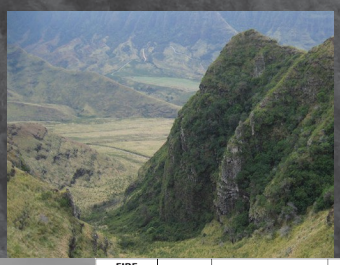
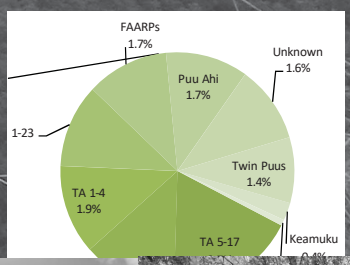
Integrated Wildland Fire Management Plan

United States Army Garrison Hawaii

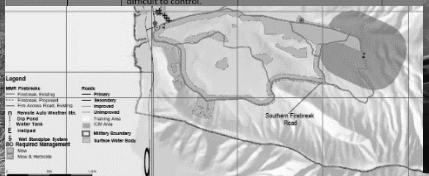
Oahu Installations

March 2023





FIRE DANGER RATING	BURN INDEX	CAUTION TO BE EXERCISED	TRAINING RESTRICTIONS	FIRE HAZAR
Green	0-17.9	Use Normal Caution	Conditions favorable for all munitions & training authorized by the DMR Range SOP. Smoking is permitted.	LOW
Yellow	18-38.9	Use Caution. Fires may start and spread.	Conditions favorable for all munitions & training authorized by the DMR Range SOP. Smoking is permitted.	MODERA
Red	39+	Use Extreme Caution. Ignitions are a near certainty. Fires are very difficult to control.	No pyrotechnics, smoke, simulators, blanks, smoking, or cooking/warming fires allowed.	VERY HI



Integrated Wildland Fire Management Plan

United States Army Garrison Hawaii
Oahu Installations

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September 2023

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Definitions of Some Technical Terms

Term	Definition
Chains per hour	Measurement of speed used in forestry. 1 chain = 66 feet.
Cutting Line	Firefighters using hand tools and/or machinery to create a path completely clear of vegetation to stop the advance of a fire. The width of the line cut is dependent on the fuels in which the fire is burning, and the fire behavior observed.
Direct Attack	Containing a fire by cutting line immediately adjacent to the flaming front.
Dead Fuel Moisture	The moisture content of dead vegetation expressed as a percentage of the dry weight.
Duty Officer	The ranking member of the on-duty Taskforce.
Fine Fuels	Fuels whose moisture content changes rapidly, coming to equilibrium with the surrounding environment in less than 10 hours. Usually these are grasses, leaves, and needles.
Fire Access Road	A road that provides access. It is not a firebreak but must be maintained so that firefighters can get to critical areas.
Fire Behavior	A measure of the characteristics of a fire and as well as a description of the way the fire is spreading. Fire behavior can be described qualitatively (smoldering, creeping, running, torching, etc.) or quantitatively, usually in terms of a rate of spread and flame length.

Fire Intensity	A measure of the heat output of the fire. It can be used qualitatively (hot, cool, etc.) or quantitatively, usually in terms of British Thermal Units per linear foot per second. This specific measurement is called fireline intensity.
Fire Severity	The effect of a fire on an ecosystem. Usually defined by the level of soil heating and mortality of the vegetation.
Firebrand	A burning fuel particle that is carried by wind or convection currents, or by rolling downhill, into unburned fuels. A firebrand is the source of ignition for a spot fire.
Firebreak	A linear path where fuel has been completely cleared to mineral soil.
Fireline	A containment line around the perimeter of an active fire where fuel is cleared to mineral soil.
Fireline Intensity	A specific measure of fire intensity. Usually measured in British Thermal Units per foot per second.
Flame Length	The average length of the flame from the fire front to the average tip of the flames. This is different than flame 'height' which is a measure of how tall the flames are.
Fuelbreak	A linear path within which surface fuels and canopy fuels have been reduced, but not removed in their entirety.
Fuels Management	Modifying vegetation in an area of any shape, usually by cutting or herbiciding, to reduce potential fire behavior, reduce large fire probability, or reduce ignition probability.
Indirect Attack	Containing a fire by cutting line some distance from the flaming front. Usually, the remaining fuels between the fire and the cut line are then removed by intentionally burning them in a controlled fashion.
Live Herbaceous Moisture	The moisture content of live vegetation expressed as a percentage of the dry weight.
Pyrophytic	Literally 'fire loving'. Species that are pyrophytic possess adaptations that make them resistant to mortality during fire and prolific following fire. Often the above ground portions of these species are burned in a fire, but the below ground portion is protected and resprouts shortly afterward.
Rate of Spread	The speed with which the fire is moving forward. Usually expressed in chains per hour.
Spot Fire	A fire ignited outside of the main fire caused by a firebrand being blown or rolling downhill into unburned fuels.

List of Acronyms

AAR	After Action Reviews
BAE	Brigade Aviation Element
BLM	U.S. Bureau of Land Management
BO	Biological Opinion
BSA	Biological Sensitive Area
CAB	Combat Aviation Brigade
CALFEX	Combined Arms Live Fire Exercises
DES	Directorate of Emergency Services
DIS	Directorate of Installation Safety
DMR	Dillingham Military Reservation
DoDI	Department of Defense Instruction
DOFAW	State of Hawaii, Division of Forestry & Wildlife
DOL	Directorate of Logistics
DPW	Directorate of Public Works
EOC	Emergency Operations Center
EOD	Explosive Ordnance Disposal
ESA	Endangered Species Act
FAD	Force Activity Designator
FD	Fire Department
FDRS	Fire Danger Rating System
ARMY FIRE WTF	ARMY FIRE Wildland Taskforce
FFD	Federal Fire Department
FY	Fiscal Year
HMR	Helemano Military Reservation
HQ	Headquarters
IC	Incident Commander
ICS	Incident Command System
ID	Infantry Division
INRMP	Integrated Natural Resources Management Plan
IOC	Installation Operations Center
IPBA	Infantry Platoon Battle Area
ITAM	Integrated Training Area Management
KLOA	Kawailoa Training Area
KTA	Kahuku Training Area
Legacy	The Legacy Resource Management Program
MIPR	Military Interdepartmental Purchase Request
MIST	Minimum Impact Suppression Tactics
MMR	Makua Military Reservation
MPRC	Multi-Purpose Range Complex
NA	Not Applicable
NAVSTA PH	Naval Station Pearl Harbor
NFDRS	National Fire Danger Rating System
NFIRS	National Fire Incident Reporting System
NIFC	National Interagency Fire Center
NWCG	National Wildland Coordinating Group

OHA	Office of Hawaiian Affairs
OIC	Officer in Charge
PPE	Personal Protective Equipment
PTB's	Position Task Books
RAWS	Remote Automated Weather Stations
RH	Relative Humidity
SBER	Schofield Barracks East Range
SBMR	Schofield Barracks Military Reservation
SFO	Senior Fire Officer
SJA	Staff Judge Advocate
SOP	Standing Operating Procedure
SRAA	South Range Acquisition Area
TA	Training Area
T&E	Threatened and Endangered Species
TCCC	Troop Construction Coordination Committee
Tripler	Tripler Army Medical Center
USAG-HI	U.S. Army Garrison Hawaii
USARHAW	U.S. Army Hawaii
USFWS	U.S. Fish & Wildlife Service
UXO	Unexploded Ordnance
WAAF	Wheeler Army Airfield
WFIR	Wildland Fire Incident Report
WFPM	Wildland Fire Program Manager
WFU	Wildland Fire Use
WIMS	Weather Information Management System

Executive Summary

Per Army Wildland Fire Guidance dated 15 March 2021, IMCOM Wildland Fire Program Policy Memo dated 7 Nov 2022, AR 200-1 Chapter 4 Section 3.d.12 'Wildland Fire Management', AR 420-1 Chapter 25 Section X, and to meet land management goals and objectives, the U.S. Army Garrison Hawaii has developed this Integrated Wildland Fire Management Plan (IWFMP). This plan replaces ***The Integrated Wildland Fire Management Plan, United States Army Garrison Hawaii, Oahu Installations***, dated March 2018.

Wildfire poses a significant threat to the sensitive ecosystems, cultural sites, and quality and flexibility of military training at the U.S. Army Garrison Hawaii (USAG-HI). The mission of the 25th Infantry Division is to fight and win military conflicts. This requires numerous actions that pose a high risk of wildfire. This IWFMP presents a comprehensive approach to reduce the frequency of wildfires, the associated costs, and damages at USAG-HI managed properties, and to mitigate the threat to the training mission. USAG-HI will implement this plan to comply with applicable laws and regulations, including the Endangered Species Act and National Environmental Policy Act documentation.

The IWFMP fulfills the requirements established by the Army Wildland Fire Policy Guidance dated March 15, 2021, and reduce the impacts of training related fires on the mission and the environment.

The IWFMP lays out specific guidance, procedures, and protocols for the prevention and suppression of wildfires on training areas and other major properties under the jurisdiction of USAG-HI. Its goal is to convey the methods and procedures necessary to minimize fire frequency, severity, and size while allowing military units the freedom to conduct the training exercises necessary to maintain a high level of combat readiness. It defines the responsibilities of all offices, departments, and agencies involved, and describes fire pre-suppression and suppression actions to be taken.

The document is organized as a Standing Operating Procedure (SOP), with the SOP supported by further documentation in the enclosures including the IWFMP itself. The SOP supersedes all enclosures. The SOP includes specific procedures and requirements regarding wildland fire and wildfire management actions, information, requirements, and upgrades for each installation under USAG-HI jurisdiction. The IWFMP, an enclosure to the SOP, includes information about land use and current conditions, fuels, weather, values at risk, relevant Army and other policies, organization, and specifics on pre-suppression and maintenance actions.

USAG-HI Fire and Emergency Services (ARMY FIRE) is the proponent for this plan. In addition to ARMY FIRE, individuals responsible for wildland fire management are the Wildland Fire Program Manager; the Installation Fire and Emergency Services, Fire Chief; the HQ USARHAW Range Officer; the Directorate of Public Works Environmental Chief on Oahu; and the Federal Fire Department, Fire Chief.

USAG-HI will maintain a Taskforce on Oahu that will serve as the primary initial attack force and will be under the direct control of the ARMY FIRE Wildland Fire Program Manager. Range Division will provide logistical and communications support during firefighting operations.

Firebreaks, fuelbreaks, and other wildland fire management improvements that aid firefighters in containing and suppressing fires will be improved and maintained. Several of these are new construction. Most will serve to contain military ignited fires, but some will also help keep non-military

ignited fires off Army lands.

The HQ USARHAW Range Division, Hawaii, and specifically Range Control, will strictly enforce the Fire Danger Rating System (FDRS) as well as munitions restrictions that are part of the Oahu Range SOPs for each of the installations under its jurisdiction. The FDRS will restrict weapons fire and training depending on weather and vegetation conditions. Range Control will be responsible for retrieving the necessary weather data collected by weather stations on the various installations and communicating to training units any restrictions imposed as a result of adverse weather and/or fuel conditions. Range Control will ensure that restrictions are adhered to, and that appropriate administrative disciplinary action is taken for non-compliance on the part of individual units and/or Officers in Charge.

USAG-HI will continue to maintain its network of Remote Automated Weather Stations (RAWS) such that at least one weather station at each installation is maintained to national standards. Weather data from these stations will continue to be archived to provide a database from which future analyses and improvements to the FDRS may be possible.

IWFMPs shall be reviewed/updated annually and certified as current by the Installation Commander to ensure the latest information is consistently incorporated into Army wildfire prevention and suppression procedures. An ad hoc review committee will be convened by the Wildland Fire Program Manager and will consider fire activity, prevention, and response effectiveness. The committee will conduct an audit and recommend what, if any, changes are necessary to improve the wildfire management program. In addition, this plan may be changed as necessary to account for the constantly evolving requirements placed on the Wildland Fire Management Program.

Standard Operating Procedures

Wildland Fire
U.S. Army Garrison Hawaii - Oahu

1. General

1.1. Purpose

a. The purpose of this Standing Operating Procedure (SOP) is to provide the specific requirements delineating the responsibilities of the ARMY Fire, Federal Fire Department (FFD), USAG- HI Fire and Emergency Services, HQ USARHAW Range Division, Hawaii personnel, and training units in the prevention and suppression of wildland fires on U.S. Army Garrison Hawaii (USAG-HI) properties on Oahu. The primary objectives of the SOP are to prevent unplanned ignitions through sound preventive measures and to establish procedures for wildland fire control and the protection of human life, property, training infrastructure, and natural/cultural resources.

1.2. Scope and Applicability

a. The provisions in this SOP are applicable to all military training units and personnel assigned to or utilizing any USAG-HI property. Senior unit commanders, regardless of service or component, whose unit has been allocated the use of any USAG-HI property, will ensure compliance with this SOP. All officers and noncommissioned officers will familiarize themselves with the contents of this SOP or receive a fire prevention briefing prior to use of any training area. This SOP is applicable to ANY and ALL activities on USAG-HI properties with the exception of indoor activities.

b. It is imperative that awareness on the part of all commanders is maintained and that all persons are instructed in fire prevention and fire suppression. It is intended that all persons be made aware of this SOP and that the instructions and guidance contained herein are employed to accomplish training with an absolute minimum of unwanted fires.

1.3. Responsibilities

a. **Installation Commander**.

1) The Installation Commander has the overall responsibility for fire prevention and protection requirements.

2) The Installation Commander will:

i. Annually review the IWFMP and certify as current.

ii. Define the roles and responsibilities as laid out in this IWFMP.

iii. Delegate to the Wildland Fire Program Manager (WFPM) or Acting Wildland Fire Program Manager oversight of the wildland fire management program.

iv. Ensure sufficient funding is available to staff and execute this IWFMP.

v. Approve the deployment of USAG-HI civilian firefighters to off-installation incidents that are not covered under existing Mutual and Automatic Aid Agreements.

b. **Wildland Fire Program Manager**.

1) The WFPM, in coordination with the Natural and Cultural Resources Managers, and ARMY FIRE, is responsible for developing, updating, and executing the IWFMP. The

WFPM is housed in the Fire and Emergency Services Directorate of the USAG-HI (hereafter Fire and Emergency Services or ARMY FIRE). The WFPM will collaborate closely with:

i. The Federal Fire Department.

ii. The City and County of Honolulu Fire Department.

iii. HQ USARHAW Range Officer.

iv. The Directorate of Public Works Natural and Cultural Resources Managers.

v. The Directorate of Public Works Maintenance Chief.

2) The WFPM will ensure that supplies, equipment, training, and qualified personnel are available to meet the goals and objectives of the IWFMP. The WFPM, in coordination with the DPW Maintenance Chief and the DPW Natural Resources Manager, ensures that firebreaks and fuel breaks are properly maintained in accordance with this IWFMP.

c. **Federal Fire Department, ARMY Fire.**

1) FED FIRE Chief is responsible for the organization, supervision, and management of all aspects of the fire prevention and protection program in accordance with the provisions of DoDI 6055.06, Fire Protection on Oahu.

2) ARMY FIRE is responsible for suppressing wildfires on all USAG-HI properties on the Island of Oahu. Through formal agreements, other fire protection entities such as the City and County of Honolulu may also fight fires on Army properties, though responsibility for every fire on federal land on Oahu ultimately rests with ARMY FIRE.

3) WFPM and FED FIRE Chief will ensure all FFD firefighters are familiar with protocols for firefighting on USAG-HI lands on Oahu, particularly those governing safety procedures pertaining to wildland firefighting operations.

d. **Range Officer, HQ USARHAW**.

1) The Range Officer has overall responsibility for enforcing the provisions of the IWFMP as delegated from the Garrison Commander. Of particular note, the Range Officer is required to ensure the Fire Danger Rating System (FDRS) is monitored hourly and that restrictions on or cessation of training activities based on the current fire danger are efficiently communicated to OICs and other USAG-HI land users.

2) The Range Officer ensures that live-fire training is suspended for the period of time necessary to facilitate suppression of ongoing fires.

3) The Range Officer ensures that fire prevention and reporting procedures are adhered to.

4) Range Control will notify the WFMP of all upcoming training events with sufficient lead time to allow the WFPM to schedule personnel to meet staffing requirements.

e. **Range Operations**.

1) Range Operations Supervisors are responsible for ensuring proper fire prevention measures are taken by troops on ranges and in all training areas and that fires are promptly reported.

2) Range Operations personnel will provide support to firefighters in the form of logistics, communications, safety, and other matters. Range Operations personnel will not actively participate in fire suppression.

f. **Officers in Charge**.

1) The Officer in Charge or the Non-Commissioned Officer in Charge (hereafter both OIC) of each unit using any USAG-HI facility is responsible for understanding and enforcing fire prevention procedures.

2) The OIC is responsible for immediately halting training operations and notifying Range Control in the event of a fire.

g. Active Duty, Civilians, Contractors, and other users of USAG-HI lands.

1) All users of USAG-HI must reduce fire potential from their activities.

2. Fire Prevention

2.1. Education

a. Fire prevention is essential to the military mission because it reduces and minimizes adverse impacts to training capability resulting from fire damage to federally protected species.

b. Range Operations personnel will include fire prevention as part of every pre-training briefing to all USAG-HI land users. This will include a review of approved and prohibited munitions and pyrotechnics for the training area and a review of the fire danger rating system procedures, a review of proper response when a fire is spotted, cease-fire requirements when there is a fire, a review of acceptable smoking areas, and a review of possible disciplinary action for failing to comply with the fire prevention policies. See the appropriate enclosure for specific guidance for each training area (Enclosures 4 through 11).

c. Signs will be posted in strategic locations as reminders of prevention and awareness of the FDRS.

d. Fire prevention and environmental pocket cards will be issued to users to increase individual's awareness of fire and environmental issues.

2.2. Enforcement

a. Primary responsibility for enforcement of range directives, which includes fire prevention procedures, is the duty of the Garrison Commander. Day to day enforcement is carried out by Range Control. The Range Officer will encourage compliance with fire prevention and reporting measures and use tools at his/her disposal to assess punitive measures on those who do not comply, including revoking range privileges.

b. Unit commanders are responsible for ensuring their unit activities comply with the IWFMP.

c. Failure to follow range protocols will result in termination of scheduled training and responsible individuals will be subjected to administrative disciplinary action in accordance with applicable regulations.

d. Range violations resulting in the loss of federally listed species may result in jail time of up to one year and fines of up to $50,000 per animal or plant destroyed.

2.3. Engineering

a. Firebreaks and fuel breaks exist or will be built at DMR, MMR, SBMR, and SRAA.

b. The WFPM will ensure that firebreaks and fuel breaks are built and managed to the standards specified in the IWFMP (Section 4.3 of Enclosure 12).

c. The SBMR impact area firebreak, including the MF firebreak; the DMR firebreak; the north and south lobe firebreaks at MMR; and the firebreak at SRAA are all critical to fire suppression success. Beginning in 2018, if these firebreaks do not meet USAG-HI standards, live-fire training and training with pyrotechnics will be suspended at the installation in question until maintenance to restore firebreak standards is carried out.

d. Ground disturbing activities and fuels management, including the use of prescribed fire, are governed by the protocols in the IWFMP (Sections 4.3 and 4.6 of Enclosure 12). The use of prescribed fire is subject to authorizations and restrictions as outlined in Section 4.6 of Enclosure 12.

2.4. Ignition Control

a. Fire danger rating systems have been developed for each installation. Training is subject to restrictions based on the fire danger. Range Control is responsible for ascertaining the fire danger every hour and communicating the hourly fire danger to users of USAG-HI lands.

b. Training with fire-prone weapons systems or training aids (those listed in each installations' FDRS under 'Training Restrictions' (See Enclosures 4 through 11)) is prohibited when the installation RAWS is not functioning. Maneuver training may occur when the RAWS is not functioning except for MMR where hourly fire danger must be determined any time any training is ongoing, whether via the RAWS or qualified individual manually determining fire danger.

c. If a RAWS is not functioning, hourly determination of the fire danger may be carried out manually by qualified individuals at the discretion of the WFPM. Alternatively, if a RAWS is not functioning, the FDRS may be over-ridden by the WFPM with written concurrence from the Garrison Commander to allow for scheduled training. Such an override will specify the ranges that are authorized for training, the justification of the override, and an expiration date of the override not to exceed two weeks. The WFPM or assigned crew member will track the weather daily. The WFPM will retain the authority to unilaterally rescind or otherwise restrict the override for any reason. The FDRS at MMR may not be overridden under any circumstances.

d. OIC's in charge of training will ascertain the fire danger via communications with Range Control prior to training and will ensure that all training complies with the current fire

danger rating at the installation. See the appropriate enclosure for specific guidance for each training area (Enclosures 4 through 11).

e. Fire-prone activities including, but not limited to, live-fire, the use of pyrotechnics, and UXO clearance are prohibited in some locations at some properties. See the appropriate enclosure for specific guidance for each training area (Enclosures 4 through 11).

f. UXO clearance via demolition is limited based on the FDRS and the WFPM's discretion.

   1) The WFPM has the authority to abort any UXO clearance operation due to insufficient fire preparations, excessive fire danger, or any other fire related issue.

   2) The WFPM will be party to all preparations regarding UXO clearance to ensure fire prevention measures are properly implemented.

g. Smoking is limited to areas of gravel, asphalt, concrete, or bare ground and approved by Range Control prior to use.

h. Fuels management is required on many ranges. See Section 4.3 of the IWFMP (Enclosure 12) for specific guidance for each training area.

3. Pre-Suppression Actions

3.1. Minimum Staffing Requirements

a. Staffing of ARMY FIRE shall be in accordance with the minimum staffing levels for each training area specified in Enclosures 4 through 11, in 4.4.3.1 of Enclosure 12 and with Appendix 4 (Step-Up-Staffing Plan).

b. A sixteen-person Taskforce (ARMY FIRE Wildland Taskforce) is maintained by the WFPM under ARMY FIRE on Oahu. The WFPM, in coordination with the Range Officer, will arrange to staff training ranges and areas when necessary while still maintaining at least two additional ARMY FIRE members in reserve.

c. Minimum staffing levels for each training area are specified in Enclosures 4 through 11 and in 4.4.3.1 of Enclosure 12. The WFPM shall ensure that minimum staffing levels are always met, including overtime authorizations. In the event of a fire, firefighting duties take precedence over other work assignments.

d. Staff in addition to those already required will be brought on at the discretion of the WFPM. The WFPM will utilize long-term fire danger indices relevant to wildfire activity on Oahu, such as drought indices or live herbaceous moisture, as well as other factors such as training load to determine whether additional staffing is required.

e. When fires require suppression action, the WFPM or Duty Officer shall determine whether remaining staffing is sufficient to account for potential additional fires elsewhere. If not, training will be restricted at all installations within the response area of the responding units to those activities authorized under RED fire danger conditions. These restrictions shall remain in place until such time as sufficient firefighting resources to meet minimum staffing levels are released from engagement on the fire and are available for response to a new incident or additional resources are brought on via overtime staffing or through mutual aid agreements.

3.2. Training

a. All USAGHI personnel engaging in wildland fire fighting activities will adhere to the Army Wildland Fire Guidance dated 15 March 2021 and IMCOM Wildland Fire Program Policy Memo dated 7 Nov 2022. All firefighting personnel must acquire and maintain National Wildland Coordinating Group (NWCG) requirements for training, certification, and physical fitness per PMS 310-1 (https://www.nwcg.gov/publications/pms310-1). All personnel engaged in wildland ground firefighting activities must satisfactorily complete the following suppression skills courses as a minimum: S-110, Basic Fire Suppression Orientation; S-130, Firefighter Training; S-190, Introduction to Fire Behavior; and I-100, Introduction to Incident Command System (ICS). All personnel will pass the NWCG pack test or similar test of physical fitness.

b. The WFPM will develop a training and certification program for Army firefighters. Training opportunities shall be shared with cooperating agencies such as the federal and county fire departments whenever possible.

c. The WFPM will coordinate with ARMY FIRE training officers to develop the annual wildland training schedule. A recurring proficiency program may include quality instruction and evaluation of employee's proficiency level through yearly training exercises that are monitored by the fire department training officer.

d. Individuals will not be assigned duties for which they lack training and/or certified experience. All ARMY FIRE personnel dispatched or assigned to wildfires or prescribed fires will be qualified for the fire position assigned, unless assigned as trainees and under direct supervision of higher qualified personnel at all times.

e. The WFPM will administer an effective qualification and certification program. The WFPM will monitor all employee's wildland fire management development (training and experience) to ensure accurate qualification and certification.

f. Further information on firefighter training is available in Section 4.8 of the IWFMP (Enclosure 12).

g. Army Wildland Fire Policy States "The Director of Military Support is responsible for deployment of military firefighters and equipment." Military personnel will not be used for firefighting assignments except per the direction of the Directory of Military Support.

3.3. Fire Equipment and Supplies

a. If required fire suppression equipment is not operational, live-fire training will be suspended until all required equipment is operational. Live-fire training will only be conducted when fully trained/certified personnel and properly functioning equipment is available for fire suppression. This requirement pertains to all types of firefighting equipment, water resources, and personnel.

b. The WFPM will maintain caches of fire equipment in a constant state of readiness. The primary Oahu fire cache is located in Area X at Schofield Barracks. A satellite cache is planned at the Kahuku Training Area. The fire caches will contain a supply of fire hand tools, chainsaws, pumps, forestry hose, foam concentrate, etc., necessary to support fire suppression activities (See Table 26 in Section 4.4.3 of Enclosure 12).

c. The WFPM will ensure that the fire cache at SBMR is equipped to outfit a minimum of 16 firefighters with appropriate PPE.

d. The WFPM will conduct periodic checks to ensure all resources are in place and will identify and immediately correct any deficiencies.

3.4. Personal Protective Equipment (PPE)

a. All firefighting personnel will be equipped with proper Refer to the Interagency Standard for Fire and Fire Aviation Operations "Redbook", (https://www.nifc.gov/policies/pol_ref_redbook.html) and Table 28 of Enclosure 12). Use of PPE is mandatory.

b. The WFPM will ensure that proper PPE is worn at all times when personnel are actively engaged in firefighting duties. Personal safety and prevention of injuries is the first priority in every fire management activity.

3.5. Fire Vehicles

a. Fire response vehicles will meet minimum requirements of a Type 6 engine as defined by the National Interagency Fire Center (NIFC) unless circumstances require a variance which will be identified in writing and signed by the WFPM. Refer to Chapter 14 of the Interagency Standard for Fire and Fire Aviation Operations ("Redbook", https://www.nifc.gov/policies/pol_ref_redbook.html) for more specifics on engine typing and required inventory.

b. Specifications for purchases of new or used fire response vehicles will be approved by the WFPM.

c. At the discretion of the WFPM, other vehicles such as ATVs, UTVs, and others may be utilized.

d. Some installations (KTA, MMR, SB West) require that a staffed fire response vehicle be on site whenever certain types of training are occurring. See the appropriate enclosure for specific guidance for each training area (Enclosures 5, 7, and 9 respectively).

e. All personnel operating fire response vehicles shall be qualified and licensed to operate emergency vehicles. The WFPM shall monitor vehicle qualification and training programs for ARMY FIRE Taskforce members.

f. FFD response will be in accordance with FFD SOPs for wildland fire response; usually a Type 6 Engine and water tender (>1000-gallon capacity).

g. ARMY FIRE Taskforce crew members will perform daily preventive maintenance inspections of fire vehicles and pumps to ensure operational readiness. All discrepancies shall be identified and annotated. The Oahu ARMY FIRE Crew Supervisor shall be responsible for reviewing and coordinating all repairs. A Priority 03 and Force Activity Designator (FAD) III for replacement parts to

support emergency fire equipment shall be assigned in accordance with AR 420-1, Army Facilities Management, Chapter 25-7.e.1.

h. Maintenance and/or repair of fire vehicles shall be performed by properly certified mechanics. The WFPM are responsible for ensuring that funding to support all maintenance and repair is included in the respective annual Wildfire Management Program budgets.

3.6. Helicopter Fire Bucket Support

a. In the event of a major wildfire, the Incident Commander (IC) may initiate a request for helicopter helibucket support through the Installation Operations Center (IOC) or the LOC (Logistic Operation Center). An example of request procedures is included in Enclosure 3 and the Combat Air Brigade (CAB) SOP for wildland fire support is included in Appendix 1 to Enclosure 12.

b. Helicopter aviation support units will provide the WFPM with a list of all pilots and aircrew members that are certified in helibuckets operations and fire suppression application techniques for wildland fires. This list will be updated twice a year or as required.

c. The Combat Aviation Brigade is issued helibuckets through a hand receipt from the ARMY FIRE Wildland Fire stock. ARMY FIRE Wildland Fire maintains six Bambi helibuckets (five 660-gallon and one 2000-gallon) for use by military aircraft assigned to conduct helibucket operations on Oahu.

d. The ARMY FIRE Wildland Fire staff is responsible for ensuring that a serviceable primary and reserve Bambi helibucket is available for use by trained helicopter aircrews at all times. The buckets shall be inspected once quarterly and repaired as needed regardless of the deployment of Army resources. Emergency repairs may also be carried out through a service contract with SEI the manufacturer of the Bambi Buckets.

e. Air-to-ground radio communication must be established with the IC and helicopter support units involved in fire suppression activities. Refer to the Army's Communication Plan and Aviation Plan for assigned radio frequencies on Oahu.

f. The full Air Operations Wildland Fire Management Plan is included as Appendix 1 to Enclosure 12 of this SOP.

3.7. Water Sources

a. The primary water source for engines and tenders will be fire hydrants.

b. Secondary sources are available at KTA, MMR, and SBMR. These are dip ponds on the installations owned by USAG-HI. Water levels in the ponds at MMR and SBMR will be maintained at 75% of capacity or better at all times. Live-fire training at SBMR, or MMR will be suspended if the water levels in the ponds/tanks at that installation fall below 75%.

c. The primary water source for air operations on Oahu are ponds and reservoirs throughout the Island. See the appropriate enclosure for specific guidance for approved water sources for each training area (Enclosures 4 through 11).

3.8. Other Resources

a. The Army has entered into Cooperative and Mutual Aid Agreements for firefighting assistance during major wildfire incidents with various federal, state, and local fire agencies. The Directorate of Emergency Services (DES) Fire Chief maintains copies of these agreements.

b. The WFPM shall review all lease agreements for water and other firefighting needs annually and update them every five years or as required.

4. Fire Suppression Actions

4.1. Fire Reporting Procedures

a. All fires, regardless of size or origin, will be reported immediately by the OIC to Range Control and in turn, to Oahu ARMY FIREDES Army Fire Crew.

b. In the event of a wildland fire on any range, impact area, or maneuver area, the unit OIC will immediately notify Range Control by the most expeditious means possible (radio or telephone), stating the exact location (grid coordinates) and the extent of the fire. The OIC will immediately initiate a “cease fire” order and remain in the area with the unit subject to the orders of Range Control, ARMY FIRE, and/or FFD when they arrive on the scene unless the situation becomes unsafe.

c. If unable to reach Range Control, the OIC will call 911 and report the fire.

d. Units will not resume training until the fire is extinguished or upon approval by the Range Operations Supervisor and the firefighting unit (FFD, ARMY FIRE, City and or County).

e. Failure to report any fire will result in termination of scheduled training and responsible individuals will be subjected to administrative disciplinary action in accordance with applicable regulations.

f. Upon notification of a fire, Range Control will immediately notify ARMY FIRE by radio or (653-0209) by telephone and provide the exact location (grid coordinates), building or range number, maneuver area, or make a reference to a prominent terrain feature (e.g., MF-5, SR-3, MOUT, etc.).

g. Range Control will contact the appropriate persons listed on the Wildland Fire Incident Report (WFIR).

h. Range Control will begin collecting information for the WFIR.

4.2. Initial Attack

a. Immediate and aggressive action is the unconditional response for all fires on USAG-HI lands, providing for safety first.

b. Within the confines of due care for personnel safety, the high resource values on and off USAG-HI lands justify the fullest commitment to expeditious containment and control of all fires. Fiscal consideration will be secondary in ensuring timely and adequate availability of necessary firefighting resources.

c. Fires will be held to the minimum size possible and extinguished as quickly as possible. The only exception to this standard will be fires within the SBMR impact area that are within the SBMR firebreak. These fires will be contained as rapidly as possible but indirect fire suppression may be required due to the Unexploded Ordinance in the Area. Fires will be managed in the safest way possible to provide for firefighter safety due to UXO's in the area. Direct attack should always be considered as the best option using firefighter and helicopters, but Indirect attack may also be considered if UXO and or safety issues preclude direct attack from being conducted.

d. Range Control will immediately close ranges as necessary to allow firefighters to safely access and fight the fire.

e. ARMY FIRE will immediately proceed to the scene of the fire and assume command and control of all firefighting activities.

f. Fire response will take precedence over training and other concerns other than personnel safety until such time as the IC determines the best course of action.

g. Firefighters will use direct and/or indirect attack at the discretion of the Incident Commander (IC) to contain and extinguish fires.

h. Firefighters will not enter any known and identified unexploded ordnance (UXO) contaminated areas to fight fires without the approval of the RMA, IC and the Directorate of Installation Safety.

i. The IC will call for aerial resources as needed. In some locations, aerial bucket response is required, regardless of fire size or behavior. See the appropriate enclosure for specific guidance for each training area (Enclosures 4 through 11).

j. Burnouts and backfiring will be avoided whenever possible outside of the firebreaks at DMR, MMR, and SBMR. Burnouts and backfiring will only be ordered by NWCG qualified individuals (Single resource qualified or higher qualified).

k. Bulldozers are only to be used as a last resort in sensitive areas. They will only be employed in sensitive archaeological areas, bat roosting habitat, or designated critical habitat with the recommendation of the DPW Environmental Division. See maps in Enclosures 4 through 11 for identification of these areas at each installation.

l. Bulldozers will not enter UXO contaminated areas without the approval of the RMA, IC and the Directorate of Installation Safety.

m. The Natural and/or Cultural Resources Managers, or their designee(s), may be present at the Incident Command post to assist in identifying sensitive areas. The Natural and/or Cultural Resources Managers shall ensure these individuals are present when fires threaten natural or cultural resources.

n. In the event a fire escapes initial attack, the IC will begin the process of transitioning the fire to extended attack by conducting a complexity analysis. Once the (CA) is completed a higher qualified ICs will be requested through WFPM as necessary. The current IC must maintain control, situational awareness, and LCES until incoming IC arrives and a transition of command is completed.

o. The Army shall work with adjacent landowners to control fires before they enter or escape the USAG-HI property boundaries.

p. USAG-HI firefighting resources are authorized and obligated to fight fires outside of USAG-HI lands when they threaten or are anticipated to threaten USAG-HI interests.

4.3. Command and Control

a. The agency in command will establish command and organize ground operations under the ICS and Unified Command during multi-agency response.

b. The WFPM or designee will assume control of any fire on USAG-HI lands.

c. The IC will establish a command post when a fire is, or is anticipated to be, serious.

d. The IC will initiate action requesting mutual aid support from other fire agencies in accordance with established Cooperative Agreements when required.

e. Once resources have been committed to firefighting, they are under the control of the IC. The IC directs the employment of all firefighting resources, Army, or others, to contain and extinguish the fire.

f. The IC will coordinate with Range Control and/or training units when requesting military assistance for combating major fires. In this situation, the primary mission of the unit commanders in the geographical area will shift from training objectives to fire control.

g. Military personnel will not be used to fight fires directly (i.e., operations roles), except at the discretion of the Director of Military Support but may serve in logistical and other support roles.

4.4. Values at Risk

a. Human safety and major property values are always the first priority in every fire management decision. Other values at risk will always be secondary priorities.

b. Infrastructure such as utility poles, communications nodes, radio towers, outbuildings, and pole barns and training assets such as plastic pop-up targets, wooden training structures, electronics cables and boxes, range limit signs, and many other items are often at risk from wildfires. These may occur anywhere at an installation. Protection priorities are at the discretion of the IC.

c. Threatened and endangered species of plants and animals and their native habitat occur on most USAG-HI lands and are protected by federal law. Wildfires pose a significant risk to them and damage to them can result in significant impacts to the training mission. The IC will ensure that federally listed species and their habitat are protection priorities.

d. Federally listed species management units have been designated throughout Oahu and Areas of Species Recovery have been designated on Hawaii. Damage to these areas may result in curtailed training opportunities, so it is important that they remain a high priority during fire prevention and suppression operations.

e. Cultural resources are protected by federal law and can be harmed by wildland fires, primarily through fire suppression activities. Wildfire suppression threatens archaeological sites but the fires themselves usually do not. Suppression techniques such as the use of bulldozer lines, off road driving of vehicles, and other fire suppression measures can damage cultural resources. The IC will ensure that cultural resources are not harmed by firefighting operations within the confines of due consideration for protection priorities. Refer to the "Minimum Impact Suppression Tactics" section of the Incident Response Pocket Guide for more details (IRPG MIST).

5. Post-Fire Actions

5.1. Army Records and Reports

a. Range Control will maintain a log of all fires on DA Form 1594, Daily Staff Journal, or Duty Officer's Log.

b. All fire incidents occurring on USAG-HI lands will also be recorded in the USAG-HI Fire Report database. This is an online database and there are also local records. The minimum report requirements are as follows:

1. Fire Size Up (ARMY FIRE FORM)

2. 1202 (Fire Report)

c. The WFPM will review all Fire Reports to ensure they are complete and accurate.

d. The WFPM will maintain a file, digital or hardcopy, of all Fire Reports and Fire Size Ups.

e. The WFPM will supply a copy of the Fire Report for any fire that burned in an environmentally sensitive area to DPW Environmental within 24 hours of the fire being extinguished (See the appropriate enclosure for specific guidance for each training area (Enclosures 4 through 11)).

f. The WFPM shall update the Wildland Fire Management Application portal (WFMAP) with any fires or prescribed fires that occur on a monthly basis.

5.2. United States Fish and Wildlife Service (USFWS) Required Reporting

a. The WFPM and DPW Natural Resources Manager will coordinate the submission of reports detailing the location of all munitions impacting outside the south lobe of the firebreak road at MMR.

b. The WFPM and DPW Natural Resources Manager will notify the USFWS and provide a copy of the WFIR within 48 hours of a fire being called "Out" or the complete extinguishment of any fire that directly affects a listed species.

c. The WFPM and the DPW Natural Resource Manager will coordinate submission of fire incident reports for fires that directly affect listed species at MMR to USFWS.

d. Fire incident reports for fires that directly affected listed species at all properties other than MMR will be provided to USFWS semi-annually. The WFPM will coordinate with the DPW Natural Resource Manager to submit these reports.

e. On a regular basis, the garrison Natural Resource PM will reach out to USFWS to ensure that USFWS POC information is current and correct. Contact information for these individuals is available in Enclosure 2 - Notification Phone Numbers.

5.3. Surveys

a. In addition to the reports and reviews that are completed immediately after a wildfire, a post-fire analysis survey of the burned area may be required depending on the fire's location and vegetation damaged. The post-fire analysis may be combined with any of the informal or formal investigations. A post-fire analysis will need to determine all or part of the following:

    1) The effect the fire may have had on native or alien flora and fauna resources and cultural resources.

    2) The effectiveness of the pre-suppression measures including fuel modifications.

    3) The effectiveness of the suppression resources and measures used.

    4) The effectiveness of the ICS.

    5) The effectiveness of fire/fuel models used.

    6) A safety review of suppression actions.

    7) A UXO contamination survey or potential UXO clean-up operation.

b. Surveys will be carried out at the earliest opportunity.

c. If the fire burned in an environmentally sensitive area, a post-fire survey of the fire area will be conducted with the coordination of the DPW Environmental and Integrated Training Area Management (ITAM) office. As soon as the fire is declared out, the post-fire survey will be conducted.

d. If a UXO survey or clearing operation is desired, coordination with the Explosive Ordnance Disposal (EOD) unit is necessary. Surveys or clearing operations must be planned, coordinated, and should be carried out immediately after a fire.

5.4. Investigations and Accident Reporting

a. After Action Reviews (AAR) will be conducted after all wildfire incidents by the IC to document safety concerns, improvements, or lessons learned and provided to the WFPM.

b. ARMY FIRE, Range Division, or DPW Environmental may request a formal investigation for any reason. Formal investigations are required for fires involving any of the following:

    1) Training related caused fires escaping or starting outside USAG-HI property boundaries.

    2) Damage or loss of valuable property exceeding $1000.00.

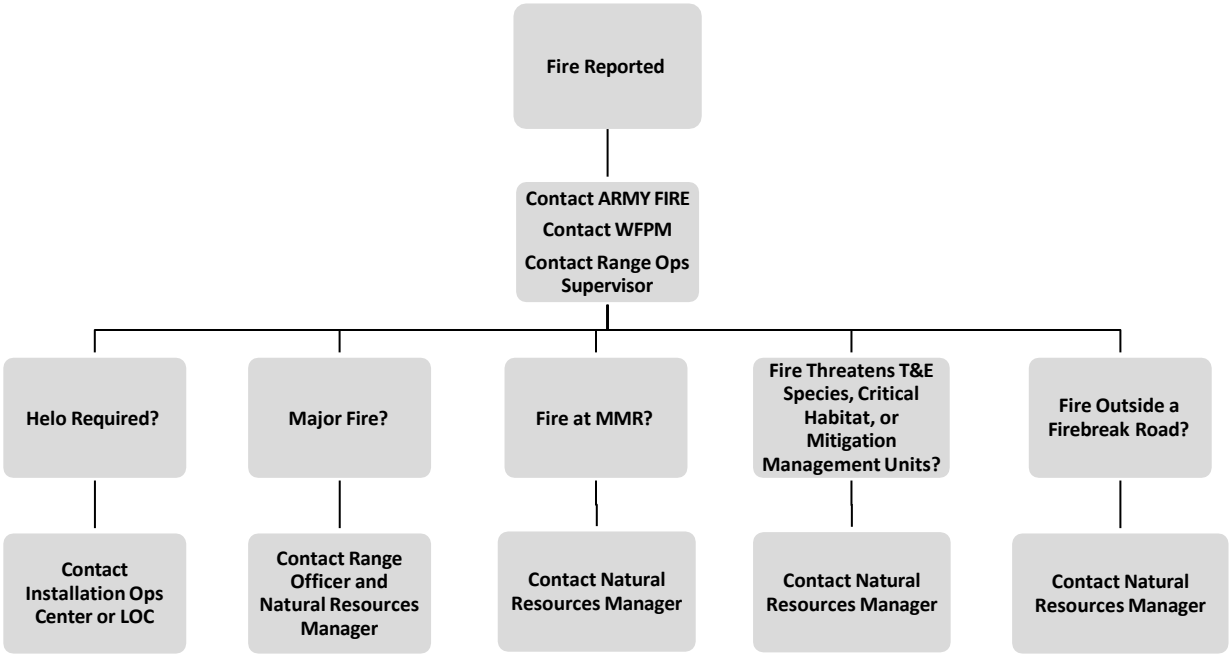
3) Damage to Biological Sensitive Area (BSA) or incidental loss of a protected plant or animal species.
4) Entrapments or fire shelter deployments.
5) Major injury or fire fatality.

6. List of Enclosures

1) Wildland Fire Notification Process
2) Notification Phone Numbers.
3) Aviation Support to Fire Bucket Operations.
4) Specific Guidance for Dillingham Military Reservation.
5) Specific Guidance for Kahuku Training Area.
6) Specific Guidance for Kawailoa Training Area.
7) Specific Guidance for Makua Military Reservation.
8) Specific Guidance for Schofield Barracks East Range.
9) Specific Guidance for Schofield Barracks West and South Ranges.
10) Specific Guidance for Schofield Barracks South Range Acquisition Area.
11) Specific Guidance for Wheeler Army Airfield, Helemano Military Reservation, Fort Shafter, Tripler Hospital, and Aliamanu Military Reservation.
12) Integrated Wildland Fire Management Plan.

Enclosure 1 – Wildland Fire Incident Decision Tree

Notification Decision Tree - Oahu



Enclosure 2 –Notification Phone Numbers

Agency/Official	Phone Number	
Wildland Fire Program Manager	Cell: Office:	798-6579 653-0209
Federal Fire Department	Emergency: Office:	911 471-3303
Installation Operations Center	Office:	656-3272
Range Management Authority	Office:	787-5187
Range Operations Desk	Kahuku: Makua: Schofield:	853-0440 655-2532 655-1434
DPW Natural Resources Manager	Office:	656-9189
DPW Head Biologist	Office: Cell:	655-9178 864-1014
DPW Cultural Resources Manager	Office:	655-9709
Public Affairs Office	Office:	656-3154
U.S. Fish and Wildlife Service **Primary Contact - Dawn Bruns**	Office: Cell:	792-9400 927-4602
U.S. Fish and Wildlife Service **Secondary Contact**	Office: Cell:	792-9462 792-9581
U.S. Fish and Wildlife Service	Office:	792-9453
State of Hawaii Division of Forestry and Wildlife	Office:	973-9778
City and County of Honolulu Fire Department	Office:	723-7139

Enclosure 3 – Aviation Support to Fire Bucket Operations

1. Mission Criteria: 25 ID is tasked with the standing mission to provide Fire Bucket to USARHAW Range Division and U.S. Army Garrison, Wildland Fire.

2. Responsibilities:

a. USAG-HI Department of Emergency Services (DES) will:

1) The Wildland Fire Program Manager (WFPM) has ultimate authority in determining if aircraft are needed. However, the WFPM may delegate this to an Incident Commander Type 4 or Single Resource Boss qualifications or higher. This will allow timely and efficient utilization of aviation assets to protect life and property. The determination to request aircraft will be briefed to the WFPM and Fire Chief, if needed, and documented by the IC's in the ICS-214 unit log.

Guidelines as to when military helicopters will be used are as follows:

- Fire threatens loss of life, property, and natural/cultural resources on military land.
- Fire started because of military training activity.
- Fire started on military property and threatens civilian property or off post resources.
- Fire started on civilian property and threatens military property.
- Fire has grown in size and requires large lift capacity.
- Fire not accessible by ground fire units.
- All other fire suppression assets are committed.
- Support is provided to another governmental agency (Federal State or County) per agreement.
- Declared Federal or State disaster support.

2) Ensure the Incident Commander, WFPM, Incident Commander Type 4, or Single Resource Boss qualifications or higher requests for aviation assets directly to the Lightning Operations Center (LOC). Once the request is processed and sent to 25th CAB, DIRALAUTH between the Incident Commander and 25th CAB is authorized.

3) Coordinate with USARHAW for support from 25 ID transportation assets or logistics support.

4) Ensure fire crews know how to properly utilize and deliver aerial water delivery systems.

5) Ensure joint partner emergency services and local emergency services understand these assets can be requested, and how to do so.

6) Coordinate for all Fire Bucket Support Operations for both Oahu and PTA.

7) Attending an annual tabletop exercise with 25th CAB to refresh all parties on requirements and expectations.

8) Ensure that a Memorandum for Record with all the names and contact numbers of Type 4 Incident Commanders, Single Resource Bosses or who has Helicopter Crewmember or Helicopter Manager Qualifications is maintained at the LOC. Update this document as necessary as this will serve as the sole way to validate a request for support for the LOC.

9) Notify Range Division of aircraft request to ensure the safety of the aircraft operating within the range complex and access to the dip pond.

10) Serve as the sole agency to coordinate for all requests for aircraft support. Should continued support be required; ensure that 25th CAB has a daily update to include a concept of operations (CONOP) for that days efforts with an estimate of the number and type of aircraft supporting.

b. 25th CAB will:

1) Support firefighting requests including during Fire Severity conditions as outlined in the Step-Up Staffing Plan.

2) Ensure on-call USARHAW MEDEVAC is not utilized for more than three (3) hours in order to preserve crew duty day and USARHAW MEDEVAC support capability. Simultaneous MEDEVAC coverage and firefighting support requires Hot POL availability to maintain MEDEVAC response timelines. If POL is not available, Range Control and the LOC will determine mitigation of prolonged MEDEVAC reaction time due to cold refuel of aircraft and flight time from fire location.

3) Maintain one (1) UH-60/CH-47 on Oahu to be available for routine firefighting and/or EOD transportation. Crews will remain on stand-by for both missions from 0600 – 1800 for a two (2) hour recall during weekdays and a four (4) hour recall on weekends. Unless the Step-Up Staffing Severity Plan requires alternate staffing.

4) Review ETP/waiver to use HH-60 to support firefighting operations annually with G3 AVN.

5) Ensure all pilots and aircrew members will be certified and trained in helibucket operations and fire suppression tactics in accordance with the appropriate Aircrew

Training Manual for wildland fires to conduct helibucket operations to effectively suppress a fire.

6) Provide the WFPM with a list of all pilots and aircrew members that are certified in helibucket operations and fire suppression application techniques for wildland fires. This list will be updated quarterly or as required.

7) Ensure that optimal crew experience/mix is considered in selecting flight crews for helibucket operations.

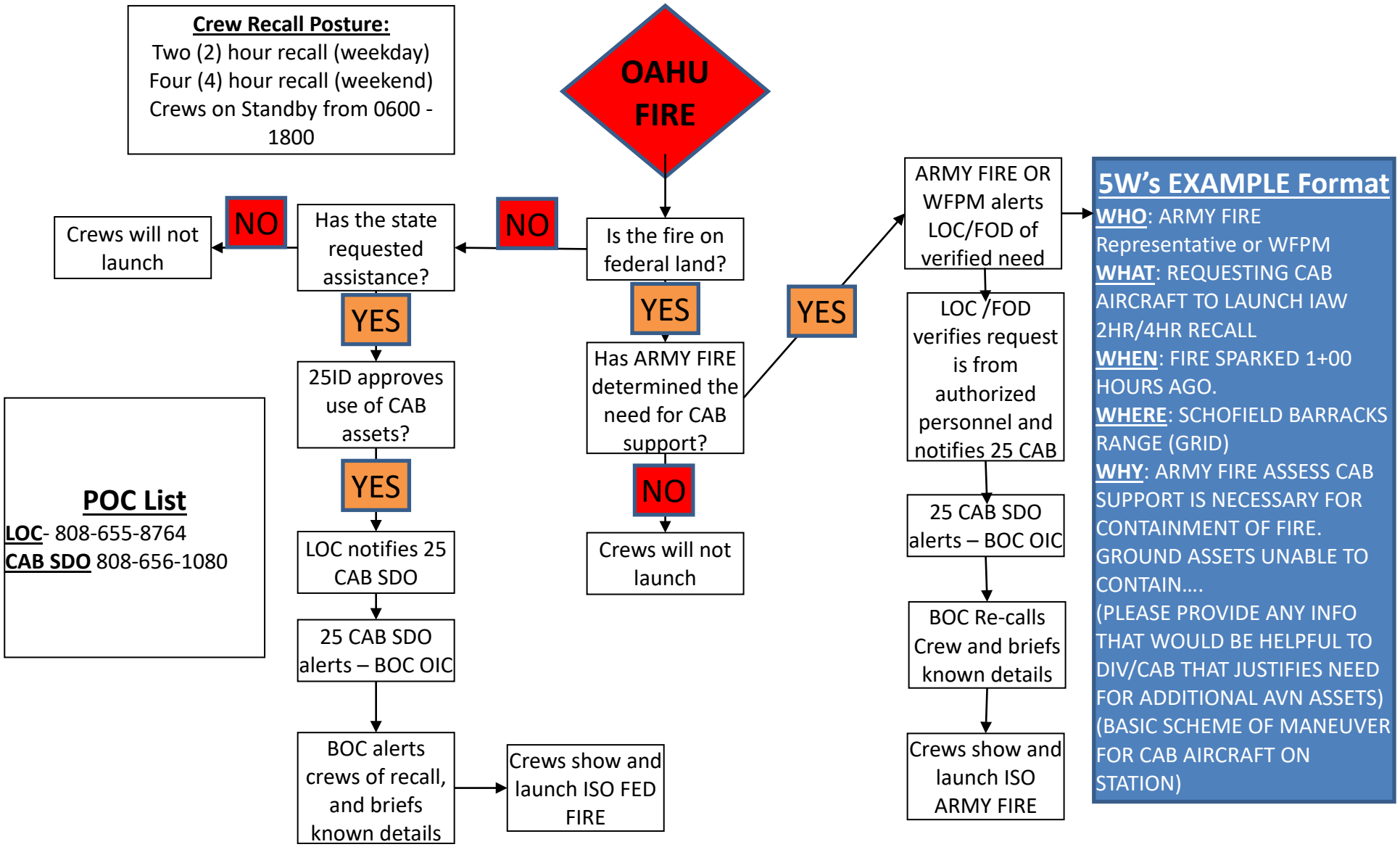
8) Assume overall responsibility for pre-mission planning, water weight/gallons lift capabilities, crew briefings, mission execution and mission abort/safety criteria. Including verification that the cargo hook and helibucket mechanisms are properly rigged and in functional working order prior to and during helibucket operations.

9) Host an annual TTX with USAG-HI DES in order to refresh all parties on requirements and expectations. The most preferable time to conduct a TTX is prior to the prescribed burn period.

c. Range Division Hawaii will:

1) Provide 25th CAB with a prescribed burn schedule to allow forecasting.
2) Restrict Airspace. All applicable Federal Aviation Administration (FAA) airspace control measures, local air traffic control rules, and Army regulations must be followed during aerial firefighting operations. Aircraft must contact the controlling FAA or military air traffic control tower, or Range Control, to enter or exit airspace and to obtain specific routes or flights. Operations within USARHAW R-3109 (SBMR), R-3110 (MMR), and R-3103 (PTA) can be coordinated with Range Control on FM 38.30.

d. Fire bucket Request Flow:



Enclosure 4 – Specific Guidance for Dillingham Military Reservation

The purpose of this enclosure is to provide the specific requirements for Dillingham Military Reservation in addition to the requirements of the Wildland Fire SOP. This document DOES NOT replace the Wildland Fire SOP.

1.1 Values at Risk

a. Threatened and endangered species habitats are in the southern portion of DMR as well as outside the installation boundary (Figure DMR -1). Federally listed species management units and designated critical habitat are also located in the vicinity.

b. Sensitive archaeological areas are present throughout most of the installation (Figure DMR-1).

1.2 Fire Prevention

a. Live-fire ammunition is prohibited at DMR.

b. Blank ammunition and some pyrotechnics are permitted but are subject to restrictions based on the FDRS. Aerial pyrotechnics are not authorized.

c. Range Control approval and guidance must be obtained prior to the use of all pyrotechnics, blanks, and simulators.

d. Training is allowed outside of firebreaks, but no ignition sources of any kind are authorized for use there. Items not authorized include, but are not limited to, pyrotechnics, blanks, smoking, and cooking/warming fires.

1.3 Minimum Staffing Requirements

a. Army Taskforce firefighters and a fire response vehicle will be staffed at SBMR or DMR for fire response when training is ongoing.

b. Type 6 engine with an Engine Boss (ENGB) and a Firefighter Type 2 (FFT2) are the minimum requirements.

c. Whenever pyrotechnics are used at DMR, the Taskforce firefighters shall be staffed at DMR.

1.4 Fire Equipment and Supplies

a. There are no equipment or supplies stored at DMR.

b. Equipment and supplies are available at the SBMR Fire cache.

1.5 Water Sources

a. Standpipes are located on the airport grounds (Figure DMR-2).

b. Aerial resources may utilize water from the approved nearby water sources listed below. Resources are listed from nearest to farthest.

Water Resource Name	Latitude	Longitude
Makua Dip Pond #1	21.519782	-158.226835
Makua Dip Pond #2	21.528903	-158.210382
Ranch 10-B	21.551251	-158.037476

1.6 Firebreaks/Fuelbreaks

a. The firebreak that follows the old asphalt runways will be maintained with no vegetation over .3 m (~ 1 ft) to a width of 40m. Additionally, a fuel free width will be maintained in accordance with the firebreak standards specified in Section 4.3 of the IWFMP. This firebreak also extends to the boundary on the eastern side of the installation (Figure DMR-2).

b. It is the responsibility of the WFPM to ensure that firebreak maintenance is properly implemented and expeditiously executed.

1.7 Fuels Management

a. Fuels along the Dillingham Military Vehicle Trail will be kept at less than 20% aerial canopy cover as ocularly estimated to 5 m from the road centerline.

   1) The trail will be monitored once annually in the spring to determine the need for fuels management. Any area with fine fuels and/or shrub cover greater than 20% crown cover will be noted and managed per the direction of the WFPM.

   2) Locations that are overgrown will be managed either through the application of herbicide or by cutting the grass or shrubs until they are in compliance.

b. Fuels throughout DMR may be managed at the discretion of the WFPM in coordination with the DPW Natural Resources Manager. Fuels management must comply with all of the protocols in the IWFMP (Enclosure 12).

1.8 Protection Priorities

a. Critical Habitat, BSA's, and Endangered Species Management Units are the top protection priorities.

b. Buildings at the airport are the second priority.

c. DLNR endangered plant greenhouse west of the DMR boundary.

d. Containing fires within the installation boundary is the third priority.

1.9 Fire Fighting Considerations

a. There is no known UXO at DMR.

b. Heavy fuels throughout the installation and steep terrain in the southern portions represent hazards to firefighters. Direct attack of fires may not be advisable depending on fire behavior.

c. Safety zones can be established at the airfield and in the open field in Training Area (TA) P-1.

d. Fire containment recommendations:

   1) Direct attack is preferred for much of the area inside the old asphalt runways.

   2) Direct Aerial attack and indirect attack by ground resources may be more appropriate elsewhere.

Reference DMR 1 - Fire Safety Briefing

The following verbiage will be included in a general safety, environmental, and fire prevention briefing to be given to all personnel before training at DMR.

The purpose of this brief is to educate users of the range about the dangers of fire on the range. Fire prevention is the responsibility of everyone working or training on the range. Fire poses a very real threat to the training mission of USAG-HI. Damage to federally protected plants and animals at and around DMR can result in detrimental restrictions on training activities. This is a very significant issue for USAG-HI. Fighting fires can also result in damage to archaeological sites. This can also result in detrimental training restrictions. These species and archaeological resources are protected by federal law. Personal fines may be issued by outside regulatory agencies if an investigation determines that negligence caused unwarranted damages to protected resources.

If a fire starts, all training must cease, and training downtime will result. For these reasons, every effort must be made to prevent fires. In order to prevent fires, you must follow these rules:

1. No lighted tobacco smoking materials will be discarded on the range. Smoking on the ranges is prohibited except on the old asphalt taxiway. Smoking is prohibited on the military vehicle trail.
2. Heat tabs and similar products must be used inside metal containers.
3. The use of smoke grenades or simulators is authorized but must be used in such a manner that they will not ignite fires. Do not place smoke grenades or simulators in any vegetated area. Place them in the dirt or in metal cans provided by Range Control.
4. No ignition sources of any kind, including smoking, are allowed outside of (south) the firebreak.
5. The use of aerial pyrotechnics is prohibited.
6. The fire danger rating system restricts what types of training are authorized. This policy is strictly enforced.

In the event a fire is started, cease training immediately. Schofield Barracks Range Control must be notified immediately. Once firefighters arrive on scene, they will extinguish the fire.

Reference DMR 2 - Fire Danger Rating System

All military users of DMR are required to be aware of and adhere to the fire danger restrictions on munitions, pyrotechnics, smoking and other ignition sources. The fire danger is updated every hour, on the hour.

Live-fire and aerial pyrotechnics are not authorized at DMR at any time. No ignition sources, including smoking, outside of the firebreak.

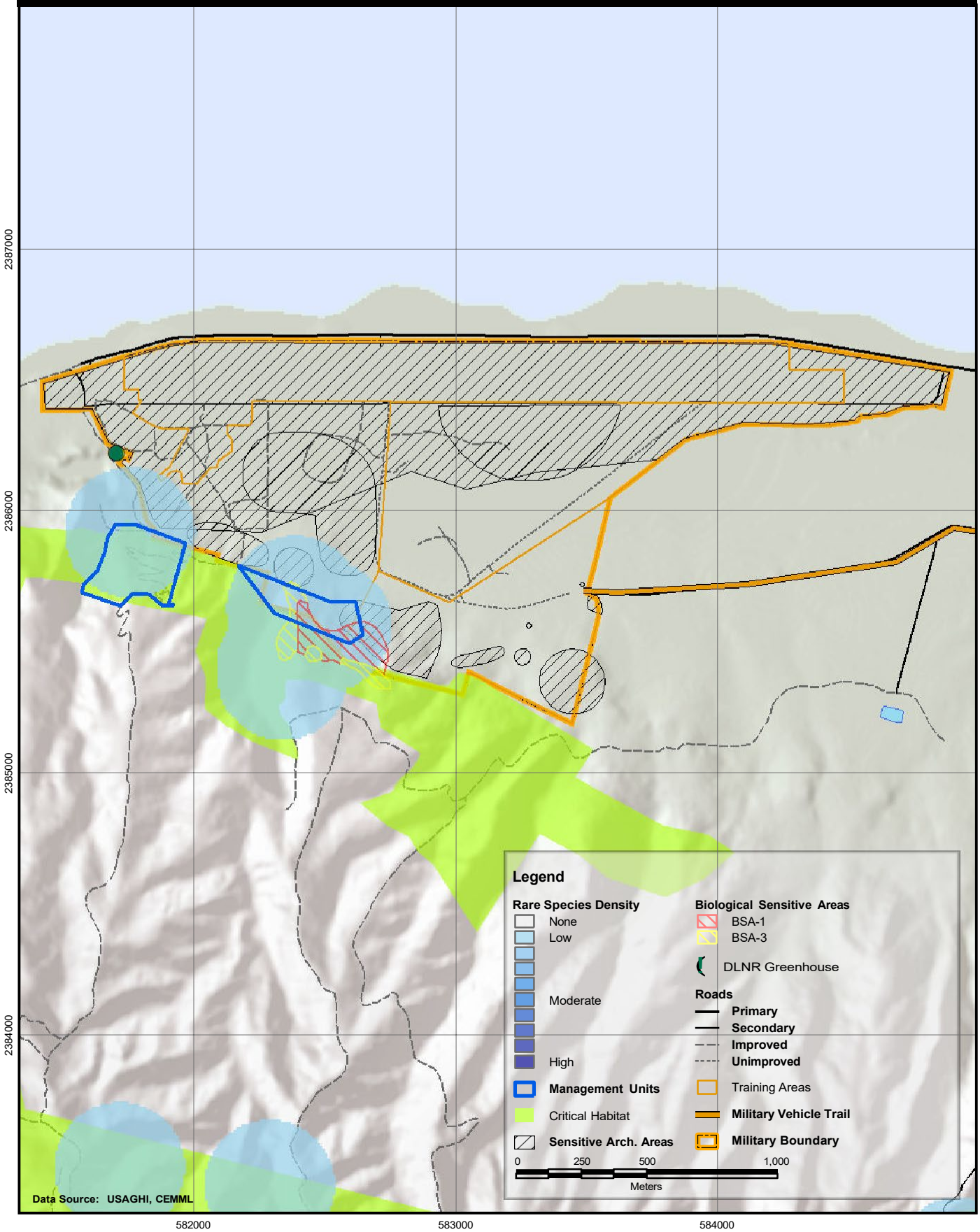
FIRE DANGER RATING	BURN INDEX	CAUTION TO BE EXERCISED	TRAINING RESTRICTIONS	FIRE HAZARD
Green	**0-17.9**	Use Normal Caution	Conditions favorable for all munitions & training authorized by the DMR Range SOP. Smoking is permitted.	LOW
Yellow	**18-38.9**	Use Caution. Fires may start and spread.	Conditions favorable for all munitions & training authorized by the DMR Range SOP. Smoking is permitted.	MODERATE
Red	**39+**	Use Extreme Caution. Ignitions are a near certainty. Fires are very difficult to control.	No pyrotechnics, smoke, simulators, blanks, smoking, or cooking/warming fires allowed.	VERY HIGH

Dillingham Military Reservation

United States Army Hawaii
Integrated Wildland Fire Management Plan

Figure DMR-1

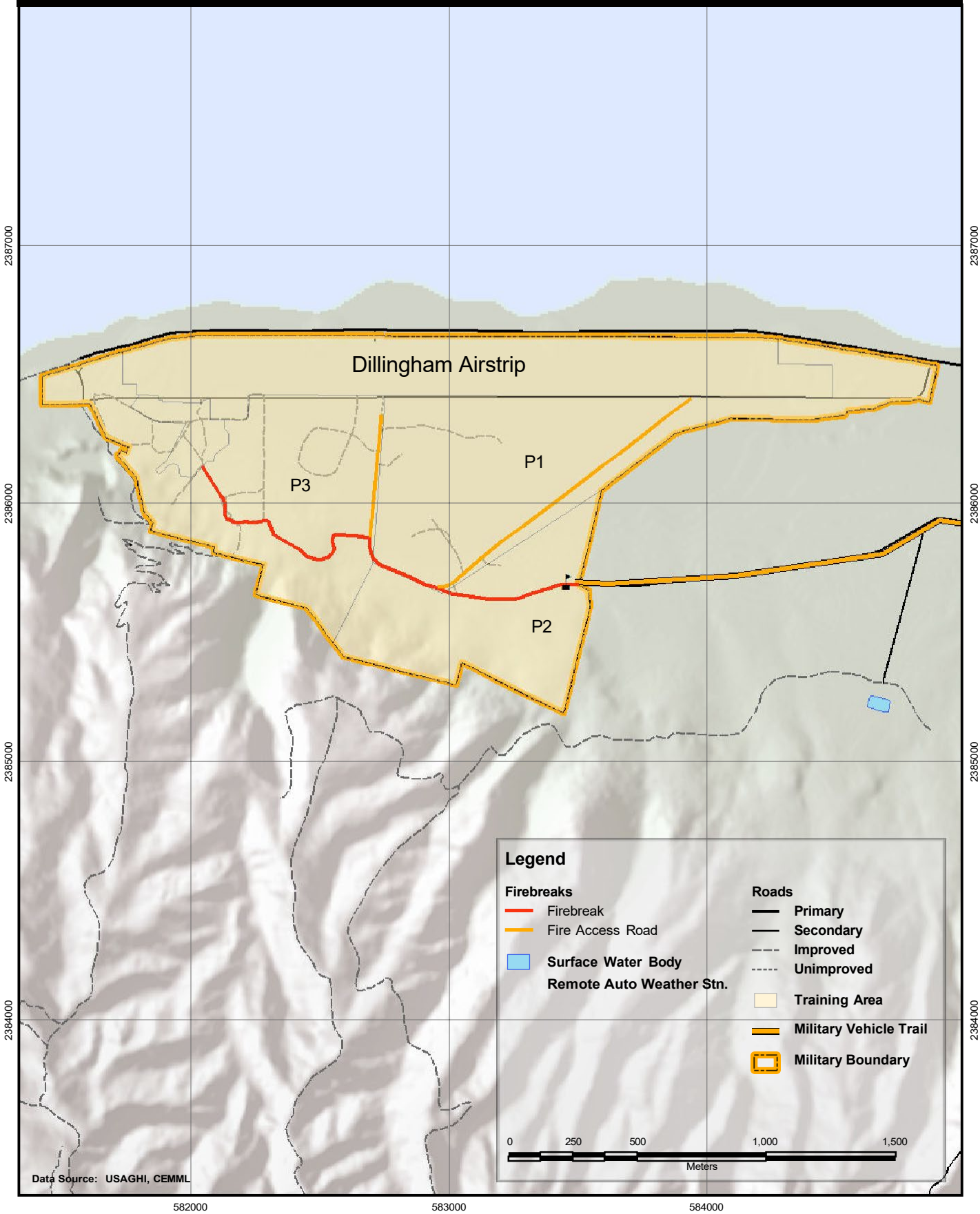
Protected Resources



Dillingham Military Reservation

United States Army Hawaii
Integrated Wildland Fire Management Plan

Figure DMR-2
Fire Suppression
Resource Locations



Enclosure 5 – Specific Guidance for Kahuku Training Area

The purpose of this enclosure is to provide the specific requirements for Kahuku Training Area in addition to the requirements of the Wildland Fire SOP.

1.1 Values at Risk

a. Threatened and Endangered species habitats are located mostly at elevations above 200 m (~650 feet). There are federally listed species in all training areas except A-1, B-1, and D-1 (Figure KTA-1). Federally listed species management units are located in TA's A-2 and C-2 as well as outside the installation boundary. Designated critical habitat is located outside the installation boundary.

b. Sensitive archaeological areas are present throughout much of the lower elevations of the installation (Figure KTA-1).

1.2 Fire Prevention

a. Live-fire ammunition is prohibited at KTA except for Short-Range Training Ammunition and Simmuntions.

b. Blank ammunition and some pyrotechnics are permitted but are subject to restrictions based on the FDRS.

c. Aerial pyrotechnics are prohibited.

d. Range Control approval and guidance must be obtained prior to the use of all pyrotechnics, simulators, and blanks.

1.3 Minimum Staffing Requirements

a. Two (2) Army Taskforce firefighters and a fire response vehicle will be staffed at KTA for initial attack fire response when training is ongoing. Type 6 engine with an ENGB and FFT2 are the minimum requirements.

b. An additional two (2) Army Taskforce firefighters and a fire response vehicle will be staffed at SBMR or at KTA for contingency response when training is ongoing at KTA. Type 6 Engine with an ENGB and FFT2 are the minimum requirements

1.4 Fire Equipment and Supplies

a. There is no equipment or supplies stored at KTA. (However a new Fire Cache is planned for KTA). Equipment and supplies are available at the SBMR fire cache.

1.5 Water Sources

a. There are fire hydrants located outside of the installation on Kamehameha Hwy and in other locations (Figure KTA-2).

b. Aerial resources may utilize water from the approved water sources listed below. Resources are listed from nearest to farthest.

Water Resource Name	Latitude	Longitude
Kahuku Dip Pond	21.676938	-157.985660
Opaeula 15	21.575138	-158.052978
Opaeula 2	21.574311	-158.037476

1.6 Firebreaks/Fuelbreaks

a. There are no firebreaks or fuelbreaks at KTA.

1.7 Fuels Management

a. There is no fuels management at KTA.

1.8 Protection Priorities

a. Protecting structures bordering the installation is the top priority at KTA.

b. Rare species are the second priority for protection.

c. Containing fires within the installation boundary is the third priority.

1.9 Fire Fighting Considerations

a. There is very little UXO at KTA, but it does exist.

b. Steep slopes and exposure to the trade winds can produce severe fire behavior under dry conditions. Direct attack of fires may not be advisable depending on fire behavior.

c. Safety zones may be established at the motocross track, in Kanes and X-Strip DZ's, at the satellite tracking station, and in large mowed or barren areas.

d. There are few opportunities for safety zones at higher elevations. The IC should ensure that escape routes are viable given current road and fire behavior conditions.

Reference KTA 1 - Fire Safety Briefing

The following verbiage will be included in a general safety, environmental, and fire prevention briefing to be given to all personnel before training at KTA.

The purpose of this brief is to educate users of the range about the dangers of fire on the range. Fire prevention is the responsibility of everyone working or training on the range. Fire poses a very real threat to the training mission of USAG-HI. Damage to federally protected plants and animals at and around KTA can result in detrimental restrictions on training activities. This is a very significant issue for USAG-HI. Fighting fires can also result in damage to archaeological sites. This can also result in detrimental training restrictions. These species and archaeological resources are protected by federal law. Personal fines may be issued by outside regulatory agencies if an investigation determines that negligence caused unwarranted damages to protected resources.

If a fire starts, all training must cease, and training downtime will result. For these reasons, every effort must be made to prevent fires. To prevent fires, you must follow these rules:

1. No lighted tobacco smoking materials will be discarded on the range. Smoking on the ranges is prohibited except on dirt or paved surfaces.
2. Open fires are prohibited.
3. Heat tabs and similar products must be used inside metal containers.
4. The use of smoke grenades or simulators is authorized but must be used in such a manner that they will not ignite fires. Do not place smoke grenades or simulators in any vegetated area. Place them in the dirt or in metal cans provided by Range Control.
5. Aerial pyrotechnics are prohibited.
6. The fire danger rating system restricts what types of training are authorized. This policy is strictly enforced.

In the event a fire is started, cease training immediately. Kahuku Range Control or Schofield Barracks Range Control must be notified immediately. Once firefighters arrive on scene, they will extinguish the fire.

Reference KTA 2 - Fire Danger Rating System

All military users of KTA are required to be aware of and adhere to the fire danger restrictions on munitions, pyrotechnics, smoking and other ignition sources. The fire danger is updated every hour, on the hour.

Live fire, aerial pyrotechnics, and open fires are not authorized at KTA at any time.

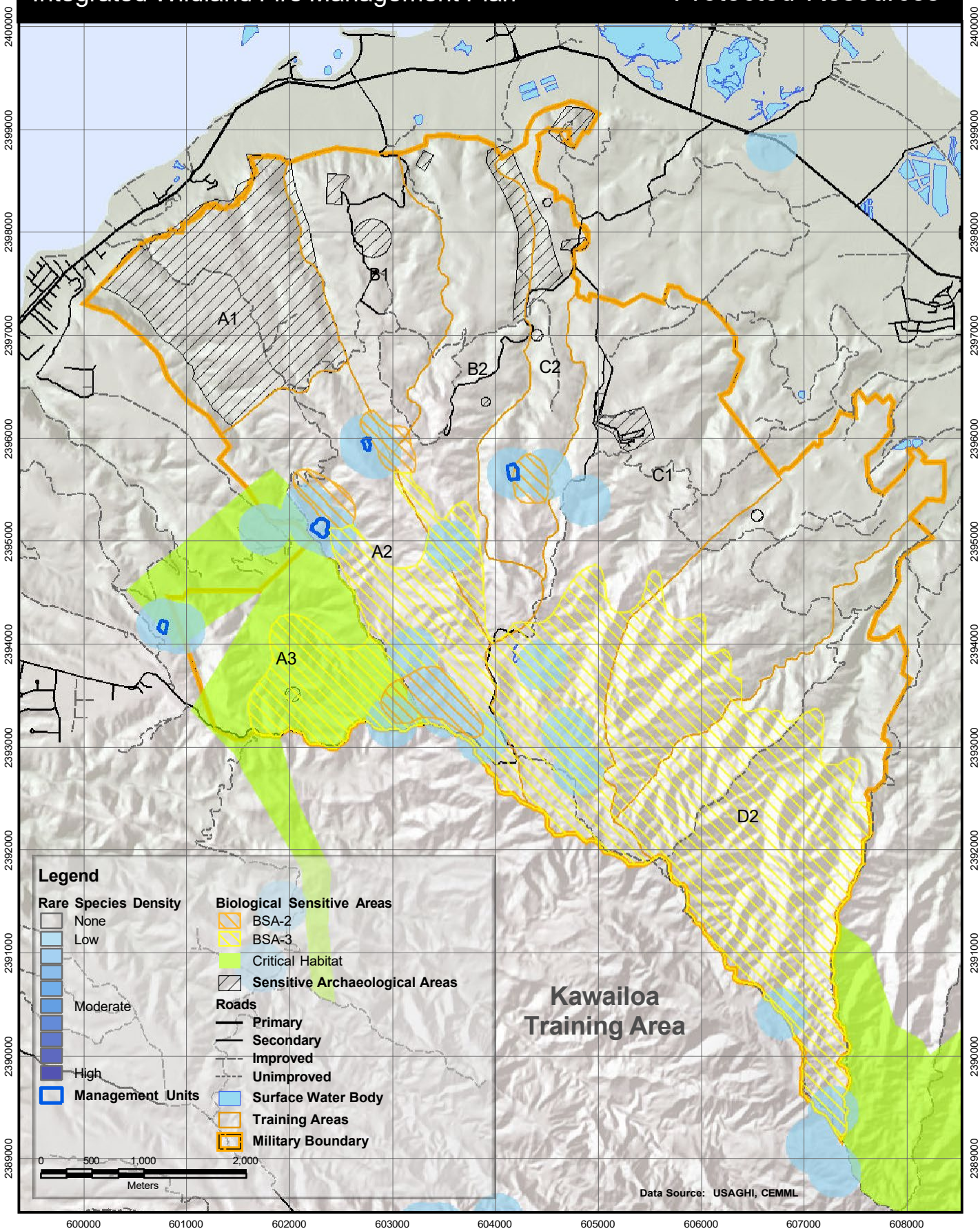
FIRE DANGER RATING	BURN INDEX	CAUTION TO BE EXERCISED	TRAINING RESTRICTIONS	FIRE HAZARD
Green	**0-6.9**	Use Normal Caution	Conditions favorable for all munitions & training authorized by the KTA Range SOP. Smoking is permitted.	LOW
Yellow	**7-31.9**	Use Caution. Fires may start and spread.	Conditions favorable for all munitions & training authorized by the KTA Range SOP. Smoking is permitted.	MODERATE
Red	**32+**	Use Extreme Caution. Ignitions are a near certainty. Fires are very difficult to control.	No pyrotechnics, smoke, simulators, blanks, SRTA. Smoking is permitted.	VERY HIGH

Kahuku Training Area

United States Army Hawaii
Integrated Wildland Fire Management Plan

Figure KTA-1

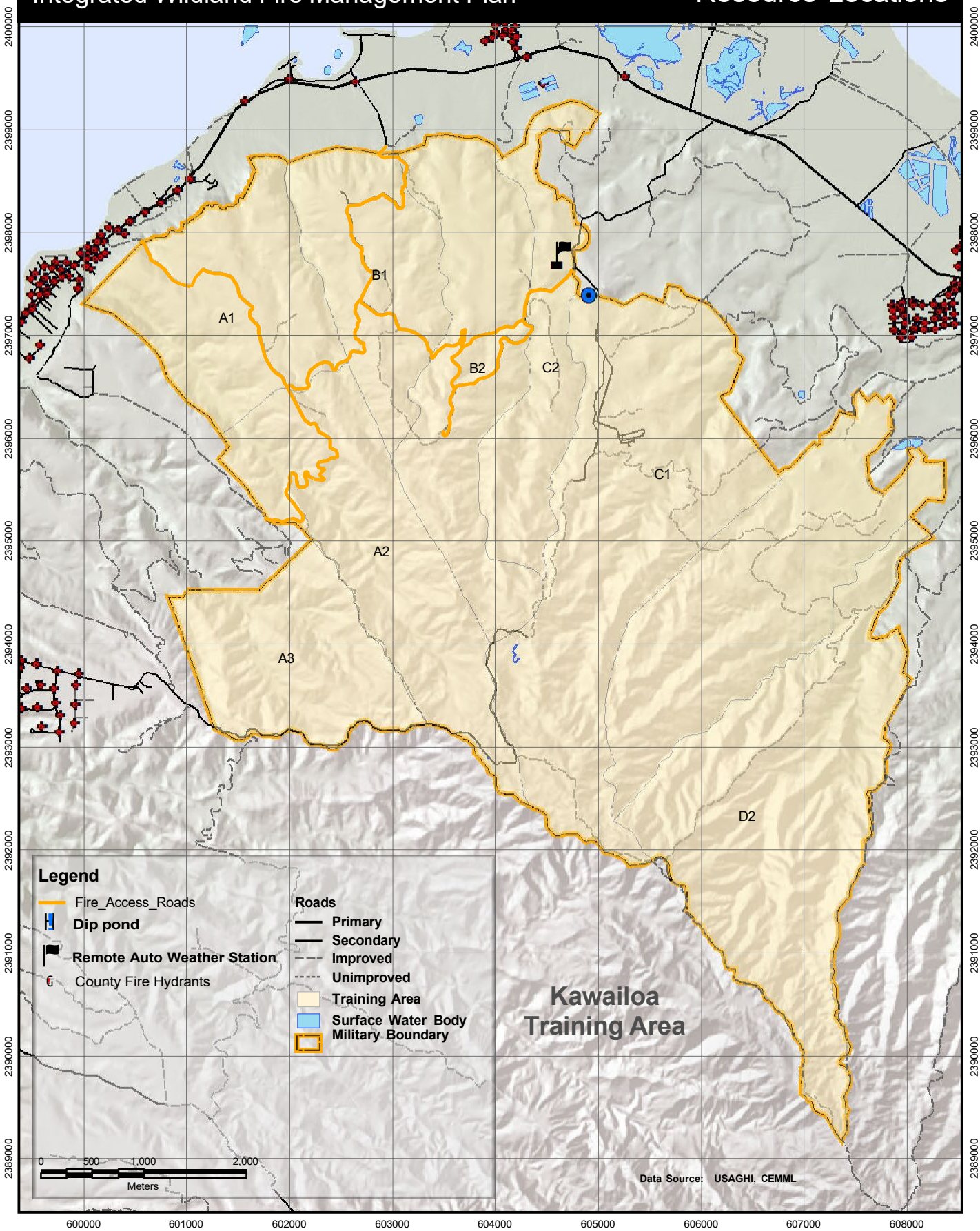
Protected Resources



Kahuku Training Area

United States Army Hawaii
Integrated Wildland Fire Management Plan

Figure KTA-2
Fire Suppression
Resource Locations



Enclosure 6 – Specific Guidance for Kawailoa Training Area

1.1 Values at Risk

a. There are federally listed species and federally listed species management units throughout the installation (Figure KLOA-1). Designated critical habitat exists outside of the installation along the Ko'olau Mountains ridgeline.

b. There are concentrations of cultural resources in the area around Puu Kapu, in drainages, and along ridgetops (Figure KLOA-1).

