

ERRATA
(3 March 2017)

Final Uniform Federal Policy Quality Assurance Project Plan
Munitions and Explosives of Concern Remedial Action
Former Waikane Training Area
Southeastern Region Munitions Response Site
Kāneʻohe, Oʻahu, Hawaiʻi
RMIS ID: H09HI035401

The Final Uniform Federal Policy Quality Assurance Project Plan (UFP-QAPP) for the Southeastern Region Munitions Response Site, Former Waikane Training Area, was originally finalized in December 2016. Subsequently, comments were received from Ms. Miriam Koyanagi and the following edits have been made.

1. In the Accident Prevention Plan (Appendix F of the UFP-QAPP), an updated Certified Safety Professional certification for Mr. Mike Coyle has been provided in Attachment C.
2. In the Accident Prevention Plan (Appendix F of the UFP-QAPP), a copy of Mr. David Gerows' Certified Industrial Hygienist certification has been provided in Attachment C.
3. In the Accident Prevention Plan (Appendix F of the UFP-QAPP), in Section 8.2, the 1st sentence of the 2nd paragraph has been revised to read:
“In addition to GSIP’s internal incident reporting requirements, in the event of an OSHA recordable injury, or an at-fault vehicle incident, or equipment or property damage greater than ~~\$2,000.00~~-\$5,000.00, the UXOSO shall be responsible for notifying the PM and Corporate H&S Manager immediately.”
4. All references to Mr. Mike Mullen were replaced with Mr. Harmon Slappy, who is the new point of contact. Changes were made to the UFP-QAPP Worksheets #3 & 5, #4, 7, 8, #6, #37 (Table 37-1), and to the Accident Prevention Plan (Appendix F), Table 10-1.
5. In the Accident Prevention Plan (Appendix F of the UFP-QAPP), POD Form 265 (October 2014) has been added to Attachment G Forms (page F-G-47).

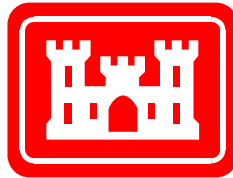
This Page Intentionally Left Blank

FINAL
UNIFORM FEDERAL POLICY
QUALITY ASSURANCE PROJECT PLAN

Munitions and Explosives of Concern Remedial Action
Former Waikane Training Area
Southeastern Region Munitions Response Site
Kāneʻohe, Oʻahu, Hawaiʻi

RMIS ID: H09HI035401

Prepared for:



U.S. Army Corps of Engineers
Honolulu District
Building 230
Fort Shafter, Hawaiʻi
96858-5440

December 2016

This Page Intentionally Left Blank

Table of Contents

<i>Acronyms and Abbreviations</i>	<i>v</i>
<i>Uniform Federal Policy Quality Assurance Project Plan and Remedial Action Work Plan Crosswalk Table</i>	<i>xi</i>
<i>Executive Summary</i>	<i>ES-1</i>
<i>Worksheet # 1 & 2: Title and Approval Page</i>	<i>1</i>
<i>Worksheet # 3 & 5: Project Organization and UFP-QAPP Distribution</i>	<i>3</i>
<i>Worksheet # 4, 7, & 8: Personnel Qualifications and Sign-Off Sheet</i>	<i>7</i>
<i>Worksheet # 6: Communication Pathways</i>	<i>19</i>
<i>Worksheet # 9: Project Planning Session Summary</i>	<i>23</i>
<i>Worksheet # 10: Conceptual Site Model</i>	<i>29</i>
10.1 Overview	29
10.2 Site Description.....	29
10.2.1 Former Waikane Training Area Munitions Response Area	29
10.2.2 Removal Action within Southeastern Region Munitions Response Site.....	29
10.3 Operational History.....	30
10.3.1 Former Waikane Training Area Munitions Response Area History	30
10.3.2 Southeastern Region Munitions Response Site History	31
10.4 Property Ownership	32
10.5 Land Use	33
10.6 Man-Made Features	33
10.7 Access Controls and Restrictions.....	33
10.8 Receptors.....	34
10.8.1 Human Receptors.....	34
10.8.2 Ecological Receptors	34
10.9 Environmental Setting.....	34
10.9.1 Climate.....	34
10.9.2 Topography	34
10.9.3 Geology.....	34
10.9.4 Soil	35
10.9.5 Hydrology	35
10.9.6 Hydrogeology	35
10.9.7 Wildlife	36
10.9.8 Vegetation.....	39
10.10 Previous Investigations	40
10.10.1 1976 and 1984 Surface Clearance.....	40
10.10.2 1990 Archaeological Survey.....	41
10.10.3 Inventory Project Report 1996 and Supplement 2004.....	41
10.10.4 2006 Engineering Evaluation/Cost Analysis	41
10.10.5 2008 Abbreviated Site Investigation.....	43
10.10.6 2011 Non-Time Critical Removal Action.....	43

10.10.7	2011 Remedial Investigation	45
10.10.8	2012 Feasibility Study	47
10.10.9	Remedial Action Documents	48
10.11	Conceptual Site Model and Exposure Assessment	49
10.11.1	Munitions and Explosives of Concern Conceptual Site Model	49
10.11.2	MEC Exposure Pathways Analysis and Conclusions	52
10.11.3	Munitions Constituents Conceptual Site Model	52
10.12	Contaminant Fate and Transport.....	54
10.12.1	MEC	54
10.12.2	MC	54
10.13	Nature and Extent of Contamination	55
10.13.1	MEC	55
10.13.2	MC	55
Worksheet # 11: Data Quality Objectives.....		57
11.1	Step 1 – State the Problem	57
11.1.1	Purpose.....	57
11.1.2	Planning Team Members	57
11.1.3	Conceptual Site Model.....	57
11.1.4	Exposure Scenarios	57
11.1.5	Available Resources and Constraints.....	57
11.2	Step 2 – Identify the Goals of the Study	58
11.2.1	Project Decision Statements	58
11.3	Step 3 – Identify the Information Inputs	58
11.4	Step 4 – Define the Boundary of the Study	60
11.5	Step 5 – Develop the Analytic Approach/Decision Rule.....	60
11.6	Step 6 – Specify Performance Acceptance Criteria	60
11.7	Step 7 – Developing the Plan for Obtaining Data.....	61
Worksheet # 12: Measurement Performance Criteria.....		63
Worksheet # 13: Secondary Data Uses and Limitations		83
Worksheet # 14 & 16: Project Tasks and Schedule.....		85
14.1	Project Tasks	85
14.2	Schedule	91
Worksheet # 15: Project Action Limits and Laboratory-Specific Detection/Quantitation Limits		93
Worksheet # 17 & 18: Sampling Design and Rationale.....		95
17.1	Removal Action Objectives	95
17.2	Data Quality Objectives	95
17.2.1	Quality Control	95
17.2.2	Quality Assurance.....	95
17.2.3	Data Incorporation into the Removal Action.....	96
17.3	Removal Action Plan	96
17.3.1	Mobilization.....	96
17.3.2	MEC and Safety Considerations	97
17.3.3	Site Preparation.....	99

17.3.4	Biological Survey and Monitoring.....	101
17.3.5	Archaeological Survey and Monitoring.....	101
17.3.6	Vegetation Clearance	101
17.3.7	IVS and Geophysical Survey Equipment	102
17.3.8	Surface and Subsurface Clearance.....	102
17.3.9	Explosive Disposal Operations	103
17.3.10	MPPEH Management	103
17.3.11	Waste Management.....	104
17.3.12	Data Management	104
17.3.13	Site Restoration.....	104
17.3.14	Demobilization.....	104
Worksheet # 19 & 30: Sampling Containers, Preservation, and Hold Times		105
Worksheet # 20: Field Quality Control Summary		107
Worksheet # 21 & 23: Standard Operating Procedures		109
21.1	Field SOP Reference Table.....	109
Worksheet # 22, 24, & 25: Field Equipment Calibration, Maintenance, Testing, and Inspection		111
22.1	Field Equipment Calibration Table.....	111
Worksheet # 26 & 27: Sample Handling, Custody, and Disposal.....		117
Worksheet # 28: Analytical Quality Control Samples and Corrective Action		119
Worksheet # 29: Project Documents and Records.....		121
29.1	Field and Technical Data	121
29.2	Data Management	122
29.3	Geospatial Data Requirements.....	123
29.3.1	Accuracy	123
29.3.2	Survey Datum and Units.....	124
29.3.3	Geographic Information System Incorporation	125
29.3.4	Plotting.....	125
29.3.5	Mapping	125
29.3.6	Final Electronic Submittals.....	126
29.4	Project Records	127
Worksheet # 31, 32, & 33: Assessments and Corrective Action.....		131
31.1	Assessments	131
31.2	Assessment Findings and Corrective Action Responses	135
31.3	Quality Assurance Management Reports Table.....	139
Worksheet # 34, 35, & 36: Data Verification and Validation Inputs and Procedures.....		141
34.1	Verification and Validation Inputs.....	141
34.2	Definable Features of Work and Verification/Validation Procedures	143
Worksheet # 37: Data Usability Assessment.....		147
37.1	Usability Assessment Process	147
37.2	Usability Assessment Documentation	149
References		153

List of Tables

Table 10-1: Southeastern Region MRS Summary of MEC and MD Found During
Previous Investigations55

Table 37-1: Personnel Responsible for Participating in the Data Usability Assessment
Preparation or Review.....149

Table 37-2: Data Usability Report.....151

List of Appendices

Appendix A Performance Work Statement

Appendix B Technical Management Plan

Appendix C Figures

Appendix D Ordnance Technical Data Sheets

Appendix E Environmental Protection Plan

Appendix F Accident Prevention Plan/Site Safety and Health Plan

Appendix G Standard Operating Procedures

Appendix H Archaeological Monitoring Plan

Appendix I Explosives Management Plan

Appendix J Waste Management Plan

Acronyms and Abbreviations

°F	Degrees Fahrenheit
%	Percent
ABIH	American Board of Industrial Hygiene
AED	Automated External Defibrillator
AHA	Activity Hazard Analysis
AM	Action Memorandum
AMP	Archaeological Monitoring Plan
AOC	Area of Concern
APC-T	Armor Piercing Capped-Tracer
APP	Accident Prevention Plan
A.S.	Associates of Science
ASP	Associate Safety Professional
ASQ	American Society for Quality
ATF	Alcohol, Tobacco, Firearms, and Explosives
ATV	All-Terrain Vehicle
AU	Authorized User
B.A.	Bachelor of Arts
bgs	Below Ground Surface
BIP	Blow-In-Place
B.S.	Bachelor of Science
CA	Corrective Action
CADD	Computer Aided Design and Drafting
CAR	Corrective Action Request
CD	Compact Disk
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CHMM	Certified Hazardous Materials Manager
CHSM	Corporate Health and Safety Manager
CHST	Construction Health and Safety Technician
CIH	Certified Industrial Hygienist
cm	Centimeter(s)
CMQ/OE	Certified Manager of Quality and Organizational Excellence
COB	Close of Business
COC	Chain-of-Custody
COF	Certificate of Fitness
CONUS	Contiguous United States
COPC	Chemical of Potential Concern
COR	Contracting Officer's Representative
CPR	Cardiopulmonary Resuscitation
CS	Contract Specialist

