage to cultural resources.

The Army would continue to identify and evaluate cultural resources on MMR in accordance with the PA found in Appendix L of this EIS.

Cultural resources would be monitored to identify effects from training. The Army would inspect cultural sites as stipulated in the executed PA. Monitoring records and photographic documentation would be included in annual reports submitted, at a minimum, to the Hawai‘i SHPO,

Other measures include continued communication between the cultural resource and fire managers to develop acceptable strategies for fire containment and control and for the protection of cultural resources. This coordination would occur during site planning preparation and preseason fire suppression operations.

*Impacts on Areas of Traditional Importance.* Training under the No Action Alternative could affect or damage Native Hawaiian ATI. For example, foot soldiers could accidentally trample some archeological resources that may be considered ATI or burial sites. Intrusion of modern activities and landscape alteration may affect the integrity of setting for resources that are eligible for listing in the NRHP.

During training exercises, UAV or other aircraft may crash and may be accompanied by fire which may cause a significant impact to ATI.

*Regulatory and administrative mitigation 2.* The Army avoids or protects all areas where ATI have been reported. The Army continues to identify Native Hawaiian organizations, groups, families, and individuals that may ascribe traditional religious and cultural importance to areas, landscapes, or historic properties at MMR. Paths would continue to be aligned to avoid directing traffic over cultural resources.

*Additional mitigation 2.* Potential mitigation measures for this impact include avoidance training and site protective measures. The Army would avoid sensitive areas for all types of training and would relocate target areas if they were considered to be too close to ATI. The Army would monitor cultural sites.

The Army would conduct cultural resource awareness and protection training, which includes procedures to avoid cultural resources during training. Instruction would include field trips, classroom training, and printed literature. This information is also included in the cultural resource annex of the range SOPs. Before each exercise, senior officers would be briefed about cultural and natural resources. Soldiers would be briefed at MMR before training. If identified ATI could not be avoided because of interference with the military mission or risk to public safety, the Army

would reinitiate appropriate consultation with Native Hawaiian groups before training, in conjunction with implementing other measures.

#### Less Than Significant Impacts

*Impacts on Archeological Resources.* The impact to archeological resources from foot traffic would be less than significant, although the Army proposes mitigation through the use of siebert stakes to further reduce potential impacts.

*Impacts on cultural resources from vehicles.* This impact is less than significant through the requirements for all Army vehicles to stay on existing on improved roads, and maintenance of security fencing that would prevent unauthorized vehicle access to the reservation.

#### No Impacts

*Impacts on paleontological resources.* A formal survey has not been conducted for paleontological resources at MMR. Within the ROI, the geology present is not normally known for fossil finds, archaeologists have not reported fossil remains, and there are no known paleontological resources. Because these resources are not known and are not likely to be present, no impacts are expected.

### Alternative 1 (Reduced Capacity Use with Some Weapons Restrictions)

#### Significant Impacts

*Impact 1: Impacts on archeological resources.* Potentially significant impacts on archeological resources include damage from ground troops. The presence of large numbers of personnel could affect resources through foot traffic, vandalism, or accidental damage. Trampling may damage artifacts or alter stone structures, which would reduce the potential information these sites contain. These impacts may affect the site's eligibility for listing in the NRHP. During CALFEXs, stray ammunition rounds from guns, mortars, and artillery could damage cultural properties, as could squad and platoon live-fire training and other types of training. Mortar and artillery shells, if they stray off target and hit eligible resources, may damage artifacts or alter stone structures, which may affect the characteristics or values that make the site eligible for listing in the NRHP. In addition, UXO clearance after training exercises could damage sites. These impacts may affect the site's eligibility for listing on the NRHP. Mitigation measures have been identified to reduce these impacts, but they may not be sufficient to reduce impacts below the significance threshold.

*Regulatory and administrative mitigation 1.* The Army designs training exercises to avoid archeological sites. Measures to protect cultural

resources during training include cultural resource avoidance training and site protection, including but not limited to installing fencing or other types of buffering. Any UXO detonation that could damage sites would be subject to further Section 106 consultation.

*Additional mitigation 1.* Potential mitigation measures for this impact include the Army relocating any targets or training activities that could disturb or damage known cultural resources. Other protective measures that could be used to protect sites include sand bagging, which has proven effective. In addition, firing points and paths would continue to be aligned to avoid shooting at cultural resources.

The Army would continue to identify and evaluate cultural resources on MMR in accordance with Section 106 of NHPA, or in accordance with an executed PA.

Cultural resources would be monitored to identify effects from training. The Army would inspect cultural sites as stipulated in the signed and executed PA. Monitoring records and photographic documentation would be included in annual reports submitted to the Hawai‘i SHPO.

Other measures include continued communication between the cultural resource and fire managers to develop acceptable strategies for fire containment and control and for the protection of cultural resources. This coordination would occur during site planning preparation and preseason fire suppression operations.

*Impact 2: Impacts on Areas of Traditional Importance.* Training under Alternative 1 could affect or damage Native Hawaiian ATI. For example, foot soldiers could accidentally trample some archeological resources that may be considered ATI or burial sites. Intrusion of modern activities and landscape alteration may affect the integrity of setting for resources that are eligible for listing in the NRHP.

During training exercises, stray ammunition rounds from guns, mortars, and artillery could damage or destroy cultural properties, as could squad and platoon live-fire training, air assault, aviation support, and other proposed training activities. Landscape alteration caused by live-fire exercises may affect the integrity of setting of resources that are eligible for the NRHP. Live-fire training would increase the threat of wildfires, which could damage or remove landscapes, flora, and fauna associated with traditional practices. In addition, UXO clearance after training exercises could damage sites. Mitigation measures identified to reduce these impacts may not be sufficient to reduce impacts below the significance threshold.

*Regulatory and administrative mitigation 2.* The Army avoids or protects all areas where ATI have been reported. The Army continues to identify Native Hawaiian organizations, groups, families, and individuals that may ascribe traditional religious and cultural importance to areas, landscapes, or historic properties at MMR. Firing points and paths would continue to be aligned to avoid shooting over cultural resources. Demolitions training would occur in the designated ordnance impact area.

*Additional mitigation 2.* Potential mitigation measures for this impact include avoidance training and site protective measures. The Army would avoid sensitive areas for all types of training and would relocate target areas if they were considered to be too close to ATI. Detonation of any ordnance outside the training area or close to existing sites would be subject to additional consultation among the Army, the SHPO, Native Hawaiian organizations, individuals and interested parties on historic properties and would comply with any additional stipulations developed through a PA, as discussed above, including site monitoring.

The Army would conduct cultural resource awareness and protection training, which includes procedures to avoid cultural resources during training. Instruction would include field trips, classroom training, and printed literature. This information is also included in the cultural resource annex of the range SOPs. Before each exercise, senior officers would be briefed about cultural and natural resources. Soldiers would be briefed at MMR before training. If identified ATI could not be avoided because of interference with the military mission or risk to public safety, the Army would reinitiate appropriate consultation with Native Hawaiian groups before training, in conjunction with implementing other measures.

*Impact 3: Access to Areas of Traditional Importance and archeological sites.* Training at MMR would limit and significantly reduce the number of days when ATI and archeological sites could be accessed. This would be a significant impact because restricting the days sites can be visited may not accommodate the Native Hawaiians' need to visit sacred or traditional areas during specific Native Hawaiian traditional periods. The effects of UXO clearance following training events on access to sites cannot be determined because the presence of surface UXO changes over time, unrelated to future training activities. Because the Ukanipō *Heiau* is geographically removed from the training area, the proposed training would not affect access to the *heiau* or conflict with the provisions of the Ukanipō *Heiau* PA.

*Regulatory and administrative mitigation 3.* The Army would continue to provide cultural access to ATI and archeological sites. Under the PA for the Ukanipō *Heiau*, access is coordinated through cultural representatives on an advisory council.

The Ukanipō *Heiau* PA has provisions for access based on military activities, site safety, and advance notification. In accordance with the Ukanipō *Heiau* PA, members of the Native Hawaiian community can access Ukanipō *Heiau* for appropriate uses.

The impact of decreased number of access days due to training may be lessened through consultation, which would include Native Hawaiian groups. Consultation results may include developing long-term scheduling goals that could facilitate access and traditional use of resources during non-training periods and provide access to additional ATI. However, consultation may not reduce the impacts below the significance threshold, so Alternative 1 would result in a significant impact.

#### Less Than Significant Impacts

*Impacts on cultural resources from vehicles.* Vehicles could have an impact on cultural resources by tire or track depressions or from soil erosion. This impact is less than significant because all vehicles are required to stay on existing or improved roads.

#### No Impacts

*Impacts on paleontological resources.* A formal survey has not been conducted for paleontological resources at MMR. Within the ROI, the geology present is not normally known for fossil finds, archaeologists have not reported fossil remains, and there are no known paleontological resources. Because these resources are not known and are not likely to be present within the training area, training is not expected to affect them. A paleontological survey is recommended to determine the presence or potential for these resources in the ROI and to allow development of avoidance measures to ensure protection of these resources.

### Alternative 2 (Full Capacity Use with Some Weapon Restrictions)

#### Significant Impacts

*Impact 1: Impacts on archeological resources.* Significant impacts on archeological sites are similar to those described under Alternative 1. In addition to the activities proposed under Alternative 1, Alternative 2 would involve an increased number of CALFEXs and the use of tracers. Additional CALFEXs would create a greater risk of accidental damage due to increased frequency of exercises. In addition, UXO clearance after training exercises could damage sites. The use of tracers would potentially increase the risk of wildfire potential and associated wildfire-related damage to archeological sites.

*Regulatory and administrative mitigation 1.* Mitigation measures are the same as those described under Alternative 1.

*Additional mitigation 1.* Mitigation measures are the same as those described under Alternative 1.

*Impact 2: Impacts on Areas of Traditional Importance.* As described under Alternative 1, training activities have the potential to destroy or damage Native Hawaiian ATI, including landscapes, shrines, archeological sites, or burials. The primary difference between Alternatives 1 and 2 is the increased number of CALFEXs and the use of tracers. Additional CALFEXs would create a greater risk of accidental damage due to increased frequency of exercises. In addition, UXO clearance after training exercises could damage sites. The use of tracers would increase the wildfire potential and associated wildfire-related damage to ATI. These activities could result in physical damage and loss of *mana* for the Native Hawaiian culture.

*Regulatory and administrative mitigation 2.* Mitigation measures are the same as those described under Alternative 1.

*Additional mitigation 2.* Mitigation measures are the same as those described under Alternative 1.

*Impact 3: Access to Areas of Traditional Importance and archeological sites.* Impacts under this alternative would be similar to those described for Alternative 1. The greater number of CALFEXs would further restrict access to these resources, therefore, Alternative 2 presents a potential for greater impacts than Alternative 1.

*Regulatory and administrative mitigation 3.* Mitigation measures are the same as those described under Alternative 1.

*Additional mitigation 3.* No additional mitigation measures have been identified.

### Less Than Significant Impacts

*Impacts on cultural resources from vehicles.* Impacts would be the same as those described under Alternative 1.

### No Impacts

*Impacts on paleontological resources.* Impacts would be the same as those described under Alternative 1.