1.2 Fire Prevention

a. Live-fire ammunition, pyrotechnics, and simulators are prohibited at KLOA.

b. Blank ammunition is permitted but is subject to restrictions based on the FDRS.

1.3 Minimum Staffing Requirements

a. Two (2) Army Taskforce fire fighters and a fire response vehicle will be staffed at SBMR or KLOA for fire response when training is ongoing.

1.4 Fire Equipment and Supplies

a. There is no equipment or supplies stored at KLOA.

b. Equipment and supplies are available at the SBMR firecache.

1.5 Water Sources

a. There are standpipes at HMR (Figure KLOA-2).

b. Aerial resources may use the water resources listed below.

Water Resource Name	Latitude	Longitude
Opaeula 16	21.570362	-158.026999
Opaeula 2	21.574311	-158.037476
Opaeula 15	21.575138	-158.052978
Helemano 11	21.568188	-158.058513
Upper Helemano	21.527461	-158.027375

1.6 Firebreaks/Fuelbreaks

a. There are no firebreaks or fuelbreaks at KLOA.

b. Drum Road is not a designated firebreak or fuelbreak, but it does provide access and a potential location from which to hold a fire.

1.7 Fuels Management

a. Fuels along the Kawailoa to Schofield Barracks Military Vehicle Trail should be cut or herbicided to USAG-HI firebreak standards wherever the trail passes through fallow fields or unmanaged fuels.

1.8 Protection Priorities

a. Rare species throughout the installation are a protection priority.

b. Containing fires within the installation boundary is a secondary priority.

1.9 Fire Fighting Considerations

a. There is no known UXO at KLOA.

b. There are very few areas with available safety zones. Ensure that escape routes to safety zones are viable given distance and current road and fire behavior conditions.

c. Direct attack is preferred for most fires at KLOA.

Reference KLOA 1 - Fire Safety Briefing

The following verbiage will be included in a general safety, environmental, and fire prevention briefing to be given to all personnel before training at KLOA.

The purpose of this brief is to educate users of the range about the dangers of fire on the range. Fire prevention is the responsibility of everyone working or training on the range. Fire poses a very real threat to the training mission of USAG-HI. Damage to federally protected plants and animals at and around KLOA can result in detrimental restrictions on training activities. This is a very significant issue for USAG-HI. Fighting fires can also result in damage to archaeological sites. This can also result in detrimental training restrictions. These species and archaeological resources are protected by federal law. Personal fines may be issued by outside regulatory agencies if an investigation determines that negligence caused unwarranted damages to protected resources.

If a fire starts, all training must cease, and training downtime will result. For these reasons, every effort must be made to prevent fires. To prevent fires, you must follow these rules:

1. No lighted tobacco smoking materials will be discarded on the range. Smoking on the ranges is prohibited except on Drum Road. Smoking is prohibited on the military vehicle trail.
2. Heat tabs and similar products must be used inside metal containers.
3. All live-fire and pyrotechnics are prohibited.
4. The fire danger rating system restricts what types of training are authorized. This policy is strictly enforced.

In the event a fire is started, cease training immediately. Schofield Barracks Range Control must be notified immediately. Once firefighters arrive on scene, they will extinguish the fire.

Reference KLOA 2 - Fire Danger Rating System

All military users of KLOA are required to be aware of and adhere to the fire danger restrictions on munitions, pyrotechnics, smoking and other ignition sources. The fire danger is updated every hour, on the hour.

Live-fire and pyrotechnics are not authorized at KLOA at any time.

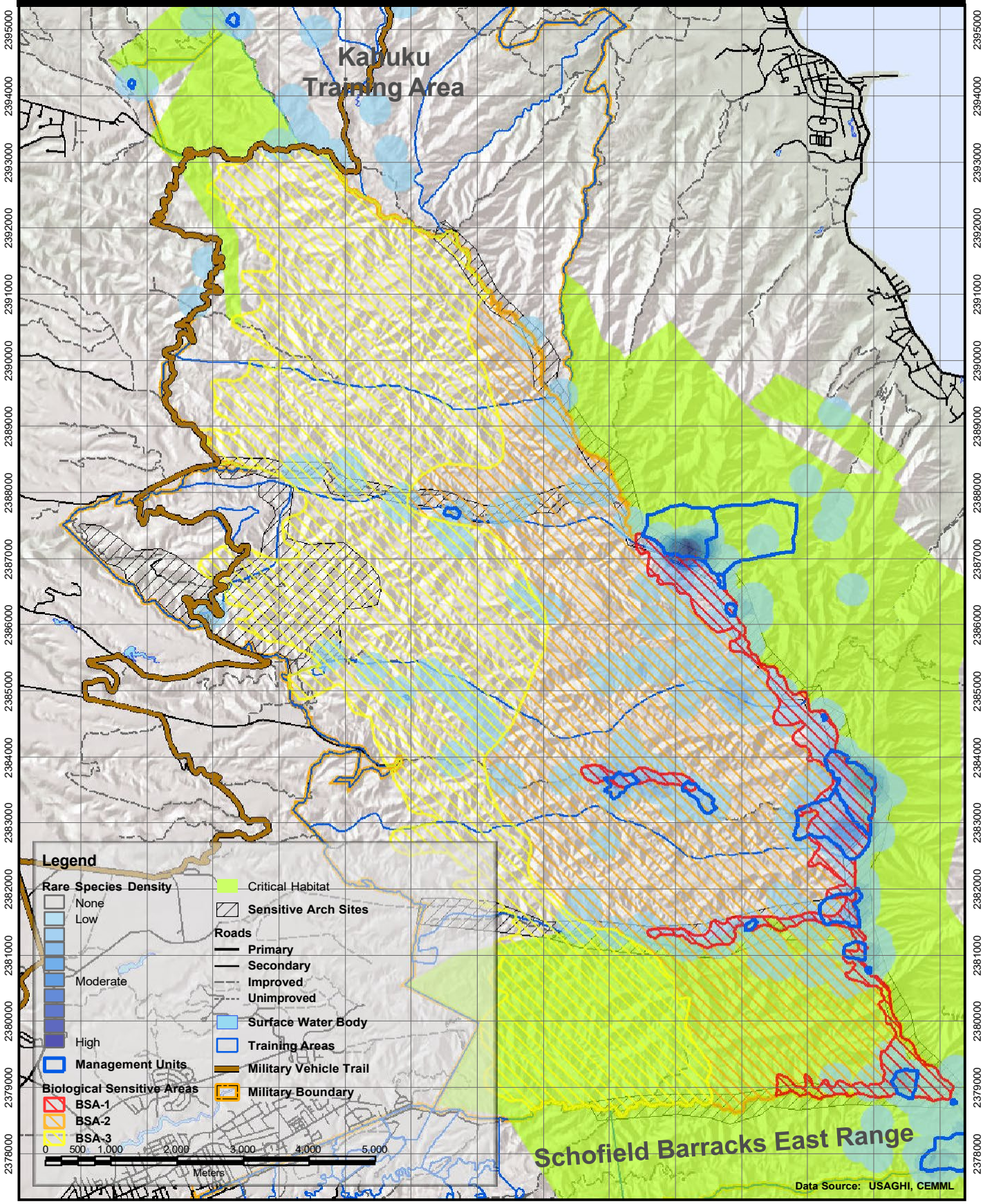
FIRE DANGER RATING	BURN INDEX	CAUTION TO BE EXERCISED	TRAINING RESTRICTIONS	FIRE HAZARD
Green	**0-11.9**	Use Normal Caution	Conditions favorable for all munitions & training authorized by the KLOA Range SOP. Smoking is permitted.	LOW
Yellow	**12-37.9**	Use Caution. Fires may start and spread.	Conditions favorable for all munitions & training authorized by the KLOA Range SOP. Smoking is permitted.	MODERATE
Red	**38+**	Use Extreme Caution. Ignitions are a near certainty. Fires are very difficult to control.	No blanks, pyrotechnics, smoke, simulators, smoking, or cooking/warming fires are allowed.	VERY HIGH

Kawailoa Training Area

United States Army Hawaii
Integrated Wildland Fire Management Plan

Figure KLOA-1

Protected Resources



Kawailoa Training Area

United States Army Hawaii
Integrated Wildland Fire Management Plan

Figure KLOA-2
Fire Suppression
Resource Locations

Enclosure 7 – Specific Guidance for Makua Military Reservation

The purpose of this enclosure is to provide the specific requirements for Makua Military Reservation in addition to the requirements of the Wildland Fire SOP. This document DOES NOT replace the Wildland Fire SOP.

1.1 Values at Risk

a. Threatened and endangered species of plants and animals and their native habitats are found outside the firebreak road, mostly along the high valley walls and on the ridgelines of the installation (Figure MMR-1). Designated critical habitat exists inside and outside of the installation as well.

b. Cultural resources, including known archeological sites, are found throughout the valley, including inside the firebreak road and within the range complex.

c. Fires at Makua are an extremely sensitive issue. All personnel will adhere to all the requirements, procedures, and precautions set forth in the USAG-HI Wildland Fire SOP.

1.2 Fire Prevention

a. Verbiage to be included in the fire prevention briefing is in Reference MMR-1. Briefings to civilians will use the same verbiage but may be limited to the pertinent items (e.g. no smoking).

b. Signs will be posted at the entrance to the training area to raise awareness of fire prevention and as a reminder of the fire danger rating system (FDRS).

c. All three RAWS at MMR shall be maintained in accordance with the most up to date NWCG National Fire Danger Rating System (NFDRS) Weather Station Standards, PMS 426-3.

d. All training and maneuvers are subject to the FDRS (Reference MMR-2 and MMR-3). The fire danger is determined by the burning index (BI) as defined by the National Fire Danger Rating System and the herbaceous fuel moisture. Because MMR's FDRS is more complex a decision tree is used to determine the hourly fire danger (Reference MMR-3).

1) Range Control is responsible for retrieving BI and herbaceous fuel moisture data from the MMR Range RAWS.

2) The BI will be monitored every hour, on the hour, and prior to projected "hot" range status. Range control will notify the training unit every hour, on the hour, of any training restrictions being imposed because of unfavorable fire danger ratings.

3) The current hourly fire danger rating will be posted on the wallboard in the Range Control office and will determine which weapons and/or munitions may be used.

4) The hourly reading shall only be 'wet flagged' and state of the weather of 5, 6, or 7 may only be used when it is raining over the entire valley or when the 10-hour fuel moisture reading at all three Makua RAWS is 20% or greater.

5) No training or maneuvers are authorized if the Weather Information Management System (WIMS) or the RAWS are not operating properly. If the fire danger cannot be determined because WIMS or the RAWS are not operating properly, the fire danger will be set to RED.

6) If the RAWS does not properly transmit its data to WIMS, the fire danger will be set to RED.

7) The Makua Range RAWS shall be programmed to use NFDRS fuel model N, climate class 2, 1978 model.

8) The three Makua RAWS may not be moved from their current locations without approval from the USFWS.

9) Stations shall be 'greened up' in WIMS when grass begins to grow again, usually in early November. Greening up the RAWS shall be subject to approval of the WFPM. The Range RAWS may only be greened up once per year and should not be greened up within nine months of a previous green up unless highly unusual weather has occurred and only with the approval of the WFPM.

e. Many munitions are prohibited at MMR including, but not limited to tracers, white phosphorous, aerial pyrotechnics, rockets, and missiles. OIC's will check with Range Control prior to commencement of any training to ensure compliance. A list of authorized munitions is included in Reference MMR-4, but all of these munitions are further restricted by the FDRS.

f. Range Control will strictly enforce the list of authorized munitions. Punitive measures will be assessed by the Range Officer if unauthorized munitions are used, regardless of whether a fire was started.

g. Range Control will strictly enforce the restrictions on munitions based on the FDRS. Punitive measures will be assessed by the Range Officer when units violate FDRS restrictions, regardless of whether a fire was started.

h. Demolitions outside of the demo pit, tire house, or bunkers are limited to UXO removal and are limited to a 300-pound net explosive weight of C4 or TNT and must be a minimum of 100 m (328 ft) inside of the south lobe of the firebreak road. Demolitions for any purpose, including UXO removal, are subject to the FDRS. Demolitions that must take place outside of the firebreak road are not authorized until a consultation with the USFWS has been completed.

i. No training of any kind is allowed outside of the firebreak roads.

j. Training in the northern firebreak road is limited to the mowed grassy area at its west end. Training within this area is limited to artillery emplacement and blank fire.

1.3 Minimum Staffing Requirements

a. The MMR Range Operations Supervisor is responsible for ensuring all minimum staffing measures are met prior to any training activity. Failure to meet these measures will violate several legally binding agreements between the Army and private and public entities. NO TRAINING will occur without ALL minimum staffing measures in place. A staffing worksheet is provided in Reference MMR 6.

b. It may be useful to estimate the day's maximum BI and associated fire danger. This can be done as much as six days in advance given the availability of National Weather Service point forecast data, but estimations more than two days into the future are often of poor accuracy. Estimation of the BI can be accomplished using data from the National Weather Service point forecast for MMR, the previous day's woody fuel moisture, and fuel moisture calculations for fine fuels, and entering the data into the Fire Family Plus NFDRS calculator. This should be

carried out by an ARMY FIRE Taskforce member with a good understanding of fire danger rating. This may be used for estimation purposes only. Note that the maximum fire danger reaches the RED category more than 50% of the time from March through October.

c. Staffing of aerial resources, personnel, and fire response vehicles is required whenever military units are down range for any purpose. Staffing numbers for each fire danger category are provided in Reference MMR 5.

d. The IC shall provide information to the Range Operations Supervisor necessary for filling out the staffing worksheet.

e. Once complete, the Range Operations Supervisor shall print the staffing worksheet and provide it to the day's IC. The IC shall provide the worksheet to the WFPM and the WFPM shall retain staffing worksheets for five years. These shall be provided to the U.S. Fish and Wildlife Service upon request through the DPW Environmental Natural Resources Manager.

f. Specifics for each staffing element required are described below:

1) Aerial Support Requirements

a) Aerial support requirements are based on the fire danger rating. These requirements are summarized in Reference MMR 5 at the end of this Enclosure.

b) At least one helicopter is required for all training uses of MMR. More are required if the fire danger exceeds the BLUE fire danger rating.

c) All helicopters will meet NWCG Type 2 or Type 1 helicopter requirements. Type 1 helicopters have 12,500+ lbs. maximum gross takeoff weight and 700+ gallon capacity, Ex.: Chinook, Blackhawk, CH-53E. Type 2 helicopters have 6000 – 12,500 lbs. maximum gross takeoff weight and 300+ gallon capacity.

d) It is the responsibility of the training unit to arrange for helicopter support during initial scheduling and coordination for the use of MMR.

e) All aircrews staffing helicopters must be trained in aerial bucket operations.

f) 15-minute response helicopters:

i. Will be stationed on-site throughout the duration of training

ii. Will land at the helispots in front of the Range Control Building. The helicopters will be parked with helibuckets hooked up.

iii. Helibuckets on helicopters will be tested prior to commencement of any live-fire training.

iv. Upon detection of a fire, aircrews are expected to be airborne in less than 15 minutes.

g) One hour response helicopters:

i. The backup aircraft at WAAF or K-Bay will be identified as the back-up for wildfire suppression mission at MMR and may not be assigned other tasks. This aircraft must be preflight/run-up, with aircrew ready to respond immediately upon notification of a fire, and able to respond to MMR within one hour.

h) Helicopters dedicated to the wildfire suppression mission at MMR may not be called for other missions except under emergency circumstances. If any of the helicopters must leave its MMR fire suppression mission, all training at MMR will stop immediately, all training personnel will return to the vicinity of the Range Control buildings, and the ranges will be visually checked for fires. If the helicopter is being re-assigned for a non-emergency mission, all of the above will occur prior to its departure.

i) MMR staff is responsible for ensuring that a serviceable primary and a reserve helibucket is always available for each helicopter. Upon arrival of the assigned helicopters at MMR, there must be confirmation that the helibucket is fully operational.

j) On days when a helicopter is required on site, the on-site helicopter crews will conduct two successful helibucket operation test drops prior to the commencement of any live-fire training. A successful test drop is defined as the ability to submerge the helibucket in the dip pond, filling the bucket to its capacity, lifting the helibucket out of the dip pond, maintaining hover over the dip pond to check for leaks (15 seconds), and activating release dump while dispersing the water back into the dip pond. If a helibucket is not operational, a replacement helibucket will be obtained and tested. Live-fire training will not commence until a serviceable helibucket is operating properly.

k) On days with fire risk exceeding BLUE, at least one fire suppression helicopter will remain on site at MMR for at least two hours after live-fire training has ceased.

l) The MMR staff will immediately note all discrepancies and status of inoperable helibuckets and report them to the WFPM to coordinate immediate replacement or repair.

m) Air-to-ground radio communication must be established between the aircraft, Range Control, the IC, and other units involved in fire suppression activities. Coordination and direction of air resources with ground firefighting crews is essential for safe and effective application. Range control and fire crews will use the MMR Range Control frequencies and air-to-ground portable radios to communicate with the aircrew when directing initial attack helibucket operations.

2) Firefighters

a) Minimum staffing during training exercises will be in accordance with Reference MMR 5.

i. All firefighters must be NWCG qualified and have a current Incident Qualification Card (“Red Card”).

ii. All firefighters must pass the NWCG Arduous level work capacity test.

b) Firefighters will staff the positions assigned by the WFPM.

c) Firefighters may not be assigned non-fire related duties.

d) The HQ USARHAW Range Officer, MMR Range Operations Supervisor, and ARMY FIRE WFPM are responsible for arranging work schedules to ensure minimum staffing levels are met.

e) When a fire is reported, firefighting duties take precedence over other work assignments.

f) All IC's assigned to staff MMR will be familiar with the locations of listed species and critical habitat.

g) Firefighters listed on the staffing worksheet will remain on site until two hours after live-fire exercises have ceased. During this time, the assigned IC shall take a one-hour reconnaissance flight over the surface danger zones of all the weapons that were fired during the live-fire exercise to check for fires.

h) Firefighters listed on the staffing worksheet may be relieved at any time by another firefighter if all minimum staffing requirements for the day are still met. Replacements will be noted on the staffing worksheet.

3) Vehicles

a) Two fully operational Type 6 or higher wildland fire engines meeting minimum vehicle requirements (SOP section 3.5) will be stationed on site near the Range Control Building whenever live-fire training is scheduled.

b) The wildland fire engines will be tested prior to any live-fire training to ensure they can pump a minimum of 100 psi of water pressure within five minutes of starting the pump.

c) The pumps on the wildland fire engines will not be older than 15 years since manufacture date.

d) One fully operational tactical water tender will be stationed on site near the Range Control Building whenever any training is scheduled.

1.4 Fire Equipment and Supplies

a. There is no fire cache at MMR. ARMY FIRE Taskforce members will ensure that engines are fully stocked prior to deployment to MMR.

b. Helibuckets

1) Helibuckets will be maintained by ARMY FIRE Wildland Taskforce crew members.

2) ARMY FIRE crew members and or the CAB will notify the WFPM of any helibuckets in need of repairs.

1.5 Water Sources

a. There are two 300,000-gallon dip ponds at MMR, one near the Range Control Building and one near objective Deeds (Figure MMR-2). The ponds are ideal for aerial bucket operations.

b. MMR staff will ensure that the upper and lower dip ponds are filled at a minimum of 75% (above the 7.5-foot mark) of their maximum capacity prior to any training, including non-live-fire training.

c. The lower dip pond is filled using the waterline into MMR. The upper dip pond #2 has no water line and can only be filled by water tender delivering water from another off-site location.

d. There are two standpipes at the Range Control Building.

e. The large water tank shall be filled to 75% of capacity or more whenever any training, including non-live-fire training, occurs at MMR.

f. MMR Range Control is responsible for ensuring the dip ponds and the water tank are filled as necessary. The WFPM will be notified immediately to coordinate service contracts as necessary to repair or refill the upper dip pond.

1.6 Firebreaks/Fuelbreaks

a. There are two firebreaks at MMR, known as the northern firebreak road and the southern firebreak road (Figure MMR-2). Additionally, there are numerous interior fire access roads within the southern firebreak road. All of these will be maintained at USAG-HI standards as specified in Section 4.3 of the IWFMP (Enclosure 12).

b. DPW Maintenance is responsible for funding maintenance of the firebreak roads.

c. The firebreaks and fuelbreaks shown in Figure MMR-2 and noted in Section 4.3.4.5 of the IWFMP (Enclosure 12) must be in place and properly maintained prior to any training at MMR.

d. The WFPM, in coordination with DPW Maintenance, DPW Environmental, and the HQ USARHAW Range Officer, shall ensure that maintenance of firebreaks and fuelbreaks is completed on time and up to USAG-HI standards.

1.7 Fuels Management

e. No training may occur at MMR without fuels management fully in compliance with Section 4.3.4.4 of the IWFMP (Enclosure 12). Note the exceptions for prescribed fire and grazing.

a. It is the responsibility of DPW Maintenance to fund and implement all mowing and herbiciding required by this IWFMP inside of the firebreaks, along the firebreaks, in the vicinity of the Range Control buildings, and in the vicinity of the upper dip pond. A list and maps of all mowing required by the IWFMP is included in Section 4.3.4.5 of the IWFMP (Enclosure 12).

b. The DPW Maintenance Division is responsible for all the mowing and herbiciding that is required outside of the firebreak roads. A list of all the mowing requirements required by the IWFMP is included in Section 4.3.4.5 of the IWFMP (Enclosure 12).

1.8 Protection Priorities

a. The primary goal of all wildland fire operations is human safety. Rare species throughout the installation are a secondary but very high protection priority. As a general rule of thumb, fires should be kept out of all forested areas.

b. Containing fires within the installation boundary is a tertiary priority.

1.9 Fire Response

a. A full response to every fire at MMR, regardless of location or cause, is an unconditional requirement. No fire will ever be allowed to burn for any reason other than safety requirements.

b. Upon notification of a fire, MMR Range Control will immediately close the range for any operation other than fire suppression. The range will be reopened at the discretion of the IC in coordination with the WFPM or designee and the HQ USARHAW Range Officer.

c. Once Range Control has confirmed it is safe to proceed down range, all staffed ground resources will respond to the fire with due regard for safety.

d. If the fire is in a non mowed area, or it is unclear where the fire is, all staffed aerial resources will also immediately respond. If the fire is in a mowed area, aerial resources may or may not be utilized at the discretion of the IC. If the fire then burns into a non mowed area, all staffed aerial resources will be brought to bear on the fire.

e. The IC will coordinate with MMR Range Control to request additional military assistance for major fires.

f. Any and all necessary firefighting resources may be ordered at the discretion of the IC including activating mutual aid resources and ordering contract helicopters.

g. MMR Range Control will notify the DPW Environmental Natural Resources Manager (808-656-9189 (W)) of all fires within one hour of the fire being reported. If the Natural Resources Manager does not answer, Range Control will leave a message. If the fire is outside of the firebreak and the Natural Resources Manager cannot be reached, MMR Range Control will notify the DPW Environmental Chief (phone #).

h. Fires that start outside of MMR, or fires that are threatening to burn out of the MMR boundary, will be reported to the City and County of Honolulu. Fires that start outside of MMR but are threatening to move into MMR will trigger the fire response outlined in this SOP.

i. If a fire is threatening the MMR boundary, MMR Range Control will notify adjacent landowners before the fire escapes the MMR boundary.

j. If extended attack is determined to be necessary by the fire's IC, MMR Range Control will notify the Installation Operations Center.

k. At a minimum, an NWCG certified ICT4 and an NWCG certified FFT2 will remain on duty between 0600 and 2100 on any day a fire is burning anywhere in MMR until the fire is declared 100% contained. Once the fire is declared 100% contained, at a minimum one

NWCG certified and current ICT5 plus an NWCG certified FFT2 will remain on duty between 0600 and 2100 on any day a 100% contained fire is burning in MMR until the fire is declared 100% out.

l. Training may not re-commence until the fire is declared 100% contained.

m. A fire may be declared 100% out only after 48 hours have passed since the last heat or smoke was found. Fires outside of the firebreak road may only be declared out by the WFPM or the Wildland Fire Crew Supervisor. Fires inside the firebreak road may only be declared out by an Army NWCG certified ICT4 firefighter or better.

1.10 Post Fire Requirements

a. If a fire has started outside the firebreak road, training will be suspended until an internal investigation has been completed by the WFPM and the DPW Environmental Office has conducted a survey of the fire area.

1.11 Special Fire Fighting Considerations

a. Fires outside the firebreak are considered a critical event and all resources will be brought to bear on them.

b. Fire suppression recommendations:

1) Fires inside the southern firebreak road may be attacked directly in most cases. Beware of UXO areas toward the eastern end of the firebreak. Use existing internal roads to help contain fires.

2) Fires in the northern firebreak and outside the firebreak road must be attacked indirectly and/or directly from the air. UXO precludes direct attack in these areas.

3) The water tender should stay on the firebreak roads to avoid getting stuck.

4) Structural engines/tenders should stay on the center road and not drive past the upper dip pond to avoid getting stuck.

5) Safety Zones are available in many of the mowed areas within the southern firebreak (assess the fuel conditions before relying on these), several barren areas around military objectives, in previously burned areas, and in the mowed area around the Range Control Building. Portions of the southern firebreak road may be used as Safety Zones at the discretion of the IC.

6) A forward staging area in a large gravel pullout is available at the intersection of the northern and southern firebreak roads or in the mowed area next to the upper dip pond.

c. During large fires, one fireline supervisor will be assigned to coordinate suppression actions at the Kaluakauila Management Unit and another will be assigned to the Kahanahaiki Management Unit if these units are both threatened.

d. The IC of any large fire will document major equipment, firefighters, pilots, and helicopter assignments on the Daily Staffing Worksheet.

e. “Restarts” of fires are not acceptable. Do not declare a fire out unless you are certain it is out.

f. Training will not occur on any day when there is not adequate fire resource staffing available to work during the entire duration of any potential fire suppression operation, including weekends and extended hours.

g. The IC on any fire at MMR has the authority to authorize any necessary and prudent expenditures to prevent fires from damaging any of the threatened and endangered species locations. Such expenditures may be restricted only by the Garrison Commander.

h. Per the 2007 Makua Biological Opinion, the use of foam or other chemical fire retardants is prohibited within 100m of the ocean, ponds, or actively running streams.

i. Prescribed burning requires that a prescribed burn plan meeting all the requirements of the 2007 Makua Biological Opinion and the 2008 amendment to the Makua Biological Opinion be in place. This plan must be reviewed by the USFWS.

Reference MMR 1 - Fire Safety Briefing

The following verbiage will be included in a general safety, environmental, and fire prevention briefing to be given to all personnel before training at MMR and to all civilian visitors.

The purpose of this brief is to educate users of the range about the dangers of fire on the range. Fire prevention is the responsibility of everyone working or training on the range. Fire poses a very real threat to the training mission of USAG-HI. Damage to federally protected plants and animals at and around MMR can result in detrimental restrictions on training activities. This is a very significant issue for USAG-HI. Fighting fires can also result in damage to archaeological sites. This can also result in detrimental training restrictions. These species and archaeological resources are protected by federal law. Personal fines may be issued by outside regulatory agencies if an investigation determines that negligence caused unwarranted damages to protected resources.

If a fire starts, all training must cease, and training downtime will result. For these reasons, every effort must be made to prevent fires. To prevent fires, you must follow these rules:

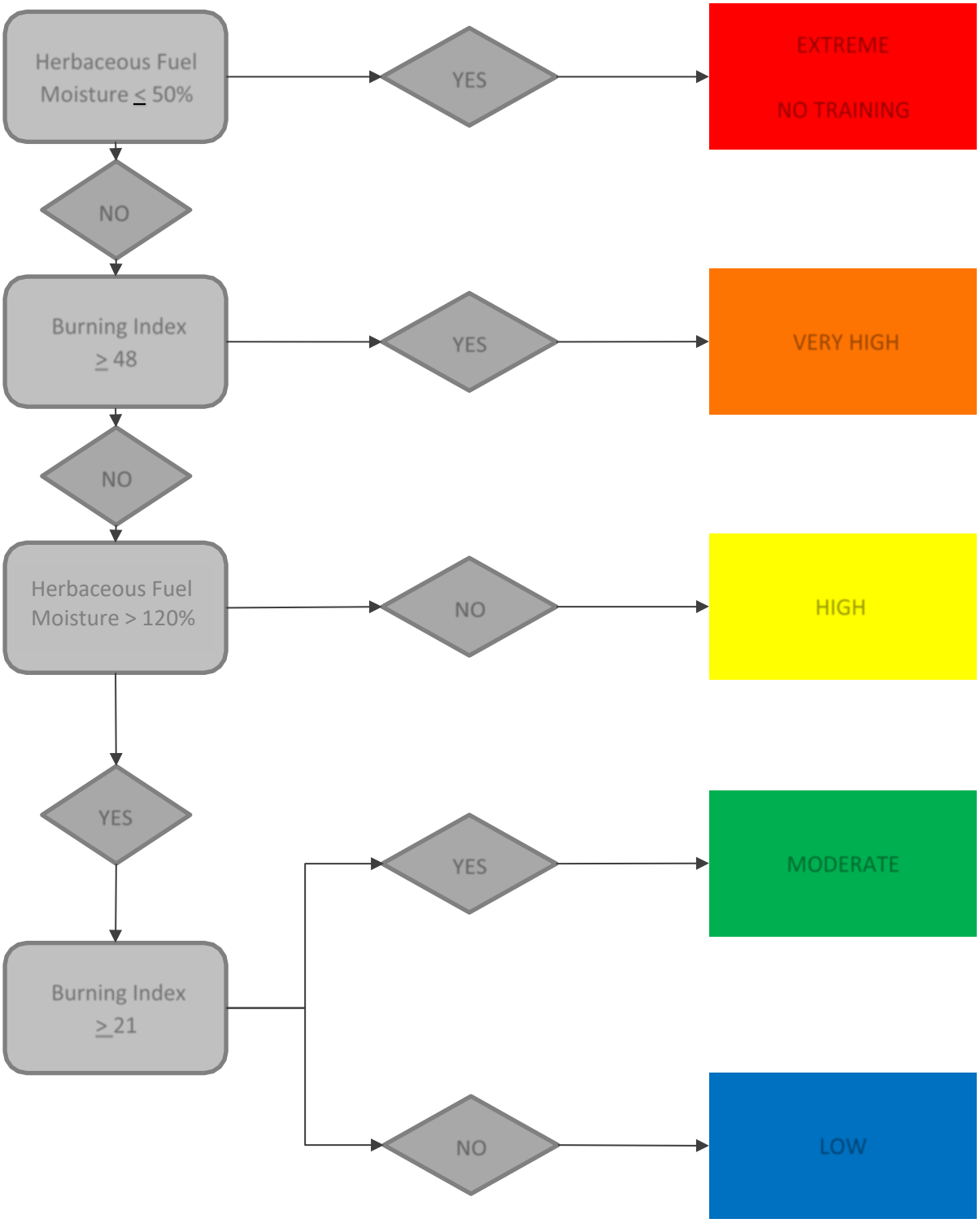
1. Smoking on the ranges is prohibited. No lighted tobacco smoking materials will be discarded on the range. Smoking is only allowed in the green grass around the Range Control buildings.
2. Many weapons, munitions, and training aids are prohibited at MMR. Your OIC has been provided with a list of authorized munitions (provide list to OIC's). Do not deviate from this list. This policy is strictly enforced.
3. No training is permitted outside of the firebreak road under any circumstances. Training within the northern firebreak road is restricted to the mowed area at its west end.
4. Heat tabs and similar products must be used inside metal containers.
5. The use of smoke grenades or simulators is authorized but must be used in such a manner that they will not ignite fires. Do not place smoke grenades or simulators in any vegetated area. Place them in the dirt or in metal cans provided by Range Control.
6. The fire danger rating system restricts what types of training are authorized. This policy is strictly enforced.

In the event a fire is started, cease training immediately. Makua Range Control must be notified immediately. Failure to notify Range Control of any fire will result in termination of scheduled training and responsible individuals may be subjected to administrative disciplinary action in accordance with applicable regulations. Once firefighters arrive on scene, they will extinguish the fire.

Reference MMR 2 - Fire Danger Rating System

FIRE DANGER RATING	CAUTION TO BE EXERCISED	AUTHORIZED MUNITIONS
Blue LOW	Use Normal Caution	Conditions favorable for all munitions & training authorized by the MMR Range SOP. Smoking is permitted.
Green MODERATE	Use Caution. Fires may start and spread.	Conditions favorable for all munitions & training authorized by the MMR Range SOP. Smoking is permitted.
Yellow HIGH	Use Caution. Fires may start, spread quickly, and cause containment difficulties.	Ball, small arms SRTA, demolitions (in demo pit, tire house, or bunker only, limit 300 lbs), hand grenades (HE, practice, and smoke only), 40 mm grenade launcher (inert only, no MK19) permitted. No mortars. No artillery. No pyrotechnics. No smoke. No UXO demolitions.
Orange VERY HIGH	Use Extreme Caution. Ignitions are a near certainty. Fires are very difficult to control.	Maneuver training only. Blanks in mowed area within the firing point firebreak are the only munition authorized. No other munitions of any type. No pyrotechnics, smoke, or simulators. No smoking on the ranges. No cooking or warming fires on the ranges. No UXO demolitions.
Red EXTREME	Use Extreme Caution. Ignitions are a near certainty. Fires are impossible to control.	**NO TRAINING AUTHORIZED** No personnel on the range except for mowing or maintenance crews and emergencies. No smoking on the ranges. No cooking or warming fires on the ranges. No UXO demolitions. No maneuver training. No simulators.

Reference MMR 3 – FDRS Decision Tree



Reference MMR 4 - List of Authorized Munitions*

Weapon	Ammunition or Charge
Small Arms	Ball Bullets or Blanks. No tracers are authorized.
Rifles	5.56 mm, 7.62 mm
Pistols	9 mm, .45-caliber, .38-caliber, .22-caliber
Machine Guns	5.56 mm, 7.62 mm, .50-caliber, 40 mm target practice (TP)
Shotguns	12-gauge shotgun (00)
Helicopter Guns	7.62 mm, .50-caliber
Green Ammunition	5.56 mm, 7.62 mm
Short-Range Training Ammunition (SRTA)	5.56 mm, .50-caliber
Mortars and Artillery	60 mm HE, 60 mm SRTA (mortar) 81 mm HE, 81 mm TP (mortar) 105 mm HE (artillery) 120 mm HE (mortar) 155 mm HE (artillery)
Smoke Grenades	Colored, hexachloroethane smoke, white smoke, and target acquisition smoke practice
Grenades	Fragmentation, offensive, practice, simulators, 40 mm (M79, M203, MK19).
Demolitions	Limit 300-pound (136-kilogram) net explosive weight, including bangalore torpedoes. Only in demo pit, tire house, or bunker.
Mines	Claymore antipersonnel, inert antipersonnel (volcano delivery device or modular packed mine system delivered), anti-tank.
Simulators	Booby trap, Smoke Pots, Smoke Generator, Artillery Simulator.

*Use of all munitions is subject to the Fire Danger Rating System, firefighter staffing, and helicopter staffing requirements.

Reference MMR 5 - Fire Staffing Chart

FIRE DANGER RATING	FIREFIGHTERS	ENGINES	WATER TENDERS	AERIAL RESOURCES
Blue LOW	3 Minimum qualifications: 1x ICT5 1x ENGB	1 Minimum Type: NWCG Type 6	1 Minimum Capacity: 2000 Gallons	1 Minimum Capacity: NWCG Type 2 On 1-hour Response
Green MODERATE	4 Minimum qualifications: 1x ICT5 1x ENGB	1 Minimum Type: NWCG Type 6	1 Minimum Capacity: 2000 Gallons	2 Minimum Capacity: NWCG Type 2 One on 15-min Response One on 1-hour Response
Yellow HIGH	4 Minimum qualifications: 1x ICT5 1x ENGB	1 Minimum Type: NWCG Type 6	1 Minimum Capacity: 2000 Gallons	3 Minimum Capacity: NWCG Type 2 Two on 15-min Response One on 1-hour Response
Orange VERY HIGH	5 Minimum qualifications: 1x ICT4 3x ENGB	2 Minimum Type: NWCG Type 6	1 Minimum Capacity: 2000 Gallons	4 Minimum Capacity: NWCG Type 2 Two on 15-min Response Two on 1-hour Response
Red EXTREME	**NO TRAINING AUTHORIZED**			

Reference MMR 6 – Staffing Worksheet

Date staffing is applicable: _____

Expected maximum BI: _____

Expected maximum Fire Danger Category (circle one): BLUE GREEN YELLOW ORANGE RED

For the expected maximum Fire Danger Category, how many of each of the following are required?:

Firefighters: ___ Engines:___ Water Tenders: **_1_**
1-Hour Response Helicopters: ___ 15-Minute Response Helicopters: ___

Identify each resource that will be used to meet the minimum staffing requirements in the tables below

Firefighter Staffing

Name	Qualification Level

Engine Staffing

Engine Call-Sign/Number	NWCG Type Class

Water Tender Staffing

Water Tender Call-Sign/Number	Water Tender NWCG Type Class

Aerial Resources Staffing

Aircraft Tail Number	NWCG Type Class

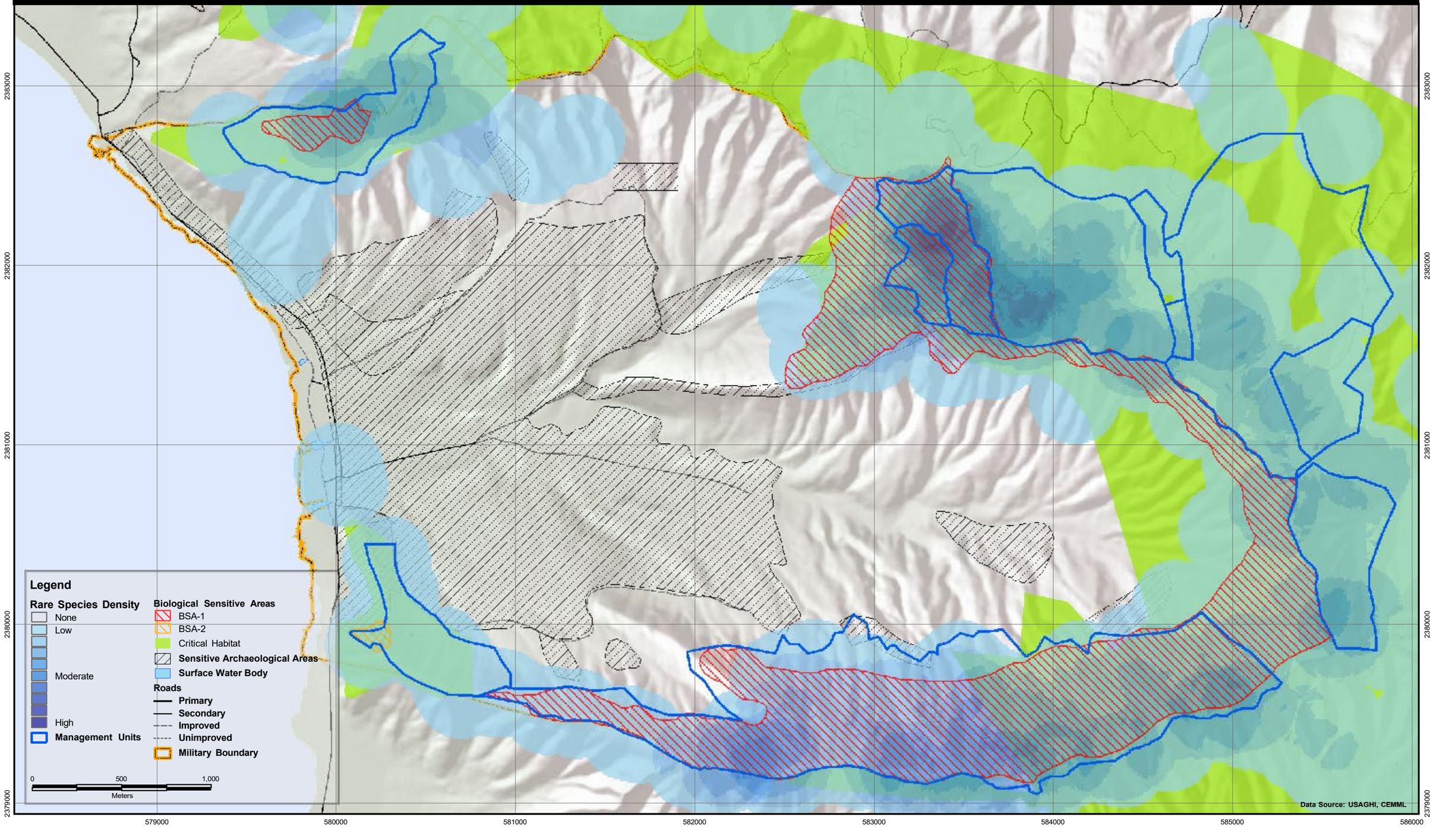
Completed by: _____

Makua Military Reservation

United States Army Hawaii
Integrated Wildland Fire Management Plan

Figure MMR-1

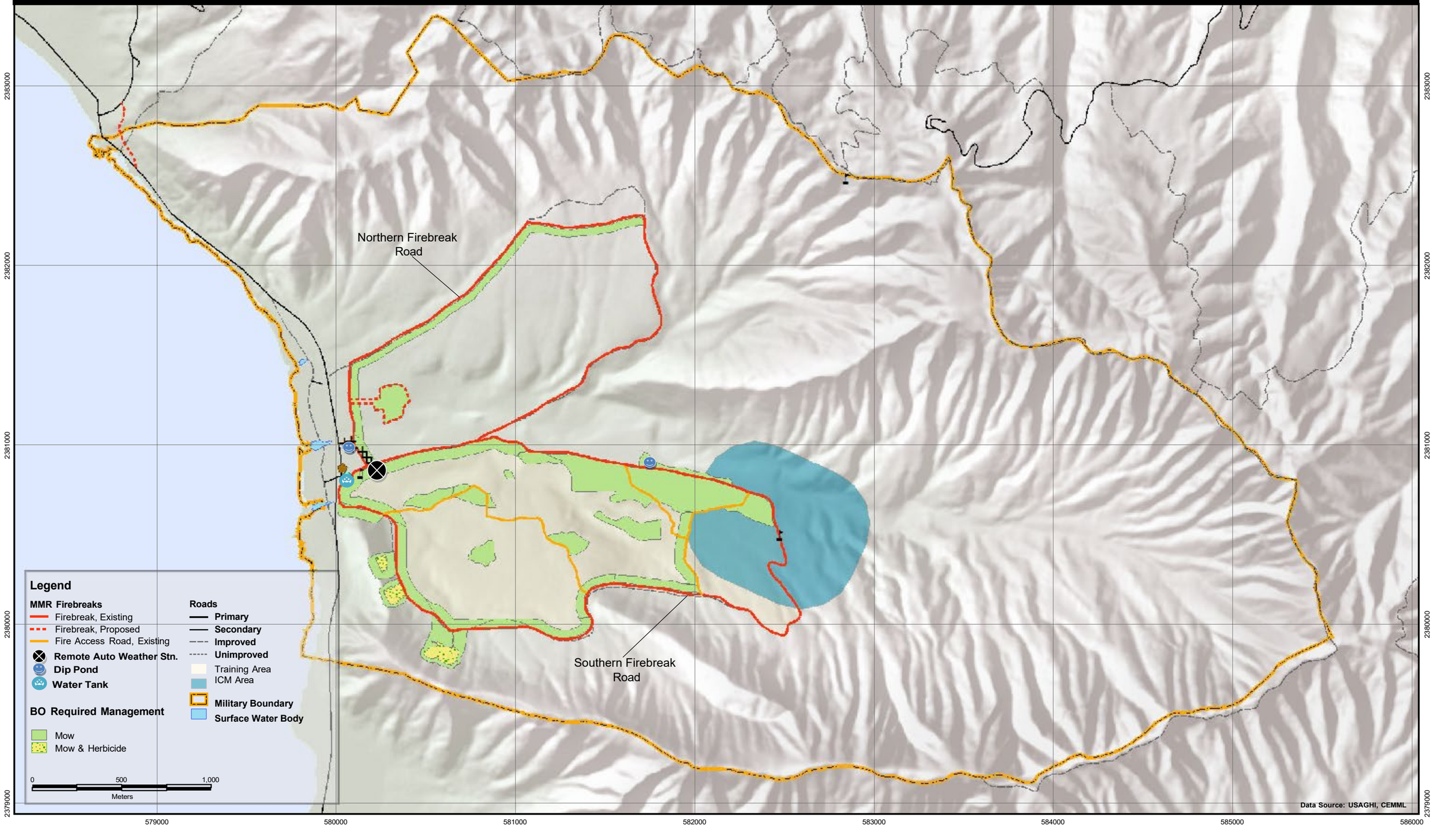
Protected Resources



Makua Military Reservation

United States Army Hawaii
Integrated Wildland Fire Management Plan

Figure MMR-2
Fire Suppression
Resource Locations



Enclosure 8 – Specific Guidance for Schofield Barracks East Range

The purpose of this enclosure is to provide the specific requirements for Schofield Barracks East Range in addition to the requirements of the Wildland Fire SOP. This document DOES NOT replace the Wildland Fire SOP.

1.1 Values at Risk

a. Threatened and endangered species habitats are located primarily in ER-13 as well at high elevations outside the installation boundary (Figure SBER -1). Federally listed species management units and critical habitat are located along the southern boundary of the installation at moderate and high elevations and all along the Ko'olau Mountains ridgeline.

b. Sensitive archaeological areas are present in ER-10, 11, and 12 (Figure SBER-1).

c. There is a minor risk to civilian properties along the northern boundary.

1.2 Fire Prevention

a. Live-fire ammunition is prohibited at SBER.

b. Blank ammunition and pyrotechnics are permitted but are subject to restrictions based on the FDRS.

c. Range Control approval and guidance must be obtained prior to the use of all pyrotechnics.

1.3 Minimum Staffing Requirements

a. Two (2) Army Taskforce fire fighters and a fire response vehicle will be staffed at SBMR or SBER for fire response when training is ongoing. This is in addition to any other staffing requirements for other ranges (SBMR, KTA, DMR)

1.4 Fire Equipment and Supplies

a. There are no equipment or supplies stored at SBER.

b. Equipment and supplies are available at the SBMR fire cache.

1.5 Water Sources

a. There is a hydrant system throughout the western end of SBER (Figure SBER-2).

b. Aerial resources may utilize water from the approved water sources listed below. Resources are listed from nearest to farthest.

Water Resource Name	Latitude	Longitude
Upper Helemano	21.527461	-158.027375
SBMR Dip Pond	21.505322	-158.077016

1.6 Firebreaks/Fuelbreaks

a. There are no firebreaks or fuelbreaks at SBER.

1.7 Fuels Management

a. There is no fuels management at SBER

1.8 Protection Priorities

a. Rare species throughout the installation are the top priority.

b. Containing fires within the installation boundary is a secondary priority.

1.9 Fire Fighting Considerations

a. There is very little UXO at SBER.

b. Safety zones may be established at barren areas within training area ER-3B, at the storage tank in ER-2, and in the heavily managed fuels (e.g., golf course) within ER-9.

Reference SBER 1 - Fire Safety Briefing

The following verbiage will be included in a general safety, environmental, and fire prevention briefing to be given to all personnel before training at SBER.

The purpose of this brief is to educate users of the range about the dangers of fire on the range. Fire prevention is the responsibility of everyone working or training on the range. Fire poses a very real threat to the training mission of USAG-HI. Damage to federally protected plants and animals at and around SBER can result in detrimental restrictions on training activities. This is a very significant issue for USAG-HI. Fighting fires can also result in damage to archaeological sites. This can also result in detrimental training restrictions. These species and archaeological resources are protected by federal law. Personal fines may be issued by outside regulatory agencies if an investigation determines that negligence caused unwarranted damages to protected resources.

If a fire starts, all training must cease, and training downtime will result. For these reasons, every effort must be made to prevent fires. To prevent fires, you must follow these rules:

1. No lighted tobacco smoking materials will be discarded on the range. Smoking on the ranges is prohibited except for on roads and other barren areas.
2. Open fires are prohibited.
3. Heat tabs and similar products must be used inside metal containers.
4. The use of pyrotechnics and simulators is authorized, but they must be used in such a manner that they will not ignite fires. Do not place pyrotechnics or simulators in any vegetated area. Place them in the dirt or in metal cans provided by Range Control.
5. The fire danger rating system restricts what types of training are authorized. This policy is strictly enforced.

In the event a fire is started, cease training immediately. Schofield Barracks Range Control must be notified immediately. Once firefighters arrive on scene, they will extinguish the fire.

Reference SBER 2 - Fire Danger Rating System

All military users of SBER are required to be aware of and adhere to the fire danger restrictions on munitions, pyrotechnics, smoking and other ignition sources. The fire danger is updated every hour, on the hour.

Live-fire and open fires are not authorized at SBER at any time.

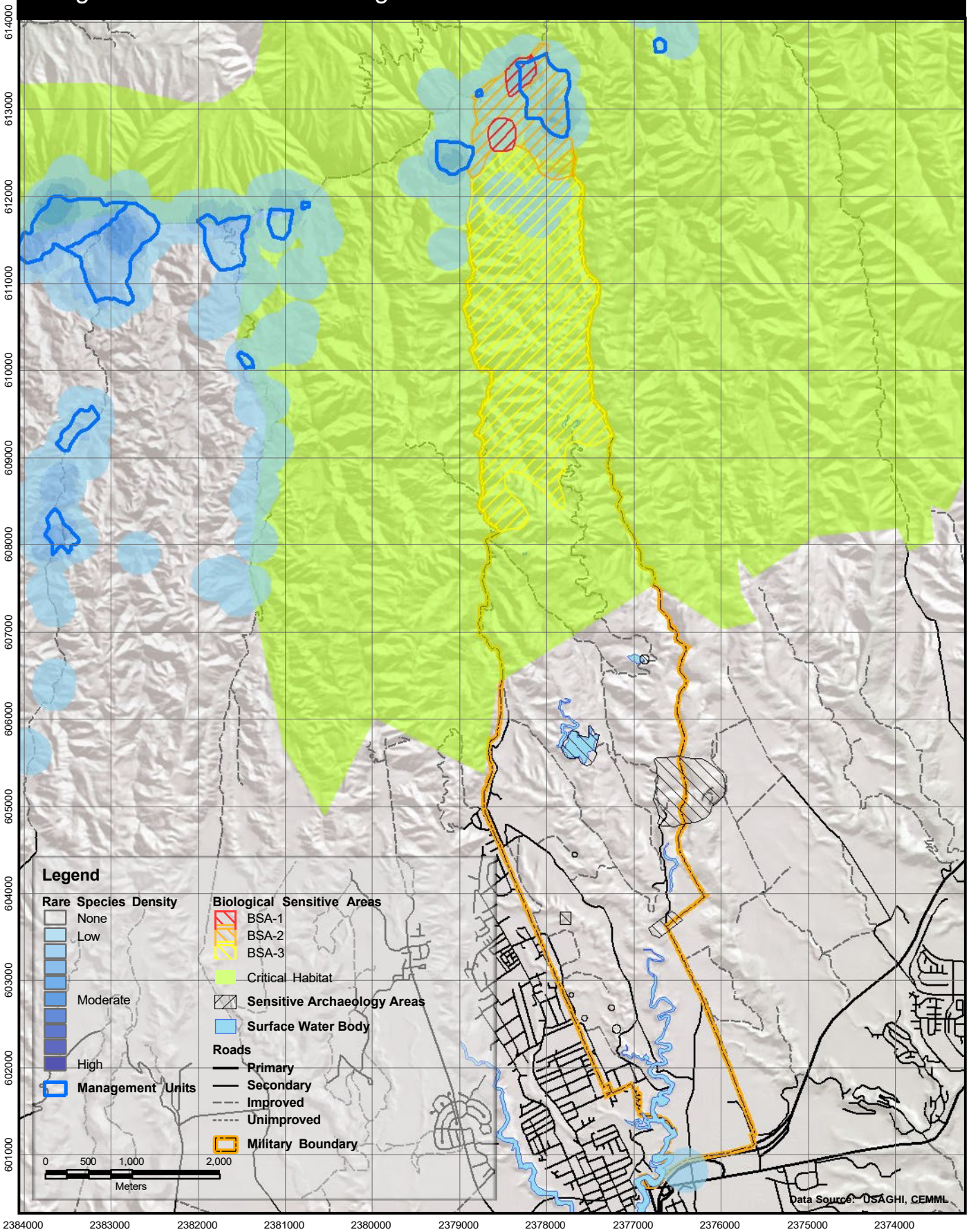
FIRE DANGER RATING	BURN INDEX	CAUTION TO BE EXERCISED	TRAINING RESTRICTIONS	FIRE HAZARD
Green	**0-11.9**	Use Normal Caution	Conditions favorable for all munitions & training authorized by the SBER Range SOP. Smoking is permitted.	LOW
Yellow	**12-37.9**	Use Caution. Fires may start and spread.	Conditions favorable for all munitions & training authorized by the SBER Range SOP. Smoking is permitted.	MODERATE
Red	**38+**	Use Extreme Caution. Ignitions are a near certainty. Fires are very difficult to control.	No pyrotechnics, smoke, simulators, blanks, open fires, or smoking.	VERY HIGH

Schofield Barracks East Range

United States Army Hawaii
Integrated Wildland Fire Management Plan

Figure SBER-1

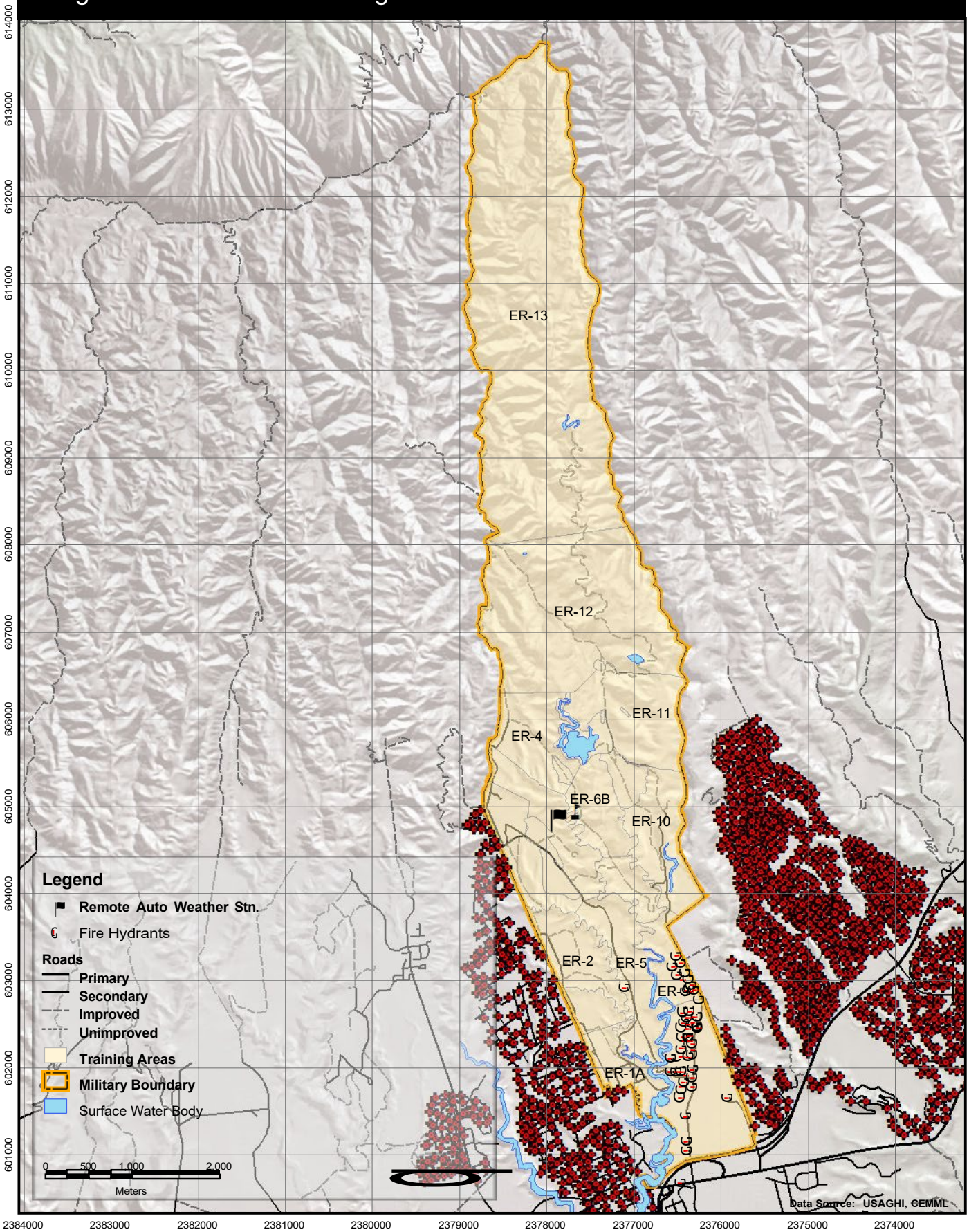
Protected Resources



Schofield Barracks East Range

United States Army Hawaii
Integrated Wildland Fire Management Plan

Figure SBER-2
Fire Suppression
Resource Locations



Enclosure 9 – Specific Guidance for Schofield Barracks West and South Ranges

The purpose of this enclosure is to provide the specific requirements for Schofield Barracks Military Reservation in addition to the requirements of the Wildland Fire SOP. This document DOES NOT replace the Wildland Fire SOP.

1.1 Values at Risk

a. Federally listed species and federally listed species management units are located throughout the area above the firebreak roads and outside of the installation (Figure SBMR-1). Federally listed species, federally listed species management units, and critical habitat are located outside the installation.

b. Sensitive archaeological areas are present throughout the installation (Figure SBMR-1).

1.2 Fire Prevention

a. All training is governed by the fire danger rating system (Reference SBMR-2).

b. Range Control is responsible for retrieving the current fire danger every hour on the hour.

c. Unit OIC's will allow live-firing or training to commence only after ascertaining the fire danger and adopting appropriate fire prevention measures. Do not deviate from the training restrictions, they are strictly enforced.

d. Range Control approval and guidance must be obtained prior to the use of all pyrotechnics.

1.3 Minimum Staffing Requirements

a. Two (2) Army Taskforce fire fighters and a fire response vehicle will be staffed at SBMR for initial attack fire response when training is ongoing. Type 6 engine with an ENGB and FFT2 are the minimum requirements.

b. An additional two (2) Army Taskforce fire fighters and a fire response vehicle will be staffed at SBMR for contingency response when training is ongoing at SBMR. Type 6 Engine with an ENGB and FFT2 are the minimum requirements

1.4 Fire Equipment and Supplies

a. A fire cache is located in the SBMR satellite fire station (not yet constructed as of this writing).

1.5 Water Sources

a. There is a hydrant system throughout the cantonment area (Figure SBMR-2).

b. Aerial resources may utilize water from the SBMR dip pond in Area X. They may also utilize water from the approved water sources listed below.

Water Resource Name	Latitude	Longitude
SBMR Dip Pond	21.505322	-158.077016
Upper Helemano	21.527461	-158.027375
Ranch 10-B	21.551251	-158.037476

1.6 Firebreaks/Fuelbreaks

a. There is a firebreak around much of the impact area.

b. A firebreak surrounds the MF ranges.

c. A firebreak surrounds the south range ranges.

1.7 Fuels Management

a. The impact area is prescribed burned at regular intervals. See Section 4.3.4.8 in Enclosure 12 (IWFMP) for more detailed information.

1.8 Protection Priorities

a. Rare species within and outside of the installation are the top priority.

b. Containing fires within the installation boundary is a secondary priority.

1.9 Fire Fighting Considerations

a. The impact area is contaminated with UXO (Figure SBMR-2). No firefighting is authorized there.

b. During extended dry periods, guinea grass and eucalyptus fuels can produce severe fire behavior. Direct attack of fires burning under these conditions may not be advisable.

c. Close coordination is required with Range Control to ensure appropriate live-fire ranges are shut down during firefighting operations.

d. Safety Zones are available at the mowed portions of any of the CR or MF ranges, some of the KR ranges, the MOUT facility in south range.

e. There are no safety zones available anywhere on the impact area firebreak or the MF firebreak. Escape routes need to be carefully considered and monitored to ensure their viability throughout the fire. Previously burned areas in the impact area are not viable safety zones due to UXO concerns.

Reference SBMR 1 - Fire Safety Briefing

The following verbiage will be included in a general safety, environmental, and fire prevention briefing to be given to all personnel before training at SBMR.

The purpose of this brief is to educate users of the range about the dangers of fire on the range. Fire prevention is the responsibility of everyone working or training on the range. Fire poses a very real threat to the training mission of USAG-HI. Damage to federally protected plants and animals at and around SBMR can result in detrimental restrictions on training activities. This is a very significant issue for USAG-HI. Fighting fires can also result in damage to archaeological sites. This can also result in detrimental training restrictions. These species and archaeological resources are protected by federal law. Personal fines may be issued by outside regulatory agencies if an investigation determines that negligence caused unwarranted damages to protected resources.

If a fire starts, all training must cease, and training downtime will result. For these reasons, every effort must be made to prevent fires. To prevent fires, you must follow these rules:

1. No lighted tobacco smoking materials will be discarded on the range. Smoking on the ranges is prohibited except for on roads and other barren areas.
2. Hand-fired aerial pyrotechnics are not authorized at SBMR. Mortar and artillery fired illumination rounds are authorized but are restricted by the fire danger rating system.
3. Open fires are prohibited.
4. Heat tabs and similar products must be used inside metal containers.
5. The use of pyrotechnics and simulators is authorized, but they must be used in such a manner that they will not ignite fires. Do not place pyrotechnics or simulators in any vegetated area. Place them in the dirt or in metal cans provided by Range Control.
6. The fire danger rating system restricts what types of training are authorized. This policy is strictly enforced.

In the event a fire is started, cease training immediately. Schofield Barracks Range Control must be notified immediately. Once firefighters arrive on scene, they will extinguish the fire.

Reference SBMR 2 - Fire Danger Rating System

All military users of SBMR are required to be aware of and adhere to the fire danger restrictions on munitions, pyrotechnics, smoking and other ignition sources. The fire danger is updated every hour, on the hour.

Open fires are not authorized at SBMR at any time.

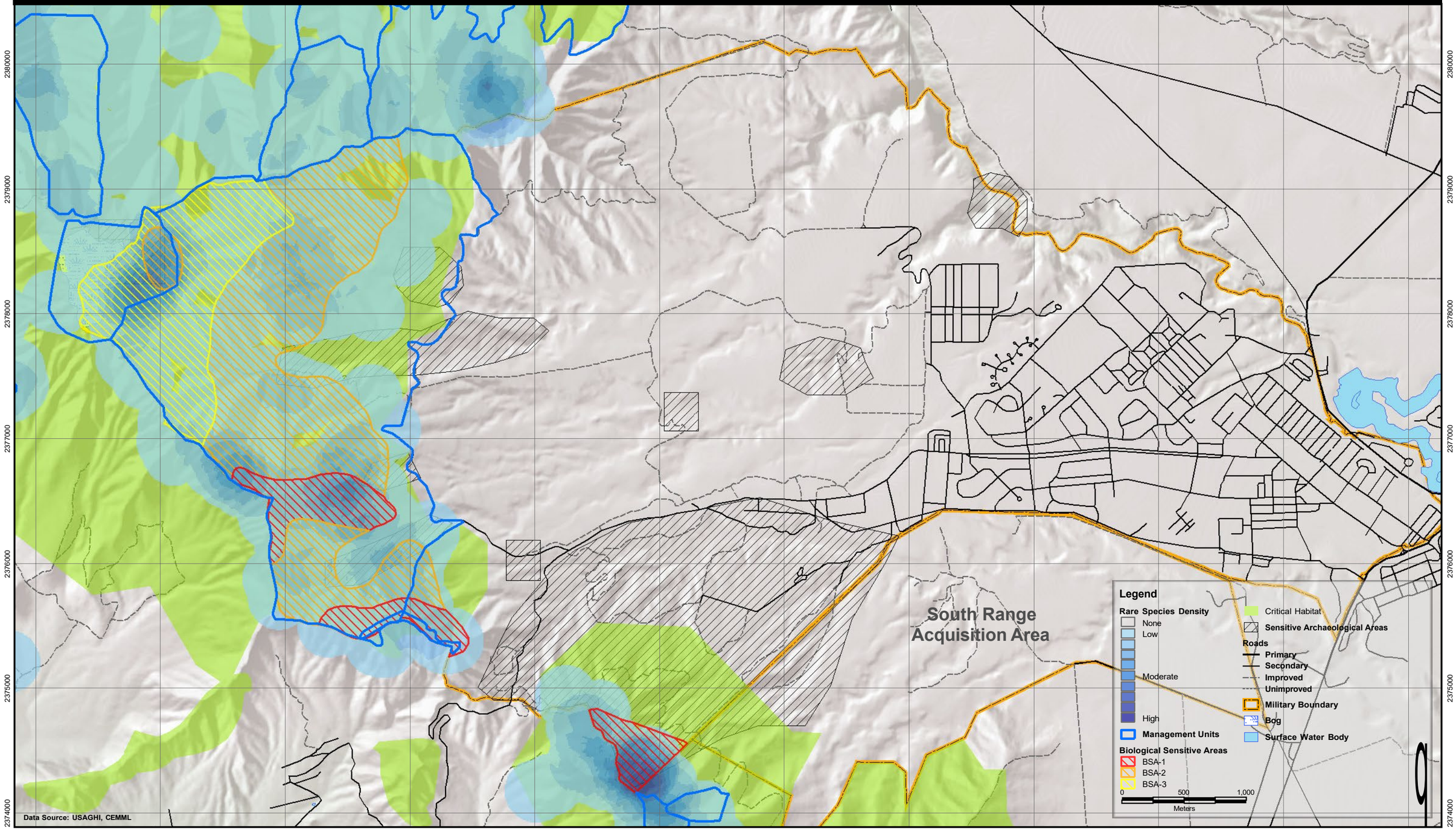
FIRE DANGER RATING	BURN INDEX	CAUTION TO BE EXERCISED	TRAINING RESTRICTIONS	FIRE HAZARD
Green	**0-21.9**	Use Normal Caution	Conditions favorable for all munitions & training authorized by the SBMR Range SOP. Smoking is permitted.	LOW
Yellow	**22-29.9**	Use Caution. Fires may start and spread.	No white phosphorous, no illumination rounds.	MODERATE
Orange	**30-48.9**	Use High Caution. Ignitions are probable. Fires spread quickly and pose containment difficulties.	No white phosphorous, no illumination rounds, no tracers. No Aerial Gunnery. No Rockets (Aerial or Ground)	HIGH
Red	**49+**	Use Extreme Caution. Ignitions are a near certainty. Fires are very difficult to control.	Blanks, UTM, and ball ammunition only. Live-fire limited to KR, CR and MF ranges and shoot houses (KR2 shoot house and UAC shoot house). No other live-fire is authorized. No pyrotechnics, smoke, simulators, powder burns, smoking. Maneuver training is authorized.	VERY HIGH

Schofield Barracks Military Reservation

United States Army Hawaii
Integrated Wildland Fire Management Plan

Figure SBMR-1

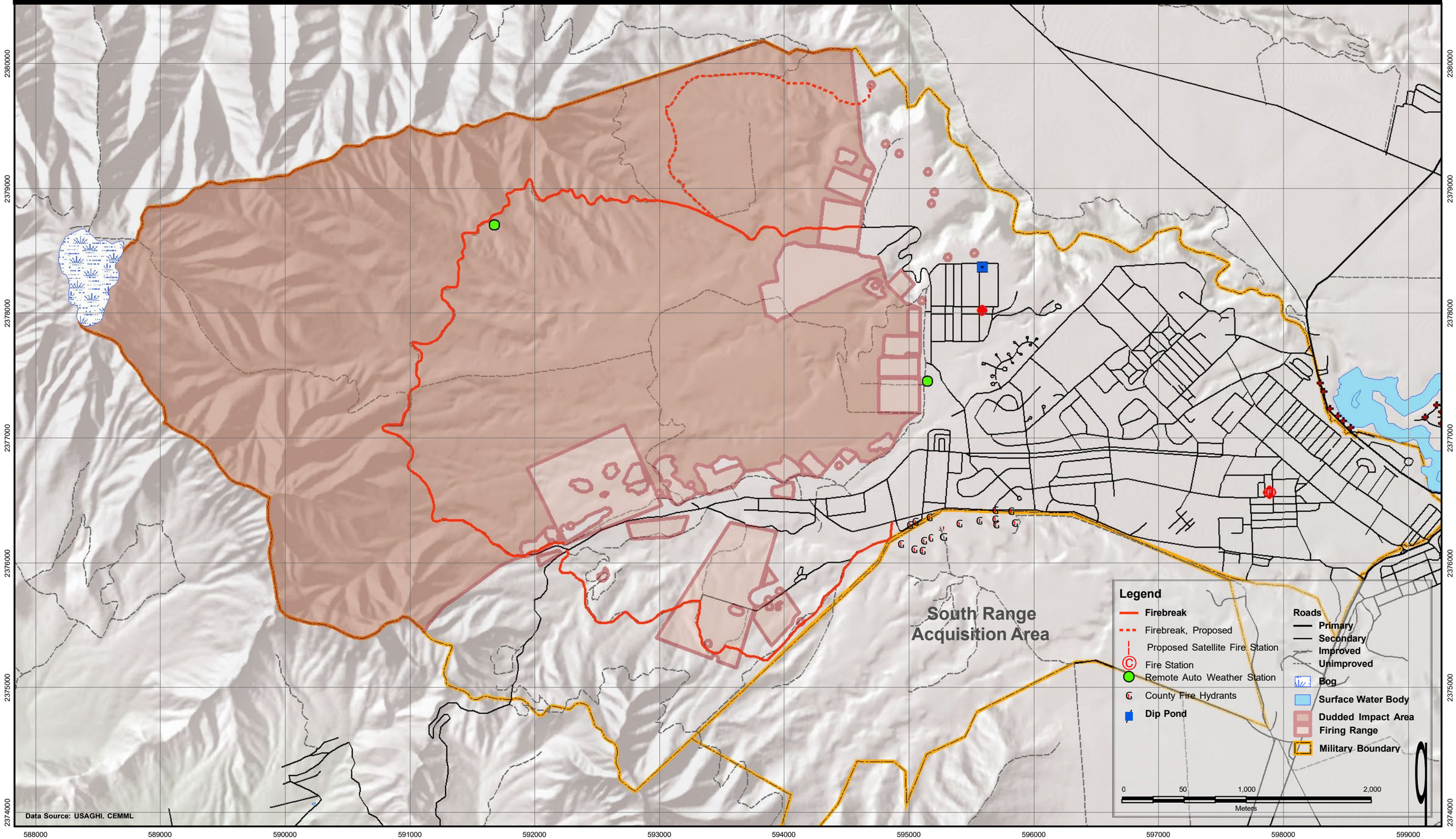
Protected Resources



Schofield Barracks Military Reservation

United States Army Hawaii
Integrated Wildland Fire Management Plan

Figure SBMR-2
Fire Suppression
Resource Locations



Enclosure 10 – Specific Guidance for Schofield Barracks South Range Acquisition Area

The purpose of this enclosure is to provide the specific requirements for Schofield Barracks South Range Acquisition Area in addition to the requirements of the Wildland Fire SOP. This document DOES NOT replace the Wildland Fire SOP.

1.1 Values at Risk

a. Federally listed species, federally listed species management units, and designated critical habitat exist above the installation on the ridge (Figure SRAA-1).

b. Sensitive archaeological areas are present in the drainages and above the firebreak road (Figure SRAA-1).

1.2 Fire Prevention

a. Live-fire is authorized, but most weapons are not authorized for use at SRAA. Tracer munitions are not authorized for use at SRAA.

b. All training is governed by the fire danger rating system.

c. Unit OIC's will allow live-firing or training to commence only after ascertaining the fire danger and adopting appropriate fire prevention measures. Do not deviate from the training restrictions, they are strictly enforced.

d. Range Control is responsible for retrieving the current fire danger every hour on the hour.

e. All pyrotechnics are prohibited. Smoke grenades and simulators are authorized.

f. Aerial signal flares and hand-held illumination flares are prohibited except for emergency purposes.

g. Training outside of the firebreak road is prohibited.

1.3 Minimum Staffing Requirements

a. Two (2) Army Taskforce fire fighters and a fire response vehicle will be staffed at SBMR or SRAA for fire response when training is ongoing. This is in addition to any other staffing requirements for other ranges (SBMR, KTA, DMR)

b. Minimum staffing requirements are 1 type 6 engine, Engine Boss (ENGB) and a Firefighter Type 2 (FFT2).

1.4 Fire Equipment and Supplies

a. There are no equipment or supplies stored at SRAA.

b. Equipment and supplies are available at the SBMR fire cache.

1.5 Water Sources

a. There are no water sources at SRAA.

b. Water is available from the hydrant system at SBMR (Figure SRAA-2).

c. Aerial resources may utilize water from the approved water sources listed below.

Water Resource Name	Latitude	Longitude
SBMR Dip Pond	21.505322	-158.077016
Upper Helemano	21.527461	-158.027375

1.6 Firebreaks/Fuelbreaks

a. A firebreak surrounds the training area at SRAA (Figure SRAA-2).

1.7 Fuels Management

a. There is no fuels management at SRAA required by the IWFMP.

1.8 Protection Priorities

a. Rare species and the federally listed species management units on the ridge above SRAA are the top priority.

b. Containing fires within the installation boundary is a secondary priority.

1.9 Fire Fighting Considerations

a. There is no known UXO at SRAA.

b. Safety zones may be established on the mowed portion of the QTR2 range or in the built-up areas of the installation.

Reference SRAA 1 - Fire Safety Briefing

The following verbiage will be included in a general safety, environmental, and fire prevention briefing to be given to all personnel before training at DMR.

The purpose of this brief is to educate users of the range about the dangers of fire on the range. Fire prevention is the responsibility of everyone working or training on the range. Fire poses a very real threat to the training mission of USAG-HI. Damage to federally protected plants and animals at and around SRAA can result in detrimental restrictions on training activities. This is a very significant issue for USAG-HI. Fighting fires can also result in damage to archaeological sites. This can also result in detrimental training restrictions. These species and archaeological resources are protected by federal law. Personal fines may be issued by outside regulatory agencies if an investigation determines that negligence caused unwarranted damages to protected resources.

If a fire starts, all training must cease, and training downtime will result. For these reasons, every effort must be made to prevent fires. In order to prevent fires, you must follow these rules:

1. Most weapons are not authorized for use at SRAA. Check with Range Control for a list of authorized weapons. This policy is strictly enforced.
2. Open fires are prohibited.
3. The use of pyrotechnics is prohibited.
4. No lighted tobacco smoking materials will be discarded on the range. Smoking on the ranges is prohibited except for on roads and other barren areas.
5. Heat tabs and similar products must be used inside metal containers.
6. Smoke grenades and simulators are authorized, but they must be used in such a manner that they will not ignite fires. Do not place smoke grenades or simulators in any vegetated area. Place them in the dirt or in metal cans provided by Range Control.
7. The fire danger rating system restricts what types of training are authorized. This policy is strictly enforced.

In the event a fire is started, cease training immediately. Schofield Barracks Range Control must be notified immediately. Once firefighters arrive on scene, they will extinguish the fire.

Reference SRAA 2 - Fire Danger Rating System

All military users of SRAA are required to be aware of and adhere to the fire danger restrictions on munitions, pyrotechnics, smoking and other ignition sources. The fire danger is updated every hour, on the hour.

Tracers and open fires are not authorized at SRAA at any time. No training of any kind outside the firebreak.

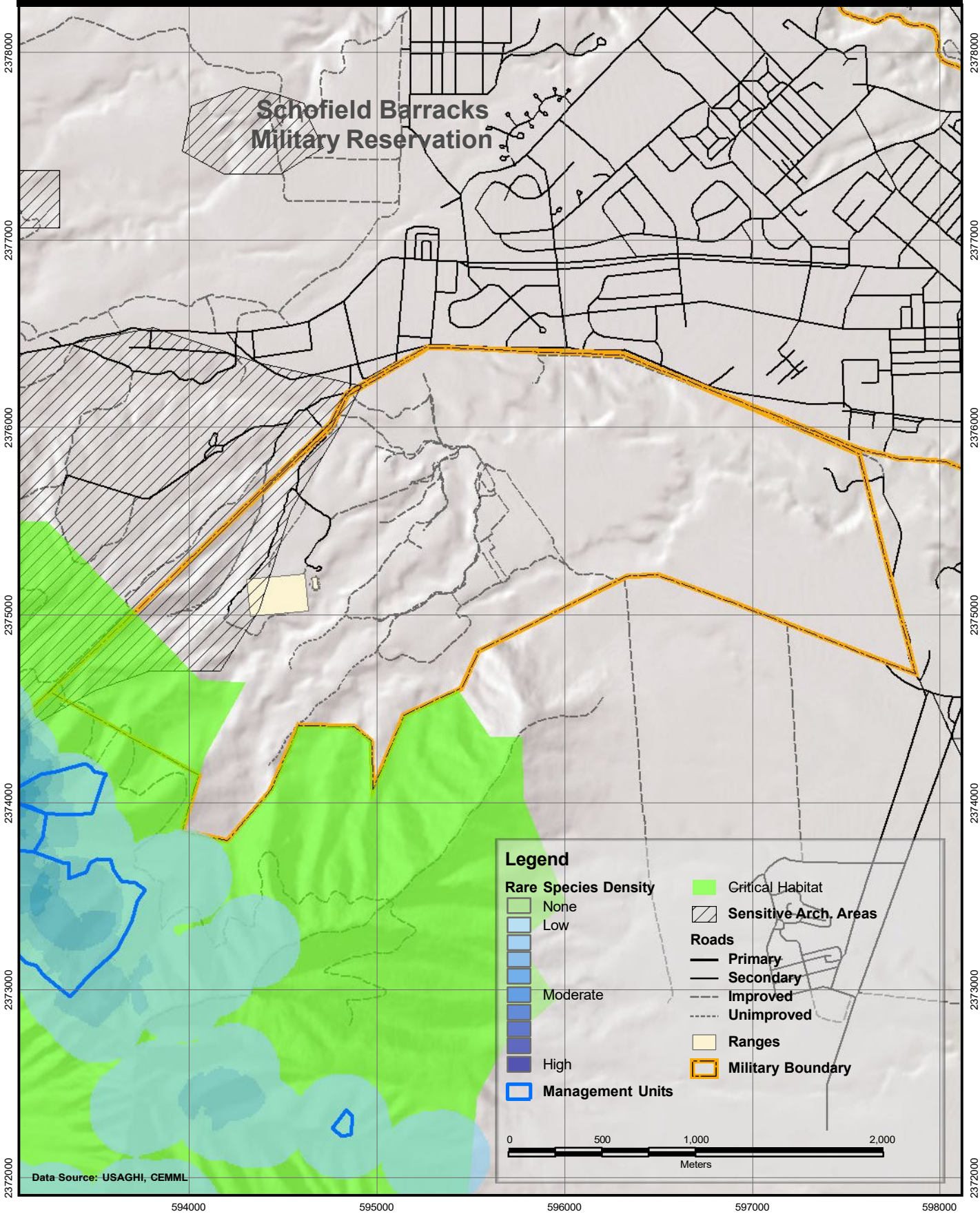
FIRE DANGER RATING	BURN INDEX	CAUTION TO BE EXERCISED	TRAINING RESTRICTIONS	FIRE HAZARD
Green	**0-21.9**	Use Normal Caution	Conditions favorable for all munitions & training authorized by the South Range Range SOP. Smoking is permitted.	LOW
Yellow	**22-29.9**	Use Caution. Fires may start and spread.	Conditions favorable for all munitions & training authorized by the South Range Range SOP. Smoking is permitted.	MODERATE
Orange	**30-48.9**	Use High Caution. Ignitions are probable. Fires spread quickly and pose containment difficulties.	Conditions favorable for all munitions & training authorized by the South Range Range SOP. Smoking is permitted.	HIGH
Red	**49+**	Use Extreme Caution. Ignitions are a near certainty. Fires are very difficult to control.	Blanks, UTM and ball ammunition only on QTR range, SR3 ISBC, CTF-Z/Q and CTF-MOUT (UTM). No other live fire is authorized. No pyrotechnics, smoke, simulators, smoking. Maneuver training is authorized.	VERY HIGH

South Range Acquisition Area

United States Army Hawaii
Integrated Wildland Fire Management Plan

Figure SRAA-1

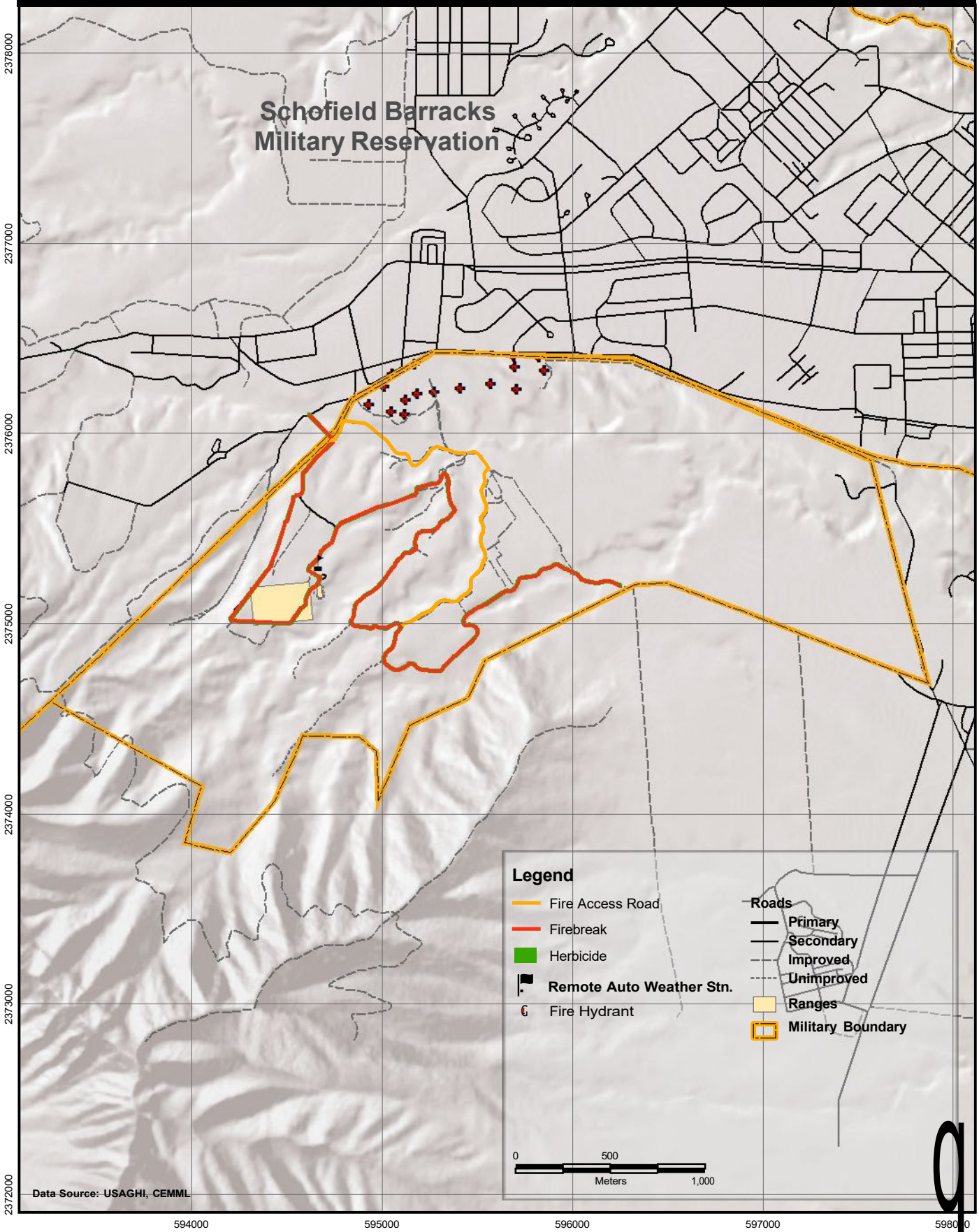
Protected Resources



South Range Acquisition Area

United States Army Hawaii
Integrated Wildland Fire Management Plan

Figure SRAA-2
Fire Suppression
Resource Locations



Enclosure 11 – Specific Guidance for Aliamanu Military Reservation, Helemano Military Reservation, Fort Shafter, Tripler Hospital, and Wheeler Army Airfield

The purpose of this enclosure is to provide the specific requirements for AMR, HMR, Fort Shafter, Tripler, and WAAF in addition to the requirements of the Wildland Fire SOP. This document DOES NOT replace the Wildland Fire SOP.