CSM	Conceptual Site Model
CSP	Certified Safety Professional
CQA	Certified Quality Auditor
CWM	Chemical Warfare Materiel
DA	Department of the Army
DAR	Daily Activity Report
DD	Decision Document
DDESB	Department of Defense Explosives Safety Board
DEMIL	Demilitarization
DERP-FUDS	Defense Environmental Restoration Program for Formerly Used Defense Sites
DFW	Definable Feature of Work
DGM	Digital Geophysical Mapping
DID	Data Item Description
DLNR	Department of Land and Natural Resources
DMP	Data Management Plan
DN	Deficiency Notice
DoD	Department of Defense
DODI	Department of Defense Instruction
DOTR	Daily Operator Test Report
DQCR	Daily Quality Control Report
DQO	Data Quality Objective
DS	Demolition Supervisor
DSR	Daily Safety Report
DVD	Digital Versatile Disc
EAL	Environmental Action Level
EE/CA	Engineering Evaluation/Cost Analysis
EM	Engineer Manual
EMCX	Environmental and Munitions Center of Expertise
EMP	Explosives Management Plan
EOD	Explosive Ordnance Disposal
EP	Engineer Pamphlet
EPA	U.S. Environmental Protection Agency
EPP	Environmental Protection Plan
ERP	Ecological Resources Plan
ESRI	Environmental Systems Research Institute
ESS	Explosives Safety Submission
ESTCP	Environmental Security Technology Certification Program
EZ	Exclusion Zone
FCR	Field Change Request
FGDC	Federal Geographic Data Committee
FS	Feasibility Study
ft	Foot/Feet

FTP	File Transfer Protocol
FUDS	Formerly Used Defense Sites
GA	Geometrician Associates, LLC
GDB	Geodatabase
GIS	Geographic Information System
GISP	Geographic Information System Professional
GPS	Global Positioning System
GSIP	GSI Pacific Inc.
GSV	Geophysical System Verification
HA	Hazard Assessment
HAZWOPER	Hazardous Waste Operations and Emergency Response
HDOH	State of Hawaiʻi Department of Health
HDOT	State of Hawaiʻi Department of Transportation
HE	High Explosive
HEAT	High Explosive Anti-Tank
HnB	Hanalei Silty Clay, 2 to 6% Slopes
HSM	Health and Safety Manager
HUMMA	Hawaiʻi Undersea Military Munitions Assessment
IAW	In Accordance With
ICP	Institutional Control Plan
ID	Identifier
IDW	Investigation-Derived Waste
IED	Improvised Explosive Device
IHS	Independent Hawaii Surveyors, LLC
INPR	Inventory Project Report
IOS	International Organization for Standardization
ISO	Industry Standard Object
IVS	Instrument Verification Strip
KO	Contracting Officer
lb	Pound
LLC	Limited Liability Company
LUC	Land Use Control
m	Meter(s)
MC	Munitions Constituents
MD	Munitions Debris
MDAS	Material Documented as Safe
MDEH	Material Documented as an Explosive Hazard
MEC	Munitions and Explosives of Concern
MGFD	Munitions with the Greatest Fragmentation Distance
MI	Multi-Incremental
MIDAS	Molecular Interactive Display and Simulation
mm	millimeter

MMRP	Military Munitions Response Program
MPC	Measurement Performance Criteria
MPPEH	Material Potentially Presenting an Explosive Hazard
MRA	Munitions Response Area
MRS	Munitions Response Site
M.S.	Master of Science
MSD	Minimum Separation Distance
msl	Mean Sea Level
mV	Millivolts
N/A	Not Applicable
NAD	North American Datum
NAD83	North American Datum of 1983
NAOC	National Association of Ordnance Contractors
NASP	National Association of Safety Professionals
NAVFAC	Naval Facilities Engineering Command
NCN	No Common Name
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NCR	Non-Conformance Report
NMRD	Non-Munitions Related Debris
NRCS	Natural Resource Conservation Service
NTCRA	Non-Time Critical Removal Action
OCONUS	Outside Contiguous United States
OESS	Ordnance and Explosives Safety Specialist
OSHA	Occupational Safety and Health Administration
PD	Point Detonating
PDF	Portable Document Format
PDS	Project Decision Statement
PDSQ	Point Detonating Impact Super Quick
PDT	Project Delivery Team
PETN	Pentaerythritol Tetranitrate
PLS	Professional Land Surveyor
PM	Project Manager
PMP	Project Management Professional
POH	Honolulu District
PP	Proposed Plan
PPE	Personal Protective Equipment
PWS	Performance Work Statement
QA	Quality Assurance
QASP	Quality Assurance Surveillance Plan
QC	Quality Control
QCM	Quality Control Manager
RA	Remedial Action

RAR	Remedial Action Report
RCA	Root-Cause Analysis
RDX	Hexahydro-1,3,5-Trinitro-1,3,5-Triazine
RI	Remedial Investigation
ROE	Right-Of-Entry
ROM	Read Only Memory
RRD	Range-Related Debris
RSL	Regional Screening Level
RSO	Radiation Safety Officer
RTE	Rare, Threatened, and Endangered
RTK	Real-Time Kinematic
SARA	Superfund Amendments and Reauthorization Act
SCS	Scientific Consultant Services, Inc.
SDSFIE	Spatial Data Standards for Facilities, Infrastructure, and Environment
SDTS	Spatial Data Transfer Standard
SERDP	Strategic Environmental Research and Development Program
SI	Site Investigation
SMC	Smallest Munitions of Concern
SOP	Standard Operating Procedure
SSHP	Site Safety and Health Plan
SUXOS	Senior UXO Supervisor
TAL	Target Analyte List
TBD	To Be Determined
TIB	Technical Integration Branch
TIFF	Tagged Image File Format
TL	Team Leader
TLD	Thermoluminescent
TMK	Tax Map Key
TMP	Technical Management Plan
TNT	Trinitrotoluene
TP	Technical Paper
UFP-QAPP	Uniform Federal Policy Quality Assurance Project Plan
U.S.	United States
USACE	U.S. Army Corps of Engineers
USAESCH	U.S. Army Engineering & Support Center, Huntsville
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
USMC	U.S. Marine Corps
UTM	Universal Transverse Mercator
UU/UE	Unlimited Use/Unlimited Exposure
UXO	Unexploded Ordnance

UXOSO	UXO Safety Officer
UXOQCS	UXO Quality Control Specialist
WMA	Former Waikoloa Maneuver Area
WMD	Weapon of Mass Destruction
WMP	Waste Management Plan
WpB	Waikane Silty Clay, 3 to 8% Slopes
WpE	Waikane Silty Clay, 25 to 40% Slopes
WpF	Waikane Silty Clay, 40 to 70% Slopes
WpF2	Waikane Silty Clay, 40 to 70% Slopes Eroded
WTA	Waikane Training Area
WVTA	Waikane Valley Training Area
WWII	World War II

Uniform Federal Policy Quality Assurance Project Plan and Remedial Action Work Plan Crosswalk Table

The Uniform Federal Policy Quality Assurance Project Plan (UFP-QAPP) is prepared in accordance with the structural and content guidelines in United States Army Corps of Engineers (USACE) Engineer Manual (EM) 200-1-15 and Chief Information Officer 2106-G-05. The UFP-QAPP Worksheets are presented with their associated portions of a typical Remedial Action (RA) Work Plan. Organization of a RA Work Plan is as follows:

RA Work Plan (9 Sections):

- Table of Contents;
- List of Tables;
- List of Figures;
- List of Appendices:
 - Appendix A: Performance Work Statement;
 - Appendix B: Resumes/Points of Contact;
 - Appendix C: Technical Project Planning Meeting Minutes;
 - Appendix D: Accident Prevention Plan/Site Safety and Health Plan;
 - Appendix E: Standard Operating Procedures;
 - Appendix F: Field Forms; and
 - Appendix G: Munitions Constituents (MC) UFP-QAPP (if MC sampling is required).
- Section 1: Introduction;
- Section 2: Technical Management Plan;
- Section 3: Field Investigation Plan;
- Section 4: Quality Control Plan;
- Section 5: Explosives Management Plan;
- Section 6: Environmental Protection Plan;
- Section 7: Property Management Plan;
- Section 8: Waste Management Plan; and
- Section 9: References.