### *Alternative 3 (Full Capacity Use with Fewer Weapons Restrictions)*

*Significant Impacts*

*Impact 1: Impacts on archeological resources.* This impact is similar to that described under Alternative 2. The additional weapons systems under this alternative would increase the potential for wildfires and for errant projectiles that may strike archeological sites. UXO clearance after training exercises could damage sites. In addition, Alternative 3 would include use of C-Ridge (the ridge between the northern and southern lobes).

*Regulatory and administrative mitigation 1.* Mitigation measures for this impact are the same as those described under Alternative 1. Additional consultations may be required among the Army, the SHPO, and Native Hawaiian groups to assess increased potential impacts.

*Additional mitigation 1.* Mitigation measures are the same as those described under Alternative 1.

*Impact 2: Impacts on Areas of Traditional Importance.* This alternative would have impacts similar to those described under Alternative 2. In addition, the wildfire potential and associated damage to ATI would be greater due to the use of illumination munitions, inert TOW missiles, and 2.75-inch rockets.

Errant inert TOW missiles and 2.75-inch rockets could damage ATI, resulting in physical damage and loss of *mana* for the Native Hawaiian culture. UXO clearance after training exercises could damage sites. In addition, Alternative 3 would include use of C-Ridge.

*Regulatory and administrative mitigation 2.* Mitigation measures are the same as those described under Alternative 1. In addition, the Army would likely enter into additional consultations with the SHPO and Native Hawaiian groups to assess increased potential impacts.

*Additional mitigation 2.* Mitigation measures are the same as those described under Alternative 1. Any additional area used for training would require surveying, site evaluation, and consultation.

*Impact 3: Access to ATI and archeological sites.* This impact would be similar to that described under Alternative 2.

*Regulatory and administrative mitigation 3.* Mitigation for this impact would include the same measures listed for Alternative 1.

*Additional mitigation 3.* No additional mitigation measures have been identified.

### Less Than Significant Impacts

*Impacts on cultural resources from vehicles.* Impacts would be the same as those described under Alternative 1.

### No Impacts

*Impacts on paleontological resources.* Impacts would be the same as those described under Alternative 1.

## Alternative 4 (Full Capacity Use with Fewer Weapons Restrictions), Pōhakuloa Training Area

The construction of the Twin Pu‘u range and the SDZ for the range all fall within the existing impact area which has had little cultural resource survey; therefore, potential impacts on unidentified archeological sites and ATI are unknown.

### Significant Impacts

*Impact 1: Impacts on archeological resources.* Impacts would be similar to those described under Alternative 3. The use of additional weapons systems under this alternative would increase the potential for wildfires and for errant projectiles that may strike archeological sites. Additionally, UXO clearance after training exercises could damage sites.

*Regulatory and administrative mitigation 1.* Mitigation measures for this impact are the same as those described under Alternative 1. Additional consultation with the SHPO and Native Hawaiian groups to assess increased potential impacts may be required under Section 106 of the NHPA.

*Additional mitigation 1.* Mitigation measures are the same as those described under Alternative 1.

*Impact 2: Impacts on Areas of Traditional Importance.* This alternative would have impacts similar to those described under Alternative 3 including the greater potential for wildfire and associated damage to ATI due to the use of illumination munitions, inert TOW missiles, and 2.75-inch rockets.

Errant inert TOW missiles and 2.75-inch rockets could damage ATI, resulting in physical damage and loss of *mana* for the Native Hawaiian culture. UXO clearance after training exercises could damage sites.

*Regulatory and administrative mitigation 2.* Mitigation measures are the same as those described under Alternative 1. Also, additional consultation with the SHPO and Native Hawaiian groups, to assess increased potential impacts under Section 106 of the NHPA, may be required..

*Additional mitigation 2.* Mitigation measures are the same as those described under Alternative 1. Any additional area used for training would require surveying, site evaluation, and consultation.

*Impact 3: Access to ATI and archeological sites.* This impact would be similar to that described under Alternative 2. There is currently no access to cultural sites in the impact area at PTA.

*Regulatory and administrative mitigation 3.* Mitigation for this impact would include the same measures listed for Alternative 1.

*Additional mitigation 3.* No additional mitigation measures have been identified.

### Less Than Significant Impacts

*Impacts on cultural resources from vehicles.* Impacts would be the same as those described under Alternative 1.

### No Impacts

*Impacts on paleontological resources.* Impacts would be the same as those described under Alternative 3.

## 4.11 HAZARDOUS MATERIALS AND WASTE

This section identifies potential hazardous material and waste impacts that may result from implementing the project alternatives. The impact analysis compares projected conditions to the affected environment and ROI described in Section 3.11. This section also addresses the following issues of concern identified by the public during the EIS scoping process:

- Types, use, and storage of ammunition;
- The impacts of UXO; and
- Potential contamination by various hazardous chemicals and materials (such as lead, pesticides, and PCBs).

### 4.11.1 Impact Methodology

Numerous federal, state, and local laws regulate the storage, use, recycling, disposal, and transportation of hazardous materials and waste. The primary goal of these laws is to protect human health and the environment.

The methods for assessing potential hazardous material and waste impacts generally include the following:

- Reviewing and evaluating each of the alternatives to identify the action's potential to use hazardous or toxic substances or to generate hazardous waste, based on the activities proposed;
- Comparing the location of proposed training activities with baseline data on known or potentially contaminated areas (i.e., potentially UXO-contaminated land);
- Assessing the compliance of each alternative with applicable site-specific hazardous material and waste management plans;
- Assessing the compliance of each alternative with applicable site-specific SOPs and health and safety plans in order to avoid potential hazards; and
- Using professional judgment to determine if any additional known or suspected potential hazardous material and waste impacts or concerns relate to each alternative. This determination is based on the current status of the range, since it is the guidance of the Army's restoration program that remedial activities be conducted only on closed ranges or those in the process of being closed and not on active or inactive ranges.

The overall methodology, including data sources and assumptions, used to conduct the hazardous materials and waste impact evaluation is consistent with the Army Manual for Installation Operations and Training (US Army 1998). This manual describes the various types of materials and waste that should be considered when assessing the potential impacts of the project alternatives.

### 4.11.2 Factors Considered for Determining Significance of Impacts

Regulatory standards and guidelines have been applied to determine the significance of each alternative's potential impact related to hazardous materials and waste. Factors considered in determining whether an alternative would have a significant safety hazard or hazardous material and waste impact include the extent or degree to which its implementation would result in the following:

- Cause a spill or release of a hazardous substance, as defined by 40 CFR Part 302 (CERCLA), or Parts 110, 112, 116, and 117 (CWA);
- Expose the environment or public to any hazardous substance through release or disposal (i.e., open burn/open detonation disposal of unused ordnance);
- Generate either hazardous waste or acutely hazardous waste, resulting in increased regulatory requirements over the long term or violating the standards established for the conditionally exempt small quantity generators and small quantity generators;
- Endanger the public or environment during the storage, transport, or use of ammunition;
- Expose military personnel or the public to areas potentially containing UXO;
- Increase the risk of accident or release from existing or proposed vehicles, equipment, procedures, or training practices;
- Contaminate soils, groundwater, or surface water with lead from ammunition (i.e., migration due to vehicle, equipment, and foot traffic on ranges, thereby increasing potential exposure to military personnel and the public);
- Cause a release of pesticides or potentially expose military personnel or the public to pesticides;
- Expose military personnel or the public to PCBs;
- Expose the public to electromagnetic fields with cycle frequencies greater than 300 hertz;
- Cause a spill or release of petroleum-based products; or
- Require the removal or upgrade of an underground storage tank.

### 4.11.3 Summary of Impacts

**Summary of Potential Hazardous Materials and Waste Impacts**

| Impact Issues | No Action Alternative | Alternative 1 MMR (Reduced Capacity Use with Some Weapons Restrictions) | Alternative 2 MMR (Full Capacity Use with Some Weapons Restrictions) | Alternative 3 MMR (Full Capacity Use with Fewer Weapons Restrictions) | Alternative 4 PTA (Full Capacity Use with Fewer Weapons Restrictions) |
|---|---|---|---|---|---|
| Unexploded ordnance | ⊙ | ⊙ | ⊙ | ⊙ | ⊙ |
| Ammunition | ○ | ⊙ | ⊙ | ⊙ | ⊙ |
| General training | ○ | ⊙ | ⊙ | ⊙ | ⊙ |
| Lead from ammunition | ○ | ⊙ | ⊙ | ⊙ | ⊘ |
| Pesticides | ○ | ⊙ | ⊙ | ⊙ | ⊙ |
| Hazardous waste management | ○ | ⊙ | ⊙ | ⊙ | ⊙ |
| Polychlorinated biphenyls | ○ | ○ | ○ | ○ | ○ |
| Electromagnetic fields | ○ | ○ | ○ | ○ | ○ |
| Petroleum, oils, and lubricants | ⊙ | ○ | ○ | ○ | ⊙ |
| Depleted Uranium | ○ | ○ | ○ | ○ | ⊙ |

LEGEND:
⊗ = Significant impact
⊘ = Significant impact mitigable to less than significant
⊙ = Less than significant impact
○ = No impact
+ = Beneficial impact

The proposed project includes both nonlive-fire training and routine company-level CALFEXs conducted by the 25th ID and other military units. SOPs would be updated for new training methods and weapon systems to ensure safe handling and compliance with Army and regulatory procedures. Summarized below are the potential hazardous materials and waste impacts that have been identified. No new ordnance impact areas are being introduced to this installation. There are no significant impacts identified from hazardous materials and waste.

The PRGs referred to in the impact analysis are contaminant concentration levels established by EPA Region IX to evaluate contaminated sites that are on the National Priorities List or that are declared remedial sites under

CERCLA or RCRA. They are used for screening and initial site cleanup. PRGs are not legally enforceable standards but instead provide long-term targets to be used to analyze different remediation techniques and alternatives. Because neither MMR nor PTA is on the National Priorities List, declared closed, or a designated CERCLA or RCRA cleanup site, the use of industrial soil PRGs and drinking water PRGs in this EIS is for comparison purposes only. Further explanation of PRG applications in this evaluation is provided in Section 3.11.1.

### *No Action Alternative*

Under No Action, MMR would be closed to live-fire military training. Army maintenance and stewardship programs would continue at a minimal level. The ICM areas are expected to remain off limits to Army personnel and the public, and security fencing would be inspected and maintained to prevent unauthorized access.

#### *Less Than Significant Impacts*

*Unexploded ordnance.* No new UXO would be introduced to the training area because there would be no live-fire training. Due to historic live-fire training at MMR, UXO is buried throughout the installation and could be unearthed by natural processes. As explained in Section 3.11, if UXO were discovered, EOD specialists would destroy all identified UXO where it is found, whether it is a result of the training just completed or from prior use of MMR. This is the current practice. UXO is a serious safety risk if encountered by members of the public or Army personnel. This is expected to be a less than significant impact because any members of the public accessing the installation would have authorized military escorts. All military escorts and security personnel would be trained to identify and avoid UXO.

*Petroleum, oils, and lubricants.* Past soil analysis confirmed that levels of VOCs, solvents, and constituents of petroleum products did not exceed the EPA's conservative public health criteria. No Action would pose less than significant impacts due to the storage of POLs, associated with ongoing range maintenance activities.