1.1 Values at Risk

a. There is minor risk to several buildings without sufficient defensible space around them at Tripler Hospital, Fort Shafter, and Wheeler Army Airfield.

b. Sensitive archaeological areas are present at Fort Shafter and Wheeler Army Airfield and there are numerous historic buildings and structures present at all of these installations.

1.2 Fire Prevention

a. There are no special fire prevention measures for any of these installations and no FDRS.

1.3 Minimum Staffing Requirements

a. There are no wildland fire staffing requirements for any of these installations. Fire response is the responsibility of the Federal Fire Department and carried out under DODI 6055.06.

1.4 Fire Equipment and Supplies

a. There is no equipment or supplies available at any of these installations.

b. Equipment and supplies are also available at the SBMR fire cache.

1.5 Water Sources

a. There are hydrant systems throughout these installations.

b. Aerial resources may utilize water from water sources approved by the incident IC.

1.6 Firebreaks/Fuelbreaks

a. There are no firebreaks or fuelbreaks at any of these installations.

1.7 Fuels Management

a. There is no fuels management at any of these installations.

1.8 Protection Priorities

a. Priorities will be set by the IC in consultation with appropriate individuals.

1.9 Fire Fighting Considerations

a. There is no known UXO at any of these installations.

b. With the exception of WAAF, most major fires are likely to start on neighboring lands and burn onto these installations. Part of pre-fire preparation should focus on preventing substantial damage from these fires.

c. No fire safety briefing or fire danger rating system is required for these installations.

Enclosure 12 – U.S. Army Hawaii Integrated Wildland Fire Management Plan

1 Introduction

Per Army Wildland Fire Guidance dated 15 March 2021, IMCOM Wildland Fire Program Policy Memo dated 7 Nov 2022, AR 200-1 Chapter 4 Section 3.d.12 'Wildland Fire Management', AR 420-1 Chapter 25 Section X, and to meet land management goals and objectives, the U.S. Army Garrison Hawaii has developed this Integrated Wildland Fire Management Plan (IWFMP). This plan replaces ***The Integrated Wildland Fire Management Plan, United States Army Garrison Hawaii, Oahu Installations***, dated March 2018.

Wildfire poses a significant threat to the sensitive ecosystems, cultural sites, and quality and flexibility of military training at the U.S. Army Garrison Hawaii (USAG-HI). The mission of the 25th Infantry Division is to fight and win military conflicts. This requires numerous actions that pose a high risk of wildfire. This IWFMP presents a comprehensive approach to reduce the frequency of wildfires, the associated costs, and damages at USAG-HI managed properties, and to mitigate the threat to the training mission. USAG- HI will implement this plan to comply with applicable laws and regulations, including Endangered Species Act and National Environmental Policy Act documentation.

The IWFMP will also fulfill the requirements established by the Army Wildland Fire Policy Guidance
dated March 15, 2021, and reduce the impacts of training related fires on the mission and the

The IWFMP lays out specific guidance, procedures, and protocols for the prevention and suppression of wildfires on training areas and other major properties under the jurisdiction of USAG-HI. Its goal is to convey the methods and procedures necessary to minimize fire frequency, severity, and size while allowing military units the freedom to conduct the training exercises necessary to maintain a high level of combat readiness. It defines the responsibilities of all offices, departments, and agencies involved, and describes fire pre-suppression and suppression actions to be taken.

Per the Army Wildland Fire Policy Guidance, this plan will be reviewed annually, and updated if necessary, at the discretion of the WFPM, and will be revised once every five years. Upon any revision of this plan, Range Control, in coordination with the WFPM, will update the Range SOPs to properly reflect the guidance of the IWFMP.

1.1 Setting

This section provides basic background information about the physical and biotic environment within which the Integrated Wildland Fire Management Plan will be implemented. For further detail on any of these subjects, please reference the section of this plan dedicated to the installation of interest or the most current version of the USAG-HI Integrated Natural Resources Management Plan (INRMP).

1.1.1 Location

All properties addressed in this IWFMP are located on the island of Oahu within the State of Hawaii. The Hawaiian archipelago is one of the most isolated land masses in the world at more than 3,200 km (2,000 mi) from the nearest continent. The principal islands are centered at 23.5° North and

157.5° West in the center of the Pacific Ocean and occupy roughly 16,800 km^2 (6,500 mi^2).

This IWFMP addresses 11 properties (Figure 1). There are seven training installations maintained by USAG-HI on Oahu - Dillingham Military Reservation (DMR), Kawailoa Training Area (KLOA), Kahuku Training Area (KTA), Makua Military Reservation (MMR), Schofield Barracks East Range (SBER), Schofield Barracks Military Reservation (SBMR), and the South Range Acquisition Area (SRAA). Additionally, Wheeler Army Airfield (WAAF) is used for helicopter training, and Helemano Military Reservation (HMR), Tripler Army Medical Center (Tripler), and Fort Shafter provide space for administrative and support duties.

1.1.2 Land Use

The USAG-HI uses land to train in support of military missions throughout the world. Part of this land use includes extensive housing and community areas dedicated to supporting Soldiers and their families where wildfire is highly unlikely. The land use of most concern to wildland fire managers is military training, though fire hazards exist in its absence as well.

Training includes live-fire Combined Arms Live Fire Exercises (CALFEX), maneuver, reconnaissance, bivouac, aviation, landing and drop zone training, and force on force training. On Oahu, MMR, SBMR, and SRAA support live-fire training, with MMR and SBMR capable of supporting company level exercises. Kahuku Training Area is the primary maneuver area, but SBER and KLOA also support mounted and dismounted maneuver training. A limited live-fire Combined Arms Collective Training Facility that supports urban warfare training is also planned for KTA. Training at KTA and DMR is primarily focused on helicopter training and small unit activities. Live-fire training is not authorized at DMR, KLOA, SBER, or on leased lands.

The most fire prone land use of USAG-HI is live-fire training. Maneuver training accounts for a smaller portion of fires started by military activities and land management activities account for the remainder.

1.1.3 Climate

The climate of the State of Hawaii is maritime tropical and is strongly influenced by the ocean. High temperatures in Honolulu average approximately 29° C (~84° F) and temperature variation between day and night, and winter and summer is minimal. Relative humidity remains high throughout the day and year, rarely falling below 40%. Trade winds blow from the northeast the majority of the year but are most prevalent in the summer months. Days when trade winds are light or absent are subject to upslope convective winds. Rainfall averages 46.4 cm (18.3 in) in Honolulu with peak rainfall in winter and a pronounced dry season in summer. Rainfall gradients in the State of Hawaii are extremely steep with dry locales receiving less than 25 cm (10 in) and very wet areas receiving over 750 cm (295 in).

1.1.4 Topography

Steep, fissured slopes leading to broad alluvial plains are typical of topography in Hawaii. The volcanic nature of the Islands produces extreme topography with slopes in excess of 50% being commonplace.

1.1.5 Geology

Oahu is roughly two to three million years old and is made up of two highly eroded mountain chains, the Waianae mountains on the western side of the island and the Koolau mountains on the eastern side.

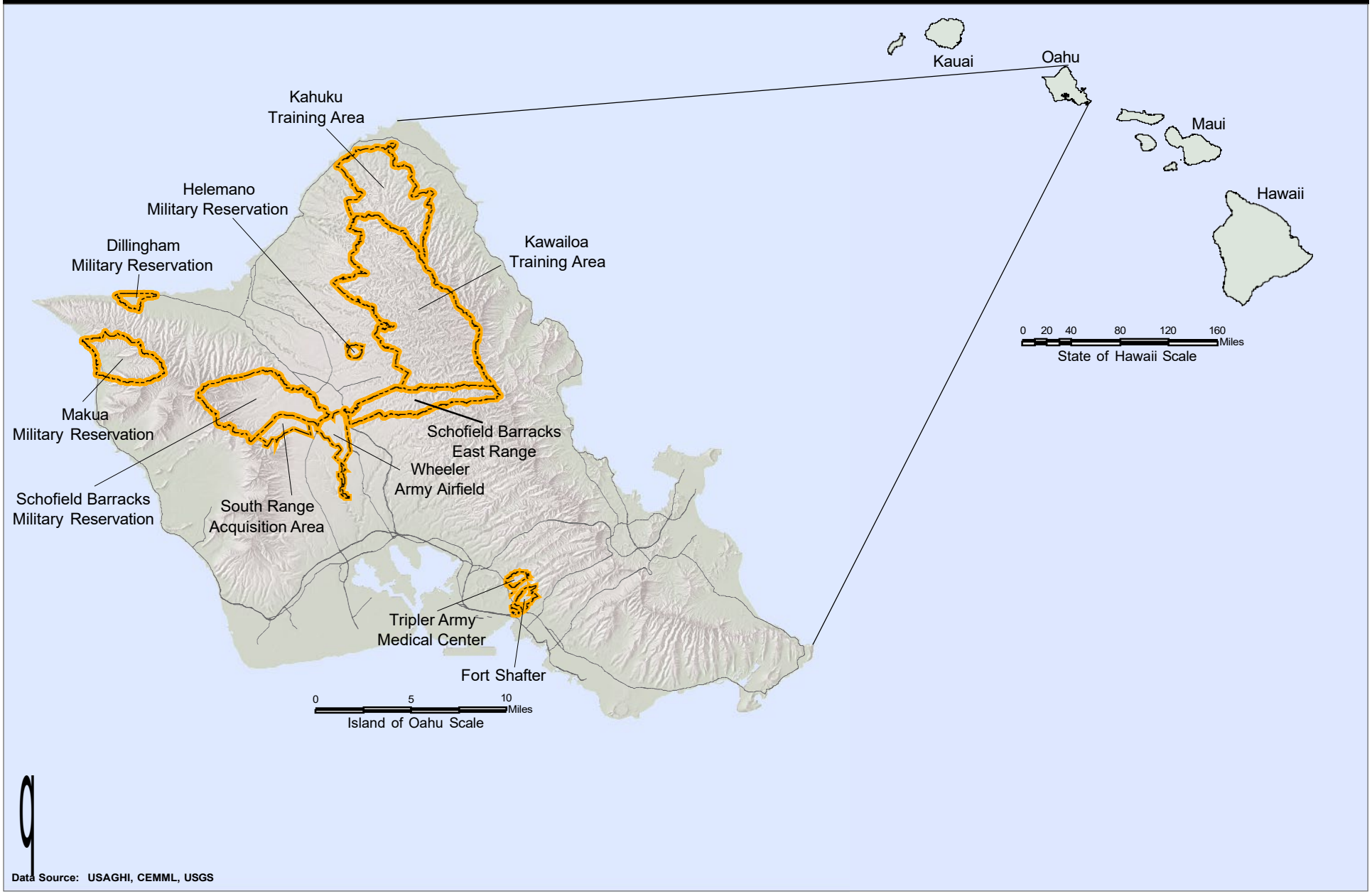
1.1.6 Soils

Soils on Oahu are usually rust colored due to their high iron content. Deep soils are present, particularly in the central plain with rocky soils dominating steeper slopes. Substrate is composed of volcanic rock and ash.

Installation Locations

Figure 1

United States Army Hawaii
Integrated Wildland Fire Management Plan



Data Source: USAGHI, CEMML, USGS

1.1.7 Air Quality

The State of Hawaii is an attainment area for National Ambient Air Quality Standards.

1.1.8 Water Quality

Most of the ocean waters in Hawaii are Class A or Class AA waters meaning they are free of excess pollutants. Surface waters on Oahu vary in quality, and some are considered 'impaired' by the Environmental Protection Agency. There are no surface water regulated by the Clean Water Act, which regulates water quality in open waters, on Army lands on Hawaii. However, there are numerous intermittent streams that flow only during and shortly after heavy or extended rainfall.

1.1.9 Vegetation

The diversity of ecosystems in Hawaii is exceptional, ranging from the earliest colonizers of lava flows to dry grasslands, extensive shrublands, and dense tropical forest. Most vegetation in the State of Hawaii suffers from some level of competition from non-native plants. Because of the isolated nature of the Islands, many native species simply cannot compete with plants that evolved in highly competitive continental locations. A high level of extinction exists as a result of this, and other causes and many dozens of plant species are currently on the federal threatened and endangered species (T&E) list.

1.1.10 Wildlife

A wide variety of wildlife occurs on USAG-HI installations, including many federally listed species. Species of special note are the Oahu elepaiao (*Chasiempis sandwichensis ibidis*), several species of snail in the genus *achatinella*, and the Opeapea (*Lasiurus cinereus semotus* - Hawaiian hoary bat).

1.1.11 Cultural Resources

Cultural resources, both historic and pre-historic, are ubiquitous throughout the USAG-HI training installations. Included in the tally are pre-historic habitations, religious sites (heiaus), and rock walls; World War II era revetments, defensive positions, and buildings; and Cold War era Nike missile sites and radar stations.

1.2 Special Considerations for Fire Management in Hawaii

1.2.1 Native Species and Ecosystems

Non-human caused fires in Hawaii have always been uncommon due to a lack of ignition sources and the relatively moist environment that covers the majority of the islands (Mueller-Dombois 1981, Smith and Tunison 1992). Lightning is infrequent relative to the mainland and is usually accompanied by precipitation, and dry lightning is extremely rare. Lava-ignited fires generally do not burn enough area in comparison to the area covered by the flow itself to be of any significance (Vogl 1969). Though fires surely took place, they were not a major factor in the development of the native vegetation. Thus, as plants made their way to the Islands, fire adaptations they may have developed in their country of origin were muted or lost entirely over many generations.

The effect of fire on individual native species is poorly studied. However, a few natives are known to possess some fire adaptive traits (Table 1). Because fire has become a common feature of the landscape, it is important to understand its effects on the local flora and fauna.

A few native species have been observed to benefit from occasional fires. These species are considered to be fire tolerant which should not be confused with fire resistant. During a fire the aboveground portion of a fire tolerant plant is usually killed, and survival occurs through resprouting or regeneration from seed. Fire resistant species possess features, such as thick or insulating bark, that allow them to resist damage during the burning event.

Pili grass (*Heteropogon contortus* (L.) Beauv. Ex Roem. Et Schult.) was a dominant species on many of the major Hawaiian Islands until the introduction of livestock grazing and aggressive exotic grass species. *Heteropogon contortus* benefited from occasional fires because the competing woody species were destroyed leaving the area free of an overstory (Shaw et al. 1995). Grasses in general tend to be adapted to fire and this is likely true for many of the Hawaiian grasses such as *Eragrostis spp.* However, the invasion of the islands by exotic pyrophytic grasses that are much better adapted to fire has made this an inconsequential point, as competition with the exotics after fire, not recovery from fire alone, is currently controlling the fate of the native species.
One of the only native species that has been documented as successfully competing with invasive grasses after fire is *Dodonaea viscosa*. It fares well after fire, even in the presence of exotic species because it resprouts vigorously and regenerates extensively from seed (Shaw et al. 1995, Hughes and Vitousek 1993), both common adaptations of fire tolerant plants elsewhere in the world. After several fires however, *Dodonaea viscosa* is generally extirpated.

The native Hawaiian species in Table 1 are known to be fire tolerant in the absence of invasive exotic species. However, in the presence of invasive species virtually all native Hawaiian species lack the ability to compete successfully after fire and are extirpated. It is critical to understand that no native Hawaiian species has ever been shown to compete successfully with invasive pyrophytic grasses after successive fires.

1.2.2 Invasive Species

In Hawaii, most wildfire related issues are closely tied to invasive alien plant species. Some of these are trees, most notably *Eucalyptus spp.* (eucalyptus), which was planted extensively to control erosion in the early and mid-portions of the 20th century. However, the most prolific and problematic species in regard to fire have been introduced grasses which benefit from the grass-fire cycle.

The primary culprit on Oahu is *Megathyrsus maximus* (Jacq.) B.K. Simon & S.W.L. Jacobs commonly known as guinea grass (previously *Urochloa Maxima* (Jacq.) R. Webster and previous to that *Panicum maximum* (Jacq.)). It has colonized major portions of the island but is concentrated at elevations below 800 meters (m) (~2600 feet (ft)). Guinea grass was introduced as forage for ranching but quickly escaped into the broader Hawaiian landscape. Fires in guinea grass produce flame lengths in excess of 15 m (~50 ft) when dry and under such conditions can easily escape containment. Though it has never been directly measured, fire intensity and severity are relatively high for a grass (pers. obs.). *Megathyrsus Maximus* is pyrophytic and far better adapted to fire than any known native Hawaiian species. It produces prolific seeds, can survive fires of moderate severity, and sprouts and/or germinates quickly after a fire has passed. In the Hawaiian ecosystem, where fire adaptations are relatively rare and not pronounced, species such as *Megathyrsus maximus* quickly exploit unfilled or temporarily empty (as after fire or disturbance) ecological niches and create a new fire regime, one of frequent, moderate intensity fires (pers. obs.).

Another common fire adapted species on Oahu is *Leucaena leucocephala*, known locally as koa haole or haole koa. A shrub to small tree, it resprouts vigorously from the root crown and belowground organs after fires or reproduces from seed. Though it does not produce a fuel matrix conducive to fire on its own, it is almost always associated with pyrophytic grasses, generally as a shrubby savanna (pers. obs.). It contributes to fire spread by providing spotfire embers in the form of seed pods which do not grow seasonally but are on the plant for most of the year (pers. obs.). Conversely, if grown to maturity, *Leucaena leucocephala* can reduce *Megathyrsus Maximus* density and biomass, presumably by competing for light, though competition for belowground resources may also be a factor (pers. obs.). It is not known if this reduction in guinea grass density is sufficient to significantly affect fire behavior.

Table 1. Fire tolerant native Hawaiian species

Scientific Name	Common Name	Response to Fire
Acacia Koa	Koa	Regenerates from seed (Scowcroft & Wood 1976) and/or root suckers (Smith, C.W. Unpublished)
Chamaesyce degeneri	Akoko	Resprouts (Smith and Tunison 1992)
Cibotium glaucum	Hapau	Resprouts vigorously after fire (Smith & Tunison 1992)
Deschampsia nubigena	N/A	Resprouts (Loope, L.L. & Smith, C.W. Unpublished)
Dodonaea viscosa	Aalii	Resprouts and regenerates extensively from seed (Hughes 1989)
Eragrostis grandis	Emoloa Grass	Resprouts (Smith et al 1980)
Eragrostis atrapioides	Hawaiian Lovegrass	Resprouts (Personal Comm. J.M. Castillo)
Gossypium tomentosum	Hawaiian Cotton	Resprouts (Vogl, R.J. & Kartawinata, K. Unpublished)
Haplostachys haplostachya	Honohono	Resprouts and regenerates from seed after low intensity fire, Regenerates from seed after moderate intensity fire (Shaw et al. 1995)
Hetropogon contortus	Pili Grass	Resprouts vigorously after low intensity fire (Tunison, J.T. Unpublished)
Ilex anomala	Kawau	Resprouts vigorously after fire (Smith & Tunison 1992)
Metrosideros polymorpha	Ohia	Resprouts from root crown (Smith & Tunison 1992), killed by high intensity fire (Hughes 1989)
Myoporum sandwicense	Naio	Resprouts but slow growth (Smith & Tunison 1992)
Pteridium aquilinum	Bracken Fern	Resprouts vigorously after fire (Smith & Tunison 1992)
Osteomeles anthyllidifolia	ulei	Fire tolerant (Smith and Tunison 1992)
Sadleria cyatheoides	Amau	Quickly reproduces killed fronds (Smith & Tunison 1992)
***Santalum* spp.**	Sandalwood	Resprouts and regenerates from seed (Smith, C.W. Unpublished)
Sida fallax	Ilima	Resprouts (Stephens 1963, 1964)
Silene hawaiiensis	HI Catchfly	Resprouts immediately (Shaw et al. 1995)
Silene lanceolata	Lanceleaf Catchfly	Resprouts unless completely consumed by fire (Shaw et al. 1995)
Sophora chrysophylla	Māmane	Resprouts but cover reduced (Mueller-Dombois 1981), seed viability diminished (Warshauer 1974)
Stenogyne angustifolia	Creeping Mint	Resprouts and regenerates from seed if precipitation occurs (Shaw et al. 1995)
Tetramolopium arenarium	Mauna Kea Pamakani	Regenerates slowly from seed (Shaw et al. 1995)
***Vaccinium* spp.**	Ohelo	Resprouts but slow growth (Loope, L.L. & Smith C.W. Unpublished)

*Note: These species possess adaptations that allow them to recover from fire. However, fire adapted exotic species will outcompete natives after fire almost without exception.

1.3 Fire History

1.3.1 Hawaiian Islands

Pre-Historic

Prior to human colonization of the Islands, fire was likely very rare. With the exception of lava flows, there simply are not any consistent ignition sources available to start fires. Lightning, the primary natural ignition source for wildfires throughout the world, occurs in Hawaii, but is much rarer than in those ecosystems considered fire prone, and when it does occur is almost always coincident with precipitation. Dry lightning is extremely rare.

Polynesians likely used fire to clear land. This practice would have led to the more heavily inhabited portions of the islands developing grasslands of pili grass (*Heteropogon contortus*), a common Hawaiian grass.

Post-European Arrival

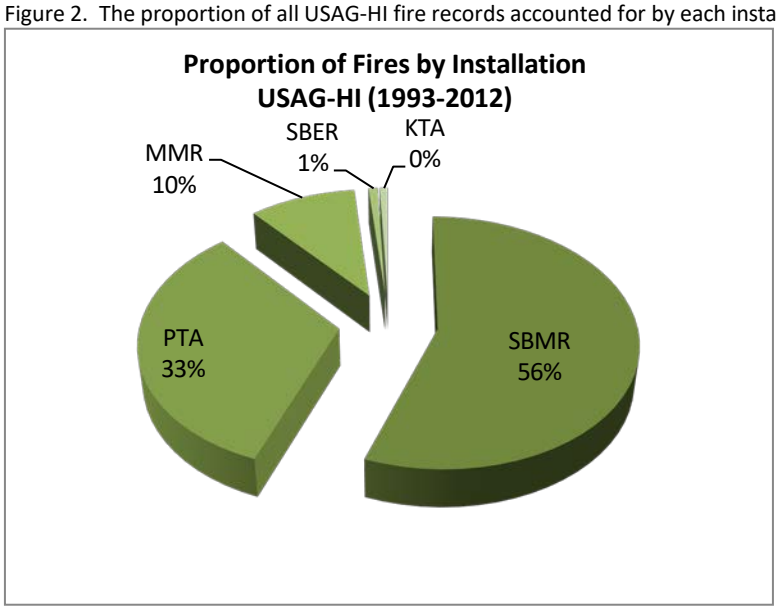
European arrival brought with it a deluge of non-native species, including many grasses used to support domestic grazing animals. Included in these were a number of aggressive, highly fire adapted species. Increased population of the Islands in the 20th century also introduced a much higher ignition rate than had been seen previously. The combination of these factors upended the historic low frequency, low intensity fire regime and replaced it in many parts of the Islands with a high frequency, moderate intensity regime that has only expanded in the interim.

1.3.2 USAG-HI

Fire records for USAG-HI are incomplete, particularly prior to 2000. Nonetheless, a substantial volume of information can be garnered from the existing records. A total of 2,004 fires have been recorded inclusive of all USAG-HI installations since the first fire was recorded at MMR in 1970 (Figures 2 to 13). There has been a notable decrease in fire frequency since 2002, which can very likely be attributed to an improved and better funded fire management program. Other factors, such as troop training levels and weather factors cannot account for the substantial drop in fire frequency. This evidence makes a strong case for continued support for the fire management program from USAG-HI.

Figure 2 divides the fire record by installation for the period 1993 to 2010, a time period when reporting is considered to be fairly complete amongst all installations. During this period, the vast majority of fires occurred at SBMR, largely due to their high training loads and the presence of live-fire activities at these installations. Though MMR is also a live-fire installation, no live-fire exercises have taken place since mid-1999.

Figure 2. The proportion of all USAG-HI fire records accounted for by each installation.



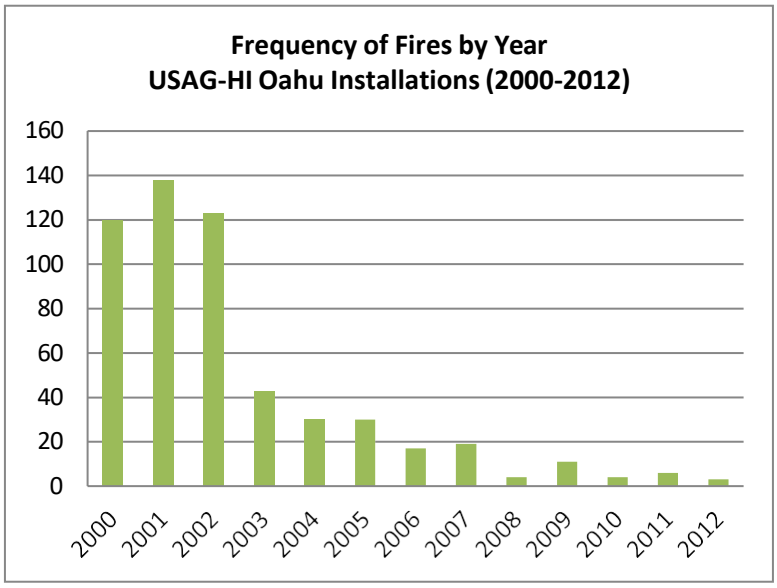
1.3.3 Makua Military Reservation

Makua Military Reservation has been closed to live-fire training and only minimal maneuver training has been authorized since prior to the 2003 IWFMP. An analysis of the fire history of MMR from 1970 to 1998 is available in 'Analysis of Fire Management Concerns at Makua Military Reservation' (Beavers et al 1999). Since 2003, there have only been two significant fires. The first occurred in July of that year as the result of an escaped prescribed fire. It burned most of the northern lobe of the valley and continued to burn off-post (pers. comm. Michelle Mansker, personal observations). The second occurred in August of 2010 and was caused by arson. It burned much of the northern ridgeline, including parts of the Kaluakauila management unit (pers. comm. Scott Yamasaki). There have been several other very small fires (pers. comm. Scott Yamasaki, Michelle Mansker), but these were not officially recorded on a WIFR.

1.3.4 Oahu Training Areas

A total of 1,208 records of fires at Oahu training installations exist, with 1,042 of them from 2000 to October of 2010(Figure 3). This number includes all Oahu training areas, including MMR. Training at SBMR accounts for the vast majority of fires during this period. There has been a dramatic decrease in the number of fires since 2002. This can be attributed, at least in part, to improved fire management including implementation of the FDRS' and prescribed burning of the SBMR impact area which vastly reduces ignitions there. Other factors, such as climate fluctuations and training load do not explain the drop. Training load, as defined by the total number of rounds fired, has actually increased over the same time period.

Figure 3. The number of fires reported each year from 2000 to 2010 on Oahu. Of 1,042 records, 548 contained a year since 2000.



Fires were more frequent in the summer months with peak fire season falling between early May and the end of September (Figure 4). Fires are rare in November and December, though presumably this is partly due to a decrease in training during the holidays. There is a very pronounced diurnal cycle of fires starting during the mid-day hours (Figure 5). Fires starting at night are very rare, partly due to low training loads at night.

Figure 4. The month each fire was reported in the fire records. Of 1,042 records, 1,040 contained a month.

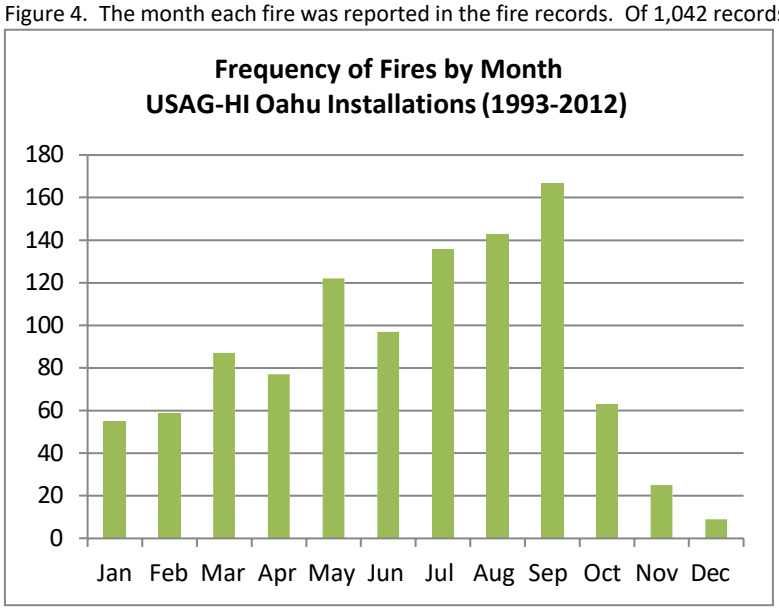
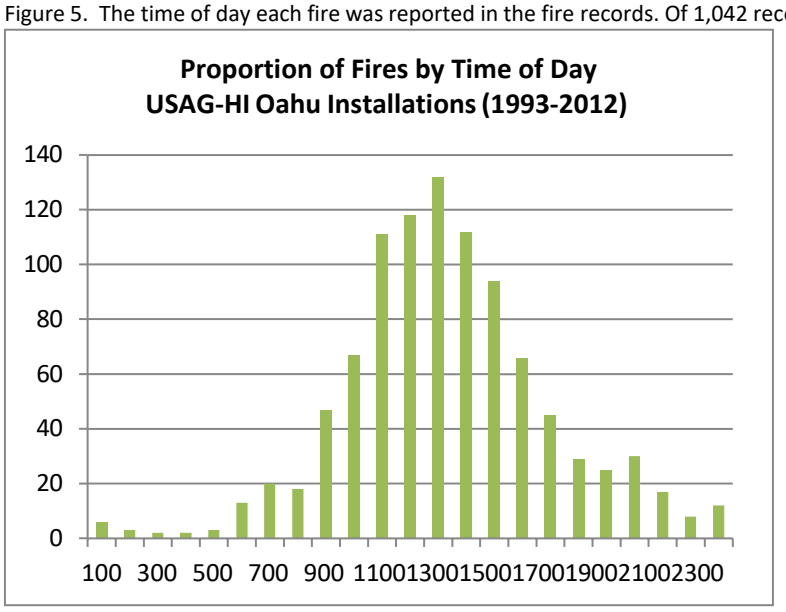


Figure 5. The time of day each fire was reported in the fire records. Of 1,042 records, 980 contained a day.



Of the fire records that have a range recorded as being responsible for the fire, 50% can be attributed to training on the MF and KR ranges (Figure 6). Fires may start somewhere other than on the range causing the fire, so the range responsible for causing the fire can be different from where the fire occurred. Of all USAG-HI fires on Oahu, 54% start on the MF ranges or in the impact area (Figure 7).

Figure 6. The proportion of fires attributed to training at each range group. The range attributed to causing the fire may differ from the location of the fire. Of 1,042 records, 1,042 contained a range responsible.

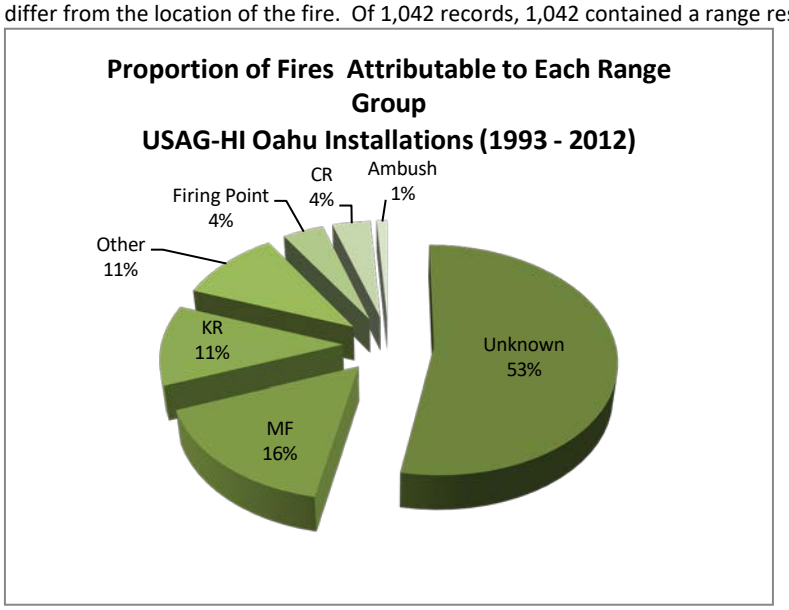
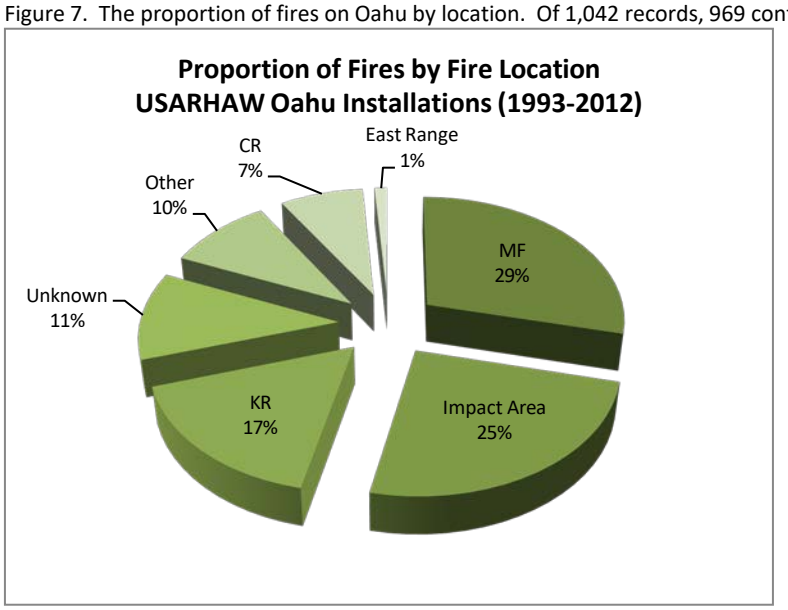
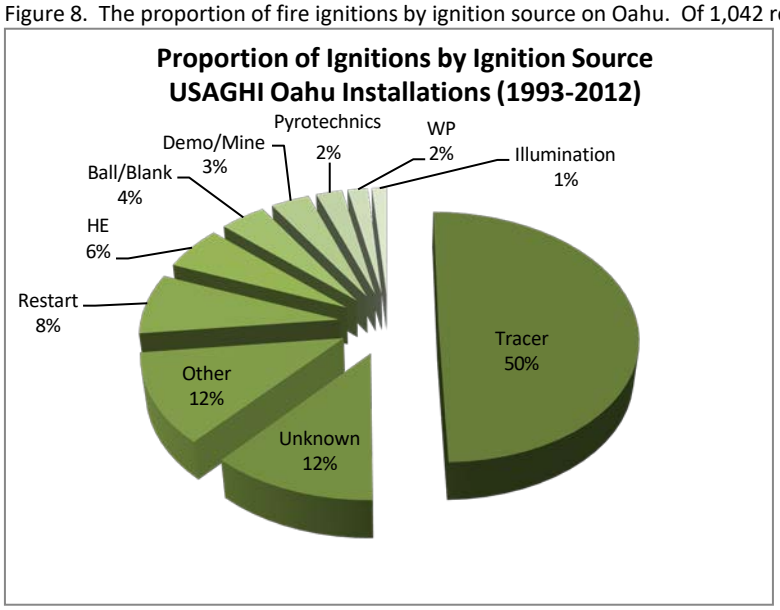


Figure 7. The proportion of fires on Oahu by location. Of 1,042 records, 969 contained a fire location.



The most common ignition source by far is tracer rounds which account for 50% of all fires on Oahu (Figure 8). Over 8% of all fires reported were from fires reigniting after suppression has been completed.

Figure 8. The proportion of fire ignitions by ignition source on Oahu. Of 1,042 records, 1,042 contained an ignition source.



The most common fire size is small fires of less than one acre in size (Figure 9). Fires on Oahu display a much more even distribution in terms of acres burned by acreage class (Figure 10). Still, a small number of large fires account for a disproportionate share of acres burned.

Figure 9. The proportion of the total number of fires by size class (acres) on Oahu. Of 1,042 records, 811 contained an acreage.

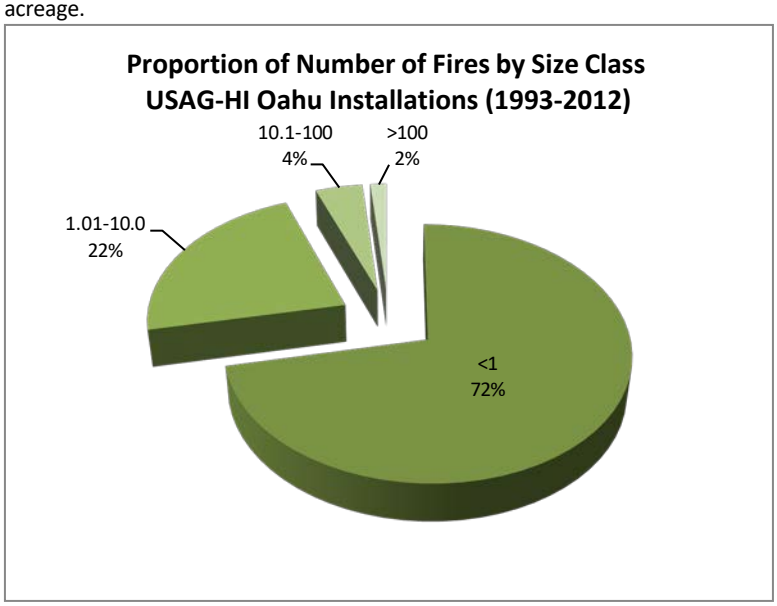
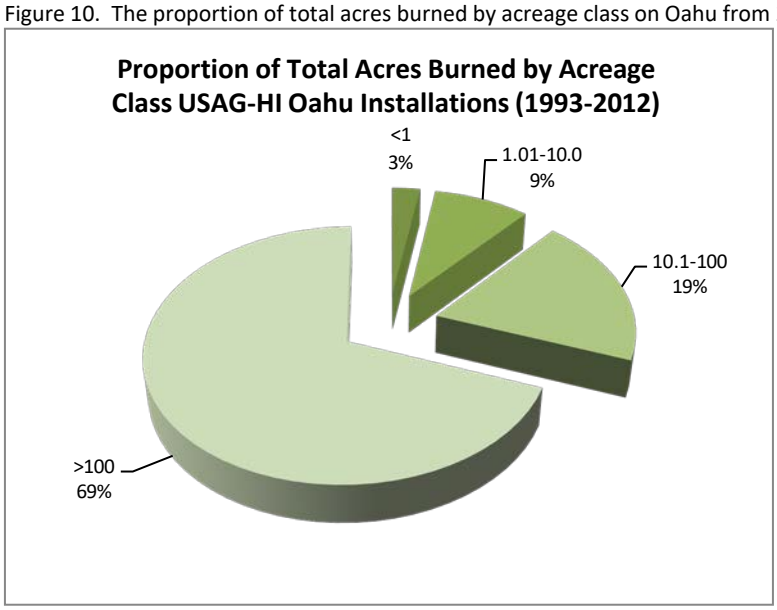
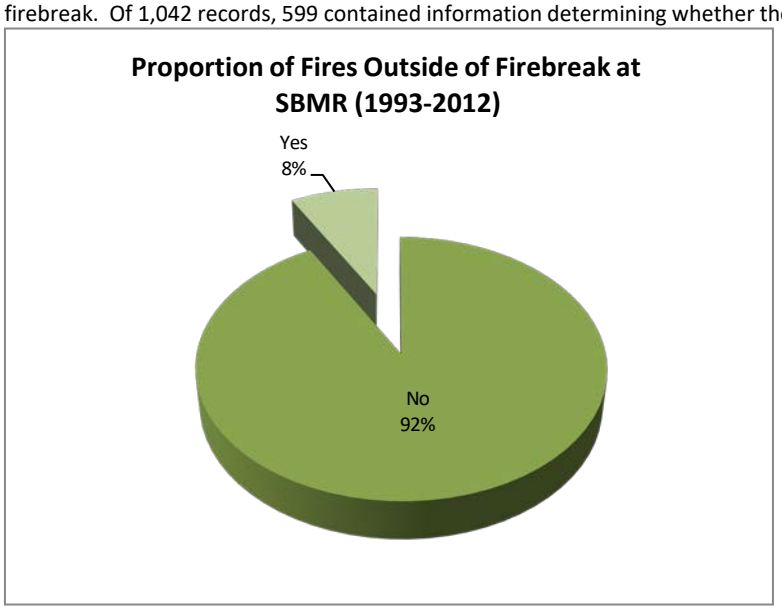


Figure 10. The proportion of total acres burned by acreage class on Oahu from 2000 to 2007.



At SBMR, keeping fires inside of the firebreak is a primary objective of the fire management program. Of the records identifying whether the fire burned outside the firebreak, over 90% of fires are ignited and contained inside of the firebreak, while less than 9% are either ignited outside of the firebreak or escape containment (Figure 11).

Figure 11. The proportion of fires at SBMR that were ignited outside the firebreak or escaped containment within the firebreak. Of 1,042 records, 599 contained information determining whether the fire was outside the firebreak at SBMR.



Response time to fires is quite good, with 81% of responses being less than 20 minutes from the time the fire was reported (Figure 12). Containment time is also very good, with over half of all fires being contained within one hour and only 5% of fires remaining uncontained after 10 hours (Figure 13). These numbers have improved, with the number of fires remaining uncontained after 10 hours reduced to 2% since 2000.

Figure 12. Response time to fires on Oahu. Of 1,042 records, 416 contained a response time.

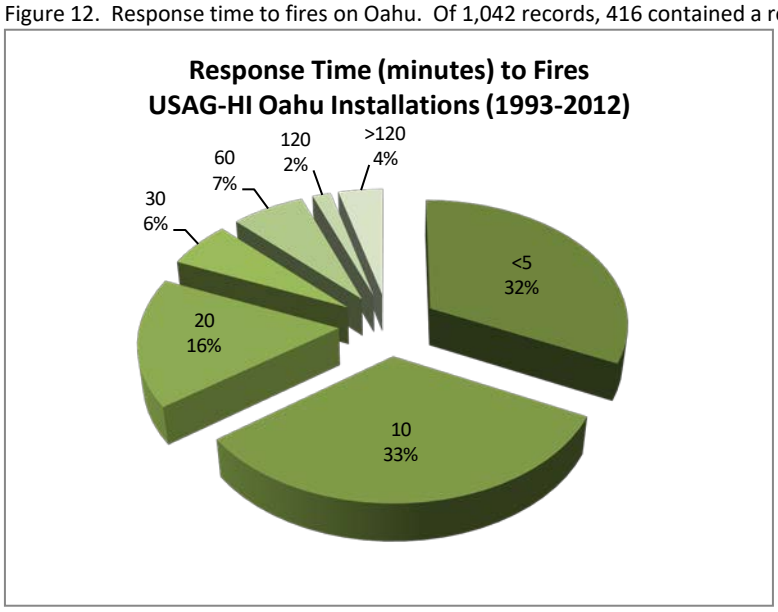
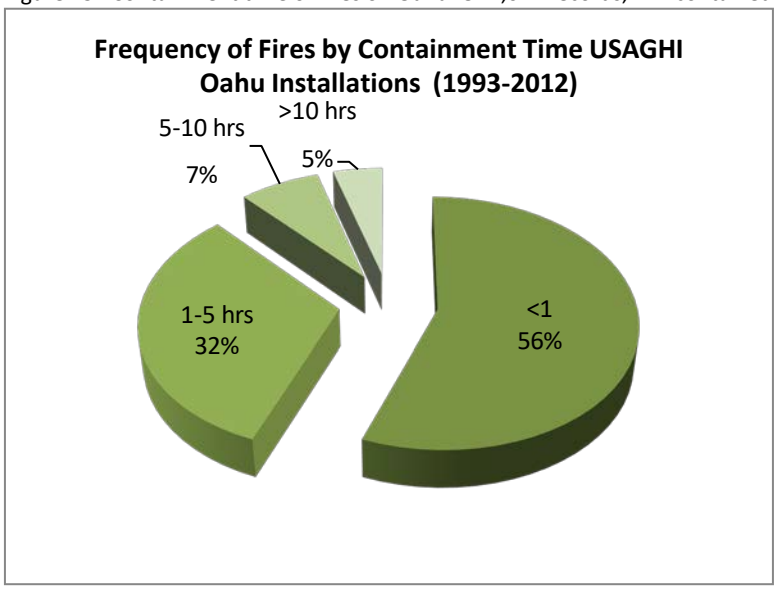


Figure 13. Containment time of fires on Oahu. Of 1,042 records, 774 contained a containment time.



1.3.5 Other Installations

Kahuku Training Area experiences a few fires per year on average. Most fires have been relatively small, though the potential for a large fire is certainly present given the fuels and wind conditions at low elevation. Fires caused by civilian use occur on occasion but is not prevalent and military training is the primary cause of fires.

Schofield Barracks East Range has experienced 10 recorded fires in the past 10 years. Only four records include fire cause information, and only one of these was training related, though it is suspected that most of the others were caused by training. No record of any fires at KLOA exists, though at least two fires have occurred there in the last 10 years. There have been no recorded fires at any of the other installations.

1.4 Fuels and Fire Behavior

1.4.1 Fuel Types and Characteristics

Fuels on USAG-HI installations on Oahu were mapped in 2003 (Kennaway et al 2003). These are the primary sources for fuels information used in this IWFMP. Additionally, an ongoing national fuels mapping project called LANDFIRE (www.landfire.org) has recently completed initial work in Hawaii. This data is more recent and is useful for some applications and where other fuels data is not available (e.g., outside of installation boundaries). However, it is of poorer resolution (30 m (98 ft)) than the data available for many USAG-HI properties and it is more heavily reliant on vegetation modeling than the higher quality in person observations that make up the bulk of the USAG-HI data.

The tables in each section below summarize the fuels and their expected fire behavior. 'Fuel Type' is a generalized description of the fuel. 'Fuel model' follows Scott and Burgan (2005). 'Vegetation classifications' refers to all of the vegetation communities described variously by Kennaway et al (2003), Shaw & Castillo (1997), Arnett (2002), or LANDFIRE that are included in the spatial distribution of the fuel type. 'Fire Behavior' is given in flame length (feet) and rate of spread (ch/hr) for three different percentile weather conditions as predicted by BehavePlus (Andrews 2009). The color coding indicates likely containment success with green meaning high likelihood of success, yellow meaning moderate likelihood of success, red meaning it is unlikely a fire under these conditions could be contained, and black meaning there is virtually no possibility of containment as long as these conditions persist. The weather conditions defining each percentile at each installation can be found in Section 1.5.

Containment Probability Key	
	High
	Moderate
	Unlikely
	Extremely Unlikely

In some cases, surface fire behavior, which is what is predicted in the tables below, is only part of the calculus of containing a fire. Fires in some fuels can produce containment difficulties because they produce a deep fuel bed that makes cutting line difficult, such as ironwood, or they produce copious firebrands like paper bark eucalyptus. These types of situations cannot be modeled effectively and are not considered in the data below.

1.4.1.1 Dillingham Military Reservation

There are eight fuel types classified at DMR (Figure 14 and Table 2). The most concerning fuel is the heavily loaded guinea grass/koa haole grassland complex that dominates much of the landscape. Fire intensity in this fuel type when it is dry can be expected to be high or extreme. The eucalyptus forest, which only covers a small portion of the installation, is also a highly volatile fuel matrix.

Table 2. Expected fire behavior in each fuel type found at DMR. Vegetation classification per Kennaway et al 2003.

Fuels			**Fire Behavior (Rate of Spread(ch/hr)/Flame Length(ft))**		
Fuel Type	*Vegetation Classifications Included*	*Fuel Model*	*50th Percentile Weather*	*80th Percentile Weather*	*97th Percentile Weather*
Agriculture	Agriculture	93	No Fire	No Fire	No Fire
Bare Ground	Roads, Disturbed Alien Grassland, Urban Development	99	No fire	No Fire	No Fire
Low Load Grass	Disturbed Alien Grassland, *Megathyrsus Maximus* Grassland	101	0.1/0.1	0.2/0.1	9.9/1.5
Mixed Forest	Mixed Cliff Communities	143	1.1/1.2	2.3/1.8	4.8/2.6
Christmas Berry Shrubland	*Schinus terebinthifolius* Forest	162	2.8/1.8	5.4/2.4	9.8/3.3
Ironwood Forest	*Casuarina spp.* Mixed Forest	188	1.4/1.6	2.0/2.0	3.1/2.5
Eucalyptus Forest	*Eucalyptus* Mixed Forest	189	2.0/2.3	3.0/2.8	4.6/3.6
Guinea Grass Grassland	*Leucaena leucocephala/Megathyrsus Maximus* Mixed Grassland, Disturbed Alien Grassland, Agriculture	Guinea Custom	6.7/7.0	13.2/9.9	25.7/14.1

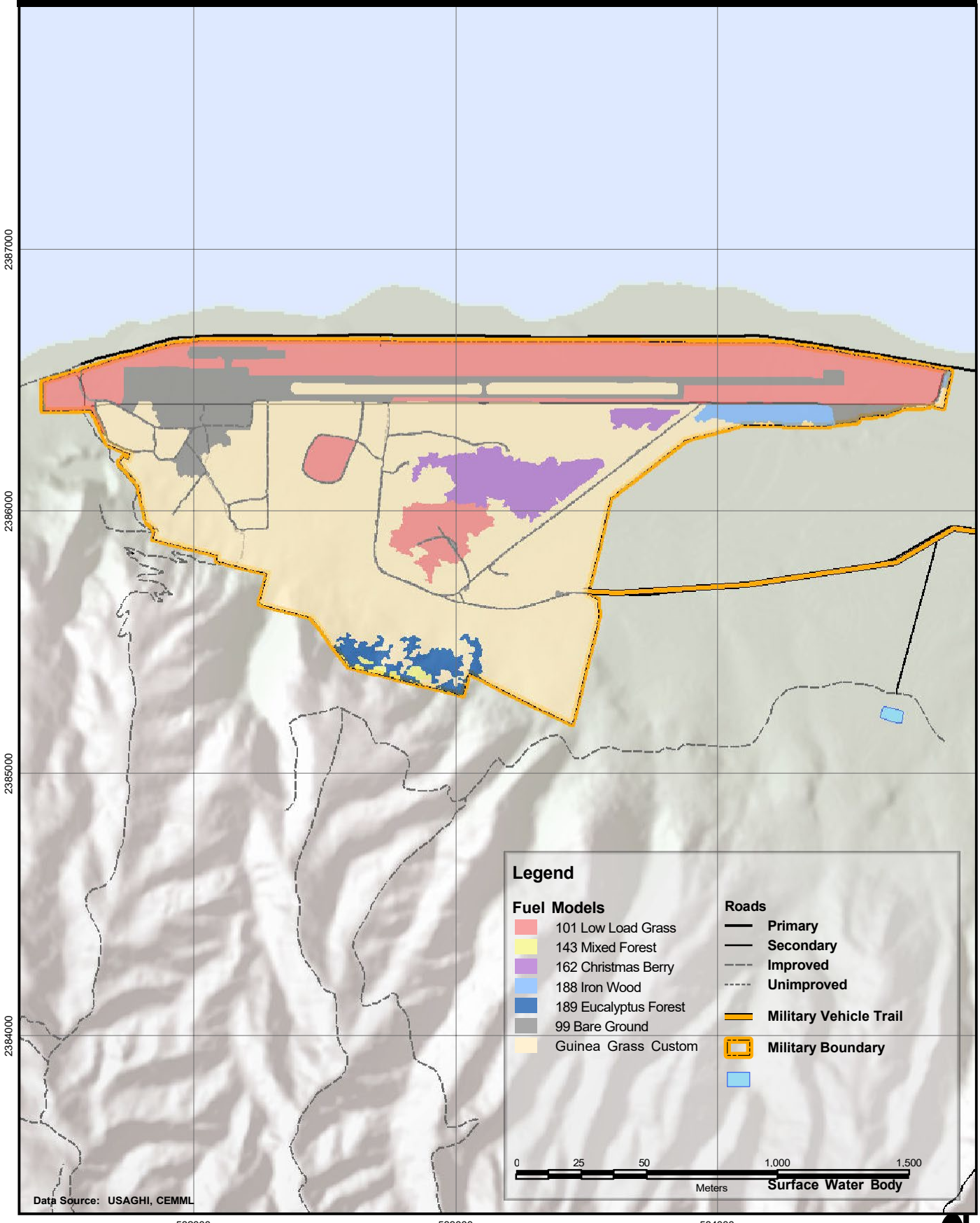
Vegetation classifications per Kennaway et al (2003).
Weather inputs from the DMR RAWS.

Dillingham Military Reservation

United States Army Hawaii
Integrated Wildland Fire Management Plan

Figure 14

Fuels



1.4.1.2 Kahuku Training Area

There are nine fuel types classified at KTA (Figure 15 and Table 3). The Guinea grass areas on the benches at low elevations and the eucalyptus and ironwood forests at low and mid elevations are of the greatest concern.

Table 3. Expected fire behavior in each fuel type found at KTA. Vegetation classification per Kennaway et al 2003.

Fuels			**Fire Behavior (Rate of Spread(ch/hr)/Flame Length(ft))**		
Fuel Type	*Vegetation Classifications Included*	*Fuel Model*	*50th Percentile Weather*	*80th Percentile Weather*	*97th Percentile Weather*
Bare Ground	Roads	99	No Fire	No Fire	No Fire
Low Load Grass	Andropogon virginicus mixed alien grassland	101	0.1/0.1	0.1/0.1	0.2/0.1
Christmas Berry Shrubland	*Schinus terebinthifolius* forest	162	6.8/2.6	10.6/3.2	15.9/3.9
Mixed Forest	*Metrosideros polymorpha/Acacia koa/Dicranopteris linearis* diverse native forest, mixed cliff, *Syzigium cumini* forest *Psidium cattleianum* shrubland	182	0.8/0.6	1.0/0.7	1.4/0.8
Ironwood Forest	*Casuarina* spp. mixed forest	188	3.2/2.3	4.4/2.7	6.1/3.3
Eucalyptus Forest	*Eucalyptus* spp. mixed forest, *Melaleuca quinquenervia* forest	189	4.8/3.4	6.6/3.9	9.1/4.7
Guinea Grass Grasslands	Disturbed alien grassland, *Megathyrsus Maximus* grassland, *Andropogon virginicus* mixed alien grassland, Leucaena leucocephala/*Megathyrsus maximus* mixed grassland	Guinea grass custom	11.0/8.6	18.6/11.2	29.4/14.2
Kukui Forest	*Aleurites moluccana* forest	Kukui custom	1.0/1.1	1.5/1.3	2.2/1.6
Uluhe Dominated Native Forest	*Metrosideros plymorpha/Acacia koa/Dicranopteris linearis* diverse native forest	Uluhe custom	1.2/0.5	1.5/0.6	2.3/1.6

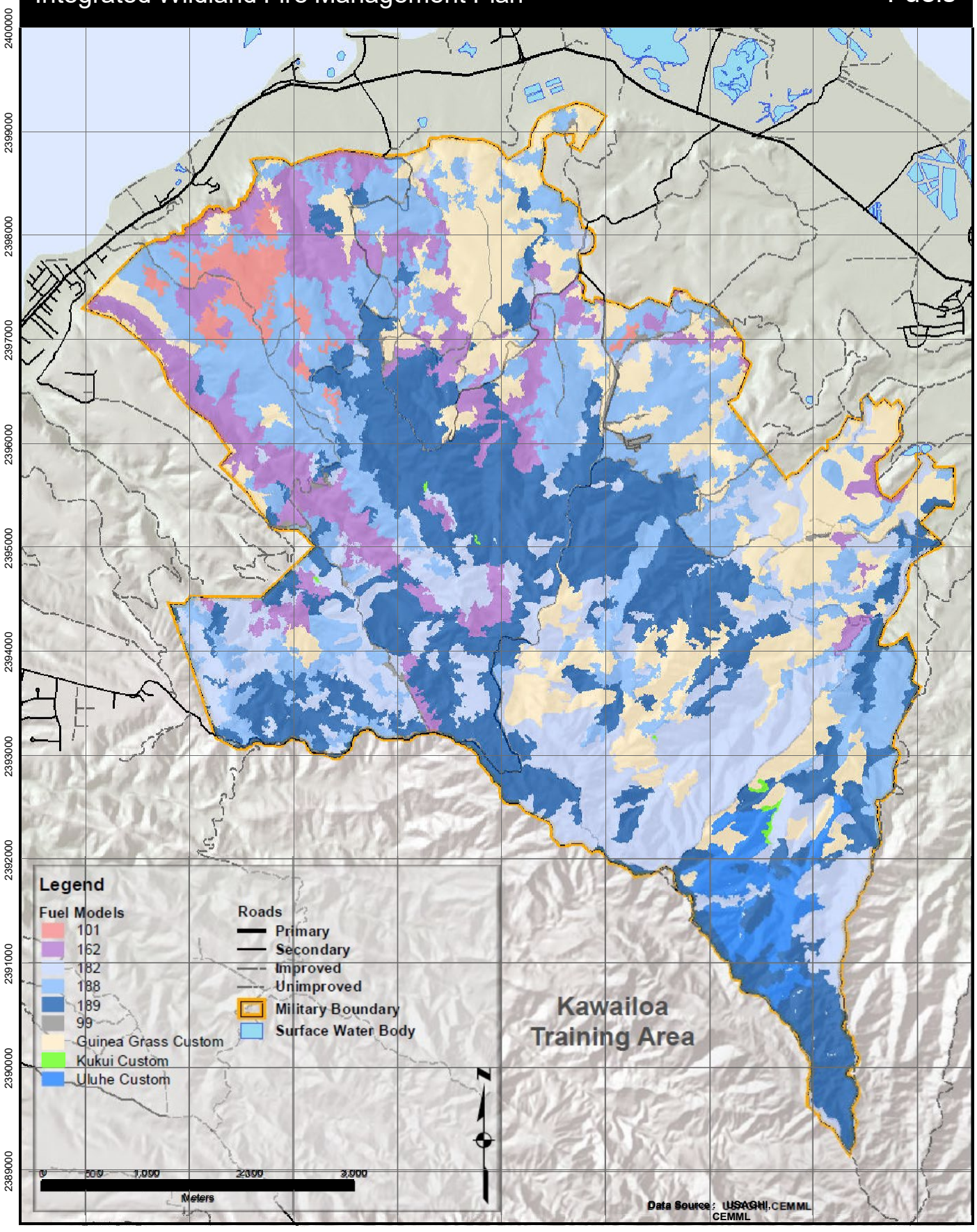
Vegetation classifications per Kennaway et al (2003).
Weather inputs from the KTA RAWS.

Kahuku Training Area

United States Army Hawaii
Integrated Wildland Fire Management Plan

Figure 15

Fuels



1.4.1.3 Kawailoa Training Area

There are eight fuel types classified at KLOA (Figure 16 and Table 4). The eucalyptus forest is of greatest concern. Guinea grass produces severe fire behavior, but there is very little of it on the landscape.

Table 4. Expected fire behavior in each fuel type found at KLOA. Vegetation classification per Kennaway et al 2003.

Fuels			**Fire Behavior (Rate of Spread(ch/hr)/Flame Length(ft))**		
Fuel Type	*Vegetation Classifications Included*	*Fuel Model*	*50th Percentile Weather*	*80th Percentile Weather*	*97th Percentile Weather*
Bare Ground	Roads	99	No Fire	No Fire	No Fire
Christmas Berry Shrubland	*Schinus terebinthifolius* Forest	162	6.7/2.6	9.5/3.1	14.3/3.8
Mixed Forest	*Metrosideros polymorpha/Acacia Koa/Dicranopteris linearis* Diverse Native Forest, Mixed Cliff, *Syzigium cumini* Forest, *Psidium cattleianum* Shrubland	182	0.9/0.6	1.0/0.7	1.3/0.8
Ironwood Forest	*Casuarina* spp. Mixed Forest	188	3.8/2.5	4.6/2.8	5.8/3.2
Eucalyptus Forest	*Eucalyptus* spp. Mixed Forest, *Melaleuca quinquenervia* Forest	189	5.6/3.7	6.8/4.1	8.7/4.6
Guinea Grass Grasslands	Disturbed Alien Grassland, *Megathyrsus Maximus* Grassland, *Andropogon virginicus* Mixed Alien Grassland, *Leucaena leucocephala/Megathyrsus maximus* Mixed	Guinea Grass Custom	9.8/8.1	16.3/10.6	29.7/14.4
Kukui Forest	*Aleurites moluccana* Forest	Kukui Custom	0.9/1.1	1.5/1.3	2.6/1.8
Uluhe Dominated Native Forest	*Metrosideros polymorpha/Acacia Koa/Dicranopteris linearis* Diverse Native Forest	Uluhe Custom	1.3/0.5	1.7/0.6	5.3/1.2

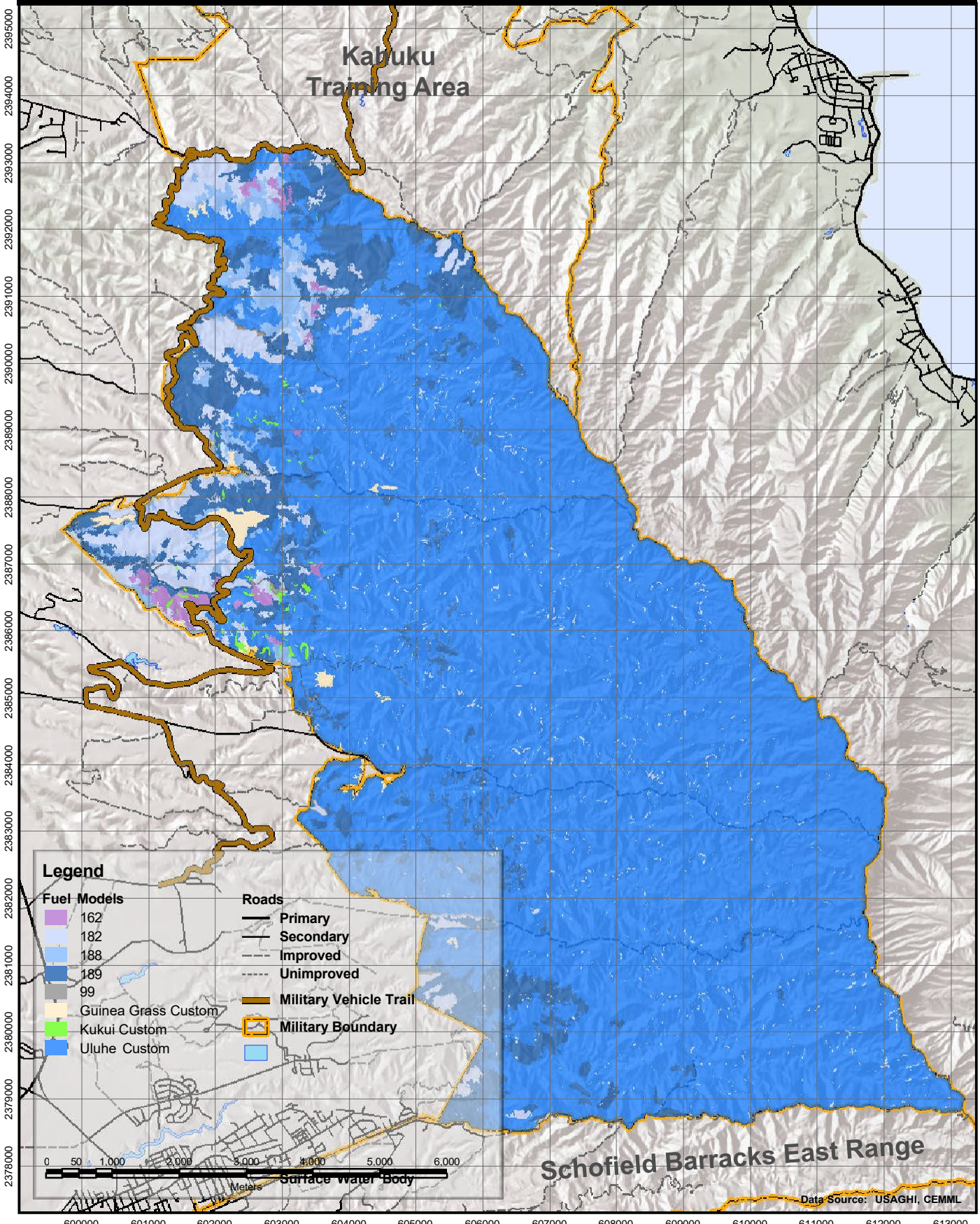
Vegetation classifications per Kennaway et al (2003).
Weather inputs from the KLOA RAWS.

Kawailoa Training Area

United States Army Hawaii
Integrated Wildland Fire Management Plan

Figure 16

Fuels



1.4.1.4 Makua Military Reservation

Makua Military Reservations is dominated by an extensive stand of guinea grass (*Megathyrsus Maximus*) that fills the valley bottom and covers most of the northern lobe of the valley. This is the primary concern because of how extensive the cover is and the fire behavior it produces.

Table 5. Expected fire behavior in each fuel type found at MMR. Vegetation classification per Kennaway et al 2003.

Fuels			**Fire Behavior (Rate of Spread(ch/hr)/Flame Length(ft))**		
Fuel Type	*Vegetation Classifications Included*	*Fuel Model*	*50th Percentile Weather*	*80th Percentile Weather*	*97th Percentile Weather*
Bare Ground	Roads, Urban Development	99	No Fire	No Fire	No Fire
Low Load Grass	Megathyrsus Maximus Grassland	101	0.6/0.3	11.7/1.7	16.9/1.9
High Load Grass	Mixed Cliff Communities, *Aleurites moluccana* Forest, *Psidium cattleianum* Shrubland	145	17.9/7.7	33.2/10.4	61.9/14.2
Christmas Berry Shrubland	Mixed Cliff Communities, *Psidium cattleianum* Shrubland, Naturalized *Melinis minutiflora / Megathyrsus Maximus* Mixed Grassland, *Schinus terebinthifolius* Forest, *Leucaena leucocephala / Megathyrsus Maximus* Mixed Grassland	162	3.8/2.0	7.0/2.7	12.9/3.7
Mixed Forest	Mixed Cliff Communities, *Leucaena leucocephala* / Megathyrsus Maximus Mixed Grassland, *Aleurites moluccana* Forest, *Schinus terebinthifolius* Forest, *Psidium cattleianum* Shrubland, Roads, Naturalized *Melinis minutiflora / Megathyrsus Maximus* Mixed Grassland	182	0.4/0.4	0.6/0.5	0.9/0.7
Ironwood Forest	Naturalized *Melinis minutiflora / Megathyrsus Maximus* Mixed Grassland, *Leucaena leucocephala / Megathyrsus Maximus* Mixed Grassland	188	1.5/1.7	2.4/2.2	3.8/2.7
Guinea Grass Grassland	Disturbed Alien Grasslands, Naturalized *Melinis minutiflora / Megathyrsus Maximus* Mixed Grassland, *Megathyrsus Maximus* Grassland, *Leucaena leucocephala / Megathyrsus Maximus* Mixed Grassland, *Andropogon virginicus* Mixed Alien Grassland, Mixed Cliff Communities	Guinea Custom	11.6/9.3	24.9/13.7	51.2/20.0
Kukui Forest	Mixed Cliff Communities, *Aleurites moluccana* Forest, *Psidium cattleianum* Shrubland, *Leucaena leucocephala / Megathyrsus Maximus* Mixed Grassland, *Schinus terebinthifolius* Forest,	Kukui Custom	0.7/1.0	1.2/1.3	4.1/2.9
Brush	*Schinus terebinthifolius* Forest	NFFL5	2.8/1.4	8.9/3.0	29.3/6.8
Short Needle Litter	Mixed Cliff Communities, *Syzygium cumini* Forest, *Psidium cattleianum* Shrubland	NFFL8	0.5/0.5	0.8/0.7	1.2/0.9
Long Needle Litter	*Casuarina spp*. Mixed Forest	NFFL9	1.7/1.3	2.8/1.7	4.9/2.3

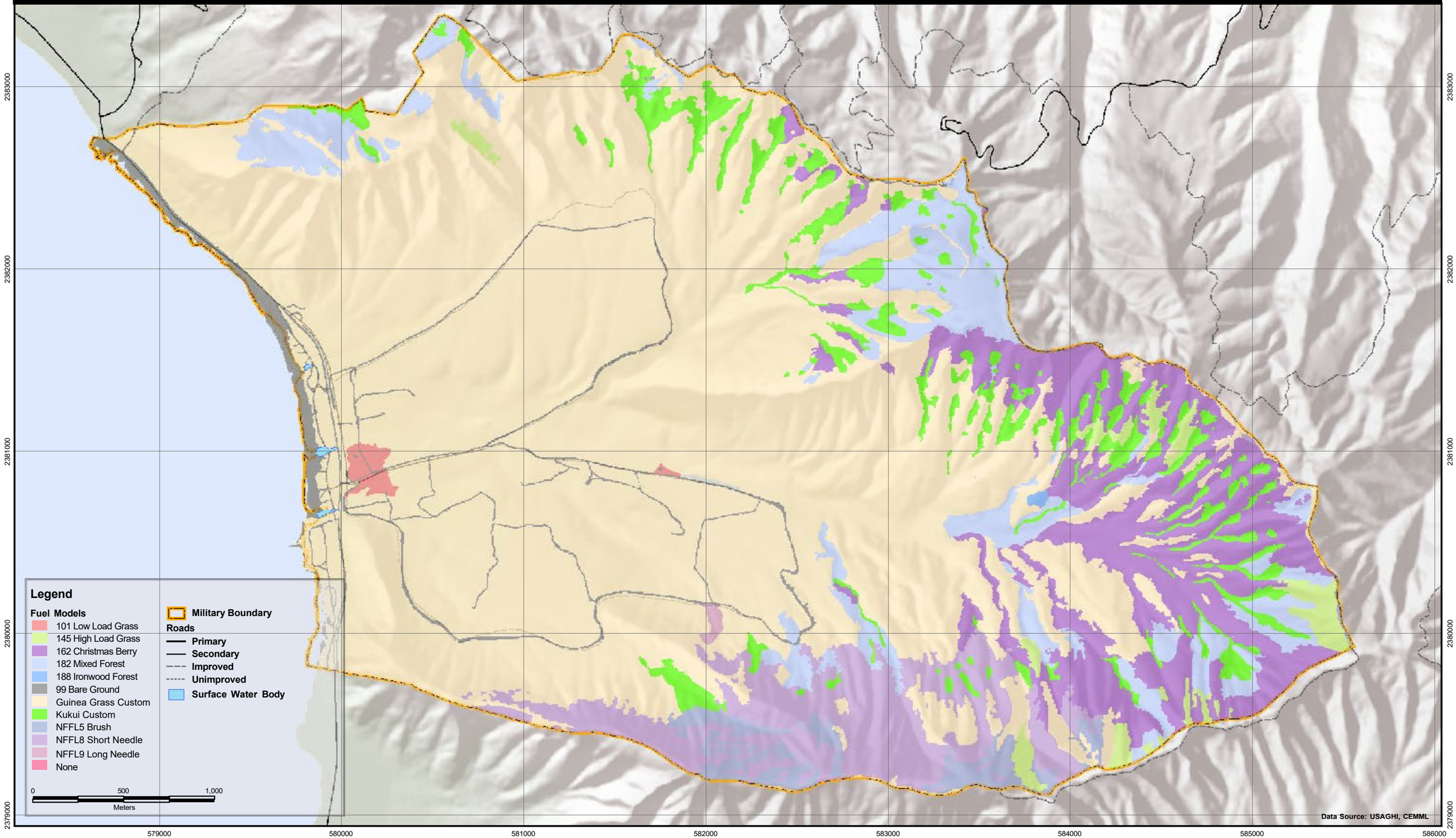
Vegetation classifications per Kennaway et al (2003). Weather inputs from the MMR Range RAWS.

Makua Military Reservation

United States Army Hawaii
Integrated Wildland Fire Management Plan

Figure 17

Fuels



1.4.1.5 Schofield Barracks East Range

There are eleven fuel types classified at SBER (Figure 18 and Table 6). Overall, these do not produce fire behavior in the range that will resist containment. The only exception is fires in guinea grass under drought conditions when severe fires are possible.

Table 6. Expected fire behavior in each fuel type found at SBER. Vegetation classification per Kennaway et al 2003.

Fuels			**Fire Behavior (Rate of Spread(ch/hr)/Flame Length(ft))**		
Fuel Type	*Vegetation Classifications Included*	*Fuel Model*	*50th Percentile Weather*	*80th Percentile Weather*	*97th Percentile Weather*
Open Water	Open Water	98	No Fire	No Fire	No Fire
Bare Ground	Roads, Urban Development	99	No Fire	No Fire	No Fire
Low Load Grass	*Andropogon virginicus* Mixed Alien Grassland	101	0.1/0.1	0.1/0.1	0.4/0.2
Moderate Load Grass	*Andropogon virginicus* Mixed Alien Grassland	102	0.1/0.1	0.1/0.1	0.8/0.4
High Load Grass	*Andropogon virginicus* Mixed Alien Grassland	103	0.2/0.2	0.2/0.2	1.4/0.6
Mixed Forest	*Syzigium cumini* Forest, Mixed Cliff Communities, *Psidium cattleianum* Shrubland, *Metrosideros polymorpha*/Acacia Koa/*Dicranopteris linearis* Diverse Native Forest	182	0.3/0.4	0.5/0.5	0.6/0.6
Ironwood Forest	*Casuarina* spp. Forest	188	1.5/1.7	2.1/2.0	2.8/2.3
Eucalyptus Forest	*Eucalyptus* spp. Mixed Forest, *Melaleuca quinquenervia* Forest	189	2.2/2.4	3.1/2.8	4.2/3.3
Guinea Grass Grassland	*Andropogon virginicus* Mixed Alien Grassland, Disturbed Alien Grasslands	Guinea Grass Custom	4.5/5.7	7.2/7.2	18.0/11.4
Kukui Forest	*Aleurites moluccana* Forest	Kukui Custom	0.5/0.8	0.7/0.9	1.2/1.2
Uluhe Dominated Native Forest	*Metrosideros polymorpha*/*Acacia Koa*/*Dicranopteris linearis* Diverse Native Forest	Uluhe Custom	0.7/0.4	1.2/0.5	4.9/1.3

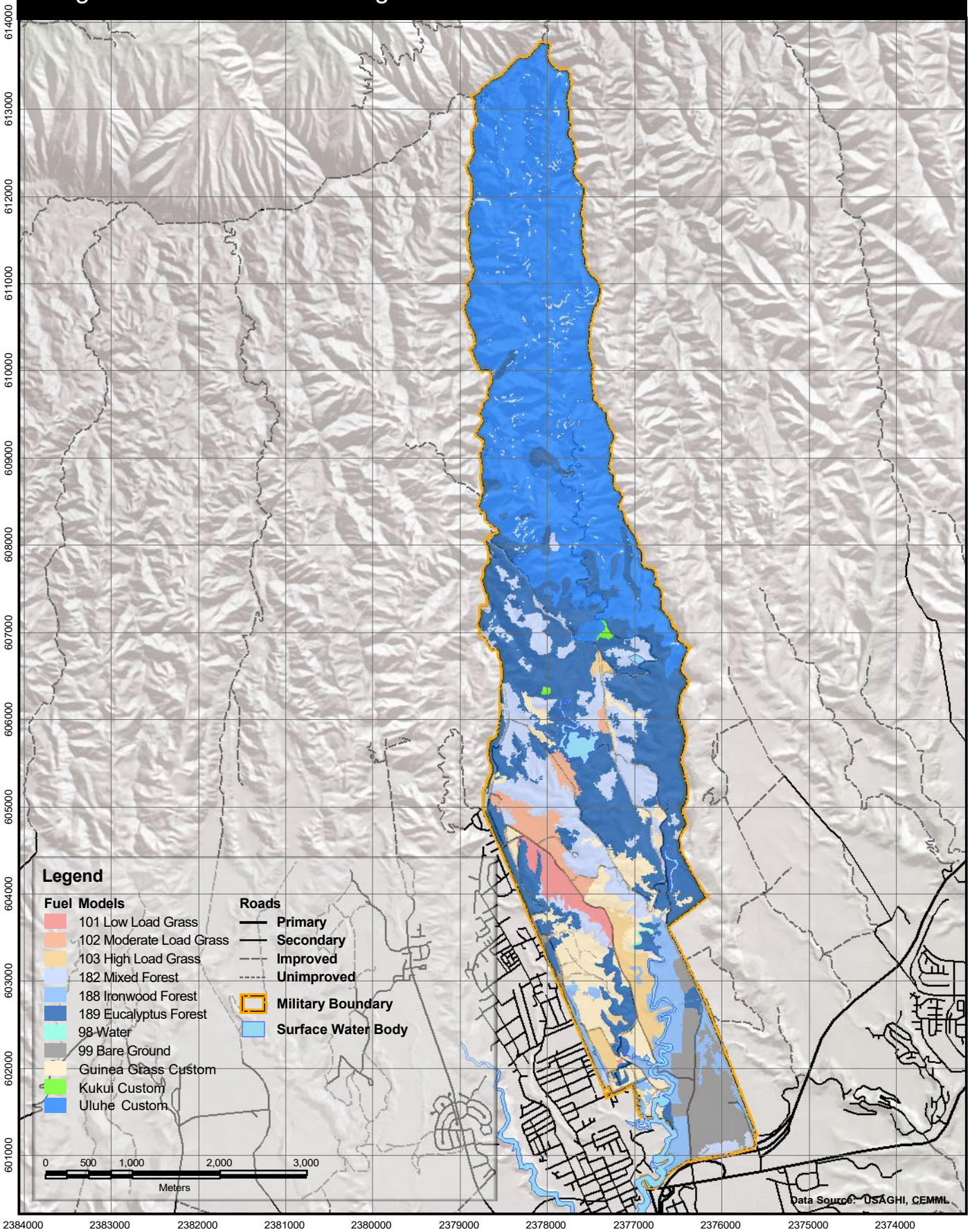
Vegetation classifications per Kennaway et al (2003).
Weather inputs from the SBER RAWS.