Table 1: UFP-QAPP Crosswalk Table

UFP-QAPP Worksheet Number(s)	Worksheet Title	UFP-QAPP Guidance Section		Work Plan Section	EM 200-1-15 Section
		Section	Title		
1 & 2	Title and Approval Page	2.2.1	Title, Version, and Approval/Sign-Off	Section 1	N/A
3 & 5	Project Organization and UFP-QAPP Distribution	2.2.3	Distribution List	Section 2	2.1, 2.2
		2.2.4	Project Organization and Schedule		
4,7, & 8	Personnel Qualifications and Sign-off Sheet	2.2.1	Title, Version, and Approval/Sign-Off	Appendix B	2.1.4, 6.2.1, 8.2.5.1
		2.2.7	Special Training Requirements and Certification		
6	Communication Pathways	2.2.4	Project Organization and Schedule	Section 2	2.1, 2.2
9	Project Planning Session Summary	2.2.5	Project Background, Overview, and Intended Use of Data	Appendix C	2.2
10	Conceptual Site Model	2.2.5	Project Background, Overview, and Intended Use of Data	Section 1	2.2.3.1, 12.2
11	Data Quality Objectives	2.2.6	Data/Project Quality Objectives and Measurement Performance Criteria	Section 3	2.2.3.2, 5.3, 9.2, 11.3
12	Measurement Performance Criteria	2.2.6	Data/Project Quality Objectives and Measurement Performance Criteria	Section 4	5.3.7, 11.3, Tables 11-3 through 11-6
13	Secondary Data Uses and Limitations	Chapter 3	QAPP Elements for Evaluating Existing Data	Section 4 and Appendix G	N/A
14 & 16	Project Tasks and Schedule	2.2.4	Project Organization and Schedule	Section 2	2.1, 2.2
15	Project Action Limits and Laboratory-Specific Detection / Quantitation Limits	2.2.6	Data/Project Quality Objectives and Measurement Performance Criteria	Section 3 and Appendix G	7, 8.2.4.6, 8.2.6.9

Table 1: UFP-QAPP Crosswalk Table

UFP-QAPP Worksheet Number(s)	Worksheet Title	UFP-QAPP Guidance Section		Work Plan Section	EM 200-1-15 Section
		Section	Title		
17 & 18	Sampling Design and Rationale	2.3.1	Sample Collection Procedure Experimental Design, and Sampling Tasks	Section 3 and Appendix G	8.2.4, 8.3.2, 8.5, 8.6, 8.7, 8.8
		2.3.2	Sampling Procedures and Requirements		
19 & 30	Sample Containers, Preservation, and Hold Times	2.3.2	Sampling Procedures and Requirements	Section 3 and Appendix G	7.5.4, 7.5.5, 7.5.6, 7.6.9, 7.7.3, 7.8.9
20	Field Quality Control Summary	2.3.5	Quality Control Requirements	Section 4	11
21 & 23	Standard Operating Procedures	2.3.2	Sampling Procedures and Requirements	Appendix E	4.4.4, 8.8.1-8.8.4
		2.3.4	Analytical Methods Requirements and Task Description	Appendix E	7.5.4, 7.5.5, 7.5.6, 7.6.9, 7.7.3, 7.8.9
22, 24, & 25	Field Equipment Calibration, Maintenance, Testing, and Inspection	2.3.6	Instrument/Equipment Testing, Calibration and Maintenance Requirements, Supplies and Consumables	Section 3 and Appendix G	6.7.2, 7
26 & 27	Sample Handling, Custody, and Disposal	2.3.3	Sample Handling, Custody Procedures, and Documentation	Section 3 and Appendix G	N/A
28	Analytical Quality Control Samples and Corrective Action	2.3.5	Analytical Quality Control and Corrective Action	Appendix G	11

Table 1: UFP-QAPP Crosswalk Table

UFP-QAPP Worksheet Number(s)	Worksheet Title	UFP-QAPP Guidance Section		Work Plan Section	EM 200-1-15 Section
		Section	Title		
29	Project Documents and Records	2.3.8	Documentation and Records Requirements	Sections 3 and 4	13
31, 32, & 33	Assessments and Corrective Action	2.4	Assessments and Data Review (Check)	Section 4 and Appendix G	4.3, Appendix B
		2.5.5	Reports to Management		
34, 35, & 36	Data Verification and Validation Inputs and Procedures	2.5.1	Data Verification and Validation Targets and Methods	Section 4 and Appendix G	8.2.4.7, 8.8.8
37	Data Usability Assessment	2.5.2	Quantitative and Qualitative Evaluations of Usability	Section 4 and Appendix G	8.8.8
		2.5.3	Potential Limitations on Data Interpretations		
		2.5.4	Reconciliation with Project Requirements		

Note:
N/A - not applicable

Executive Summary

This Uniform Federal Policy Quality Assurance Project Plan (UFP-QAPP) was prepared for the munitions and explosives of concern (MEC) Remedial Action (RA) at the 36-acre area within the 151-acre Southeastern Region Munitions Response Site (MRS), former Waikane Training Area (WTA), Kāneʻohe, Oʻahu, Hawaiʻi.

The project will be conducted per the requirements specified in the Decision Document (DD) for the Southeastern Region MRS (RMIS ID H09HI035401), former WTA, dated July 2015. In addition, the work will be conducted in compliance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 Code of Federal Regulations (CFR) Part 300, and the Department of Defense (DoD), Department of the Army (DA), and United States (U.S.) Army Corps of Engineers (USACE) Regulations and Guidance to include Interim Guidance and Data Item Descriptions (DIDs).

The former WTA is located in Waikane Valley in the District of Koʻolaupoko on the windward side of the island of Oʻahu, Honolulu County, Hawaiʻi. The former WTA was used by the DoD from 1942 to 1976 for various types of training such as maneuver, jungle, small arms, artillery, rocket, and mortar firing. Based on the previous investigations' findings, the Southeastern Region MRS was likely used as an impact area. In addition, foot maneuvering activities appear to have been conducted based on the significant amount of small arms debris found (USACE, 2012b). The types of MEC and munitions debris (MD) found within the Southeastern Region MRS include a variety of types including projectiles, mortars, practice rounds, rockets, grenades, signals, flares, simulators, firing devices, fuzes, and small arms debris. MEC items recovered in the Southeastern Region MRS were recovered at an average depth of 3.3 inches below ground surface (bgs).

Based on the results of the MEC Hazard Assessment (HA) performed during the Remedial Investigation (RI), MEC presents an unacceptable risk to human receptors based on the current and anticipated land use at the MRS. A risk assessment was conducted to determine the human health and ecological risks associated with potential munitions constituents (MC) exposure at the former WTA Munitions Response Area (MRA). Based on the MC analytical results, the risk assessments concluded that the potential for adverse risks to human health or ecological receptors from exposure to MC is negligible.

The DD was prepared to document the approval of the selected RA for a portion of the Southeastern Region MRS (36-acre area). The 36-acre area identified is comprised of the expanded area around the previous Non-Time Critical Removal Action (NTCRA) area where anticipated future land use includes intrusive activities (*e.g.*, agricultural and residential use) and in areas where the highest MD density was found and the potential for MEC to exist. The Selected Remedy presented in the DD consists of surface and subsurface MEC clearance and implementation of land use controls (LUCs) (*i.e.*, community MEC awareness training and distribution of informational documents). The scope of this RA UFP-QAPP is limited to the

surface and subsurface MEC clearance. The implementation of LUCs is beyond the scope of this project.

The objective of the RA is to mitigate the explosives safety hazard posed by MEC from the 36-acre area within the Southeastern Region MRS. The objective will be accomplished by locating and removing MEC and MD to 2 feet (ft) bgs within the limitations in detection technology. The following activities will be performed at the RA area:

- A biological survey will be conducted by qualified botanist/biologist prior to RA field activities to identify sensitive plant and animal species. The botanist/biologist will conduct biological resources awareness training for the field teams on how to identify important species and habitats. During field activities, the botanist/biologist will be notified and will investigate any findings;
- An archaeological survey will be conducted prior to RA field activities to identify sensitive archaeological sites. A qualified archaeologist will maintain a physical presence on site during the RA fieldwork;
- Vegetation clearance will be completed to facilitate the analog geophysical surveys and surface and subsurface clearance activities. Vegetation less than 3 inches in diameter will be cut and left in place;
- A surface clearance will be completed to remove metal from the surface so that an effective analog geophysical survey can be performed to locate anomalies for investigation during the subsurface clearance;
- Analog geophysical surveys will be performed using handheld analog metal detectors to locate anomalies for investigation during the subsurface clearance;
- A subsurface clearance will be completed through anomaly investigations that will identify and remove all MEC, MD, and metal equal to or greater than the mass and diameter of the smallest munitions of concern (SMC) known to have been used/found on the MRS (*i.e.*, 37 millimeter projectile) to a depth of 2 ft bgs within the limitations in detection technology;
- In areas cluttered with metallic contamination, an analog EM61-MK2 detector may be utilized to reduce the number of small anomalies to focus investigation efforts. In these areas, EM61-MK2 digital geophysical mapping (DGM) and anomaly investigation will be utilized to verify detector responses are below anomaly threshold;
- Explosive disposal operations may be required to dispose of any Material Potentially Presenting an Explosive Hazard (MPPEH)/MEC discovered; and
- MPPEH/Material Documented as Safe (MDAS) processing and management will be conducted as required for safe disposition and transfer to a metal recycler.

Worksheet # 1 & 2: Title and Approval Page

**FINAL
Uniform Federal Policy
Quality Assurance Project Plan**

December 2016

**Munitions and Explosives of Concern Remedial Action
Former Waikane Training Area
Southeastern Region Munitions Response Site
Kāneʻohe, Oʻahu, Hawaiʻi**

Prepared for:
**U.S. Army Corps of Engineers
Honolulu District
Building 230
Fort Shafter, HI 96858-5440**

Prepared by:
**GSI Pacific Inc.
181 South Kukui Street, First Floor
Honolulu, HI 96813-2329**

Prepared under:
Contract No. W9128A-15-C-0006

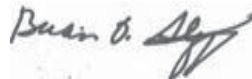
**PIEN.KEVIN.CL.136
7179100**

Digitally signed by PIEN.KEVIN.CL.1367179100
DN: c=US, o=U.S. Government, ou=DoD, ou=PKI,
ou=USA, cn=PIEN.KEVIN.CL.1367179100
Date: 2016.12.01 09:14:53 -10'00'

Approval Signature/Date: _____

Kevin Pien
United States Army Corps of Engineers Honolulu District Project Manager

Concurrence
Signature/Date: _____



11/28/16

Brian Stepp
GSI Pacific Inc. Senior Project Manager

Concurrence
Signature/Date: _____

Concurrence received in letter dated 21 November 2016
State of Hawaiʻi Department of Health

1. This Uniform Federal Policy Quality Assurance Project Plan (UFP-QAPP) was prepared in accordance with (IAW) the requirements of the Uniform Federal Policy for Quality Assurance Plans (United States [U.S.] Environmental Protection Agency [EPA], 2005), EPA QA/G-5 (EPA, 2002), Engineer Manual (EM) 200-1-15 (U.S. Army Corps of Engineers [USACE], 2015b), and Performance Work Statement (PWS) (Appendix A).
2. Identify regulatory program:
 - Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA); and
 - Defense Environmental Restoration Program for Formerly Used Defense Sites (DERP-FUDS).
3. This UFP-QAPP is a project-specific UFP-QAPP.
4. List dates of scoping sessions that were held:

Scoping Session	Date
Kickoff Meeting	9 October 2015

5. List dates and titles of any UFP-QAPP documents written for previous site work that are relevant to the current investigation:
 - No UFP-QAPPs were previously prepared for this site.
6. List organizational partners (stakeholders) and connection with lead organization:

Organization Partners/Stakeholders	Role
USACE Honolulu District (POH)	USACE POH is the Geographic/Contracting District and Lead Organization. USACE POH is the district responsible for project oversight, providing right-of-entry (ROE), community relations support, regulatory liaison, and other critical support and guidance to this project.
U.S. Army Engineering & Support Center, Huntsville (USAESCH)	USAESCH is the Design Center. USAESCH will provide expertise for munitions and explosives of concern (MEC)-related activities.
State of Hawaiʻi Department of Health (HDOH)	HDOH is the State Regulatory Agency and will be provided the opportunity to review all work plans and reports completed for the project.
City and County of Honolulu	The City and County of Honolulu is a land owner of the Remedial Action (RA) site.
ʻŌhulehule Forest Conservancy Limited Liability Company (LLC)	ʻŌhulehule Forest Conservancy LLC is a land owner of the RA site.
GSI Pacific Inc. (GSIP)	GSIP is the Prime Contractor. As the prime contractor to USACE POH, GSIP will provide overall technical support and services for implementation of the RA activities. GSIP is responsible for performing the activities detailed in the PWS and included in the project UFP-QAPP.