#### *No Impacts*

*Ammunition.* Under No Action, there would be no live ammunition impacts because there would be no training at MMR.

*General training.* Vehicles used during limited training activities may expose additional areas to potential leaks or spills to the environment. No additional training above the current authorized use would be conducted at MMR under this alternative.

*Lead from ammunition.* Lead was identified in soil samples collected during the current hydrogeologic sampling, at the Elk Objective area. Out of all the samples taken, only one lead concentration was detected exceeding industrial PRGs, and it was detected in an isolated location. While no additional lead from ammunition would be deposited, soils contaminated with lead from previous training could be redistributed by natural processes. Because there would be no activities that could expose people to lead, there would be no impacts under No Action.

*Pesticides.* While the current hydrogeologic investigations have shown that pesticides are present in Mākua Valley, they were detected in areas with no direct exposure pathway to Army personnel, the public, or the off-site environment. Furthermore, there has been no indication of pesticide migration to areas with direct exposure potential. No Action assumes that herbicides would not be applied along the firebreak roads and that alien weeds and building pests would not be controlled at MMR; therefore, there would be no impacts from pesticides.

*Hazardous waste management.* Because no hazardous waste would be generated under this alternative, there would be no impacts.

*Polychlorinated biphenyls*. PCBs were detected in soil samples taken from the OB/OD area and from a remote location with no public access, but the PCB concentration at the OB/OD area was below the PRG. Because no activities under this alternative would result in additional PCB contamination or result in human exposure to contamination, there would be no impact.

*Electromagnetic fields.* Current sources of EMFs include the RAWS located at MMR. No Action assumes that the Army would no longer maintain the RAWS. Under this alternative, there would be no impact on Army personnel or the public from exposure to EMFs.

*Depleted Uranium.* Due to vegetative growth and explosive hazards, a 2007 Army survey and an aerial visual observation were unable to determine whether DU is present at MMR. Soil samples were collected in areas where sediment had deposited from past runoff/erosion events. Ten soil samples were collected around the perimeter of the MMR during the scoping survey. All of the samples were analyzed for isotopic uranium by alpha spectrometry. All of the results are consistent with naturally occurring concentrations of uranium. None of the results indicate uranium depletion (Cabrera Services 2008).

The Army proceeded with a follow-on survey of MMR in December 2008 using a highly efficient technology alternative to conducting ground-based

surveys where munitions and explosives of concern may be present, such as the impact area of MMR. The Army deployed this technology to more accurately enable the characterization of radiological data at MMR. The data was also compared to ground-based walkover data performed in some of the same areas in previous surveys. The results of this survey confirmed that no DU is found at MMR.

The fully detailed report indicating the results of these additional surveys at both MMR and PTA will be released to the public separately from the EIS.

### *Alternative 1 (Reduced Capacity Use with Some Weapons Restrictions)*

Less Than Significant Impacts

Unexploded ordnance. Potential impacts from UXO under Alternative 1 would be similar to those under No Action. However, Alternative 1 would involve 10 to 19 company-level CALFEXs, which could elevate the threat of new UXO to MMR.

The only weapons used at the site that can produce UXO are grenades, mortars, artillery, rockets, and missiles; all other ammunition is either inert or is incapable of producing UXO. Of the newly introduced weapons, the 120mm mortar, the 155mm howitzer, and the Javelin missile could produce UXO.

EOD specialists would continue to destroy all identified UXO in order to minimize safety hazards and the impact on the environment, as discussed under No Action. As discussed in Section 3.11, Unexploded Ordnance, following training, a group of 30 to 40 people, including EOD specialists and Soldiers, conduct two surface sweeps of the ordnance impact area to identify UXO (Husemann 2003d). EOD specialists destroy all identified UXO where it is found, whether it is a result of the training just completed or from prior use of MMR. No known unexploded rounds are left in place at the conclusion of a training exercise. These procedures ensure that training at MMR would not increase the amount of UXO on the site (USARHAW and 25th ID[L] 2001a).

All future potential UXO would be contained within the MMR ordnance impact area, and no new ordnance impact areas would be introduced under Alternative 1. The CALFEX training area is strictly monitored for UXO following training. Because these measures would continue, no significant UXO impacts are expected from live-fire training at MMR under Alternative 1.

Although EOD specialists initially cleared the northern valley of MMR, including a portion of the trail from DMR, UXO has been discovered on the trail in this area. If UXO were suspected or encountered during maneuvers or as foot traffic disturbs the earth, EOD specialists would follow procedures outlined in the Skills Level 2 through 4 Manual and Field Manual 21-16, Unexploded Ordnance Procedures (HQDA 1994), detailing the types of UXO, safety guidelines, and handling procedures, as discussed in Section 3.11. Unit personnel would also be informed about the presence of UXO and would be trained to identify the material, as is the current practice. Because these practices are implied under the current SOPs, the potential exposure is not expected to be significant; however, the potential exposure of personnel and the public to UXO from continued use of MMR under Alternative 1 is a less than significant impact.

Ammunition. The unit ammunition section from the battalion support platoon draws ammunition to be used for the exercise at the ammunition storage point at Wheeler Army Airfield (WAAF), at the naval magazines at Lualualei, or at West Loch, where ammunition types for military units in Hawai‘i are stored in specially designed facilities. Section leaders sign for the exact quantities of ammunition issued, and any unused ammunition is accounted for and returned at the end of the exercise. Permanent ammunition storage is not authorized at MMR.

When possible (i.e., weather permitting), ammunition is flown into MMR to avoid transporting it through the local community. The Army airlifted all ammunition used for CALFEX training from 2001 to 2003.

Vehicles used to transport ammunition must pass a rigorous safety inspection before they are allowed to enter any ammunition storage facility. All personnel involved in transporting ammunition are trained in accordance with Army, federal, and state standards and are certified to transport hazardous materials. Artillery and mortar ammunition are packed separately from ignition fuses to preclude accidental detonations. In addition, all ammunition is stored in specialized packing materials designed to withstand an impact 15 times greater than the force of gravity, further minimizing the risk of accidental explosion. All vehicles used in moving ammunition are powered by diesel fuel or JP-8 (kerosene), fuels that are much less volatile than gasoline.

If ground transport of ammunition is required, the ammunition is transported with a front and back escort at a maximum speed of 45 miles (72 kilometers) per hour, in accordance with State of Hawai‘i Department of Transportation (DOT) rules and regulations for the transport of explosive materials (Husemann 2003c). Vehicles transporting explosives, grenades, mines, artillery rounds, anti-tank rounds, and mortar rounds

avoid using Farrington Highway from 5:00 AM to 7:00 PM. Vehicles transporting other munitions and ordnance on Farrington Highway avoid using the highway during peak traffic hours and at times when children are traveling to and from school (5:30 AM to 8:30 AM and 12:30 PM to 6:30 PM). These restrictions combine to substantially reduce the risk of vehicle accidents involving ammunition transport vehicles and public exposure to potential accidental explosion of munitions should a vehicle accident ever occur.

The general use of any kind of ammunition poses a safety risk to Soldiers. However, the Army follows existing SOPs during training to limit safety impacts from ammunition to less than significant. The 120mm mortar, the 155mm howitzer, and the Javelin missile would be the new weapon systems introduced to MMR under Alternative 1. Residual chemical components resulting from the detonation of high explosive weapons are expected to be minimal, as warheads are designed to combust completely on impact.

The 120mm mortar is a high explosive weapon typically used against personnel, bunkers, and light materiel targets. The steel projectile is loaded with explosive TNT. Based on the amount of explosive charges added, the 120mm mortar can be fired from 656 feet (200 meters) to 23,622 feet (7,200 meters) (Federation of American Scientists 1998). Because the 120mm mortar is similar to existing mortar systems, this new weapon is not expected to introduce a new threat to the environment and is not expected to be a significant impact.

When used during training, the high explosive 155mm howitzer would replace the high explosive 105mm howitzer currently used at MMR. Like the 105mm howitzer, this new weapon system is a self-mobilized combat support weapon, and there are no tracks on the firing unit that could degrade the land surface. It allows 360 degree firing capabilities. The 155mm howitzer system has a projectile range of up to 72,178 feet (22,000 meters). The system also includes a .50-caliber machine gun as a secondary weapon (Federation of American Scientists 2000c). The firing points used for the 105mm howitzer also would be used for the 155mm howitzer, and the same number of rounds would be fired. Because this munition would be used interchangeably with an existing munition with similar composition, capabilities, and handling, this change is not expected to introduce new impacts to the environment. Ammunition handling and methods of use would not change.

Demolitions training, which includes shape and cratering charges, would also be used under this alternative. This type of training has occurred in the past at MMR near Objective Deer but was discontinued in 1998 due to

potential impacts on cultural sites. As described in Chapter 2, demolitions training uses a shape charge composed of C4 plastic explosive to create a narrow borehole and a cratering charge containing ammonium nitrate to expand that borehole into a wide crater. Ammonium nitrate is a hazardous, unstable chemical with high reactivity and toxic smoke and fumes. Once detonated, ammonium nitrate is similar to other munitions generating nitrogen dioxide, carbon dioxide, water, carbon, and nitrogen. Most of these substances would be burnt off in the explosion. No new substances would be introduced to the environment by demolitions training. SOPs would be updated to ensure that the material is handled and stored according to manufacture specifications in order to minimize this impact. Demolitions training is a localized technique that would not escape the existing ordnance impact area or potentially produce UXO.

As a standard practice when methods or equipment is changed, SOPs are updated to include proper handling and safe storage methods. MMR SOPs would be updated to address the high explosive 120mm mortar system, the high explosive 155mm howitzer, Javelin missiles, demolitions training using shape and cratering charges. SOPs already exist for safe management of weapon systems previously used at MMR. Right and left firing limits as well as projectile limitations would be established for all ordnance. The SOPs would specify safety precautions, such as storage and handling protocol, as well as respirator use and distance and time requirements, to avoid residual fumes from the ammonium nitrate in the cratering charges. As these procedural guidelines would be updated in conjunction with these changes, there are no significant hazardous materials or waste-related impacts under Alternative 1. The impact level relating to ammunition under Alternative 1 is expected to be less than significant.

*General training.* Equipment and vehicles used during training activities may expose additional areas to potential leaks or spills to the environment. The UAV would be used in future training efforts at MMR. The UAV is the only new aircraft to be used at MMR. The UAV would take off from MMR or be flown in from WAAF before a CALFEX to obtain pictures for reconnaissance and photo observation.

No training would be conducted on Mākua Beach. Equipment and vehicles used in training would present a risk of spills, releases, or accidents involving hazardous materials or wastes during training under Alternative 1. Per SOPs, the Army would undertake the following measures to minimize the potential for spills or other harm to the environment during any on-site operational activities within a specific project area:

- Implement applicable spill response and contingency plans following any release to the environment. This includes reporting spills to the appropriate local, state, and federal government agencies, as required, based on the type and volume of the release;
- Refuel training equipment on relatively flat, paved surfaces when possible;
- Refuel when there is no precipitation. Secondary containment would surround the fueling area to prevent an accidental release from migrating beyond the immediate area. Unless necessary, fueling would not be conducted near navigable bodies of water or storm sewer inlets;
- Maintain training equipment to prevent drips or leaks from hoses or reservoirs containing hazardous materials or substances; and
- Maintain all vehicles and equipment to ensure proper working order prior to training events at MMR.