Schofield Barracks East Range

Figure 18

United States Army Hawaii
Integrated Wildland Fire Management Plan

Fuels



1.4.1.6 Schofield Barracks West Range

Repeated prescribed burning of the impact area at SBMR has converted some of it from a grassland to a mix of forbs, annuals, and grasses. Much of this area will no longer carry fire as long as this practice continues, but guinea grass may return if prescribed burning stops.

The primary fuel for fires elsewhere is guinea grass (*Megathyrsus Maximus*), but there are pockets of eucalyptus (*Eucalyptus spp.*) and ironwood (*Casuarina equisetifolia*) that could cause fire containment problems.

Table 7. Expected fire behavior in each fuel type found at SBMR. Vegetation classification per Kennaway et al 2003.

Fuels			**Fire Behavior (Rate of Spread(ch/hr)/Flame Length(ft))**		
Fuel Type	*Vegetation Classifications Included*	*Fuel Model*	*50th Percentile Weather*	*80th Percentile Weather*	*97th Percentile Weather*
Agriculture	Agriculture	93	No Fire	No Fire	No Fire
Open Water	Open Water	98	No Fire	No Fire	No Fire
Bare Ground	Roads	99	No Fire	No Fire	No Fire
Low Load Grass	Disturbed Alien Grasslands, *Metrosideros polymorpha / Acacia koa / Dicranopteris linearis* Diverse Native Forest, *Megathyrsus Maximus* Grassland, *Schinus terebinthifolius* Forest, *Eucalyptus spp.* Mixed Forest	101	0.1/0.1	0.2/0.1	4.7/1.0
Moderate Load Grass	*Andropogon virginicus* Mixed Alien Grassland, *Megathyrsus Maximus* Grassland, Disturbed Alien Grasslands, *Metrosideros polymorpha / Acacia koa / Dicranopteris linearis* Diverse Native Forest, *Schinus terebinthifolius* Forest	102	0.1/0.1	0.1/0.1	2.8/0.8
High Load Grass	*Eucalyptus spp.* Mixed Forest, *Schinus terebinthifolius* Forest	103	0.2/0.2	0.3/0.2	22.2/4.2
High Load Grass	Mixed Cliff Communities, *Schinus terebinthifolius* Forest, *Metrosideros polymorpha / Acacia koa / Dicranopteris linearis* Diverse Native Forest	145	12.0/5.8	10.4/8.2	31.3/10.2
Low Load Timber/Grass/Shrub	*Metrosideros polymorpha / Acacia koa / Dicranopteris linearis* Diverse Native Forest	161	0.2/0.3	0.3/0.4	0.5/0.5
Moderate Load Timber/Shrub	Mixed Cliff Communities, *Schinus terebinthifolius* Forest, *Metrosideros polymorpha / Acacia koa / Dicranopteris linearis* Diverse Native Forest, *Metrosideros polymorpha / Acacia koa / Dicranopteris linearis* Diverse Native Forest, *Schinus terebinthifolius* Forest, *Eucalyptus spp.* Mixed Forest, *Leucaena leucocephala / Megathyrsus Maximus* Mixed Grassland, Disturbed Alien Grasslands, *Megathyrsus Maximus* Grassland	162	3.4/1.9	4.9/2.3	7.5/2.8

Mixed Forest	*Metrosideros polymorpha / Acacia koa / Dicranopteris linearis* Diverse Native Forest, Mixed Cliff Communities, *Schinus terebinthifolius* Forest, *Syzygium cumini* Forest, Roads, *Psidium cattleianum* Shrubland, *Leucaena leucocephala / Megathyrsus Maximus* Mixed Grassland	182	0.4/0.4	0.5/0.5	0.7/0.6
Ironwood Forest	*Casuarina spp.* Mixed Forest	188	1.7/1.8	2.2/2.1	3.0/2.4
Eucalyptus Forest	*Eucalyptus spp.* Mixed Forest, *Schinus terebinthifolius* Forest, *Metrosideros polymorpha / Acacia koa / Dicranopteris linearis* Diverse Native Forest, Disturbed Alien Grasslands, *Aleurites moluccana* Forest	189	2.6/2.6	3.3/3.0	4.5/3.5
Guinea Grass Grassland	Mixed Cliff Communities, *Leucaena leucocephala / Megathyrsus Maximus* Mixed Grassland, *Megathyrsus Maximus* Grassland, Disturbed Alien Grasslands, Naturalized *Melinis minutiflora / Megathyrsus Maximus* Mixed Grassland, *Casuarina spp.* Mixed Forest	Guinea Custom	7.5/7.4	11.9/9.4	20.2/12.3
Kukui Forest	Aleurites moluccana Forest, *Metrosideros polymorpha / Acacia koa / Dicranopteris linearis* Diverse Native Forest	Kukui Custom	0.6/0.9	0.9/1.1	1.3/1.3
Uluhe Dominated Native Forest	Mixed Cliff Communities, *Metrosideros polymorpha / Acacia koa / Dicranopteris linearis* Diverse Native Forest	Uluhe Custom	1.1/0.5	1.8/0.7	7.9/1.9

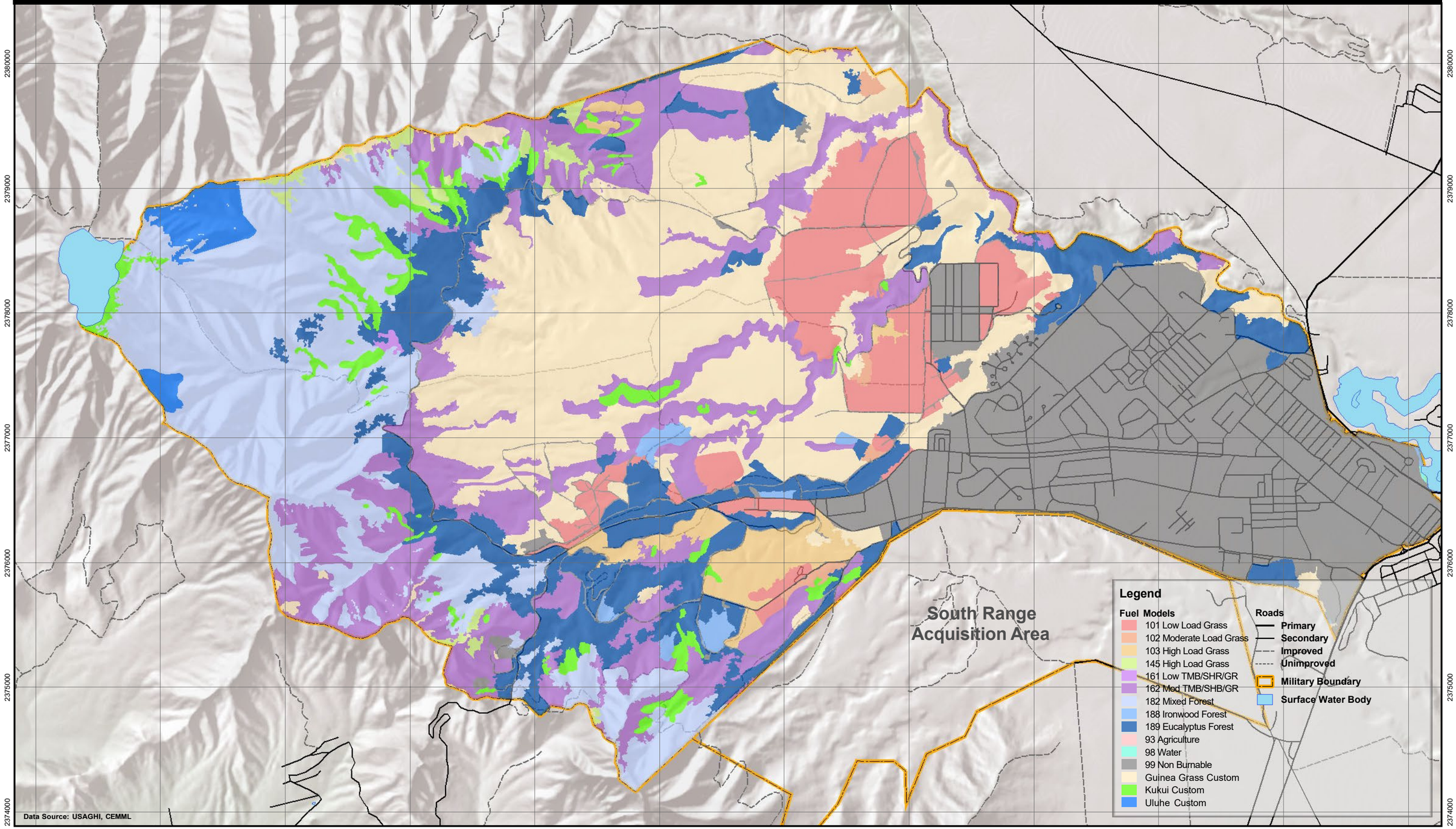
Vegetation classifications per Kennaway et al (2003).
Weather inputs from the SBMR Range RAWS.

Schofield Barracks Military Reservation

United States Army Hawaii
Integrated Wildland Fire Management Plan

Figure 19

Fuels



1.4.1.7 South Range Acquisition Area

There are ten fuel types classified at SRAA. The primary fuels of concern are the guinea grass grasslands that are ubiquitous throughout the previously agricultural land and the eucalyptus forest.

Table 8. Expected fire behavior in each fuel type found at SRAA. Vegetation classification per Kennaway et al 2003.

Fuels			**Fire Behavior (Rate of Spread(ch/hr)/Flame Length(ft))**		
Fuel Type	*Vegetation Classifications Included*	*Fuel Model*	*50th Percentile Weather*	*80th Percentile Weather*	*97th Percentile Weather*
Agriculture	Agriculture	93	No Fire	No Fire	No Fire
Open Water	Open Water	98	No Fire	No Fire	No Fire
Low Load Grass	Agriculture	101	0.1/0.1	0.2/0.1	4.7/1.0
High Load Grass	Eucalyptus spp. Mixed Forest, Schinus terebinthifolius (Christmas berry) Forest, Aleurites moluccana (Kukui) Forest, Megathyrsus Maximus Grassland	145	12.0/5.8	10.4/8.2	31.3/10.2
Moderate Load Timber/Shrub	Aleurites moluccana (Kukui) Forest, Schinus terebinthifolius (Christmas berry) Forest	162	3.4/1.9	4.9/2.3	7.5/2.8
Mixed Forest	Metrosideros polymorpha (Ohi'a) / Acacia koa / Dicranopteris linearis (Uluhe) Diverse Native Forest	182	0.4/0.4	0.5/0.5	0.7/0.6
Ironwood Forest	Casuarina spp. (Ironwood) Mixed Forest	188	1.7/1.8	2.2/2.1	3.0/2.4
Eucalyptus Forest	Casuarina spp. (Ironwood) Mixed Forest, Aleurites moluccana (Kukui) Forest, Melaleuca quinquenervia (Paper bark eucalyptus) Forest, Schinus terebinthifolius (Christmas berry) Forest	189	2.6/2.6	3.3/3.0	4.5/3.5
Guinea Grass Grasslands	Eucalyptus spp. Mixed Forest, Schinus terebinthifolius (Christmas berry) Forest, Agriculture, Aleurites moluccana (Kukui) Forest, Megathyrsus Maximus Grassland, Megathyrsus Maximus Grassland	Guinea Custom	7.5/7.4	11.9/9.4	20.2/12.3
Kukui Forest	*Aleurites moluccana* Forest	Kukui Custom	0.6/0.9	0.9/1.1	1.3/1.3

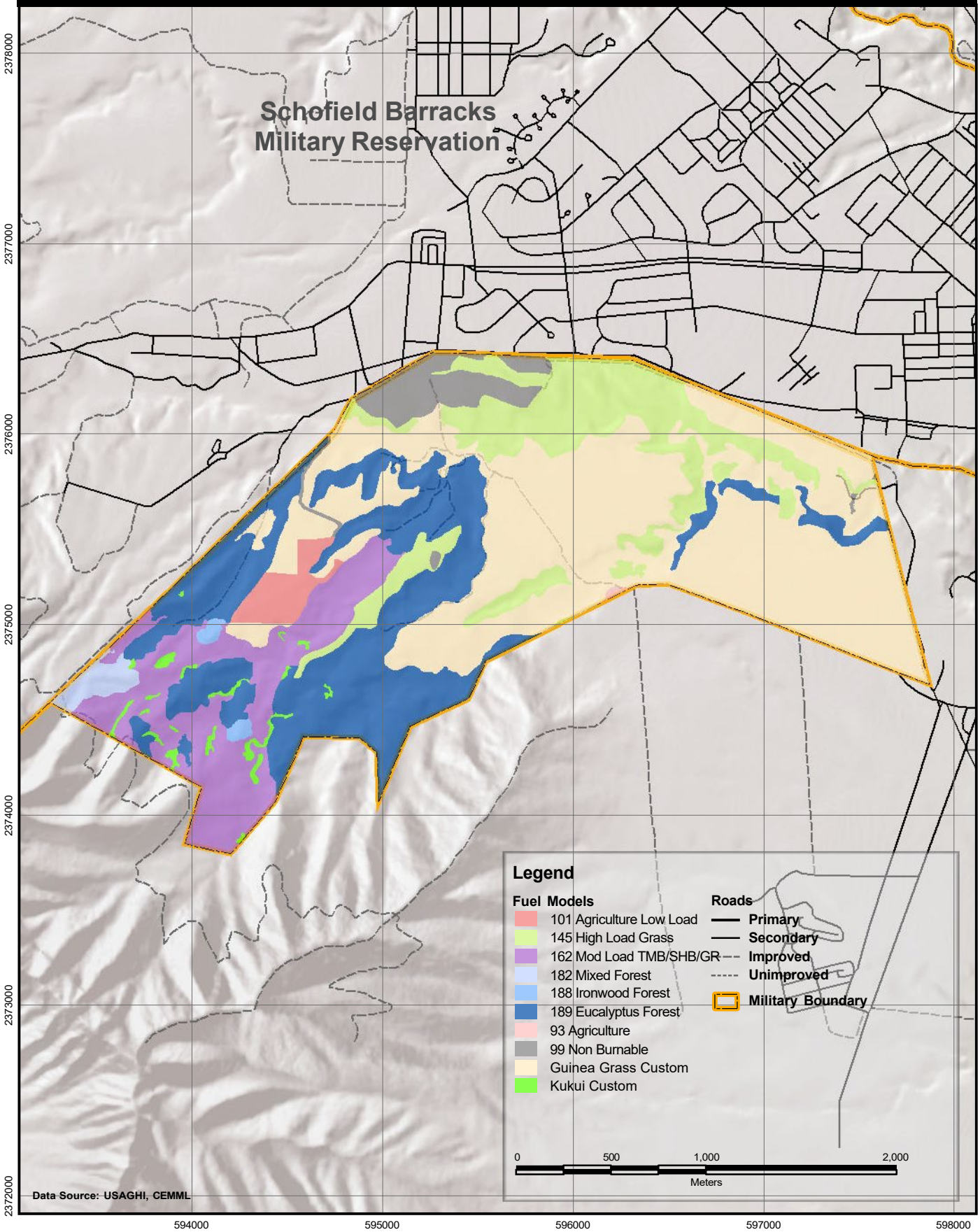
Vegetation classifications per Kennaway et al (2003).
Weather inputs from the SBMR RAWS.

South Range Acquisition Area

United States Army Hawaii
Integrated Wildland Fire Management Plan

Figure 20

Fuels



1.4.1.8 Fort Shafter, Helemano Military Reservation, Wheeler Army Airfield, and Tripler Army Medical Center

These installations do not have frequent fires and no fuels management of any kind is planned. Fuels were not mapped for the purposes of this IWFMP.

1.4.2 Fuel Load

Fuel loads for guinea grass have been measured through Army sponsored sampling initiatives at MMR, SBMR, and DMR, as well as in the Waianae Kai Forest Reserve. Guinea grass has been studied in greater depth than other fuels.

1.4.2.1 Guinea Grass

Guinea grass fuel loads vary considerably from site to site as well as temporally, though site location is a stronger predictor of fuel load than year (as influenced by weather, presumably rain/drought). Average measured fuel loads in undisturbed guinea grass range from 6.34 Mg/ha (2.82 t/ac) at SBMR to 30.34 Mg/ha (13.53 t/ac) at DMR. A rule of thumb average fuel loading for guinea grass is in the neighborhood of 17.5 Mg/ha (~8 t/ac).

The total fine fuel load in guinea grass appears to be highest in late spring and early summer compared with fall and winter, though this trend is not statistically significant (Ellsworth et al, unpublished data). Guinea grass consistently caries a dead fuel load that is several times larger than the live fuel load typically ranging from 2.5 to 5 times the live fuel load (Ellsworth et al, unpublished data).

1.4.2.2 Fountaingrass

Fountaingrass is currently limited in distribution on the Island of Oahu but can be expected to expand its range in the coming years due to its highly invasive nature. Beavers (unpublished data) found an average fountaingrass fuel load of 8.16 Mg/ha (3.64 t/ac) in the northern and western portion of Keamuku Military Reservation on Hawaii. In a study near Puu Anahulu, also on Hawaii, Castillo et al (2006) found average fountaingrass fuel loads of about 10.3 Mg/ha (4.5 t/ac).

1.4.2.3 Pili Grass

Very little information exists for pili grass on or near Army properties. A single set of measurements by Weise (unpublished data) indicate a fuel load of 2.7 Mg/ha (1.2 t/ac). Prescribed fires in this fuel were not able to carry and went out even when fuel moisture was less than 10% and wind speeds were 6.7 m/s (15 mph). It should be noted that total aerial cover was very thin, averaging only 30% and with a median of 22%, indicating a few patches of heavier fuels, but that most measured plots were in the range of 20% cover. This was lower cover, and presumably fuel loading, than in adjacent areas pili grass stands which were not burned due to containment concerns, so it is not possible to conclude that pili grass will not burn.

1.5 Weather

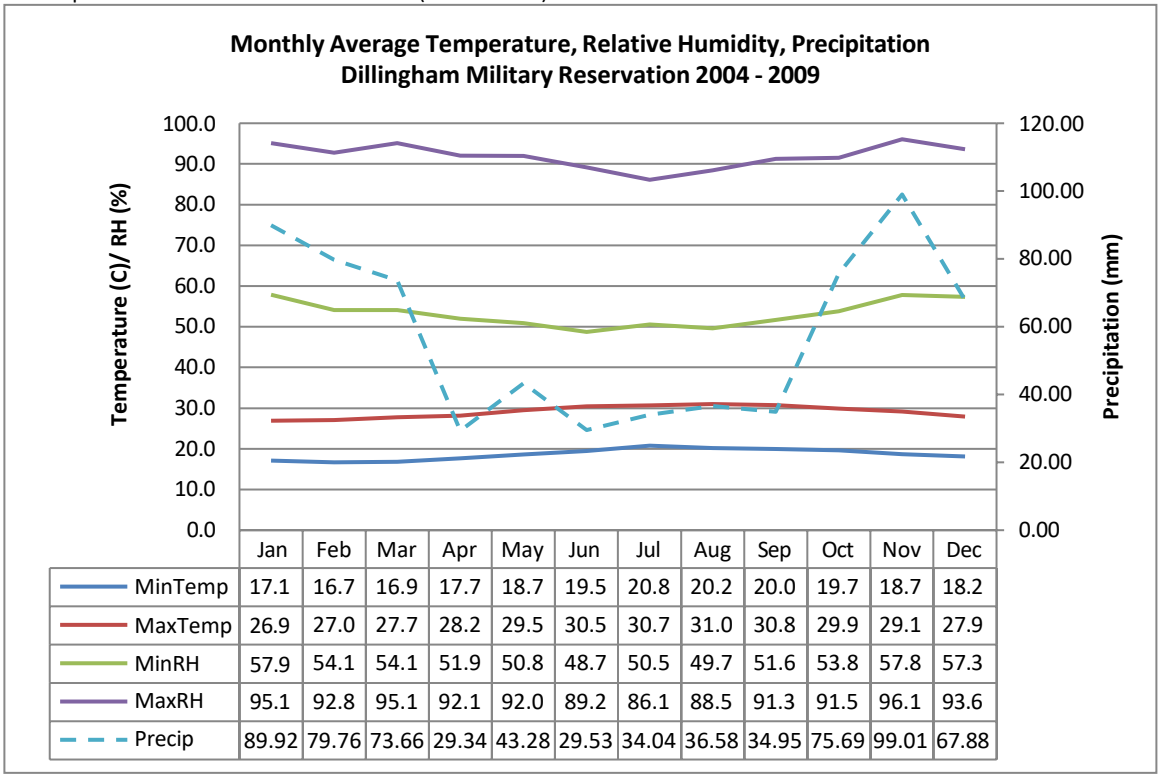
Weather data has been compiled for each installation from a representative weather station, usually the installation RAWS (Table 27, Section 4.4.4). The entire period of record for each weather station is used to calculate monthly average as well as percentile weather are presented in the sections below. The once daily observation is taken at 1200 and is utilized for the percentile weather calculations which is standard practice for fire weather analyses. Stations on the mainland typically take their daily reading at 1400, but ARMY FIRE has altered the timing per the recommendations of the National Interagency Fire Center (NIFC) RAWS Depot personnel.

1.5.1 Dillingham Military Reservation

Notable components of the weather at DMR include high summer temperatures and an extended dry season (Figure 21). Average monthly high temperatures are over 30° C (86° F) from July through September. The dry season lasts from April through September, longer than at other Oahu installations. Among Oahu training installations, only MMR is drier during the summer. Yearly precipitation at DMR is low, averaging 55.51 cm (21.9 in). Monthly precipitation is highly unpredictable from November through February, but is much less variable, though very low, during the summer months. Relative humidity is low throughout the summer and humidity recovery at night is moderate in the winter and poor in the summer. This is reflected in an 80th percentile relative humidity (RH) value of 49% (Table 9). Live herbaceous moisture only drops to low levels in the 90th percentile indicating that the likelihood of a severe fire is not present on most days.

Wind is a major factor at DMR. Wind speed is much higher during daytime hours and also tends to favor a northeasterly direction as compared to at night which favors a more east-southeast direction (Figure 22). Wind speeds during the day exceed 17 knots (19.5 mph) over 25% of the time. Winds from the west through north are unusual and winds from the south through west are quite rare. Fires during the day will tend to be pushed to the southwest, into the steep hillsides and important protected resources.

Figure 21. Monthly average minimum and maximum temperature and relative humidity and monthly average precipitation for the period of record of the DMR RAWS (2004 - 2009).

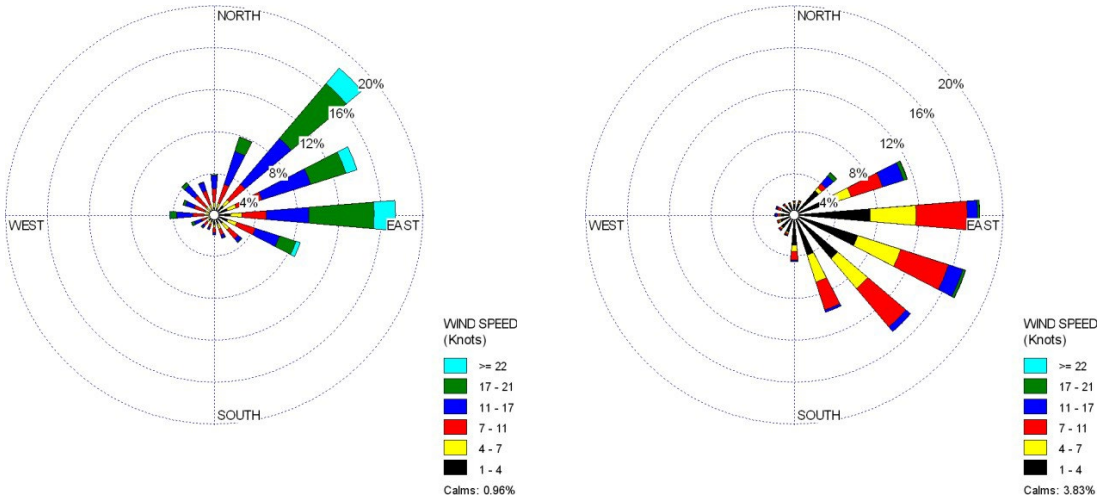


	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
MinTemp	17.1	16.7	16.9	17.7	18.7	19.5	20.8	20.2	20.0	19.7	18.7	18.2
MaxTemp	26.9	27.0	27.7	28.2	29.5	30.5	30.7	31.0	30.8	29.9	29.1	27.9
MinRH	57.9	54.1	54.1	51.9	50.8	48.7	50.5	49.7	51.6	53.8	57.8	57.3
MaxRH	95.1	92.8	95.1	92.1	92.0	89.2	86.1	88.5	91.3	91.5	96.1	93.6
Precip	89.92	79.76	73.66	29.34	43.28	29.53	34.04	36.58	34.95	75.69	99.01	67.88

Table 9. Percentile weather data for the period of record (2004 - 2009) of the DMR RAWS.

Percentile	Temperature (°F)	RH (%)	Windspeed (mph)	1 hr. Moist. (%)	Live Herb. Moist. (%)
50	83	56	7	8	210
80	86	49	10	7	149
90	87	46	11	6	131
97	88	43	13	6	111

Figure 22. Daytime (0700 - 1900, left) and nighttime (1900 - 0700, right) wind roses for the period of record of the DMR RAWS (2004 - 2009).

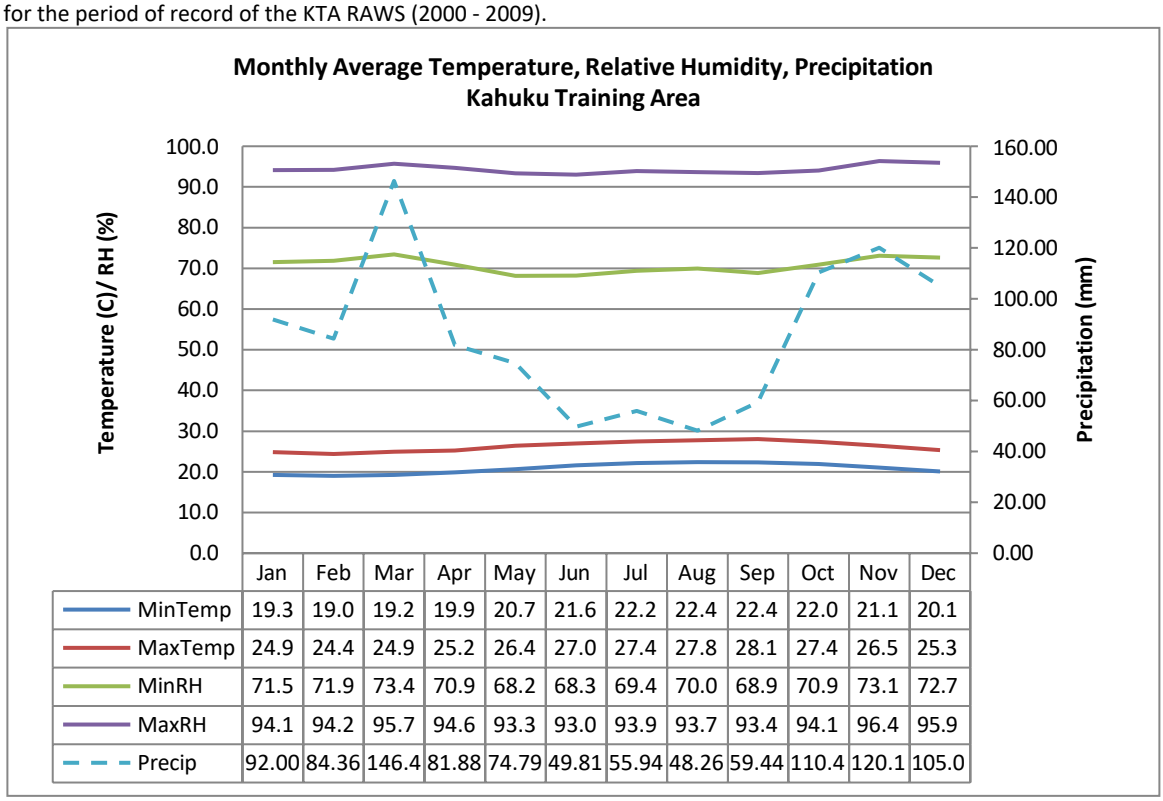


1.5.2 Kahuku Training Area

Weather factors of note at KTA include high wind speeds and high average minimum relative humidity (Figure 23). The average monthly minimum RH never falls below 65% and average relative humidity hovers between 70% and 80% year-round. Precipitation shows a typical summer dry period from June through July, during which monthly average precipitation is in the neighborhood of 45 mm (1.75"). Monthly average precipitation varies more in the winter than the summer with November through January being the most variable months. Live herbaceous moisture is relatively high except under drought conditions (97th percentile) when it can drop to the point where major fires are a possibility (Table 10).

Winds are very high at KTA due to its direct exposure to the trade winds and the wind's orientation to the landscape which, in some areas, magnifies the wind speed. Even under 50th percentile conditions, wind speeds are high enough to produce wind driven fires (Table 10). Winds blow almost exclusively from the east (Figure 24).

Figure 23. Monthly average minimum and maximum temperature and relative humidity and monthly average precipitation for the period of record of the KTA RAWS (2000 - 2009).

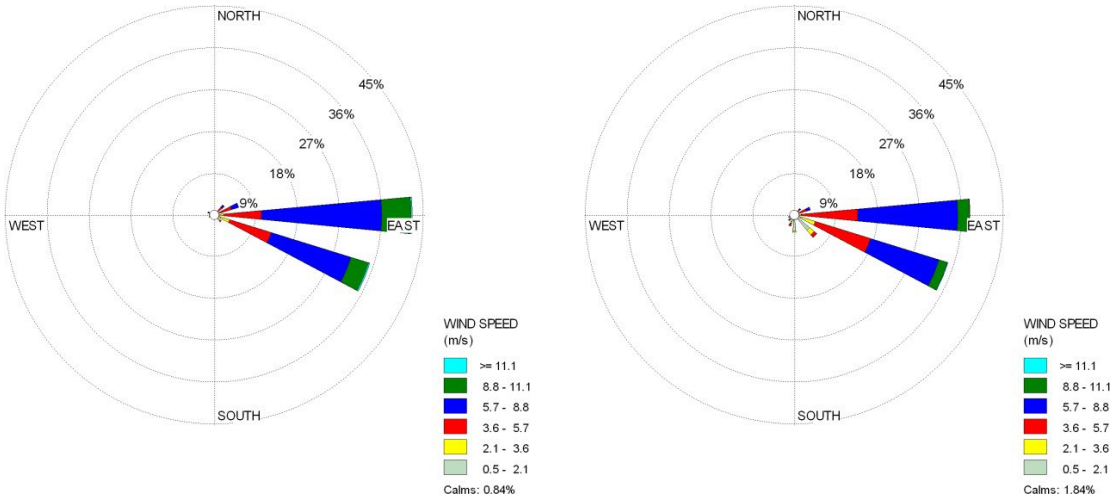


	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
MinTemp	19.3	19.0	19.2	19.9	20.7	21.6	22.2	22.4	22.4	22.0	21.1	20.1
MaxTemp	24.9	24.4	24.9	25.2	26.4	27.0	27.4	27.8	28.1	27.4	26.5	25.3
MinRH	71.5	71.9	73.4	70.9	68.2	68.3	69.4	70.0	68.9	70.9	73.1	72.7
MaxRH	94.1	94.2	95.7	94.6	93.3	93.0	93.9	93.7	93.4	94.1	96.4	95.9
Precip	92.00	84.36	146.4	81.88	74.79	49.81	55.94	48.26	59.44	110.4	120.1	105.0

Table 10. Percentile weather data for the period of record (2000 - 2009) of the KTA RAWS.

Percentile	Temperature (°F)	RH (%)	Windspeed (mph)	1 hr. Moist. (%)	Live Herb. Moist. (%)
50	78	74	14	10	231
80	80	65	18	9	180
90	82	61	20	8	162
97	83	56	23	7	131

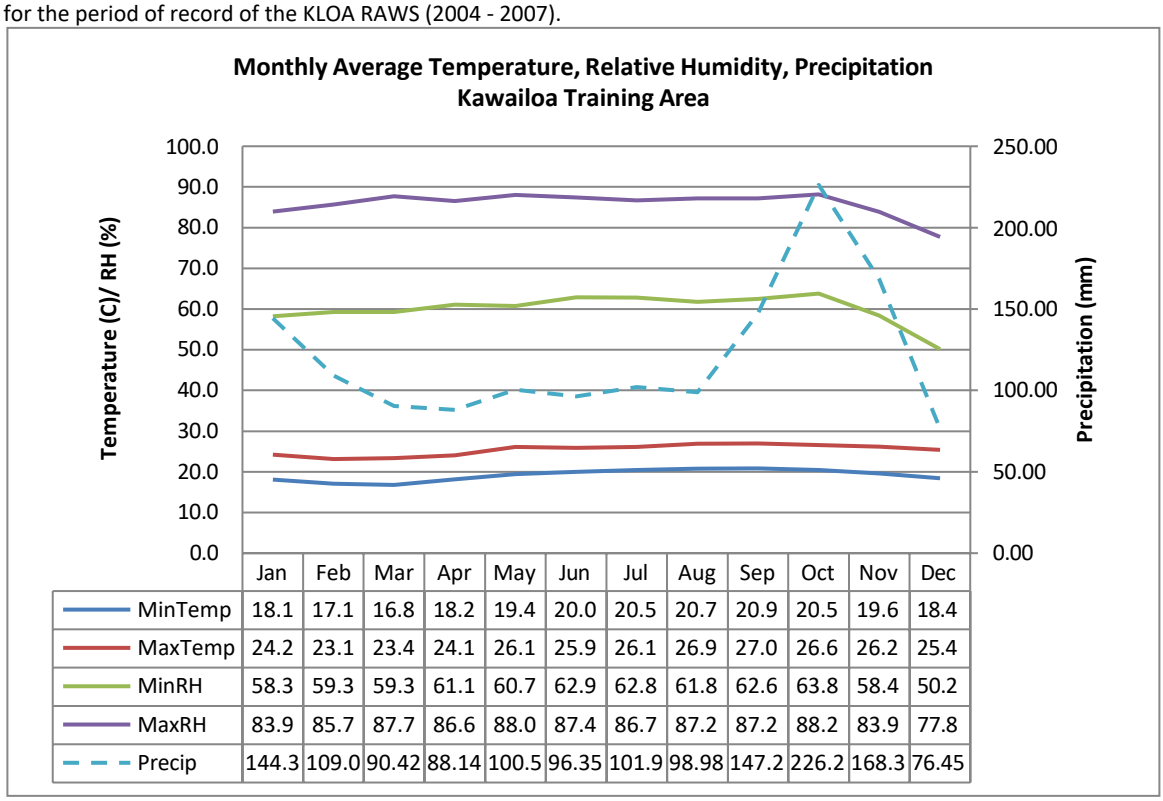
Figure 24. Daytime (0700 - 1900, left) and nighttime (1900 - 0700, right) wind roses for the period of record of the KTA RAWS (2000 - 2009).



1.5.3 Kawailoa Training Area

Data available from the KLOA RAWS is limited 2004 to 2007. Given the very short period of record, conclusions about general climate conditions are difficult to make. Existing data is presented below for completeness but should be regarded with a degree of skepticism since individual readings can skew the results dramatically with such a limited dataset.

Figure 25. Monthly average minimum and maximum temperature and relative humidity and monthly average precipitation for the period of record of the KLOA RAWS (2004 - 2007).

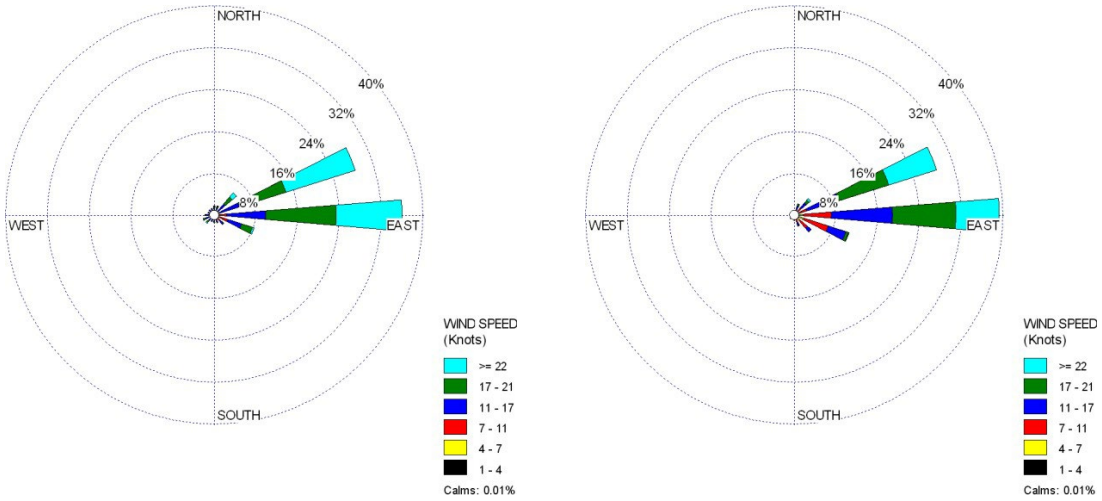


	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
MinTemp	18.1	17.1	16.8	18.2	19.4	20.0	20.5	20.7	20.9	20.5	19.6	18.4
MaxTemp	24.2	23.1	23.4	24.1	26.1	25.9	26.1	26.9	27.0	26.6	26.2	25.4
MinRH	58.3	59.3	59.3	61.1	60.7	62.9	62.8	61.8	62.6	63.8	58.4	50.2
MaxRH	83.9	85.7	87.7	86.6	88.0	87.4	86.7	87.2	87.2	88.2	83.9	77.8
Precip	144.3	109.0	90.42	88.14	100.5	96.35	101.9	98.98	147.2	226.2	168.3	76.45

Table 11. Percentile weather data for the period of record (2004 - 2007) of the KLOA RAWS.

Percentile	Temperature (°F)	RH (%)	Windspeed (mph)	1 hr. Moist. (%)	Live Herb. Moist. (%)
50	77	65	10	9	245
80	79	58	13	8	177
90	81	54	14	7	158
97	83	48	16	7	113

Figure 26. Daytime (0700 - 1900, left) and nighttime (1900 - 0700, right) wind roses for the period of record of the KLOA RAWS (2004 - 2007).



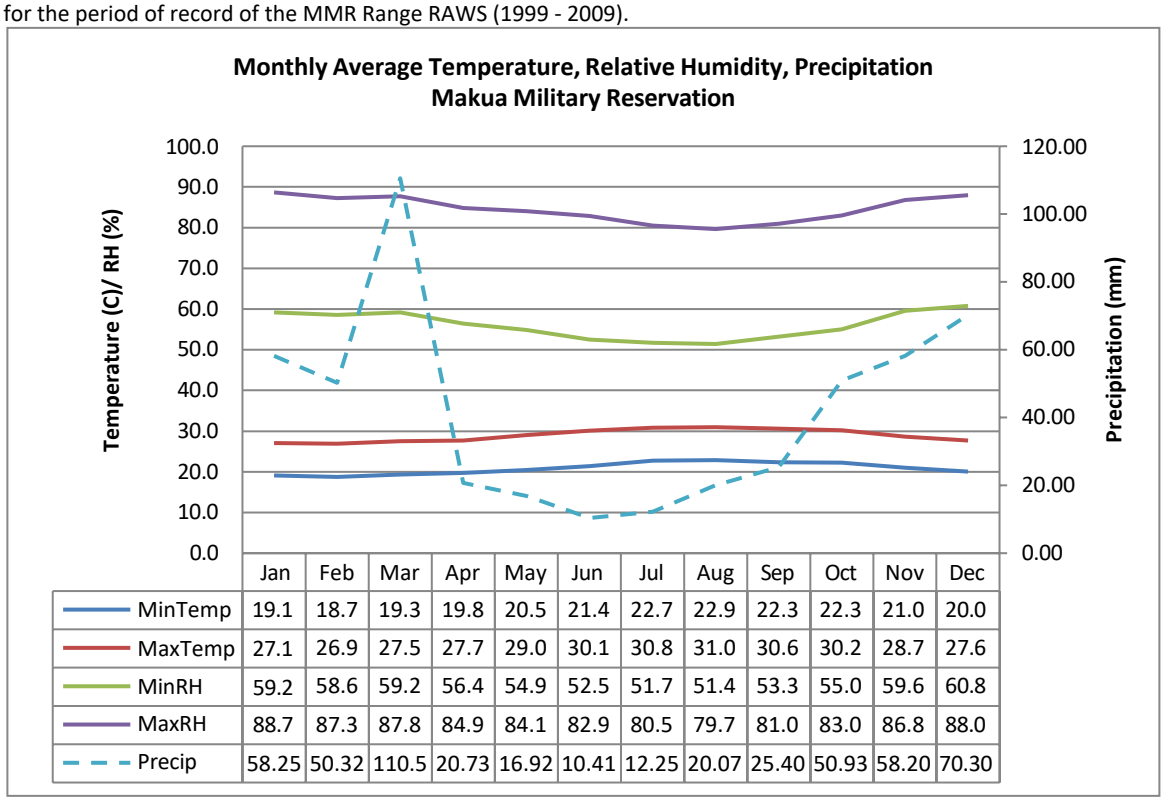
1.5.4 Makua Military Reservation

There are three RAWS located at MMR. This analysis is of the Range RAWS located near the range control building. This is one of the longest running RAWS in the USAG-HI inventory and has been running continuously since 1999. This is a highly fire prone climate. Of particular note are the low precipitation, low fuel moistures, and high wind speeds. From April through September, averaging less than 20 mm (0.79 in) per month (Figure 27). Minimum relative humidity is also quite low during the summer months for Hawaii, flirting with 50% on many days, and humidity recovery at night is poor, with monthly averages throughout the year consistently below 90%. High temperatures often exceed 30° C (86° F) as well.

Makua is extremely dry. Live herbaceous moisture is below 95% and fine dead fuel moisture is 8% or below over 50% of the time (Table 12). Wind speeds are greater than 12 mph 20% of the time and there is very little canopy cover to reduce these wind speeds as they come into contact with any fire. When considering only the weather, this combination of factors makes MMR the single most fire prone environment within which USAG-HI trains on the Island of Oahu.

Winds tend to be dominated by the trade winds, but onshore winds occur with regularity in the daytime and are generally present during large fires (Figure 28). Wind speeds are not notably high, but the very dry fuels make wind speed slightly less important.

Figure 27. Monthly average minimum and maximum temperature and relative humidity and monthly average precipitation for the period of record of the MMR Range RAWS (1999 - 2009).

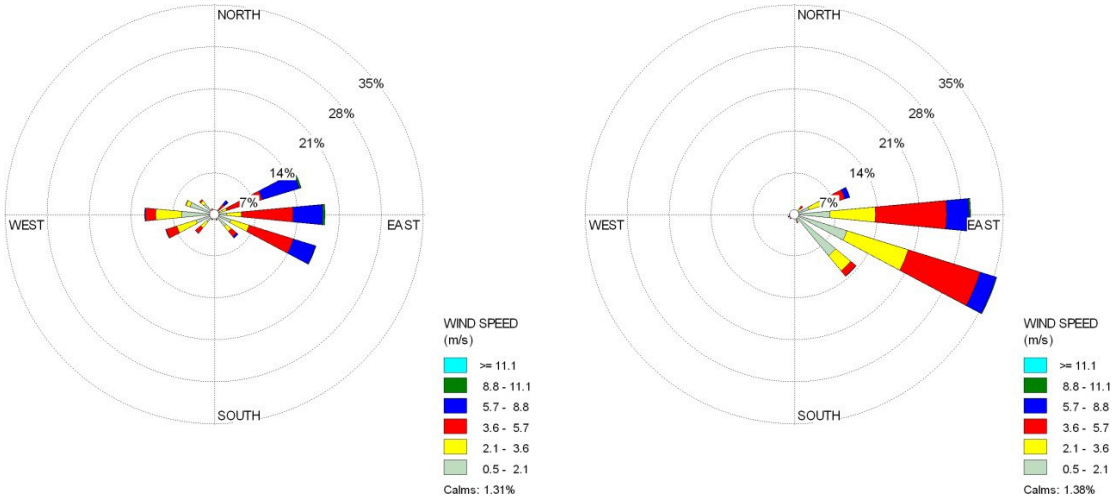


	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
MinTemp	19.1	18.7	19.3	19.8	20.5	21.4	22.7	22.9	22.3	22.3	21.0	20.0
MaxTemp	27.1	26.9	27.5	27.7	29.0	30.1	30.8	31.0	30.6	30.2	28.7	27.6
MinRH	59.2	58.6	59.2	56.4	54.9	52.5	51.7	51.4	53.3	55.0	59.6	60.8
MaxRH	88.7	87.3	87.8	84.9	84.1	82.9	80.5	79.7	81.0	83.0	86.8	88.0
Precip	58.25	50.32	110.5	20.73	16.92	10.41	12.25	20.07	25.40	50.93	58.20	70.30

Table 12. Percentile weather data for the period of record (1999 - 2009) of the MMR Range RAWS.

Percentile	Temperature (°F)	RH (%)	Windspeed (mph)	1 hr. Moist. (%)	Live Herb. Moist. (%)
50	82	60	7	8	94
80	85	52	12	7	65
90	86	48	14	6	51
97	88	42	17	6	39

Figure 28. Daytime (0700 - 1900, left) and nighttime (1900 - 0700, right) wind roses for the period of record of the MMR Range RAWS (1999 - 2009).

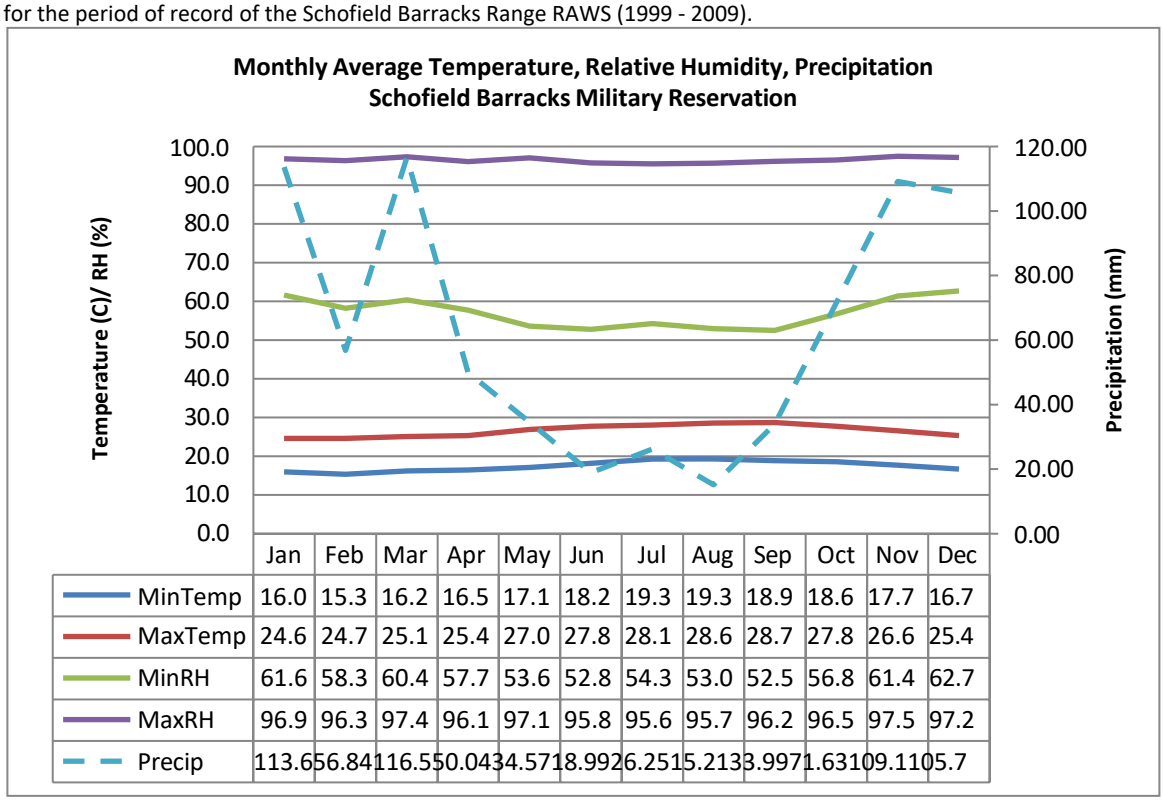


1.5.5 Schofield Barracks Military Reservation

The most notable weather variable at SBMR is the low summer precipitation. Annual precipitation is moderate, averaging 64.01 cm (25.2 in), but monthly averages during the period June through August are usually below 20 mm (0.79 in) (Figure 29). Relative humidity is fairly low as is one hour fuel moisture, but live herbaceous moistures tend to remain well above 100% for most of the year (Table 13).

Winds are variable throughout the day and night but tend to be from the east during the day and the west at night (Figure 30). Nighttime winds are generally very light.

Figure 29. Monthly average minimum and maximum temperature and relative humidity and monthly average precipitation for the period of record of the Schofield Barracks Range RAWS (1999 - 2009).

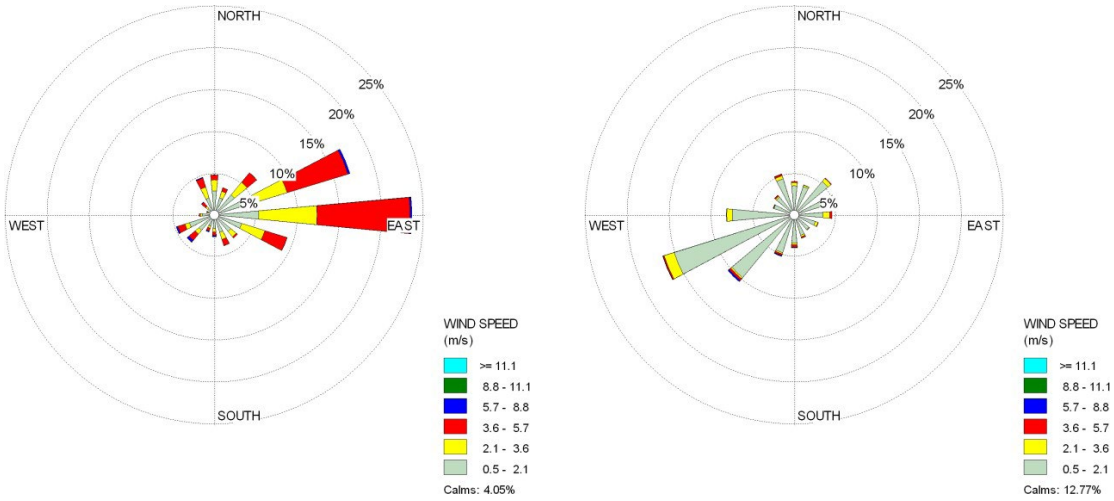


	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
MinTemp	16.0	15.3	16.2	16.5	17.1	18.2	19.3	19.3	18.9	18.6	17.7	16.7
MaxTemp	24.6	24.7	25.1	25.4	27.0	27.8	28.1	28.6	28.7	27.8	26.6	25.4
MinRH	61.6	58.3	60.4	57.7	53.6	52.8	54.3	53.0	52.5	56.8	61.4	62.7
MaxRH	96.9	96.3	97.4	96.1	97.1	95.8	95.6	95.7	96.2	96.5	97.5	97.2
Precip	113.6	56.84	116.5	50.04	34.57	18.99	26.25	15.21	33.99	71.63	109.1	105.7

Table 13. Percentile weather data for the period of record (1999 - 2009) of the Schofield Barracks Range RAWS.

Percentile	Temperature (°F)	RH (%)	Windspeed (mph)	1 hr. Moist. (%)	Live Herb. Moist. (%)
50	78	59	7	8	164
80	81	52	9	7	129
90	83	49	10	7	113
97	84	45	12	6	98

Figure 30. Daytime (0700 - 1900, left) and nighttime (1900 - 0700, right) wind roses for the period of record of the Schofield Barracks Range RAWS (1999 - 2009).

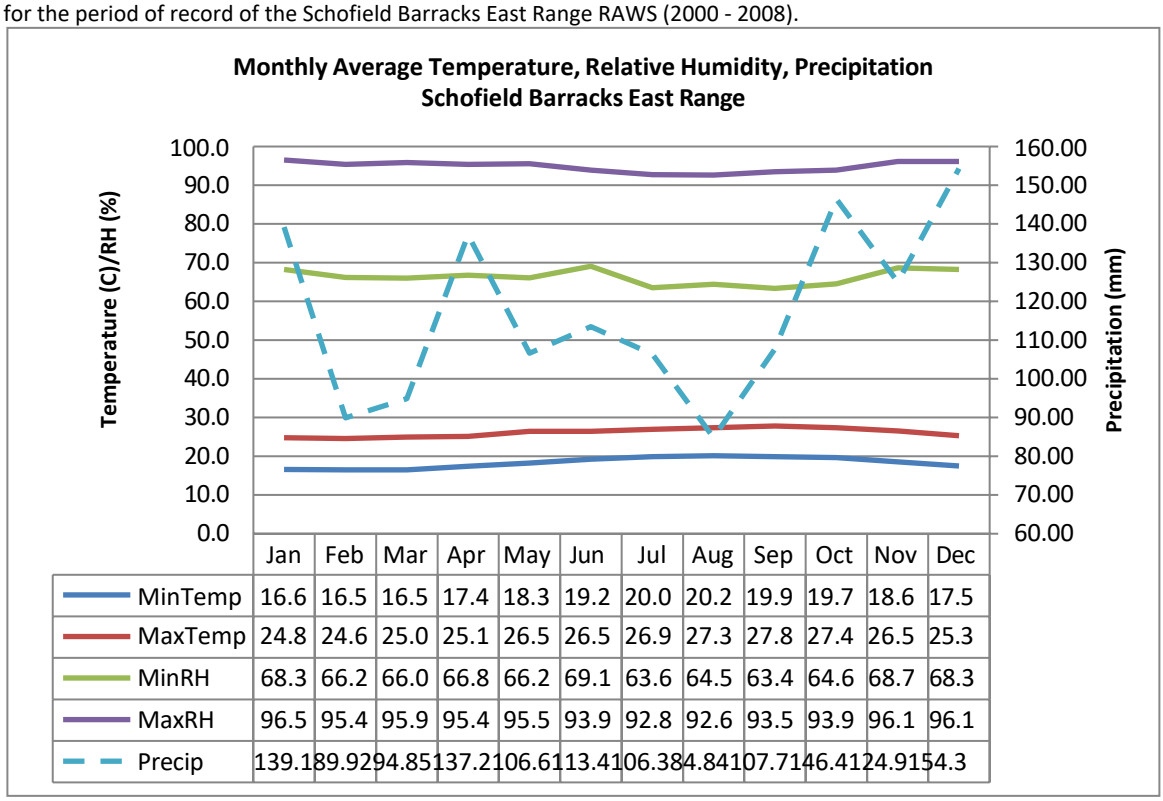


1.5.6 Schofield Barracks East Range

SBER is generally not a fire prone environment. Moistures remain fairly high throughout the year due in part to the high average relative humidity (Figure 31) and consistent rainfall. During drought periods, it is possible for fuel moistures to fall into the range where large fires become a possibility, but these conditions are limited to the 97th percentile (Table 14).

Winds are generally trade wind dominated but wind speeds are generally fairly low. There is little diurnal variation (Figure 32).

Figure 31. Monthly average minimum and maximum temperature and relative humidity and monthly average precipitation for the period of record of the Schofield Barracks East Range RAWS (2000 - 2008).

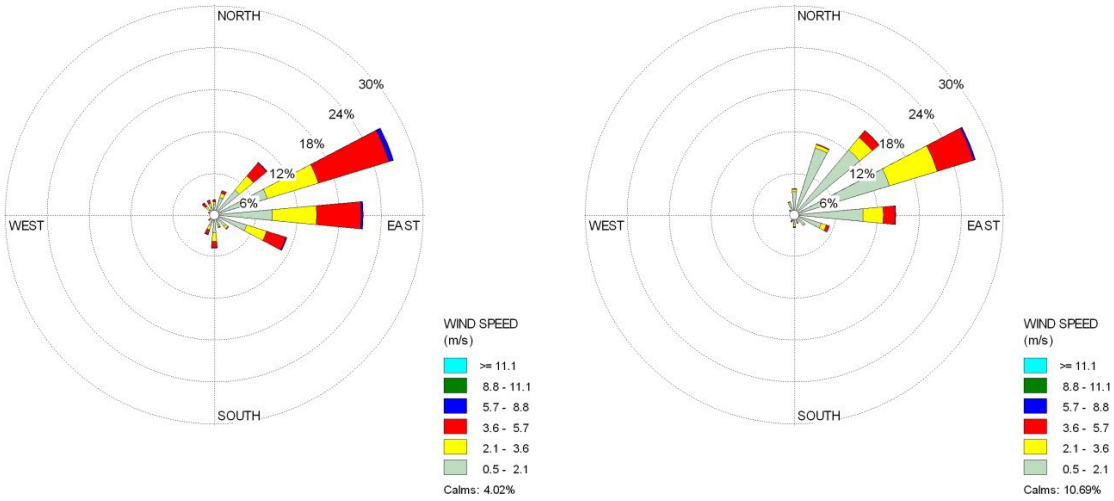


	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
MinTemp	16.6	16.5	16.5	17.4	18.3	19.2	20.0	20.2	19.9	19.7	18.6	17.5
MaxTemp	24.8	24.6	25.0	25.1	26.5	26.5	26.9	27.3	27.8	27.4	26.5	25.3
MinRH	68.3	66.2	66.0	66.8	66.2	69.1	63.6	64.5	63.4	64.6	68.7	68.3
MaxRH	96.5	95.4	95.9	95.4	95.5	93.9	92.8	92.6	93.5	93.9	96.1	96.1
Precip	139.1	89.9	94.8	137.2	106.6	113.4	106.3	84.8	107.7	146.4	124.9	154.3

Table 14. Percentile weather data for the period of record (2000 - 2008) of the Schofield Barracks East Range RAWS.

Percentile	Temperature (°F)	RH (%)	Windspeed (mph)	1 hr. Moist. (%)	Live Herb. Moist. (%)
50	77	67	6	9	249
80	80	58	9	8	230
90	81	54	10	7	190
97	83	48	12	7	92

Figure 32. Daytime (0700 - 1900, left) and nighttime (1900 - 0700, right) wind roses for the period of record of the Schofield Barracks East Range RAWS (2000 - 2008).



1.5.7 Other Installations

A RAWS is currently in place at SRAA, but archived data is so far insufficient for analysis. The remaining three installations do not have their own weather stations and have not experienced wildland fires in the past and are not analyzed here.

2 Values at Risk

This section describes the features found on USAG-HI installations that should be considered when establishing fire management alternatives during pre-suppression activities and suppression operations. Ultimately, protection priorities during a fire incident must be left to the Incident Commander. However, the IC should make decisions based in part on input from USAG-HI, DPW Environmental Natural and Cultural resources, and other ARMY FIRE professionals. However, human safety and major infrastructure or housing, natural and cultural resources should be considered the highest priority when fighting fires on USAG-HI lands. Important cultural and natural resources are indicated on the 'Protected Resources' maps for each installation located in both the installation specific SOPs and in this IWFMP.

Much of the land under USAG-HI management is very sensitive to disturbance due to natural or cultural resource considerations. As a result, all fire management activities must comply with the USAG-HI INRMP and ICRMP**.** Any non-emergency activity involving vegetation removal or ground disturbance must be coordinated with the DPW Environmental Natural Resources Manager and Cultural Resources Managers and must comply with applicable Biological Opinions.

Management units have been designated through consultations with the U.S. Fish and Wildlife Service (USFWS) under Section 7 of the Endangered Species Act. These units are located throughout Oahu as mitigation measures for potential impacts to federally protected species resulting from military training. The units are named based on the mitigation consultations that created them. Makua Implementation Plan Management Units and Oahu Implementation Plan Management Units are scattered throughout Oahu with the vast majority located in the Waianae and Koolau Mountains. All of these units are critical to the continued viability of federally protected species and will always be considered a fire management priority. Some of these units are located on land that is not under the jurisdiction of USAG-HI. Though they are not on lands managed by USAG-HI, these units also require protection from fire as well and ARMY FIRE will respond to off-installation fires that threaten these resources whenever possible. These units may change under future implementation plans.

Biological Sensitive Areas are designated to help preserve the most pristine native Hawaiian natural communities. They are split into three categories with category 1 being most sensitive and category 3 least sensitive. Biological Sensitive Areas are the broadest definition of a protected area and thus encompass most rare species and federally listed species management units. They are only designated on USAG-HI lands. These are important ecologically and should be considered in the protection priority hierarchy.

Cultural resources are usually defined by distinct sites or buildings. Areas that have a high probability of containing archaeological artifacts are designated as Archaeologically Sensitive Areas. Because so much of the installations are designated as Archaeologically Sensitive Areas, for the purpose of this plan all USAG-HI lands should be considered archaeologically sensitive. Any non-emergency ground disturbing activity must be coordinated with the DPW Environmental Cultural Resources Manager. To the degree feasible, the Incident Commander should coordinate ground disturbing firefighting activities with a DPW Environmental Cultural Resources professional. Any cultural resources that are found during fire management activities should always be considered sensitive and should be avoided and brought to the attention of a DPW Environmental Cultural Resources professional.

In the following sections a brief description of the values at risk is given. More detail can be found in the respective sections of the INRMP's and ICRMP's. Only those values that exist at the installation are discussed.

Readers interested in the specific numbers, locations, or types of species or cultural resources at any given property are referred to the most current Oahu INRMP or the ICRMP respectively.

2.1.1 Dillingham Military Reservation

2.1.1.1 Rare Species

The slopes on the south boundary of the installation include stands of native forest and shrubland vegetation that harbor several protected species and two Makua Implementation Plan Management Units (Figure 33). Small BSA's have been designated in this area as well. A priority is to keep fires off of these slopes.

2.1.1.2 Cultural Resources

There are cultural resources including archaeological sites and historic buildings throughout DMR and most of the installation is culturally sensitive (Figure 33). There is an extensive complex of agricultural and occupation features in the rocky sloping area between the airfield and the cliffs. The coastal dune areas were used for burial during the pre-contact period, and it is possible they contain human remains. There are also World War II era buildings on site.

2.1.1.3 Wildland Urban Interface

There are several storage buildings near the western end of the airfield that may be difficult to protect.

2.1.1.4 Training Resources

Cover and concealment resources would be destroyed in any fire. Minimizing fire acreage is important to retain sufficient vegetation for training purposes.

2.1.2 Kahuku Training Area

2.1.2.1 Rare Species

There are several rare species known within training areas A2, C1, C2, and D1 at KTA some of which are federally protected. The only known population of *Eugenia koolauensis* is located here and damage to it could lead to substantial training restrictions. Most of this area is designated with BSA 2 or 3 status. Oahu Implementation Plan Management Units have been designated in the same area. They are a fire protection priority.

2.1.2.2 Cultural Resources

The bulk of known cultural resources and archaeologically sensitive areas are at middle to low elevation and include the historically significant Opana Mobile Radar Station as well as permanent habitation deposits and religious sites (Figure 34). This area is also where most fires occur.

2.1.2.3 Training Resources

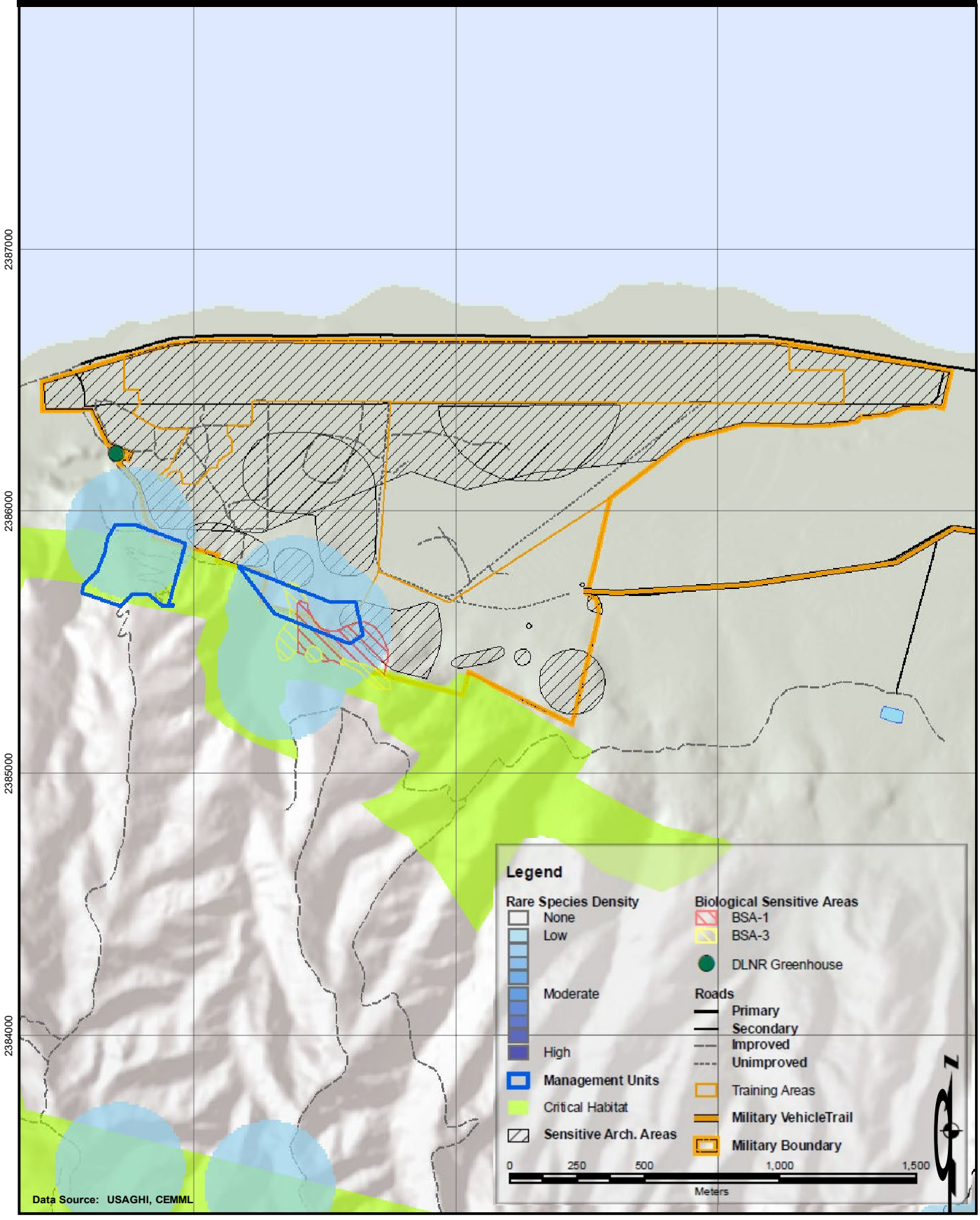
Cover and concealment resources would be destroyed in any fire. Fires may also induce erosion leading to road closures.

Dillingham Military Reservation

United States Army Hawaii
Integrated Wildland Fire Management Plan

Figure 33

Protected Resources

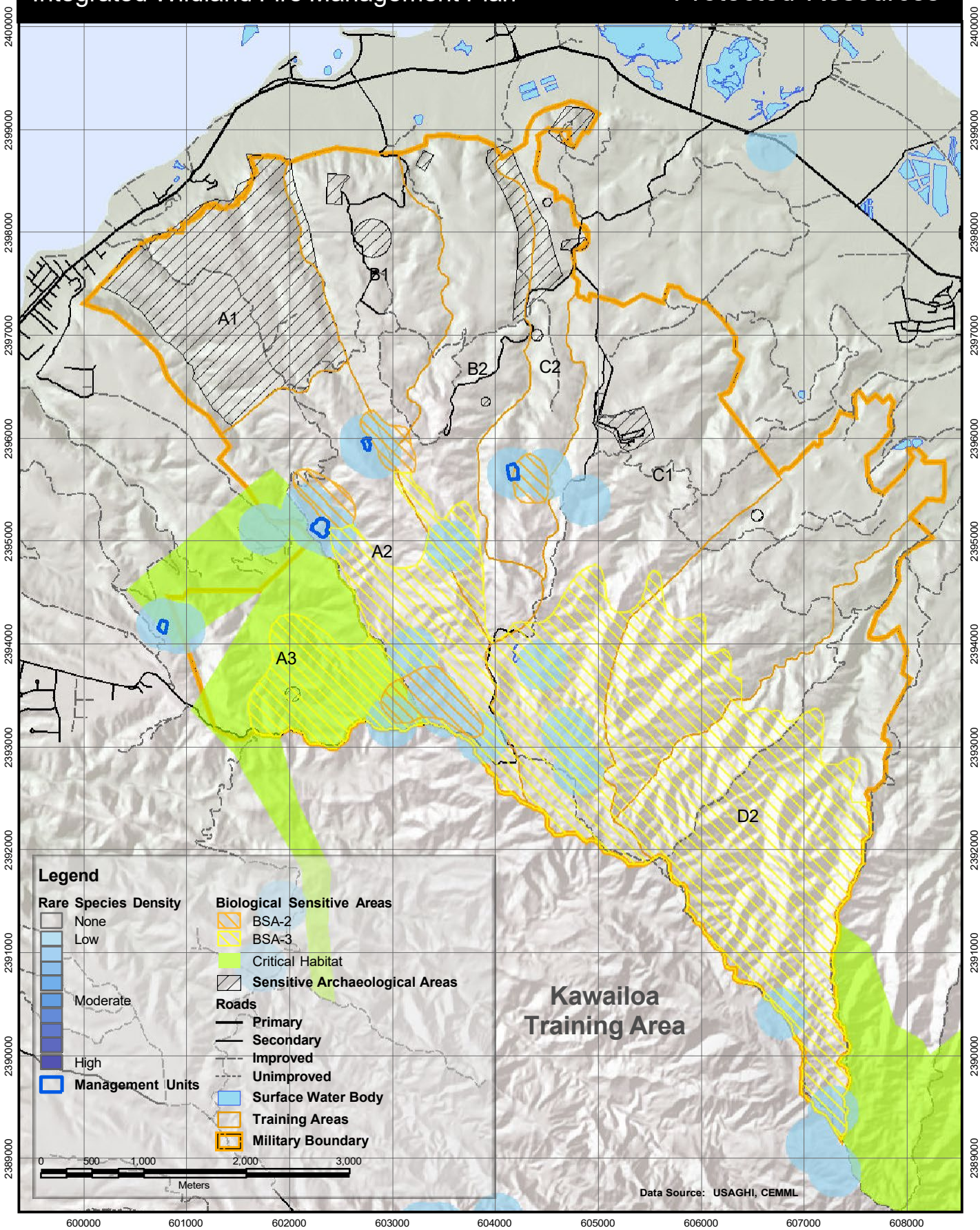


Kahuku Training Area

United States Army Hawaii
Integrated Wildland Fire Management Plan

Figure 34

Protected Resources



2.1.3 Kawailoa Training Area

2.1.3.1 Rare Species

Much of KLOA is relatively undisturbed and it contains large contiguous tracts of native forest as well as a large number of rare species. Additionally, it contains multiple Oahu Implementation Plan Management Units and one Makua Implementation Plan Unit. Most species and management units are located high on the ridge crest and are at little risk of fire, but a number occur near the western edge of the installation where more training occurs and there is a risk of fires burning onto the installation from fallow fields. Almost the entire installation is designated as a biological sensitive area.

2.1.3.2 Cultural Resources

Most of the sensitive sites are clustered in a single area (Figure 35) and include burial caves, irrigation sites, walls, enclosures, terraces, and other features. Additional areas along the Summit Trail and several ridgelines are considered archaeologically sensitive. There is a high probability of encountering archaeological resources in stream valleys as well.

2.1.3.3 Training Resources

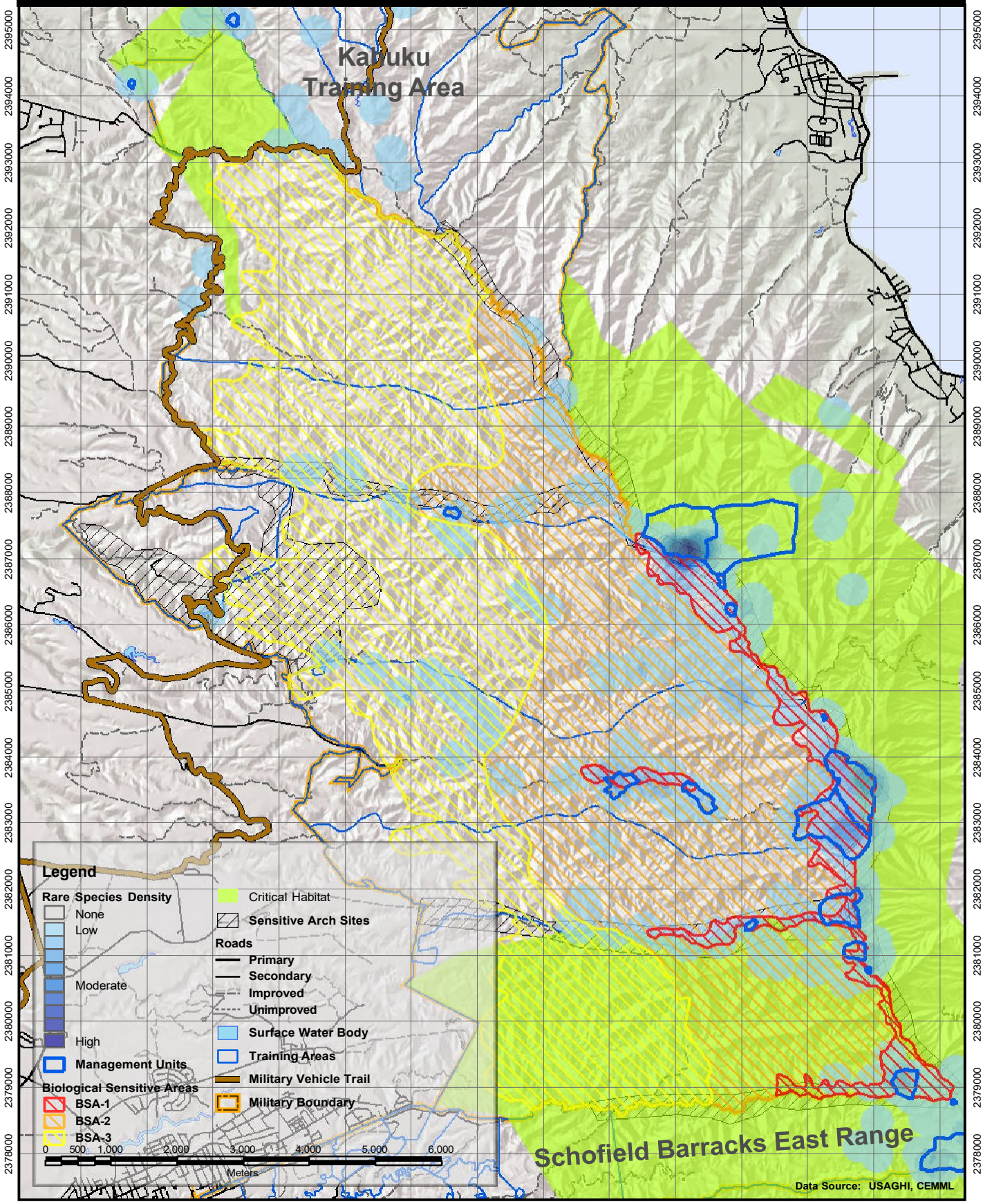
Cover and concealment resources would be destroyed in any fire.

Kawailoa Training Area

United States Army Hawaii
Integrated Wildland Fire Management Plan

Figure 35

Protected Resources



2.1.4 Makua Military Reservation

2.1.4.1 Rare Species

Makua Military Reservation contains more federally protected species than any other USAG-HI installation on Oahu. Virtually all of MMR outside of the firebreaks is considered a fire protection priority. The entire southern ridgeline is contained in two Makua Implementation Plan Management Units. Makua Implementation Plan Management Units are also located within MMR at the east end of the northern valley lobe and just over Kaluakauila ridgeline. Multiple management units line the entire Makua Valley ridgeline just outside the installation from the NIKE site on the north to the easternmost point of the ridgeline on the south. In addition, there are rare species, some federally protected and some not, on most of valley slopes. Biological Sensitive Areas ring much of the installation as a result.

2.1.4.2 Cultural Resources

Makua is arguably the most culturally sensitive installation in USAG-HI's inventory. Extreme sensitivity must be shown during all fire management activities. The Ukanipo heiau and Kahanahaiki Terrace are of particular concern but there are cultural sites throughout the installation including inside the firebreak roads where all training takes place (Figure 36).

2.1.4.3 Training Resources

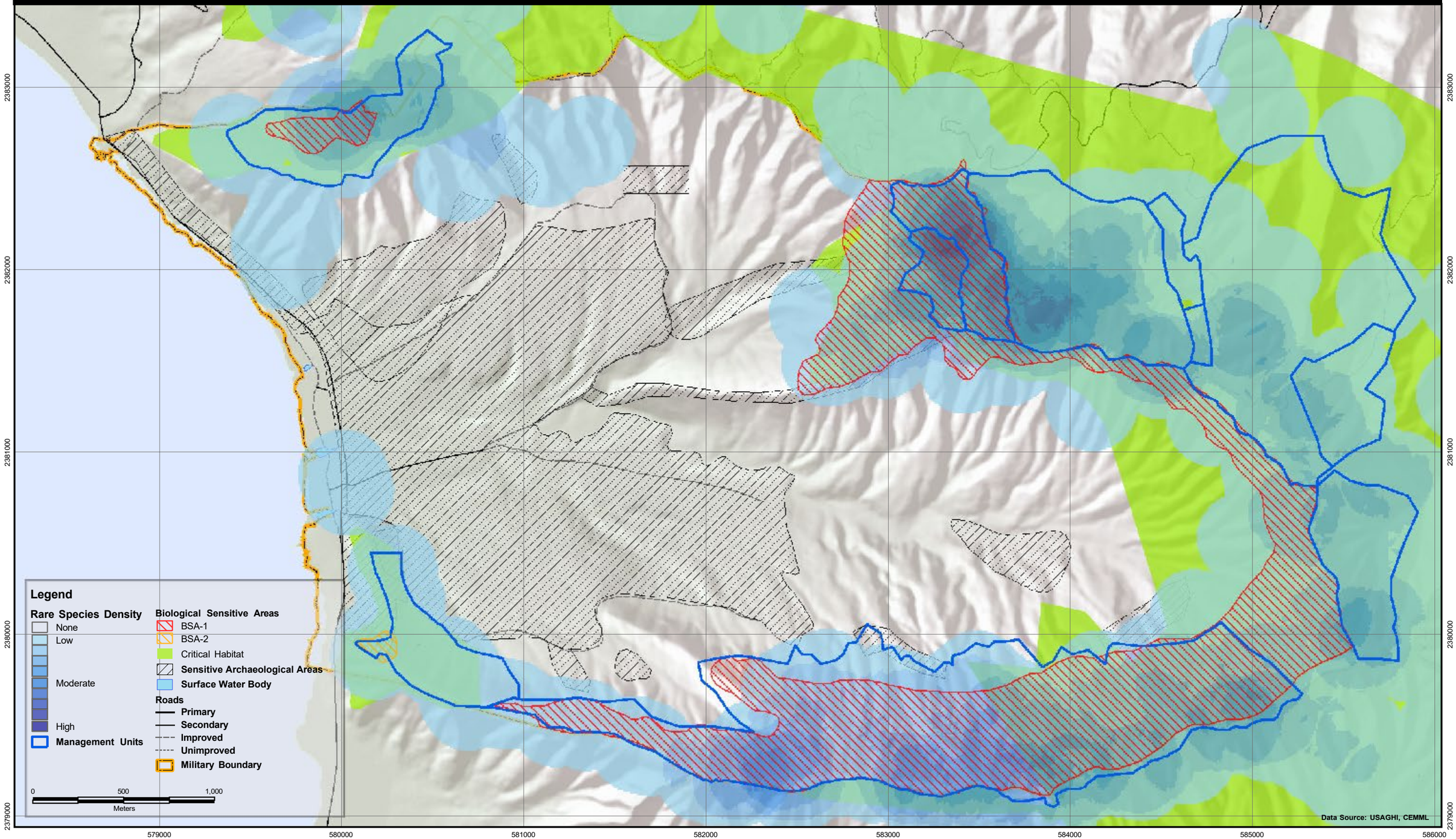
Cover and concealment resources would be destroyed in any fire. Target systems and wooden training structures may be destroyed. Large fires or fires in sensitive areas may result in temporary stoppages in training that could last for extended periods of time.