Notes:

Refer to the Technical Management Plan (TMP) (Appendix B) for additional details on project organization.

7. Lead organization (see Worksheet #3 & 5 for detailed list of data users):
 - USACE POH.

Worksheet # 3 & 5: Project Organization and UFP-QAPP Distribution

UFP-QAPP Recipient¹	Title/Role	Organization	Telephone Number	E-mail Address
Kevin Pien*	PM	USACE POH	(808) 835-4091	kevin.c.pien@usace.army.mil
Uyen Tran*	Technical Lead/COR	USACE POH	(808) 835-4096	uyen.tran@usace.army.mil
Harmon Slappy*	OESS	USACE POH	(808) 202-7459	harmon.l.slappy@usace.army.mil
Gary Wolover*	OESS	USACE POH	(808) 315-6449	gary.j.wolover@usace.army.mil
Kanalei Shun*	Senior Archaeologist	USACE POH	(808) 835-4097	kanalei.shun@usace.army.mil
Kevin Nishimura*	Natural Resources Specialist	USACE POH	(808) 835-4086	kevin.h.nishimura@usace.army.mil
Graeme Silva	CS	USACE POH	(808) 835-4380	graeme.l.silva@usace.army.mil
Joan Kaimikaua	KO	USACE POH	(808) 835-4376	joan.f.kaimikaua@usace.army.mil
Kim Meacham*	Technical Manager	USAESCH	(256) 895-1667 (office) (256) 307-2227 (cell)	kim.k.meacham@usace.army.mil
Debra Edwards*	Independent Geophysicist	USAESCH	(256) 895-1626	debra.l.edwards@usace.army.mil
Brian Stepp	Senior PM	GSIP	(808) 754-1914	bstepp@gsisg.com
Michael Coyle	CHSM	GSIP	(808) 349-3178	mcoyle@gsisg.com
Daniel Haines	QCM	GSIP	(808) 896-9845	dhaines@gsisg.com
Daniel Wolf	PM	GSIP	(808) 895-7815	dwolf@gsisg.com
Robert Cook	HSM/UXOSO	GSIP	(808) 354-3783	rcook@gsisg.com
Benjamin Konshak	Project Geophysicist	GSIP	(808) 285-2454	bkonshak@gsisg.com
Marco Beltran	SUXOS	GSIP	(808) 960-3362	mbeltran@gsisg.com
John Coberley	UXOQCS	GSIP	(808) 887-1131	jcoberley@gsisg.com
Matt Rosete	GIS Manager	GSIP	(808) 206-0875	mrosete@gsisg.com
Elizabeth Pestana	Archaeological Support	SCS ²	(808) 283-8586	elizabeth@scshawaii.com

UFP-QAPP Recipient¹	Title/Role	Organization	Telephone Number	E-mail Address
David Gerow	CIH	Kauai Environmental Inc. ²	(808) 651-3977	daveg@kauaienvironmental.com
Ron Terry	Natural Resources Support	GA ²	(808) 969-7090	rterry@hawaii.rr.com
TBD	Land Surveyor	IHS ²	(808) 959-0360	info@hawaiiboundary.com

Notes:

¹ Section 6 of the PWS provides submittal guidance (*e.g.*, number of copies) (Appendix A).

² Managed and subcontracted by GISP as the prime contractor.

* Requires copy

CHSM - Corporate Health and Safety Manager

CIH - Certified Industrial Hygienist

COR - Contracting Officer's Representative

CS - Contract Specialist

GA - Geometrician Associates, LLC

GIS - Geographic Information System

HSM - Health and Safety Manager

IHS - Independent Hawaii Surveyors, LLC

KO - Contracting Officer

OESS - Ordnance and Explosives Safety Specialist

PM - Project Manager

QCM - Quality Control Manager

SCS - Scientific Consultant Services, Inc.

SUXOS - Senior UXO Supervisor

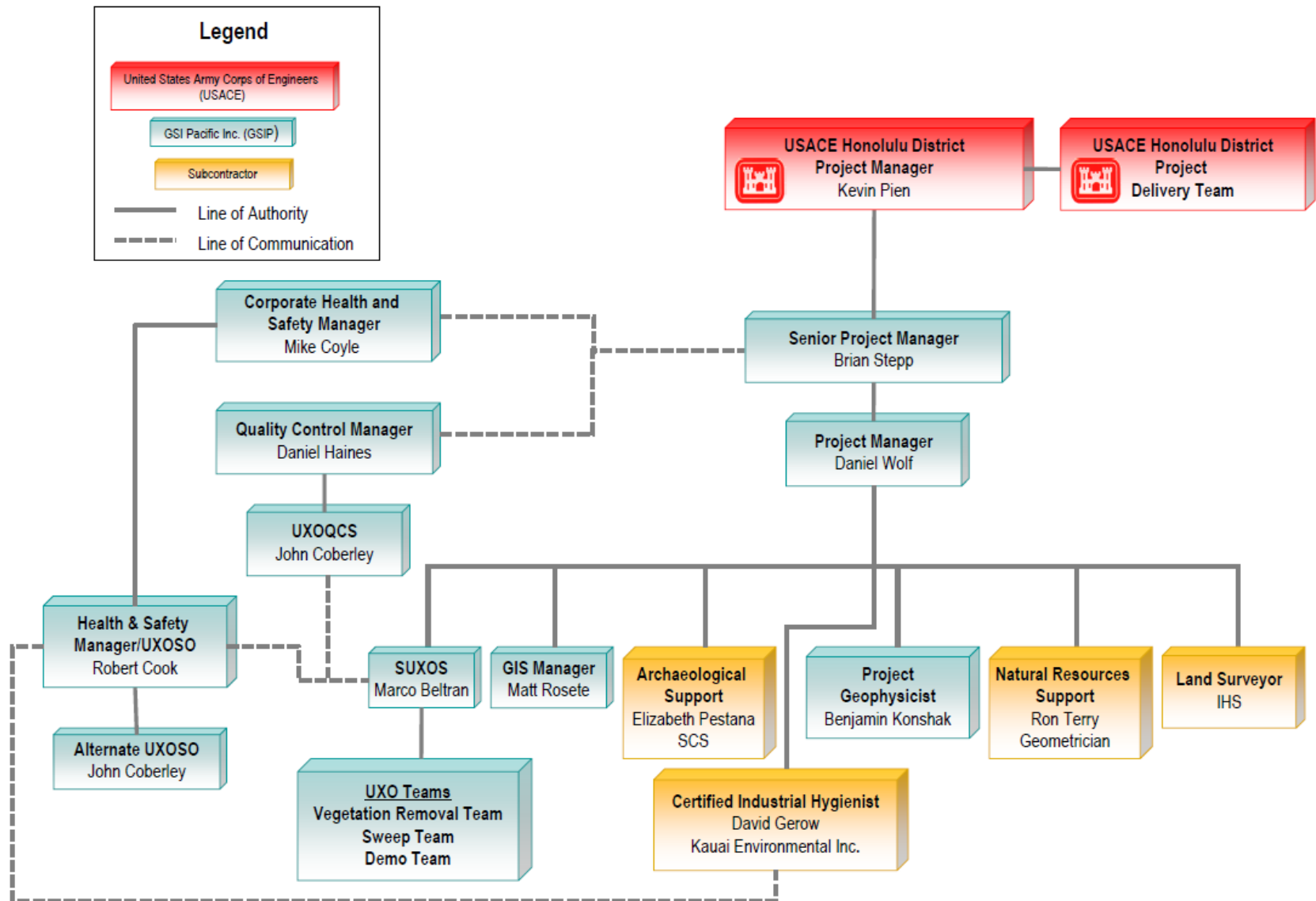
TBD - to be determined

UXO - unexploded ordnance

UXOSO - UXO Safety Officer

UXOQCS - UXO Quality Control Specialist

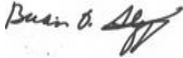
Project Organizational Chart






This Page Intentionally Left Blank


Worksheet # 4, 7, & 8: Personnel Qualifications and Sign-Off Sheet

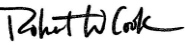
Name	Project Title/Role	Organization Affiliation	Education/Experience	Specialized Training/Certifications	Signature Date
Debra Edwards	Independent Geophysicist	USACE	<p>– Master of Science (M.S.), 1993, Geophysics, Colorado School of Mines</p> <p>– Bachelor of Science (B.S.), 1976, Earth Sciences, University of New Orleans</p> <p>Ms. Edwards is a registered geologist with 34 years of experience, evaluated geophysical data for quality and applicability.</p>	<ul style="list-style-type: none"> ▪ Registered Professional Geologist in the State of Tennessee, certified since July 2001 ▪ American Geophysical Union, 1983-present ▪ UX Analyze Advanced, 2012, 2013, 2014, 2015 ▪ Trimble GPS Surveying and Mapping, 2012 ▪ Environmental Security Technology Certification Program (ESTCP) Technology Transfer Workshop on Advanced Anomaly Classification, 2012 ▪ MetalMapper Training, 2012 ▪ Classification Methods Applied to Munitions Response, 2011 ▪ Visual Sample Plan, 2011 ▪ Geophysical System Verification-Alternative to Geophysical Proveouts, 2009 ▪ Geosoft Oasis Montaj UX Process Update, 2009 ▪ UX-Detect software training, October 2001 ▪ Hydroscience, University of Nevada Las Vegas, 1995 ▪ Advanced Hydrogeology, 	