Based on the measures listed above, there would be no significant impact, and no mitigation would be necessary.

Although ICMs would not be used in live-fire training practices, ICM areas are present near the CCAAC. In this area, no training or maneuvers would be conducted due to a significant safety risk, and no military personnel would be admitted. Because training activities conducted under Alternative 1 would follow existing protocol and SOPs, no significant impacts are expected.

*Lead from ammunition.* Training activities proposed under Alternative 1 would continue to deposit lead from small arms into firing range berms. Although lead was identified in soil samples collected during the current hydrogeologic investigation at the Elk Objective, only one sample taken from an isolated location contained a lead concentration exceeding industrial PRGs. Taking into account the limited lead findings on the range following years of historic live-fire training, the expected increase in lead deposition under Alternative 1 is expected to be a less than significant impact. As a part of routine training, military personnel could continue to redistribute soils previously contaminated with lead or otherwise be exposed to lead-contaminated soils during ground maneuvers. However, because the exposure risk is relatively low and training cleanup activities would continue, by following BMPs, the impact would be kept to a less than significant level.

*Pesticides.* Of the various pesticides available for use on plants and animals, only herbicides, such as Round Up, are currently used on MMR,

and they would be used only along the outside edge of the firebreak roads on a monthly to bi-monthly basis, due to UXO concerns. The grass would be cut to control the wildfire fuel loads within the CCAAC.

Pesticides currently used at MMR could accumulate in the environment. As a part of routine training, military personnel could be exposed to pesticide-contaminated soils during ground maneuvers. BMPs, such as routine monitoring, adhering to manufacturer guidelines, and training cleanup, would maintain pesticide impacts at a less than significant level. Activities associated with Alternative 1 would not affect pesticide management on MMR.

While the hydrogeologic investigations have shown that pesticides are present in Mākua Valley, they were detected in areas with no direct exposure pathway to Army personnel, the public, or the off-site environment. Furthermore, there was no indication of pesticide migration to areas with direct exposure potential. There were no pesticides detected in the air monitoring conducted during recent CALFEXs. DDT was detected in one *muliwai* sediment sample at a less than significant level to human health or the environment. Three herbicide compounds were detected at less than significant concentrations in three *muliwai* sediment samples. Under Alternative 1, the Army would include pesticide constituents in the monitoring program to ensure that increased training and increased movement on the range would not accelerate pesticide migration on- or off-site or indirectly expose Army personnel to pesticide contamination.

*Hazardous waste management.* There would be two new wastes to profile under Alternative 1. As discussed in Section 3.11.4, unused propellant from artillery and mortar training is burned in the on-site burn pan. Propellant from each type of munition is burned separately, and residues from the burning are bagged and stored separately in the HWSSP until analytically profiled and properly disposed of. Like the 105mm high explosive howitzer, the 155mm howitzer would use powder bag charges for weapons firing. This waste would be profiled separately, but there would be no change in the amount of unused propellant burned in the on-site burn pan due to this substituted munition. Incorporating the 120mm mortar system into training at MMR would produce a second new waste to profile through this process. As this munition is similar to existing weapon systems, munitions constituents would be the same, and no new handling or disposal procedures would need to be adopted. The increased quantity of residue generated under Alternative 1 would be minor, and MMR would continue as a conditionally exempt small quantity hazardous waste generator with conditional exclusions under RCRA. For these reasons, the

impact from hazardous waste management under Alternative 1 is expected to be less than significant.

*No Impacts*

*Polychlorinated biphenyls.* PCBs were detected in one soil sample collected in the OB/OD area during the current hydrogeologic sampling, but the concentration was below the PRG. There are no existing PCB sources on MMR and no additional PCB-containing fluids or materials would be introduced under Alternative 1. Training would not create a risk of exposure to PCBs.

*Electromagnetic fields.* As discussed in Section 3.11.4, sources of EMFs include the existing RAWS and mobile equipment used during training. The Army would continue to manage EMFs. Because no new sources of EMFs would be introduced under Alternative 1, there would be no impact related to Army personnel or public exposure to EMFs.

*Petroleum, oils, and lubricants.* Under Alternative 1, no change in the usage, storage, or management of POLs would occur. Only necessary quantities of petroleum products would be staged on-site during training events; they would be removed following each event. Products stored on site for management or contractor use would continue to follow existing SOPs. Field investigators have discovered no POL constituents above EPA Region IX PRG levels. There would be no impacts under Alternative 1.

*Depleted Uranium.* The description for the No Action Alternative is applicable to this alternative. The Army has not confirmed that DU has been used on MMR. No DU containing ammunition would be introduced under this alternative, thus there would be no impact under Alternative 1.

### Alternative 2 (Full Capacity Use with Some Weapons Restrictions)

*Less Than Significant Impacts*

*Unexploded ordnance.* The UXO impacts and handling procedures shown under Alternative 2 are the same as those identified under Alternative 1. Although tracers would be added to the training inventory at MMR under this alternative, these munitions do not produce UXO.

*Ammunition.* Because the Army would introduce the same weapon systems, vehicles, and demolitions training under this alternative as described under Alternative 1, the impacts would be similar. The safe transport and use of ammunition to MMR would be similar to Alternative 1. The increased use of the range under Alternative 2 is expected to use greater amounts of ammunition than under Alternative 1. In addition,

tracer ammunition would be reinstated into the weapons training inventory. The range officer would designate specific firing points for tracers and all ordnance before each training exercise to prevent rounds from escaping the ordnance impact area and firebreak road. With this precaution, the impact of tracer munitions is expected to be less than significant in regards to impacts specific to hazardous materials or waste.

Although not technically a hazardous materials or waste impact, tracer ammunition carries a significant threat of wildfire outbreak due to its ignitable components. Further discussion on the burnout times of tracers and wildfire impacts is presented in Chapter 2 and in Section 4.14.

In addition, Stryker units conducting dismounted training at MMR would fire MK 19 (40mm), 7.62mm, and .50-caliber machine guns from the roads into the CCAAC and the ordnance impact area. Dismounted training conducted by Stryker units would also include firing 120mm mortars into the ordnance impact area. The SOPs for using these munitions would be updated to incorporate the Stryker as the firing point.

*General training.* Training activities and associated impacts are the same as those described under Alternative 1.

In addition, the Stryker would be used in future training efforts at MMR under this alternative. Up to five Strykers would be used as command and control vehicles. Two to three Strykers would be used to fire MK 19 (40mm), 7.62mm, and 50-caliber machine guns from the road into the CCAAC and the ordnance impact area. Strykers also would fire 120mm mortars at the ordnance impact area, as discussed above.

*Lead from ammunition.* Impacts under this alternative are similar to those described under Alternative 1. However, due to the increased number of CALFEXs under this alternative, there would be a greater amount of lead deposition.

*Pesticides.* Impacts under Alternative 2 are similar to those discussed under Alternative 1. Under Alternative 2, the Army would include pesticide constituents in the monitoring program to ensure that increased training and increased movement on the range would not accelerate pesticide migration on- or off-site.

*Hazardous waste management.* Hazardous waste management impacts under Alternative 2 are the same as those identified under Alternative 1.

### *No Impacts*

*Polychlorinated biphenyls.* There are no existing PCB sources on MMR, and no additional PCB-containing fluids or materials would be introduced under Alternative 2. The proposed training activities would not generate a risk of exposure. Impacts are the same as identified under Alternative 1.

*Electromagnetic fields.* No new sources of EMFs would be introduced under Alternative 2. There is no change from Alternative 1. There would be no impact on the public from exposure to EMFs.

*Petroleum, oils, and lubricants.* Impacts under Alternative 2 are the same as those described under Alternative 1.

*Depleted Uranium.* The description for the No Action Alternative is applicable to this alternative. The Army has not confirmed that DU has been used on MMR. No DU containing ammunition would be introduced under this alternative, thus there would be no impact under Alternative 2.

### Alternative 3 (Full Capacity Use with Fewer Weapons Restrictions)

#### Less Than Significant Impacts

*Unexploded ordnance.* The impacts and handling procedures from UXO under Alternative 3 would be similar to those identified under Alternative 2. Although tracers, inert TOW missiles, and illumination munitions would be added to the training inventory at MMR under this alternative, these munitions do not produce UXO. The 2.75-inch rockets would also be added to the munitions inventory under Alternative 3 and could produce additional UXO. Potential UXO would be contained within the MMR ordnance impact area, and no new ordnance impact areas would be introduced under Alternative 3. The CALFEX training area is strictly monitored for UXO following training. Because these measures would continue, no significant UXO impacts are expected from live-fire training at MMR under Alternative 3.

*Ammunition.* Ammunition impacts would be similar to those described under Alternative 2. In addition to the weapon systems described under Alternative 2, Alternative 3 would use inert TOW missiles, 2.75-inch rockets, and illumination munitions. These weapon systems and tracer rounds have historically presented the greatest training-related threat of wildfire ignition for Mākua Valley. Both the inert TOW missiles and the 2.75-inch rockets would be a potential wildfire source due to the elevated temperature of their thrusters and metal parts; the explosive warhead on the 2.75-inch rocket also would present a wildfire hazard.

The 2.75-inch rocket would be fired directly into the ordnance impact area from helicopters flying in a downward path. The downward firing position

enhances the penetration potential of the munition into the ground, thus avoiding indirect landing outside of the firebreak road. Although the rocket can be fired to a range of 32,808 feet (10,000 meters), the new munition would be fired at close range in order to ensure greater accuracy. Helicopters would transport this weapon, which would not be stored on the installation. The rocket motor has been documented as being sensitive to EMF exposure (Federation of American Scientists 2000b).

The Army would consider this and other weapon hazards when incorporating safe storing and handling measures for the newly introduced weapons into the training plans and SOPs to minimize safety hazards. These precautions, and the aforementioned measures for handling and using the new munitions, would minimize the impact to human health and the environment. SOPs already exist for safe management of weapon systems previously used at MMR.

The range officer would designate specific firing points for tracers and all ordnance before each training exercise to prevent rounds from escaping the ordnance impact area and firebreak road. Because safety precautions would be taken and SOPs would be updated in conjunction with the changes in training or the use of new munitions, there are no significant hazardous material or waste-related impacts associated with Alternative 3.

*General training.* General training-related impacts would be the same as those described under Alternative 1.

*Lead from ammunition.* Impacts under this alternative are similar to those described under Alternative 2. Sniper training, to be introduced from the ridgeline between the northern and southern valleys, would be directed into the ordnance impact area, preventing the spread of lead contamination to new areas. Cleanup protocol of this firing point following training would be identical to existing procedures and would therefore maintain a less than significant impact level under Alternative 3.

*Pesticides.* Pesticide impacts under Alternative 3 are the same as those described under Alternative 1.

*Hazardous waste management.* Hazardous waste management impacts are the same as those identified under Alternative 1.

### No Impacts

*Polychlorinated biphenyls.* Impacts under this alternative are the same as those described under Alternative 1.

*Electromagnetic fields.* No new sources of EMFs would be introduced under Alternative 3; there is no change from Alternative 2. There would be no impact on the public from exposure to EMFs.