Makua Military Reservation

United States Army Hawaii
Integrated Wildland Fire Management Plan

Figure 36

Protected Resources



2.1.5 Schofield Barracks East Range

2.1.5.1 Rare Species

Nearly two dozen rare species are documented at SBER, but they are restricted to the easternmost three km (1.9 mi) of the installation. This area is relatively wet and is not used extensively for training, so these populations are at little risk of fire. Biological Sensitive Areas have been designated for much of the eastern third of the installation. Additionally, much of the installation lies within critical habitat for the Elepaiao.

2.1.5.2 Cultural Resources

There are only 12 known cultural sites at SBER including several historic military features (Figure 37).

2.1.5.3 Training Resources

Cover and concealment resources would be destroyed in any fire.

2.1.5.4 Wildland Urban Interface

There are several homes abutting the northern boundary that could be at risk during a severe fire.

2.1.6 Schofield Barracks West Range

2.1.6.1 Rare Species

Rare species occur throughout the slopes on the western side of the installation. Makua Implementation Plan and Oahu Implementation Plan Management Units are located in this area as well and are also present outside of SBMR abutting the northern installation boundary. Biological Sensitive Areas are designated along much of the western boundary as well as in the southern corner. Critical Habitat for the picture-wing fly abuts a small portion of the southern boundary as well (Figure 38). Though most of these areas are relatively wet, they will burn during the summer or drought years. Grass encroachment from the impact area also presents a major hazard to some of them.

2.1.6.2 Cultural Resources

There are numerous known cultural resources in the training area with most clustered along the stream beds including a heiau, agricultural sites, and habitation sites.

2.1.6.3 Training Resources

Cover and concealment resources would be destroyed in any fire. Targetry systems and wooden training structures may be destroyed.

2.1.6.4 Wildland Urban Interface

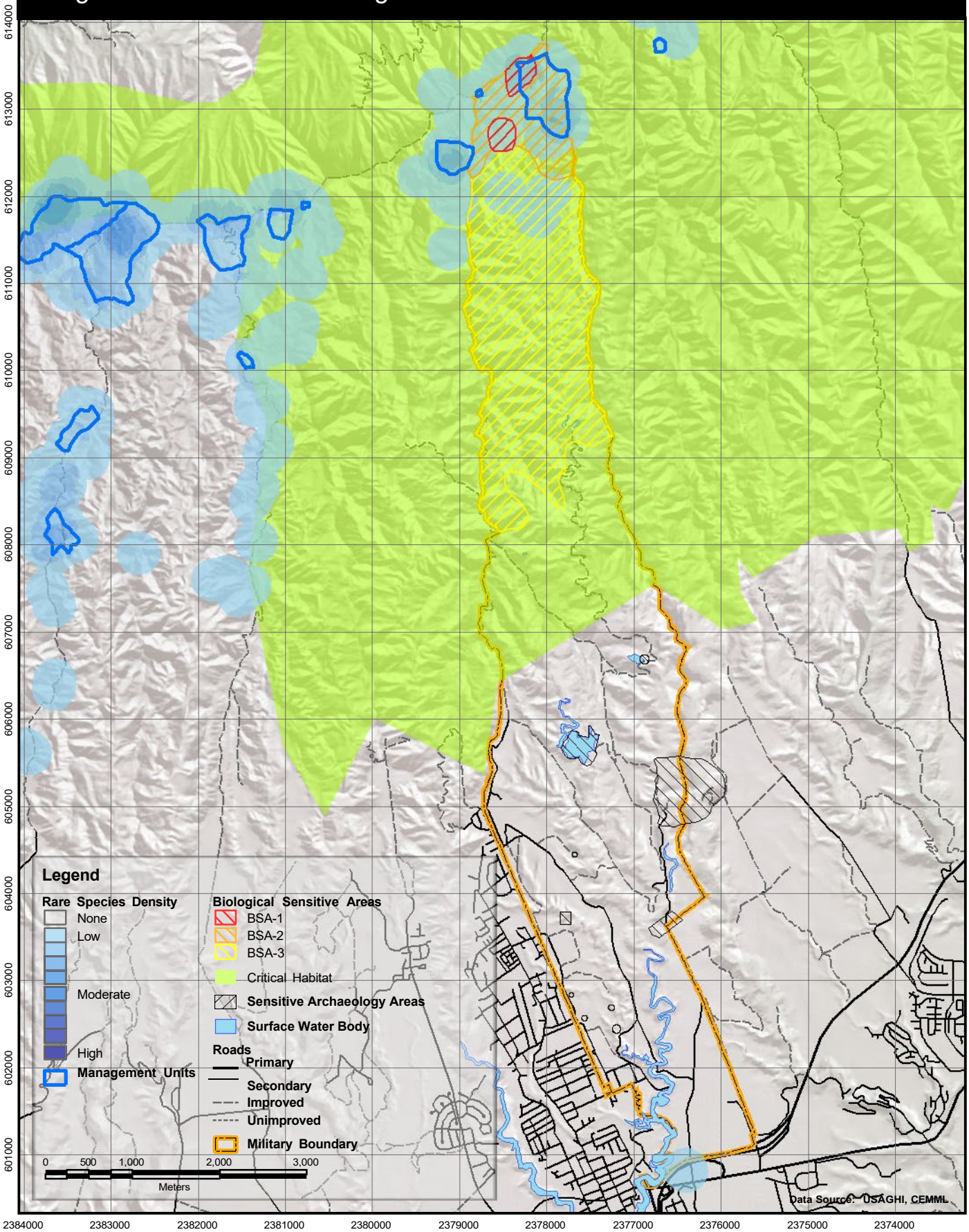
There are several homes on the cul-de-sacs along Akolea Drive that do not have sufficient defensible space. Fires in the gulch to the west and north could present a hazard to these buildings.

Schofield Barracks East Range

Figure 37

United States Army Hawaii
Integrated Wildland Fire Management Plan

Protected Resources

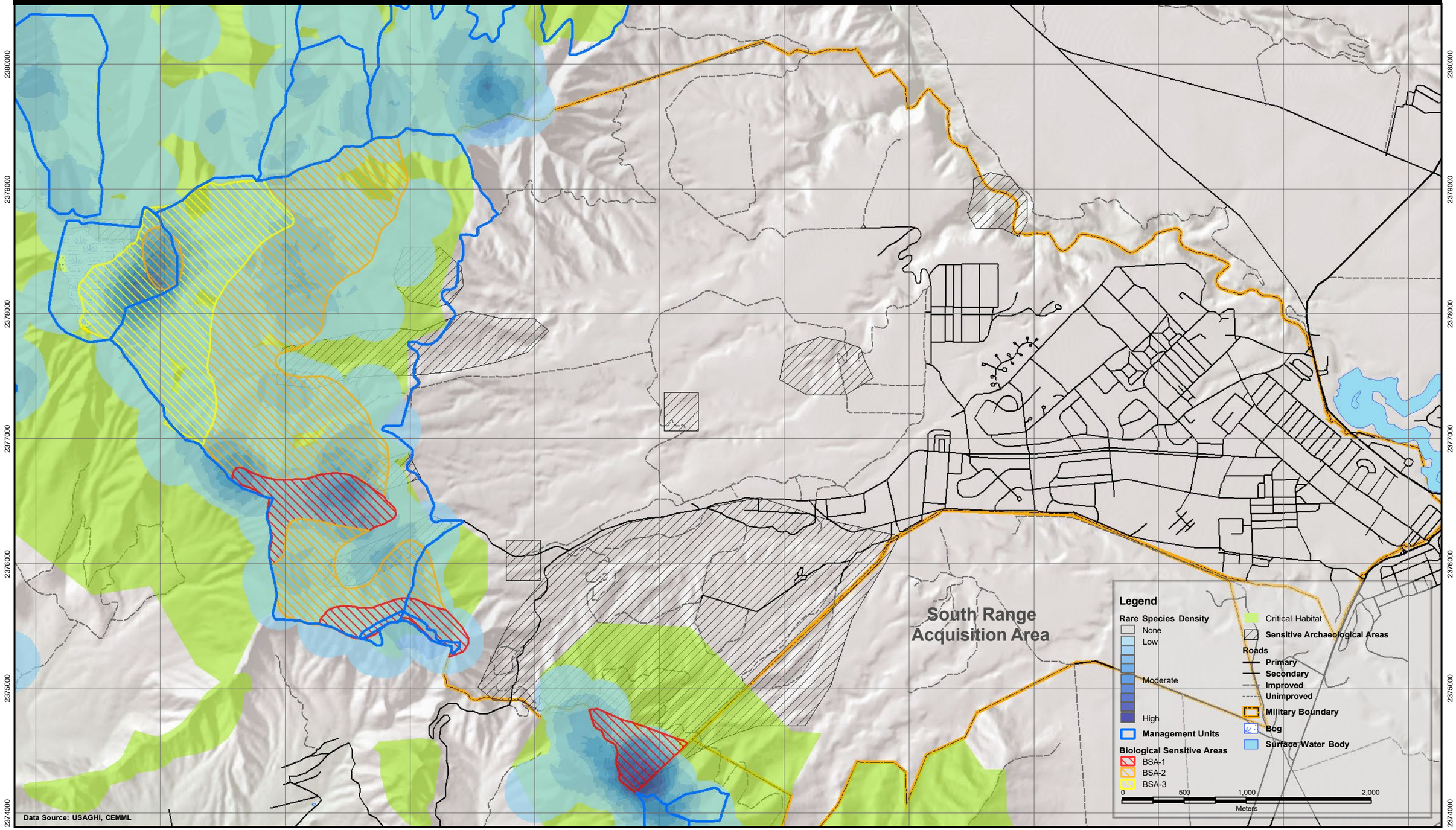


Schofield Barracks Military Reservation

United States Army Hawaii
Integrated Wildland Fire Management Plan

Figure 38

Protected Resources



2.1.7 South Range Acquisition Area

2.1.7.1 Rare Species

There are no known rare species within the boundaries, but the forested slopes to just the west harbor over two dozen rare species, most of which are federally protected. Additionally, these slopes are designated as critical habitat for the picture-wing fly and contain several Makua Implementation Plan and Oahu Implementation Plan Management Units. No BSA's are designated (Figure 39).

2.1.7.2 Cultural Resources

Most of SRAA has been surveyed and cultural sites were found throughout. Like SBMR, most are grouped along stream beds.

2.1.7.3 Training Resources

Cover and concealment resources would be destroyed in any fire. Targetry systems and wooden training structures may be destroyed.

2.1.8 Fort Shafter, Helemano Military Reservation, Wheeler Army Airfield, and Tripler Army Medical Center

2.1.8.1 Cultural Resources

Fort Shafter contains numerous structures listed as needing a decision on eligibility that are potentially threatened by wildland/urban interface issues. It also includes over two dozen archaeological sites. Helemano Military Reservation does not have any cultural resources that can be considered threatened by fires or fire management activities. Wheeler Army Airfield contains just over one dozen archaeological sites that are scattered throughout the drainage that makes up the western and southern portions of the installation. These same areas and the cantonment area are considered archeologically sensitive. Tripler Army Medical Center contains two archaeological in its vegetated northern portion and two historic buildings that are potentially threatened by wildland/urban interface issues.

2.1.8.2 Training Resources

Only WAAF contains any training resources. Cover and concealment resources would be destroyed in any fire.

2.1.8.3 Wildland Urban Interface

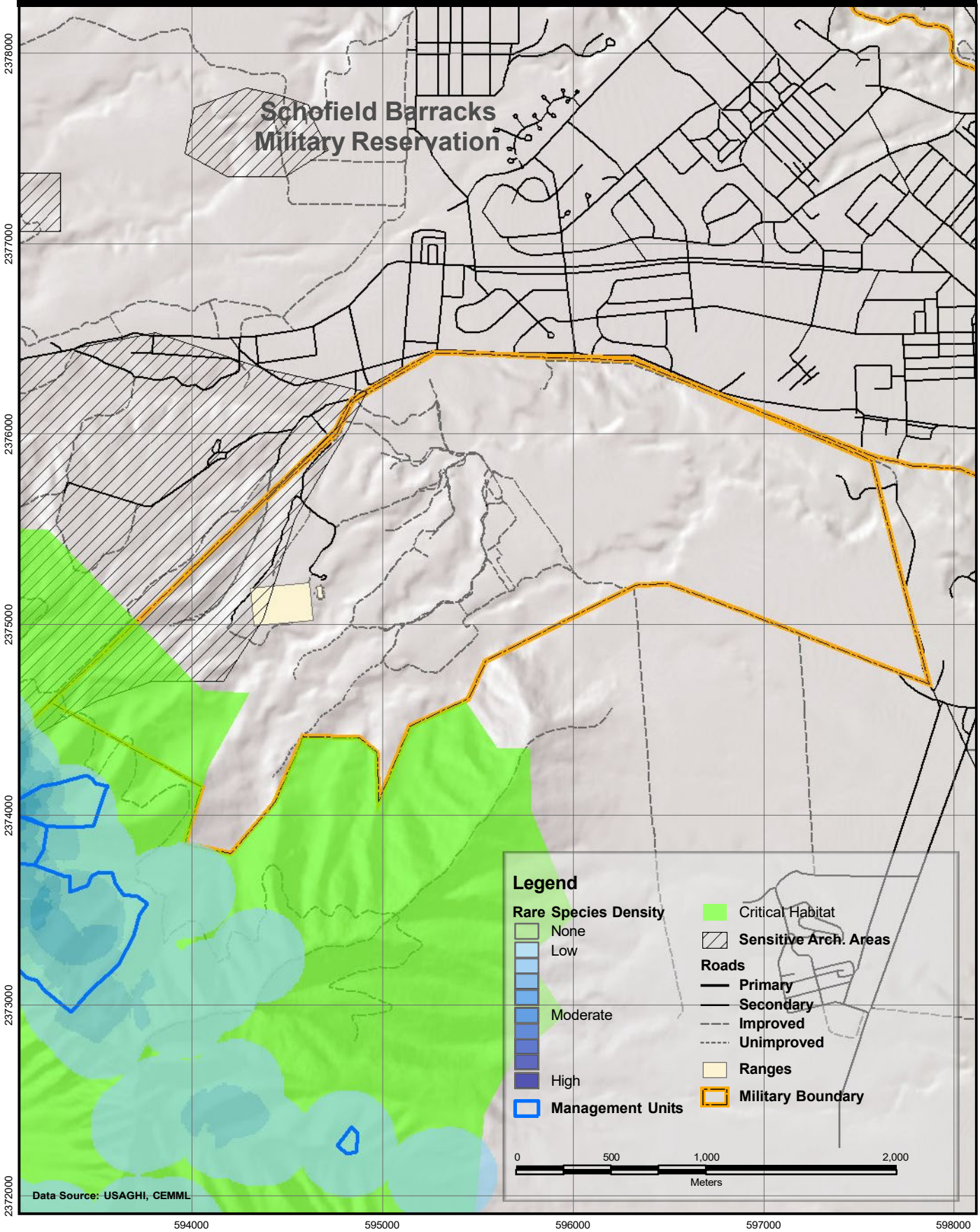
At Fort Shafter there are numerous homes at risk from fire along Park Road, Parks Drive, Hase Drive, Macomb Road, and cul-de-sacs off of it, as well as multiple private homes on the western boundary. At TAMC homes and buildings on Krukowski Road and Jackson Place do not have sufficient defensible space. At WAAF there are several homes on loop streets off of Kahana Street that do not have sufficient defensible space in the event of a fire in the gulch below. There are no WUI issues at HMR.

South Range Acquisition Area

United States Army Hawaii
Integrated Wildland Fire Management Plan

Figure 39

Protected Resources



3 Policy and Organization

3.1 Goals and Objectives

3.1.1 Goals

Lay out the methods and protocols necessary to control fire frequency, intensity, and size on USAG-HI lands in order to comply with federal and state laws and meet USAG-HI's land stewardship responsibilities. At the same time, provide for firefighter and public safety and allow continuation of military training necessary for the 25th Infantry Division (25th ID) and other military units to maintain a high level of combat readiness.

3.1.2 Objectives

a) Provide, first and foremost, for firefighter and public safety. All other objectives are secondary.
b) Through a program of prevention, pre-suppression, and suppression, protect all installation infrastructure and buildings, and, to the extent feasible, natural and cultural resources.
c) Prioritize locations throughout USAG-HI lands for funding and implementation of fire management improvements.
d) Support the goals and objectives of existing USAG-HI land management plans.
e) Coordinate and cooperate where possible and beneficial with other federal, state, and local agencies.
f) Examine resource requirements and resources currently available at each organizational level, identify deficiencies, and establish a plan to acquire additional manpower and equipment.
g) Continue to improve the capabilities of USAG-HI wildland firefighters through training, improved equipment, and increased incentives to facilitate employee retention.
h) Base all fire management activities on the best available science.
i) Base fire management decisions on an evaluation of social factors, resource values, and economic considerations.
j) Continually evaluate and improve upon fire management policies and procedures with the goal of constantly improving fire protection for USGHI lands and resources.

3.1.3 Specific Objectives

a) No training related fires outside of the firebreak roads at Makua Military Reservation and Dillingham Military Reservation.
b) Limit fires outside the Schofield Barracks West Range and South Range Acquisition Area firebreak roads to four hectares (10 acres) or less.
c) No more than one ignition per year per installation by a weapon or training aid not authorized by the FDRS at all installations except MMR. No ignitions by a weapon not authorized by the FDRS at MMR.
d) Establish a record of zero prescribed fire escapes.
e) Continue to reduce fire frequency and size from training related ignitions.
f) Develop roads to compartmentalize the Schofield Barracks West Range impact area when opportunities are presented by UXO clearing operations for other purposes.

3.2 Compliance with Policy, Laws, and Regulations

3.2.1 U.S. Army Policy

All policies in this document meet or exceed the requirements established by the Army's Wildland Fire Policy Guidance dated September 2002 and Army Regulation 200-1 chapter 4-3 dated December 2007 and are in compliance with DODI 6055.06, DOD Fire and Emergency Services Program.

3.2.2 Federal Wildland Fire Policy

All policies in this document are in accordance with the 2001 Federal Wildland Fire Management Policy, to which the Department of Defense is a signature. All firefighter training complies with the National Wildland Coordinating Group (NWCG) Wildland Fire Qualifications Subsystem Guide, PMS 310-1.

3.2.3 U.S. Army Garrison Hawaii Policy

The IWFMP also conforms with policies established by the USAG-HI INRMP and ICRMP, and all USAG-HI policies and training regulations.

3.2.4 Federal Regulatory Requirements

There are multiple federal laws that apply to wildland fire management. This IWFMP complies with all portions of all pertinent laws including:

- Endangered Species Act
- National Historic Preservation Act
- Clean Air Act
- Clean Water Act
- National Environmental Policy Act
- Migratory Bird Treaty Act
- Invasive Species Executive Order
- Sikes Act

3.3 Integration with Existing Plans and Requirements

3.3.1 Integrated Natural/Cultural Resources Management Plans

The IWFMP is written to comply with the goals and objectives of the USAG-HI INRMP and ICRMP.

The purpose of the USAG-HI INRMP is "to integrate land use needs, the military mission, and the management and conservation of natural resources at Schofield Barracks Military Reservation and its sub-installations". The INRMP does not address installations where no rare natural resources are located.

The purpose of the USAG-HI ICRMP is "to comprehensively manage cultural resources while sustaining the Army's capability to successfully achieve its mission".

3.3.2 Integrated Training Area Management

The Integrated Training Area Management (ITAM) program, part of the Army's Sustainable Range Program, "provides the Army with the capabilities to manage and maintain training and testing lands by integrating mission requirements with environmental and land management practices." Though the ITAM program itself does not establish policy, it carries out a wide variety of activities that need to be coordinated with fire management efforts.

3.3.3 U.S. Fish and Wildlife Service Biological Opinions

There are three Biological Opinions that currently regulate land use and management on USAG-HI lands on Oahu - two for training at Makua Military Reservation and one for Oahu training areas. The U.S. Army Garrison Hawaii has agreed to abide by the requirements specified in these documents and the IWFMP is required to follow them. Many of the requirements directly address wildland fire management. The installation is working on a PBA that will supersede all 3 consultations once finalized.

3.3.4 Environmental Impact Statements

There are numerous environmental impact statements affecting land management on USAG-HI lands. The three that directly address wildland fire are the Final Environmental Impact Statement for Transformation of 2nd Brigade, 25th Infantry Division to a Stryker Brigade Combat Team in Hawaii; Final Environmental Impact Statement for Permanent Stationing of the 2/25th Stryker Brigade Combat Team; and Environmental Impact Statement for Military Training Activities at Makua Military Reservation, Hawaii

3.3.5 U.S. Army Hawaii Range Complex Master Plan

The IWFMP must coordinate with Range Planners to ensure that wildland fire concerns are considered in the placement of new ranges or facilities.

3.4 Stakeholders and Responsibilities

The responsibilities listed below are a short summary of the major requirements of each individual, directorate, or agency. Additional responsibilities are detailed throughout the IWFMP.

3.4.1 U.S. Army Garrison, Hawaii

3.4.1.1 U.S. Army Hawaii, Commanding Officer

The Installation Commander has overall responsibility for fire prevention and protection requirements. The Installation Commander will:

- Define the roles and responsibilities as laid out in this IWFMP.
- Delegate to the Wildland Fire Program Manager to oversee the wildland fire management program.
- Approve the deployment of U.S. Army Garrison Hawaii (USAG-HI) civilian firefighters to off-installation incidents. Army Wildland Fire Policy Guidance requires the Garrison Commander to approve the deployment of Army civilian firefighters to any off-installation incident not covered by a mutual aid agreement.

3.4.1.2 U.S. Army Garrison Hawaii, Installation Fire Chief

The Installation Fire Chief is responsible for the management of fire and emergency services for Army installations on Oahu and serves as a liaison with the Federal Fire Department, Navy Region Hawaii. The Installation Fire Chief may also provide supervision to the Installation Wildland Fire Program Manager.

3.4.1.3 U.S. Army Garrison Hawaii, Wildland Fire Program Manager

The Wildland Fire Program Manager (WFPM), in coordination with the Natural and Cultural Resources Managers and the Federal Fire Department (FFD) is responsible for developing, updating, and executing the IWFMP. The WFPM is housed in the Directorate of Fire and Emergency Services of the USAG-HI (hereafter Fire and Emergency Services or ARMY FIRE). The WFPM will collaborate closely with:

- The Federal Fire Department.
- The City and County of Honolulu Fire Department.
- The HQ USARHAW Range Officer.
- The Directorate of Public Works Natural and Cultural Resources Managers.
- The Directorate of Public Works Maintenance Chief.
- The Integrated Training Area Management Coordinator.

The WFPM will ensure that supplies, equipment, training, mutual aid agreements, and qualified personnel are available to meet the goals and objectives of the IWFMP. The WFPM ensures that firebreaks and fuelbreaks are properly maintained in accordance with this IWFMP. The WFPM is responsible for ensuring that wildland fire responses at Oahu installations are in accordance with this IWFMP, Army Regulations (AR 420-1), and Department of Defense Instruction (DoDI) 6055.06, Fire Protection Program.

The WFPM has authority over the ARMY FIRE Taskforce and the Oahu FDRSs. The WFPM also works closely with ARMY FIRE to ensure an effective response to all wildland fires. The WFPM reviews and approves burn plans for prescribed fires at Oahu installations to ensure consistency with the IWFMP, the Integrated Natural Resource Management Plan (INRMP), and other applicable operating instructions such as state and local regulations.

3.4.1.4 U.S. Navy, Federal Fire Department, Fire Chief

The FFD Fire Chief is responsible for the organization, supervision, and management of all aspects of fire prevention and protection program in accordance with the provisions of DoDI 6055.06, Fire Protection. The FFD is responsible in some instances for suppressing wildfires on all USAG-HI properties on Oahu. The FFD Fire Chief will ensure all FFD firefighters are familiar with protocols for firefighting on USAG-HI lands, particularly those governing safety procedures.

3.4.1.5 U.S. Army Garrison Hawaii, G3/MSE-HI Range Officer

The Range Officer has overall responsibility for enforcing the provisions of the IWFMP and other applicable training directives and regulations, including restrictions on or cessation of training activities based on the day's fire danger rating. The Range Officer ensures that fire prevention and reporting procedures are adhered to at all training installations. The Range Officer will provide logistical support during fire incidents.

Range Control personnel will support the IWFMP and firefighting by supporting and enforcing fire prevention measures, providing logistical support during fire incidents, and tracking information on the Wildland Fire Incident Report. Range Control dispatchers shall:

- Be familiar with the IWFMP and wildfire SOPs.
- Know who to notify in the event of wildfire and how to notify them.
- Know who to call if additional resources are required.
- Ensure emergency radio traffic is kept to a minimum.
- Be familiar with documentation and proper entries on the WFIR.
- Know how to access weather data.
- Know how to activate helicopter support when requested by the IC.

3.4.1.6 U.S. Army Garrison Hawaii, Directorate of Public Works, Environmental Division Chief

The DPW Environmental Division Chief will assure environmental oversight, technical support, and planning assistance (for environmental fire effects, protection priority, and post-fire restoration) is provided to the WFPM. As allowed by the US Army Environmental Funding Guidance and the IMCOM Environmental Funding Guidance, the DPW Environmental Division Chief shall fund portions of the fire management program directly related to protection of federally listed species from fire and other environmental compliance-related fire management requirements.

3.4.1.7 U.S. Army Garrison Hawaii, Directorate of Public Works, Maintenance Division Chief

The Business Operations Division Chief assists in planning and delegating of fire related projects; provides support with Troop Construction Coordination Committee (TCCC) project planning and execution; monitors work orders for timely execution; and maintains the firebreaks. Specific tasks that are the responsibility of DPW include, but are not limited to, mowing of ranges and maintenance of roadways and firebreaks.

3.4.1.8 U.S. Army Garrison Hawaii, Director of Installation Safety

The Director of Installation Safety ensures that the IWFMP is carried out in compliance with relevant safety operating procedures.

3.4.1.9 25th Infantry Division Aviation Brigade

The 25th Infantry Division (ID) Combat Aviation Brigade (CAB) is responsible for providing air support to wildland fire suppression operations. The Aviation Brigade shall provide air support at the request of the fire IC within the constraints of training requirements and helicopter availability.

3.4.1.10 Officer in Charge

The Officer in Charge (OIC) of each unit using any USAG-HI facility is responsible for complying with fire prevention procedures and immediately halting training operations and notifying Range Control in the event of a fire.

3.4.1.11 Non-Military Range Users

Non-military range users are responsible for understanding and adhering to fire prevention procedures.

3.4.2 External Stakeholders

3.4.2.1 U.S. Fish and Wildlife Service Pacific Islands Fish and Wildlife Office

The U.S. Fish and Wildlife Service (USFWS) is charged with determining many of the requirements that the IWFMP must meet in order to reduce the risk of fire to a level in compliance with the protections required by the Endangered Species Act (ESA). The USAG-HI works closely with the USFWS to determine what training, natural resource, and fire management actions are necessary and/or acceptable under ESA and the USAG-HI currently has an extensive mitigation program, of which the IWFMP is one part.

3.4.2.2 State of Hawaii Department of Land and Natural Resources

The State of Hawaii Department of Land and Natural Resources (DLNR) is a mutual aid agency and, as an owner of neighboring property, frequently cooperates with the USAG-HI to reduce fire risk. Most fire related agreements with DLNR fall under the Division of Forestry and Wildlife (DOFAW). The Army also manages federally listed species on DLNR land as part of their mitigation efforts. Under this IWFMP, management of these species includes firefighting response to fires in these areas.

3.4.2.3 State of Hawaii Office of Hawaiian Affairs

The USAG-HI manages T&E species on lands that the Army has purchased as part of the Army Compatible Use Buffer program and titled to the Office of Hawaiian Affairs (OHA). Under this IWFMP, management of these species includes firefighting response to fires in these areas.

3.4.2.4 Hawaii Biodiversity and Mapping Program

The Hawaii Biodiversity and Mapping Program was previously known as the Hawaii Natural Heritage Program. It keeps a database of rare species and supplies USAG-HI Natural Resources personnel with information required to develop and implement the IWFMP.

3.4.2.5 U.S. Department of the Navy

The Federal Fire Department is responsible for fire suppression on USAG-HI lands and responds to all fires (see Section 3.4.1). The USAG-HI also manages T&E species on Department of the Navy Lands (Lualualei Naval Reservation). Under this IWFMP, management of these species includes firefighting response to fires in these areas.

3.4.2.6 U.S. Department of the Air Force

The USAG-HI manages T&E species on Department of the Air Force Lands (Mt. Kaala). Under this IWFMP, management of these species includes firefighting response to fires in this area.

3.4.2.7 Board of Water Supply, City and County of Honolulu

The USAG-HI manages T&E species on the Board of Water Supply Lands. Under this IWFMP, management of these species includes firefighting response to fires in these areas.

3.4.2.8 Private Landowners

Numerous private landowners cooperate with USAG-HI in T&E species management (e.g., Dole Food Co. Ltd., Kamehameha Schools, Bishop Estates, James Campbell Trust Estates).

3.4.2.9 U.S. Bureau of Land Management

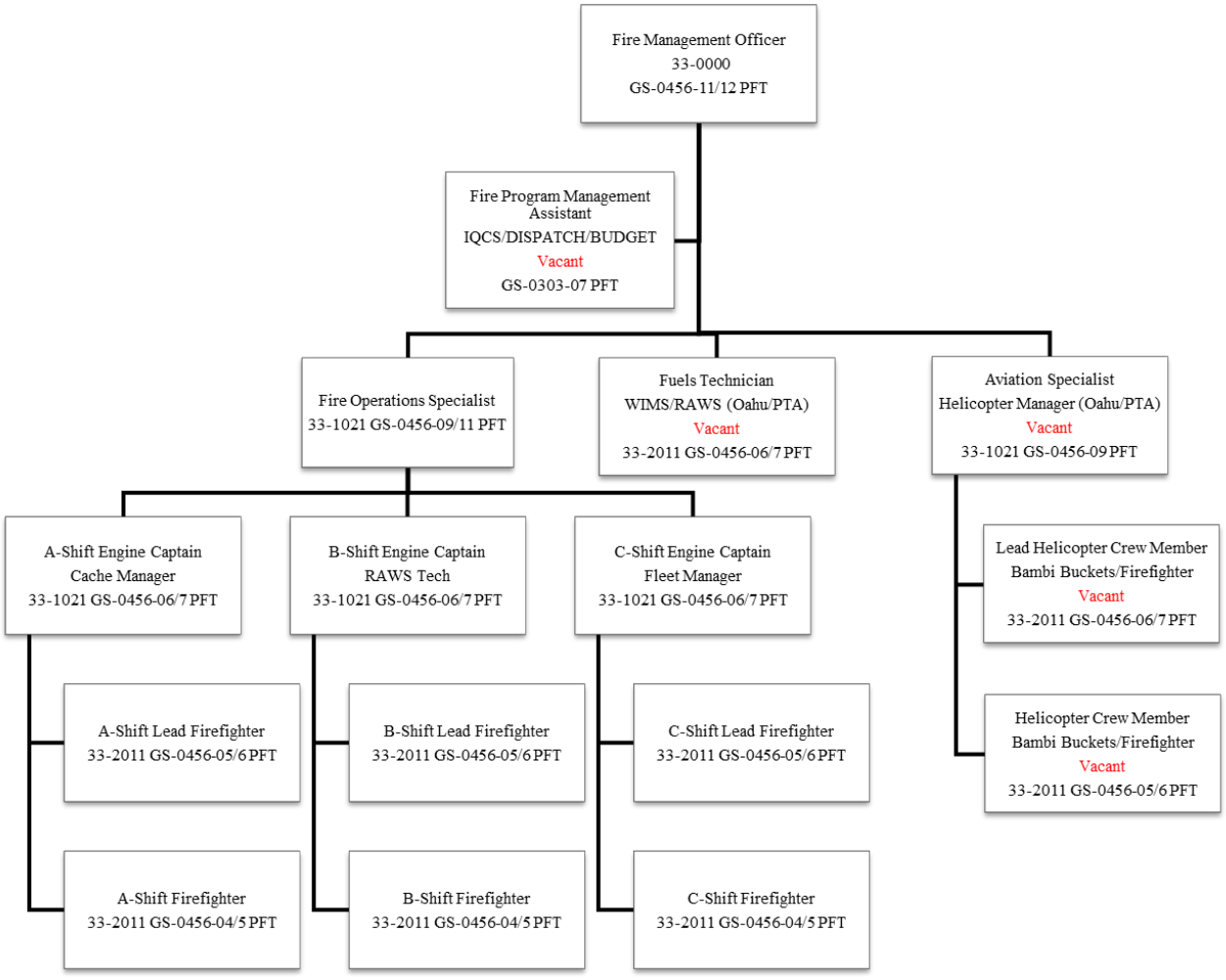
The USAG-HI currently contracts the U.S. Bureau of Land Management (BLM) to maintain its remote automated weather stations (RAWS). The BLM may also provide subject matter experts to

present National Wildfire Coordinating Group (NWCG) certified courses for Army firefighters. BLM instructors can be acquired through Military Interdepartmental Purchase Request (MIPR).

3.5 Wildland Fire Fighting Agencies

3.5.1 Fire and Emergency Services Taskforce

This is a crew of 16 NWCG trained firefighters supported by 4 Type 6 wildland engines and a Type 3 water tender. The crew is managed by the WFPM or Fire Management Officer. This is the only wildland fire specific, NWCG certified crew anywhere on Oahu. These firefighters can respond in a matter of minutes to range fires and provide initial attack. The crew is trained and experienced in a broad range of fire suppression strategies and tactics. The crew can respond as a handcrew, a Taskforce of engines and firefighters, helitack, or single resource. They are highly mobile and can reach fires almost anywhere they may burn. Qualified individuals act as Incident Commanders on any fire on Army Lands, including under unified command.



The Taskforce may also provide personnel for fuels management projects, prescribed fire, and other labor-intensive tasks; maintenance of RAWS, fire records, and analysis of fire records for trends; upkeep of firefighting equipment including 'Bambi' helibuckets, engines, and water tenders; and other tasks determined at the discretion of the Wildland Fire Program Manager.

3.5.2 Federal Fire Department

Fire protection services on USAG-HI installations on Oahu are provided by the consolidated Federal Fire Department (FFD) and Naval Station Pearl Harbor (NAVSTA PH) through an Interservice Support Agreement (ISA). Fire protection services have generally been built around the structural fire department concept. In the past, wildland fire fighting has been a secondary function and has been the least planned and financed. FFD has historically only been staffed to carry out structural and/or airfield firefighting missions on Army installations.

ARMY FIRE will support USAG-HI in the suppression of wildland fires on Army lands through the supply of NWCG trained personnel and equipment. Coordination and cooperation between FFD and Army firefighters are essential to the success of this IWFMP.

3.5.3 DPW Environmental

DPW Environmental may supply resources to fight fires in terms of contract helicopter time and funding to support firefighting efforts during extended attack.

Some DPW Environmental staff members may receive firefighter training at the discretion of the WFPM with the concurrence of the DPW Environmental Natural Resources Manager. Utilization of these individuals is at the discretion of the WFPM.

3.5.4 External Agencies

Unlike mainland wildfire operations where resources can be pulled from anywhere in the country, resources in Hawaii are limited to those found on each island. On very large incidents, resources may be drawn from other islands. There are several outside agencies that will assist the Army with wildfire suppression through mutual aid agreements. These agencies are:

- City and County of Honolulu Fire Department
- State of Hawaii Department of Land and Natural Resources, Division of Forestry and Wildlife

3.6 Fire Management Areas

Fire Management Areas are often defined in a fire management plan to delineate different areas within which fire management protocols are different. In this IWFMP, each installation is considered a single fire management area and fire management protocols are equivalent throughout the installation. Fire management areas are not discussed further in this IWFMP.

4 Pre-Suppression Actions

4.1 Risk Analysis

4.1.1 Ignition Sources

There are three sources of ignitions on Army land - natural, arson/accidental, and military activities.

Natural ignition sources are rare in Hawaii, but they do occur, primarily through lightning strikes, but also from volcanic activity. Because of climatic conditions and location, these occurrences are very rare on Army land. However, natural fires have started elsewhere and spread onto Army lands in the past.

Arson and/or accidental fires occur occasionally on Army land. Ignitions from children playing with fire, smoking, power lines, and vehicles (which make up the majority of ignitions on most public lands) are only a small fraction of the total number of fires that start on Army lands. Fireworks play an important part in the local culture and are pervasive. Many types of fireworks are legal and are used several times during the year. Deliberate arson occurs occasionally.

The vast majority of fires on Army land are the result of military activities. Due to the volume of potential ignition sources in the form of munitions and pyrotechnics, the Army experiences a high incidence of wildfires. The principal ignition sources on Army land are tracers, pyrotechnics, illumination rounds, and explosive ordnance.

4.1.2 General Risk Factors

4.1.2.1 Dillingham Military Reservation

High fuel loads, a dry and windy environment, and a small area combine to make a fire at DMR potentially problematic. Most fires will be pushed to the southwest by the predominant winds. Even a moderate fire can reach the installation boundary in only a couple of hours, so much of the highest protection priorities are at risk during virtually any fire. Once fires get onto the steep slopes south of DMR, there is virtually nowhere to establish a containment line.

4.1.2.2 Kahuku Training Area

Higher live fuel moistures at KTA moderate fire behavior, but the high winds and complex and very steep terrain negate this small advantage. Fires that start or burn into the gulches are difficult to contain due to terrain and erratic winds produced by the interactions with the terrain. Access to fires is often difficult.

4.1.2.3 Kawailoa Training Area

Fires are very rare at KLOA, but during drought periods much of the installation becomes much more fire prone due to the large expanses of uluhe fern. This fern is known to produce fire behavior substantial enough to resist containment when drought conditions exist. Steep terrain and very limited access mean only a few fire crews on Oahu are capable of reaching any fires that do not occur adjacent to Drum Road. Remote fires will have to be fought almost exclusively from the air, making full containment difficult.

4.1.2.4 Makua Military Reservation

The problematic nature of fires at MMR has been proven time and again, most recently in August of 2010. Fires burning inside of the firebreak roads can almost always be contained because of the extensive network of firebreaks, fire access roads, barren areas, and fuels management.

However, fires burning outside of the firebreak roads are extremely difficult to extinguish. Lack of access to firefighters because of steep slopes and UXO, heavy fuel loads, a dry environment, and the close proximity of some protected resources to high probability ignition areas such as Farrington Highway and the training areas all conspire to defeat even the best fire management and fire suppression response.

Daytime winds are often onshore, meaning many fires are pushed to the east and onto steeper slopes and where fewer pre-established containment lines exist. The ridges throughout the valley produce highly unpredictable winds that can push a fire in multiple directions at the same time meaning there may be more than one front to the fire.

Protected resources low on the slopes in the western third of the valley are at highest risk. These areas are close to ignition sources and vegetation is almost exclusively comprised of pyrophytic grasses. The eastern third of the installation is at lower risk simply because it is far from ignition sources and there are several bands of less fire prone vegetation between protected resources and the fire source. The northern third of the valley has burned multiple times in the last 15 years and is a near monoculture of pyrophytic grasses resulting in high fire risk throughout that area.

4.1.2.5 Schofield Barracks East Range

The fire risk at SBER is generally low due to a lack of large expanses of contiguous fire prone vegetation and higher fuel moistures throughout most of the year. During drought conditions, fires are much more likely to burn and spread vigorously and fuels that are normally too wet to carry fire, such as uluhe fern, may produce significant fire behavior.

There are numerous homes crowding the northern boundary of SBER that could be threatened by fire, especially considering this is the one part of the installation where pyrophytic grasses dominate. Most other protected resources occur at high elevations in the native and non-native forest where a large fire is unlikely.

4.1.2.6 Schofield Barracks West and South Ranges

Fires at SBMR have been frequent in the past due to the heavy training load and a fuel bed that is receptive to ignition sources. Repeated prescribed burning of the impact area over the last eight years has drastically altered the fuel loading and vegetation composition and has been, at least in part, responsible for a dramatic decrease in ignitions.

The primary fire risk at SBMR is still Puu Pane ridge where a 'wick' of pyrophytic grasses extends from inside the impact area up to the top of the ridge. This population of grass persists despite the fact that populations of grasses elsewhere in the impact area have been decimated by the prescribed burn program. This area is also close to and directly down range from MF-2, the range accounting for the most fires at SBMR. Once fires make their way onto the ridge, they are resistant to containment efforts because of a lack of firefighter access, UXO contamination, and steep slopes.

4.1.2.7 South Range Acquisition Area

The fire threat at SRAA is relatively low. Training, the primary ignition source, is restricted to the eastern side of the firebreak and while fuel loads in the old plantation fields are high, there are numerous potential containment lines, and a bulldozer, if available, can easily create fire lines anywhere needed.

In the unlikely event that a fire burns on the western side of the firebreak, fire suppression will be heavily hampered by the steep and dissected terrain and almost complete lack of access. Large stands of Eucalyptus also complicate firefighting efforts.

4.1.2.8 Other installations

There is some threat of fire at WAAF, particularly south of the airfield. Fuels are mixed, with patches of highly fire prone vegetation interspersed with less fire prone vegetation. Numerous homes sitting at the top of steep slopes could potentially present a difficult wildland urban interface problem. However, ignitions are unlikely.

There is virtually no risk presented by wildfire at HMR. At Fort Shafter, Aliamanu Military Reservation, and Tripler Army Medical Center there are small acreages of wildland fuels that could present some risk to buildings in the immediate vicinity, but the probability of ignition is very low.

4.1.3 Spatial Fire Behavior and Risk Assessment

A spatial risk assessment was run for SBMR. However, due to a lack of accurate ignition probability data, it was determined that this risk assessment may not be representative of the true threat. There is an ongoing effort to establish a probabilistic risk assessment for live-fire installations using ballistics modeling and range usage to estimate ignition potential as opposed to the relative risk assessments completed for this IWFMP, and that assessment is not included here. Non-live-fire installations were not modeled due to the much lower overall probability of fires occurring there.

4.1.3.1 Schofield Barracks West Range

Ignition probability is almost exclusively driven by fire-prone munitions usage, in this case represented by ignition locations from the SBMR fire history.

The effects of mowing are clearly visible near the MF and CR ranges (Figure 40). Also apparent is the effect of the forest vegetation on fire spread. In most instances, west of the firebreak road forest vegetation drastically reduces the fire's ability to move across the landscape. Where forest vegetation is not present, for example on Puu Pane ridge, the fire risk remains elevated well outside of the firebreak road.

Overall, fire risk at SBMR is manageable due to the continued existence of large tracts of forest vegetation outside the firebreak road and a well-established firebreak. Methodical observance of the FDRS is key to keeping fires inside of the firebreak. In areas where past failures have produced grasslands outside of the firebreak, like Puu Pane, fire will pose a substantial challenge until long term solutions such as re-establishing forest cover can be implemented.

4.2 Ignition Prevention

4.2.1 Fire Danger Rating System

The Army uses a set of internal fire danger rating systems (FDRS) to manage wildfire ignitions. The FDRS restricts the use of weapons systems and types of training based on the weapon's or training's propensity to start fires and the current weather and fuel conditions. As weather and fuel conditions become more conducive to fire, more weapons systems and more types of training are restricted. A separate FDRS is in place for each FMA. Specific FDRS indices and instructions are discussed in detail in Enclosures 4 through 11 of the wildfire SOP. The methods used to update the FDRSs are described in Appendix 1.

The table below summarizes the method used for determining the FDRS break points at each installation.

Table 15. Method utilized to determine FDRS break points for each installation's FDRS. MMR FDRS break points have not changed from the 2003 IWFMP.

Installation	RAWS Station ID	Method	NFDRS FM (Correlation only)	BEHAVE FM (Correlation only)	Slope (correlation only)	Wind Adj (correlation only)
DMR		BI/FL Correlation	Sawgrass (N)	Guinea Custom	0	0.4
KTA		BI/FL Correlation	Sawgrass (N)	Guinea Custom	5	0.4
KLOA		BI/FL Correlation	Sawgrass (N)	Guinea Custom	10	0.4
MMR*		BI/FL Correlation	N/A	N/A	N/A	N/A
SBER		BI/FL Correlation	Sawgrass (N)	Guinea Custom	20	0.4
SBMR		BI/FL Correlation	Sawgrass (N)	Guinea Custom	20	0.4

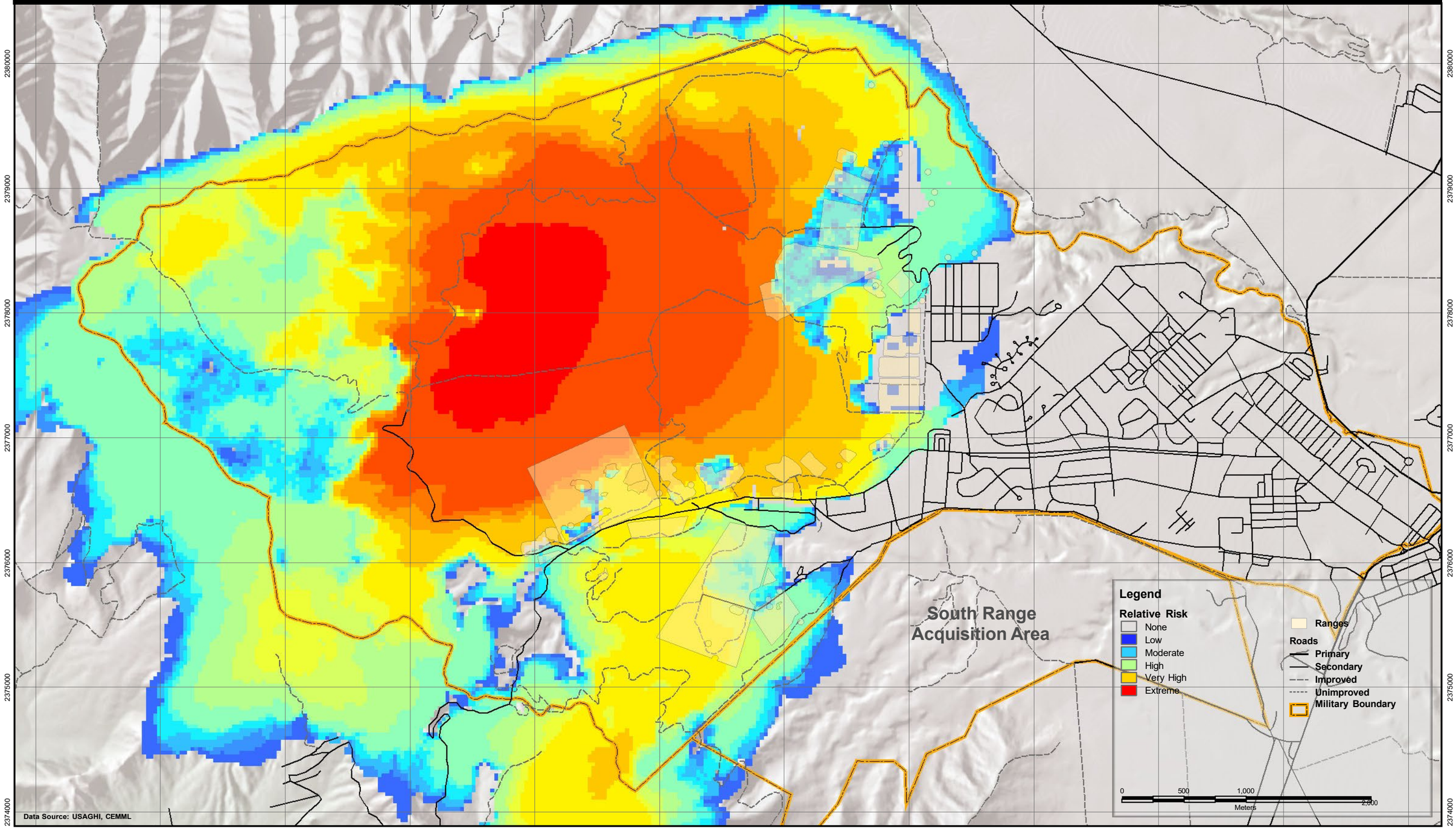
BI = Burning Index
FL = Flame Length
FFP = Fire Family Plus fire analysis software
*No change from 2003 FDRS.

Schofield Barracks Military Reservation

United States Army Hawaii
Integrated Wildland Fire Management Plan

Figure 40

Fire Risk Assessment



4.3 Firebreaks, Fuelbreaks, and Fuels Management

The U.S. Army Garrison, Hawaii maintains an extensive series of firebreaks, fuelbreaks, and areas of modified fuels. All USAG-HI land managers support the wildland fire pre-suppression fuels management program by assisting in their design, implementation, and maintenance. Excellent communication between the WFPM, the DPW Facilities Maintenance Chief, Range Facility Managers, the ITAM Program Coordinator, and the DPW Environmental Office is imperative to the successful implementation of fuels management projects.

To alleviate confusion, definitions are provided below:

- A **firebreak** is a linear path where fuel has been completely cleared to mineral soil.
- A **fuelbreak** is a linear path within which surface fuels and canopy fuels have been reduced, but not removed in their entirety.
- A **fire access road** is a road that provides access. It is not a firebreak but must be maintained so that firefighters can drive to critical areas.
- A **fuels management area** is an area of any size or shape within which fuels have been modified (usually cut or herbicided) to reduce potential fire behavior, reduce large fire probability, or reduce ignition probability.

Firebreaks and fuelbreaks may be used separately or in conjunction, usually with a firebreak embedded within a fuelbreak.

4.3.1 Standards for Firebreaks, Fuelbreaks, and Fuels Management

There are two sets of standards, one for installations on Oahu and another for installations on Hawaii. In some locations slope, drainages, or other factors may make these standards unreasonable. Standards will be adhered to wherever terrain and other constraints permit.

Firebreak standards are defined in Table 16. Firebreaks will be three meters wide of bare mineral soil. All vegetation will be removed from the firebreak, including overhanging branches from shrubs and trees if possible. Depending on species, overstory trees on the perimeter of the firebreak may be left intact to reduce sunlight available to grassy fuels growing in the understory. This decision will be made on a case-by-case basis by the WFPM or another qualified individual. All firebreaks will be maintained at least once per year or more frequently as determined by the WFPM. Fuels along the edges of firebreaks will be maintained at .3 m (one ft) in height or 20% crown cover, at the discretion of the WFPM, to a minimum distance of one meter (3.2 feet) from the edge of the firebreak. All firebreaks will be roads that are navigable by 4WD Type 5 brush engines.

Fire Access Roads are not considered firebreaks and will not meet firebreak standards. They are only required to be navigable by a 4WD NWCG Type 6 wildfire engine.

Fuelbreaks require the removal of most, but not all, fuels. Fine fuels and shrubs within fuelbreaks will be kept to less than 20% crown cover OR a maximum of .3 m (one ft) high. Crown cover is total aerial cover, so it can never exceed 100% and overlapping crowns are not counted twice. Tree species may be limbed to two meters (approximately 6 feet) high, rather than removed entirely, to reduce the impacts to sensitive ecosystems such as Palila Critical Habitat. Dead and cut herbaceous fuels will be left where they fall but all woody material such as branches and limbs will be removed from the fuelbreak entirely. Fuelbreaks will be monitored once annually. Ocular estimation will be

used to determine crown cover and stubble height. Wherever fuelbreaks are not to standard, maintenance of the fuels will be implemented to reduce them.

There are no standards for fuels management outside of fuelbreaks and firebreaks. Fuels are modified based upon the requirements of each specific project and at the discretion of the WFPM.

Table 16. Minimum Specifications for USAG-HI firebreaks and fuelbreaks.

	Standard
Firebreak	Navigable by 4WD NWCG Type 6 Fire engine. 3 meters wide, bare mineral soil, with edge fuels maintained to 1 meter from edge at 20% crown cover or 1 foot high.
Fire Access Road	Navigable by 4WD Type 5 brush engine. May be overgrown with vegetation.
Fuelbreak	20% aerial crown cover* or 1 foot high

*Crown cover is total aerial cover. Overlapping canopies are not counted twice.

4.3.2 Implementation and Maintenance of Firebreaks, Fuelbreaks, and Fuels Management

Any activity that disturbs vegetation or the ground surface must be coordinated with the DPW Environmental Natural and Cultural Resources Managers. This means all new firebreaks, fuelbreaks, or fuels management projects must be approved through DPW Environmental first.

Ground disturbing activities may require consultation under Section 106 of the National Historic Preservation Act. Activities that disturb vegetation or wildlife habitat may require consultation under Section 107 of the Endangered Species Act. These consultations can be time consuming. Early coordination with the Natural and/or Cultural Resources Managers is critical to ensuring timely completion of the project.

4.3.3 Responsibilities

Responsibility for capital funding, maintenance funding, and implementation of every project required by this IWFMP are summarized in Table 30 in Section 7 of this enclosure as well as in each installation's respective section within Section 4.3.4 of this enclosure.

Wildland Fire Program Manager
It is the responsibility of the WFPM to ensure that firebreaks, fuelbreaks, and fuels management are properly implemented and regularly maintained. As applicable, the WFPM will coordinate new construction and maintenance with the DPW Facilities Maintenance Chief, DPW Natural and Cultural Resources Managers, the HQ USARHAW Range Officer, and the ITAM Program Coordinator.

DPW Environmental Chief
The DPW Environmental Chief is responsible for funding capital costs associated with construction of the firebreaks, fuelbreaks, and fuels management required by Biological Opinions. DPW Environmental will also fund and carry out maintenance of many, but not all, fuelbreaks and fuels management areas.

DPW Maintenance Chief
The DPW Maintenance Chief is responsible for funding firebreak and fire access road maintenance, including roadside vegetation management, and ensuring that firebreaks and fire access roads as defined in this IWFMP are maintained to the standards defined in this IWFMP.

4.3.4 Firebreaks, Fuelbreaks, and Fuels Management at USAG-HI Installations

4.3.4.1 Dillingham Military Reservation

Firebreaks
A single designated firebreak extends from the eastern boundary to the western end of the airfield. This firebreak consists of a standard width bare mineral soil combined with a fuelbreak. Several roads, including the old taxiways, serve as fire access roads (Figure 41). A service contract shall be initiated to maintain the firebreak. The service contract shall be funded by DPW Environmental with actual funds acquired from the Army Environmental Command.

Fuelbreaks
There is a fuelbreak of three to four meters (10 to 13 feet) in width on both sides of the firebreak. The fuels will be maintained at .3 m (one ft) or less in height.

The SBMR to DMR military vehicle trail does not currently exist. Once it is implemented, fine fuels alongside the trail will be kept to less than .3 m (one ft) in height or less than 20% crown cover as ocularly estimated to a distance of three meters (10 feet) from the edge of the trail. Where the trail passes through active agricultural lands, no fuels management is necessary. The trail will be monitored once annually prior to May 1 to determine the need for fuels management. Any deficiencies will be noted and corrected by June 15. Herbicide or cutting will be employed to manage vegetation.

Fuels Management
Fuels inside the firebreak will be considered for mechanical treatment dependent on funding, resource availability, and will be implemented at the discretion of the WFPM.

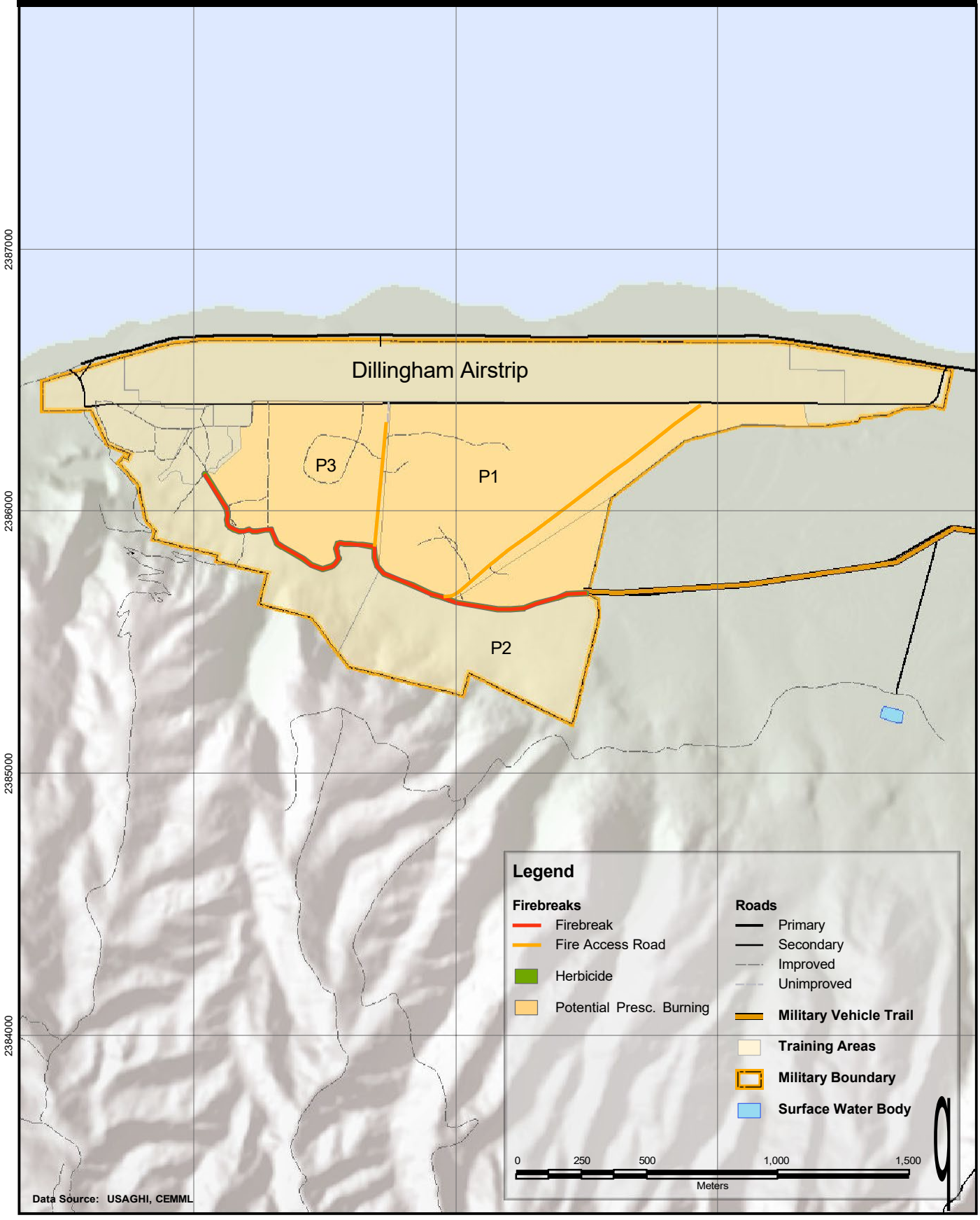
Table 17. DMR funding and implementation responsibilities.

Project	Capital Funding	Maintenance Funding	Implementation
Firebreak	DPW Env.	DPW Maint.	DPW Maint.
Fire Access Roads	N/A	DPW Maint.	DPW Maint.
Fuelbreak	DPW Env.	DPW Env.	DPW Env.
Military Vehicle Trail Fuels Maintenance	HQ USARHAW	HQ USARHAW	HQ USARHAW
Fuels Reduction Via Mechanical, Chemical treatment or grazing	WFPM	N/A	WFPM

Dillingham Military Reservation

United States Army Hawaii
Integrated Wildland Fire Management Plan

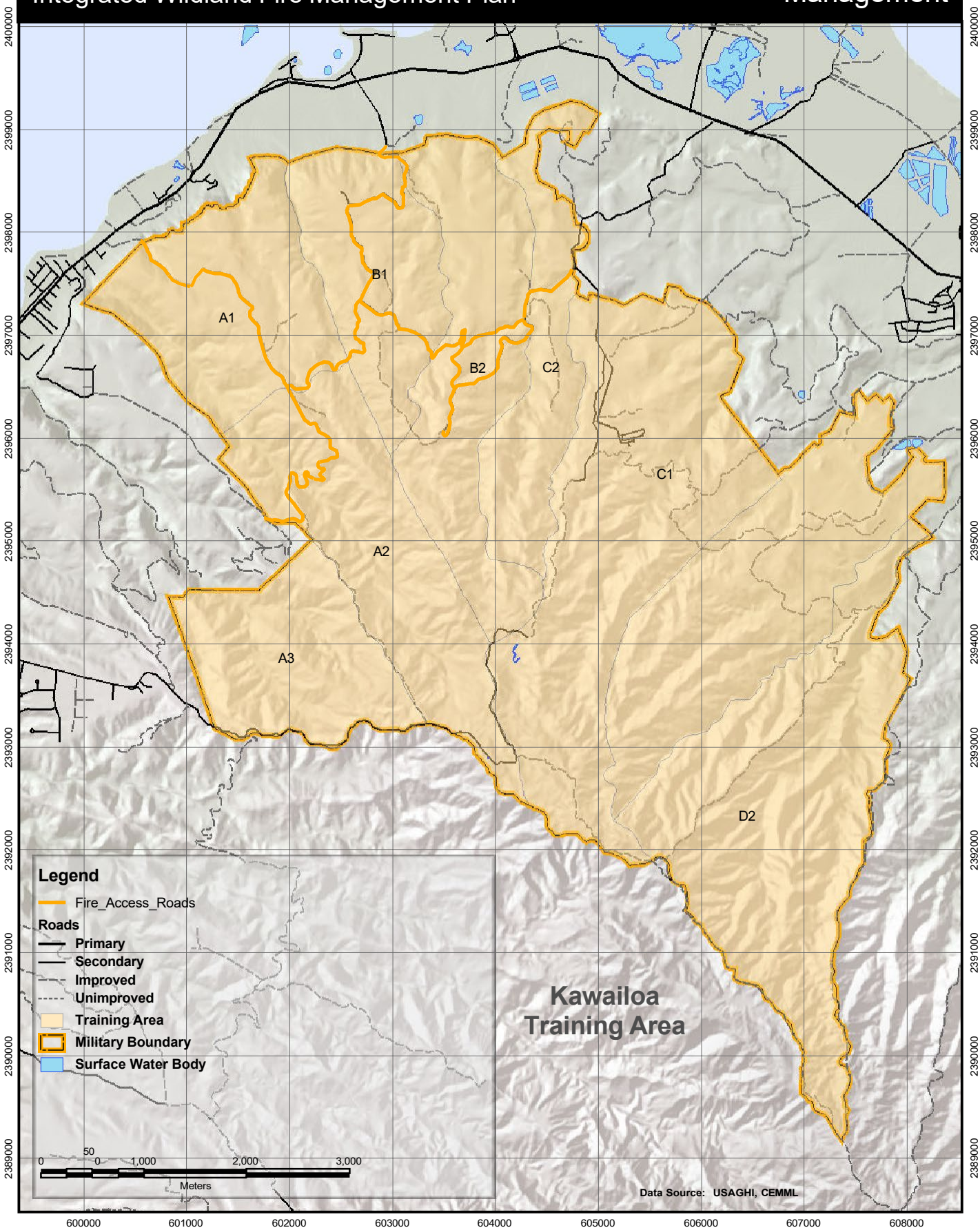
Figure 41
Firebreaks and Fuels Management



Kahuku Training Area

United States Army Hawaii
Integrated Wildland Fire Management Plan

Figure 42
Firebreaks and Fuels Management



4.3.4.2 Kahuku Training Area

There are no firebreaks, fuelbreaks, or fuels management areas required by this IWFMP at KTA. There are a number of roads that serve as fire access roads (Figure 42). These are maintained by HQ USARHAW as part of standard range maintenance.

Table 18. KTA funding and implementation responsibilities.

Project	Capital Funding	Maintenance Funding	Implementation
Fire Access Roads	N/A	DPW Maint.	DPW Maint.

4.3.4.3 Kawailoa Training Area

There are no firebreaks or fuels management areas required by this IWFMP at KLOA. Drum Road will serve as a fire access road (Figure 43).

Fine fuels alongside the SBMR to KLOA military vehicle trail will be kept to less than .3 m (one ft) in height or less than 20% crown cover as ocularly estimated to a distance of three meters (10 feet) from the edge of the trail. Where the trail passes through active agricultural lands, no fuels management is required. The trail will be monitored once annually prior to May 1 to determine the need for fuels management. Any deficiencies will be noted and corrected by June 15. Herbicide or cutting will be employed to manage vegetation.

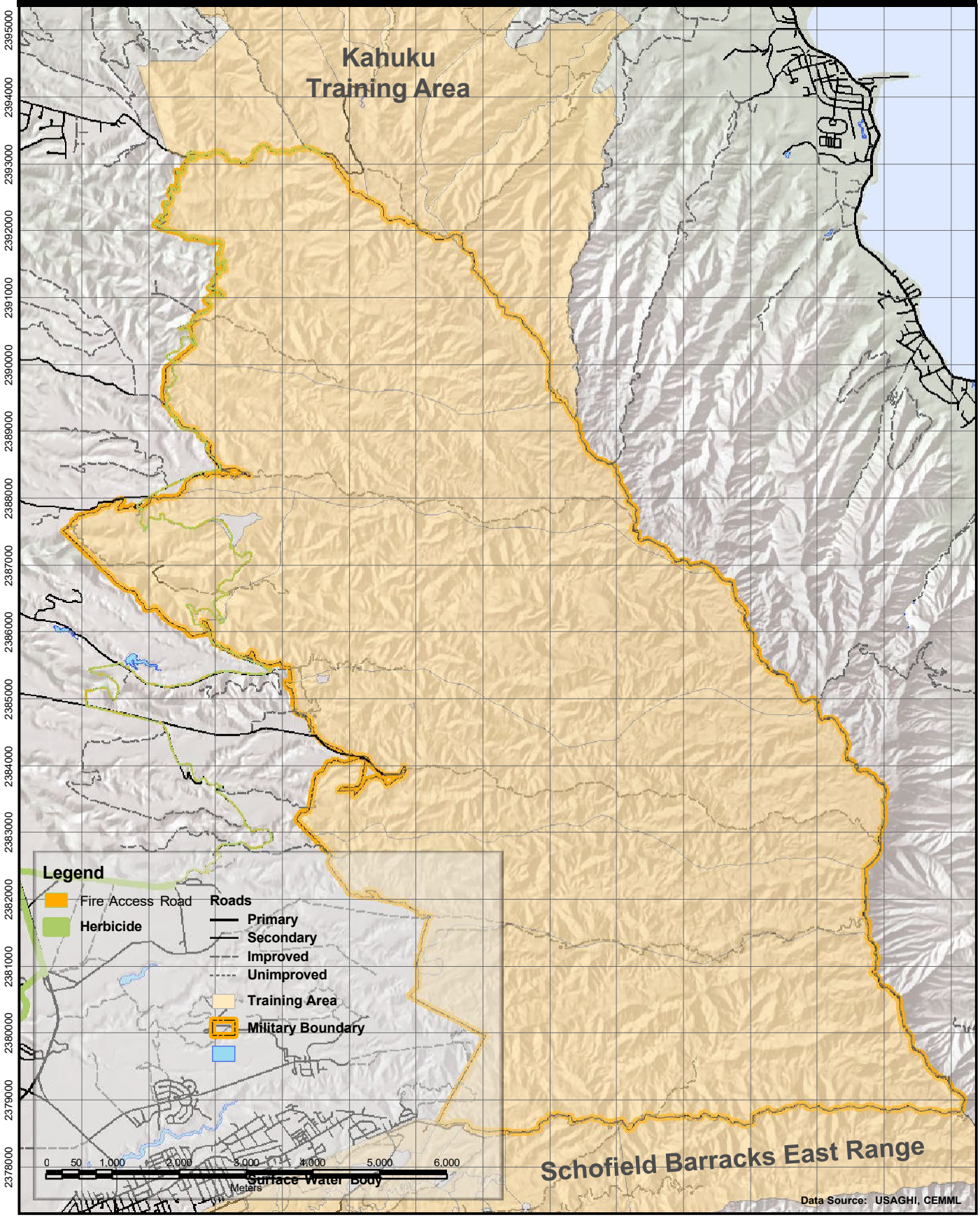
Table 19. KLOA funding and implementation responsibilities.

Project	Capital Funding	Maintenance Funding	Implementation
Fire Access Road	N/A	DPW Maint.	DPW Maint.
Military Vehicle Trail Fuels Maintenance	DPW Maint.	DPW Maint.	DPW Maint.

Kawailoa Training Area

United States Army Hawaii
Integrated Wildland Fire Management Plan

Figure 43
Firebreaks and Fuels Management



4.3.4.4 Makua Military Reservation

The Makua Biological Opinion (2007), and the Amendment of the Makua Biological Opinion (2008), commonly known as the 2008 Makua Hibiscus amendment, require specific mitigation measures regarding wildland fire. With the exception of grazing and prescribed fire, all of the fuels treatments listed below are required by these legally binding documents. Proper execution and documentation of that execution are crucial to the Army's continued use of MMR as a training area. The WFPM shall ensure that all of the fuels management listed below is implemented properly and on time and will document all fuels management and firebreak maintenance.

The measures listed below will be revisited in upcoming Section 7 Consultations. The mitigation measures below will be updated to comply with the requirements of the new Biological Opinion once it is finalized.

Firebreaks
There are two substantial firebreaks at MMR known as the southern and northern firebreak roads. The southern firebreak encompasses nearly all of the area available for live-fire training. A firing point also exists within the northern firebreak. A proposed firebreak will contain the firing point (Figure 44). All of these firebreaks will meet or exceed USAG-HI firebreak standards. There are numerous fire access roads within the southern firebreak (Figure 44).

Fuelbreaks
A 60 m (197 ft) wide fuelbreak will be maintained within most of the southern firebreak road and along roughly half of the northern firebreak road (see Figure 44). Fuels within these fuelbreaks will be maintained at 30 cm (1 ft) in height or less by cutting or other means.

Fuels Management
The WFPM, in cooperation with the DPW Environmental Natural Resources Manager, and in coordination with the HQ USARHAW Range Officer, the DPW Facilities Management Chief, and the DPW Environmental Cultural Resources Manager, will implement a grazing program at MMR in two phases. In phase one, grazing will be implemented within the northern firebreak road with the exception of the mowed firing point. A pilot project will identify and protect sensitive locations, establish fence lines and water sources, and introduce cattle within the northern firebreak. Stocking levels will be adjusted as needed to reduce fuel loads by at least half. The WFPM may increase stocking levels to facilitate further fuel load reductions.

Phase two will expand grazing to much of the rest of the low elevations of MMR. Steep slopes, rocky terrain, rare species, and cultural resources will limit the viable area. The specifics of the grazing plan must be approved by the USFWS per the 2007 MMR BO. Implementing a full-scale grazing program will eliminate the BO requirement for a fuelbreak inside the northern firebreak and will greatly reduce the fire threat throughout MMR.

Grazing may not be feasible at MMR due to concerns regarding interference with training scenarios and damage to cultural resources among others. However, a grazing program as described here is the only viable long-term, large-scale solution to the fire issue at MMR. If both Phase one and phase two of the grazing program are not implemented, the fuelbreak in the northern firebreak will continue to be mowed.

Grass will be cut and/or herbicided within the Lower Ohikilolo Makua Implementation Plan Management Unit (Figure 44). Grass within three meters (10 feet) of all *Hibiscus brackenridgei* will be removed such that total grass cover is 1% or less. Within the weed management area, grass will be kept to less than 20% crown cover. Cliff areas that are greater than 60% slope and thus too steep to access safely are excluded from these requirements. In the remainder of the management unit, grass will be maintained at <30 cm (1 ft) or <20% cover. The DPW Environmental Natural Resources Crew will be responsible for all of the cutting within the *Hibiscus* population. Contracted cutters may be utilized elsewhere within the management unit.

Grasses will continue to be maintained at stubble height in objectives Badger, Buffalo, Coyote, Deeds, Deer, Elk, and Wolf. This is the responsibility of the HQ USARHAW Range Officer.

Within the firing point within the northern lobe of the firebreak, grasses will also be maintained at stubble height and irrigated to ensure live fuel moisture is 200% or higher based on visual greenness as defined by Table 6 of Appendix B to the NWCG Fireline Handbook PMS 410-1 before any use of the firing point. A firebreak meeting or exceeding USAG-HI standards will encompass the entire firing point and be tied into the main northern lobe firebreak on both ends.

The Army will coordinate with the State of Hawaii DLNR to pursue implementation of several improvements within Yokohama State Park. A historic road just north of the MMR boundary will be improved to USAG-HI firebreak standards. A coincident fuelbreak meeting USAG-HI fuelbreak standards will be established on the western side of this firebreak as well as on the southern side of the satellite tracking station road from Farrington Highway to the security post.

Prescribed burning will be considered as a fuels management tool at MMR but is restricted to the months of October through May and to the insides of the northern and southern lobe firebreaks. Prescribed fires must conform to the prescribed burn plan included in appendix D of the 2007 MMR BO and may only be executed with the concurrence of the U.S. Fish and Wildlife Service.

Extensive areas within the southern firebreak road are currently regularly mowed for reasons other than fire management. Only the 60 m (197 ft) perimeter and the mowing of the military objectives is required per this IWFMP in accordance with the 2007 and 2008 Makua BOs. Other areas within the southern firebreak road that are currently mowed may be allowed to return to an unmanaged state if so desired by the HQ USARHAW Range Officer and the DPW Environmental Natural and Cultural Resources Managers. There is no requirement as part of this IWFMP to continue mowing these areas within the southern firebreak road, and the IWFMP will not fund or implement these actions, though mowing of these areas may continue under the purview of other programs.

Table 20. MMR funding and implementation responsibilities.

Project	Capital Funding	Maintenance Funding	Implementation
North and South Firebreaks & Fire Access Roads	N/A	DPW Maint.	DPW Maint.
60 m North and South Firebreak Fuelbreaks	DPW Env.	DPW Env.	DPW Env.
Grazing Program	DPW Env.	DPW Env/HQ USARHAW	DPW Env./HQ USARHAW/ WFPM/ITAM
Lower Ohikilolo Fuels Management	DPW Env.	DPW Env.	DPW Env.
Military Objectives Fuels Management	HQ USARHAW	HQ USARHAW	HQ USARHAW
Yokohama Improvements	N/A	N/A	WFPM
Upgrade Water Tank	DPW Env.	DPW Fac.	DPW Fac./WFPM
Upgrade Water Line	DPW Env.	DPW Fac.	DPW Fac.
Prescribed Burning (Fuels Management)	WFPM	WFPM	WFPM
Prescribed Burning (UXO or other purpose)	Directorate Making Request	N/A	WFPM

Makua Military Reservation

United States Army Hawaii
Integrated Wildland Fire Management Plan

Figure 44
Firebreaks and Fuels Management

MMR to Yokohama Firebreak

Firing Point

Lower Ohikilolo Fuelbreaks

Legend

MMR Firebreaks
- Firebreak, Existing
- Firebreak, Proposed
- Fire Access Road, Existing

BO Required Management
- Mow
- Mow & Herbicide
- Potential Prescribed Burning

Roads
- Primary
- Secondary
- Improved
- Unimproved
- Military Boundary
- Surface Water Body

0 500 1,000
Meters

Data Source: USAGHI, CEMML

2383000
2382000
2381000
2380000
2379000

579000 580000 581000 582000 583000 584000 585000 586000

4.3.4.5 Schofield Barracks East Range

There are no firebreaks, fuelbreaks, or fuels management areas required by this IWFMP at SBER. There are a number of roads that serve as fire access roads (Figure 45).

Table 21. SBER funding and implementation responsibilities.

Project	Capital Funding	Maintenance Funding	Implementation
Fire Access Road	N/A	DPW Maint.	DPW Maint.

4.3.4.6 Schofield Barracks West Range

Firebreaks

Two firebreaks currently exist at SBMR. One surrounds much of the impact area and has been in place for many years. It will be maintained and upgraded where necessary to meet USAG-HI firebreak standards. Where it passes below Puu Pane ridge, fuels management will extend three meters (10 feet), instead of the required 1 m (3.3 ft), from the edge of the firebreak toward the inside of the firebreak (Figure 46).

The other existing firebreak surrounds much of south range. Some of these firebreaks need to be upgraded to meet firebreak standards.

An existing road west of the MF ranges will be upgraded to firebreak standards. This firebreak will connect with the impact area firebreak and extend to firing point 308. Surface fuels along the sides of the firebreak will be cut or herbicided to maintain vegetation at .3 m (one ft) in height or 20% cover. Mature trees may be left in place if limbed to two meters (approximately six feet). This fuels management will extend three meters (10 feet) from the edge of the firebreak toward the inside of the firebreak and 1 m (3.3 ft) to the outside. This firebreak is required by the Oahu BO.

Fuels Management

Prescribed burning will continue to be employed within the dudded impact area as a method to control fuels and increase available training time. The WFPM will coordinate with the DPW Environmental Chief to monitor potential adverse effects of repeated fires, particularly soil erosion and invasive species. An objective of this IWFMP is to compartmentalize the SBMR impact area as opportunities arise in order to facilitate greater flexibility in prescribed burning. The WFPM will coordinate with the HQ USARHAW Range Officer to take advantage of any UXO removal operations that may occur as part of range development to achieve this objective.

There are no fuelbreaks required by this IWFMP at SBMR.

Table 22. SBMR funding and implementation responsibilities.

Project	Capital Funding	Maintenance Funding	Implementation
Impact Area Firebreak	N/A	DPW Maint.	DPW Maint.
South Range Firebreak	N/A	DPW Maint.	DPW Maint.
MF Firebreak	DPW Env.	DPW Maint.	DPW Maint.
Prescribed Burn Impact Area	N/A	HQ USARHAW	WFPM
Monitor Prescribed Burn Effects	N/A	DPW Env.	DPW Env.
Construct Fire Station SBMR	WFPM	DPW Fac.	DPW Fac./WFPM

4.3.4.7 South Range Acquisition Area

Firebreaks

The SRAA firebreak starts on Lyman Road just north of the new motor pool and ties in with Hauula Road at the southern installation boundary. Part of Hauula Road and part of one of the old agricultural roads will serve as a fire access road as defined in Figure 47. All training is required to take place to the east of the SRAA firebreak per the Oahu BO.

There are no fuelbreaks or fuels management areas required by this IWFMP at SRAA.

Table 23. SRAA funding and implementation responsibilities.

Project	Capital Funding	Maintenance Funding	Implementation
Firebreak	N/A	DPW Maint.	DPW Maint.
Fire Access Roads	N/A	DPW Maint.	DPW Maint.