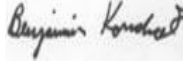
Name	Project Title/Role	Organization Affiliation	Education/Experience	Specialized Training/Certifications	Signature Date
Debra Edwards <i>(continued)</i>				University of Nevada Las Vegas, 1996 <ul style="list-style-type: none"> ▪ Hazardous Site Characterization and Remediation, University of Nevada Las Vegas, 1998 ▪ 40-Hour Occupational Safety and Health Administration (OSHA) Hazardous Waste Operations and Emergency Response (HAZWOPER) and current 8-Hour Refresher 	
Harmon Slappy	OESS	USACE	<ul style="list-style-type: none"> – U.S. Naval School Explosive Ordnance Disposal (EOD) School (1976) – Basic EOD Technician, Senior EOD Technician, Master EOD technician – Naval Facilities Engineering Command (NAVFAC), Regional Officer in Charge of Construction Kaho'olawe, GS-802 Engineering Technician (Explosive Safety/ Quality) – CEPOH-PPE, GS-0018 OESS 	<ul style="list-style-type: none"> ▪ NAVFAC Construction Safety and Health Certification Course. ▪ 40-Hour OSHA HAZWOPER and current 8-Hour Refresher ▪ First-Aid/Certified Adult Cardiopulmonary Resuscitation (CPR)/ Automated External Defibrillator (AED). 	
Brian Stepp	Senior PM	GSIP	<ul style="list-style-type: none"> – U.S. Naval EOD School (1979) – B.S. Business Administration, Columbia College (1987) – M.S. Leadership, Troy State University (1992) <p>Mr. Stepp is a Master EOD Technician with over 35 years of experience. He has filled the roles of Operations Manager, Program Manager, PM, SUXOS, UXO Safety Manager, and UXO QCM on Military Munitions Response Program (MMRP) projects at Formerly Used Defense Sites (FUDS) in Hawaiʻi and on the mainland U.S.</p>	<ul style="list-style-type: none"> ▪ Project Management Professional (PMP)—Project Management Institute ▪ Certified Manager of Quality and Organizational Excellence (CMQ/OE)— American Society for Quality (ASQ) ▪ Certified Quality Auditor (CQA)—ASQ ▪ Certified Health and Safety Officer—National Association 	 11/28/16

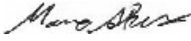

Name	Project Title/Role	Organization Affiliation	Education/Experience	Specialized Training/Certifications	Signature Date
Brian Stepp <i>(continued)</i>			Throughout his long career, he has accumulated extensive experience planning, scheduling, budgeting, staffing, mobilizing, and managing MEC removal projects. As a former career Air Force EOD technician, he has served in numerous capacities supervising range clearance and disposal operations at installations on the mainland U.S., Alaska, Japan, Korea, and in Panama.	<ul style="list-style-type: none"> of Safety Professionals (NASP) ▪ Level V Certification – International Society of Explosive Engineers ▪ 40-Hour OSHA HAZWOPER and current 8-Hour Refresher ▪ EOD Advanced Access and Disablement ▪ EOD Advanced Course Refresher 	
Michael Coyle	CHSM	GSIP	<p>– Bachelor of Arts (B.A.) Natural Science, University of Pennsylvania (1988)</p> <p>Mr. Coyle is a Certified Safety Professional (CSP) and Certified Hazardous Materials Manager (CHMM) with 25 years of health and safety management experience in performing design-build and construction services. Twenty-three years have been in construction services with over \$1 billion in repair and renewal projects, 20 years of which were in a supervisory position. He has performed on projects for the Department of Defense (DoD), municipalities, private developers, and petroleum refineries.</p> <p>Mr. Coyle has managed programs across a wide geography including multiple contiguous U.S. (CONUS) and outside CONUS (OCONUS) DoD facilities including Afghanistan, Kwajalein, Japan, Korea, Saipan, Greenland, Spain, Oman, Guam, Hawaiʻi, and Alaska.</p> <p>Mr. Coyle has performed as the CHSM for all construction services. His position included the safety oversight for projects ranging in size from \$100,000 to over \$200 million. His background includes providing extensive environmental health and safety training, owning his own business, and health and safety</p>	<ul style="list-style-type: none"> ▪ CSP ▪ CHMM ▪ 40-Hour OSHA HAZWOPER and current 8-Hour Refresher ▪ 10-Hour OSHA Construction Safety Training ▪ 16-Hour OSHA Disaster Site Worker Training ▪ OSHA Disaster Site Worker Train-the-Trainer ▪ OSHA 500 Construction Safety Train the Trainer ▪ 40-Hour Radiation Safety Officer ▪ Asbestos Inspector ▪ Asbestos Contractor/Supervisor ▪ Asbestos Project Monitor 	  11/23/16

Name	Project Title/Role	Organization Affiliation	Education/Experience	Specialized Training/Certifications	Signature Date
Michael Coyle <i>(continued)</i>			management for construction and hazardous material remediation projects. He has also been a lecturer in the Occupational Environmental Safety Management Program at the Honolulu Community College.		
Daniel Haines	QCM	GSIP	<ul style="list-style-type: none"> – U.S. Naval EOD School (1996) – B.S. Business Management, University of Phoenix (2006) – Master of Engineering: Quality, Reliability, and Statistical Engineering, Ira A. Fulton Schools of Engineering, Arizona State University (Expected 2017) <p>Mr. Haines is a CMQ/OE and a senior member of the ASQ. Mr. Haines is a member of the National Association of Ordnance Contractors (NAOC) Operations and Standards Committee and is involved in discussions and document reviews with the Environmental and Munitions Center of Expertise (EMCX) on the latest USACE military munitions response guidance, industry issues, and advanced technologies.</p> <p>He has over 19 years of experience working on active military ranges and in the MMRP industry at FUDS sites performing removal actions and Remedial Investigation (RI) projects. Mr. Haines has experience as a military EOD and civilian UXO Team Leader (TL), PM, Operations Manager, SUXOS, UXOSO, and UXOQCS, and a digital geophysical mapping (DGM) survey TL and data processor on MMRP projects. He is currently the Quality Manager for GSIP and final reviewer for all MEC Division submittals.</p> <p>Mr. Haines' technical skills, MMRP knowledge and field experience provides a valuable insight for developing and managing the MEC and munitions constituents (MC) quality assurance (QA)/quality control (QC) program.</p>	<ul style="list-style-type: none"> ▪ CMQ/OE ▪ ASQ member ▪ USACE/ NAVFAC Construction Quality Management ▪ 40-Hour OSHA HAZWOPER and current 8-Hour Refresher ▪ 8-Hour OSHA HAZWOPER Supervisor ▪ 30-Hour OSHA Construction Safety ▪ 10-Hour OSHA Construction Safety ▪ International Organization for Standardization (IOS) 9001:2008 ▪ NAVFAC QA Assessor Certificate ▪ Hawai'i State Explosives Blaster's License Certificate of Fitness ▪ First-Aid/Certified Adult CPR/AED First Responder 	 11/29/16


Name	Project Title/Role	Organization Affiliation	Education/Experience	Specialized Training/Certifications	Signature Date
Daniel Haines <i>(continued)</i>			He is responsible for reviewing and approving work plans, IAW project goals, client and stakeholder needs, industry standards, and USACE and DoD Explosives Safety Board (DDESB) regulations, guidance, and policies. Mr. Haines also has experience managing and performing third-party QA for several MMRP RI projects in Guam and Hawaiʻi.		
Daniel Wolf	PM	GSIP	<p>– Basic EOD School (1983)</p> <p>Mr. Wolf has, over the past 20 years, filled the positions of SUXOS, UXO Demolition Supervisor (DS), PM, Explosives Engineering Technician, and Foreman for Explosives Operations.</p> <p>Mr. Wolf currently serves as the MEC Program Manager at GSIP, where he is responsible for the overall MEC Program for the company. He directs the safe destruction and/or removal of MEC and munitions debris (MD).</p> <p>Mr. Wolf has filled the position of UXO Blaster/Manager for previous task orders in the Former Waikoloa Maneuver Area (WMA), located on the Big Island of Hawaiʻi, and has also managed one UXO clearance team in support of previous operations at WMA.</p>	<ul style="list-style-type: none"> ▪ Explosive Drivers Course ▪ Range Safety Officer ▪ Material Handling Equipment Operators Course ▪ Heavy Equipment Instructor Course ▪ Defense Nuclear Weapons School ▪ Joint Nuclear EOD Training Course ▪ Demo Operations Supervisor Course ▪ Heavy Equipment Operator ▪ Project Management Applications ▪ Project Management Fundamentals ▪ 40-Hour OSHA HAZWOPER and current 8-Hour Refresher ▪ OSHA 30 Hour Construction Safety Course ▪ Current CPR/First Aid ▪ Confined Space Training ▪ High Speed Project 	 11/22/16

Name	Project Title/Role	Organization Affiliation	Education/Experience	Specialized Training/Certifications	Signature Date
Daniel Wolf <i>(continued)</i>				Management <ul style="list-style-type: none"> ▪ Hawaiʻi Blaster License WH-100 ▪ Registered to the International Association of Bomb Technicians and Investigators ▪ Registered to the International Society of Explosives Engineers 	
Robert Cook	HSM/ UXOSO	GSIP	<p>– U.S. Naval EOD School (2001)</p> <p>As a graduate of a U.S. military EOD School, Mr. Cook has over 24 years of experience working in safety management positions for both construction and EOD/UXO projects. In addition, he has 14 years of combined EOD and UXO experience, all of which has been on DoD or FUDS installations, and for the past five years has worked as a site safety health officer and UXOSO at the WMA, specializing in disposal and management of MEC and related constituents.</p> <p>Mr. Cook is experienced in all phases of munitions response actions and range clearance activities and has served as a UXO Technician II/III and UXO Technician Instructor in the U.S. and Cambodia. His construction safety experience includes nine years managing the facilities safety program for the construction and maintenance of 12 Department of Health clinics, five environmental health facilities, and the Riverside General Hospital and Riverside County Regional Medical Center, California.</p>	<ul style="list-style-type: none"> ▪ Construction Health and Safety Technician (CHST) ▪ CSP ▪ Associate Safety Professional (ASP) ▪ 40-Hour OSHA HAZWOPER and current 8-Hour Refresher ▪ 30-Hour OSHA Construction Safety ▪ Emergency Medical Technician ▪ First Aid/ CPR/ AED Instructor ▪ First Aid/CPR Primary Responder ▪ Hawaiʻi State Blaster License ▪ Confined Space ▪ Tennessee Higher Education Commission Certified UXO Instructor ▪ Alcohol, Tobacco, Firearms, and Explosives (ATF) Employee Possessor License 	 11/23/16