*Petroleum, oils, and lubricants.* Impacts under this alternative are identical to those described under Alternative 1.

*Depleted Uranium.* The description for the No Action Alternative is applicable to this alternative. The Army has not confirmed that DU has been used on MMR. No DU containing ammunition would be introduced under this alternative, thus there would be no impact under Alternative 3.

### Alternative 4 (Full Capacity Use with Fewer Weapons Restrictions), Pōhakuloa Training Area

#### Significant Impacts Mitigable to Less than Significant

*Lead from ammunition.* Based on the results of a 2002 soil study at PTA, the highest lead concentrations were detected in samples from Ranges 9, 10, and 11. Two of these samples exceeded the industrial soil PRG.

At the training ranges, berms would be used to stop projectiles fired at the ranges that are expected to contain significant quantities of lead and potentially UXO. The Army would retain lead-contaminated soils from existing berms on-site and use the soils in the construction of new berms associated with the new ranges. If lead-contaminated soils were not reused at the site for new berm construction, contaminated soils would be remediated for lead in accordance with applicable federal and state standards.

#### Less Than Significant Impacts

*Unexploded ordnance.* The impacts and handling procedures from UXO under Alternative 4 would be similar to those identified under Alternative 3. Less than significant impacts are expected from live-fire training at PTA due to the location and orientation of this range and procedures in place to detect and destroy UXO. Potential UXO would be contained within the existing PTA ordnance impact area, and no new ordnance impact areas would be introduced under Alternative 4. This impact area is in a very remote location that is closed and inaccessible to the public. The CALFEX training area would be strictly monitored for UXO following training and existing procedures would be implemented to remove and or destroy UXO.

*Ammunition.* SDZs are configured toward a cumulative ordnance impact area (approximately 51,000 acres [20,634 hectares]) in the central portion of PTA. Their designation would place emphasis on the effects of ricochets at closer ranges. Although ICMs are no longer used on any

Army training land due to the extreme safety risk (HQDA 2001), there is a 16,800-acre (6,800-hectare) ICM impact area within the larger impact area. ICMs, also referred to as cluster bombs, are artillery munitions that contain multiple submunitions. The ordnance impact area and ICM area are not accessible to the public.

During training, ordnance is temporarily stored in ammunition holding areas on PTA for safety and security purposes. At the completion of training, unused ammunition is returned to the ammunition supply point on WAAF. Permanent ammunition storage is not authorized on PTA.

Additional ammunition would be brought from WAAF or Lualualei to PTA via boat (LSV or barge) or helicopter. If boats were used, the ammunition would be driven from Kawaihae Harbor to PTA. There have been no accidents involving the transport of ammunition in the last two years. Per state regulation, military convoys are not authorized to operate on state highways during "rush hour" between the hours of 6:00 AM and 8:30 AM or between 3:00 PM and 6:00 PM, Monday through Friday. Movements on Saturday, Sunday, and holidays are by special request only. Military convoys are also normally restricted from operating on state highways between 6:00 AM and 8:30 AM and between 3:00 PM to 6:00 PM during the normal work week. This is to avoid peak traffic hours and to reduce the risk of accidents. In addition, convoys and ammunition movements normally are not authorized to pass through a school zone when students are in transit; that is, when school zone lights are flashing.

*General training.* General training-related impacts would be the same as those described under Alternative 1.

*Pesticides.* Although Alternative 4 would generate a slight increase in the amount of pesticides used on these installations in order to maintain the proposed ranges, pest management would continue to be managed by DPW in accordance with the USAG-HI Integrated Pest Management Plan, and pesticides would continue to be stored at the Environmental Shop on PTA. This impact would be considered less than significant.

*Hazardous Waste Management.* Hazardous waste generated under Alternative 4 is the same as described under Alternative 1. PTA would continue as a small quantity generator, and no new handling or disposal procedures would need to be adopted. For these reasons, the impact from hazardous waste management under Alternative 4 would be expected to be less than significant.

*Petroleum, oils, and lubricants.* Soil samples analyzed in 1993 indicated that four areas were contaminated with low concentrations of petroleum-

based substances (likely used motor oil and fuel oil such as kerosene). Gross petroleum was not apparent based on field observations and analytical results indicated that VOCs and SVOCs were below EPA PRGs. If left in place, this would pose minimal, if any, threat to human health and the environment (US Army and USACE 2004). Under Alternative 4, no change in the usage, storage, or management of POLs would be required, and impacts would be less than significant.

*Depleted Uranium.* In 2006 and 2007, The Army conducted a survey for DU at the ranges at SBMR, MMR, and PTA. The survey confirmed that DU is present at PTA. The DU present at PTA includes components of the Davy Crockett weapons system. These components have been found only in the impact areas of PTA and all sampling data analyzed to date indicate that DU remains within the impacts areas. After several surveys, DU has not been found in other locations though additional sampling continues (Cabrera Services 2008). Follow-on characterization surveys conducted in December 2008 at PTA indicated that DU is not present at the twin Pu'u range site considered under Alternative 4 of this EIS. Although, the Army considers the presence of DU in the impact area at PTA to contribute to a less than significant impact rating under this alternative.

There are several reasons that there would be little or no risk to either local residents or employees who work on the installation. First, the fragments from the spotting rounds are well inside controlled areas (impact ranges) of garrison property where contact with the material would be unlikely because access to impact areas is restricted. Second, DU is only slightly radioactive. Third, DU's properties have been studied for decades, and are well understood by scientists and health experts. Many non-military agencies, to include the World Health Organization (WHO) and RAND Corporation, have found that possible impacts to health from DU at impact sites are extremely unlikely (Cabrera Services 2008). Finally, the potential for DU to move or migrate from the PTA impact areas is very unlikely due to the hydrogeological conditions.

AR 385-63, *Range Safety*, prohibits the use of DU ammunition for training worldwide. This policy has been in effect for over 20 years. Thus, no additional DU containing ammunition would be introduced under Alternative 4.

### No Impacts

*Polychlorinated biphenyls.* A preliminary assessment/site inspection of four potential contaminant sources (a former pesticide storage area, a fire training area, and two landfills) was conducted within the boundaries of PTA in 1993. The analytical results for soil sampling in these areas

indicated that PCB concentrations were all below the listed PRG. Devices that were found to contain regulated levels of PCB have been either removed and upgraded with non-PCB devices, or were retrofilled or removed, drained, packaged, and disposed of in accordance with 40 CFR Part 761. There are no existing PCB sources on PTA and no additional PCB containing fluids or materials would be introduced under Alternative 4. (US Army and USACE 2004).

*Electromagnetic fields.* Because no new sources of EMFs would be introduced under Alternative 4, there would be no impact related to Army personnel or public exposure to EMFs.

## 4.12 SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE

### 4.12.1 Impact Methodology

The impact analysis presents projected conditions under No Action and the Proposed Action alternatives. Potential disproportionate effects on low-income or minority populations and the potential for increased adverse health effects on children are also assessed to identify environmental justice effects.

The impact analysis identifies and describes the potential project impacts on ROI population, employment, income, business volume, and schools (the ROI is defined for MMR as Honolulu County and for PTA as Hawai‘i County). Also assessed are the effects on housing, environmental justice, and the protection of children. To determine whether low-income and minority populations could be disproportionately affected by the alternatives, the proportion of these groups in the areas surrounding the proposed project were identified. If high percentages of low-income and minority populations were identified, the potential was addressed for these populations to be disproportionately affected by environmental or public health and safety effects (e.g., increased traffic through their neighborhoods, potential exposure to hazardous materials). To evaluate whether children could encounter disproportionate environmental health or safety risks, the population under the age of 18 surrounding the proposed project areas was estimated. The potential environmental health and public safety risks for each alternative were identified and evaluated for disproportionate proximity to populations of children, in comparison to other age groups.

### 4.12.2 Factors Considered for Determining Significance of Impacts

Factors considered in determining whether an alternative would have a significant impact on socioeconomics and environmental justice include the extent or degree to which its implementation would result in the following:

- Adversely affect the unemployment rate for the county;
- Change total income;
- Change business volume;
- Affect the local housing market and vacancy rates, particularly with respect to the availability of affordable housing;
- Change any social, economic, physical, environmental, or health conditions in such a way as to disproportionately affect any particular low-income or minority group; or

- Disproportionately endanger children in areas on or near the project site.

In addition to the project description in Chapter 2, the following assumptions were used for the analysis of project impacts:

- The Proposed Action would not generate any employment either in the short term or long term; and
- The Proposed Action would have no impact on population or housing. Therefore, in terms of socioeconomic resources, no impacts would be expected.

### 4.12.3 Summary of Impacts

**Summary of Potential Socioeconomics and Environmental Justice Impacts**

| Impact Issues | No Action Alternative | Alternative 1 MMR (Reduced Capacity Use with Some Weapons Restrictions) | Alternative 2 MMR (Full Capacity Use with Some Weapons Restrictions) | Alternative 3 MMR (Full Capacity Use with Fewer Weapons Restrictions) | Alternative 4 PTA (Full Capacity Use with Fewer Weapons Restrictions) |
|---|---|---|---|---|---|
| Economic development | ○ | ○ | ○ | ○ | ⊙+ |
| Protection of children | ⊙ | ⊘ | ⊘ | ⊘ | ○ |
| Environmental justice | ⊙ | ⊗ | ⊗ | ⊗ | ○ |

LEGEND:
⊗ = Significant impact
⊘ = Significant impact mitigable to less than significant
⊙ = Less than significant impact
○ = No impact
\+ = Beneficial impact

#### *No Action Alternative*

*Less Than Significant Impacts*

*Protection of children and environmental justice.* There would be less than significant impacts under this alternative. Non-live fire training would occur. Live ammunition would not be transported on Farrington Highway through Wai‘anae. There would be limited military vehicular traffic on Farrington Highway and aircraft and UAV flights over MMR. Security fencing at the installation would be maintained to prevent unauthorized access and potential exposure to site hazards.

Under No Action, nonlive fire training would impact the number of days when ATI and archeological sites could be accessed. Aircraft lasing and UAV training would probably be at a frequency well less than CALFEX exercises and CLF training. Combined with consultation discussions with the Wai‘anae community, impacts would be reduces to less than significant.

#### No Impacts

*Economic development.* Under No-Action, no effects are expected because there would be no substantial change to population, employment, or business volumes in the ROI. The Army would continue to train at MMR, although it would be non-live-fire training. No change in employment or business volume associated with this alternative (such as purchasing supplies from local businesses) is expected.

### Alternative 1 (Reduced Capacity Use with Some Weapons Restrictions)

#### Significant Impacts

*Impact 1: Environmental justice (access to Areas of Traditional Importance and archeological sites).* Impacts on public access of ATI are addressed in Section 4.10. Under Alternative 1, use of the range for 242 training days would reduce the number of days when ATI and archeological sites could be accessed. Because community members within the Wai‘anae CCD have been the primary participants in cultural access events at MMR, they would be disproportionately affected by the access restrictions.

*Regulatory and administrative mitigation 1.* Regulatory and administrative measures to mitigate this impact would be the same as those identified in Section 4.10 for cultural resources relative to cultural site access. However, consultation measures identified in that section would not likely be able to reduce the impacts below the significance threshold and Alternative 1 would result in a significant impact.