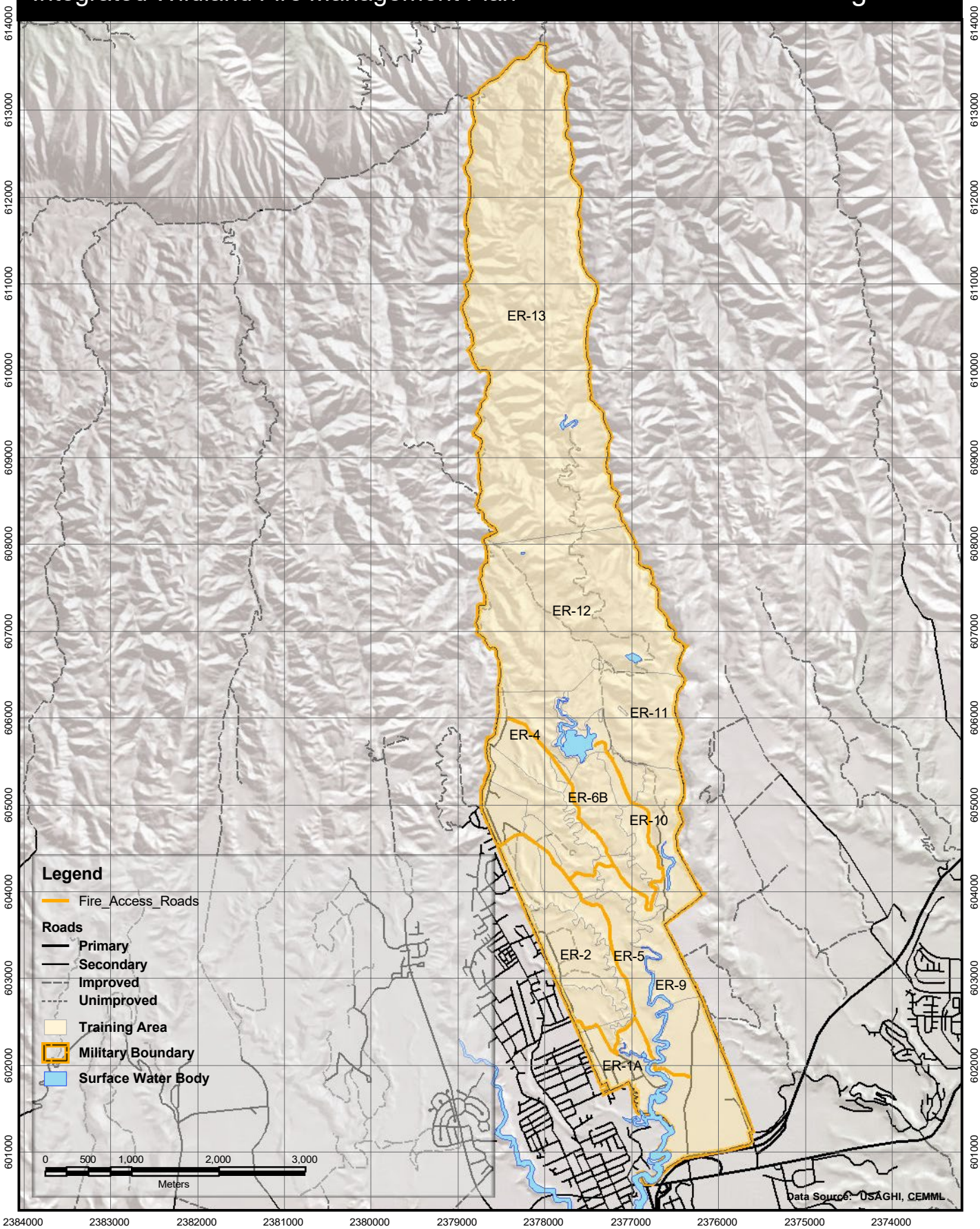
4.3.4.8 Fort Shafter, Helemano Military Reservation, Wheeler Army Airfield, and Tripler Army Medical Center

There are no firebreaks, fuelbreaks, or fuels management areas required by this IWFMP at any of these properties.

Schofield Barracks East Range

United States Army Hawaii
Integrated Wildland Fire Management Plan

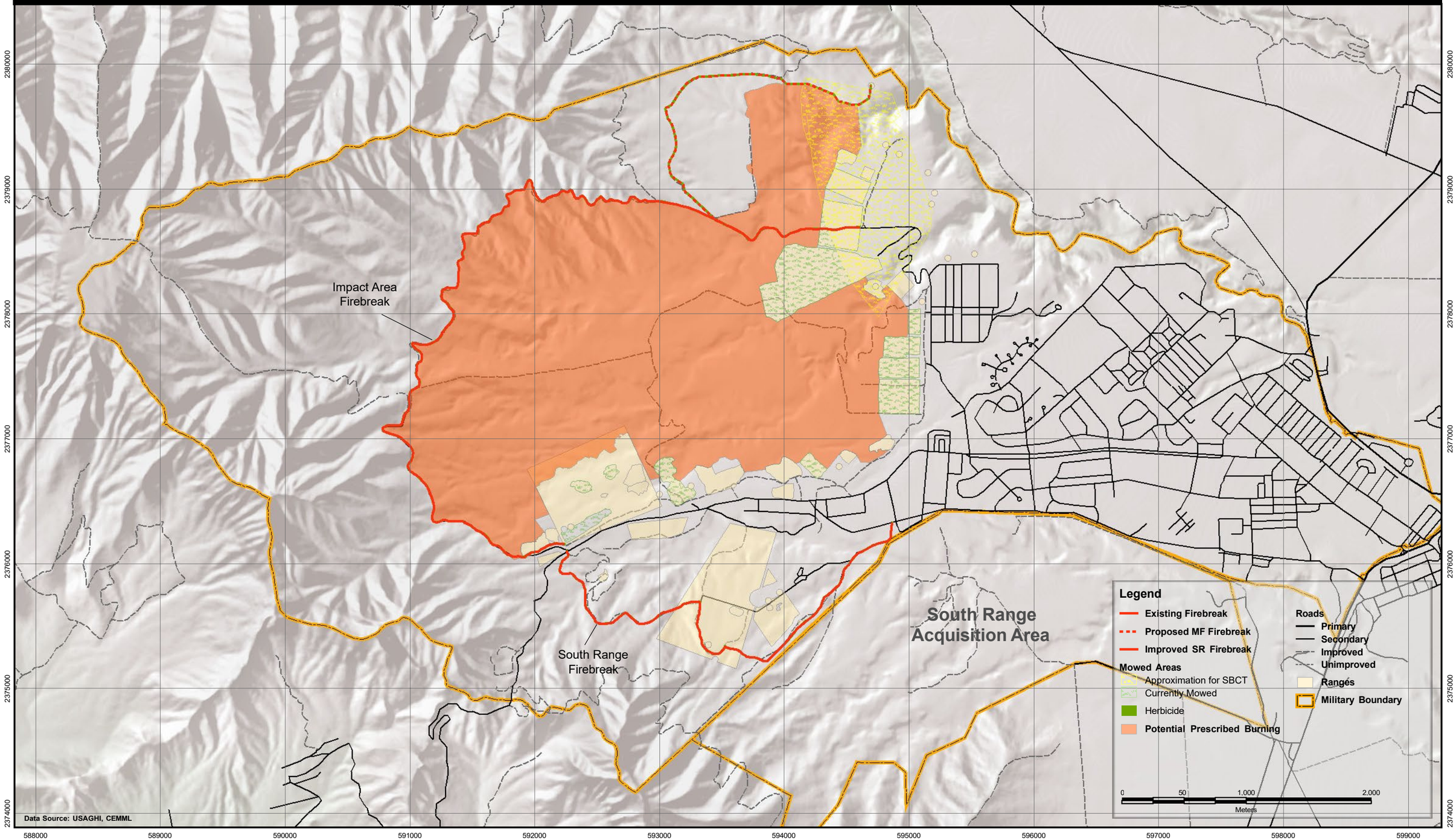
Figure 45
Firebreaks and Fuels Management



Schofield Barracks Military Reservation

United States Army Hawaii
Integrated Wildland Fire Management Plan

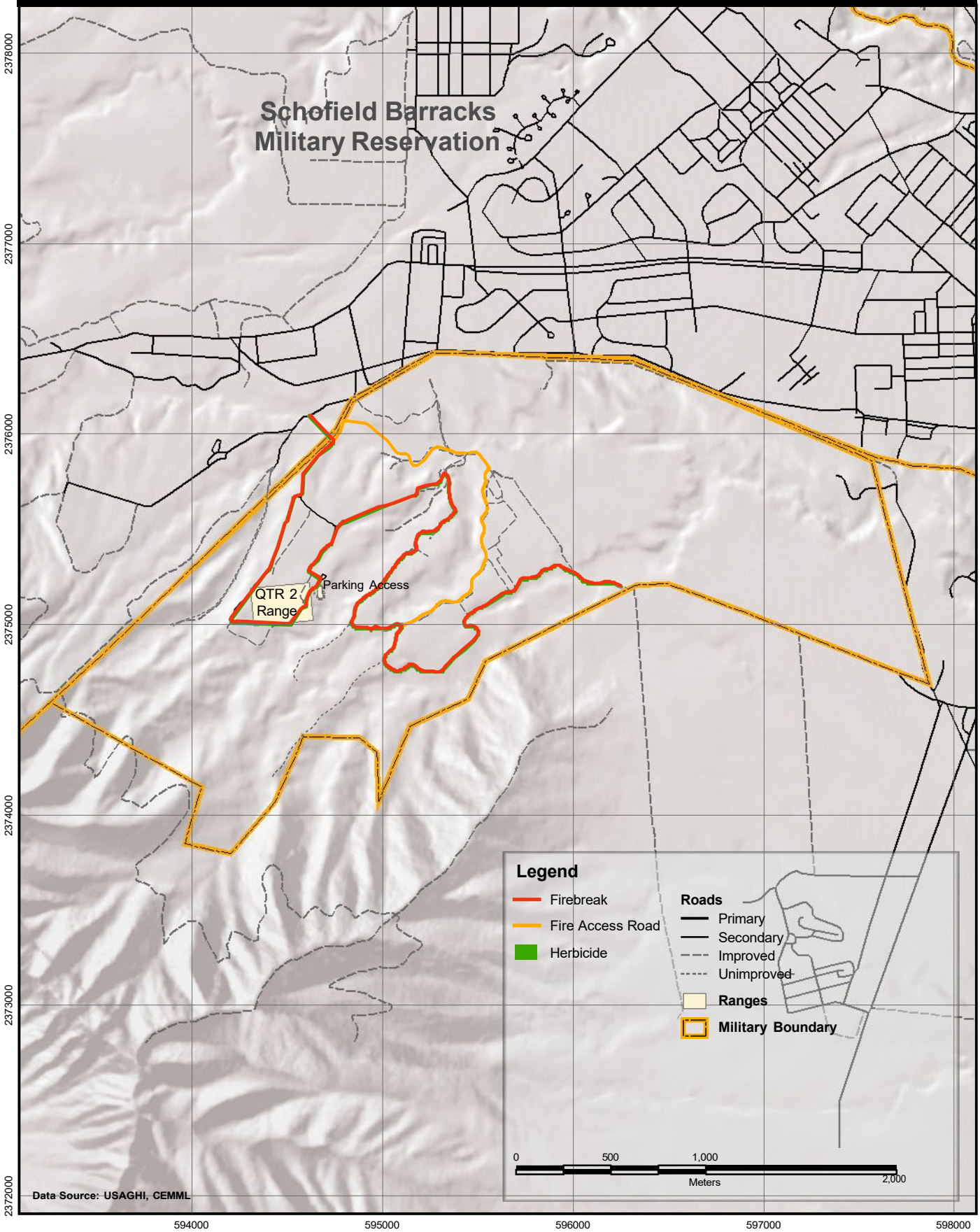
Figure 46
Firebreaks and Fuels Management



South Range Acquisition Area

United States Army Hawaii
Integrated Wildland Fire Management Plan

Figure 47
Firebreaks and Fuels Management



4.4 Operations, Infrastructure, Resources, and Supplies

4.4.1 Fire Stations

The ARMY FIRE Taskforce works out of a base yard located at Area X. A fire station shall be constructed adjacent to Dragon X at SBMR (See Figure SBMR-2 in the SBMR SOP). It shall accommodate in enclosed garages/bays one Type 3 water tender and four Type 6 wildland engines. It shall include overnight quarters for 10 individuals, a full kitchen, a restroom, showers, a training/conference room with AV equipment to accommodate 20 personnel, and office space sufficient to accommodate three personnel, computers, and file cabinets. The station is expected to be constructed in late 2023.

The Range Tower at MF-2 shall be made available to ARMY FIRE firefighters during wildland fire incidents at SBMR. The WFPM shall be provided two keys to the tower.

4.4.2 Minimum Staffing Requirements

The USAG-HI ARMY FIRE Directorate will staff a minimum 16-person Taskforce stationed on Oahu. The daily schedule may vary to provide coverage and staffing at multiple areas, but in general there are 3 shifts. This maintains an average of 4 firefighters on duty with overlap to cover employee leave and holidays.

a. A shift (Sunday, Monday, and Tuesday)
b. B shift (Tuesday, Wednesday, and Thursday)
c. C shift (Thursday, Friday, and Saturday)

Each range has specific firefighter staffing requirements; however, the most common scenario is having a minimum daily and overnight staffing at SBMR of 4 firefighters total consisting of 2 ICT4s or ENGBs, and 2 firefighters (FFT2 minimum).

1. Initial attack crew consisting of an ICT4 or ENGB and 1 Firefighter to staff hot and occupied ranges.
2. Contingency crew consisting of an ICT4 or ENGB and 1 Firefighter as a contingency or able to respond to any additional fires.

There may be situations on an incident that require fire crews, firefighters, or single resource personnel to work hours beyond what is considered normal for work/rest standards. This is acceptable provided resources are given the appropriate hours off to mitigate the excess hours or brought back into compliance at the earliest opportunity possible. In situations where the excess hours are not mitigated immediately, supervisors and incident commanders need to assess fatigue level of the resource before making a decision on additional down time.

ARMY FIRE personnel are expected to mitigate worker fatigue and adhere as close as possible to the NWCG (Work-to-Rest Ratios) for wildland firefighters. Work to Rest ratio is an expression of the amount of rest that is required for each hour an individual is in work status. Current NWCG guidelines require one hour of rest for every two hours in work status. If an employee works 16 hours they would need 8 hours in a “Rest Status”. The Fire Chief, Wildland Fire Program Manager, and Supervisor have the final say in staffing and overtime allocation.

There are some training events and training durations that are out of the control of management. It is expected that firefighters will remain on shift until 0800 for any training going beyond Midnight. This is to ensure that there is adequate firefighter coverage overnight and to provide mitigation for firefighter safety and fatigue by reducing driving time to and from the duty station.

d. Fatigue Example: (Leaving at 0400 hrs. driving home and then returning at 0700 for regular shift.)
e. Staffing Example: (Units ceased training at 0200 and a resulting fire was not detected until 0400. If firefighters had departed when training ceased there would have been no response available to fight the fire.)
f. Anytime Pyrotechnics, Tracers, Artillery, or Aerial Gunnery is taking place the firefighters must remain on shift for 1.5 hours after the range goes cold. This is to ensure there are no holdover fires resulting from training. It is not uncommon for fires to be detected several hours after training has stopped.

The Interagency Incident Business Handbook states in Chapter 11, Part 12.7-2:
"When filling incident assignments, individuals and their supervisors should consider when the requested individual's last day off occurred, to ensure the individual's readiness and capability for the assignment."

12.7-4 of the Interagency Incident Business Handbook states:
"Supervisors, Fire Chief, and Wildland Fire Program Manager, must manage work schedules for initial attack, dispatch and incident support personnel during extended incident situations."

Mission requirements of the ARMY make it difficult to always adhere to the "Work to Rest" ratio however, it is also expected that the supervisor will mitigate this issues as soon as possible. It is not uncommon for firefighters to be on shift for 48 to 72 hours during live fire training events. This would be considered "like" an initial attack period. Once the training subsides the firefighter should be given his or her next scheduled off duty period (scheduled Day Off) to have rest and rehabilitation.

At the discretion of the WFPM, staffing levels may be increased above minimum requirements due to drought or other circumstances see (Appendix 4 – Step-Up Staffing Plan). The WFPM will track long-term fire danger indices, such as drought indexes, 100 and 1000-hour fuel moisture, KBDI, or live herbaceous fuel moisture to help make these determinations. Shorter term indices, such as daily or hourly indices or weather reports will not drive staffing decisions. The WFPM may work with outside agencies and individuals to establish reasonable indices to use and decision points. Factors other than weather, including training load and types of training scheduled, may be considered in staffing decisions.

4.4.2.1 ARMY FIRE Taskforce

This Taskforce will provide services that support wildland firefighting on Oahu. There are many other labor-intensive tasks, but most include: maintenance of RAWS, upkeep of firefighting equipment including Bambi buckets, wildland engines, wildland firefighting equipment, and water tenders, and other tasks determined at the discretion of the Wildland Fire Program Manager.

All firefighters on the Taskforce will be NWCG qualified. At least three members of the Taskforce, exclusive of the WFPM, will be qualified at the Incident Commander type 4 and Single Resource Boss Level. These will most likely be the Engine Captain 0456 GS-6,7 positions. There will also be at least three qualified at the Incident Commander type 5 level and Firefighter Type I level and are the 0456 GS-5/6 positions.

4.4.2.2 Fire Response Vehicles

All fire response vehicles will be staffed at a minimum level for safety purposes:

Table 24. Minimum staffing on fire response vehicles.

Vehicle Type	Minimum Staffing Level
Wildland Engines, All Types	2
Water Tenders, All Types	1
Dozers, All Types	2

4.4.2.3 Fire Management Areas

Minimum staffing levels vary at each FMA and shall be based on the size and scope of military training activities authorized at each training area. Refer to minimum staffing requirements for each area in Enclosures 4 through 11. Typical staffing configurations is:

a. Two (2) Army fire fighters (ENGB and FFT2) and a fire response vehicle will be staffed at SBMR for initial attack fire response when training is ongoing. Type 6 engine with an ENGB and FFT2 are the minimum requirements.

b. An additional two (2) Army fire fighters (ENGB and FFT2) and a fire response vehicle will be staffed at SBMR for contingency response when training is ongoing at SBMR. Type 6 Engine with an ENGB and FFT2 are the minimum requirements.

Should a fire occur that requires only one unit to respond, the other unit will be available for response to any fire that may occur on USAG-HI lands. Should a fire occur that requires two units to respond, or should two fires need to be suppressed simultaneously, mutual aid could be activated if the area of response does not involve UXO or down range on certain training areas. The use of mutual aid and where resides with the IC and IWFMP to ensure fire response coverage for USAG-HI.

The WFPM shall ensure that the following minimum staffing levels are available during training exercises at each FMA.

Table 25. Minimum staffing requirements at each FMA.

Fire Management Area	Minimum Staffing Level
Kahuku Training Area	2
Makua Military Reservation	Varies with fire danger
Schofield Barracks West Range and South Range Acquisition Area*	4

*SBMR and SRAA may share firefighting resources.

Special requirements pertain to staffing at Makua Military Reservation. See the MMR enclosure to the wildfire SOP. For more detail about staffing requirements at each FMA, see the respective enclosure to the wildfire SOP.

4.4.3 Fire Fighting Equipment and Supplies

4.4.3.1 Fire Caches

The primary fire cache on Oahu is located at SBMR in the fire tower compound.

It is the responsibility of the WFPM to ensure these caches are properly stocked. Each fire cache will be inventoried and inspected annually as well as after every major event in which the cache was utilized.

Table 26. Minimum fire cache resources

Equipment Type	Quantity
Personal Protective Equipment (PPE)	20
Fire Shelters	20
Hand Tools	30
Chain Saws	5
Portable Fire Pumps	2
Forestry Hose (Feet)	1000
Backpack Pumps (40 gal)	10
Drip Torches	5
Fusees (cases)	2
Weather Belt Kits	2
Portable Flexitanks	2

If the required fire suppression equipment is not operational, live-fire training will be suspended until the situation is rectified or waived by the WFPM. Live-fire training will only be conducted when fully trained/certified personnel and functioning equipment is readily available for fire suppression. This requirement pertains to all types of firefighting equipment, water resources, and personnel. Any discrepancies shall be reported to the WFPM for immediate corrective action.

4.4.3.2 Fire Response Vehicles

The WFPM shall ensure that fire response vehicles (Brush Engines and Water Tenders) assigned to specific installations are available and operating in a constant state of readiness. If at any time the equipment on the fire vehicle is not operational, immediate notification must be initiated to higher authority to correct deficiencies. Priority for repairs shall be in accordance with Memorandum of Understanding between the G3/DPTM, Range Division, DPW, DOL or contract services statement of work. Fire response vehicles will be equipped per NWCG standards.

The WFPM shall maintain a minimum of four (4) Type 6 or better wildland engines and one (1) Type 3 or better water tender on Oahu. These resources may be assigned at the WFPM's discretion to meet staffing requirements throughout Oahu. Each will be outfitted with an appropriate level of hose, fittings, etcetera as determined by the WFPM.

4.4.3.3 Aircraft

The WFPM will explore the possibility of purchasing or contracting a moderate payload rotary-winged firefighting aircraft, similar to a Bell 205++ or Bell Super 205. It would have a minimum payload of no less than 300 gallons (US) of water at sea level, crew transport capability, and continued performance at altitudes up to 3,000 m (~10,000 ft). This aircraft's primary purpose would be firefighting duties, but it would also be available for logistical support for fire management related projects. It would not be assigned to duty as an on-call aircraft for MMR as its purpose would be rapid response throughout Oahu and extended attack response for Hawaii. A pilot would be contracted or could be hired and a Helitack crew with Helicopter manager would be hired as part of ARMY FIRE

4.4.3.4 Remote Automated Weather Stations

Remote Automated Weather Stations

There are Remote Automated Weather Stations (RAWS) placed throughout many of the USAG-HI training installations with the exception of WAAF (Table 27). These collect a full range of fire weather data including.

- Temperature
- Humidity
- Dew point
- Wind speed, wind direction and wind gust speed and direction
- Wet bulb
- Solar radiation
- Fuel temperature

Other variables are calculated from these, including fuel moistures and the FDRS indices.

Table 27. Remote Automated Weather Stations operated by USAG-HI

FMA	Location	WIMS ID	Latitude	Longitude	Elevation (m)	Maint Priority
DMR	30 m SW of Charlie Gate	490308	21° 32' 19"	158° 11' 55"	6	2
KTA	Near Range Control	490306	21° 40' 45"	157° 59' 22"	182	1
KLOA	K2C in Puu Kapu	499903	21° 35' 14"	158° 00' 47"	388	2
MMR	Range Control	490301	21° 31' 43"	158° 13' 43"	6	1*
MMR	Ridge	490302	21° 32' 34"	158° 11' 56"	533	1*
MMR	Firebreak	490303	21° 31' 43"	158° 12' 15"	158	3*
SBER	ER-6B	499908	21° 29' 58"	157° 59' 36"	655	2
SBMR	Range Control	499902	21° 29' 42"	158° 04' 55"	299	1
SBMR	Portable - in storage.	499910	N/A	N/A	N/A	3

*Per the 2007 Makua BO these stations must be managed in accordance with PMS 426-3. MMR Firebreak is inaccessible due to UXO.

Each RAWS station has been assigned a maintenance priority level associated with its importance to fire prevention measures. Stations assigned a level 1 priority control a FDRS and it is critical that they function properly for the FDRS to be credible and to avoid training downtime per the requirements of the SOP (see section 2.4 of the Wildland Fire SOP). Each of the priority 1 stations will be maintained in accordance with PMS 426-3 which requires annual maintenance and calibration and that additional maintenance be carried out within three days whenever the station is not working properly. Additional time may be necessary when parts are required which take seven to ten days to ship to Hawaii. Repair will occur promptly upon receipt of replacement parts.

Priority level 2 stations shall be maintained to PMS 426-3 maintenance standards a minimum of once every two years. Priority level 3 stations shall be maintained at the discretion of the WFPM.

A minimum of two staff members who are proficient in RAWS maintenance shall be retained within DES. This individual is responsible for all RAWS maintenance throughout USAG-HI.

4.4.4 Cooperative Wildland Firefighting Resources

The Army maintains mutual aid agreements with most firefighting agencies on Oahu. The primary agreements are with the Hawaii County Fire Department, the Oahu County Fire Department, and the State of Hawaii DLNR.

Mutual Aid Agreements shall be updated as needed and reviewed at least once every 5 years. They may be updated more frequently at the discretion of the WFPM.

4.5 Personnel Safety

Public and firefighter safety is the first and highest priority. Safety is an attitude that must be promoted at all operational levels and is the responsibility of everyone assigned to a wildfire incident. Once personnel are committed to an incident, they become the most valuable resource to be protected.

Fighting wildfires is inherently dangerous, and firefighters risk injury or even death in these operations. Nationally, there are wildland firefighter fatalities nearly every year. In addition to the danger from the fire itself, the need to use cutting tools, mobile apparatus, heavy equipment, and aircraft add to the risk involved. If firefighters are properly trained and equipped, know how to recognize potentially hazardous situations and how to mitigate them, they can reduce or eliminate much of that risk.

The training program and the qualification and certification process are the foundations of the safety program. Only qualified personnel will be assigned firefighting duties. All firefighters must meet National Wildfire Coordinating Group (NWCG) training standards. All personnel engaged in actual fireline operations (in the vicinity of the fire) must have completed, S-110 Basic Fire Suppression Orientation; S-130, Firefighter Training; S-190, Introduction to Fire Behavior, Your Fire Shelter, and Standards for Survival; and I-100, Introduction to Incident Command System (ICS). All firefighters are required to complete an annual refresher course (RT-130). All personnel will have NWCG certified training for tasks they are assigned (see Section 4.8).

The Incident Commander shall ensure that safety briefings occur at all operational levels. The identification and location of escape routes and safety zones will be stressed at every briefing.

All fire suppression actions must be in compliance with Army Regulation (AR) 420-1 Army Facilities Management, and the NWCG “10 Standard Fire Orders” and “18 Watch Out Situations”. A copy of the Fire Orders and Watch Out Situations are listed in Appendix 2 of this fire management plan.

All Personal Protective Equipment (PPE) shall meet or exceed the NFPA 1977 Standard on Protective Clothing and Equipment for Firefighters (current edition, described in PMS 210, http://www.nwcg.gov/sites/default/files/products/pms210.pdf). A list of mandatory PPE is included in Table 28.

Table 28. Mandatory personal protective equipment. All firefighters will carry all of this equipment on every deployment.

Equipment	Required when…
Hard hat	On the fireline.
All leather, minimum 8" high boots with slip and melt-resistant soles and heels. No steel toes.	On the fireline.
Flame resistant clothing (e.g., Nomex). Sleeves should be rolled down.	On the fireline, in helicopters.
Leather or other approved gloves	On the fireline.
Eye, face, and neck protection	When necessary.
Fire Shelter	On the fireline
Hearing protection	When working with high noise-level firefighting equipment, such as helicopters, air tankers, chain saws, pumps, etc.
Chaps (only required for sawyers and swampers).	When operating or swamping for chain saws.
Dust/smoke mask	When necessary.

It is mandatory that all firefighting personnel be equipped with the proper PPE necessary for fighting wildfires. Wildland firefighters must be intimately familiar with the tools used and PPE worn. Knowledge of proper selection, use, and care of the various tools used in wildland fire fighting aids firefighters in performing their job as efficiently and effectively as possible. Likewise, knowledge of the proper donning, care, capabilities, and limitations of PPE gives firefighters a better sense of which situations are tenable, and which are not. Firefighting personnel will ensure that proper PPE is worn at all times when actively engaged in firefighting duties.

4.6 Use of Prescribed Fire

Prescribed fire will be used to control fuels in isolated cases, primarily within the SBMR impact area. Because of the possibility of negative outcomes, prescribed fire will only be utilized when necessary or when the benefits of prescribed burning are substantial relative to other methods of achieving the same management objective. The WFPM has sole discretion over the implementation of any prescribed fire for any purpose, including burns proposed for UXO clearance.

Prescribed fire is not authorized at any installation during the months of June through September. These are typically the driest months of the year and the history of prescribed fire use during these months indicates a high risk of escape. This restriction may be overridden with the concurrence of both the WFPM and the DPW Natural Resources Manager.

In order to bring to bear the latest and most up to date prescribed fire planning, all prescribed fire burn plans will adhere to the most recent version of PMS 484, the Interagency Prescribed Fire Planning, and Implementation Procedures Guide. At the discretion of the WFPM, PMS 484-1, the NWCG template for prescribed fire plans, may be used. The Prescribed fire Goals, Priority areas and smoke management plans will be developed and documented in the yearly Burn Plans.

4.6.1 Responsibilities

4.6.1.1 Wildland Fire Program Manager

The WFPM shall:

- Compose Prescribed Fire Burn Plans
- Approve Prescribed Fire Burn Plans.
- Ensure that prescribed fires are planned and scheduled in coordination with other directorates, including as appropriate:
  - Directorate of Fire and Emergency Services
  - Directorate of Public Works
    - Environmental Chief
    - Range Operations and Maintenance Chief
    - Natural Resources Manager
    - Cultural Resources Manager
  - Directorate of Installation Safety
  - HQ USARHAW Range Officer
  - Public Affairs Office
- Ensure that Prescribed Fire Burn Plans and the personnel executing them meet minimum NWCG, DoD-wide, and Army Wildland Fire Policy requirements.
- Develop smoke management criteria for making "go/no go" decisions on use of prescribed fire.
- Coordinate workforce and equipment needs for prescribed fires.
- Ensure that prescribed fire use and fire protection responsibilities do not exceed USAG-HI capabilities and are coordinated with Command suppression needs.

4.6.1.2 Range Officer

The Range Officer shall ensure that days for prescribed fires are scheduled to meet IWFMP management goals.

4.6.2 Policy

The following policy statements apply to the use of prescribed fire on all USAG-HI managed lands:

1. A management ignited prescribed fire burn plan must be completed for all prescribed burning projects in advance of ignition.
2. Naturally ignited prescribed fires are not considered in this document because there are very few naturally ignited fires in Hawaii.
3. A prescribed fire that exceeds, or is anticipated to exceed, one or more prescription parameters and/or line holding capability must be declared a wildfire and cannot be re-delegated as a prescribed fire. At this point, appropriate suppression action must be taken.
4. Conduct each prescribed fire in compliance with the approved burn plan.
5. Use only trained and qualified personnel to execute each prescribed burn plan.
6. The WFPM must personally approve each prescribed fire burn plan and any changes. This responsibility may not be re-delegated.
7. On USAG-HI lands, only management ignited prescribed fires are authorized. Naturally ignited prescribed fires are too rare to consider, and training ignited fires will be suppressed at minimum feasible size, per the IWFMP SOP, within the constraints of best fire management practices and firefighter safety.

4.6.3 Fire Containment and Declaration of Wildfire Status

If the prescribed fire exceeds the predetermined and pre-approved constraints on holding actions, the fire must be declared a wildfire and appropriate fire suppression action taken. If a single spot fire escapes, it may be designated as a separate fire. If additional suppression forces are needed, the spot fire is declared a wildfire. The prescribed burn may continue as long as adequate holding forces remain on the prescribed burn as specified in the prescribed burn plan, separate from the suppression action on the spot fire, and the burn remains in prescription. The capability to hold the prescribed burn shall not be jeopardized by moving essential holding forces to fight a spot fire.

If a prescribed burn accidentally crosses the prescribed perimeter, immediate action by the holding crews must be taken to control it. The burn plan will allow the burn boss to take limited holding actions on fires outside the planned perimeter before it is declared a wildfire. The temporary use of personnel who do not meet NWCG qualifications is appropriate for prescribed fires that escape and are declared wildfires.

4.6.4 Prescribed Fire Organization

Prescribed Fire Manager

The Prescribed Fire Manager shall write burn plans and organize prescribed fires. The WFPM will usually serve in this role but may designate a Prescribed Fire Manager for Oahu. The Prescribed Fire Manager:

- Coordinates range scheduling, personnel, and equipment requirements, including resources called for in the holding actions and contingency actions sections of the burn plan.
- Ensures appropriate public notice is given prior to and during the prescribed fire activity.
- Coordinates and schedules the ignition and management of two or more simultaneous management ignited prescribed fires.
- Monitors prescribed burn projects to ensure that all plan requirements are being met.

- Records and reports costs and accomplishments of the prescribed fire program and recommends improvements to the WFPM.

Burn Boss

The WFPM shall be qualified as an RXB2 (Prescribed Fire Burn Boss Type 2) and be the burn boss or designate a Burn Boss Type 2 for every management ignited prescribed fire. The Burn Boss will be an individual experienced with local weather, fire behavior, fuels, and terrain conditions and shall personally supervise the burning operations. Some prescribed fires may require a Firing Boss and a Holding Boss as well, but on very simple burns, the Burn Boss may also act as the Firing Boss and/or Holding Boss. The Burn Boss has direct responsibility for on-site implementation of the approved prescribed burn plan. The Burn Boss is accountable to the Prescribed Fire Manager, though the same individual may hold both positions. The Burn Boss has several responsibilities that may not be re-delegated:

- Ensure safety of personnel.
- Ensure that all prescribed fire burn plan requirements are met and that personnel are briefed before proceeding with ignition.
- Ensure that the fire prescription is met before proceeding with ignition.
- Make the decisions to proceed, accelerate, defer, or curtail operations based on attainment of the approved prescription criteria or lack thereof, including daily validation of prescribed criteria on multi-day projects.
- Ensure that the forecast on-site weather parameters are within prescription at the time of ignition and predicted to remain so during the expected life of the burn.
- Ensure the availability of suppression resources in the event the prescribed fire escapes and is declared a wildfire.
- Control directly, or through supervision of the Firing Boss, the method, rate, and location of firing.
- Accomplish mop up to predetermined standards in accordance with the Prescribe Fire Burn Plan.
- Certify that the fire is out.

Holding Boss

The Holding Boss reports to the Burn Boss. The Holding Boss ensures that the fire is confined to the area designated in the burn plan and takes suppression actions when the fire exceeds or has the potential to exceed the planned area.

Firing Boss

The Firing Boss reports to the Burn Boss. The Firing Boss maintains control of all ignition sources, including aerial ignition devices, on the burn project at all times. The Firing Boss ensures that burn objectives will be met by the deployment, sequence, and timing of all ignition sources.

4.7 Water Resources

There are on-site freshwater resources at MMR,BMR, and at KTA. There are no water resources at the other installations. When on-site resources are depleted or are not available, the Army has established formal agreements with surrounding landowners to use water on their lands. A list of water resources approved for use during fire suppression is included below.

Table 29. Approved water sources for firefighting on Oahu.

Name/Location	Latitude	Longitude	Capacity (gal)	Use
Helemano 11	21.568188	-158.058513	Unknown	Aerial
Kahuku Dip Pond	21.676938	-157.985660	300,000	Aerial or Ground
Kawailoa 18	TBD	TBD	Unknown	Aerial
Makua Dip Pond 1 (Lower)	21.529782	-158.226835	300,000	Aerial or Ground
Makua Dip Pond 2 (Upper)	21.528903	-158.210382	300,000	Aerial or Ground
Makua Storage Tank	21.528297	-158.226951	60,000	Ground
Opaeula 15	21.575138	-158.052978	Unknown	Aerial
Opaeula 16	21.570362	-158.026999	Unknown	Aerial
Opaeula 2	21.574311	-158.037476	Unknown	Aerial
Ranch 10-B	21.551251	-158.132001	Unknown	Aerial
SBMR Dip Pond	21.505322	-158.077016	300,000	Aerial or Ground
Upper Helemano	21.527461	-158.027375	Unknown	Aerial

4.7.1 Kahuku Training Area

A 300,000-gallon capacity dip pond is sited near KTA Range Control. The water level will be maintained at a minimum of 75% of capacity when any pyrotechnics are used at KTA. The KTA Range Control Officer is responsible for immediately notifying the WFPM when service contracts are required to repair the dip pond. The KTA Range Control Officer is responsible for refilling the dip pond.

4.7.2 Makua Military Reservation

The Army maintains two 300,000-gallon capacity dip ponds at MMR to enhance its water supply resources and firefighting capability. These will be filled to a minimum of 75% (the seven-foot mark) prior to any training at MMR.

There is a fire hydrant near the Range Control Building.

A water tank is available near the Range Control building for firefighting operations. This tank will be upgraded to hold 60,000 gallons and an overhead standpipe fill station will be added to it per the Makua BO. The WFPM shall coordinate these upgrades with DPW Facilities. This tank will be filled to a minimum of 75% of capacity prior to any training at MMR.

The WFPM will coordinate with DPW Facilities to upgrade the water supply to provide water for the water tank and the lower dip pond as well as a watering station for filling the upper dip pond and for firefighting operations. This is required per the Makua BO. The upgrade will provide sufficient water to exceed the water supply currently provided by the 4 cm (1.6 in) water pipe that currently supplies MMR.

The MMR Range Control Officer is responsible for immediately notifying the WFPM when service contracts are required to repair either dip ponds. The MMR Range Control Officer is responsible for refilling the dip ponds and the water tank.

4.8 Firefighter Training

ARMY FIRE, USAG-HI firefighters, and outside cooperating agencies shall meet the required wildland training and physical fitness requirements outlined within each respective agency's established policies or training program.

All USAG-HI personnel engaged in fire suppression and prescribed fire duties will meet National Wildland Coordinating Group requirements for the positions they are assigned. The NWCG requirements are established in PMS 310-1, Wildland Fire Qualifications Guide. All USAG-HI firefighters will meet NWCG physical fitness standards or the Army's physical fitness standards.

Individuals will not be assigned duties for which they lack training and/or certified experience. All personnel dispatched or assigned to wildfires or prescribed fires will be qualified for their assigned position unless assigned as trainees under the direct supervision of higher qualified personnel.

4.8.1 Applicability

This program establishes training and qualification requirements for wildland planning, prevention, suppression, and supervision duties. The Wildland Firefighter Qualification Program was established to provide standardization for directorates and organizations that are responsible for wildfire duties under the Wildfire Management Program.

4.8.1.1 USAG-HI & USAG-HI

Any USAG-HI organization or directorate intending to supply human resources to Fireline duties during wildfire incidents will be expected to meet the requirements described in this program.

4.8.1.2 Federal Fire Department

USAG-HI recommends that FED FIRE adopt this program, or institute a similar policy, to ensure that USAG-HI receives the highest quality wildfire protection.

4.8.1.3 Cooperating Agencies

When responding to a wildfire incident on Army lands, the responding cooperative agency's wildfire qualifications are accepted at the firefighter level for internal agency supervision (within their own organization).

4.8.2 Training Standards

USAG-HI follows the training standards established by the NWCG, Interagency Incident Management Systems for Wildland Fire Qualification under PMS 310-1, Wildland Fire Qualifications Subsystem Guide, most current version. This program is designed to establish minimum training and qualification standards for wildland fire assignments to ensure safe and effective fire suppression.

4.8.3 Description of the Program.

4.8.3.1 Responsibilities.

USAG-HI and USAG-HI Commanders, Directors, Supervisors, and Leaders.
Ensure individuals requiring firefighting training within their command are available for scheduled training. They will notify the WFPM when the qualifications of their personnel expire.

Wildland Fire Program Manager
The WFPM approves the annual training plan and courses of instruction, monitors training for standardization and is responsible for selecting potential trainees, scheduling courses, proper use of task books, documentation of course completion, certification and recertification of trainees, and selection of personnel to fill ICS positions.

The Fire Operations Specialist (FOS) GS-0456-09/11 will develop an annual schedule of course instruction and a training plan for each Fiscal Year and submit the training plan and course of instruction to the WFPM for review and approval. The FOS will coordinate the training plan with other fire managers and outside agencies for cross-leveling and sharing training opportunities. Training will be announced with sufficient time for supervisors to schedule and meet workloads.

Incident Commander (IC).
The Incident Commander for each wildfire incident shall ensure that all responders are qualified for the duties assigned to them. The IC will consider the qualifications requirements of outside fire departments or cooperating responders for duties at the incident.

The IC is responsible for managing a training and qualification program on the incident, should one be used. The IC shall ensure that if personnel are assigned duties for which they are not properly certified, that they are directly supervised by someone who is qualified.

Individual Firefighters.
Each firefighter is responsible for showing proof of qualifications and completing training. This is usually in the form of an Incident Qualifications Card, commonly known as a 'Red Card'.

Individuals are responsible for informing their supervisor when qualification requirements are in danger of expiring and maintaining their uncompleted Position Task Books.

4.8.3.2 Training Method.
The USAG-HI Wildland Firefighter Qualification Program uses the same techniques as other NWCG based training programs where education and on the job, experience are both required for certification. The educational portion of the program uses the completion of approved training courses with a passing score on an examination, while the performance portion of the program uses hands on evaluation under realistic conditions to ensure proper performance under field conditions. Qualification is based upon course completion and hands-on performance as measured on the job.

Per NWCG requirements, all courses of instruction shall be taught by an NWCG certified instructor experienced in the skill being taught. USAG-HI will provide its own instructors for basic level courses (100/200 level) but will bring in outside qualified personnel from other state or federal agencies to teach more advanced courses.

The NWCG utilizes Position Task Books (PTB's) to document trainee on the job performance. PTB's will be used by USAG-HI wildfire managers and supervisors to keep track of everyone’s training experience. It is the responsibility of the trainee to maintain each of their PTB's.

4.8.3.3 Training

The WFPM will develop an overall program to ensure that all necessary individuals are trained and certified at an appropriate level for their expected duties.

The FOS will develop an annual schedule of course instruction and a training plan for each Fiscal Year (FY) for all USAG-HI firefighters. Training will be coordinated among USAG-HI fire managers, land managers, and ARMY FIRE.

To the degree possible, training will be open to personnel from USAG-HI or outside cooperative fire agencies with the goal of training as many firefighters as possible at each training session with a focus on mutual aid responders. In instances where prospective attendees exceed training capacity, USAG-HI firefighters will be given priority.

Training may be arranged by any USAG-HI agency. However, training must meet the criteria of this program and meet NWCG standards and will be coordinated with the WFPM.

4.8.3.4 Fitness Standards

All USAG-HI firefighters are required to meet NWCG fitness standards for the position(s) they are expected to hold. All personnel assigned to fireline duties must pass the NWCG pack test at the arduous level. The WFPM has sole discretion over fitness requirements for all other duties for personnel on Oahu. NWCG fitness categories are defined in PMS 310-1 as are the required fitness level for each ICS position. Work capacity tests shall meet requirements in PMS 307/NFES 1109.

4.8.3.5 Certification

Personnel who have learned skills or been NWCG certified from sources outside the Army, such as training programs through other agencies, shall not be required to complete specific courses or training again in order to qualify in a wildfire position. However, this training and experience must be documented and be consistent with the requirements outlined in this program and approved by the WFPM, and the individual must have maintained currency in the discipline as defined by PMS 310-1.

The training courses are required to prepare the employee to perform in the position. Training courses required for each position are defined by the NWCG in PMS 310-1. The WFPM has sole discretion over which individuals will be provided training courses on Oahu.

Certification will be documented and tracked by the WFPM and submitted to IMCOM for final certification and insertion in IQCS. A certificate and or copy of the certificate will be provided to ARMY FIRE, the individual who successfully completed the training, and the commander or director of the organization that the individual belongs to. All personnel qualifications will be maintained in the Army's central IQS/IQCS database IAW IMCOM Policy Memo.

The WFPM is responsible for maintaining all certification and will compile a qualification list of all wildland trained personnel in USAG-HI. Additionally, the WFPM will document training by issuing an incident qualification card. This is for use in identifying to outside agencies that the individual is qualified to perform in a specified position.

4.8.3.6 Currency Requirements

Currency requirements follow NWCG protocols. The "maximum time allowed for maintaining currency is three (3) years for air operations and dispatch positions and five (5) years for all others". Per PMS 310-1:

"Currency for a position can be maintained by meeting any of the following requirements:

1. By successful performance in the position qualified for within the given timeframe.
2. By successful performance in a position identified in [PMS 310-1] guide as Other Position Assignments That Will Maintain Currency.
3. By successful performance in a higher position(s) for which that position is a prerequisite, providing the individual was previously qualified in that position."

An annual safety refresher (NWCG course RT-130) is required for most ICS positions, including all Fireline duties.

It is the responsibility of the WFPM to annually certify the qualifications of all USAG-HI firefighting personnel. Personnel who have lost currency must re-take the required courses and go through the on-the-job training again.

5 Suppression Actions

5.1 Fire Response Protocols

5.1.1 Fire Detection and Reporting

Early fire detection is critical to an effective initial attack of wildfires on Army training lands. Any agency, unit leader, or individual noticing a fire is responsible for reporting it as soon as it is detected.

Any person witnessing a fire or detecting smoke must report it by contacting Range Control, ARMY FIRE, or dialing 911. Notification of fire managers and responders will be initiated through the Emergency Services Response System.

Upon detection of a fire, regardless of size or location, the Officer in Charge (OIC) will immediately halt training and notify Range Control, giving the location and size of the fire. Range control will contact ARMY FIRE and firefighting units will respond within 5 minutes of notification and be on-scene at SBMR within 12 minutes of call out.

Range Control will halt any training affecting access to the fire area. If it is determined by Range Control in communication with the IC that resuming training will not affect firefighting efforts, Range Control will notify units that training may resume. Units will not resume training until Range Control notifies the OIC that training may resume. Units shall follow the fire reporting and notification procedures that are outlined in the SOP for each respective FMA.

5.1.2 Initial Attack

Immediate and aggressive attack is the primary response to all fires on USAG-HI lands. If any wildfire suppression strategy other than full suppression is to be utilized in initial attack, the rationale must be documented as part of the Initial Attack Size Up Report.

Within the confines of due care for personnel safety, fires will be contained at a small size whenever feasible. Fiscal consideration must be secondary to ensuring timely and adequate availability of necessary firefighting resources.

Firefighting will follow standard wildland fire fighting procedures with an incident command system in place and a single Incident Commander or Unified Command.

Some fires may pose a threat to human safety. The IC will evacuate any areas/buildings considered threatened by the fire. Firefighters also have the authority to evacuate civilians or military personnel during wildfires when following the instructions of the IC. Military Security Officers may enter recently burned areas in order to secure an area or may enter actively burning areas with a properly certified escort at the discretion of the IC.

On fires that threaten protected resources, at least one member of the DPW Environmental Natural and/or Cultural Resources staff will be present within the incident command structure to provide information. This individual will be a liaison only. He/she will inform decisions made by the IC but will not have decision-making authority.

5.1.3 Extended Attack

The IC will request assistance for any fire exceeding the suppression capabilities of on-site resources. Additional requested resources will be deployed under the Incident Command System (ICS). The IC will establish a command post and communications plan. Extended attack action requires an Escaped Fire Situation Analysis to guide the re-evaluation of suppression strategies.

5.1.4 Communications

All firefighting crews will be in vocal or radio contact at all times. At a minimum, communications equipment and procedures will allow the ability to:

1) Conduct routine operations required for normal fire management.
2) Communicate clearly and effectively with a wide variety of firefighting agencies and material resources, including aerial resources, in the fire suppression effort.
3) Perform (1) and (2) simultaneously.

Telephones, cellphone, and radio are used in firefighting efforts. The telephone is the primary means of communications between fixed facilities. Radio is the primary means of communication between the fixed base facilities and mobile fire response vehicles, helicopters, or ground forces.

Should telephone communications fail or prove inadequate, radio communications will become the primary means of communication. The USAG-HI/USAG-HI Command Network is designed for this purpose and the Area District Fire Chief or IC will request its activation during emergency or natural disasters, if required.

Oahu fire response will use the Range Control frequency to communicate with Range Control and get to the fire location. Once on site, the IC shall notify all personnel to move to the Army Fire frequency. All operations on Oahu are conducted on the Army Fire Frequency. Radio traffic on the Army Fire frequency will be limited to those transmissions regarding fire suppression efforts.

Range Control shall monitor all radio transmissions during normal duty hours and any periods of live firing. Range Control shall be prepared to transmit information useful to the IC and fire fighting forces.

ARMY FIRE has radio facilities for external communications on mutual aid radio networks with local, state, and federal agencies.

5.1.4.1 Radio Networks

.
RANGE CONTROL PRIMARY RADIO NETWORK. Provides the means for the Range Control Officer to exercise technical control and direction over subordinate components of the Range Control and military training units assigned in direct firefighting support. This network may be reassigned to

the Incident Commander. The radio network may function as an alternative to ARMY FIRE radio network when radio facilities assigned to that network fail. Range Control Dispatchers will:

- Be familiar with the IWFMP and wildfire SOPs.
- Know who to notify in the event of wildfire and how to notify them.
- Know who to call if additional resources are required.
- Ensure emergency radio traffic is kept to a minimum.
- Be familiar with documentation and proper entries on the WFIR.
- Know how to access weather data.
- Activate helicopter support when requested by the IC.

USAG-HI COMMAND RADIO NETWORK. Allows the Installation Commander to exercise command and control over subordinate units, directorates, sub-installations, Disaster Commanders and in the case of a wildfire, the Incident Commander (IC). This network is activated as required for destructive weather, fire, and disaster or emergency conditions. Commanders may be directed to enter this network if such action is required due to circumstances of the emergency. The network control station will be at the Installation Operations Center (IOC)/Emergency Operations Center (EOC) at Schofield Barracks. The USAG-HI Command Radio Network is operated over a radio repeater that ensures complete radio coverage of Army installations and most surrounding communities.

5.1.5 Air Operations

Army and contract aircraft will be provided at the request of the IC pending availability. Aerial resources, once committed, are under the operational control of the IC.

5.2 Special Considerations for Fire Fighting on USAG-HI Lands

5.2.1 Unexploded Ordnance (UXO)

Explosive hazards may be encountered at any time on any installation, even when no training is occurring, but are most pronounced at MMR, SBMR. Duds on the ranges and in the training areas and live ammunition or explosives in the possession of military training units on the ranges create extremely hazardous conditions. Unexploded ordnance on the ranges is destabilized when heated by a wildfire and may detonate at any time.

Authorization to enter low hazard UXO areas is subject to approval by the Range Officer, Range Control Safety Technicians, or Explosive Ordnance Disposal (EOD) personnel. Fire suppression forces will not enter low hazard areas to conduct fire suppression operations down range unless authorized and properly escorted. If proper safety precautions are taken, firefighting in these areas is approved per Army Reg. DA PAM 386-63. Fire fighters will only request entry to low hazard UXO areas when fighting the fire there is required to establish or maintain control of the perimeter or to protect valuable resources.

All personnel are prohibited from entering high hazard areas. Under no circumstances will firefighters or soldiers enter designated high hazard areas to fight fires.

5.2.2 Live-Fire Military Training

Live-fire range facilities are hazardous whenever live-fire is occurring.. Access to the down range portion of the live-fire ranges to conduct firefighting operations is prohibited to all personnel while live-fire is taking place. A responding IC must ensure that these ranges are in a “check or cease fire” condition before sending fire suppression forces down range.

5.2.3 Protected Resources

USAG-HI lands contain dense pockets of highly valuable natural and cultural resources, many of which are protected by federal law. The WFPM will ensure that the ARMY FIRE Taskforce is familiar with those locations harboring the most sensitive resources and that protection priorities and suppression strategies reflect their importance. Specific guidance for each FMA is included in the respective SOP enclosure.

5.2.4 Minimum Impact Suppression

The Incident Commander (IC) will select suppression tactics sufficient to effectively control the fire while having the lightest possible environmental impact. This is referred to as Minimum Impact Suppression Tactics (MIST). Minimum impact suppression increases emphasis on minimizing the effects of suppression measures on the vegetation, soils, and watershed while providing sufficient suppression forces to suppress a wildfire.

Minimum impact suppression tactics will not override considerations for safety or containment and control of the wildfire. However, they will be used to the maximum extent possible within these constraints. On USAG-HI lands, many fires are fought from pre-existing firelines, firebreaks, or from the air making compliance with MIST relatively easy.

Protection of the local environment will be considered in fire management strategies, particularly in the location of fuelbreaks and control lines. Special biological resources will be protected from fire and suppression activities and are identified in each installation's SOP Enclosure (Enclosures 4 through 11 to the SOP).

Fire managers and Incident Commanders will familiarize themselves with:

- Long term effects of physical ground/vegetation disturbance.
- Alien vegetation introduction through the use of dirty equipment or the creation of invasion routes.
- Creation of erosion problems.
- Protection of natural resources and cultural sites.
- Limitations on use of fire suppression chemicals (foam and retardant).

  AFFF usage and spills must be reported to DPW Environmental to complete reporting requirements in compliance with ASD (IE&E) memorandum, (Army Policy for Response and Reporting of Aqueous Film Forming Foam (AFFF) Usage and Accidental Releases or Spills on Military Installations and National Guard Facilities and for Reporting of Mutual Aid Responses Involving AFFF), 15 September 2022.

  AFFF usage must be in compliance with current DOD AFFF MIL-SPEC (MIL-PRF-32725) dated 6 January 2023.

During fire suppression the IC will:

- Ensure minimum impact suppression tactics are implemented during line construction and other environmentally destructive activities.
- Consult with environmental staff prior to implementing line construction in sensitive areas, providing time permits and proper personnel are available.

Bulldozers are a useful tool in fire suppression efforts but can have a severe impact on natural and cultural resources. Dozers will primarily be used to construct fire-lines within pre-established fuelbreaks as this provides for safe dozer operations, enhances ground firefighter safety, and causes the least environmental impact. The use of dozers is restricted in biologically sensitive areas. Dozer operators will be:

- Equipped and trained for wildland fire protection.
- Trained in environmental sensitive issues relating to the use of dozers (i.e., long term effects of physical disturbance, potential introduction of alien plants, erosion control, and location of endangered and threatened species populations).
- Given natural/cultural resource orientation prior to any work assignment to an FMA.

If dozer operators have not been trained on environmental issues, a swamper (escort) who has been trained, will accompany every dozer and mark a path that will have a minimum impact. When fire conditions and safety permits, DPW Environmental personnel trained in basic wildland fire behavior, may be utilized as swampers.

The aerial use of chemical retardant, fire foam and saltwater will be weighed against the potential for fire damage to sensitive plants. However, no foams or additives are currently being utilized by ARMY FIRE. In the event foams are used at some point, usage must be in compliance with the references above.

6 Post-Fire Actions

6.1 Records and Reports

All wildfire incidents will be recorded in accordance with Army record management policy. The ARMY FIRE WFPM will maintain all wildfire records. Fire records will be kept in a database as part of long-term land management records and will not be disposed of at any time. Fire records will not be subject to Army limitations on record keeping and will be kept indefinitely.

6.1.1 Federal Fire Department Reports

The Federal Fire Department will complete a fire report in the National Fire Incident Reporting System (NFIRS) on incidents that are not in training areas and where they are the IC. This report will be available to the Army FIRE Wildland Fire Program Manager within 24 hours of conclusion of the incident through NFIRS.

6.1.2 Fire Reports to U.S. Fish and Wildlife Service

The WFPM will supply a copy of the fire report, for any fire that burns in an environmentally sensitive area, to the DPW Environmental Natural Resources Manager. The DPW Environmental Natural Resources Manager will make a determination whether to provide the fire report to the USFWS.

Environmentally sensitive areas include, but are not limited to:

- Any fire outside the firebreak at SBMR, MMR, or DMR
- Any BSA
- Any Critical Habitat

All of these environmentally sensitive areas are depicted on maps in Enclosures 4 through 11 of the SOP and Figures 33 – 39 of this IWFMP (Enclosure 12 of the SOP).

The WFPM and Oahu DPW Natural Resources Manager will notify the USFWS within 48 hours of the extinguishment of any fire that directly affects a listed species.

The WFPM and the DPW Natural Resource Manager will coordinate submission of quarterly fire incident reports for fires that directly affect listed species at MMR to USFWS no later than 10 January, 10 April, 10 July, and 10 October of each calendar year. Fire incident reports for fires that directly affected listed species at all properties other than MMR will be provided to USFWS semi-annually.

The WFPM and DPW Natural Resources Manager will coordinate submission of quarterly reports detailing the location of all munitions impacting outside the south lobe of the firebreak road at MMR.

6.2 Reviews and Formal Investigations

6.2.1 Informal Reviews

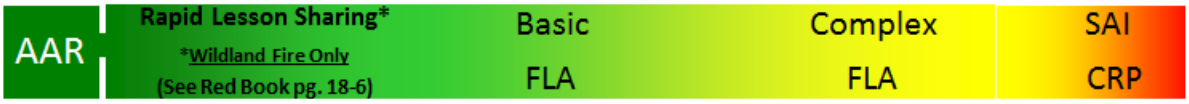
All wildland and prescribed fires will be informally reviewed regardless of size. These may be conducted as After-Action Reviews or tailgate briefings. All informal reviews will be conducted as constructive critiques aimed at determining the facts related to the specific fire. Reviews are intended to resolve operational issues and reinforce proper tactics, not impose punitive actions. Reviews are also conducted for the following purposes:

- To examine the progress of an ongoing fire incident and to confirm effectiveness of decisions or to correct deficiencies.
- To identify new or improved procedures, techniques, or tactics.
- To determine the cost effectiveness of a fire operation.

Informal reviews can be conducted by the WFPM and will serve as sufficient documentation on fires less than four hectares (ten acres) in which no unusual events occurred.

6.2.2 After Action Reviews (AAR) and Facilitative Learning Analysis (FLA).

When choosing between an AAR or an FLA consider that the FLA process is adaptable based on the situation. Think of it like the management of wildland fire, the more complex the further up the scale you should go. The FLA implementation guide is included in Appendix 5.



1. AAR: Similar to a Type 5 or Type 4 incident in fire management, it involves conducting a local After-Action Review (AAR), which is simple, cost-effective, and quick. AARs are confidential and focus on local learning.
2. Basic FLA (Enhanced): This is a more thorough response that fulfills agency requirements. It's like an "After Action Review on Steroids" and can be led by a small team. It may result in a short report or a more comprehensive one if more time and resources are available.
3. Complex FLA: This in-depth process delves deeply into unintended outcomes and generates lessons for the entire organization. It involves a larger team, including experts, working for an extended period to produce a comprehensive report. This report tells a compelling accident story and analyzes the event's nature and surrounding conditions.

On fires where any of the following occurred, it is required that the WFPM conduct a basic FLA.

- Failure to follow instructions.
- Damage to any protected resource including, but not limited to, protected species, protected habitat, or any cultural resource.
- Fires burning within 200m (~1000 ft) of USAG-HI property boundaries.
- Excessive response time.

Required participants in the Basic FLA:

- WFPM - (Wildland Fire Program Manager)
- The Incident or wildfire IC - (Incident Commander)
- DES Director or Deputy Director

Optional participants are:

- DPW Environmental Representative- if damage to any protected resource including, but not limited to, protected species and protected habitat.
- PPW Cultural Representative- if damage to any cultural resource.
- Range Control Representative- if there are issues concerning range operations and procedures in regard to the incident.
- 25th ID CAB (Combat Aviation Brigade)- if there are concerns involving the operation and procedures of the CAB on the incident.

6.2.3 Formal Investigations or Complex FLA

The Installation Commander will decide at the conclusion of any major incidents if a formal investigation or Complex FLA is necessary. The Commander may base this decision on advice or recommendations from the fire investigator(s), the WFPM, the Range Officer, the Provost Marshal, the Staff Judge Advocate, Inspector General, or the Chief of the Environmental office.

If the Installation Commander deems a Complex FLA is necessary, then it is advised that the FACILITATED LEARNING ANALYSIS IMPLEMENTATION GUIDE be utilized. See Appendix 5.

If the Installation Commander deems a formal investigation necessary, an investigating officer or review board shall be assigned to conduct a formal investigation. Formal investigations will be carried out in accordance with Army Regulation (AR) 15-6, "Procedures for Investigating Officers and Board Officers". The Installation Commander shall review the findings and recommendations of the assigned investigating officer or review board. All formal investigations will include an AAR.

ARMY FIRE Chief, WFPM, or the Installation Commander may request a formal investigation of any fire, but formal investigations should be limited to fires involving the following:

- Any fire on Oahu greater than ~500 ac.
- Training related fires escaping or starting outside of the boundary of any USAG-HI property.
- Any fire escaping the boundary of any USAG-HI property.
- Damage or loss of property exceeding $10,000.00.
- Incidental loss of federally protected plant or animal species.
- Damage to any cultural resource.
- All entrapments or fire shelter deployments.
- Major injury or fire fatality.
- Believed to be intentional Arson.

6.3 Post-Fire Analysis

6.3.1 Surveys

In addition to the reports and reviews that are completed immediately after a wildfire, a post-fire survey and analysis of the burned area may be required depending on the fire's location and damage caused. Surveys will be performed at the discretion of the WFPM, or the DPW Environmental

Natural or Cultural Resources Managers.

A post-fire survey may be combined with any of the informal or formal investigations. A post-fire survey will determine all or part of the following:

- The effect the fire may have had on installation infrastructure, native or alien flora and fauna, and cultural resources.
- The effectiveness of the pre-suppression measures including fuel modifications.
- The effectiveness of the suppression resources and measures used.
- The effectiveness of the ICS.
- The effectiveness of fire/fuel models used.
- A safety review of suppression actions.
- UXO contamination or potential for UXO cleanup operations.

Post-fire surveys will be conducted in coordination with the DPW Environmental and ITAM offices. Soliciting support from other cooperators or subject matter experts is encouraged. Cooperation may be required with external authorities, such as Special Agents of the US Fish and Wildlife Service, who may assist USAG-HI personnel in damage assessment. If a UXO survey is desired, then coordination with the Explosive Ordnance Disposal unit is necessary.

If during the survey it becomes evident that a wildfire has affected a BSA/ASR or threatened or endangered species, the USFWS and the State of Hawaii DOFAW will be notified.

The effects of fire on federally protected species or effects from catastrophic fire events (e.g., severe erosion or water pollution) must be surveyed at the earliest opportunity.

6.3.2 Monitoring

Post-fire monitoring of vegetation may be appropriate in some circumstances. Fires can provide opportunities to investigate the effects of burning on native plants, invasive plants, and the dynamics between the two. Post-fire monitoring may be incorporated into normal land/natural resources condition studies at the discretion of the DPW Environmental Natural Resources Manager and/or the ITAM Coordinator.

6.3.3 Post-Fire Restoration

Some fires may require post-fire restoration, rehabilitation, and/or revegetation to prevent long-term problems with soil erosion, loss of cover and concealment, and conversion from native to invasive species. Large scale revegetation of burned areas with native vegetation is not feasible at this time due to limitations in understanding of native/invasive species competition dynamics and a lack of extensive seed sources. Research by the U.S Forest Service into this subject area is ongoing. Revegetation with non-native species will be reviewed by the USFWS prior to implementation if listed species or Critical Habitat will be affected.

7 Budget and Implementation

Table 30 summarizes the responsibilities for funding and implementation of each major task in the IWFMP. Firefighter salaries, standard equipment (brush engines, hose, pumps, etc.), and training are funded through the standard DES budget and are not included here.

Where more than one directorate/individual is responsible, responsibility is listed with primary responsibility first and decreasing responsibility following.

Table 30. Projects and maintenance required by the IWFMP by geographic location. A 3% per year inflation factor is assumed for all projected costs.

Installation	Project	Capital Expenditures			Maintenance Expenditures							Implementation Responsibility	Comments
		Capital Cost	FY of Capital Expenditure	Capital Funding Responsibility	2023	2024	2025	2026	2027	2028	Maintenance Funding Responsibility		
All	RAWS Purchase and Maintenance	$0	N/A	WFPM	$18,000	$18,540	$19,096	$19,669	$20,259	$20,867	WFPM	WFPM	
All	Prescribed Burning (Fuels Management)	Varies	N/A	WFPM	$0	$0	$0	$0	$0	$0	N/A	WFPM	
All	Prescribed Burning (UXO or Other Purpose)	Varies	N/A	Directorate Making Request	$0	$0	$0	$0	$0	$0	N/A	WFPM	Costs borne by directorate making burn request
Oahu	Fill Dip Ponds/ Water Tanks	$0	N/A	N/A	$0	$0	$0	$0	$0	$0	HQ USARHAW	HQ USARHAW	Water supplied from existing water infrastructure
Oahu	Maintain Dip Ponds/ Water Tanks	$0	N/A	N/A	$20,000	$20,600	$21,218	$21,855	$22,510	$23,185	WFPM	WFPM	Average. 20 yr. liner replacement cycle.
DMR	Firebreak and Fuelbreak	$0	N/A	N/A	$85,924	$88,502	$91,157	$93,892	$96,709	$99,610	DPW Maint.	DPW Maint.	
DMR	Fire Access Roads	$0	N/A	N/A	$212	$218	$225	$232	$238	$246	DPW Maint.	DPW Maint.	Based on one herbicide treatment/4yrs
DMR	Military Vehicle Trail Fuels Maintenance	$0	N/A	N/A	$3,047	$3,139	$3,233	$3,330	$3,430	$3,533	HQ USARHAW	HQ USARHAW	
KLOA	Fire Access Road	$0	N/A	N/A	$0	$0	$0	$0	$0	$0	DPW Maint.	DPW Maint.	Maintained as part of standard range maintenance
KLOA	Military Vehicle Trail Fuels Maintenance	$0	N/A	N/A	$9,833	$10,128	$10,431	$10,744	$11,067	$11,399	DPW Maint.	DPW Maint.	
KTA	Fire Access Roads	$0	N/A	N/A	$0	$0	$0	$0	$0	$0	DPW Maint.	DPW Maint.	Maintained as part of standard range maintenance
MMR	North and South Firebreaks & Fire Access Roads	$0	N/A	N/A	$0	$0	$0	$0	$0	$0	DPW Maint.	DPW Maint.	Maintained as part of standard range maintenance
MMR	60 m North and South Firebreak Fuelbreaks	$0	N/A	N/A	$86,772	$89,375	$92,057	$94,818	$97,663	$100,593	DPW Env.	DPW Env.	Based on once quarterly mowing
MMR	Lower Ohikilolo Fuels Management	$0	N/A	DPW Env.	$13,200	$13,596	$14,004	$14,424	$14,857	$15,302	DPW Env.	DPW Env.	
MMR	Military Objectives Fuels Management	$0	N/A	HQ USARHAW	$0	$0	$0	$0	$0	$0	HQ USARHAW	HQ USARHAW	Maintained as part of standard range maintenance
MMR	Upgrade Water Tank	$130,000	14	DPW Env.	$0	$0	$0	$0	$0	$0	DPW Fac.	DPW Fac./WFPM	
MMR	Upgrade Water Supply	$75,000	14	DPW Env.	$0	$0	$0	$0	$0	$0	DPW Fac.	DPW Fac.	
SBER	Fire Access Road	$0	N/A	N/A	$0	$0	$0	$0	$0	$0	DPW Maint.	DPW Maint.	Maintained as part of standard range maintenance
SBMR	Impact Area Firebreak	$0	N/A	N/A	$116,898	$120,405	$124,017	$127,737	$131,569	$135,516	DPW Maint.	DPW Maint.	Maintained as part of standard range maintenance
SBMR	South Range Firebreak	$0	N/A	N/A	$46,873	$48,279	$49,727	$51,219	$52,756	$54,338	DPW Maint.	DPW Maint.	Maintained as part of standard range maintenance
SBMR	MF Firebreak	$92,744	14	DPW Env.	$33,202	$34,198	$35,224	$36,281	$37,370	$38,491	DPW Maint.	DPW Maint.	
SBMR	Prescribed Burn SBMR	$0	N/A	N/A	$46,400	$47,792	$49,226	$50,703	$52,224	$53,790	HQ USARHAW	WFPM	Assumes no overtime
SBMR	Monitor Prescribed Burn Effects	$0	N/A	N/A	$0	$0	$0	$0	$0	$0	DPW Env.	DPW Env.	
SBMR	Construct Fire Station SBMR	$10,000,000	2023	WFPM	$0	$0	$0	$0	$0	$0	HQ USARHAW	HQ USARHAW	
SRAA	Firebreak	$0	N/A	N/A	$180,207	$185,613	$191,181	$196,917	$202,824	$208,909	DPW Maint.	DPW Maint.	
SRAA	Fire Access Roads	$0	N/A	N/A	$32,961	$33,950	$34,968	$36,017	$37,098	$38,210	DPW Maint.	DPW Maint.	

DPW Env. = DPW Environmental
DPW Maint. = DPW Maintenance
DPW Fac. = DPW Facilities
HQ USARHAW = Headquarters U.S. Army Hawaii (Range Control)
ITAM = Integrated Training Area Management
WFPM = Wildland Fire Program manager

Appendix 1 – Air Operations Wildland Fire Management Plan

25TH INFANTRY DIVISION

AIR OPERATIONS

WILDLAND FIRE MANAGEMENT PLAN

12/14/2022

1. AIR OPERATIONS.

1.1 Objective.

a. This Aviation Plan establishes policy and procedures for requesting the use of Army military helicopters and Army contracted helicopters capable of providing aerial support during wildland fires on military installations and within the state of Hawaii. This Aviation Plan further outlines the responsibilities required to provide essential logistical support to military helicopters operating fire support missions.

b. Firefighting is a secondary duty for all Army aviation assets resulting in less-than-ideal response times for aerial assets. Additionally, Army pilots are often only stationed in Hawaii for 2 to 3 years providing them with little opportunity to become proficient in aerial helibucket operations.

1.2 References.

- AR 95-1/2/3
- AR 420-90, Fire Protection, Facilities Engineering
- AR 420-1, Army Facilities Management
- PTA External SOP, Oct 98
- 25th CAB Flight Standardization and Training SOP, 1 Sep 2013
- Mutual Aid Fire Fighting Agreement, 17 May 2012

1.2.1 Aircraft Use.

Helicopters are a proven, powerful, multi-mission weapon in the fight against unplanned wildfires. Helicopters provide close-in aerial delivery, with rapid refill and return time, to provide essential support to contain a fire and prevent the loss of life, property, and natural/cultural resources from wildfires.

Fire Managers use a variety of helicopters to augment ground operations. Fire managers use helicopters in a wide variety of ways:

- Transport equipment, supplies, and hand crews.
- Aerial observations
- Command and Control
- Fire Suppression and Containment support utilizing Water Buckets

Helicopters are required, during live fire training exercises, to stage on-site at Makua (MMR) and during Battalion-sized training at PTA as a risk management/mitigation tool in order to decrease response time.

Aerial operations can utilize Army helicopters, fire agency helicopters, or helicopters under contract. Military aircrews conducting aerial bucket operations must be certified and current in accordance with the appropriate Aircrew Training Manuel.

The Army utilizes military helicopters capable of helibucket operations to combat wildland fires on Army training lands. A mutual aid agreement has been incorporated so that the military can assist other state and local agencies in the combat of wildfires off military installations.

1.2.2 Proponency.

The 25th Infantry Division, G3 Aviation is the proponent for this Aviation Plan.

1.2.3 Notification

a. The Installation Operations Center (IOC) will notify 25th ID Division Operations Center (DOC) to request the use of 25th CAB aircraft to conduct helibucket operations to combat wildland fires on military installations or within the state of Hawaii if necessary. (Reference 5.7.2.1-3)

b. Authorization. Notification for support from military helicopters will be coordinated through the Chain of Command. Military aircraft may be used when any of the following are occurring:

(1) Fire threatens loss of life, property, and natural/cultural resources on military land.

(2) Fire started because of military training activity.

(3) Fire started on military property and threatens civilian property or off post resources.

(4) Fire started on civilian property and threatens military property.

(5) Fire has grown and requires large lift capacity.

(6) Fire not accessible by ground fire units.

(7) All other fire suppression assets are committed.

(8) Support is provided to another governmental agency (Federal State or County) per an agreement.

(9) Declared Federal or State disaster support.

1.2.4 Aircraft Alert Response Schedule.

a. Military aircraft are limited to daylight helibucket operation missions only.

b. 25th ID Combat Aviation Brigade will execute a fire mission request as quickly as possible.

(1) Daily schedules and alert response times will follow the Step-Up Staffing Plan and are as follows:

Staffing Class	SC1	SC2	SC3	SC4	SC5
Fire Danger	Low	Moderate	High	Very High	Extreme
Aviation	1 UH60 or 1 CH 47 2hr Call Back -4hr on Weekends	1 UH60 or 1 CH 47 2hr Call Back -4hr on Weekends	1 UH60 or 1 CH 47 2hr Call Back -2hr on Weekends	1 UH60 or 1 CH 47 1hr call back 1 UH60 or 1 CH 47 2hr Call Back	1 UH60 or 1 CH 47 30 Min Launch 1 UH60 or 1 CH 47 2hr Call Back

1.2.5 Command and Control.

Command and control of a fire scene will be organized under the Incident Command System (ICS) and as follows:

Firefighting operations on military property will be coordinated by the Army Fire Service (ARMY FIRE), which is subordinate to the Directorate of Emergency services (DES).

Firefighting operations on state, county, or city property will be coordinated by the responsible controlling agency of that land, i.e., State Forestry, State Civil Defense, National Park Service, Civilian Fire Department, or through a Unified Command.

Aircraft in formation or from the same unit may coordinate internally.

A "Ground Contact", Firefighter on the ground, may be designated to control aircraft for the incident commander (IC) and act similarly to an air traffic controller to coordinate large numbers of aircraft.

Radio Frequencies. A common interagency working radio frequency for "checking in" during a fire will be developed. The following radio frequencies are to be used by helicopters at the fire scene:

UHF	250.10	Fire Bucket Operation Frequency
VHF	122.925	Army Fire Department
	123.456	Hawaii County Fire Department
FM	38.30	Primary Range Control (SB, Makua, PTA)
	40.70	Alternate

Close coordination between air and ground operations is critical for both safety and effectiveness. The IC must configure communications so that air to ground and air to air communications can be established. The IC must prioritize when and where to use air resources to maximize their effectiveness and their value to ground operations.

1.2.6 Aerial Fire Bucket Operations.

Military and civilian contracted aircrews can be assigned to conduct helibucket missions provided that:

- The crew is qualified and briefed to conduct operations.
- The aircraft is equipped to carry and operate the aerial helibucket.
- The weather meets the requirements for Visual Flight rules (VFR) at the operational area.

Normally the owning unit/operation of helibuckets is responsible for recurring maintenance and repairs. However, during aerial attack operations, Oahu Fire and Emergency services personnel may be available for emergency repairs.

Helicopter Fire Bucket Capacities

Agency	Aircraft Type	Lift Capacity (Gals)	Bucket Type
US Army	CH-47F "Chinook"	2000	Bambi
	UH-60L/M "Blackhawk"	660	Bambi
County Fire	Hughes 500/Bell 206	75/110	Bambi
Civilian	Hughes 500/Bell 412	110/200	Bambi

*** Note: Lift capacities may be less than indicated at higher elevations.**

1.2.7 Execution.

All pilots and aircrew members will be certified and trained in helibucket operations and fire suppression tactics in accordance with the appropriate Aircrew Training Manual for wildland fires to conduct helibucket operations to effectively suppress a fire.

The assigned aircraft will ensure mission briefings, aircrew safety briefs, and aircraft preflight are completed to meet the assigned mission requirements.

Before beginning the mission, the information regarding the fire incident will be provided via the 25th ID DOC.

Upon arrival at the fire scene, the air mission commander will attempt airborne and/or ground communication with the Incident Commander for an operational briefing. If two-way communications cannot be established, military helicopters will attempt to land near the Incident Command Post (ICP)

for a face-to-face brief. The following information should be passed during the operational brief:

- Update of fire scene: hazards, fire movement, location of critical sensitive areas, populous and/or structures being threatened by wildfires.
- Tactics, strategy, and areas of responsibility.
- Water resource locations.
- Additional helicopters working in the area and location.
- Call signs and radio frequencies of airborne and ground fire suppression units.
- Other special requirements.

1.2.7.1.1 In the absence of air to ground radio communication, military helicopters should adhere to the following:

- Work the flanks of the fire from the heel toward the head fire(s).
- When combating wildfires off military installations, civilian fire department or contract helicopters have primary responsibility for firefighting; therefore, military helicopters should stay clear of their operating area.
- Avoid approaches that produce downwash in the vicinity of other firefighting aircraft, vehicles, and personnel.
- If the fire presents danger to structures or residential area and additional support appears necessary, establish separation to integrate with other helicopters working the area.
- Always remain predictable for enroute, drop, and egress routes.

- For extended attack or prolonged fire suppression operations, or as directed by the appropriate chain of command, an air-to-ground radio support component may be required for insert to the Command-and-Control Center or at the fire scene CP, to further enhance radio communication.

1.2.8 Unit Responsibilities:

(a) Operations Officer: Maintain a current hazards map of all Army training areas. Currency of hazards posted will be confirmed by pilot report on mission debriefings. If more than 30 days have elapsed since the last hazard confirmation, a day recon is required prior to execution of helibucket operations.

(b) Unit Commanders: Ensure that specific crew experience/mix is considered in selecting flight crews for helibucket operations.

(c) Pilot in Command: Overall responsibility for pre-mission planning, water weight/gallons lift capabilities, crew briefings, mission execution and mission abort/safety criteria.

(d) Crew Chief: Ensure that cargo hook and helibucket mechanisms are properly rigged and in functional working order prior to and during helibucket operations; ensure that aircraft electrical receptacles are inspected. Perform duties for lift/drop coordination and safety as directed by the Pilot in Command.

1.2.9 **Qualification/Currency**.

Qualification/Currency will be in accordance with the appropriate Aircrew Training Manual.

1.2.10 Aviation Procedures:

Pre-mission Planning: Will include specific attention to flight crew qualifications, crew experience/mix, compliance with the crew endurance program, determination of maximum gallons of water that can be lifted, and maximum flight hours on-station.

Passengers: Are not permitted on board during helibucket operations. The Battalion Commander is the waiver authority to this restriction.

Night Vision Goggles (NVGs) Fire Bucket Operations are considered an extremely high-risk mission requiring the first General Officer in the chain of command to provide mission approval.

1.2.11 Special Requirements.

Standby Helicopters are required on site during Live-fire training at Makua (MMR.

Training units without aviation assets will coordinate tasking through appropriate channels for a standby helicopter to remain on-site during live-fire training at MMR in accordance with range training SOPs.

Standby helicopters will augment ground firefighting resources during initial attack on wildfires caused by live-fire activities on training ranges. The ability to control the spread of wildfires from the onset and extinguishing wildfires at its earliest will further enhance training opportunities.

Water Resource Locations. Water resource locations that are approved and available for training and/or use during emergency helibucket missions will normally be one or more of the locations identified in this plan (See Reference 5.7.4).

Transportation of DOD personnel and equipment. This Aviation Plan authorizes in cases where an emergency exists, the requirement to transport DOD firefighting personnel or required fire equipment to a fire scene by military aircraft IAW AR 420-1, Army Facilities Management.

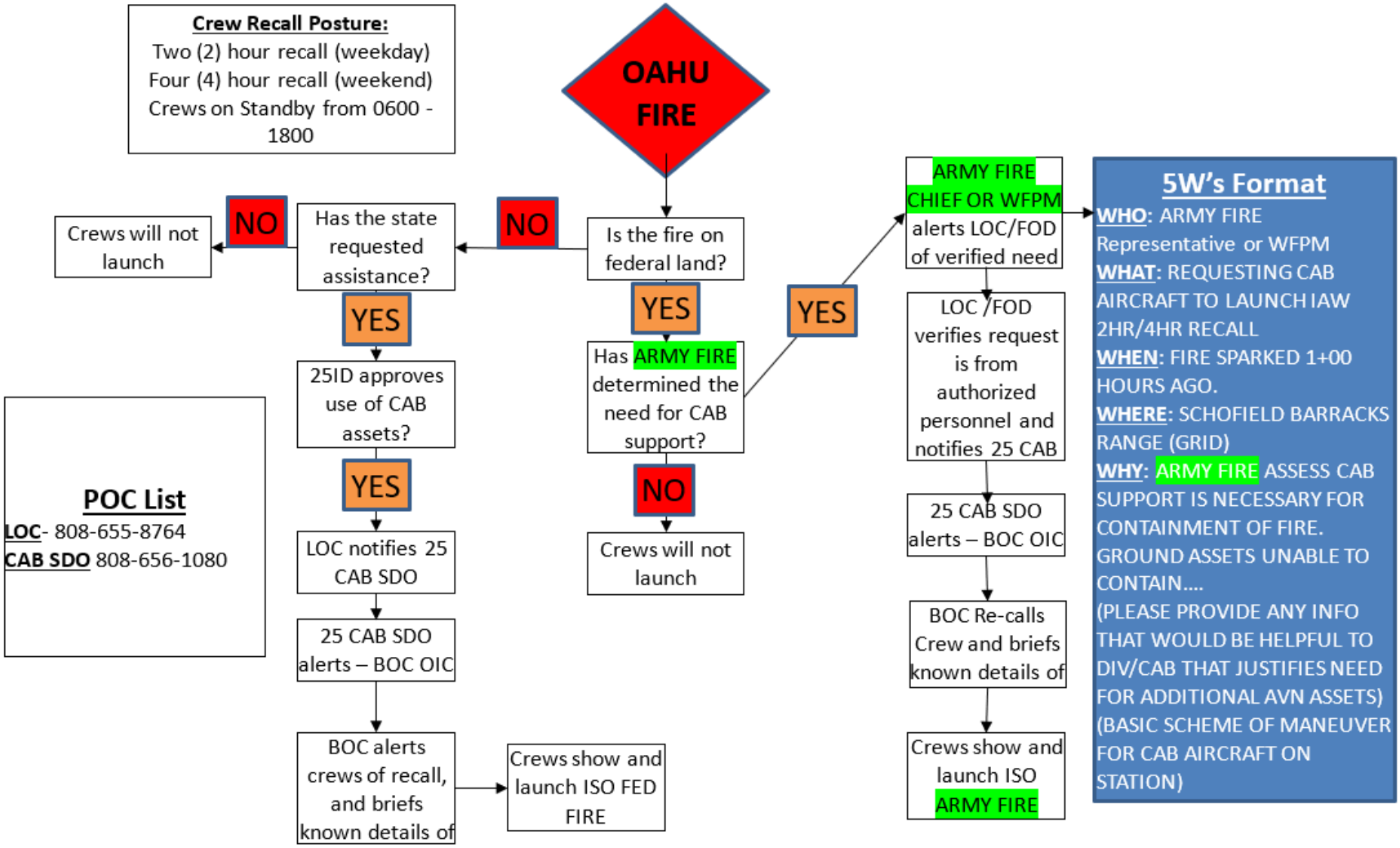
1.2.12 Airspace.