Name	Project Title/Role	Organization Affiliation	Education/Experience	Specialized Training/Certifications	Signature Date
Benjamin Konshak	Project Geophysicist	GSIP	<p>– B.S. Geology, Western Washington University (1995)</p> <p>Mr. Konshak has 20 years of experience in the field of Geology and 14 years of directly related experience performing oversight on geophysical investigation planning and field execution efforts. He is proficient in various geophysical analysis software tools, field data collection instruments and platforms, various handheld analog detectors, and Global Positioning System (GPS). He has a broad range of experience using land, marine and airborne approaches for removal actions, RIs, wide area assessment and advanced classification projects in executing projects for multiple agencies.</p> <p>Mr. Konshak has served in a geophysical or project management role on Non-Time Critical Removal Action (NTCRA) and RI/Feasibility Study (FS) projects at WMA since 2004. He managed subcontracts in support of ESTCP demonstrations that consisted of primary collection with an EM61 electromagnetic metal detector followed by surveys with advanced electromagnetic induction MetalMapper and Man Portable Vector sensors. Mr. Konshak’s oversight included appropriate study site selection, surface clearance/UXO escort, mapping transects for MD density, installation of seed items, stakeholder briefings, plan development, and coordination of archaeological and biological surveys. Mr. Konshak also participated and assisted directly with the advanced sensor data collection.</p>	<ul style="list-style-type: none"> ▪ CQA, CMQ/OE ASQ ▪ 40-Hour OSHA HAZWOPER and current 8-Hour Refresher ▪ ESTCP/ NAOC UX-Analyze Training and Classification Course ▪ Visual Sample Plan Training ▪ Strategic Environmental Research and Development Program (SERDP) Geophysical System Verification (GSV) – Alternative to Geophysical Prove-Outs ▪ First-Aid/Adult CPR, American Red Cross 	 11/23/16

Name	Project Title/Role	Organization Affiliation	Education/Experience	Specialized Training/Certifications	Signature Date
Marco Beltran	SUXOS	GSIP	<ul style="list-style-type: none"> – U.S. Naval EOD School (2002) – Associates of Science (A.S.) Electronic Engineering (1996) – B.S. Automated Manufacturing (1997) <p>Mr. Beltran has over 13 years of UXO and chemical warfare materiel (CWM) experience which includes various types of U.S. and foreign conventional, nuclear, and chemical munitions, as well as improvised explosive device (IED)/weapon of mass destruction (WMD); all phases of EOD and UXO/CWM operations.</p> <p>Mr. Beltran has served as SUXOS at the WMA RI/FS; PM at Pohakuloa Training Area; UXOSO at Sasa Valley, GU; DS at Yuma Proving Ground, AZ, and WMA, HI.</p>	<ul style="list-style-type: none"> ▪ Construction Quality Control Corporate Quality Control Manager ▪ Hawaiʻi Certificate of Fitness (Blasters License) ▪ 40-Hour OSHA HAZWOPER and current 8-Hour Refresher ▪ 30-Hour OSHA Construction Safety ▪ First Aid/CPR/AED/Bloodborne Pathogens 	 11/28/16
John Coberley	UXOQCS	GSIP	<ul style="list-style-type: none"> – U.S. Naval School EOD, Indian Head Maryland (1976) <p>Mr. Coberley has extensive EOD/UXO experience, training, and knowledge in both the military and civilian fields.</p> <p>As a graduate of a Naval EOD School, Mr. Coberley has over 20 years of experience working in safety, quality control, and management positions for MEC/EOD/UXO projects. He has held positions as a UXOQCS, Technician III – Demolition Supervisor, Technician III – TL, Technician II –Team Member, UXOSO, and SUXOS at both domestic and overseas sites. He has experience in soil sampling, compliance, QC audits, corrective action identification, and safety inspections.</p> <p>Mr. Coberley has served as UXOQCS for the Montana RA and Mount Gretna RI. He is currently the SUXOS for the ESTCP Munitions Response at Pueblo Chemical Depot.</p>	<ul style="list-style-type: none"> ▪ 40-Hour OSHA HAZWOPER and current 8-Hour Refresher ▪ First Aid/CPR/AED ▪ 30-Hour OSHA Construction Safety ▪ USACE/NAVFAC Construction Quality Management ▪ 8-Hour OSHA HAZWOPER Supervisor 	 <i>for and on behalf of John Coberley</i> 11/22/16

Name	Project Title/Role	Organization Affiliation	Education/Experience	Specialized Training/Certifications	Signature Date
Matt Rosete	GIS Manger	GSIP	<p>– B.S. Physical Geography, University of California, Santa Barbara (2005)</p> <p>Mr. Rosete is a certified GIS Professional (GISP). He has technical and managerial experience on a diverse range of environmental projects including MEC NTCRAs and RIs as well as hazardous materials surveys and abatement. Mr. Rosete has over nine years of academic and professional experience in GIS and has co-authored technical articles.</p> <p>Mr. Rosete oversees geospatial data management for GSIP/Environet’s Hawaiʻi based projects including WMA, WTA, Pohakulola Training Area, Heeia/Pali, Popoki Target Area, Hawaiʻi Undersea Military Munitions Assessment (HUMMA), Bellows Air Force Station FS. He also directs GIS staff and evaluates geospatial software and hardware needs. He develops standard operating procedures (SOPs) for GIS operations, including cartographic design, geodatabase production, and survey and database management.</p>	<ul style="list-style-type: none"> ▪ GISP – GIS Certification Institute ▪ 40-Hour OSHA HAZWOPER and current 8-Hour Refresher ▪ 30-Hour OSHA Construction Outreach ▪ 10-Hour OSHA Construction Safety and Health ▪ Hazard Communication Training ▪ State of Hawaiʻi Department of Transportation (HDOT) Hazardous Material Training ▪ UXO Safety Awareness Course ▪ Hawaiʻi Geographic Information Coordinating Council member 	<p style="text-align: right;"><i>Matthew Rosete</i> 11/22/16</p>
Elizabeth Pestana	Archaeological Support	SCS ¹	<p>– Associates of Arts Liberal Arts, Leeward Community College, Hawaiʻi (2002)</p> <p>– B.A. Anthropology, University of Hawaiʻi at Mānoa, Hawaiʻi (2006)</p> <p>Ms. Pestana has over 15 years of professional experience in Cultural Resource Management Archaeology, which included project management, laboratory oversight, and administrative duties.</p> <p>Ms. Pestana is a Project Director and Archaeologist at SCS. She has technical and managerial experience on a diverse range of archaeological projects including surveys, reconnaissance, monitoring, burial treatment and removal, and data recovery. Ms. Pestana also has extensive laboratory and data analysis experience, and has co-authored a technical article.</p>	<ul style="list-style-type: none"> ▪ 40-Hour OSHA HAZWOPER and current 8-Hour Refresher ▪ Section 106 Essentials Workshop 	<p style="text-align: right;"><i>Elizabeth Pestana</i> 11/29/16</p>

Name	Project Title/Role	Organization Affiliation	Education/Experience	Specialized Training/Certifications	Signature Date
Ron Terry	Natural Resources Support	GA ¹	<p>– B.A. Geography, University of Hawaii at Hilo (1980) – Ph.D. Geography, Louisiana State University (1988)</p> <p>Dr. Terry has over 30 years of academic and professional experience in geography, environmental analysis, and flora and fauna studies. He was an Assistant Professor of Geography at the University of Hawaiʻi at Hilo from 1987 to 1992. He is currently an Affiliate Professor at the University of Hawaiʻi at Hilo and has been a board member of several State boards and commissions related to environmental management. He has been qualified as an expert witness in environmental assessment in numerous administrative and judicial proceedings. He has conducted more than 300 biological reports and Environmental Assessments for seven federal agencies, 10 State of Hawaiʻi agencies, and numerous county agencies on five of the eight Hawaiian Islands.</p> <p>He started a full-time consulting business following his professorship and specializes in Environmental Assessments and Impact Statements, flora and fauna studies, remote sensing of vegetation, and Section 7 Consultation.</p>	▪ N/A	 11/23/16

Name	Project Title/Role	Organization Affiliation	Education/Experience	Specialized Training/Certifications	Signature Date
David Gerow	CIH	Kauai Environmental, Inc. ¹	<p>– B.A. Chemistry, University of Colorado (1982)</p> <p>– M.S. Analytical Chemistry, Virginia Commonwealth University</p> <p>Mr. Gerow is a CIH and CSP with over 25 years of professional experience in the areas of Environmental and Health and Safety Services and is the current Safety Manager/CIH for GSIP on the WMA contract.</p> <p>Mr. Gerow has documented experience in air monitoring technologies and in the development of personal protective equipment (PPE) programs for working in potentially hazardous atmospheres. He has written and implemented numerous Health and Safety Plans for hazardous materials investigation and remediation projects, industrial facilities, and construction projects. These projects have included measures for monitoring worker exposures, analysis of site hazards, and selection of PPE and safe working practices.</p> <p>Mr. Gerow has performed industrial hygiene and safety audits of industrial and construction projects, collected air samples for OSHA compliance, and written company safety programs for a variety of industries and hazards.</p>	<ul style="list-style-type: none"> ▪ American Board of Industrial Hygiene (ABIH) CIH, Comprehensive Practice ▪ CSP, Comprehensive Practice ▪ ABIH CIH, Chemical Aspects 	<p style="text-align: center;"><i>David Gerow</i></p> <p style="text-align: center;">11/23/16</p>

Notes:

¹ Managed and subcontracted by GISP as the prime contractor.