*Additional mitigation 1.* No additional mitigation measures have been identified.

#### Significant Impacts Mitigable to Less than Significant

*Impact 2: Protection of children and environmental justice (transport of ammunition).* Under Alternative 1, the Army would transport live ammunition, weapons, and propellants to and from MMR. During the occasional times that ground transport would be used, Army inconsistencies with Hawai‘i DOT policies and instructions concerning ammunition transport are considered to be a significant impact (see Section 4.6). The Army would provide no advance notification to allow

the police or fire departments to undertake preventative measures to protect the public in event of an accidental explosion when ammunition is being transported on Farrington Highway through Waiʻanae. The Waiʻanae CCD has a high percentage of low-income and minority populations, as well as children who walk along or wait for buses along the Farrington Highway. Because ammunition transportation routes pass through the Waiʻanae CCD, this community, relative to other communities on Oʻahu, would bear a disproportionate potential public health and safety risk from any accidental explosions.

*Regulatory and administrative mitigation 2.* No regulatory and administrative mitigation measures have been identified.

*Additional mitigation 2.* Additional mitigation measures for this impact are the same as those identified in Section 4.6 for traffic and transportation relative to ammunition hauling policies (see Impact 1 under Section 4.6). The Army would transport ammunition in accordance with all Hawaiʻi DOT rules and regulations.

### No Impacts

*Economic development.* No effects are expected because Alternative 1 would not change population, employment, or business volumes in the ROI. The Army would continue to train at MMR. No change in employment or business volume associated with MMR training (such as purchasing supplies from local businesses) is expected.

*Protection of children (hazardous materials and waste).* Hazardous materials or waste would not compromise the health or safety of children. As discussed in Sections 4.7, 4.8, and 4.11, MMR has no known contamination sources that would affect off-post residences. The Army has conducted extensive field investigations as part of this EIS to evaluate the potential for contaminants to migrate beyond the boundaries of MMR. MMR also has a spill plan to minimize spills of hazardous materials.

*Environmental justice (hazardous materials and waste).* Hazardous materials or waste would not compromise the health or safety of low-income or minority populations. As discussed in Sections 4.7, 4.8, and 4.11, MMR has no known contamination sources that would affect off-post residences. The Army has conducted extensive field investigations as part of this EIS to evaluate the potential for contaminants to migrate beyond the boundaries of MMR. MMR also has a spill plan to minimize spills of hazardous materials.

*Environmental justice (recreation at Mākua Beach).* No environmental justice effects are expected. There would be no disproportionately high or

adverse human health or environmental effects on minority or low-income populations as a result of implementing Alternative 1 under either the 10 to 19 CALFEX scenarios. MMR has sufficient acreage to provide SDZs between the training range and any residential or public areas.

Recreational users of Mākua Beach would be exposed to noise from helicopter overflights, mortars and artillery, and demolitions if the recreational users are on the beach when the Army is conducting training at MMR. Significant and unmitigable noise impacts would occur under Alternative 1. Projected US Army CHPPM noise contours from the level of ordnance to be used under Alternative 1 would result in Mākua Beach being within a Zone III (greater than 70 dB CDNL) noise contour (see Figures 4.5-1 and 4.5-2 in Section 4.5). The Zone III contour extends over the beach area. Zone III is considered incompatible with noise sensitive land uses (such as housing, schools, and in this case, a recreation area), so the impact level is considered significant. However, minority or low-income populations are not expected to bear a disproportionate share of the adverse noise impacts on recreation because Mākua Beach is a public beach, and all members of the public have equal access to the beach. Additionally, similar beaches are available north and south of Mākua Beach that are not highly used on weekday mornings and could be used during training. Therefore, no disproportionate adverse impacts from noise on minority or low-income populations would occur under Alternative 1. See Sections 4.1 and 4.5 for further discussion on impacts and mitigation measures considered.

### *Alternative 2 (Full Capacity Use with Some Weapons Restrictions)*

#### *Significant Impacts*

*Impact 1: Environmental justice (access to Areas of Traditional Importance and archeological sites).* Impacts and mitigation measures under Alternative 2 are similar to those described for Alternative 1.

#### *Significant Impacts Mitigable to Less than Significant*

*Impact 2: Protection of children and environmental justice (transport of ammunition).* The impacts and mitigation measures for this alternative are similar to those described for Alternative 1.

#### *No Impacts*

*Economic development.* Impacts identified under this alternative are similar to those described for Alternative 1.

*Protection of children (hazardous materials and waste).* Impacts identified under this alternative are similar to those described for Alternative 1.

*Environmental justice (hazardous materials and waste).* Impacts under Alternative 2 are similar to those described for Alternative 1.

*Environmental justice (recreation at Mākua Beach).* The impacts under this alternative are similar to those described for Alternative 1.

### Alternative 3 (Full Capacity Use with Fewer Weapons Restrictions)

#### Significant Impacts

*Impact 1: Environmental justice (access to Areas of Traditional Importance and archeological sites).* Impacts and mitigation measures under Alternative 3 are similar to those described for Alternative 1.

#### Significant Impacts Mitigable to Less than Significant

*Impact 2: Protection of children and environmental justice (transport of ammunition).* The impacts and mitigation measures are similar to those described for Alternative 1.

#### No Impacts

*Economic development.* Impacts identified under this alternative are similar to those described for Alternative 1.

*Protection of children (hazardous materials and waste).* Impacts identified under this alternative are similar to those described for Alternative 1.

*Environmental justice (hazardous materials and waste).* Impacts under Alternative 3 are similar to those described for Alternative 1.

*Environmental justice (recreation at Mākua Beach).* The impacts under this alternative are similar to those described for Alternative 1.

### Alternative 4 (Full Capacity Use with Fewer Weapons Restrictions), Pōhakuloa Training Area

#### Less than Significant Impacts

*Economy*. The Proposed Action would be expected to have direct and indirect minor beneficial effects on employment, income, and business volume in Hawai‘i County and Pā‘auhau-Pa‘auilo CCD, North Kona CCD, South Kohala CCD, and North Hilo CCD, resulting from range construction and training at PTA, and the resultant increased expenditures that would stimulate the economy within the ROI. The expenditures and employment associated with construction would increase ROI sales volume, income, and employment. The economic benefits would mainly last for the duration of the range construction. These changes in the specific economic parameters (sales, income, and employment) would fall

within historical fluctuations, be within the capacity of society and the economy to absorb, and are considered minor.

*Employment.* There would be a less than significant impact on employment. Construction activities for the range would result in a temporary increase in employment. Subsequent indirect increases in employment are produced by the multiplier effect resulting from increased spending by construction employees. Increased construction employment in Hawai‘i County would be considered temporary and less than significant.

*Income.* There would be a less than significant impact on income. Changes in income represent the wage and salary payments made to construction workers, primarily during construction of the range. The Proposed Action would only temporarily increase total annual income of Hawai‘i County.

### No Impacts

*Population and housing.* There would be no impacts on population or housing. No new staff would be added at PTA. There would be no increased military population at PTA and, therefore, no increase in the demand for housing.

*Protection of children.* There would be no impact on the health and safety of children. A Girl Scout camp is located about 8 miles (13 kilometers) from the PTA cantonment area, a distance that would prevent the camp from being impacted by noise from proposed construction projects. Nor would the camp be impacted from noise or dust from training maneuvers because no training occurs near the camp. Proposed PTA construction projects would take place in areas that are off-limits to the general public. Restricted areas would continue to be posted with signs, enclosed by a fence, or stationed with guards. Risks to children and to the general public would be minimized by strictly adhering to applicable safety regulations and procedures.

*Environmental justice.* No disproportionate effects on environmental justice populations would occur. PTA is relatively isolated, and there are no military or civilian personnel permanently stationed there. There are no residential neighborhoods or schools nearby that would be affected by noise or traffic from training or construction activities. Potential effects to native Hawaiian cultural or spiritual resources, or to Hawaiian Homelands, are addressed in Section 3.10, Cultural Resources.

## 4.13 PUBLIC SERVICES AND UTILITIES

This section is an analysis of the potential impacts on public services and public utilities. Public services include police, fire, and emergency medical. Public utilities include potable water, stormwater, wastewater, solid waste management, telephone, and electricity.

### 4.13.1 Impact Methodology

An impact is identified when the requirements of a project alternative increase demand on an existing public service or public utility. Analyzing a project alternative and its anticipated need for public safety and public utility services identifies potential impacts. When a project alternative requires additional resources of a public service or utility, the increase in demand is estimated. These estimates are compared to the capacity of the public utility to determine if the capacity would be exceeded.

### 4.13.2 Factors Considered for Determining Significance of Impacts

Factors considered in determining if an alternative would have a significant impact on public services or utilities include the extent or degree to which its implementation would result in the following:

- Disrupt a public service as a result of a programmatic demand beyond the capacity of the provider;
- Require a public utility service beyond the capacity of the provider to the point that substantial expansion, additional facilities, or increased staffing levels would be necessary; or
- Generate additional quantities of stormwater runoff that could not be disposed of by the existing drainage system.

### 4.13.3 Summary of Impacts

***No Action Alternative***

*Less than Significant Impacts*

*Solid Waste Management.* Less than significant impacts would be expected as a result of solid waste generation associated with ongoing air lasing target maintenance, road maintenance activities, and activities associated with command and control elements and blank ammunition training. Increasing the frequency of contracted solid waste management services could address any additional nonhazardous solid waste generated by increased activity at MMR.

*No Impacts*

*Police, fire, and emergency medical service.* No impacts on police, fire, and emergency medical services are expected because there would be no increase in the demand for service. MMR would remain under the

jurisdiction of federal police and fire services. County ambulance and emergency medical services would remain available in the area.

**Summary of Potential Public Services and Utilities Impacts**

| Impact Issues | No Action Alternative | Alternative 1 MMR (Reduced Capacity Use with Some Weapons Restrictions) | Alternative 2 MMR (Full Capacity Use with Some Weapons Restrictions) | Alternative 3 MMR (Full Capacity Use with Fewer Weapons Restrictions) | Alternative 4 PTA (Full Capacity Use with Fewer Weapons Restrictions) |
|---|---|---|---|---|---|
| Police, fire, and emergency medical service | ○ | ⊙ | ⊙ | ⊙ | ⊙ |
| Potable water | ○ | ⊙ | ⊙ | ⊙ | ⊙ |
| Wastewater | ○ | ⊙ | ⊙ | ⊙ | ⊙ |
| Solid waste management | ⊙ | ⊙ | ⊙ | ⊙ | ⊙ |
| Stormwater | ○ | ○ | ○ | ○ | ⊙ |
| Telephone | ○ | ○ | ○ | ○ | ⊙ |
| Electricity | ○ | ○ | ○ | ○ | ⊙ |

LEGEND:
⊗ = Significant impact
⊘ = Significant impact mitigable to less than significant
⊙ = Less than significant impact
○ = No impact
+ = Beneficial impact

*Potable water and wastewater.* No impacts are anticipated on the potable water and wastewater under No Action. The Army's presence at MMR would likely be reduced to minimal levels, involving maintenance and stewardship programs only.

*Stormwater.* No impact on the stormwater system is anticipated under No Action. No construction that could increase runoff is planned at MMR. Stormwater quality as it is affected by soil erosion is addressed in Section 4.8.

