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 456 hours for the UH-60 and 513 hours for the OH-58 for 19 CALFEXs. This would increase for both the UH-60 and OH-58 to 672 hours for 28 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 Tables 4.4-1 and 4.4-2, aircraft emissions associated with 19 or 28 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 19 to 28 CALFEXs. Ordnance use during live-fire training would vary with thetype and design of the exercise. The detonation process converts most of the energetic material in ordnance items into carbon soot and simple gaseous products, such as carbon dioxide, carbon monoxide, water vapor, and nitrogen gas. Trace quantities of undetonated energetic materials and small quantities of particulate matter would also be released.

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
Stryker	2,850 hours	0.069	0.019	0.076	0.043	0.014
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.

Table 4.4-2
Estimated Criteria Pollutants Emitted for 28 CALFEXs (tons/year)

Item	Number or Use	NOx	VOC	CO	PM_{10}	SOx
HMWVV	10,186 hours	0.229	0.071	0.269	0.030	0.036
Stryker	4,244 hours	0.104	0.029	0.112	0.064	0.021
Medium tactical vehicles/vans	8,417 hours	0.189	0.059	0.295	0.038	0.038
Blackhawk	672 sortie hours	0.406	0.090	1.254	0.365	0.365
Warrior	672 sortie hours	0.588	0.588	2.419	0.605	0.572
Chinook	336 sortie hours	0.561	0.176	1.764	0.084	0.025
Shadow UAV	336 sortie hours	0.168	0.588	0.588	0.067	0.039
Small arms ammunition	970,564 rounds	0.007	0.002	0.003	0.004	0.002
Grenades (frag/smoke)	1,288	0.005	0.005	0.009	0.009	0.006
60mm inert mortar	1,288	0.003	0.003	0.003	0.003	0.001
155mm HE howitzer	5,508	0.050	0.050	0.050	0.070	0.003
120mm HE mortar	Unknown	0.000	0.000	0.000	0.000	0.000
HE mortars/howitzers (60mm, 81mm, 105mm)	3,739	0.016	0.001	0.021	0.001	0.001
Bangalore, claymore	336	0.003	0.003	0.003	0.004	0.003
Shape, crater, and C4 charges	224	0.005	0.003	0.003	0.003	0.003
Javelin and AT-4 anti-tank rockets	140	0.005	0.004	0.004	0.004	0.002
Totals		**2.339**	**1.672**	**6.797**	**1.351**	**1.117**

Source: Tetra Tech

Note: Small arm ammunitions 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. Tables 4.4-1 and 4.4-2 show the emissions of criteria pollutants from munitions used for 19 and 28 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 Tables 4.4-1 and 4-2 for mobile sources for 19 and 28 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. 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 to existing roadways and trails.

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 4.4-3 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 4.4-3. 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 4.4-3. 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**.**

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

Table 4.4-3
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 4.4-3, illumination munitions, 2.75-caliber 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-caliber 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-caliber 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.