Restricted Airspace. All applicable Federal Aviation Administration (FAA) airspace control measures, local air traffic control rules, and Army regulations must be followed during aerial firefighting operations. Aircraft must contact the controlling FAA or military air traffic control tower, or Range Control, to enter or exit airspace and to obtain specific routes or flights. Operations within USARHAW R-3109 (SBMR), R-3110 (MMR), and R-3103 (PTA) can be coordinated with Range Control on FM 38.30.

During large scale extended attack, the IC may establish a special use airspace for aerial firefighting operations within the restricted military airspace. This must be done in coordination with the controlling agency.

REFERENCE 5.7.2.1
FIRE BUCKET SUPPORT COMMUNICATION PLAN

***DES shall have the authority to initiate immediate requests for helibucket support in the event of imminent threat of fire escape from the military installation boundary**



REFERENC 5.7.4
AERIAL FIRE BUCKET WATER SOURCE LOCATIONS

OAHU TRAINING AREAS:

RESERVOIR	GRID COORDINATES
Ranch 10-B	EJ 895837
Kawailoa 18	FJ 473844
Opaeula 16	FJ 005859
Opaeula 2	FJ 993864
Opaeula 15	FJ 977864
Upper Helemano	EJ 005812
Helemano 11	EJ 971857
Makua Dip Pond 1	EJ 801810
Makua Dip Pond 2	EJ 818809

Appendix 2 - Updated Fire Danger Rating System Methods.

The FDRSs throughout the USAG-HI IWFMP have been adjusted relative to the 2003 IWFMP. This is due to an increase in the quality and quantity of fire history and weather data compiled since that time. The following is an explanation of the methods used to create the updated USAG-HI IWFMP FDRSs.

DMR, KTA, KLOA, SBER

The same method used in the 2003 IWFMP was used again to update the FDRS at these installations. The difference in the BI from the 2003 IWFMP to the current plan relates to the additional weather data recorded since 2003. The method involves correlating 50 randomly chosen BI readings with flame length outputs from BEHAVE using the custom guinea grass fuel model. A full description of the method is available in "Wildland Fire Risk and Management on West and South Ranges, Schofield Barracks, Oahu" (Beavers and Burgan, 2001).

Because some of the weather stations had only been running for two or three years when the 2003 IWFMP was written, there are some FDRSs with fairly substantial changes, particularly at the low (Green) end. Because there is now more data, mostly in the range of 7 to 10 years, the updated FDRSs should be more accurate than the old ones.

SBMR and SRAA

SBMR and SRAA share a FDRS, though it is run off of each installation's RAWS separately. Though the conditions at SRAA may be slightly different, the SRAA RAWS was installed in mid-2008 and there is not enough data currently to develop a reliable FDRS solely for that site.

There is over 10 years of reliable weather and fire data from SBMR. Therefore, it is possible to run an analysis of weather/fire correlations and develop a FDRS in that manner, rather than through a correlation between weather/model outputs as was done for the 2003 IWFMP. This method is more accurate as it is a direct correlation between fire occurrence and RAWS outputs.

The weather data included all weather from the SBMR Range RAWS (WIMS ID 499902). Fire occurrence data came from the USAG-HI fire history created for this IWFMP and runs through 2009. These data were all entered into Fire Family Plus, a fire weather analysis program.

The following fire analysis options were used to develop conditional and non-conditional probability analyses of fire occurrence.

- Fire Cause - All
- Analysis Type - Both (cumulative and probability)
- Fire Definitions - Large Fire = 5 acres
  - Multi Fire Day = 2 fires
- Analysis Variable - BI

There was insufficient data for a conditional probability analysis of multi and large fire days. While this is disappointing, it reflects the fact that there have only been a small number of large fires at SBMR and only occasionally does more than one fire ignite on any given day. Figure 1 below illustrates the probability of a fire based on BI. The results for large fire days and multi-fire days are suspect due to insufficient data.

Figure 1 - Probability of a fire at Schofield Barracks West and South Ranges based on the Burning Index derived from the Schofield Barracks Range RAWS.

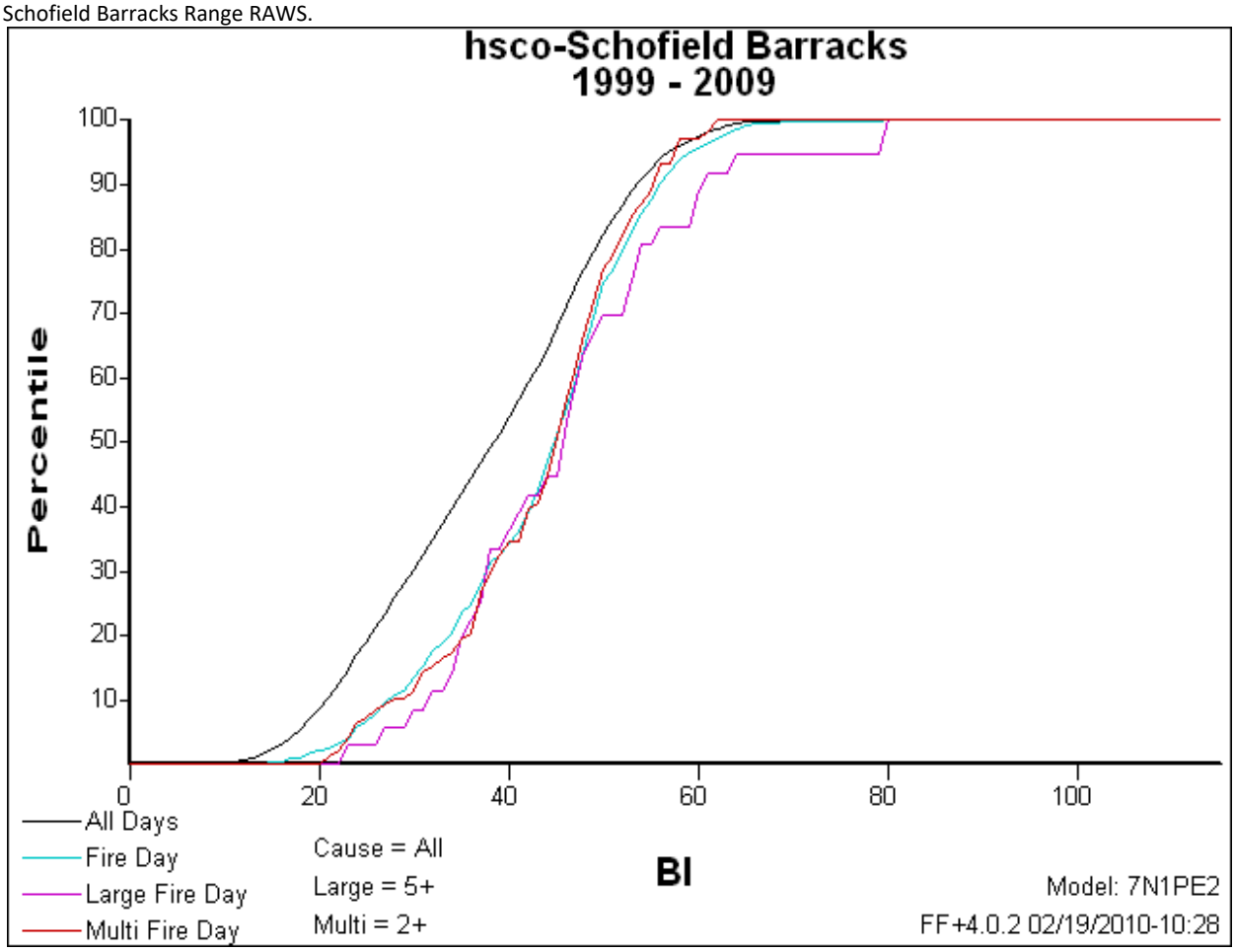
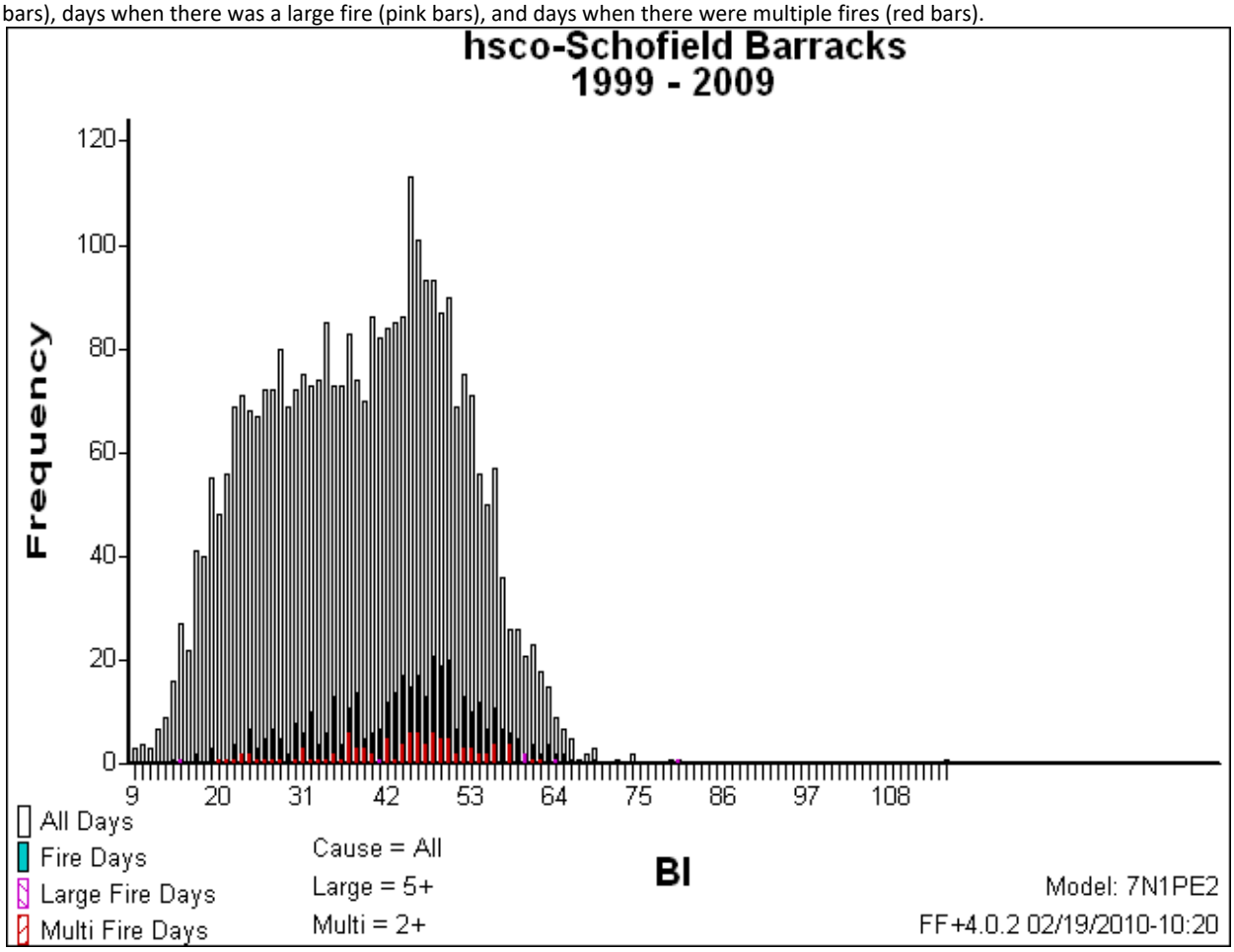


Figure 2. Histogram of the Burning Index from the Schofield Barracks Range RAWS showing days when there was a fire (black bars), days when there was a large fire (pink bars), and days when there were multiple fires (red bars).



These results are for the *daily* BI, collected once per day at 1300. An hourly analysis of this type is not possible with current software packages. Nonetheless, most fires at SBMR occur in the middle of the day when the daily BI is representative of conditions for the day as a whole.

There are two notable pieces of information in these graphs. The first is that large fires (pink) are very rare below a BI of about 30. There was only one large fire on a day with a BI of 22 or less. The second is that the fire frequency (histogram), does not show any consistency in fire starts until the BI is greater than 22. These two pieces of information suggest that below a BI of 22 there is very little fire activity, so the fire risk is low. Below a BI of 30, there is very little, large fire activity, so the risk of a large fire is low. Beyond a BI of 30, fire frequency and large fire frequency increase rapidly, with the greatest number of fires and large fires occurring between BIs of about 40 and 55.

All of this was then incorporated into the SBMR FDRS. It considers not only BI, but the level of fire risk posed by each weapons system, fuels management on the ranges, and lessons learned over the past 10 years of range usage.

2023 Review of Fire Danger Rating System Methods

Data was collected for the FDRS from 2017 to 2023 incorporating the fires and daily burn index indices.

The weather data included all weather from the SBMR Range RAWS (WIMS ID 499902). Fire occurrence data came from the USAG-HI fire history created for this IWFMP and runs through December of 2022. These data were all entered into Fire Family Plus, a fire weather analysis program.

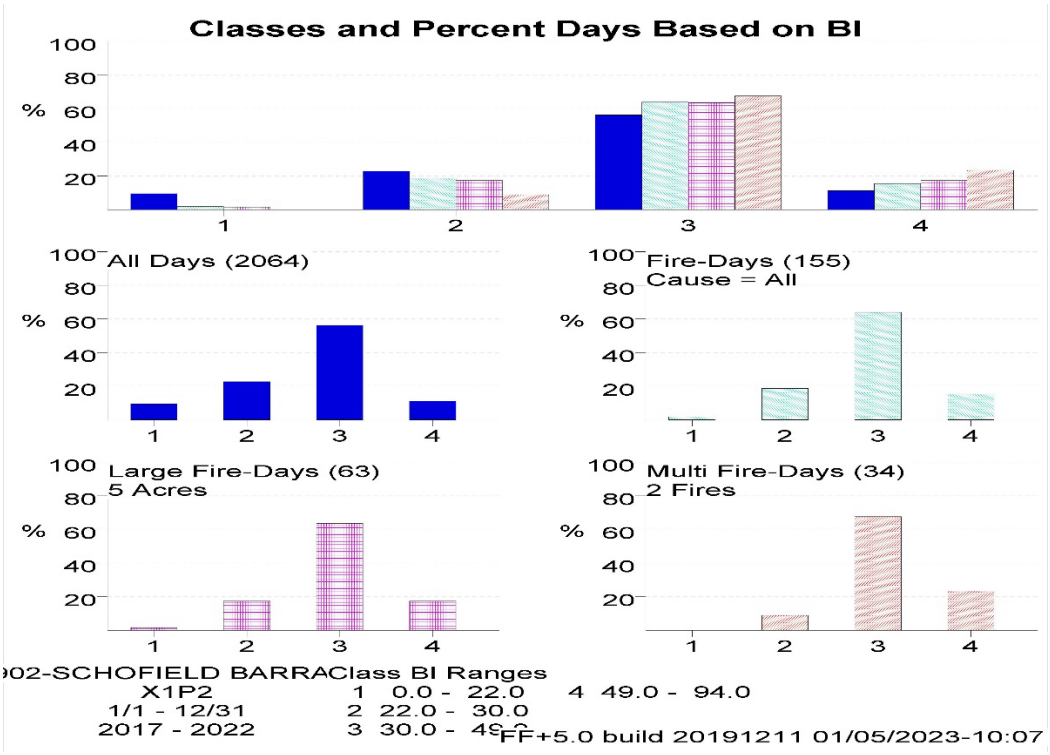
The following fire analysis options were used to develop conditional and non-conditional probability analyses of fire occurrence:

FireFamily Plus Decision Points
499902-SCHOFIELD BARRACKS
Variable: BI

- Time Frame: 1/1 - 12/31
- Data Years: 2017 - 2022
- Cause = All
- Large Fire Day = 5 acres
- Multiple Fire Day = 2 fires

There was sufficient data for a conditional probability analysis of multi and large fire days. Unlike the 2018 IWFMP we can now analyze our Fire Business Class thresholds. After running the data in Fire Family Plus we can see that the current FDRS and Burn Index ratings are still valid and do not require updating see Figure 3.

Figure 3. Classes and Percent Days based on Burning Index from the Schofield Barracks Range RAWS showing days when there was a fire (blue bars), days when there was a large fire (pink bars), and days when there were multiple fires (orange bars).



The class break used in the Figure 3 analysis are the same class break points that were created in 2018. They show that as the Burn Index goes from Yellow to orange there is a significant increase in fire activity, Fire Size and Multi Fire days. The new 2022 model reflects that as well as the new 2022 fire occurrence data.

Usually, we want to see these numbers continue to increase as the model goes from class break point 3 to 4 (Orange to Yellow). This shows that the model is predicting accurately, and the class points are distributed correctly. However, the data in Figure 3 shows that there is a drastic **decrease** in Fires, Large Fires and Multi Fire days when the Burn Index goes above 49. This is counter intuitive to what should have happened. However, there is an obvious cause for this discrepancy. 99% of the Fires are caused by training on SBMR. Since 2018 the only training that was authorized when the burn Index was above 49 was blank and ball ammunition. We removed the fire ignition source resulting in a human caused skew in the data. This shows that since 2018 we have greatly reduced the number of fires that could have occurred by following the FDRS. Without the FDRS restrictions already in place, the 4th class break point would have had more fires, larger fires and more multi fire days than in the 3rd class break. Therefore, the data from 2018 and the FDRS created are still valid and will continue to be used.

Appendix 3 - Safety Notes

L Lookouts

C Communications

E Escape Routes

S Safety Zones

The 10 Standard Fire Orders

Fire Behavior

1. Keep informed on fire weather conditions and forecasts.
2. Know what your fire is doing at all times.
3. Base all actions on current and expected behavior of the fire.

Fireline Safety

4. Identify escape routes and safety zones and make them known.
5. Post lookouts when there is possible danger.
6. Be alert. Keep calm. Think clearly. Act decisively.

Organizational Control

7. Maintain prompt communications with your forces, your supervisor and adjoining forces.
8. Give clear instructions and insure they are understood.
9. Maintain control of your forces at all times.

If 1-9 are considered, then...

10. Fight fire aggressively, having provided for safety first.

The 10 Standard Fire Orders are firm. We don't break them; we don't bend them. All firefighters have the right to a safe assignment.

The 18 Watch Out Situations

1. Fire not scouted and sized up.
2. In country not seen in daylight.
3. Safety zones and escape routes not identified.
4. Unfamiliar with weather and local factors influencing fire behavior
5. Uninformed on strategy, tactics, and hazards.
6. Instructions and assignments not clear.
7. No communication link between crewmembers and supervisors.
8. Constructing line without safe anchor point.
9. Building line downhill with fire below.
10. Attempting frontal assault on fire.
11. Unburned fuel between you and the fire.
12. Cannot see main fire, not in contact with anyone who can.
13. On a hillside where rolling material can ignite fuel below.
14. Weather gets hotter and drier.
15. Wind increases and/or changes direction.
16. Getting frequent spot fires across line.
17. Terrain or fuels make escape to safety zones difficult.
18. Feel like taking a nap near fireline.

Appendix 4 – STEP-UP STAFFING PLAN

- **Background**

  Per Army guidance dated March 2019, AR 200-1 Chapter 4 Section 3.d.12 'Wildland Fire Management', AR 420-1 Chapter 25 and to meet land management goals and objectives, the U.S. Army Garrison Hawaii has an Integrated Wildland Fire Management Plan (IWFMP).

  The IWFMP lays out specific guidance, procedures, and protocols for the prevention and suppression of wildfires on training areas and other major properties under the jurisdiction of USAG-HI. Its goal is to convey the methods and procedures necessary to minimize fire frequency, severity, and size while allowing military units the freedom to conduct the training exercises necessary to maintain a high level of combat readiness. It defines the responsibilities of all offices, departments, and agencies involved, and describes fire pre-suppression and suppression actions to be taken. However, at the conclusion of the 2022 fire season it was obvious that there were shortfalls in the planning, preparedness, and implementation of wildfire suppression operations that the IWFMP had not addressed. This appendix titled, "***Step-Up Staffing Plan"*** attempts to bridge the gap we have had in fire response, planning and preparedness.

  The 2022 Wildland Fire season brought previously unseen drought conditions and extreme fire behavior that tested the skills and capabilities of the Wildland Fire Crew on Oahu. In August of 2022, following several long duration fires in Makua Military Reservation and on Schofield Barracks Training ranges, the Directorate of Public Works - Environmental Division, Range Control, 25th ID Combat Aviation Brigade and Army Fire conducted several AAR's and meetings to establish a more efficient and effective means for preparing and responding to increased Fire Danger throughout the fire season.

  Through these meetings, and with consultation and cooperation with our partners in the United States Fish and Wildlife Service (USFWS), we have completed a Step-Up-Staffing Plan that provides guidance for Seasonal Wildfire Prevention and Preparedness mitigation steps that the ARMY will implement.

  Prepared by:
  DES Wildland Fire
  United States Army Garrison, Hawaii

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Step Up Staffing Plan

Fire preparedness is the state of being ready to provide an appropriate response to wildland fires based on identified objectives. Preparedness is the result of activities that are planned and implemented prior to fire ignitions. Preparedness requires identifying necessary firefighting capabilities and implementing coordinated programs to develop those capabilities.

Preparedness requires a continuous process of developing and maintaining firefighting infrastructure; predicting fire activity; implementing prevention activities; identifying values to be protected; hiring, training, equipping, pre-positioning, and deploying firefighters and equipment; evaluating performance; correcting deficiencies; and improving operations. All preparedness activities should be focused on developing fire operations capabilities and on performing successful fire operations. A critical tool that Fire Managers can utilize for preparedness and planning is a Step-Up Staffing Plan.

- **Step-Up Staffing Plan Process**

The Step-Up Staffing plan (Figure 1) is used for emergency preparedness and involves actions taken to provide extra protection during times of high, very high or extreme fire danger. The Step-Up Staffing Plan is based off changes in the Fire Season and Seasonal thresholds at Schofield Barracks WIMS weather station #499902. These thresholds are measured as Staffing Classes. Staffing Class 1 being the least concerning with minimal potential for Fire Danger and Staffing Class 5 being the most concerning with potential for Extreme Fire Danger. Figure 3. shows the current thresholds for establishing the daily Staffing Class. These will be updated every 5 years with each rewrite of the Integrated Wildland Fire Management Plan to maintain accuracy.

Appropriate activities may include utilizing NWCG qualified emergency temporary firefighters such as soldiers, Borrowed Military Manpower (BMM), placing existing staff on extended tours of duty, adjusting, or increasing staffing, pre-positioning resources, increasing, or initiating special detection operations, and leasing initial attack aircraft. These actions are aimed at ensuring prompt response to wildfires. The Wildland Fire Program Manager (WFPM) must use this information in combination with real time observations and predicted weather and other seasonal indicators to determine and adjust staffing. Once Staffing class 3 or higher is reached, and when live-fire training at Makua entails use of weapons other than ball ammunition or blanks, the Step-Up Staffing Plan becomes a requirement that must be implemented before any live-fire training can be conducted. The Step-Up Staffing plan is only utilized when staffing classes 3, 4 or 5 are in effect or when live-fire training at Makua entails use of weapons other than ball ammunition or blanks.

In the event that requirements of the Step-Up Staffing Plan cannot be met, then site-specific risk assessment and mitigation efforts ensure any fire ignited would be contained in initial attack must be documented and approved by the WFPM and the Garrison Commander before any training above blank and ball ammunition can be approved. This should only be allowed sparingly so as not to cancel out the intent of the Step-Up Staffing Plan.

Assessment of fire containment capability in instances when the Step-Up Staffing Plan is not implemented would be conducted using the CONTAIN module of BehavePlus, a site-specific spot weather forecast, and indices from 499902 (for Schofield), 490301 (for Makua), and designated WIMS station at the other training areas. Fuel model for the vegetation adjacent to the training site would be used. At Makua Military Reservation, if training other than ball ammunition and blanks would be used when the Step-Up Staffing plan is not implemented, the following guinea grass fuel model parameters would be used in the assessment and documentation of the sufficiency of the day's fire suppression staffing.

Fuel Loading (tons/acre)				1-hr SA/V	Live HRB SA/V	Fuel Bed Depth (feet)	Wind Adj. Factor	Moisture of Extinction	Heat Content (BTU/lb)
1-hour fuel	10-hour fuel	Live Herbaceous	Live Woody						
4.0	3.0	4.0	0.0	1200	1100	4.11 ft when Live Herbaceous Fuel Miosture 99% or lower	0.5	40%	8000
						2.71-ft when Live Herbaceous Fuel Moisture 100-149%			
						2.4-ft when Live Herbaceous Fuel Moisture 150-199%			
						1.88-ft when Live Herbaceous Fuel Moisture 200% or higher			

For fire containment assessments at Makua Military Reservation when the Step-Up Staffing Plan is not implemented, the following helicopter productivity rates would be used: Type 1 helicopter productivity 10 chains/hour (less skilled pilots or fuel not available on-site), 30 chains/hour (skilled pilots, long-line, on-site refueling, can be increased to 35 when forecast wind speed is less than 10 mph). Type 2 helicopter productivity 5 chains/hour (less-skilled pilots and when fueling is not available at Makua or Dillingham Airfield (on-site)) or 30 chains/hour (for skilled pilots, using long-line, with on-site fuel available). Type 3 helicopter productivity 3 chains/hour (less skilled pilots and when fuel not available on-site) or 10 chains/hour (skilled pilots, long-line, with on-site refueling, can be increased to 20 chains/hour when forecast wind speed is less than 10 mph). Until the pilot's and aircraft capabilities are established use the ½ max of all options for chains/hour line production rate calculations.

- Type 1= 17.5 Ch/Hr
- Type 2= 15 Ch/Hr
- Type 3= 5 Ch/Hr

Mitigation efforts must offset the potential for negative outcomes to the local environment, Threatened and Endangered Species, and the potential loss of training time due to a long duration fire. For example: One training range may not be as dry as others because it has not been impacted by local weather patterns and this could be explained with weather data from WIMS. Helicopters may not be available to meet the call back times so mitigations may be to only allow certain low risk munitions in low-risk areas. An area may have been recently burned in a prescribed fire and therefore there are no available fuels to start a fire in the weapon's SDZ and potential ricochet areas. These are just basic examples, and any mitigations must be thoroughly thought out and documented by the WFPM and signed by the Garrison Commander.

Figure 1. Step Up Staffing Plan.

Step Up Staffing Plan Staffing Class Matrix

Staffing Class	SC1	SC2	SC3	SC4	SC5
Fire Danger	Low	Moderate	High	Very High	Extreme
Fire Staff (Increase or extend)	No	No	Yes	Yes	Yes
Overhead	ICT5	ICT4	ICT4 Duty Officer will be available during normal tour of duty	ICT4, ICT4 ICT3 within one operational period Duty Officer available 24 hours	ICT3, ICT4, ICT4 Duty Officer will be available 24 hours Check availability of additional resources
Staffing Class	**SC1**	**SC2**	**SC3**	**SC4**	**SC5**
Fire Danger	Low	Moderate	High	Very High	Extreme
Aviation	1 UH60 or 1 CH 47 2hr Call Back -4hr on Weekends	1 UH60 or 1 CH 47 2hr Call Back -4hr on Weekends	1 UH60 or 1 CH 47 2hr Call Back -2hr on Weekends	1 UH60 or 1 CH 47 1hr call back 1 UH60 or 1 CH 47 2hr Call Back	1 UH60 or 1 CH 47 30 Min Launch 1 UH60 or 1 CH 47 2hr Call Back
Engines Per Engine = (ENGB+ 1 FFT)	2 - Type 6 Engines	2 - Type 6 Engines	3 - Type 6 Engines	3 - Type 6 Engines 1 - 600+ Gal Tender	4 - Type 6 Engines 1 - 600+ Gal Tender
Management Actions	7 Day (Min ICT5 or ENGB) coverage	7 Day (ICT4) Coverage Monthly evaluate NFDRS for Fire Severity trends	7 Day (ICT4) Coverage Every 14 days evaluate NFDRS for Fire Severity trends	7 Day (2 - ICT4) Coverage WFPM determines need for extended hours Every 7 days Evaluation of NFDRS	7 Day (ICT3 & 2 ICT4's) Coverage WFMP determines need for extended hours Every 3 days Evaluation of NFDRS

Staffing Class	SC1	SC2	SC3	SC4	SC5
Fire Danger	Low	Moderate	High	Very High	Extreme
Prevention Activities	Fire Danger and Prevention Briefings are given by Range Control to all Range Users		Co-Ordinate with Range Control to ensure fire danger briefings are being given to all Range Users. PAO release Garrison Wide information on Fire Danger and Fire Prevention. **SC4 Pyrotechnics will be authorized by WFPM on case-by-case basis determined by local NFDRS.**		Training will only be authorized in the Green and Yellow for Burn Index in all training areas. **No Pyrotechnics will be authorized until the Fire Danger returns to SC4 or Lower**

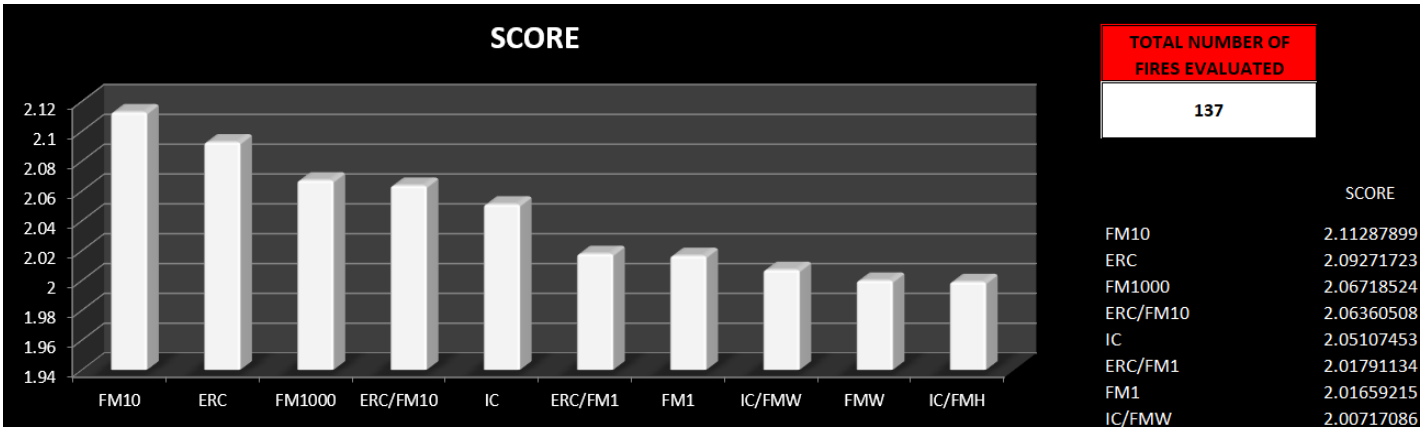
- **National Fire Danger Rating System (NFDRS) Analysis**

  Fire Weather and Fire Danger Indices are tracked via the Weather Information Management System (WIMS). WIMS can be accessed via the internet at: http://fam.nwcg.gov/fam-web/. WIMS indices are utilized in calculating the staffing classes.

  Fire Managers need to evaluate changes in Fire Season and try to predict Fire Severity. This evaluation or analysis is often completed by using Fire Danger Thresholds and computer software. The analysis looks at fire season trends, fire history, and climatology.

  In 2012 a complex program was developed by the National Park Service that allowed Fire Managers to calculate the cost of using different National Fire Danger Rating System (NFDRS) Indices and Components (Fig 2). *See Glossary for more in-depth explanation of NFDRS and fire terminology.* Up to 3 combinations of NFDRS indices and components, at varying critical thresholds, can be evaluated to see which indices and components work best for predicting fire days and reducing the number of days that would involve staffing up and spending money but not having a fire. Running 6 years for NFDRS data and ARMY Fire History it showed that using 100-hour fuel moisture (FM100) and Keetch-Byram Drought Index (KBDI) to evaluate staffing class thresholds was the most cost effective and accurate for predicting fires and not over staffing or under staffing.

Figure 2. NFDRS Analysis.



- **Staffing Classes**

  The Step-Up Staffing Plan is based off changes in the Fire Season and Seasonal thresholds. These thresholds are measured as Staffing Classes. Staffing Class 1 being the least concerning with minimal potential for Fire Danger and Staffing Class 5 being the most concerning with potential for Extreme Fire Danger. Figure 3. shows the current thresholds for establishing the daily Staffing Class. These will be updated every 5 years with each rewrite of the Integrated Wildland Fire Management Plan to maintain accuracy. When staffing level 4 is reached, then 10-hour fuel moisture needs to be evaluated with FM100 and KBDI to raise the Staffing Class to 5.

  Both FM100 and KBDI must be in the same Staffing Class thresholds otherwise default to the lowest that one of them falls in. If KBDI is 634 and is in SC 3 and FM100 is 15.5 and is in SC 4 then default to the lowest Staffing Class that one of them align in. In this example it would be KBDI 634 and in SC 3.

Figure 3. Staffing Class Levels

	FM100	KBDI	FM10	
97th or 3rd %	14.5	702	9.7	FM100 and KBDI are the drivers for staffing class changes until SC4. Then FM10 needs to be evaluated as well to get to SC5 KBDI is evaluated as a running 3 day average.
SC5	< 15	> 685	< 10	
SC4	<16	650 - 685		
SC3	16 - 18	600 - 650		
SC2	> 18	560 to 600		
SC1	>18	<560		

Figure 4. shows the number of days the Staffing Classes would have been triggered over the last 4 years. Generally, about 90% of the days throughout the year are in Staffing Class 1 or Staffing Class 2.

Fig 4. Staffing Class Days 2019 to 2022.

SC 1 & 2 DAYS		
1460 Potential Days		
1347 Days SC1 & SC2		
Year	Days	% of Days
2019	344	94.2%
2020	334	91.5%
2021	341	93.4%
2022	328	89.9%

SC 3 DAYS ACTIVATED		
1460 Potential Days		
48 Days SC3 ACTIVATED		
Year	Days	% of Days
2019	10	2.7%
2020	12	3.3%
2021	18	4.9%
2022	9	2.5%

SC 4 DAYS ACTIVATED		
1460 Potential Days		
51 Days SC4 ACTIVATED		
Year	Days	% of Days
2019	11	3.0%
2020	12	3.3%
2021	6	1.6%
2022	22	6.0%

SC 5 DAYS ACTIVATED		
1460 Potential Days		
13 Days SC5 ACTIVATED		
Year	Days	% of Days
2019	0	0.0%
2020	7	1.9%
2021	0	0.0%
2022	6	1.6%

- **Delegation of Authority**

The Installation Commander has the overall responsibility for fire prevention and protection requirements.
The Installation Commander Responsibilities:

1. Approve the IWFMP.
2. Define the roles and responsibilities as laid out in the IWFMP.
3. Delegate to the Wildland Fire Program Manager (WFPM) or Acting Wildland Fire Program Manager oversight of the wildland fire management program.
4. Ensure sufficient funding is available to staff and execute this IWFMP.
5. Approve the deployment of USAG-HI civilian firefighters to off-installation incidents that are not covered under existing Mutual and Automatic Aid Agreements.

Wildland Fire Program Manager Responsibilities:

1. Monitor unit incident activities for compliance with safety policies.
2. Coordinate and set priorities for unit suppression actions and resource allocation.
3. Document decisions and actions.
4. Must be available by phone 24 hours a day (1-hour call back when in Staffing Level 1-3)
5. Review, update, and distribute Daily Staffing
6. Review Step-Up-Plan requirements and ensure they are being met.
7. Adjust staffing class as needed.
8. Authorize extended staffing.

9. Position resources.
10. Prioritize incidents.
11. Assign an Incident Commander.
12. Approve strategy and review the complexity analysis.
13. Ensure compliance with the Integrated Wildland Fire Management Plan (IWFMP).
14. Ensure logistical considerations are being met.
15. Be familiar with and follow protocols for assistance with cooperators and mutual aid response.
16. Request and Dispatch ARMY aircraft within ARMY boundary or within mutual aid response.
17. The delegation of authority for Type 3, Type 4 and Type 5 fires is given to the Wildland Fire Program Manager (WFPM) who then in turn delegates to the Duty Officer (DO) and/or Incident Commander (IC). A Type 3, 4, or 5 IC will receive a formal written delegation of authority and will receive a briefing describing their responsibilities and authorities from their assigned supervisor or the WFPM.

Duty Officer Responsibilities:

This is not a permanent staff position, and the Duty Officer assignment rotates among staff members. The responsibilities of the Duty Officer require a combination of fire management qualifications and fire program management skills. The Duty Officer must be well versed in policies and procedures as well as resource mobilization processes.

At a minimum, the Duty Officer must be a fully qualified ICT 4, have detailed knowledge of Army values at risk and special resource issues, and have a working knowledge of the Integrated Wildland Fire Management Plan (IWFMP). If the Duty Officer must engage in a fire, then the Duty Officer roles and responsibilities fall back to the WFPM. Duty Officer Responsibilities to assist the fire management staff include:

1. Coordinating daily activities.
2. Fire size-up.
3. Setting Fire priorities.
4. Mobilizing resources.
5. Daily 214 Unit Logs and Incident Reporting.
6. Engine assignments

- **Initial Response Plan**

Strategic Fire Size-up Procedures**:**

All unplanned wildland fires will be initially sized-up by the initial attack Incident Commander (IC). This size-up information will be immediately communicated to Range Control and the Duty Officer (DO). All wildfire incidents will require a complexity analysis to assist in determining and documenting decisions regarding appropriate level of management. A complexity analysis is required anytime an incident is transferred, escalated, or deescalated to a new Incident Commander.

Notification Process:

Upon discovery of a fire, the Duty Officer or the Incident Commander should send notification to interested parties at the earliest possible time. At a minimum, this should include the ARMY Fire Chief, the WFPM and DPW Environmental. Additional notifications should be made as determined by the WFPM, in consultation with DES,

DPW and PAO, particularly regarding wildlife and the public. Updates may be done via email, text, or phone if appropriate.

The DO or WFMP is the primary source of information for all fire-related activities. Fire information dissemination is critically important, and if other duties interfere with the ability to get timely, accurate information to all concerned parties, serious consideration should be given to formally assigning those duties to someone else.

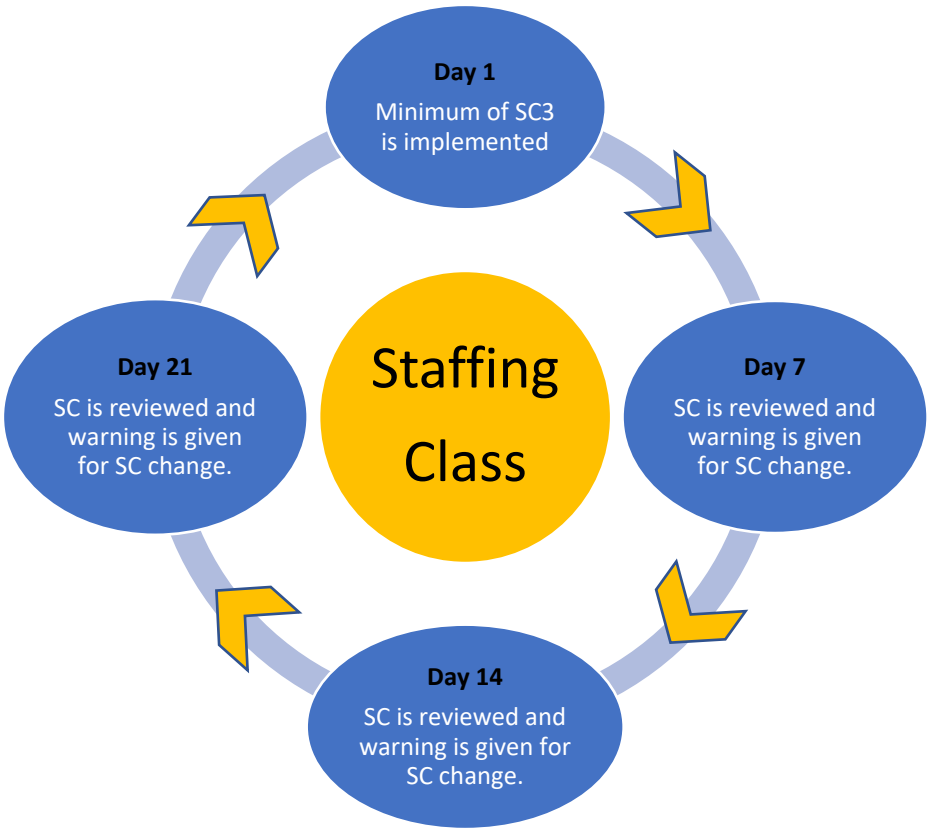
- **Implementation and Oversight.**

Implementation of this addendum will begin once all required signatures have been obtained. The WFPM has direct oversight to ensure that the Step-up-staffing plan is being utilized and adhered to when SC3, SC4, or SC5 are triggered.

The WFMP will coordinate with Range Control to implement appropriate training and weapons restrictions and verify with the CAB that the correct number of aircraft and standby and callback times are being utilized. If

Once a staffing class 3 (SC3) is triggered a 7-day cycle begins (Figure 5). The staffing class will remain in effect for 7 days. After 7 days the Staffing class can be reduced, maintained, or increased based on the NFDRS and Staffing Class thresholds. This process will be repeated indefinitely until the Staffing Class goes back to SC2 or SC1. The 7-day period allows ARMY FIRE, CAB and Range Control to schedule resources, implement restrictions, and send out notifications as it pertains to the Step-Up-Staffing Plan.

Fig 5. Staffing Class Assessment and Implementation



Example of Staffing Class Step Up Plan Notification:

FIRE DANGER

U.S. Army Garrison Hawaii
DES ARMY FIRE
Date: 10-19-2022

U.S. Army Wildfire Preparedness Step-Up Plan

CURRENT STAFFING CLASS LEVEL: SC3

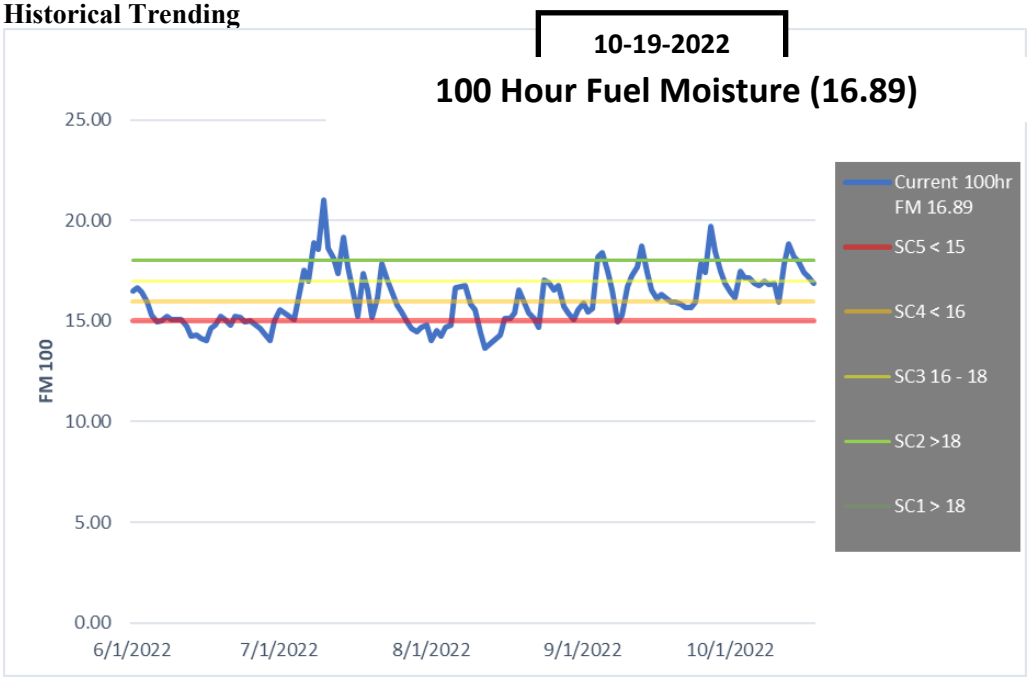
Station Name: SCHOFIELD BARRACKS

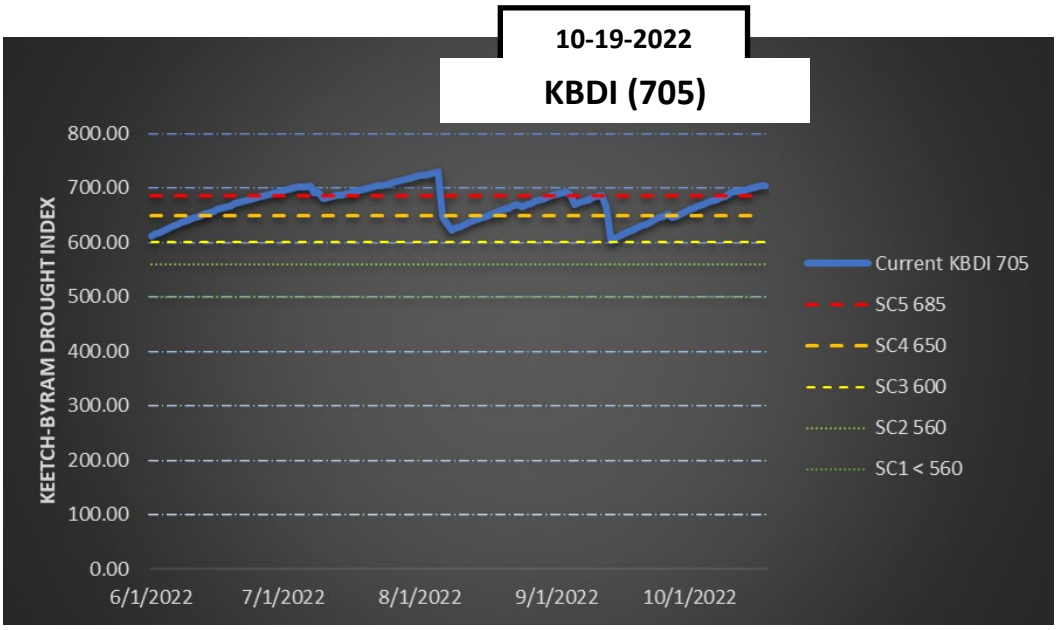
Obs Date	Obs Time	WDY FM	HRB FM	1H FM	10 FM	100 FM	TH FM	ERC	BI	KBDI
18-Oct-22	12	140.3	82.6	8.27	9.99	16.89	18.29	14.6	45.1	705

Discussion: We are currently holding in High fire danger. The Occasional showers and overcast days are helping the 100-hour fuel moisture (FM100) to hold around 16.9. However, at this time the KBDI is now in SC5 and has gotten even dryer from 693 last week to 705 now, and this indicates that suppression actions will require more effort/time and more water to extinguish fires. Furthermore, without several days and weeks of rain this number is not likely to improve.

Mitigations	Current Staffing Class = SC3 CURRENT FIRE DANGER = High
Fire Staff (Increase or extend)	Yes
Overhead	ICT4 Duty Officer will be available during normal tour of duty
Aviation	1 UH60 or CH 47 2hr Call Back 2hr on Weekends
Engines Per Engine = (ENGB+ 1 FFT)	3 - Type 6 Engines
Management Actions	7 Day (ICT4) Coverage Every 7 to 14 days evaluate NFDRS for Fire Severity trends
Prevention Activities	Co-Ordinate with Range Control to ensure fire danger briefings are being given to all Range Users. PAO release Garrison Wide information on Fire Danger and Fire Prevention. **SC4 Pyrotechnics will be authorized by WFPM on case-by-case basis determined by local NFDRS.**

Historical Trending





Step-Up Staffing Plan

The Step-Up Staffing plan (Figure 2) is used for emergency preparedness and involves actions taken to provide extra protection during times of high, very high or extreme fire danger. There are five staffing classes that describe escalations in preparedness responses to increased fire danger (Figure 1). The Step-Up Staffing plan is only utilized when staffing classes (SC) 3, 4 or 5 are in effect.

Figure 1. Step Up Staffing Plan

	FM100	KBDI	FM10	
97th or 3rd %	14.5	702	9.7	FM100 and KBDI are the drivers for staffing class changes until SC4. Then FM10 needs to be evaluated as well to get to SC5 KBDI is evaluated as a running 3 day average.
SC5	< 15	> 685	< 10	
SC4	<16	650 - 685		
SC3	16 - 18	600 - 650		
SC2	> 18	560 to 600		
SC1	>18	<560		

Both FM100 and KBDI must be in the same Staffing Class thresholds otherwise default to the lowest that one of them fall in. If KBDI is 634 and is in SC 3 and FM100 is 15.5 and is in SC 4 then default to the lowest Staffing Class that one of them align in. In this example it would be KBDI 634 and in SC 3.

Figure 2. Step Up Staffing Plan.

Step Up Staffing Plan Staffing Class Matrix

Staffing Class	SC1	SC2	SC3	SC4	SC5
Fire Danger	Low	Moderate	High	Very High	Extreme
Fire Staff (Increase or extend)	No	No	Yes	Yes	Yes
Overhead	ICT5	ICT4	ICT4 Duty Officer will be available during normal tour of duty	ICT4, ICT4 ICT3 within one operational period Duty Officer available 24 hours	ICT3, ICT4, ICT4 Duty Officer will be available 24 hours Check availability of additional resources
Staffing Class	**SC1**	**SC2**	**SC3**	**SC4**	**SC5**
Fire Danger	Low	Moderate	High	Very High	Extreme
Aviation	1 UH60 or 1 CH 47 2hr Call Back -4hr on Weekends	1 UH60 or 1 CH 47 2hr Call Back -4hr on Weekends	1 UH60 or 1 CH 47 2hr Call Back -2hr on Weekends	1 UH60 or 1 CH 47 1hr call back 1 UH60 or 1 CH 47 2hr Call Back	1 UH60 or 1 CH 47 30 Min Launch 1 UH60 or 1 CH 47 2hr Call Back
Engines Per Engine = (ENGB+ 1 FFT)	2 - Type 6 Engines	2 - Type 6 Engines	3 - Type 6 Engines	3 - Type 6 1 - 600+ Gal Tender	4 - Type 6 Engines 1 - 600+ Gal Tender

Staffing Class	SC1	SC2	SC3	SC4	SC5
Fire Danger	Low	Moderate	High	Very High	Extreme
Management Actions	7 Day (Min ICT5 or ENGB) coverage	7 Day (ICT4) Coverage Monthly evaluate NFDRS for Fire Severity trends	7 Day (ICT4) Coverage Every 14 days evaluate NFDRS for Fire Severity trends	7 Day (2 - ICT4) Coverage WFPM determines need for extended hours Every 7 days Evaluation of NFDRS	7 Day (ICT3 & 2 ICT4) Coverage WFMP determines need for extended hours Every 3 days Evaluation of NFDRS
Prevention Activities	Fire Danger and Prevention Briefings are given by Range Control to all Range Users		Co-Ordinate with Range Control to ensure fire danger briefings are being given to all Range Users. PAO release Garrison Wide information on Fire Danger and Fire Prevention. **SC4 Pyrotechnics will be authorized by WFPM on case-by-case basis determined by local NFDRS.**		Training will only be authorized in the Green and Yellow for Burn Index in all training areas. **No Pyrotechnics will be authorized until the Fire Danger returns to SC4 or Lower**

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Appendix 5 - FACILITATED LEARNING ANALYSIS IMPLEMENTATION GUIDE.

FACILITATED LEARNING ANALYSIS

IMPLEMENTATION GUIDE

RISK MANAGEMENT AND HUMAN PERFORMANCE

IN COOPERATION WITH THE OFFICE OF SAFETY & OCCUPATIONAL HEALTH

"Our national pastime of baseball differs from the society that spawned it in one crucial way: The box score of every baseball game, from the Little League to the Major League, consists of three tallies: runs, hits, and errors. Errors are not desirable, of course, but everyone understands that they are unavoidable. Errors are inherent in baseball, as they are in medicine, business, science, law, love, and life. In the final analysis, the test of a nation's character, and of an individual's integrity, does not depend on being error free. It depends on what we do after making the error."[*]

"Any safety system depends crucially on the willing participation of the workforce, the people in direct contact with the hazards. To achieve this, it is necessary to engineer a reporting culture—an organizational climate in which people are prepared to report their errors . . . An effective reporting culture depends, in turn, on how the organization handles blame and punishment . . . What is needed is a just culture . . ."[†]

"I got behind the safety shelter; then in a little bit, I heard a voice say, Get in This Truck!"

2011, Salt Fire Entrapment and Shelter Deployment FLA. U.S. Forest Service Photo by Tony DeMasters

This guide is intended for use by any organization wishing to foster organizational learning as the response to unexpected outcomes.

[*] Carol Tavris and Elliot Aronson, *Mistakes Were Made (but not by me): Why We Justify Foolish Beliefs, Bad Decisions, and Hurtful Acts* (Orlando, FL: Harcourt, 2007), p235.

[†] J. T. Reason, *Managing the Risks of Organizational Accidents* (Aldershot, England: Ashgate, 1997), p195.

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"The way leadership responds to a bad outcome is enormously important. It will vector us either towards, or away from, a learning culture."

Harv Forsgren
Former Regional Forester, Intermountain Region

PART 1 - BACKGROUND, PURPOSE AND NEED: CONSIDERATIONS FOR THE AGENCY ADMINISTRATOR

A. THE BENEFITS OF A FACILITATED LEARNING ANALYSIS

The essential step in organizing for high reliability is developing and nurturing a "Learning" culture. A learning culture sees unintended outcomes as valued opportunities to learn and grow and be better, more reliable tomorrow.

How an agency responds to an accident is enormously important. The leaders' responses will either vector the agency toward a Learning Culture or away from it. If the leadership assumes the accident happened because someone failed to do something right, then the natural response is to determine (in dazzling hindsight) what rules or protocols were broken. We can then identify (or blame) the rule breaker and return the system to safety. All that's needed are better rules or better compliance. End of story—*until the next accident.*

Alternatively, leaders can see that while accidents[3] are very rare, risk is ever present. It is ubiquitous. Yes employees make mistakes but most of the time (almost continuously) they are *creating safety*. Employees regularly and systematically adapt and make judgments to handle emerging risks, and these adaptations will never be perfect. Errors, mistakes, and lapses are commonplace. So are irrational optimism and fatalism. So are taking shortcuts to save money, time, and effort. So are under- and overestimating risk. Indeed, human performance variability is not only normal, it's the rule! Understanding this, progressive leaders can treat accidents and other unintended outcomes as precious opportunities to look deeply into the operation to better understand how employees perceive and manage risk. This view enables deep learning and with it, *an accident can become* a *safe opportunity* for those involved to share their story.

"Take your pick: You can blame human error, or you can try to learn from the failure."[4]

{A 40 minute video "Overview of the FLA Process" is available at: https://www.youtube.com/watch?v=_spEZD9aGc0}

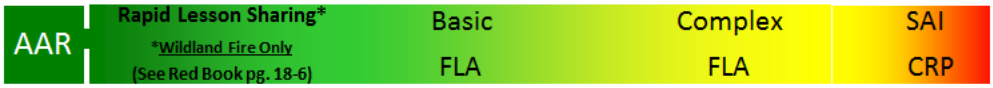
[3] The term "unintended outcome" can be used interchangeably with "accident" throughout this guide.
[4] Sidney Dekker, *The Field Guide to Understanding Human Error* (Aldershot, England: Ashgate, 2006), p4.

B. An Expandable Process: From Basic to Complex FLA[5]

The FLA process is designed to be flexible and expandable depending upon the need. One way to think about the difference between a basic FLA and a complex FLA is an analogy with wildland fire incident management.

The cheapest and fastest way (most often the best way) to learn from an event is to conduct a local After Action Review (AAR). Using the wildland fire analogy, **an AAR would be like a Type 5 or Type 4 incident.** AARs are relatively simple, inexpensive, and not time-consuming. The AAR is a powerful tool to capture immediate local learning. The involved group then moves on, goes back to work, while learning from mistakes and building on successes. AARs are predominantly closed, personal, and confidential, enabling participants to speak freely about mistakes. Consequently, the learning that occurs from an AAR is typically local in nature and not shared beyond the work unit (crew or team).

A more complex event often warrants a more vigorous learning response, one that can bring benefit beyond the local group. After an accident, the response should also fulfill the agency's requirement to complete an accident investigation required by internal policy and the Occupational Safety and Health Administration (OSHA). To respond effectively, administrators are encouraged to bring in outside expertise and take the time needed to "flesh out" what people who were directly involved in the event learned and will share outside of their group.



This is a basic FLA, which has been referred to as an "After Action Review on Steroids." The basic FLA can be led by as few as just a couple of people. The report may be only a few pages in length. With a larger FLA team, and given more time, the FLA team can produce a more powerful learning tool, telling the story of the incident and displaying lessons learned for the greater organization. In our analogy with wildland fire, **a basic FLA is like a Type 3 Incident**.

A complex FLA will search much deeper. It is the most robust process to analyze an unintended outcome and develop lessons learned for the broader organization. A complex FLA report will contain a compelling accident story designed specifically for organizational learning. Most importantly, the report will also draw upon human performance expertise to explain the nature of the accident and analyze the key conditions that surround the event. A complex FLA may involve a team of 5 to 15 people (including subject matter experts and specialists), who work weeks or months to develop their analysis and craft their report.

In our wildland fire analogy, **a complex FLA is like a Type 2 or Type 1 Incident.** In the Forest Service the "Coordinated Response Protocol" utilizes the Complex FLA process and incorporates additional agency efforts such as the Office of Learning, Law Enforcement and employee wellness.

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[5] In 2012, the Accident Prevention Analysis (APA) process was rolled into the FLA process. A complex FLA is essentially identical to an APA.

C. CRITICAL CONSIDERATIONS FOR THE AGENCY ADMINISTRATOR

[Agency Administrators - see also **APPENDIX A: IS AN FLA THE RIGHT TOOL? ON PAGE 48]**

Before the FLA team is formed, the Agency Administrator (in consultation with safety and technical specialists) should consider how thorough and detailed the analysis and the report should be. What does the administrator base this decision on? This is an important question for which there is no simple answer. Every incident is unique. Unfortunately, the natural tendency is to base the size and complexity of the FLA team upon the severity of the outcome. The more "serious the accident," the more resources are put toward the review team.

To illustrate, recently a FLA was done on a tree-cutting accident in which a firefighter was hit by a glancing blow from a tree cut by a fellow firefighter. The injured firefighter was knocked unconscious, treated, and released the same day. He has recovered completely. Based solely on the outcome, this wasn't considered a "significant" accident."

But was it really *not* significant? Perhaps it wasn't significant according to our reporting system. But to the firefighter and his co-workers, friends and family, this incident was *very significant*. In fact, had the tree fallen one or two inches to the left, the firefighter would have been killed or at least seriously and probably permanently injured. Had the tree fallen two inches to the right, the worst outcome would have been a startled and perhaps angry firefighter.

The GAP: *Advice to Agency Administrators*

Human performance experts refer to the difference between what administrators *think* is going on and what is *really* going on in the field as "The Gap." The most intriguing part of this "Gap" is the difference between how much risk employees are taking in getting their work done—compared to how much risk administrators would say is *acceptable*. A large gap—indicated by shock and awe when it is revealed (usually in the wake of an accident)—is illustrated by this quote from Dr. David Woods: *"The future seems implausible before an accident . . . But after the accident, the past seems incredible."*

- - - - -

Advice from the experts: The greater the gap between the level of risk acceptance by employees and risk acceptability by managers, the more resources, time, and effort should be put into the FLA.

Should a chance occurrence of two inches be the determining factor for organizational learning? The best guidance available to the agency administrator to decide on a Complex versus a Basic FLA is this:

The greater the gap between the employees' and managers' acceptability of risk, the more resources, time, and effort should be put into the FLA. The level of shock after an accident is a good indicator of the size of the gap.

Questions to Consider When Deciding to Mobilize a Facilitated Learning Analysis Team

- How "deep" should we look?
- Is there enough trust here to support such an analysis?
- How might we use this event to make a large cultural impact on organizational safety?
- What kinds of specialized subject matter experts might be needed to conduct the kind of analysis we want?
- How long should this take? How much time should we be willing to spend on this analysis?
- Are there conflicting stories surrounding the event? If so it may take time and skill to work through them.
- Regardless of the outcome, do people close to the accident believe it could have been much more severe?
- What could be the cost of *not* choosing a "complex" FLA in terms of opportunities lost?
- How close are <u>you</u> to the incident? How much do you own the decisions?
- Are recommendations going to be an essential part of this report?
- What other jurisdictions or agencies are involved? Do you need to consult an interagency agreement on accident investigations to determine team composition?

D. Report/Review Requirements

Implementing an FLA does not change the accident reporting requirements (Reference FSM 6732 and local policies if applicable).

If the accident involves personnel from more than one agency, consult your Occupational Safety & Health Advisors for the appropriate protocols. The DOI and the Forest Service (for example) have signed an MOU agreeing on the team composition and protocols to be used on accidents that involve both DOI and FS employees.

A Complex FLA Meets All "Accident Investigation" Requirements

A complex FLA meets the serious accident investigation procedural and documentation requirements of the Occupational Safety and Health Administration's (OSHA) Executive Order 12196, as well as the accident investigation regulations (29 CFR 1960.29) and internal policies of the U.S. Forest Service (FSM 6731 and FSH 6709.12).

E. How We Got Here

By the end of 2004, the U.S. Forest Service fire community was stunned and disoriented by a string of administrative decisions and legal actions against firefighters involved in accidents. To many firefighters and agency administrators, the word "accountability" had become synonymous with "punitive actions." Owning mistakes and sharing lessons learned from an accident were seen to be career-ending decisions. Any learning that was occurring from bad outcomes was local and had to stay local or go underground.

Against this background, fire leaders—concerned with the obvious safety implications—called for a shift to "principle-centered management" or "doctrine." The "Pulaski Conference" soon followed. In 2005, two members from the USFS Fire Operations Risk Management Council pushed the limits of policy by conducting a learning-focused serious accident investigation on the I-90 Tarkio Fire Entrapment. "Just Culture" (see definition on page 8) became the Risk Management Council's mantra for a higher standard of accountability.

Building upon the popular support of the "Just Culture" doctrine and learning-focused accident investigations—and with an eye toward internal disputes over how accidents should be investigated—in 2006, the Risk Management Council put forth the briefing paper titled *Peer Review–Purpose and Process.* Based on continuous improvement and fair and just accountability, this paper was a call for a new paradigm in accident investigations.

That summer, five CALFIRE firefighters deployed their fire shelters on the Ball's Canyon Fire in Region 4. Although the firefighters were uninjured, policy required entrapments be investigated. CALFIRE joined Region 4 to quickly execute the first "Peer Review," overtly testing the model of a *Just Culture* within an accident investigation. The review also broke the narrative-model and used nonfiction storytelling instead. Support among firefighters was outstanding!

Two months later, ten fuels specialists and contractors were involved in a fire entrapment and shelter deployment on the Little Venus Fire on the Shoshone National Forest. Building upon the success of the Balls Canyon Fire Shelter Deployment report, Region 2 launched a *Just Culture* based Peer Review. This investigation team tested the facilitated dialogue concept and refined the use of nonfiction storytelling

in a highly complex accident investigation. The Little Venus Fire Entrapment report was so popular that agency administrators across the country wanted to replicate this process.

In 2006, the Risk Management Council developed a Peer Review guide for a Just Culture-based accident investigation process. The Risk Management Council promoted this guide and conducted trainings and national workshops on this process. Over the years, this process—initially known as a "Peer Review"—has evolved, grown, shrunk, and is now refined as the Facilitated Learning Analysis. The FLA was formally accepted by the Forest Service in July 2013. Reports generated from the Forest Service's Coordinated Response Protocol (the agency's response to the most serious of accidents) are called "Learning Reviews". The investigative process used to execute a Learning Review however, is the Complex FLA process.

The guide you are reading now is the hard-won product of ten years of promoting Just Culture and collaborative trial and error following an unintended outcome. The effort has involved personnel from throughout the Forest Service at all administrative levels. This guide reflects the critique and feedback from safety experts at other public agencies, private industry, and academic review. The editors of this Guide honor those wildland firefighters – whose courage to face the risks of both fires *and accident investigations* – provided the inspiration to change the way the Forest Service responds to unintended outcomes and learn from a variety of contexts ranging in all disciplines within the agency.

This guide is continually refined to reflect evolving expertise in human performance and user experiences. See **APPENDIX B: LESSONS AND ADVICE FROM 9 YEARS OF FLA EXPERIENCES** for lessons and advice from previous FLA teams. Your comments and feedback on this guide are welcome! Please send them to: **FLA.GUIDE.IMPROVEMENTS@GMAIL.COM.**

Considering an FLA for a Success Story?

This guide assumes that unintended outcomes offer the best opportunities for learning through the FLA process. Some have suggested that the FLA process be used to examine successes.

One challenge of doing an FLA on a success story is that is difficult to identify *why* something went right. In general, when this has been tried, teams have tended to pat themselves on the back for strengths they were already championing. But how do they know *those* specific initiatives contributed, and how do they know they did not just get lucky that one time? In other words, what teams look for is generally what they find.

Your team could certainly try this (and if you do, send us feedback and let us know how it went): **FLA.GUIDE.IMPROVEMENTS@GMAIL.COM**

F. FLAs *BEYOND* ACCIDENTS

The FLA process was designed to be a tool for accident investigation and learning from *accident-like* unintended outcomes. However, the process has been used successfully as a tool to learn from events that were not accidents; including close call/near-miss events and events that weren't necessarily

negative but had outcomes surprising to administrators. Sometimes we've used this process because we wanted an answer to the question: Why were we surprised by this event? Two recent examples of FLAs used on non-accidents are:

- Retardant Avoidance FLA
- Bear Meadows Stop Work FLA

Agency administrators and users of this guide are encouraged not to let the word "accident" (as used throughout this guide) dissuade them from using this process as a tool to examine non-accidents, surprise outcomes, and even exceptional successes.

"Most employees involved in a serious accident genuinely want to share what they believe really happened. They feel everyone knows the outcome but not why the decisions and actions made sense at the time. Generally, employees want to own their decisions and almost all want to turn the accident into something positive. Unfortunately, we have provided our employees with powerful incentives to not openly or frankly share their story of events. Our history justifies the belief that if our employees disclose their decisions and actions they will be disciplined, embarrassed, or otherwise blamed for the accident."

Fire Operations Risk Management Council U.S. Forest Service

PART 2 - ESSENTIAL PRINCIPLES OF THE FACILITATED LEARNING ANALYSIS PROCESS

A. "JUST CULTURE": THE GOLD STANDARD OF ACCOUNTABILITY

FLA teams must have a good grasp of the "Just Culture" model. It is fundamental to this process. It is forward-looking accountability. It is concerned with preventing the next accident, not focused on correcting history.

To most people, being held accountable - *equals*-being punished. Within the model of a Just Culture however, accountability means: *the degree to which one can account for one's influence on the outcome.* The focus is on fairness and there is recognition that leaders and administrators bear responsibility for the system and, to a large extent, for the culture of the workplace. The *justice* of a Just Culture is that accountability is distributed, not retributive. The system, the culture and supervisors are fairly held accountable for their influence.

Definition of Just Culture

"Just Culture" is a workplace where employees at all levels are held fairly to account for their participation and their commitment to the organization's safety culture. Accountability is the focal point and it is justly distributed under this model. Workers are recognized to be inheritors of the production incentives, tools, trainings, procedures, and even the safety-vs.-production *values* of the workplace. Management, in contrast, is accountable for how it manages these artifacts, especially the safety-vs.-production values of the workplace.

In a Just Culture, Management purposefully and deliberately learns from workers how work gets done and how risks are perceived and managed. Management partners with employees to continuously enhance performance, risk management and the certainty of outcomes.

In a mature Just Culture, workers and administrators see information as the *lifeblood of safety*. Therefore, *all* employees disclose unsafe conditions, as they do individual mistakes. Employees and administrators openly share stories of how they balance the tradeoffs between safety and production; between efficiency and thoroughness. This sharing is routine and protected through the fair and just distribution of rewards for participation in the safety culture.

*(see also **APPENDIX F: REFERENCE MATERIALS** for Team Members)*

{*Fire Management Today* published a brief article on Just Culture in 2011, see: http://www.fs.fed.us/fire/fmt/fmt_pdfs/FMT71-1.pdf}

B. Administrative Assurance of No Punitive Actions

It is critical to maintain a solid firewall between the FLA and any potential administrative actions that may be taken against the employee. *Information is the lifeblood of safety*. We must cherish it and protect it. Of course supervisors need to use the tool of discipline from time to time but accidents are rare opportunities to examine how the system is not working.

"In a just culture, management can balance the tension between needing to know what is going on, and needing to correct what is going on."
- **Fire Operations Risk Management Council, U.S. Forest Service**

After an accident, everyone is surprised - especially those directly involved. In the interest of a learning culture, we exploit this opportunity. In essence we are telling employees "we trust that they did not intend for this to happen. We trust that they are good, competent employees. And, what happened to them could happen to other good, competent employees. Now, please trust management that our only goal is to learn everything we can about this accident."

If we punish employees for actions that, in perfect hindsight, appear to have caused the accident, we may (or may not) stop them from making that mistake again, but we will definitely stop these employees from sharing with management how they make sense about which rules are relevant, which are not, and how they balance the tradeoff decisions between production and safety; efficiency and thoroughness.

Therefore, all FLAs must have a signed delegation from the Agency Administrator giving their employees assurance that nothing discovered, or revealed by the FLA team will result in administrative actions. Administrative actions include any type of disciplinary actions and other adverse actions such as forced retraining, removal from an incident or reduction in planned overtime. This promise has never been broken in the history of the FLA implementation in the Forest Service; a promise kept on literally hundreds of FLAs across the country! Employees should be cautioned that the Agency Administrator cannot offer immunity or protection from legal actions arising from law enforcement agencies, or civil suits.

Often the reason for the FLA (the accident) turns out to be fairly simple and instead the response to the accident becomes the focus of the Lessons Learned - as was the case in the Wenatchee Complex Faller Fatality FLA, 2012

HANDOUT A: UNDERSTANDING THE WORK UNDER A JUST CULTURE

☑ PARADIGM CHECK POINT

If some team members are new to the process, it may be helpful to pause and have a team discussion or even a full dialogue session around these points. Team members will have a hard time understanding the FLA process unless they understand these concepts.

ALIGNING THE TEAM: NORMAL WORK, RISK, SAFETY AND JUST CULTURE

- Risk is inherent in everything we do. Short of never doing anything, there is no way to avoid all risk or ever to be 100% safe.
- How employees (at any level) perceive, anticipate, interpret, and react to risk is systematically connected to conditions associated with the design, systems, features, and culture of the workplace.
- "Risk does not exist 'out there,' independent of our minds and culture, waiting to be measured. Human beings have invented the concept of 'risk' to help them understand and cope with the dangers and the uncertainties of life. Although these dangers are real, there is no such thing as a 'real risk' or 'objective risk.'"[6]
- The best definition of "safety" is: *the reasonableness of risk*. It is a feeling. It is not an absolute. It is personal and contextual and will vary between people even within identical situations.
- While safety is an essential business practice, our agency does not exist to be safe or to protect our employees. We exist to accomplish a taxpayer-funded mission as efficiently as possible—knowing that many activities we choose to perform are inherently hazardous (for example, firefighting, driving, flying in helicopters, horseback riding, tree cutting, and even walking through a forest).
- Mistakes, errors, and lapses are normal and inevitable human behaviors. So are optimism and fatalism. So are taking shortcuts to save time and effort. So are under – and overestimating risk. In spite of this, our work systems are generally designed for the optimal worker, not the normal one.

Isn't there always a tradeoff between safety and performance?

The answer depends on how you view the mission and define performance. If performance is viewed as producing widgets then yes, providing for safety often involves a cost.

But if performance is viewed as taking reasonable risk to achieve outcomes on the ground which are *also* safe, then these two concepts are intertwined and become difficult to separate. Ultimately, the question becomes a false choice.

- Essentially *every* risk mitigation (every safety precaution) carries some level of "cost" to production or compromise to efficiency. One of the most obvious is the cost of training. Employees at all levels (administrators, safety advisors, system designers, and front-line employees) are continuously—and often subconsciously—estimating, balancing, optimizing, managing, and accepting these subtle and nuanced tradeoffs between safety and production.
- All *successful* systems, organizations, and individuals will trend toward efficiency over thoroughness (production over protection) over time until something happens (usually an accident or a close call)

[6] Paul Slovic, as quoted in Daniel Kahneman, *Thinking Fast and S*low (Farrar, Straus and Giroux, 2011), p141.

that changes their perception of risk. This creativity and drive for efficiency is what makes people, businesses and agencies successful.

- Our natural intuition (our common sense) is to let outcomes draw the line between success and failure and to base safety programs on outcomes. This is shortsighted and eventually dangerous. Using the science of risk management is more potent and robust. Importantly, Risk Management is wholly concerned with managing risks, *not* outcomes. Risk management is counterintuitive.

The Elkhorn 2 Escaped Prescribed Fire FLA in 2008 was one of the first attempts to use the FLA process to fulfill the requirement for Escaped Prescribed Fire Reviews. The FLA Process is now recommended for these reviews.

PART 3 - INITIATING THE FLA: BEFORE THE FLA TEAM ARRIVES

A. PRIORITY AGENCY ADMINISTRATOR ACTIONS

1. A critical incident is an event that has the capacity to overwhelm an individual's or an organization's normal coping mechanisms. Following a critical incident involving a near-miss, serious injury or death, it is the responsibility of the Agency Administrator to insure that the appropriate physical and counseling support needs are provided for the employee, their families and co-workers. Pre-incident planning is crucial in becoming familiar with resources within the Administrator's community. At the Agency level, Critical Incident Peer Support (CIPS) is a resource providing professional and peer-support by specially trained individuals in stress management. These types of early peer support interventions may mitigate negative long-term effects of a critical incident. The Employee Assistance Program may or may not have adequate resources to provide a response.

2. Provide employees with a trusted liaison who will explain the FLA process and who will be available to support employees until the FLA is completed. In complex events, it can take days before the FLA team is assembled. Employees will have questions and concerns about what is happening. In most cases, the liaison will need the authority to authorize overtime, travel, meals, etc. On wildland fire incidents, this liaison needs to ensure that critical employees or contractors are not demobilized *before* the FLA team is ready for them to leave. When personnel are held at a location post-accident they can have high levels of anxiety about what is going to happen next; it will be very important to provide them with real-time information and answer their questions**.** This employee liaison can also help the FLA team with logistics, travel, and other tasks.

3. Once the employees, families, and co-workers are cared for, the liaison could ask those involved to separately take a moment to jot down notes of what they remember as significant events, observations, decisions, etc. Personal note-taking should occur as soon as possible after the event—if possible, *before* employees discuss the accident with other employees. The purpose is to capture their thoughts and perceptions as close as possible to the time when the event occurred. Memories will change as sensemaking evolves. Ask employees to write their notes in brief "bulleted" form. Ask employees to try the best they can to *refrain* from building a story or make sense of what happened. Assure them that they will get a chance to tell their story later. What are needed now are bullet statements of memories that might get lost later. Remind employees that these notes are their own property and will not be collected or read by anyone else.

Facilitated Learning Analysis Teams **NEVER** collect or request written "witness statements."

B. FORMING THE FLA TEAM

The Agency Administrator should form the FLA team in consultation with their safety advisors. Again the general rule is that the more surprised the supervisors and agency leaders are in the outcome and/or the risks employees were accepting, the richer the potential harvest of learning can be by opting for a complex (instead of a Basic) FLA team.

Regardless of whether a complex or basic FLA team is formed, the team must meet the following minimum attributes:

1. A basic understanding of Just Culture.
2. A basic understanding of the FLA process (team leaders and facilitators should be formally trained in the process or have experience under a trainer).
3. A solid reputation for dealing with confidential matters.
4. Generally, team members should not be from the local unit or have any strong social ties with anyone directly involved in the event.
5. Team Leaders and Facilitators should not be from the hosting unit.

POTENTIAL FLA TEAM MEMBERS AND ROLES

FLA teams, much like the Incident Command System, are comprised of a changeable, scalable response organization providing a set of roles and responsibilities to enable people to work together effectively. Depending upon the situation one or two people can manage the responsibilities of all the roles listed below. Conversely, as the situation elevates in complexity it becomes necessary to expand the team and delegate roles to individual people. The key to successfully managing and developing a team is to stay flexible and accommodate the team's needs as they develop by expanding or merging roles as needed.

- ❑ **Team Leader**

The team leader is typically (but not necessarily) at the same level of seniority as the supervisor or line officer of the unit where the incident occurred. The team leader ensures that the team stays on task and is meeting deadlines. The team leader also is the mediator between the delegating official and the FLA team. The delegation of authority is issued to the team leader, who is ultimately the responsible official accountable for the quality and content of the FLA.

- ❑ **Lead Facilitator**

This position is needed on all FLAs, basic and complex. On most FLAs, the lead facilitator is the team's "FLA process expert." This position is analogous to "chief investigator" on a Serious Accident Investigation Team. A basic FLA does not demand the same skill level as a complex FLA. On a basic FLA, the facilitator needs to be a good listener and have solid facilitation skills. The more complex the FLA, the more the facilitator needs experience and competence in reflective listening, interviewing techniques, and accident sequence re-creation. Most importantly, the complex FLA lead facilitator should have a solid understanding of the Lessons Learned Analysis process (see **PAGE 35, PROCESS FOR CONDUCTING THE LESSONS LEARNED ANALYSIS**).

❑ **Documentation Specialist**

On most FLAs, the facilitator, or a combination of the facilitator and others, can handle the report writing. A complex FLA may involve a lot of documentation and a lengthy report. In these instances, bringing in a writer-editor/documentation specialist is a good idea. Also, if there is private property damage or personal injuries involved in the accident, then litigation or claims against the government may arise months to years later. In such cases, the FLA document may be the government's only official accident investigation report. As a general rule, if the accident involves significant private property damage or personal injuries, a separate claims investigation *should* occur. For a variety of reasons, this doesn't always happen. Therefore, a critical position that involves potential claims or litigation is the documentation specialist who will track and catalog important claims-related documents.

❑ **Storyteller**

The most effective way to share the learning throughout the organization is with a powerful story. If the FLA will feature an accident story (or a story about an intended outcome), it is generally recommended to bring in a person with this unique skill set. While there are talented storytellers in our agency, this is a rare skill. This position must have the ability to create the story of the accident and to write it accurately, clearly, and compellingly in such a way as to take maximum advantage of its learning potential for the greater organization. See special section **STORYTELLING BASICS: TIPS FOR CREATIVE NONFICTION STORYTELLERS ON PAGE 40**.

❑ **Peer**

Individuals directly involved in the accident should be represented by an FLA team member with intimate knowledge of the duties and skills necessary to serve in a similar position/job title. For example, if the accident is an engine rollover, a member of an engine crew should be on the FLA team. The peer can also function as the facilitator.

❑ **Subject Matter Experts**

The more complex an FLA, the more we will be looking for lessons learned for the larger organization. Therefore, it is important to have an FLA team member with expertise in the activity surrounding the accident. For example, if the accident occurred on a prescribed fire, the team should have a member with expert knowledge of prescribed burning operations, planning, coordination, and execution. Another example would be if the incident required expert knowledge of heavy equipment or specialized tools (aviation, artillery, etc.) the team may look for a Heavy Equipment Operator, Helicopter Manager or Demolitions expert. In many cases, the peer and subject matter expert may be the same person.

Subject matter experts from the Missoula Technology Development Center (MTDC)(406.329.3900) must be consulted to analyze the performance of **PPE**, particularly if the event involved a burnover or fire shelter deployment.

If **escape routes** or **safety zones** are a critical component of an entrapment, contact the Missoula Fire Lab @ 406.329.4801.

❑ **Technical Specialists**

Human performance specialists can add great value and competency to a complex FLA. Other specialists such as videographers or graphic designers can provide quality graphics, maps, video, and even animation. If the report can easily be turned into a training exercise because of the way it is designed, the impact of the learning can be much enhanced.