*Telephone.* No impact is expected on the telephone system under No Action. Telecommunication systems at MMR are being converted to the DoD HITS system, at which time MMR would receive a new phone number. The conversion would relieve demand on the commercial and residential telephone system operated by Verizon.

*Electricity.* No impacts on the electrical system are expected under No Action. Electrical consumption is expected to remain at or below present levels with the reduction of activities at MMR.

### Alternative 1 (Reduced Capacity Use with Some Weapons Restrictions)

#### Less than Significant Impacts

*Police, fire, and emergency medical service.* Less than significant impacts on police, fire, and emergency medical services are expected. MMR would remain under the jurisdiction of federal police and fire services. Emergency medical transport is typically provided by an available military vehicle or helicopter.

*Potable water.* The average daily consumption of water between September 2001 and February 2003 was approximately 6,700 gallons per day (25,400 liters per day), equivalent to 0.073 percent of the average Waianae Water District consumption for fiscal year 2001. An increase in employee consumption of potable water is not likely because staffing levels are not expected to increase.

Units training at MMR typically furnish their own 500-gallon (1,900-liter) water trucks, or "water buffaloes," as a source of drinking water. A full water truck is capable of providing a day's supply of water to a 150-soldier company. Potable water is drawn from the MMR freshwater tank to refill the water trucks when needed.

Proposed mitigation measures for wildfire management would increase the on-site storage capacity and would improve water distribution for fighting fires.

Compared to historic levels, the total quantity of water used at MMR is expected to remain approximately the same. Proposed improvements would eliminate the need to obtain water from an off-site county-owned fire hydrant. The increased storage and improved delivery systems are intended to allow trucks to be filled on-site and to eliminate the need for water trucks entirely.

*Wastewater.* Training under Alternative 1 would have a less than significant impact on the permanent wastewater system as staffing levels are expected to remain constant. Additional portable toilets would be supplied to meet the demand of the units training at MMR.

*Solid waste management.* Alternative 1 would not have a significant impact on solid waste management. Increasing the frequency of contracted

solid waste management services could address any additional nonhazardous solid waste generated by increased activity at MMR.

*No Impacts*

*Stormwater.* No impact on the stormwater system is anticipated under Alternative 1. No construction that could significantly increase runoff is planned at MMR. Stormwater quality as it is affected by soil erosion is addressed in Section 4.8.

*Telephone.* No impact is expected on the telephone system under Alternative 1. Telecommunication systems at MMR are being converted to the DOD HITS system, at which time MMR would receive a new phone number. The conversion would relieve demand on the commercial and residential telephone system operated by Verizon.

*Electricity.* Impacts on the electrical system are not expected under Alternative 1. Units training at MMR typically supply their own power with portable generators. The sole exception is power for the tactical operations center, which is supplied by the administration building as a matter of convenience. The tactical operations center is capable of operating on generator power as well. Electrical consumption is expected to be similar to historic levels.

### Alternative 2 (Full Capacity Use with Some Weapons Restrictions)

The public services and utility requirements and potential impacts are the same as those described under Alternative 1.

### Alternative 3 (Full Capacity Use with Fewer Weapons Restrictions)

The public services and utility requirements and potential impacts are the same as those described under Alternative 1.

### Alternative 4 (Full Capacity Use with Fewer Weapons Restrictions), Pōhakuloa Training Area

*Less than Significant Impacts*

*Police, fire, and emergency medical service.* Less than significant adverse effects on law enforcement, fire protection, and emergency medical services would be expected. The increase in training activities could increase the demand for these services, but they should be adequate to accommodate such an increase. There would be no change in jurisdiction for any law enforcement agencies or fire departments (US Army and USACE. 2004).

*Potable water.* Increased training maneuvers could increase the demand for potable water at PTA, but this should not have a significant adverse effect on the potable water supply system. Water supplied to the Twin Pu‘u range location would be brought in by truck, and no wells or distribution lines would be required.

*Wastewater and Stormwater.* The wastewater and stormwater collection and treatment systems at PTA are anticipated to have adequate capacity to handle increases in volume that could result from Alternative 4. New impervious surfaces would be limited to range control and maintenance facilities.

*Solid waste management.* The range to be constructed would generate construction and demolition waste that could reduce the useful life of the landfill, but this reduction should be negligible. This waste stream would be minimized by recycling. A minimal increase in solid waste would result from increases in training. These changes should be within the capacity of the existing waste collection and disposal system.

*Telephone.* Construction of the range maintenance and control facilities would include some additional telecommunications lines and fiber optic cabling. These cables would extend service from existing locations.

*Electricity.* The HELCO substation and distribution system is estimated to be adequate to supply the anticipated energy demands of the range facility. Secondary power lines from these primary overhead lines would be extended underground to pad-mounted transformers on the site, from which range targets, lights, maintenance, and control facilities would be powered.

## 4.14 WILDFIRES

### 4.14.1 Impact Methodology

Most fire history files for MMR and PTA are incomplete and were primarily retained as manual records, which were destroyed after five years, following disposition of records, in accordance with the Modern Army Recordkeeping System (USARHAW and 25th ID[L] 2003). As a result, limited historical wildfire records are still available and complete to compare wildfire incidences from previous training to the proposed training. Therefore, the following documents were used as the primary sources of summarized historical wildfire information:

- *Integrated Wildland Fire Management Plan, O'ahu and Pōhakuloa Training Areas* (USARHAW and 25th ID[L] 2003);
- *Analysis of Fire Management Concerns at Mākua Military Reservation* (Beavers et al. 1999);
- *Integrated Natural Resources Management Plan and Environmental Assessment/Finding of No Significant Impact 2002-2006 O'ahu* (USARHAW and 25th ID[L] 2001b);
- *Integrated Natural Resources Management Plan and Environmental Assessment/Finding of No Significant Impact 2002–2006 Pōhakuloa Training Area* (USARHAW and 25th ID[L] 2001c); and
- *Final Environmental Impact Statement, Permanent Stationing of the 2/25th Stryker Brigade Combat Team* (US Army and USAEC 2008)

Based on the background wildfire information provided by these documents and on previous Army training activities, the likelihood of proposed training activities to start a wildfire was assessed. The following issues influence wildfire ignition:

- Frequency, timing, and location of training activities;
- Type of weapons used during training;
- Implementation of the IWFMP; and
- Vegetation composition.

Potential direct impacts from wildfires include, for example, damage to biological resources and cultural resources and impairment of air quality. Examples of potential indirect impacts from wildfires include increased soil erosion rates due to removal of vegetation from the land and diminished water quality from water running over land cleared by fire.

These impacts are addressed in their respective resource sections in this chapter and could occur from the ignition and spread of a wildfire, either from activities associated with training or the reignition of a fire thought to be extinguished. Because it is possible for many fires to affect a relatively limited area, resulting in limited impacts, and for one fire to affect a large area, resulting in many impacts, the frequency of wildfires is not used as a means for assessing the impacts of wildfires. Instead, the potential for wildfire ignition is used as the criterion for assessing wildfire impacts.

This methodology assumes no white phosphorus would be used during training and that vegetation management would take place at MMR and PTA under Alternatives 1, 2, 3, and 4; only the fuel breaks would be maintained under No Action.

Vegetation management is used to prevent the spread of a fire by creating firebreaks and to control the abundance of highly flammable plants so that fires cannot easily ignite. Conducting prescribed burns is one form of vegetation management; mowing and applying herbicides are others. The Army is evaluating the environmental effects of vegetation management, including prescribed burns, in a separate NEPA document.

Under Alternatives 1, 2, 3, and 4, smoking may be permitted only in the administration area, bivouac site, or other designated areas. In the event of a fire at any location, training is stopped immediately and the unit takes all appropriate actions to put out the fire.

### 4.14.2 Factors Considered for Determining Significance of Impacts

Factors considered in determining whether an alternative would have a significant wildfire ignition potential include the extent or degree to which implementing the alternative would involve the following wildfire ignition issues:

- Use of weapons with a history of causing wildfires at MMR or PTA;
- Occurrence of nighttime training;
- Use of weapons not previously used at MMR or PTA; and
- Use of weapons capable of landing outside the firebreak road.

The potential ignition of a wildfire was analyzed within the ROI. There would be less than significant impacts under No Action. The potential for the ignition of a wildfire would have a significant and mitigable impact under Alternative 1. Alternatives 2, 3, and 4 would have significant impacts.

### 4.14.3 Summary of Impacts

**Summary of Potential Wildfire Impacts**

| Impact Issues | No Action Alternative | Alternative 1 MMR (Reduced Capacity Use with Some Weapons Restrictions) | Alternative 2 MMR (Full Capacity Use with Some Weapons Restrictions) | Alternative 3 MMR (Full Capacity Use with Fewer Weapons Restrictions) | Alternative 4 PTA (Full Capacity Use with Fewer Weapons Restrictions) |
|---|---|---|---|---|---|
| Wildfire ignition | ⊗ | ⊘ | ⊗ | ⊗ | ⊗ |

LEGEND:
⊗ = Significant impact
⊘ = Significant impact mitigable to less than significant
⊙ = Less than significant impact
○ = No impact
+ = Beneficial impact

#### *No Action Alternative*

*Significant Impacts*

*Impact 1: Aircraft participating in nonlive-fire training activities could crash within the MMR ROI, resulting in fire ignition. With respect to unmanned aerial vehicles (UAVs), as stated in the 2007 MMR BO (USFWS 2007), UAVs may take off at Mākua and fly over the MMR ROI without on-site or standby wildland fire suppression staffing. The size of the UAV, amount of fuel contained within it, and the low likelihood of a crash poses little potential for a fire event. Because of the lack of fire suppression staffing, fire ignition at MMR could mean a minor fire could go out of control and have devastating impacts on sensitive species within the MMR ROI. Under this alternative, there would be reduced fire-fighting capabilities onsite to extinguish any resulting fire.*

*Impact 2: Wildfire ignition.* No military live-fire training would occur under No Action. Under this alternative, the Range and Training Land Program, the ITAM program, the IWFMP, and other environmental management activities and programs would continue but at a reduced level. While Army live-fire and other types of weapons firing activities, the primary sources of historical wildfire ignition, would no longer be present, the continuation of range management would prevent highly flammable exotic plant species to increase thus reducing risk of a fire from spreading. The maintenance of fire and fuel breaks would also reduce the probability of fires igniting on post from spreading into sensitive areas. However, the reduction in fire-fighting support during training activities proposed under the No Action Alternative, could leave the area vulnerable if a fire were to ignite.

*Regulatory and administrative mitigation*. The Army would continue to implement the INRMP and fire prevention measures contained within the IWFMP.

*Additional mitigation 1*. Potential mitigation measures for this impact include having standby wildland fire suppression staffing available for the non live-fire events.

*Additional mitigation 2*. Potential mitigation measures for this impact would also include the use of standby helicopters equipped to conduct fire suppression procedures during training events.

### Alternative 1 (Reduced Capacity Use with Some Weapons Restrictions)

*Significant Impacts Mitigable to Less Than Significant*

*Impact 1: Wildfire ignition.* Under Alternative 1, the Army would conduct live-fire training during 10 to 19 CALFEXs and other training exercises. This would include the use of ammunition (such as 120mm HE mortars, 84mm HE anti-tank rockets, Javelins, launcher assault rockets, and the 155mm HE howitzer) that is explosive and flammable, and/or new to training at MMR, and capable of landing outside the firebreak road. This alternative also would include other training activities that are capable of starting wildfires, such as demolitions training.