N/A - not applicable

This Page Intentionally Left Blank

Worksheet # 6: Communication Pathways

Communication Driver	Organization Responsible Individual	Name	Contact Information	Procedure
Public and regulatory agency interface	USACE PM	Kevin Pien	(808) 835-4091	The USACE PM will provide relevant project documentation to stakeholders/regulatory agencies. The USACE PM will be responsible for notifying stakeholders/regulatory agencies when significant changes to the UFP-QAPP or corrective actions (CAs) occur. Following the MEC removal, educational land use controls (LUCs) will be implemented at the site to make the public aware of the potential MEC hazards utilizing the 3 R's: Recognize, Retreat and Report.
Program management (e.g., contract changes)	GSIP Senior PM	Brian Stepp	(808) 754-1914	The GSIP Senior PM is the point of contact with the USACE Contracting Office and will document and approve any changes to the contract or UFP-QAPP prior to and during fieldwork.
Project management (e.g., field progress reports)	GSIP PM	Daniel Wolf	(808) 895-7815	The GSIP PM will provide all project related communication (e.g., progress status reports) to the USACE PM on a weekly basis. The GSIP PM will notify the GSIP Senior PM of proposed changes to the procedures specified in the project UFP-QAPP during field activities by the close of business (COB) the following day.
Safety management (e.g., CAs)	USACE OESS	Harmon Slappy	(808) 202-7479	The OESS will communicate any safety issues to the District PM for resolution with the contractor and, if necessary, the state regulator.
	GSIP CHSM	Michael Coyle	(808) 349-3178	The GSIP CHSM will be responsible for ensuring that the Safety Program is established and meets the requirements of the contract. The GSIP CHSM will communicate directly with project safety management (e.g., HSM) and Senior GSIP PM on safety related issues such as non-conformance and CAs.
	GSIP HSM	Robert Cook	(808) 354-3783	The GSIP HSM will responsible for ensuring that the UFP-QAPP and safety plans meet the requirements of the contract. The GSIP HSM will communicate directly with onsite safety management (e.g., UXOSO) regarding field related safety activities and generating safety reports. Non-conformances and CAs will be reported to GSIP Senior PM and CHSM within one day of CA.
	GSIP Subcontractor CIH	David Gerow	(808) 651-3977	The CIH will conduct plan reviews, edits, and approvals of safety plans, as required as the CIH. The CIH will conduct audits, training, and investigations as needed, and will oversee accident investigations and assist with OSHA 300 reporting as required. The CIH will interface with the PM, GSIP CHM, GSIP HSM, UXOSO, and provide guidance, as needed.

Communication Driver	Organization Responsible Individual	Name	Contact Information	Procedure
Quality management (<i>e.g.</i> , data verification and validation issues)	USACE Independent Geophysicist	Debra Edwards	(256) 895-1626	The geophysicist will communicate any quality issues to the District PM for resolution with the contractor and, if necessary, the state regulator.
	GSIP QCM	Daniel Haines	(808) 896-9845	The GSIP QCM will responsible for ensuring that the UFP-QAPP and quality plans meet the requirements of the contract. The GSIP QCM communicates directly with onsite quality management (<i>e.g.</i> , UXQCS) regarding field related quality activities and generating quality reports. Non-conformances and CAs will be reported to GSIP Senior PM within one day of CA.
Field Progress Reports	GSIP SUXOS	Marco Beltran	(808) 960-3362	The GSIP SUXOS will be responsible for ensuring that all MEC related operational procedures are implemented during field activities IAW UFP-QAPP. The GSIP SUXOS will communicate and provide progress reports to the GSIP PM daily during field activities by written report, phone and/or e-mail.
Operations				The GSIP SUXOS will have the authority to stop work if field activities are not implemented according to the project UFP-QAPP. The SUXOS may be required to perform CAs during field activities. Personnel will be notified via written reports and/or verbal communication. The GSIP PM and Senior PM will be immediately notified with a follow-up report within one day for all incidents.
Field Progress Reports	GSIP UXOQCS	John Coberley	(808) 887-1131	The GSIP UXOQCS will be responsible for ensuring that all quality related procedures are implemented during field activities IAW UFP-QAPP. The GSIP UXOQCS will review the field data and provide progress reports to the GSIP PM daily during field activities by written report, phone and/or e-mail.
Operational Quality				The GSIP UXOQCS will have the authority to stop work if field activities are not implemented according to the project UFP-QAPP. The UXOQCS may be required to perform CAs during field activities. Personnel will be notified via written reports and/or verbal communication. The GSIP PM and QCM will be immediately notified with a follow-up report within one day for all incidents.

Communication Driver	Organization Responsible Individual	Name	Contact Information	Procedure
Field Progress Reports	GSIP UXOSO	Robert Cook	(808) 354-3783	The GSIP UXOSO will be responsible for ensuring that all safety related procedures are implemented during field activities. The GSIP UXOSO will communicate relevant field information to the GSIP PM daily during field activities, by written report, phone and/or e-mail.
Operational Safety				The GSIP UXOSO will have the authority to stop work if field activities are not implemented according to the project UFP-QAPP. The UXOSO may be required to perform CAs during field activities. Personnel will be notified via written reports and/or verbal communication. The GSIP PM, CHSM and HSM will be immediately notified with a follow-up report within one day for all incidents.
Field Progress Reports	GSIP Project Geophysicist	Benjamin Konshak	(808) 285-2454	The Project Geophysicist will be responsible for ensuring that all geophysical related procedures are implemented during field activities IAW the UFP-QAPP. The Project Geophysicist will communicate relevant field and processing information to the USACE PM during field activities by written report, phone and/or e-mail.
Data Review	GSIP GIS Manager	Matt Rosete	(808) 206-0875	The GSIP GIS Manager will be responsible for reviewing electronic data (<i>i.e.</i> , GPS and GIS data) generated during fieldwork. The GSIP GIS Manager will communicate relevant field information to the GSIP PM and UXOQCS daily during field activities by written report, phone and/or e-mail.

This Page Intentionally Left Blank

Worksheet # 9: Project Planning Session Summary

Session 1: Project Kick off Meeting

Purpose: Project Kick off Meeting

Date of Session: 09 October 2015

Location: GSIP Honolulu Office (181 South Kukui Street, First Floor, Honolulu, HI 96813) and Teleconference

Project Name: MEC RA, Southeastern Region Munitions Response Site (MRS), former Waikane Training Area (WTA)

Participants: See table below

Name	Project Role	Affiliation	Telephone Number	E-mail Address
Kevin Pien	PM	USACE POH	(808) 835-4091	kevin.c.pien@usace.army.mil
Uyen Tran	Technical Lead/COR	USACE POH	(808) 835-4096	uyen.tran@usace.army.mil
Kanalei Shun	Senior Archaeologist	USACE POH	(808) 835-4097	kanalei.shun@usace.army.mil
Kevin Nishimura	Natural Resources Specialist	USACE POH	(808) 835-4086	kevin.h.nishimura@usace.army.mil
Graeme Silva	CS	USACE POH	(808) 835-4380	graeme.l.silva@usace.army.mil
Kim Meacham	Technical Manager	USAESCH	(256) 895-1667 (office) (256) 307-2227 (cell)	kim.k.meacham@usace.army.mil
Debra Edwards	Independent Geophysicist	USAESCH	(256) 895-1626	debra.l.edwards@usace.army.mil
Brian Stepp	Senior PM	GSIP	(808) 754-1914	bstepp@gsisg.com
Daniel Wolf	PM	GSIP	(808) 895-7815	dwolf@gsisg.com

Purpose: Project Kick off Meeting

Date of Session: 09 October 2015

Location: GSIP Honolulu Office (181 South Kukui Street, First Floor, Honolulu, HI 96813) and Teleconference

Project Name: MEC RA, Southeastern Region Munitions Response Site (MRS), former Waikane Training Area (WTA)

Participants: See table below

Name	Project Role	Affiliation	Telephone Number	E-mail Address
Michael Van Woerkom	HSM	GSIP	(808) 554-6820	mvanwoerkom@gsisg.com
Armando Robles	UXO Supervisor	GSIP	(702) 461-3177	arobles@gsisg.com
Erik Lash	Archaeological Support	SCS ¹	(808) 265-9458	erik@scshawaii.com
Ron Terry	Natural Resources Support	GA ¹	(808) 969-7090	rterry@hawaii.rr.com

Note:

¹Managed and subcontracted by GISP as the prime contractor.

Notes/Comments:

This Project Kickoff meeting was held for USACE and GSIP Team members. The purpose of the call was to introduce the roles and responsibilities of the USACE and GSIP team members, as well as key subcontractors and project stakeholders. Overviews of GSIP's scope, technical approach, schedule, and near term deliverables were provided.

Consensus Decisions:

Non-munitions related debris (NMRD) such as cars, washers, and rubbish, may be present on the site due to illegal public dumping. As agreed upon during the project kick-off meeting, the project team will not be removing any illegal public dumping related NMRD found at the site. If encountered, these items will be moved to the side and the area beneath will be checked for MEC/MD/Material Potentially Presenting an Explosive Hazard (MPPEH) to a depth of 2 feet (ft) below ground surface (bgs).

Action Items:

The following action items were generated from the Project Kickoff Meeting:

- SCS will provide Mr. Kanalei Shun with Mr. Erik Lash's resume and all related documents;
- SCS will provide GSIP with Erik Lash's resume, 40-Hour Certification, 8-Hour Certification, and current physical;
- USACE will provide ROE; and
- Ms. Uyen Tran requested that all contract-related items be sent through her and she will send to Ms. Joan Kaimikaua, KO.

Teleconferences related to Southeastern Region MRS RA:

Date	Purpose	Attendees
N/A	N/A	N/A

Other Meetings related to Southeastern Region MRS RA:

Date	Purpose	Attendees
N/A	N/A	N/A

This Page Intentionally Left Blank

Worksheet # 10: Conceptual Site Model

10.1 Overview

This worksheet presents the project's Conceptual Site Model (CSM). The CSM is a tool to assist in the development of the data quality objectives (DQOs) for the RA being performed at the 36-acre area within the Southeastern Region MRS at the former WTA Munitions Response Area (MRA). The CSM presented in this project UFP-QAPP addresses the existing or potential exposure pathways for MEC and MC for both human and ecological receptors. The background information provided in the following sections presents the available information, used as inputs, for developing the MEC and MC CSMs for the MRS.

10.2 Site Description

10.2.1 Former Waikane Training Area Munitions Response Area

The former WTA MRA (FUDS Property Number H09HI0354) is located on the coastal plain adjacent to Kāneʻohe Bay and on the slopes of the Koʻolau Mountain Range in the District of Koʻolaupoko, on the eastern side of the Island of Oʻahu, Hawaiʻi (Figure 1, Appendix C). The former WTA MRA (933 acres) is a portion of the Waikane Valley Training Area (WVTA) (1,061 acres) that was used from 1942 to 1976 by the DoD for maneuvers, jungle training, small arms, artillery, and mortar firing. The remainder of the WVTA is currently owned by the U.S. Marine Corps (USMC) and is therefore not an eligible property under the DERP-FUDS program.

Based on the previous investigations conducted at the site (Section 10.10), the former WTA MRA was divided into three MRSs (Southeastern Region MRS [151 acres], Southern Impact Region MRS [90 acres], and Western/Mountainous Region MRS [692 acres]) (USACE, 2013b).