❑ **Union Representative**

The National Federation of Federal Employees (NFFE) has been a strong supporter of Just Culture and the FLA process. Anytime an employee wishes union representation, the Team Leader needs to ensure that request is honored. On complex FLAs, if employees on the unit are represented by a union, having a union representative is often valuable as a full team member. As with all other members, the union representative must meet the minimum team member attributes

❑ **Interagency Participation**

If the event involved employees from other agencies, consider involving these agencies by having a representative on the FLA team. This person could serve as the peer, subject matter expert, or other role. For further guidance, see the selection table for DOI USFS Serious Accident Investigation Type based on the 1995 Interagency MOU (available on the web).

C. Clear Mutual Objectives: The In-Briefing

When arriving at the host unit, the FLA team should in-brief with the Agency Administrator and then with individuals involved in the accident. This is an opportunity to establish common expectations of what will happen over the next days or weeks and to discuss what the outcome of the review will look like. *Always be wary of host unit expectations for a "quick wrap-up."*

Together, the Agency Administrator and the FLA team should review the delegation of authority and each item in **Appendix E: Tickler List of In-Briefing Discussion Items**.

It is critical that everyone involved in this process have a basic understanding of the purpose and intent of an FLA and how it differs from other types of investigations. . Everyone should be assured that no administrative punitive actions will result from information gathered by the FLA team. This assurance of no agency imposed administrative actions should be clearly stated in the delegation to the FLA Team Leader.

However, all participants must understand that this assurance of no administrative action does not protect employees against actions taken by the Department of Justice, Office of Inspector General, or other authorities

Open, Frequent Communication

Regularly scheduled conversations should occur between the FLA Team Leader and the agency official who authorized the FLA. The purpose of these discussions is two-fold:

- To keep the agency official updated on the FLA team's progress, and
- To ensure that the FLA is meeting the needs of the sponsoring official.

These conversations are not an opportunity for the Agency Administrator to "steer" the analysis in a particular direction. Rather, they are opportunities to ensure that the needs of the administrator are being met and that the FLA Team is answering all of the "how" and "why" questions that initially triggered the review.

***that are outside the control of your federal agency*.**

All participants should understand that if the FLA team learns someone involved in the accident acted with a *willful and reckless disregard for human safety* (that is, they expected their actions would result in harm), the FLA will be canceled immediately in order to preserve the integrity of the FLA process while other administrative actions take place.

The FLA Team Leader *must* not disclose any details to the Agency Administrator other than a recommendation to pursue an administrative or law enforcement investigation.

D. TRUST

The use of the FLA process is growing every year in wildland management agencies because employees and administrators are beginning to trust the process and trust the teams that are implementing it. All FLA team members *must* guard this trust and never betray the confidentiality of the employees involved or divulge any information not contained in the report to anyone outside the team. The only exception to this promise of confidentiality would be because of judicial order outside of agency control.

E. COOPERATION WITH OTHER INVESTIGATIONS

Sometimes other investigations must proceed alongside an FLA. FLAs are independent from other investigations or reviews that may be occurring. Communications with the people involved in the incident, internal team deliberations, and draft reports will be held confidential to the extent possible.

If other investigations are occurring concurrently with an FLA, the Agency Administrator must ensure that the FLA process is insulated from these other activities. For example, if compliance officers from OSHA or investigators from the Office of Inspector General (OIG) wish to conduct an accident or a criminal investigation, they should be supported by the Agency Administrator but kept separate from the FLA process and team members. (See 29 CFR 1960.29 for OSHA guidance on accident investigations.)

Material items that are evidentiary in nature such as photographs, transcripts of dispatch logs, law enforcement reports, personal protective equipment, etc., must be shared with OSHA, OIG, and other investigative authorities when requested. Requests for this type of information should be directed to the Agency Administrator and the team response should go back through the Agency Administrator. Interaction directly between the FLA team and OSHA, agency law enforcement, or any other investigative authority is generally inappropriate and should be minimized.

F. "RECOMMENDATIONS"? *USE CAUTION*

Our traditional safety paradigm has been that we prevent accidents by investigating them, discovering their cause, and then fixing the cause to prevent a repeat of the accident. Causal statements however, are typically problematic and highly subjective. They are always outcome dependent. FLAs must avoid causal statements. *For more information on the problem with causal factors, see* ***PAGE 31***.
Recommendations can be trouble too, when they play into this narrative. Managers used to the "causal" model may jump straight to the "Recommendations" section of the report, develop an action

plan, and believe they've solved the problem. Readers may look to recommendations for security, "If I'm following these recommendations, then I must be safe". In both cases, our cultural baggage around recommendations may make learning harder. Remember that an accident represents a single data point with a single outcome.

Often, the best outcome of an accident investigation or an FLA is simply learning how we make sense of risk. Effective learning can increase dialogue, change behaviors, change how we understand risk, change how we go about accomplishing work, and change how we make difficult trade-off decisions between efficiency and thoroughness, or production and safety. In many circumstances, recommendations actually interfere with learning. Often recommendations, when implemented, add complexity to the workplace, which has the paradoxical effect of increasing risk. Instead of recommendations, consider ways to make the FLA report an effective and compelling learning tool.

In lieu of written recommendations in the report, the Team Leader can discuss recommendations informally with the Agency Administrator. This should be discussed in the delegation of authority letter.

G. Human Performance Expertise

One positive attribute of Basic FLAs is that they are relatively quick and the sharing of lessons learned across the agency is rapid (at least in governmental terms). In some cases, however, the effort to keep the FLA at the basic level comes at a high cost in terms of lost opportunity to involve specialist, particularly a human performance expert. There are numerous FLA coaches and Human Performance experts available, including in the Forest Service's Office of Learning, to help an agency administrator decide if it would be worthwhile to bring in a Human Performance expert to leverage the event for its full safety and learning value.

When Do We Transition From a Basic to a Complex FLA?

At the outset, the FLA team and the Agency Administrator should agree (at least in principle) on the bounds of the FLA. That is, how long it will take, the complexity of the analysis, how the report will appear, etc. How these various aspects could change should also be discussed. Usually, this first assessment of the size and complexity of the FLA team is correct. Often, additional time is needed but it is rare for additional team members to be required.

Occasionally, a team will uncover a surprise, a rich vein of learning opportunities. Doing so may require technical experts including a human performance expert. This will add cost, complexity, and time. The report may also be ripe for a good storyteller to help turn the event into a powerful organizational learning experience. Of course, this will add more cost, time, and complexity. The team and the Agency Administrator may need to modify the delegation of authority to explore more fully a gap that has been revealed.

To shift from a basic or moderately complex FLA to a much more thorough and complex analysis is difficult, but can be absolutely necessary. Team members that committed to a week may have to spend a month. A unit that budgeted a few thousand dollars for an FLA may have to come up with tens of thousands. There is no easy answer to these issues. Frequent, open communication will make them easier to deal with.

H. Suggested FLA Report Outlines: Complex and Basic

Complex FLA	Basic FLA
1. Executive Summary A one- to two-page summary of the accident with highlights of lessons learned.	**1. Summary** A one- or two-paragraph summary of the accident.
2. Introduction An overview of the accident, the setting, and background information on conditions.	**2. Narrative or Chronology** A brief summary of what happened. This can be told in the form of a timeline, a narrative, story or a first-hand account.
3. The Accident Story The factual story of the accident using the techniques of nonfiction storytelling.	**3. Lessons Learned by Those Involved** A listing or creative display of the views expressed by those involved in the accident related to what they learned and what they believe the organization should learn from their experience. Alternatively stated as: *"What would I do differently next time, knowing what I know now?"*
4. Lessons Learned by Those Involved A listing or creative display of the views expressed by those involved in the accident related to what they learned and what they believe the organization should learn from their experience.	**4. Summary (Recommendations Optional)** A brief summary of the FLA. If it is requested by the Agency Administrator, this summary may also contain team lessons learned. (Recommendations are generally not advisable.)
5. Lessons Learned Analysis An analysis of the relevant workplace conditions to explain the nature of the accident. The relevance (to the accident) of a given condition is a subjective determination made by the FLA team and, where feasible, originates from the lessons learned by the peers. Highlight conditions that were key to the accident and that may be setting the organization up for a subsequent accident.	
6. Summary A brief summary of the Lessons Learned Analysis. Performance-shaping factors or workplace conditions that pose an unnecessary risk to future operations should be discussed in this section and will serve as the basis for any recommendations.	
7. Appendices The appendices feature information such as a Human Performance Analysis/Human Factors report, fire shelter performance report, engineer's structural analysis, fire behavior analysis report, etc.	
8. Recommendations (Optional) A listing of reasonable courses of action that modify, enhance or remedy performance-shaping factors that create unnecessary risk to future operations. Recommendations are often the most contentious part of the report; if required, should be given to Delegating Authority separately.	

"Hindsight bias is the chief saboteur of any accident investigation. Interviewers should remember their highest objective, to be able to describe how interviewees (the people they are interviewing) developed their understanding of the situation—and then made sense of their choices at the time, and in context."

Fire Operations Risk Management Council
U.S. Forest Service

PART 4 - THE FLA PROCESS

A. SETTING THE STAGE

Throughout the FLA process, team members should be prepared to explain the history of FLA and its major underpinnings, such as the degree of confidentiality, Just Culture and The Gap. A frank discussion of the delegation can be useful, too, to frame the conversation and to give assurance about the Agency Administrator's stance on punitive action. Agency Administrators and FLA participants may not be familiar with the process; there is also a tendency after an incident for participants to worry that this time the "investigators" are out to get them. Explaining the process can help put them at ease and make them more responsive through the process.

The heart of the FLA process is the conversations with the participants. It's important to use both group discussion and individual interviews. Important learning can happen from both. It may not be essential to do individual interviews in every case, but you should always conduct a facilitated dialogue with those involved with the incident.

For both individual and group interviews, the team should attempt to control the environment by making it as comfortable for the participants and conducive to the planned conversation as possible. Do everything in your power to discourage the impression of an interrogation.

B. INTERVIEWING

For a basic FLA, the facilitator may have enough background information to go right to the dialogue. The team may not need to conduct individual interviews. Most often however, key people involved in the accident should be interviewed before the dialogue session. These interviews will frame the dialogue and ensure key events and conditions are brought forth. For complex FLAs, extensive interviewing is often necessary and should not be hurried to meet an arbitrary date. Conducting interviews appropriately is crucial to the FLA process.

No Witness Statements: An FLA Commitment

Very often people involved in a traumatic event remember things that never actually happened and cannot recall key events that they were directly involved with. This is what happens to normal and honest people. We expect and intend for participants involved in the event to actually learn along with the FLA team.

The facilitated dialogue session (see page **25**) is when the participants and witness all share their contrasting memories together with other information gathered by the team. This session is often punctuated by moments of shock and surprise as participants compare their memories with others.

Witness statements and recorded interviews may actually *interfere* with recreating the best account of what happened. Consequently, FLA Teams *never* collect written witness statements or record interviews. We don't want participants to feel like that have to maintain or defend early perspectives of what they think happened.

The team leader should select interviewers based on their experience, skills in empathic listening, interviewing, and interpersonal communication. Interviews should occur as soon after the accident as possible, especially for accident victims who demonstrate a strong emotional response to the event.

For key accident participants or witnesses, the team leader should consider using a team of two interviewers. Please note: because using two interviewers can sometimes be intimidating to the interviewee, this approach should be used with appropriate caution and understanding. Participants who are more tangential to the accident may be interviewed in groups of two to four at a time.

All interviewers will battle hindsight bias (see Handout C: Mitigating Hindsight Bias). Interviewers must strive to focus on their objective to be able to describe how the people involved developed their understanding of the situation and made sense of their choices at the time and in context.

Before interviews begin, the FLA facilitator should coach interviewers on using the interview process guidance outlined in this chapter. The FLA facilitator should also remind the interviewers to collect quotes from the interviewees.

Interview information will be displayed in the FLA report the headings, such as:

- "What the Employees Involved in the Incident Learned for Themselves and for Their Peers Across the Agency"
- "What the Employees Involved Believe Management Should Learn From Their Experience"

Members of the FLA Team should debrief with each other daily. During these meetings, the results of interviews should be discussed and adjustments made to the questions, setting, etc. Typically teams meet every evening for an hour or two for this discussion.

The specific details of interviews and deliberations must never be shared with anyone outside of the FLA Team, including the Agency Administrator.

Often the best place to conduct interviews is at the accident site as was the case with the Little Venus Entrapment, 2006

Pictures Are Precious

FLA teams need to be proactive and even assertive in asking for pictures or video. Often employees won't admit in public that they were taking pictures on an assignment but they may do so in private. Not only do pictures add much visual appeal to FLA reports, but they also contain valuable information, like time stamps, GPS coordinates and other important metadata.

HANDOUT B: INTERVIEW QUESTIONS

Copy this page for interviewers

Control the interview environment. Find a location that's comfortable, private, and appropriate.

1. Ask the interviewee to tell the story from his or her point of view. Try not to "correct" or interrupt the interviewee unless you need to ask them to slow down or clarify for your notes.
2. Tell the story back to them to ensure that you can make sense of their decisions the same way that they made sense of them at the time.
3. Accept the interviewee's perspective and story. Remain neutral. Try not to agree or disagree with statements made, including when critical junctures are discussed in their story. Rather, probe deeper into these junctures with questions such as:

Clues

- What were you seeing?
- What were you focusing on?
- What did you feel was going to happen; what was your level of optimism?
- Did you have any feelings of doubt, or worry about how things would turn out?
- What else were you thinking about (*friends? finances? painful feet?*)

Interpretation

- If you had to describe the situation to a peer, what would you have told them?
- What were your thoughts about dangers and risks?
- Are there any feelings that come to mind concerning the confidence you felt in your situation?

Previous Experience

- Were you reminded of any previous experiences?
- Did this situation fit a standard scenario? Was it "normal"?
- How do you feel you were trained or prepared to deal with this situation?
- What rules and SOPs did you find helpful in this situation? Which ones weren't?
- What was your gut telling you?

Goals

- What were your goals at the time?
- What were the conflicts or trade-offs to make between goals?
- Were there time pressures?

Taking Action

- How did you feel that you could influence the course of events?
- How did you feel you were prevented from taking action or not taking action?
- Did you discuss or mentally imagine other options? Or, did you know straight away what to do?

Outcome

- What surprised you the most? What other events surprised you?

Hindsight

- Looking back (using your hindsight) what would you do differently?
- What do you feel you learned from this event? What do you think the agency needs to learn?

HANDOUT C: MITIGATING HINDSIGHT BIAS

☑ *Before* beginning the interviews, the FLA team should consider referring to this page and discussing the following tools to mitigate "hindsight bias." A team dialogue session may be needed to ensure that all members are comfortable with these concepts.

All your data pertaining to the event is after the fact. It's all viewed from the perspective of already knowing the outcome. The issue isn't fighting hindsight; the issue is overcoming *the bias of hindsight*. While team members will never be able to completely overcome "hindsight bias," they can mitigate many of the negative effects using the following threefold approach:*

1. As faithfully as possible, the interviewers need to try to achieve the same limited perspective experienced by the participants leading up to the incident. If the interviewer doesn't feel some sense of surprise that the outcome occurred, then the interviewer has failed in this regard.
2. The team should reason together to explain how the exact same decisions could have led to the outcome that had been expected by the participants; and, conversely, how the accident participants could have undertaken a different set of initiatives that might have resulted in the same unexpected outcome.
3. The team must avoid using "counterfactual" expressions or even thinking in terms of counterfactuals. (See sidebar and continued discussion below.)

What is a counterfactual?

A counterfactual is a statement that contains at least two assumptions that are linked: 1) somebody could (and should) have done something different that 2) had that action been taken it would have produced a different (and often better) outcome.

This is problematic because it assumes that the action was possible, that it would have produced a counterfactual outcome, and that no other variability would have been introduced in the process. Counterfactuals have tended to lead to punitive models for accountability. They also assume a perfect model of human performance, which the FLA rejects.

What team members may think *should have happened* are the most seductive counterfactuals and they will blind the team from understanding the event in context. Examples include *"If only the firefighter had . . ." "The crew leader failed to . . " "The supervisor should have . . ."*

When counterfactuals come to mind, FLA team members should try to overcome their effect by telling themselves that even if the counterfactual had happened, the outcome might still have been the same. Remember, if the person involved in the accident had known what the results would be, they probably would have taken a different action. But the future hadn't happened yet, and they couldn't have known the outcome. The bottom line is that the human being sitting in front of the interviewer simply *did not* take the counterfactual action at that time and it is unknowable what would have happened if they had.

Interviewers should appreciate that the accident participants are also affected by hindsight bias. Human memory connects images and facts to build a coherent mental story that makes sense in the light of the *now known* outcome. This is not a conscious process. "Sensemaking" (see definition on page 37) does not stop after the accident. It is common to interview a firefighter involved in an accident and find their language packed with things they wished *they* had done differently. Then, in the subsequent weeks, this person's language changes to the certainty of what *other people* should have done. A recommended solution is to interview those involved in the accident as soon as possible and help keep them focused on telling the story solely from their perspective. That is, how they saw, felt or sensed events happening.

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* Sidney Dekker, *The Field Guide to Understanding Human Error* (Aldershot: Ashgate, 2008) and Neal J. Roese and Kathleen D. Vohs, "Hindsight Bias," *Perspectives on Psychological Science* 7 no. 5 (September 2012), 411-426. The latter, available at http://pps.sagepub.com/content/7/5/411.full.pdf+html , is recommended reading for all FLA teams!]

C. THE HEART OF THE FLA PROCESS: THE FACILITATED DIALOGUE

The heart of the FLA process is a dialogue session with those directly involved with the event. This generally includes one facilitator helping a group of people think together about the incident and talk their way through what happened and what they can learn from it. The following pages provide a flexible structure for adapting to any audience, event, organization, and facilitator.

Strongly Recommended Reading for all FLA Facilitators
Dialogue and the Art of Thinking Together by William Isaacs

PRINCIPLES AND AGREEMENTS FOR ALL INVOLVED IN THE FACILITATION

1. We have clear agreement with the Agency Administrator that no administrative actions, (that is, disciplinary actions such as letters of caution, stand-downs, and forced re-trainings) may result from anything learned through the FLA process. If there is any question about this, stop and clear up confusion.
2. *Respectful* discussion is the rule; it can be emotional but it must remain respectful.
3. Learning for future events is more important than assessing past blame.
4. We all make mistakes—it's inevitable; it's the human condition. It's okay to openly discuss these occurrences.
5. Almost all human actions and decisions are intuitive responses to circumstances largely based on past experiences. It is extremely rare that our people are actually careless, meaning that they didn't care if the outcome was or was not as intended.
6. Accidents are almost always the result of rare combinations of normal performance variability and chance combinations of unlikely events.
7. Safety is never an absolute.
8. Within this dialogue, safety should be thought of, and referred to, as the reasonableness of risk. It is a feeling about which two experienced, competent professionals can disagree—*and both be right!*

"In skillful discussion, we inquire into the reasons behind someone's position and the thinking and the evidence to support it. As this kind of discussion progresses, it can lead to a dialectic, the productive antagonism of two points of view. A dialectic pits different ideas against one another and then makes space for new views to emerge out of both."

William Isaacs
From *Dialogue and the Art of Thinking Together*

D. THE DIALOGUE SESSION

PARTICIPANTS

Who is involved in the dialogue session? It depends. An experienced FLA facilitator is one most qualified to know who should and shouldn't be present. Typically participants include everyone directly involved in the event including permittees, outfitters, cooperators, etc.

Depending upon the situation, consider including:

- Supporting FLA team members
- Supervisors of people involved
- Project Planners
- Project leaders
- Trainee Facilitators

When project leaders, supervisors, and agency administrators are involved in the dialogue the discussions often become broader in scope with organizational and interdepartmental topics included. In some cases, it may be more productive to conduct the discussion without these high level members present. Indeed as a general rule supervisors should not be present unless they were directly involved in the event. The team leader and facilitator should confer about, and control, who is present based on what they learned from the interviews. Don't be afraid to ask the participants themselves who should be involved.

Do interview project leaders, supervisors, agency administrators because they are participants in the decision. Their perspective on risk and how it may differ from participants is important for the FLA team to explore.

AGENDA FOR THE DIALOGUE SESSION

Only a general agenda is necessary. It should not constrain the flow of the discussion. Experienced facilitators have learned to ensure there is more than enough time available; dialogues often go for several hours or longer. Occasionally a dialogue session opens a rich vein of sharing and understanding that you will not want to shortcut. Plan for the amount of time you think you'll need then make contingency plans in case the dialogue needs to go twice as long.

Make sure to take a few minutes to explain the FLA process and discuss the principles and agreements above. Also, discuss the nature of the report that will document the learning.

SUGGESTIONS TO FLA FACILITATOR FOR INITIATING THE DIALOGUE

- **Location.** The setting is extremely important. It is basically the "stage" for the FLA performance. The best location is almost always the field where the incident occurred. If going to the field is not an option, don't just accept the "available conference room." Get a location where the workers directly involved in the incident feel most comfortable. If the FLA involves a fire engine accident, the best location might be their engine bay, using their sand table. If the FLA involved a wilderness crew, the best location might be the horse stable with a projector and screen set up to show Google Earth images.

A Dose of Humor and Humility

The master FLA facilitator, Paul Chamberlin (recently retired, US Fish & Wildlife Service) would sometimes "accidently" spill water on the front of his pants just prior to beginning a facilitated dialogue. He would use this embarrassing moment to disarm the participants and introduce stories about how unexpected things happen despite the best of intentions.

- **Willingness to be vulnerable.** Give strong assurance of two things: first that we are *not* here to find who "caused" the accident. We are here only to share what each individual has learned from the incident and then see if we can turn that into collective learning. The FLA team is not here to "fix" a problem. This is only about taking advantage of an opportunity to learn. Second, that nobody will be disciplined or "stood down" because of anything learned here. For this, we have the Agency Administrator's assurance. Moreover, this dialogue will be respectful. If anyone would rather use this session to prove someone else was wrong, they are invited to leave.

- **You are not your point of view!** Give the participants an introductory story or an example of a situation where a smart person was absolutely convinced things were one way when, in fact, the person turned out to be completely wrong (a personal story from your past is often the best type of story). The goal is to get people to feel that they don't have to defend their perspective. There will be differences of opinions on history; there always are. People have the right to change their opinions through the course of the dialogue. Get agreement with your audience upfront that nobody's credibility is on the line.

- **Incite uncertainty.** Our workplace culture has trained us to be very careful about what we say in meetings. Consequently, when others are talking, we tend to be barely listening. Rather, we are thinking about what we are going to say next. Dare people to suspend any certainty they have in what happened and challenge them to anticipate (and even *imagine*) that over the next hour or two, they will be surprised by what they didn't know. They need to listen deeply to each person, seeking clues and insights into this new understanding.

- **Listen for the silent voice.** Many people, even some extroverts, do not feel comfortable speaking up in a group of peers. Some great thinkers don't feel confident in their ability to *think on their feet,* developing coherent arguments while talking at the same time. The facilitator needs be

attentive these quiet participants and work them into the dialogue. Don't allow a self-directed dialogue to continue very long unless everyone is participating.

SAND TABLES AND GOOGLE EARTH

If you can't physically go to the site where an event occurred, you can utilize a computer, a projector, and Google Earth. People skilled with Google Earth can set up and animate a display that adds a bird's eye view and various features that often help participants see a larger perspective.

Using an informal, interactive sand table approach to present what happened during an event can also be particularly helpful. The very act of setting up the sand table using people involved in the event can reveal different understandings of what the different participants viewed as "reality."

Either Google Earth or a sand table presentation can illustrate how well-intentioned people acted when confronted with difficult situations. Via the re-creation of the event, you can share what people perceived, what they were thinking, how they performed, and—now—what they might think about differently in the future. .

Leader's Intent for a Basic FLA

A basic FLA is successful if it simply captures the information about an event with enough detail to provide a picture of the incident so that the reader (or listener) can determine (on their own) why the actions made sense. In its purest form, this is the intent of a Basic FLA. The process does not require analysis or judgment; rather, it presents information like a documentary. A Basic FLA is somewhat like a staff ride. Observations and recollections do not have to agree; in fact, the process should capture the *fog of war*.

HANDOUT D: TWO SUGGESTIONS FOR DIALOGUE FOCUS

The facilitator may want to refer to this page during the dialogue.

This page contains questions modeled after the After Action Review and the hallmarks of High Reliability Organizing (HRO), two discussion tools that participants may be familiar with.

AFTER ACTION REVIEW-TYPE QUESTIONS

Dialogue facilitators most commonly use the well-known After Action Review questions. These questions are designed to evoke discussion and escort participants to share their perspectives. By discussing the answers to these questions, a better "picture" of the event can be formed that further explores the decisions and behaviors involved in the event. Notes from the Dialogue session will be very helpful when writing of the FLA story and report.

1. What was planned? What was your leader's intent?
2. What information were you provided? What did you feel was missing? Why couldn't you get this?
3. What was the situation? What did you see? What were you aware of that you couldn't see?
4. What did you do? Why did you do it? What didn't you do? Why didn't you do it?
5. What was routine? What surprised you?
6. What did you learn? What might you do differently next time? What can we learn as an organization? What might we do differently?

ORGANIZING FOR HIGH RELIABILITY-TYPE QUESTIONS

The Five Traits of Highly Reliable Organizations

- ☑ Preoccupation with Failure
- ☑ Reluctance to Simplify
- ☑ Sensitivity to Operations
- ☑ Deference to Expertise
- ☑ Commitment to Resilience

The five hallmarks of High Reliability Organizations (HRO) can also be used to help structure or frame a facilitated dialogue. Generally, these questions should be reserved for cases in which the people who were involved with the incident are already familiar with the HRO traits and understand the principles. To base the dialogue on HRO traits, ask each participant what happened before the incident and what was learned about the organization after the accident, with regard to each of the traits. The core of the dialogue is getting an answer to the question, "What did you (or we) learn from this event that will move us closer to actualizing each of these traits?" Example questions include:

1. What were we sure that we not want to misestimate? How well did we do? Did we do a premortem? What were our trigger points and how effective were they?
2. Where was our attention? How did we name what was going on, and why?
3. What cues were we paying attention to in the environment? Where did we contain small errors before they had big consequences? What surprised us and why?
4. Who did we listen to, and why? Who did we not listen to and why not?
5. Was this a "brutal audit"? What did we learn about our system, including brittle points where small errors had big consequences? Where do we need to build in more redundancy or more slack? How easily can we bounce back? What does this incident tell us about the environment we work in now?

Self-reporting of intentional rule violations and even deliberate law violations is one of the most valuable features of an FLA; this is the chief reason why we offer the assurance of "no administrative actions."

Fire Operations Risk Management Council
U.S. Forest Service

E. Event/Accident Reconstruction

The exact process of reconstructing the incident (generally by chronology and key events) will vary. No set procedure is prescribed. The final incident story (or chronology, or narrative) need not be completed until the very end of the process. For the sake of efficiency, however, the team should build a time line of events as they go and post all the known times of significant events. It may be helpful to post a series of flip chart pages together and construct a chronology or timeline of events. Timestamps from photographs and dispatch logs are also helpful for verifying critical times

F. Final Considerations

1. Sensitivity to Admitting Mistakes

The credibility of the FLA depends on open and honest discussion regarding the events and actions and decisions surrounding the incident. However, when writing the report, the FLA team must make decisions about which details to include. Keep in mind that the purpose of the report is organizational learning. In crafting this report, the team must be sensitive to human nature and human pride. The team must seek to minimize embarrassment to individuals, leaders, and organizations (including cooperators). Why would people choose to participate if they thought it would result in professional embarrassment?

In addition to making selections about what to include in the public report, pay close attention to how those details and ideas are presented. Admitting or "owning" mistakes can be presented in a way that is quite admirable.

When Intentional Rule Violation is *Not*
Reckless and Willful Disregard for Human Safety

The FLA team must remain aware that an intentional violation of a rule or procedure does not equate to reckless or willful disregard for human safety. Most often, a procedural rule violation falls within the category of normal, if not predictable, human performance. Frequently when we probe into why a person intentionally violated a rule, we find that the rule was interfering with experienced safe practices. Most often, rule violations are the byproduct of workplace pressures or incentives on employees to increase efficiency. For instance, a firefighter talking to a duty officer on a cell phone while driving to a fire is a commonplace example of an employee knowingly violating a rule in order to achieve an additional measure of efficiency and productivity.

It is our best and brightest employees who learn how and where to be efficient in ways the rule makers never imagined. The gap between procedures and practice should be respected as the *evolution of expertise*.

From a safety perspective, we must react to knowledge of intentional rule violations with careful appreciation. Information such as this is the lifeblood of safety and anything that is done to impede the flow of this information will result in less upward reporting.

Understanding the expectation of the employee is critical to discriminate between a normal procedural rule violation, on the one hand, and reckless and willful disregard for human safety, on the other. Admissions of procedural rule violation or at-risk behavior must be protected, and even cherished, throughout the FLA process.

2. CHARACTERIZE THE ACCIDENT BY CONDITIONS AND CHANCE CONJUNCTIONS, NOT "CAUSAL FACTORS"

There is a deliberate effort in the FLA process to avoid labeling human errors, omissions or other actions (or non-actions) as "causal." Labeling these findings as "cause" impedes our ability to explain or understand what was experienced in context before the accident. Constructing causal statements inevitably degrades our ability to understand the complex nature of accidents, the role of chance, and nature of human performance functioning in dynamic environments.

Causal statements inevitably lack context because, for one, context is too complex; and two, because once context is explained you'll find cause becomes a conclusion that no longer follows from the premise (a non sequitur). Cause isn't something investigators 'find' or 'discover'; cause is always something we create by recreating the event showing how certain anomalies led to the accident. This leads to the simplistic (and therefore *wrong*) conclusion that if the people who were dealing directly with the risks just complied with the rules (or complied better), or just paid attention to the right things, the unintended outcome would not have happened.

If the Delegation Requires You to Determine "Cause"

If the delegation *requires* the FLA team to find cause, determine cause, or identify causal factors in the report, the team should define the word "cause" within the report as "The team's judgment of the conditions that describe the nature of the accident" including:

- Conditions that create tension between production and protection; and,
- Conditions that collectively permit the chance conjunctions of local triggers and active failures to breach all the barriers and safeguards.

Adapted from *The Human Condition* by James Reason

In reality, however, most of those discrete omissions or actions occur during the course of normal work *continuously*. They are not anomalies at all. Indeed, those same omissions and actions typically lead directly to successful outcomes and even avert disasters. A chance conjunction of events is almost always the difference between *normal* success and the *rare* accident.

Finally, causal statements tend to imply that safety is the responsibility of the people on the front lines facing the risks ("the driver was speeding," "the faller's face cut was too shallow," "the firefighter lost situational awareness," etc.). This impedes learning because it faults only one part of the system. However, safety is in the entire system. Practitioners at the "sharp end" (those workers who directly confront the risks of the workplace) are inheritors of policies, training programs, tools, culture, incentives, etc., that are the responsibility of those managers and administrators at the "blunt-end[*]."

The FLA report should explain the nature of the accident. The key commitment of the FLA team is that accidents are *not* caused by anomalous, blundering, or deviant behavior. Accidents are more accurately

[*] Sharp end refers to the field practitioners who are in direct contact with operational risks. They are the actualizers of a work program designed and organized by those at the blunt end. Practitioners at the sharp end are those who make real-time, operational risk management decisions. Those at the blunt end are the supervisors, and administrators who are engaged in strategic risk management

understood as *unexpected combinations of normal performance variability*[*] (both human and system performance variability).

3. AVOID COUNTERFACTUAL ARGUMENTS

FLA teams must guard against making counterfactual arguments such as: *"If this person had done X, then the outcome would have been Y and the accident would not have occurred."* The FLA is only useful when it learns why people did what they actually did (why it made sense to them at the time), rather than why they did not do something that—in hindsight—others might think they should have. **SEE HANDOUT C: MITIGATING HINDSIGHT BIAS**).

4. DISPLAY MISALIGNMENTS BETWEEN ADMINISTRATORS' AND EMPLOYEES' PERSPECTIVES

Many unsafe behaviors are well tolerated and even valued—until there is an accident. Indeed, one of the values of experience is that it teaches us what rules and procedures are important and which ones can be shortcut to increase efficiency or effectiveness.

Once the FLA team understands how the accident participants made sense of their environment, the team should contrast this understanding with how administrators thought employees would (or should) make sense of the environment. Illuminating the gap between work as imagined by administrators and work as actually accomplished will illuminate substantial and critical organizational vulnerabilities.

Deficiencies in physical ability, knowledge, skill, or leadership competencies may also be uncovered and considered key conditions or risk factors. Once again, in these situations, the focus of the FLA team is not on the *individual* but on the *system* (the organizational conditions) that enabled people who were underqualified or under-capable to be placed in critical or difficult situations

[*] Eric Hollnagel *Safety Management – Looking Back or Looking Forward,* Resilience Engineering Perspectives, Vol 1 (Ashgate 2008), p75

G. Terminating A Review

Serious Crimes or Reckless and Willful Disregard for Human Safety

During the course of the FLA process, though highly unlikely, it could be discovered that an agency employee acted with a reckless and willful disregard for human safety or committed a serious criminal act. For example, say it was discovered that the accident victim was drunk or on illegal drugs at the time of the event, or one employee involved in the accident intentionally tried to hurt another. If such a discovery is made, then the event is no longer appropriate for a "safety investigation" (FLA). ***Why? Because the event is no longer considered an "accident."***

The FLA team leader should write a memo to the delegating official stating that the FLA has been terminated and that there may be cause to initiate an administrative or law enforcement investigation. The FLA team leader should release all physical evidence (that is, photographs, sketches, PPE or other physical equipment gathered by the FLA team) to the Agency Administrator. Notes of interviews and other team products should be given to the FLA lead facilitator for confidential and secure storage. At this point, the FLA process has terminated and FLA team members should take no further actions.

Collecting and Storing the Analysis Materials

After the FLA report is accepted, the FLA team's facilitator will collect and secure all electronic data storage devices, notes of interviews, team deliberations, and draft reports.

Material "evidence" such as photographs, personal protective equipment used, audio files/transcripts of radio communications, law enforcement reports, etc. shall be collected, cataloged, sealed, and given to the Agency Administrator for secure storage.

Agency Administrators should consult with their appropriate legal counsel or records managers on retention of these records.

By choosing the FLA process, the Agency Administrator and the FLA team members share a mutual promise to maintain separation between the FLA process and any other sort of disciplinary, administrative, or law enforcement action under agency control. While the FLA team leader and the Agency Administrator must have some degree of discretion and flexibility to handle unique situations, including discussions on confidential matters, there must remain a firm firewall between the FLA and any other internal (agency-controlled) process that could use information from the FLA for non-safety related purposes. (See also **Appendix E: Tickler List of In-Briefing Discussion Items**.)

If an FLA is terminated for the above reasons, team members ***must not*** discuss anything they learned during the FLA process with anyone. *This includes agency officials performing internal (agency-controlled) administrative or agency-controlled law enforcement actions*. To do otherwise would violate the integrity of the process and the implicit agreement within the FLA process. However, at any time, any team member may be required to cooperate with inquiries or investigations from external authorities (not under agency control) such as civil police agencies or officials from the U.S. Department of Justice, the Office of Inspector General, and the Office of Safety and Health Administration.

Once an FLA is terminated, arrangements should be made to notify all involved. This is especially true for people who were interviewed by FLA team members who will suspect the worst if they are not quickly contacted to let them know the FLA was terminated. Obviously you will not be able to discuss

details. A simple statement such as; "the team found it could not meet the requirements of the delegation and so they terminated the review" may be all that you can say.

REPORT COMPLETION

As soon as practical, the FLA team should complete a draft of the report and those involved in the event should review it. The recommended method for conducting this review is to read the report verbally (or with a projector displaying the report). Distributing copies of the draft is not recommended but in some cases, may be unavoidable. While the accident victims and others involved don't have to fully agree with everything in the report, they need to know that they had a fair opportunity to correct any errors.

If approved by the delegating authority, the report should be distributed appropriately. Wildland fire-related reports should be posted on the Wildland Fire Lessons Learned Center website at www.wildfirelessons.net.

H. IMPROVING THE PROCESS

This guide is revised and updated continuously based on lessons learned from users like you (for examples, see **APPENDIX B: LESSONS AND ADVICE FROM 9 YEARS OF FLA EXPERIENCES**). It is helpful for FLA teams to reconvene (at least with a conference call) and to conduct an After Action Review of their FLA experience. Document any suggestions for improving the process or the guide. Forward these suggestions to: **FLA.GUIDE.IMPROVEMENTS@GMAIL.COM**.

From your mobile device, scan this link to email suggestions for the guide:

Privacy - A General Rule

Facilitated Learning Analysis reports must avoid using people's names and only refer to gender if it is relevant to the incident or meaningful to the story. Using position titles (e.g., holding boss) may be awkward within the story. One acceptable technique is to use fictitious, gender neutral names such as Terry, Tracy, Lynn, Leslie, etc. If fictitious names are used, ensure the reader understands they are fictitious and why.

For some types of incidents such as wildland fires, it is usually appropriate to include a person's Incident Command System (ICS) position for organizational and command issues to provide context and make sense to the reader. This can be annotated as "DIVS A" or "DIVS Smith" (where "Smith" is fictitious but the person was performing in a Division/Group Supervisor role).

"A Lessons Learned Analysis is not about explaining why those involved in the accident made their decisions. Rather, it about understanding the conditions surrounding the event so thoroughly that team members begin to believe that they themselves would have made exactly the same decisions! This is the defining moment of clarity. The team has gained the wisdom of knowing that similar conditions in the future will again lead to similar decisions and outcomes. These are the conditions that need to be understood by others who work in similar circumstances."

From NAFRI's Learning from Unintended Outcomes Workshop

PART 5 – ADDITIONAL STEPS FOR A COMPLEX FLA

Because of the necessary time and expertise, two components of a "complex" or thorough FLA are generally not featured in a "basic" FLA: the Lesson Learned Analysis and well developed accident story.

The Lessons Learned Analysis is one of the most powerful tools for mining deeper organizational issues. A basic FLA focuses almost exclusively on the lessons learned by those involved. The complex FLA takes this to the next step—to the organizational level—by using the Lesson Learned Analysis process. This process can take several days and requires an FLA team that has subject matter experts on both human performance and the specific activity surrounding the event. If no one on the FLA team is experienced in this process, a Lessons Learned Analysis coach may also be needed.

A. PROCESS FOR CONDUCTING THE LESSONS LEARNED ANALYSIS

The Lesson Learned Analysis begins with a closed-door confidential team dialogue. Expect it will take at least a few hours and maybe a few days to complete. The task is for the team to achieve the same level situational awareness, belief, and expectation that was held by those involved in the accident - which they had *before* the accident. The end-state is the insight generated from the dialogue itself. Consensus is not the goal. Tension between individual team member's perspectives is valuable.

Pick someone on the team to facilitate the dialogue; typically the Lead Facilitator is best suited for this role. The facilitator will then guide the team through a discussion of the key decisions and actions running them through the "six hows" below. The function of the six hows is simply to provoke and frame the discussion on *"How*?"—until the team is able to reach the level of sensemaking that was shared by those people directly involved in the accident. As Dekker and Pruchnicki write, "Actions that are interpreted as 'bad decisions' after an adverse event are, at the same time actions that seem reasonable – or people would not have taken them." [The FLA team], "…does not see wrongdoing, but rather tries to understand how people can see their actions as being right." [*]

Through the Lessons Learned Analysis and the use of the Six Hows, the Complex FLA Team will gain the ability to identify, understand, and explain the risks of the situation and the performance-shaping

[*] Dekker & Pruchnicki (2013) *Drifting into Failure: Theorizing the dynamics of disaster incubation*. Theoretical Issues in Ergonomic Science

factors surrounding the incident. This is very different than trying to determine the cause; indeed, this exercise will make it obvious how the label 'cause' distracts from understanding the nature of the accident. Most often, the Lessons Learned Analysis will reveal that multiple improbable events were necessary for the accident to occur. A quality Lessons Learned Analysis may conclude simply that we need to learn to think statistically if we are to enhance our odds in future endeavors. In some cases, the best that can come from reviewing an incident is to illuminate conditions where human mistakes are likely, especially where conditions can fool people into misperceiving dangerous situations.

B. THE SIX HOWS - *SENSEMAKING*

PROCESS→ For each key action or decision, the FLA Team will deliberate on the "Six Hows" below.

***How it made sense at the time of- and leading up to - the incident to…*:**

The Six Hows

1 …see things the way they were seen.

2 …expect what was expected.

3 …forgo an available hazard mitigation.

4 …shortcut typical procedure.

5 …accept a risk that—*in hindsight*—seems unreasonable to have accepted.

6 …ignore a risk that—*in hindsight*—seems so obvious.

KEY PRINCIPLE→ Keep the focus on the players involved in the incident. The focus is NOT "how" it makes sense to the *FLA team*, but rather "how" it made sense *to those involved*.

You'll find that some of these 'hows' do not apply and some will be redundant. Use those that are helpful and don't waste time trying to cook-book the process. Every situation is unique.

In the write up of the Lessons Learned Analysis, summarize the Team's insight from this dialogue session. Use whatever format for this summary that is deemed appropriate. In some cases the title of this summary may simply be "How the Accident Happened".

The intent of this write up is twofold. First to explain to the reader how and why the sensemaking occurred in that decisions and actions that seem wrong in hindsight were actually valid or at least legitimate in context at the time. Secondly to display the Team's insight on conditions that could lead to another similar unintended outcome. This is as close to a recommendations section as the FLA process allows.

"Usually what we find is that our workplace systems, protocols and rules are designed to accommodate optimal employees – not actual employees."

Fire Operations Risk Management Council
U.S. Forest Service

C. STEPS FOR LESSONS LEARNED ANALYSIS:

1. Gather the FLA team members together in a secure, private meeting room.

2. Post around the room the quotes and key bits of information gathered from the interviews. Use tools like flip chart paper and sticky notes. Highlight what the participants learned from this incident for themselves and what they want management or fellow employees to also learn.

3. Discuss the useful and interesting quotes. These are the one that stand out: surprising or potentially troubling statements, or actions that you seemingly cannot empathize with.

4. Identify interesting, odd, and disturbing lessons learned. For each of these discuss why it took this event or experience to cause this to be a "lesson learned." Specifically what were the:

    - Beliefs
    - Perceptions
    - Expectations
    - And paradigms that were held before the experience that in hindsight the characters now know were either wrong or inaccurate or misleading, or deceptive.

Wikipedia Definition of "Sensemaking"

Sensemaking is "the ability or attempt to make sense of an ambiguous situation." More precisely, "sensemaking is the process of creating situational awareness and understanding in situations of high complexity or uncertainty in order to make decisions. It is 'a motivated, continuous effort to understand connections (which can be among people, places, and events) in order to anticipate their trajectories and act effectively.'"

5. Identify and discuss the "key decisions" or "key actions" that the characters made because they held these belief, perceptions, expectations, and paradigms. These actions are especially key if the characters or others reading the story would say these decisions/actions were mistakes, errors, or otherwise "bad."

6. Agree as a team on those key decisions or actions that seem most important. Then for each of these deliberate on the 6 How's engaging in a dialogue session.

7. From this dialogue session the team will be able to write up the "Lesson Learned Analyses" explaining the sensemaking that occurred before and during the event and why, in context, why the actions and decisions made sense.

"Stories are truer than arid accident narratives comprised of facts and findings. Stories illuminate paradox; they let us know how the characters felt about the facts; stories give us the context that binds the facts together and makes them make sense. To be blunt, a report that is just facts and findings leaves too much to chance."
Steve Holdsambeck

PART 6 - CAPTURING AND SHARING THE STORY

A central feature of the FLA is the "story" of the accident. Effective storytelling is the most powerful teaching tool we have to convey the wisdom and experience gained from living through an incident. The dictionary defines wisdom as the ability to think and act utilizing knowledge, experience, understanding, common sense and insight. To effectively impart wisdom, we must share mishaps as well as mastery. Through storytelling, we strive to share knowledge and wisdom the participants of the unintended outcome experienced. In this way, storytelling moves *Lessons Learned* into the vicarious experience of *Lessons Lived*.

A. FLA STORYTELLING

In an FLA, 'the story' should not be confused with fiction or an enhancement of facts. An FLA's story is a factual description of what occurred. The story can be in narrative form or told in first person as if an accident victim was just asked, *"tell us what happened."*

Cognitive scientists have shown that humans make sense of, and remember, "facts" by attaching them to narratives (i.e., stories) that give them context and a sensory or emotional association. If given a listing of findings with no story as context, our minds are prone to give these findings relevance by either creating a story, or by associating them with a story that is already within our memory. In other words, *the lack of* the story behind the "facts" will actually lead to a distortion of the facts within our minds. Giving the reader/listener the facts within the context of a memorable story that is true to what actually happened, is the best way to communicate the meaning and the lessons from the event. Indeed, storytelling is widely recognized by educators as the most effective tool for experiential teaching and leading cultural change within an organization.

Effective FLA stories include sensory details gleaned from interviews and dialogue with the participants to enhance the reader's vicarious experience. That the characters in the story were hot, thirsty, confused, or angry gives readers anchors upon which to attach themselves emotionally to the event and provides for experiential learning. The emotions and sensory observations of those who *lived the event* are the sinews holding narrative and facts together and they make the lessons learned real.

The participants did not expect the outcome that occurred. Persons reading (or hearing) the story should be able to feel (or at least respect) the sense of surprise felt by the participants at the time, and understand why they were expecting something very different. Master storytellers say the most effective stories for learning are told *where the ending feels like it is discovered only after it happens*.

After a draft of the story is developed, read it aloud to the FLA team and a few guests (people who have no firsthand knowledge of the event). The setting for this reading should be casual, private, and relaxed. After the reading, each team member and guest should be able to relate a sense of what the accident participants were *feeling* at the time.

Storytelling is a common talent but story-*writing* is unnatural for most people accustomed to writing linear narratives. If the team is struggling on this task, consider bringing in a skilled nonfiction storywriter.

B. Different Perspectives

The story should strive to enable its readers to "walk in the shoes" of the accident's key players. At a minimum, the story should show how the decisions of the people who were there made sense within their social and cultural context based on information known to them at the time.

It is inevitable in any complex event that the people involved in the accident will have different perspectives and memories of what happened, and how, and why. Often the facilitated dialog session will reconcile disparate stories. Occasionally however there will remain very different accounts of what happened. Don't see this as somebody being right and somebody being wrong. Instead, "…*respect otherness, difference in accounts about what happened as a value in itself. Diversity of narrative can be seen as an enormous source of resilience in complex system not as weakness. The more angles the more there can be to learn."*[*]

Multiple stories are not only acceptable but can add meaning and humanity to the report.

The Pagami Creek Fire Shelter Deployment & Entrapment FLA is highly complex but also easy to read. It successfully tells the accident story from multiple perspectives.

[*] Dekker, Cillers, Hofmery 2011. *The Complexity of Failure: Implications of Complexity Theory for Safety Investigations*. Safety Science 49 (2011) p. 944

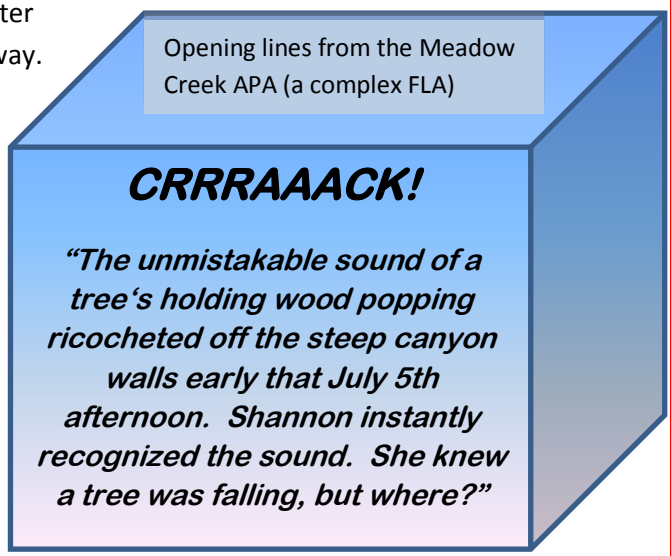
C. STORYTELLING BASICS: TIPS FOR CREATIVE NONFICTION STORYTELLERS

Most good stories begin with a hook to bring the reader in. Once you give them a reason to turn the page, begin introducing or setting up two elements:

1. **Set up the main character(s)/protagonist in the story** -- without using actual identifying information (not as difficult as it seems). Tell us about the characters. Tell us who these people are: their experiences and backgrounds, and even limited personal family backgrounds and physical traits. Give us enough information so to we as readers can relate to (or affiliate ourselves with) the character(s). Be mindful of when and how to get this information out to the reader. Doing a typical written experience "dump" in your final report will give your story a traditional, factual report feel.
2. **Set up the place.** Give us a good description of the environment where the action will take place. The fact that it was hot or cold, steep or flat, dusty or damp, may have no relevance to the actual event but these *sensory* details are necessary if we are to vicariously join the characters in their experience.

The body of a good story generally contains four elements:

1. **Connect the main characters with 'the place.'** Give the readers the backstory of the event, the setting, how the event has been evolving, etc. If the event was a wildland fire, for example, describe the fire. Tell us how long the fire has been going, how big it is, how many firefighters are working it, how many houses lost, etc. The storyteller needs to give enough information about the environment so the reader can visualize it and meet the characters in that place. The storyteller also needs to share how the characters came to that place specifically. For example, if an accident occurred on Interstate 90, the character shouldn't just appear driving on an interstate highway. A driver must first decide they need to get work, so he gets into his 1978 blue mustang convertible, leaves the top up because it feels chilly this morning, take the drive through at McDonalds, gets a coffee – spilling a little bit on the seat, negotiate heavy city traffic and then merges on to Interstate 90 near exit 287 where the traffic is unusually heavy. The storyteller's objective here is to anchor the characters to the real world, 'the place' that is important to the event.



2. **Share the character's internal voice.** What do they want to achieve and why? If present, details like the following are important to capture: What is motivating them to do what they have set out to do? How committed are they? Are they flexible or ambivalent? Are there any differences between their personal goals and their public/outer goals? Are there any differences between what the characters want to do and with what they are expected to do?

3. **Challenges and Obstacles or conflict.** With this element the Storyteller completes the portrait of the conditions that influenced the characters behaviors. This element builds on the previous two elements to set up the context for sensemaking and decision making. Providing the reader the full context is extraordinarily important. Context is why decisions make sense. The storyteller is providing this so the reader understands the challenges and obstacles the characters are up against. Also in all endeavors there are trade-offs between efficiency and thoroughness; there are always goal conflicts, tell the reader what these are. Let the reader know about time constraints, distances needed to travel, radio problems, interpersonal tensions, shortcuts available, etc. What conditions are capturing most of the characters' attention?
4. **Sensemaking and decision making.** The characters have shared with the FLA Team, either in interviews or in the facilitation session, how they came to understand the conditions they faced and then made the decisions they made. This evolution of understanding and perspective needs to be faithfully retold. In this element the storyteller relates how the decisions made sense within the context of the event. This can be tricky. Remember to never qualify the decisions as good or bad or unfortunate, etc., even though the characters themselves may tell you their decisions were 'bad' or 'stupid'. These decisions must have seemed reasonable at the time given the conditions the character understood at the time. This does not mean that the storyteller is defending the decisions; rather, they are only relating how decisions made sense at the time. If the storyteller is having difficulty relating how the decisions made sense in context, have the FLA Team run through the Lessons Learned Analysis exercise as discussed on page **37**. It is most important to expose what the characters believe is true contrasted with what is actually true.
5. **Completing the story**. This is the easy part of storytelling: just tell what happened. A really memorable story will make the reader feel the same sense of surprise felt by the characters as the event unfolded. Include descriptions of the character's fear, anxiety, confusion, bewilderment, etc., that they have shared with the FLA team. One tool that has been used many times successfully is to switch the narrative from past to present-tense as the unintended outcome is unfolding. Then, after the unintended outcome occurs and the characters react, the story teller can go back to past-tense to relate how the characters recovered.

One final note: there may be a trap here. When we sit down to write, we bring along all the writing tenets we have learned and developed from grade school through college. We are asking you to hold in check those traditional mental models of writing and instead consider the tenets regarding a written story as described in this section. The trap here is you will need to put down your old mental models, utilize the tools outlined in this section and being writing. Do not let any structures hinder individual creativity when you start.

The intent of these tips are for you to use it as a quality check against what you already written. Once you have a solid start, return to this section and review the key elements of basic storytelling and continue to build, polish and strengthen the story. Many successful story writers just start writing what happened and then they add layers by continuing to develop the story with fact checks, performing read backs, adding sensory information, checking grammar and spelling, etc.

D. STORY VALIDATION

All of the key individuals involved with the accident should have an opportunity to hear the finalized FLA report's story read out loud by the FLA Team. They should be requested to correct or clarify important details and ensure that their lessons learned are captured correctly. Remember this is their story, not yours. There is high value in participants seeing their thoughts and inputs captured in the report. Even emotional or controversial comments can be powerful points of learning—providing they are captured appropriately in the context in which they were offered.

If significant discrepancies surface, there are two different ways to respond. Sometimes the discrepancies can be resolved through further follow-up interviews if the discrepancies are a mistake made by the team. However some discrepancies develop due to multiple perspectives, different memories, etc. These discrepancies will need to be captured in the report to respect all the participants' viewpoints. A word of caution when writing: be very cognizant of the language used to describe these discrepancies and make sure it does not sound judgmental or utilize hindsight bias.

The validation should occur in two phases: first to those directly involved in the incident and secondly to the other participants, supervisors, and administrators. If people are shown a hard copy of the report, all copies should be collected afterward to prevent contradictory copies from being circulated.

In some situations, it may be appropriate to bring all persons involved in the incident together for story validation in a facilitated group setting. Use caution with this approach, as strong supervisors may suppress the voices of those who have different perspectives. It is usually preferable to read the story to those directly involved first, then to supervisors and administrators. After corrections are made to the story from both readings, it can then be read to all, led by a strong facilitator, in a group setting.

Leader's Intent for a Complex FLA

A Complex FLA is successful if it describes what happed and shows how the decision and choices made by the people involved made sense leading up to the event. The FLA should include enough information about the context of the event such that the reader (or listener) can literally feel some of the surprise that the actors in the event felt at the time. The story within the complex FLA must make the accident *make sense,* so that the reader can vicariously learn the lessons others had to learn the hard way.

The analysis section should daylight the important workplace and human performance conditions that were influential in sensemaking at the time. It should also display the *Gap* between work as imagined by the administrators as compared to actual work accomplished by employees.

The product of the FLA team, (report or video, etc.) should be in a format conducive to widespread agency learning.

HANDOUT E: TIPS FOR FACILITATED LEARNING ANALYSIS

COLLECTING GOOD INFORMATION DURING INTERVIEWS AND SITE VISITS

- Look and listen – write down sounds, colors and smells when in interviews or site visits. Get personal background information on the protagonist(s). You'll need to share some of this in the story to build a relationship between your reader and the characters involved.
- Take photos generously so that you can incorporate them as the story unfolds. Take photos of the scene and also visual reminders that might not be obviously important at the time. Don't try to preplan which ones you will need ahead of time. You will inevitably miss the ones that are most valuable.
- In interviews or group discussions, ask clarifying questions to ensure that you are tracking their thoughts and feelings accurately. Generally it's best to have one person to do most of the asking and then let the other interviewers ask follow-up questions toward the end. This tends to set a flow that helps round out the story by not skipping from one topic to the next.
- Directly after an interview or group discussion, reflect with the team and highlight key information, themes, and quotes. This will help everyone listen for themes in proceeding interviews.
- Seek out storytelling critical elements (empathy pathways) that you'll need to weave into the story:[*]
  - The difference between what the protagonist(s) believes is true and what is actually true.
  - The difference between what the protagonist(s) wants to do and what s/he is expected to do.
  - The difference between the protagonist(s) inner goals and his/her external goals.

WORKING WITH AN FLA TEAM

- Have one person write the story; don't divide it up between team members. This gives the writer the space and the freedom to choose a voice, be creative, and to use common themes or visualizations throughout the story. Give them time to write without micromanaging.
- Be careful about the pitfalls of editing as a group. The team should be consulted for major decisions like scope, character development, and tone, but be wary about editing at the sentence level as a group. This can be a waste of time. Save sentence polishing for the final, final, final draft.

WRITING THE STORY

- Start strong. The first sentence or paragraph sets the tone and either captures the audience or doesn't.
- Describe the smells, tastes, sounds experienced. The reader must know what the protagonist(s) were feeling and what was causing these feelings! Use adjectives. Use a thesaurus!
- Capture quotes. Some participants are very expressive speakers. Their quotes can add a lot of flavor to a story. They can initiate metaphors or similes that can be stretched throughout a paragraph or story. Be careful however, to not limit your perspective to just that of these expressive speakers.
- Don't be concerned about capturing all the details. A story in an FLA is not an exhaustive report. Focus on events, perspectives and feelings that have the most significance.
- Read the story aloud to the team to see if it "sounds" good. Insure you have covered the storytelling critical elements (above).

[*] Lisa Cron, *Wired for Story* (Ten Speed Press, 2012), p130

"Experience is the cruelest teacher.
She gives you the exam first, then the lesson later."

Attributed to Albert Einstein, Vern Law, and others

PART 7 - COMPLETING THE COMPLEX FLA REPORT

A. THE SUMMARY

The summary section needs to be sufficiently thorough to give the reader context behind the accident. At a minimum, it should include a synopsis of the accident and an overview of the conditions that supported assumptions, expectations, and actions taken. Consider making note of the combinations of events and conditions necessary to surprise the characters involved. Give proper attention to the foreseeability and likelihood of accident triggers in the time and space necessary for them to have their effect.

The summary also provides an overview of the lessons learned, especially lessons that the participants believe need to be learned by the agency. Avoid summarizing the lessons learned as this will raise the question over why some lessons learned were included in the summary and some were not.

B. THE RECOMMENDATIONS

(See earlier discussion **"RECOMMENDATIONS"? USE CAUTION ON PAGE 16**.) The FLA Team Leader and delegating official should discuss and consider the value of recommendations. Recommendations are often problematic. Importantly, there is no Forest Service policy or regulatory requirement that accident investigations, or FLAs, etc., contain recommendations. As mentioned before, an accident is a single data point; be very wary of recommending systemic or organizational changes based on that single point of data. There may be no way to predict some of the unintended consequences of a particular system or organization change. In other words, how can you know whether the system or organization will be "better" or "worse" as a result of the changes you recommend?

If recommendations are desired, keep them to the minimum absolutely necessary. Care should be taken to ensure that recommendations are realistic and achievable, recognizing the limitations of the organization for which they are designed.

FLA recommendations should be focused on workplace conditions that pose an unnecessary risk to future operations. They may also focus on actions the administrator can take to move the organization toward a more Just Culture.

C. EXAMPLE

The following example illustrates how a complex FLA report links the Lessons Learned, the Lessons Learned Analysis and the Summary. In this example, the Story section of the report describes a serious accident that occurred when an engine captain was driving a vehicle with an under-inflated tire that

became overheated and blew out, resulting in losing control of the vehicle. With protection from administrative actions, the employee admits that, although he had been told periodically to check the tire pressure, he never takes the time to do so.

- A Lesson Learned by a person directly involved in the accident:

  "Under inflated tires can be deadly! I will, from now on, regularly check the air pressure in my tires."

- A Lesson Learned for management from someone directly involved with the accident:

  "Some employees do not know how dangerous it can be to drive with an under-inflated tire. I had to learn the hard way. Management should ensure that we all understand the importance of checking tire pressures."

- A Lessons Learned Analysis provided by the FLA Team:

  Key Conditions Related to Risk:

  - The unit recently began using pooled vehicles rather than assigning vehicles to individuals.
  - Those interviewed reported that maintenance deficiencies (including over- and under-inflated tires, low oil levels, bad shocks, worn wiper blades, etc.) are now common among pooled vehicles.
  - Unit vehicles are considered to have low reliability and unit members generally seem to have accepted this as normal.
  - Rules such as requiring all unit members to perform all maintenance checks on vehicles are generally known but not enforced.
  - Most of the employees on the unit believe that routine maintenance on vehicles is everyone's responsibility—but not the responsibility of anyone in particular.
  - The person actually involved in the accident rarely checks the tire pressure or performs any maintenance on fleet vehicles.
  - There is no record of the tires ever being checked but it is likely the tires were last checked at the last oil change, approximately 11 months and 14,000 miles prior to the accident.
  - According to the manufacturer, tires such as those on the vehicle involved in the accident can experience bead separation at 290 degrees resulting in catastrophic failure. This temperature threshold can be reached after moderate driving at highway speeds when the cold tire pressure is less than 8 lbs.

  Key Conditions Shaping Workplace Performance:

- Management and employees have become accustomed to—have normalized and accepted—driving vehicles that lack regular or standard maintenance. There is a general and pervasive sense that vehicle maintenance is nobody's responsibility and that the related safety concerns are minimal. While the maintenance policy exists in writing, there is no administrative or social pressure to maintain vehicles.

❖ The Summary section could state:

Through the lens of hindsight, we know that not checking tire pressure regularly is a very risky behavior. In a culture where this behavior is accepted, the risks associated with the behavior become normalized. Once normalized, the risks are no longer managed. Instead, they become routine and ignored or treated as unavoidable risks.

A key workplace condition that supported the decisions and perceptions of risk involved in this accident is that the unit has no process in place to enforce (or provide the social or administrative incentives to comply with) the existing rules requiring regular and routine maintenance of all vehicles.

The Deer Park Fire FLA report relays the story of a serious accident and then another accident which occurred during the rescue operation.

D. Report Approval and Publication

Upon final completion, the FLA report is presented for comments and recommendations to the delegating Agency Administrator and other officials chosen by the administrator.

The FLA team leader, the FLA facilitator, and the Agency Administrator should work together to resolve any items of dispute pertaining to the report. While it is important to distribute the report as quickly as possible, the integrity of the process is most important.

Throughout the FLA process, the FLA team should be communicating the key points of its analysis with the Agency Administrator in a spirit of full disclosure to prevent any "last-minute" surprises. However, in the unlikely event of an irreconcilable dispute between the Agency Administrator and the FLA team leader, the report should be withheld from publication.

Under no circumstance should the FLA report be changed or redacted without the explicit approval of the FLA team leader.

If other agencies are involved in the accident (for instance, cooperator personnel were injured or were associated with the event), coordination should occur with those agencies prior to the release of the FLA report.

Agency Administrator Authority

The Agency Administrator retains the authority to request the FLA report be vetted by legal counsel, Freedom of Information Act, or Claims and Privacy Act specialists. To neutralize unnecessary legal or political damage to the agency, the FLA Team shall comply with these requests.

As soon as possible, the report should be posted on safety and lessons learned websites. The team leader should work with the Regional Safety Advisor or Fire Operations Risk Manager to post appropriately. Wildland fire-related reports should be posted on the Wildland Fire Lessons Learned Center website: http://www.wildfirelessons.net/ .

PART 8 - APPENDICES

APPENDIX A: IS AN FLA THE RIGHT TOOL?

FIVE QUESTIONS FOR THE AGENCY ADMINISTRATOR

Determining if an FLA is the appropriate investigative tool requires the Agency Administrator to gather sufficient information to answer the following five questions:

1. **Isn't a Serious Accident Investigation required by policy?**

   This is no longer the case for the Forest Service. This is now handled through the Coordinated Response Protocol. Even within the CRP process, the Chief may choose from among several processes (including the FLA process) to execute the investigation. The Chief's Office may also choose to investigate any other type of accident (Reference FSM 6731.1 and FSH 6709.12 section 34.1). Implementing an FLA does not change the accident reporting requirements (Reference FSM 6732 and local policies if applicable).

   If the accident is interagency in nature (involving personnel from more than one agency or jurisdiction), the authorizing Memorandum of Understanding between the agencies may stipulate investigative requirements. Nothing in the *Interagency Standards for Fire and Aviation Operations* (the "Red Book") precludes any agency from utilizing the FLA process.

2. **Is litigation against an employee or the agency likely as a result of the accident?**

   If the answer to this question is "Yes," the Agency Administrator should consider a confidential administrative investigation. An FLA investigation is inappropriate under the threat of a criminal or civil action.

3. **Is there evidence that an act of reckless and willful disregard for human safety directly contributed to the accident?**

   If the answer to this question is "Yes," the Agency Administrator should consider an administrative or law enforcement investigation. If the FLA Team uncovers an act of reckless and willful disregard for human safety, the team may not be able to sustain the trust and confidence of other accident participants—knowing that disciplinary action is likely. (A reckless and willful disregard for human safety is conduct that is intentional, unjustifiable, and occurred with the foreknowledge that the conduct was likely to result in serious harm, death, or injury to a human. See shaded box on page 30.) Moreover, one of chief benefits of an FLA is to hold the agency accountable for designing safe systems and managing human reliability. If an employee harms another employee intentionally, that employee is responsible and an FLA is likely the wrong response. FLAs are for the vast majority of events in which good people, doing what they thought made sense at the time, ended up in an unexpected situation.

4. **Is the Agency Administrator committed to disseminating the lessons learned in a public report?**

The answer to this question must be "Yes." The report documents an unintended outcome. Some information in the report may make you feel uncomfortable. This is exactly what is needed in a learning culture. Members at all levels need to see that leaders are reflecting on their experiences and standing up to share what they learned from accidents and close calls to help prevent future accidents.

5. Is the Agency Administrator committed to "learning" rather than "punishing"?

The answer to this question must be "Yes." This "learning" concept is central to the FLA philosophy and process. If punishment is intended, in whatever form, the FLA process should be dropped. The FLA's overriding purpose is always individual and organizational learning. Therefore, if learning is the more important goal, an FLA is the appropriate vehicle. The learning that will result from this constructive process will far outweigh any perceived benefit that might be derived from punishing individuals for making errors, mistakes, or violating rules.

Have You Decided To Do an FLA?

Assistance in fielding a quality FLA team is only a phone call away.

Coaches for FLA Teams are also available. They can coach the team through the entire process by telephone.

Call for Help
Larry Sutton: 208.387.5970
or
Steve Holdsambeck: 801.721.7258

The FLA process can be used in almost any type of unintended outcome, including aviation incidents such as the Davies Creek Ridge FLA in 2011

APPENDIX B: LESSONS AND ADVICE FROM 9 YEARS OF FLA EXPERIENCES

The following are Lessons Learned shared by teams over the past 8 years of implementing FLAs.

1. Choose the Local Liaison Wisely and Put the Liaison to Work Quickly.

The more traumatic the incident the more urgent is the need to heed this advice. In the days, hours, and seconds following an accident the people involved relive the incident over and over. They wonder what they could have done or said that would have changed the outcome and they also ponder what they might have done wrong that contributed to the outcome. As soon as practical the Team Leader needs to work with the Agency Administrator to assign a trusted FLA team liaison(s) to local unit. The duty of the liaison is to meet personally with those involved and explain the FLA process, what is FLA team will do and what is the outcome of an FLA review. Most importantly the liaison needs to explain that the FLA process is predicated on a Just Culture (See page **8**, and the Just Culture References in **APPENDIX F: REFERENCE MATERIALS FOR TEAM MEMBERS**). The liaison should also coordinate with the FLA Team Leader to line up interviews, site visits, and other actions to make the expectations of those involved consistent with the FLA philosophy. Usually the best liaison is someone known and trusted by the people who were directly involved in the event.

2. Build the Team & Align Team Values.

Make sure everyone reads the FLA guide. Once together, invest the time early on in the process to get to know each other and build team cohesion and trust. Plan for this to take at least couple of hours. **HANDOUT A: UNDERSTANDING THE WORK IN A JUST CULTURE** on page **10**, has proven to be very valuable to teams when they discuss each of the points, one-by-one, in a respectful dialogue.

3. Lay Out the Road Map and Adjust as Needed.

The Lead Facilitator should lay out a schedule so everyone knows where they are in the process and what is planned next. Don't just tell team members to "trust the process". People want know where they are and what is going to happen next and know they are making progress. Obviously the schedule needs to be flexible and might be adjusted daily.

4. Debrief with the Team Every Evening.

The Lead Facilitator should schedule a time at the end of each day to give each team member time to share what they did, what they learned and even how they are feeling about the process. This is the time to share what was heard during interviews.

5. Stay Together.

Keep the team physically together until you have a solid draft. Letting people go home and trying to complete the report by emails and conference calls will inevitably add problematic delays.

6. Don't Skimp on Peer Participation (this is CRITICAL).

Ensure that peers are part of the team. The importance of having people on the team that are "peers" to the people involved in the unintended outcome cannot be overstated. Don't try to save money or minimize the footprint of the team by cutting these positions.

APPENDIX C: DELEGATION OF AUTHORITY FOR A BASIC FLA

Delegations of Authority should be negotiated between the team and the administrator.

File code: 6730 Date:

Route to:

Subject: Delegation of Authority

To: (Facilitated Learning Analysis Team Leader)

I have chosen to utilize the Facilitate Learning Analysis Process to fulfill my responsibility to

Choose one:

Investigate the (accident name).

or,

Review the (event name).

This memorandum formalizes your appointment as Team Leader for the Facilitated Learning Analysis Team.

As Team Leader, you have the full authority of my office to execute and complete an FLA. To the extent reasonable, follow the procedures displayed in the 2013 Facilitated Learning Analysis Implementation Guide. You are scheduled to in-brief with my staff and me on (date and location). _____ will be your logistical coordinator and my liaison to you. Please contact him/her at (phone number) to discuss your logistical support needs.

_____ will be your team's coach. I expect you to consult with her/him frequently to ensure you and your team are benefiting from the mentor's experience in FLAs. Please contact your coach at _____ as soon as practical.

You are expected to produce the 72-hour (or Preliminary Accident Briefing) report and the final report as soon as practicable.

Based on the situation as I know it now, this event does not warrant a complex FLA with a Lessons Learned Analysis or accident story. Therefore, I expect you will limit your team accordingly and complete this FLA promptly. Please contact me immediately if you learn of information that would warrant significantly adding to the complexity of this FLA thus changing it to a Complex FLA.

I expect you to terminate this investigation if you uncover information that leads you to believe this accident resulted from a reckless and willful disregard for human safety. I respect that the information you collect from interviews will remain confidential even in this instance. I also agree that no punitive actions will be taken by the Forest Service against any employee as a result of information provided to any member of your team. Please ensure participants understand that actions taken by civil authorities, or other agencies, are outside of my authority. I will contact

you periodically for an update on your progress.

Your authority includes, but is not limited to:

- Controlling, organizing, managing, and directing the analysis.
- Controlling and managing the confidentiality of the process.

Add other direction as appropriate such as:

- Include a peer or other FLA team member from the other agencies that were involved in this accident.
- Provide me your recommendation verbally at the conclusion of this FLA. If you believe it is appropriate to add a recommendation section in the report, please consult with me in advance.

- Protecting and managing the integrity of evidence collected.
- Authorizing and requesting additional personnel, including technical specialists, to support the FLA Team, and releasing them upon completion of assigned duties.
- Authorizing and coordinating the expenditure funds.
- Coordinating all media releases about the investigation.
- Issuance of Safety Alerts, if warranted, in coordination with _____, the Regional Safety Manager, cell number: _____.

All travel, equipment, and salary costs related to this investigation should be charged to [job code] with an override code of _____.

For additional information, please contact me at _____

/s/_____
Agency Administrator

APPENDIX D: DELEGATION OF AUTHORITY FOR A COMPLEX FLA

Delegations of Authority should be negotiated between the team and the administrator.

File code: 6730 Date:

Route to:

Subject: Delegation of Authority

To: (Facilitated Learning Analysis Team Leader)

I have chosen to utilize the Facilitate Learning Analysis Process to fulfill my responsibility to

Choose one:

Investigate the (accident name).

or,

Review the (event name).

This memorandum formalizes your appointment as Team Leader for the Facilitated Learning Analysis Team.

As Team Leader, you have the full authority of my office to execute and complete a thorough Facilitated Learning Analysis. To the extent reasonable, follow the procedures displayed in the 2013 Facilitated Learning Analysis Implementation Guide. The focus is how the events leading up to this accident made sense at the time *to those involved*. You are scheduled to in-brief with my staff and me on (date and location). _____ will be your logistical coordinator and my liaison to you. Please contact him/her at (phone number) to discuss your logistical support needs.

_____ will be your team's mentor and coach. I expect you to consult with her/him frequently to ensure you and your team is benefiting from his/her experience in complex FLAs. Please contact your mentor/coach at _____ as soon as practical.

You are expected to produce the 72-hour (or Preliminary Accident Briefing) report and the final report as soon as practicable.

Based on the situation as I know it, I am expecting you to complete a Complex FLA report including a Lesson Learned Analysis and an Accident Story. Please prepare your team accordingly.

I expect you to terminate this effort if you uncover information that leads you to believe this accident resulted from a reckless and willful disregard for human safety. I respect that the information you collect from interviews will remain confidential even in this instance. I also agree that no punitive actions will be taken by the Forest Service against any employee as a result of information provided to any member of your team. Please ensure participants understand that actions taken by civil authorities, or other agencies, are outside of my authority. I will contact

you periodically for an update on your progress.

I expect you to interview all participants in this event, including the Agency Administrator.

Your authority includes, but is not limited to:

- Controlling, organizing, managing, and directing the analysis.

Add other direction as appropriate such as:

- Include a peer or other FLA team member from the other agencies that were involved in this accident.
- Provide me your recommendation verbally at the conclusion of this FLA. If you believe it is appropriate to add a recommendation section in the report, please consult with me in advance.

- Controlling and managing the confidentiality of the process.
- Protecting and managing the integrity of evidence collected.
- Authorizing and requesting additional personnel, including technical specialists, to support the FLA Team, and releasing them upon completion of assigned duties.
- Authorizing and coordinating the expenditure funds.
- Coordinating all media releases about the investigation.
- Issuance of Safety Alerts, if warranted, in coordination with _____, the Regional Safety Manager, cell number: _____.

All travel, equipment, and salary costs related to this investigation should be charged to [job code] with an override code of _____.

For additional information, please contact me at: _____.

/s/_____
Agency Administrator

APPENDIX E: TICKLER LIST OF IN-BRIEFING DISCUSSION ITEMS

If the unit is represented by the union, ensure union representation is present at the in-briefing.

Note: points in italics are generally relevant only to Complex FLAs.

1. Why an FLA?

a. This event was unexpected. Unexpected outcomes are disturbing to our organizational and personal security. The suffering of our employees and their families from accidents are unacceptable to us. If there is something we can change so that it never happens again, we are ethically and morally compelled to do so.

b. We've learned the hard way that how we react to any accident will either shift us toward, or away from, a learning culture. The FLA process, as demonstrated and refined by years of implementation and experience, will move us toward a learning culture.

c. We knew there was a chance of this type of accident happening. It may have been a surprise but it probably wasn't outside of the range of what we felt could happen. The FLA report will show how our employees made sense of their situations and reveal the workplace systems and conditions that made such sensemaking reasonable and perhaps even inevitable. With this information, management can make system adjustments that should enhance performance and reliability in the future.

d. All accidents are required by OSHA and by U.S. Forest Service policy to be "investigated" and all escaped prescribed burns are to be reviewed per Forest Service policy. This FLA shall constitute an investigation/review and fulfill that requirement.

e. The FLA report will tell the story of the event in a way that gives others across the country a vicarious experience of the accident. It is hoped this experience will be a "portal" experience leading to a greater awareness of risks and safety. (Leader: consider discussing the meaning and value of portals.)

2. The Process the FLA will Follow

a. The FLA team will gather background information such as timelines, maps, dispatch records, and photographs, and information from conversations with those involved. This enables the team to piece together all the "facts" and to create a timeline of the accident story and an outline of key events. Concurrently, team members will work closely with those most directly involved with the accident to understand what they believed happened and how the decisions and actions leading up to the event made sense at the time.

b. Using the FLA's Lessons Learned Analysis process, the team will examine and interpret the workplace conditions and other factors that led to the sensemaking that occurred before and during the accident. Lessons learned by those directly involved will be featured in this analysis, preferably in their own words.

c. A draft of the report will be read in a confidential setting to the key characters involved with the incident. A vetting process will occur between the team and the key characters until there is agreement on the factuality of the report and that their perspectives have been adequately captured.

d. A draft of the report will be then be submitted to the Agency Administrator. If requested, this draft will include recommendations that the team believes will enhance risk management in the future. Any changes to the draft document will be negotiated between the Agency Administrator, the FLA team leader, and facilitator.
e. As soon as the FLA report is accepted, it will be posted on appropriate websites for widespread distribution and learning.
f. Other steps or items this particular FLA may include:

_____

_____

_____

3. What the FLA Team Needs from the Agency Administrator

a. Assurance of no administrative actions against any employee involved in this FLA. (Leader: consider discussing what administrative actions mean from the employee's perspective.)
b. A commitment to comment on and approve the report promptly.
c. Support for the FLA team with regard to facilities, logistics, making employees available, etc. Immediate logistical needs include:

_____

_____

_____

4. Expectations

a. FLA team members will be absolutely confidential in all deliberations and conversations.
b. If the FLA team discovers a willful and reckless disregard for human safety (for example, "the crew was smoking dope"), the FLA will be terminated and the team will leave. The background and details of the discovery will remain confidential. (Leader: consider discussing the meaning of a "willful and reckless disregard for human safety" or reading the text box on page 30.)
c. The draft report should be completed by about __/__/___.

5. The Desired End State

a. The employees and their colleagues better understand not only what happened but why the choices made leading up to the accident made sense at the time, in the context of the event.
b. Employees see that their supervisors can be trusted (at least in this incidence) to react to an accident in a way intended to build trust and a learning culture.
c. Administrators and employees have a document that will be helpful for use in future operational training, safety training, or risk management. This document may also be useful to other units for these purposes across the country.
d. The accident investigation policy requirement is completed with the acceptance of the FLA report. The Agency Administrator may choose to implement the recommendations—or not.

SUMMARY

"Risk Management" and even "Safety" can be somewhat obscure and indefinite goals, especially in the aftermath of an accident. A tangible goal, however, is simply to be better than we were before.

One of the traits of HROs is *a preoccupation with failure*. This isn't negative thinking, it is intelligent wariness. As Karl Weick wrote, *"If eternal vigilance is the price of liberty, then chronic unease is the price of safety."* We know that we cannot make our workplace free from all potential or even recognized hazards; intentional exposure to hazards is, in fact, a hallmark of emergency response. But we can *exploit the value of accidents and close calls* by focusing on learning from our mistakes and continuously improving how we discern, interpret, and manage risks.

APPENDIX F: REFERENCE MATERIALS FOR TEAM MEMBERS

JUST CULTURE

Dekker, Sidney. *Just Culture: Balancing Safety and Accountability.* Aldershot, England: Ashgate, 2007.

Marx, David. *Patient Safety and the "Just Culture": A Primer for Health Care Executives.* New York: Trustees of Columbia University, 2001. Available on line at: http://www.unmc.edu/rural/patient-safety/tools/Marx%20Patient%20Safety%20and%20Just%20Culture.pdf

On-line training modules and articles on the application of Just Culture, available at: www.JustCulture.org and www.sg-collaborative.com

ACCIDENT, SAFETY AND HUMAN PERFORMANCE

Dekker, Sidney. *The Field Guide to Understanding Human Error*. Aldershot, England: Ashgate, 2006.

Hollnagel, Erik. *The ETTO Principle Efficiency-Thoroughness Trade-Off: Why Things That Go Right Sometimes Go Wrong*. Farnham, England: Ashgate, 2009.

Kahneman, Daniel. *Thinking Fast and Slow*. New York, NY: Farrar, Straus and Giroux, 2011

Neal J. Roese and Kathleen D. Vohs, "Hindsight Bias," Perspectives on Psychological Science 7 no. 5 (September 2012), 411-426. Available at http://pps.sagepub.com/content/7/5/411.abstract

Reason, J. T. *Managing the Risks of Organizational Accidents*. Aldershot, England: Ashgate, 1997.

Reason, J. T. *The Human Contribution: Unsafe Acts, Accidents and Heroic Recoveries*. Farnham, England: Ashgate, 2008.

Tavris, Carol, and Elliot Aronson. *Mistakes Were Made (but not by me): Why We Justify Foolish Beliefs, Bad Decisions, and Hurtful Acts.* Orlando, FL: Harcourt, 2007.

Woods, D.D. and R.I. Cook. "Nine Steps to Move Forward from Error." *Cognition, Technology, & Work* 4, no. 2 (2002): 137-144. Available online at: http://www.ctlab.org/documents/NineSteps.pdf

ORGANIZATIONAL LEARNING AND LEARNING CULTURE

Jonathan Gottschall, *The Storytelling Animal; How Stories Make Us Human,* NY, New York, Mariner Books, 2012.

Isaacs, William. *Dialogue and the Art of Thinking Together: A Pioneering Approach to Communicating in Business and in Life*. New York: Currency/Doubleday, 1999.

RISK MANAGEMENT

Taleb, Nassim. *The Black Swan: the impact of the highly improbable*. 2nd edition, New York, NY: Random House, 2010