The proposed weapons and ammunition have historical wildfire ignition records and are capable of igniting wildfires because of their explosive and flammable properties. The 120mm HE mortar, the 155mm HE howitzer, and the Javelin would be the only HE weapons that have not been previously used during training at MMR. The standing operating procedures for MMR in the IWFMP were prepared to address potential wildfire ignition from weapons previously used at MMR. It is expected that the standing operating procedures would be sufficient for managing the newly introduced weapons under this alternative because they are similar to the weapons previously used at MMR. For example, according to the MMR Range Manager, use of the 155mm HE howitzer would be similar to recent use of the 105mm HE howitzer, which did not cause any fires during the 23 recently conducted, live-fire training events (Husemann undated).

Weapons capable of starting wildfires would be used during both the daytime and nighttime exercises (upon authorization). Based on these factors, the potential for wildfire ignition would be significant and mitigable to less than significant. It is noted that the impact from implementing Alternative 1 is potentially less significant than if the Army were to implement the No Action Alternative. Under the No Action

Alternative, the Army would continue to implement the ITAM, IWFMP, and other programs to minimize the risk of fire, but at reduced levels. Although no live-fire training would occur under the No Action Alternative, the reduction in fire-fighting support during training activities proposed could leave the area vulnerable if a fire were to ignite, thus creating a significant but mitigable impact. Conversely, if the decisionmaker were to choose to implement Alternative 1, the use of weapons that are similar or the same as used previously at MMR, combined with the mitigations listed below, could reduce the expected level of impact to less than significant.

*Regulatory and administrative mitigation 1.* A fire manager at MMR is needed to implement the IWFMP. According to *Analysis of Fire Management Concerns at Mākua Military Reservation,* one of the most frequently cited reasons for the decrease in fire prevention and suppression success in the 1990s has been the lack of a well-trained, devoted fire manager on-site at MMR, who could be relied on to implement the IWFMP. At present, MMR does not have a devoted fire manager on-site to implement the IWFMP. The IWFMP outlines the standing operating procedures, which include, for example, the fire danger rating system for MMR. Mitigation measures that were considered include training the MMR range safety manager to also act as the fire manager.

As recommended in *Analysis of Fire Management Concerns at MMR*, additional data input categories would be added to the fire incident report (Beavers et al. 1999). These data input categories include the following:

- Date fire declared out;
- Time of escape (if appropriate);
- Burning index and fire danger rating category every hour that the fire burns;
- Resources used to suppress the fire (including number and type of equipment and personnel);
- Location of the fire burn boundary;
- The number of acres that burned outside of the firebreak road;
- The number of acres that burned inside the firebreak road;
- Whether any of the known endangered species locations were burned;
- Copy of the remote automated weather stations data collected during the fire; and

- Fire situation analysis and large fire narrative for fires that escape initial attack and grow beyond approximately 100 acres (40.5 hectares) in size.

Adding these data input categories to the fire incident report form would improve fire management at MMR by providing more details for post-fire analyses.

USARHAW would continue to inform troops before training about methods for preventing and responding to wildfires.

*Additional mitigation 1a.* Potential mitigation measures for this impact include the Army Range Division enforcing fire-related procedures and policies and taking appropriate action when range safety procedures and policies are violated. Units would be disciplined or admonished administratively when procedures and policies pertaining to wildfires are not followed. Enforcing fire-related procedures and policies and taking appropriate action when range safety procedures and policies are violated would further emphasize to Soldiers the importance of preventing fires at MMR.

The IWFMP would be updated to address nighttime training and management of wildfires. The Army would implement the new nighttime presuppression and suppression procedures identified in the IWFMP (and in accordance with the 2007 BO) to minimize the wildfire risk from nighttime training.

The Army would provide funding and a funding mechanism that would better support the IWFMP, which contains specific guidance, procedures, and protocols for managing wildfires. Also, the Army would install fiber optics to improve local area network telecommunications during fire fighting operations. In addition, a water distribution line would be installed to the upper dip pond to improve water resupply capability.

*Additional mitigation 1b.* Potential mitigation measures include installing a new radio repeater within range of Mākua Valley to facilitate communications between Mākua and wildland firefighters and cooperators stationed outside Mākua valley.

*Additional mitigation 2.* Potential mitigation measures for this impact would also include the use of standby helicopters equipped to conduct fire suppression procedures during training events.

### *Alternative 2 (Full Capacity Use with Some Weapons Restrictions)*

*Significant Impacts*

*Impact 1: Wildfire ignition.* The impacts addressed above under Alternative 1 for wildfires would also occur under Alternative 2. Additionally, under Alternative 2, up to 50 CALFEXs would be conducted in one year, which would result in at least 50 days of live-fire training.

Under Alternative 2, the Army would resume the use of tracers, in addition to using the weapons and artillery discussed above under Alternative 1. The burning compound in tracers can ignite a wildfire. Historically, tracers accounted for 49 percent of the wildfire ignition sources; therefore, the potential for wildfire ignition and spread is expected to increase under Alternative 2.

Resuming the use of tracers dramatically increases the quantity of weapons that have records for igniting most of the historical fires at MMR. These weapons would also be used during nighttime training, when it is more difficult to extinguish a fire. They would also be used approximately once per week, including during the most fire-prone months at MMR; therefore, the potential for igniting a wildfire under this alternative would be significant. Although potential mitigation is identified, it is not expected to reduce the impacts to less than significant, because the IWFMP has only been relied upon to a limited extent in the past to manage wildfire ignition, and this didn't include the use of tracers.

*Regulatory and administrative mitigation 1.* Mitigation measures considered include those described for Alternative 1.

*Additional mitigation 1.* Mitigation measures considered include those described for Alternative 1. Potential mitigation measures include the Army increasing staff to assist the program manager of the Wildfire Management Program. For example, a contracted or full-time 10-person strike team that is wildland fire trained and red carded could be used to respond to fires and assist daily in managing other wildfire prevention areas of the program. This would include working on RAWS, fire cache, fire vehicle maintenance, wildland fire training, fire bucket repair and maintenance, fire trend analysis, and firebreak and fuelbreak maintenance.

Fire fighting infrastructure would be improved to respond to the increased potential for wildfire ignition throughout the year. An additional larger capacity (60,000-gallon [227,000-liter]) water storage tank would be installed and the existing water distribution system would be upgraded to increase flow capacity from the city's water meter to support the new

storage tank, fire hydrant, and overhead filling systems. In addition, a water distribution line would be installed to the upper dip pond to improve water resupply capability.

*Additional mitigation 2.* Potential mitigation measures for this impact would also include the use of standby helicopters equipped to conduct fire suppression procedures during training events.

### Alternative 3 (Full Capacity Use with Fewer Weapons Restrictions)

#### Significant Impacts

*Impact 1: Wildfire ignition.* The impacts under this alternative would be similar to those described under Alternative 2. Inert TOW missiles, illumination munitions, and 2.75-inch rockets would be used under Alternative 3, as well as the weapons and artillery discussed above under Alternatives 1 and 2. These additional weapons and ammunition are capable of igniting a wildfire because of their explosive and flammable properties. The missile or rocket propellant or illumination munitions may not be fully consumed before reaching the ground, creating the potential for igniting a wildfire. The use of the 2.75-inch rocket would be a new addition to training at MMR, as well as the 120mm HE mortar and the 155mm HE howitzer discussed above under Alternative 1. This would increase the amount and intensity of use of previously used and new weapons that have the potential for igniting a wildfire, including during the most fire-prone months at MMR. Also, these weapons are capable of landing outside the firebreak road; because the 2.75-inch rocket is fired from a helicopter rather than from a fixed position, this weapon has an increased risk of misfiring.

For these reasons and the reasons identified under Alternative 2, the potential for igniting a wildfire under this alternative would be significant. Although mitigation is identified, it is not expected to reduce the impacts to less than significant because the IWFMP has been relied on only to a limited extent in the past to manage wildfire ignition and this didn't include the use of tracers. Also, the IWFMP would be used to prevent and suppress fires ignited by new weapons systems; the effectiveness of the IFWMP for these weapons systems is not known.

*Regulatory and administrative mitigation 1.* Mitigation measures considered include those described for Alternatives 1 and 2.

*Additional mitigation 1.* Mitigation measures considered include those described for Alternatives 1 and 2. Potential mitigation measures include the Army leasing or procuring an S70A Fire Hawk or similar helicopter

that is dedicated to wildland fire standby and response to wildfires on military training lands. Staffing (e.g., for another fire truck) and additional aircraft on-site would be increased. In addition, a water distribution line would be installed to the upper dip pond to improve water resupply capability.

*Additional mitigation 2.* Mitigation measures considered include those described for Alternatives 1 and 2. The use of standby helicopters equipped to conduct fire suppression procedures during training events would be considered.

### Alternative 4 (Full Capacity Use with Fewer Weapons Restrictions), Pōhakuloa Training Area

#### Significant Impacts

*Impact 1: Wildfire ignition.* Although the activity would occur on a different Island, the impacts under this alternative would be similar to that of Alternative 3. The weapon systems that will be used for CALFEX training under this alternative would create a greater fire risk, especially since there are no other training activities of this intensity within the area. Training at the proposed Twin Pu‘u site would also increase the threat of wildfires for the Kīpuka Kālawamauna area due to its proximity to the range footprint.

The impact of wildfire on listed species and habitat would be greatly reduced by implementing the BO, PIP, INRMP, IWFMP, and ITAM programs, which would diminish the overall significance of fire on the natural resources at PTA. However, even with the implementation of these plans and programs, wildfire could result in an irretrievable loss of individuals of sensitive species or their habitat, thus the impacts may not be reduced to a less than a significant level.

In addition to the mitigation measures addressed below, a number of measures to reduce the impact and ignition potential of fire were identified in Section 4.9, Biological Resources, such as implementing the IWFMP, eradicating fountain grass, establishing fire and fuel breaks, and habitat restoration following a fire.

*Regulatory and administrative mitigation 1.* Mitigation measures considered include modified versions of those described for Alternatives 1, 2, and 3. The additional data input categories identified in Alternative 1 mitigation would be added to the fire incident report for PTA, as well as enforcing fire-related procedures and policies and taking appropriate action when range safety procedures and policies are violated. As addressed in Alternative 2, an increase in staff to assist the program

manager of the WFMP and of fire fighting infrastructure would be implemented in this alternative. Lastly, as identified in Alternative 3, PTA would also increase the number of available helicopters to ensure there are enough resources to respond to fires that may occur from multiple training activities that take place concurrently on the installation.

*Additional mitigation 1a.* As with the SBCT training, mitigation considered for CALFEX training would be to update the IWFMP to address proposed activities within the Twin Pu‘u range. These updates would be completed before activities commence. Additionally, ITAM geographic information systems would be used to monitor the effectiveness of wildfire management activities. To the extent possible, IWFMP wildfire management infrastructure would be constructed before CALFEX training commenced. During training, appropriate personnel and equipment would be assigned to water resources for responding to a wildfire.