10.2.2 Removal Action within Southeastern Region Munitions Response Site

This RA is focused on approximately 36 acres of the Southeastern Region MRS. The 36 acres identified for the RA includes an expanded area around the previous NTCRA area in the Southeastern Region MRS; in focused areas where anticipated future land use activities includes intrusive (*e.g.*, agricultural and residential use); and in areas where the highest MD density and potential MEC was identified during the previous investigations (USACE, 2015a).

The Southeastern Region MRS (RMIS ID H09HI035401) is approximately 151 acres and is located in the southeastern portion of the former WTA MRA (Figure 2). The MRS is bordered by the Southern Impact Region MRS to the west, the USMC parcel to the north, and the City and County of Honolulu property to the south and east. The MRS is characterized by predominantly rolling hills with areas of dense vegetation, steep terrain, unimproved dirt access roads, and trails.

10.3 Operational History

10.3.1 Former Waikane Training Area Munitions Response Area History

In 1942, the Department of the Army (DA) entered into a lease agreement with Lincoln L. McCandless heirs and Waiāhole Water Company, Ltd. For the right to use approximately 1,061 acres in Waikane Valley for advanced offensive warfare training and air-to-ground practice bombing due to the valley's geographical location and terrain. Between 1943 and 1953, the Army used this property for maneuvers, jungle training, small arms, artillery, and mortar firing. Authorization for the Army to use Waikane Valley continued until July 1953, when the USMC was substituted as lessee. USMC training consisted of small arms fire, 3.5-inch rockets, and possibly medium artillery fire. Due to fire hazards, incendiaries were prohibited and all ammunition in excess of .50 caliber was fired into the two designated impact areas which are located within what are now the Southern Impact Region MRS and the USMC property. The USMC leased the WVTA from 1953 until 1976.

In 1944, while the site was an active training area, a 60 millimeter (mm) High Explosive (HE) mortar was discovered in Waikane Valley. Two individuals were injured and two individuals were killed when the mortar accidentally detonated. Three children were injured in 1963 when a souvenir rifle grenade, reportedly discovered in Waikane Valley, exploded after it was thrown against a wall. There are no other reports of fatalities or injuries attributable to MEC discovered at Waikane Valley.

Live fire at the former WVTA reportedly ceased in the early 1960s, but numerous types of munitions have since been recovered from the site, including:

- 37mm HE Projectile, M63 or MKII;
- 75mm HE Projectile, M48;
- 3-inch HE Projectile, M42/M42A1;
- 37mm Armor Piercing Capped-Tracer (APC-T), M51;
- 58mm HE Mortar, Type 89,
- 60mm HE Mortar, M49A2/M49A3;
- 81mm HE Mortar, M56 or M43A1/M43A1B1;
- 60mm Practice, M50A2/M50A3;
- 81mm Practice, M43A1;
- 2-inch Smoke Mortar, M3;
- 2.36-inch High Explosive Anti-Tank (HEAT) Rocket, M6A1;
- 3.5-inch HEAT Rocket, M28A2;
- 2.36-inch Practice Rocket, M7A1;
- 3.5-inch Practice Rocket, M29;

- Rifle Grenade HEAT, M9A1;
- Rifle Grenade Practice, M29;
- Grenade Frag, MKII;
- HEAT Grenade, M28;
- Grenade Smoke, M18;
- Grenade Smoke, AN-M8;
- Grenade Training, MK1A1;
- 0.50 pound (lb) Trinitrotoluene (TNT) Block;
- Trip Flare, M48;
- Flare, Surface, M49A1;
- Signal Illumination, M17/M19/M21/M51;
- Signal, Smoke and Illumination, AN-MK13 Mod O;
- Simulator, M27A1B1;
- Artillery Flash Simulator, M110;
- Firing Device, M1;
- Fuze Point Detonating (PD), M52;
- Fuze PD, M58;
- Fuze PD Impact Super Quick (PDSQ), M48;
- Fuze PDSQ, M51;
- Fuze PDSQ, M54;
- Small arms; and
- Unidentifiable munitions fragments of varying sizes.

10.3.2 Southeastern Region Munitions Response Site History

The types of munitions related activities conducted at the Southeastern Region MRS are consistent with the activities conducted at WTA. Based on the previous investigations conducted to date, a portion of the MRS was likely an impact area due to the presence of MEC and high concentrations of MD found. Munitions recovered from the MRS during previous investigations include:

- 37mm HE Projectile, M63;
- 75mm HE Projectile, M48;
- 3-inch HE Projectile, M42/M42A1;
- 37mm APC-T, M51;

- 58mm HE Mortar, Type 89;
- 60mm HE Mortar, M49A2/M49A3;
- 81mm HE Mortar, M56 or M43A1/M43A1B1;
- 60mm Practice, M50A2/M50A3;
- 81mm Practice, M43A1;
- 2-inch Smoke Mortar, M3;
- 2.36-inch HEAT Rocket, M6A1;
- Rifle Grenade HEAT, M9A1;
- Grenade Frag, MKII;
- Grenade Smoke, M18;
- Grenade Smoke, AN-M8;
- Grenade Training, MK1A1;
- 0.50 lb TNT Block;
- Flare, Surface, M49A1;
- Signal, Smoke and Illumination, AN-MK13 Mod O;
- Simulator, M27A1B1;
- Artillery Flash Simulator, M110;
- Firing Device, M1;
- Fuze PD, M52;
- Fuze PD, M58;
- Fuze PDSQ, M48;
- Fuze PDSQ, M51;
- Fuze PDSQ, M54;
- Small arms; and
- Unidentifiable munitions fragments of varying sizes.

Ordnance Technical Data Sheets are provided in Appendix D.

10.4 Property Ownership

The Southeastern Region MRS is owned by both private and public owned landowners. Private owners include various owners (Tax Map Key [TMK] Number 4-8-006:009). Public landowners include the City and County of Honolulu (TMK Number 4-8-006-008) and the ʻŌhulehule Forest Conservancy LLC (TMK 4-8-014-005 and 4-8-006-001), which owns the majority of the land

within the MRS. The 36-acre RA area is owned by the City and County of Honolulu and ʻŌhulehule Forest Conservancy LLC (TMK 4-8-006-001) (Figure 3).

10.5 Land Use

The Southeastern Region MRS is comprised of mostly undeveloped open areas and densely forested lands and is currently used for recreational activities such as hiking, hunting, motocross, and all-terrain vehicle (ATV) riding. In addition, the MRS also contains residential and light agricultural uses; and City and County of Honolulu personnel pass through the MRS for access to the irrigation canals in the Western/Mountainous Region MRS. Locals also regularly visit a memorial located within the MRS. In the interim, it is expected that current land use patterns will likely continue. There are single family homes, industrial or warehouse areas, and a park within two miles of the former WTA MRA.

The City and County of Honolulu produced a proposed Waikane Valley Master Plan to potentially develop a portion of the existing Southeastern Region MRS (TMK Number 4-8-006:008) for a Waikane Valley Nature Park. The city is planning to establish trails, rest and picnic areas, lookouts to view surrounding landmarks of the site, a ceremonial gathering place (halau), re-vegetation areas for native plants, stream ecology study areas, ponds for aquatic wildlife studies, agricultural fields, parking areas, and a visitor orientation area.

In addition, the ʻŌhulehule Forest Conservancy LLC publically presented future land development plans for the highest elevations of the ʻŌhulehule Forest Conservancy LLC mauka property that include restoring and preserving the native forest; protecting the only known ʻelepaio (*Chasiempis ibidis*—listed as endangered) nesting grounds; re-establishing taro farming along Waikane stream and lower portions of Waikeʻekeʻe stream; growing high-quality organic cacao in the areas closest to the 36-acre RA area; and building a single-home residence for owner personal use (Figure 4) (USACE, 2015a).

10.6 Man-Made Features

There are single family homes, industrial or warehouse areas, and a park within two miles of the former WTA MRA. There are no known overhead power lines or underground utilities on the site. Several areas within the Southeastern Region MRS are littered with NMRD such as household trash, construction materials, old cars and car parts due to illegal dumping activities. Deteriorated fences and fence posts, and other assorted metallic trash, wire, banding material, and nails have been found (Figure 4) (USACE, 2012b).

10.7 Access Controls and Restrictions

The majority of the Southeastern Region MRS can be easily accessed by unimproved roads, ATV and motorcycle trails, and streams along Kamehameha Highway (Figure 4). There is a gated access road (unimproved road) extending from Waikane Valley Road but many local residents possess keys to the main gate. The remaining MRS is limited by dense vegetation and steep terrain (Figure 5) (USACE, 2015a).

10.8 Receptors

The following sections summarize the potential human and ecological receptors for the Southeastern Region MRS.

10.8.1 Human Receptors

Potential human receptors include residents (adults and children), authorized contractors and site visitors (*e.g.*, wildlife management workers and research scientists), agriculture and construction workers, recreational users, and trespassers (*e.g.*, hunters, hikers, motocross, and ATV enthusiasts) (USACE, 2012b).

10.8.2 Ecological Receptors

Soil organisms, plants, and ground-dwelling small animals (*e.g.*, rodents, wild hogs, and mongoose) and birds (*e.g.*, ʻelepaio) are potential receptors. The Unnamed Stream runs through the MRS and 36-acre RA area and contains sediment-dwelling organisms and those that prey on them are considered potential receptors (USACE, 2012b).

10.9 Environmental Setting

10.9.1 Climate

According to the Western Regional Climate Center, the former WTA MRA area receives an average of 144.1 inches of precipitation each year, with most of this rainfall occurring in October through March. The average maximum temperature for this area is 84.2 degrees Fahrenheit (°F) and the average minimum temperature is 71.4°F (Western Regional Climate Center, 2015).

10.9.2 Topography

The former WTA MRA is located on the coastal plain near Kāneʻohe Bay and on the slopes of the Koʻolau Mountain Range. Elevation ranges from 90 to 2,090 ft above mean sea level (msl). Most of the former WTA MRA is covered with dense jungle vegetation, including the forested coastal plain and thick grasses and shrubs in the higher elevations. There are several gulches and canyons with sheer cliffs throughout the area as well as areas with steep slopes in excess of 58 percent (%) grade (USACE, 2012b).

The 36-acre RA area is located in relatively low elevations between 160 and 325 ft above msl. Slopes in certain areas are steep (*i.e.*, greater and 30 degrees) however the majority of the site is less than 20 degrees (Figure 5).

10.9.3 Geology

The Island of Oʻahu is the result of varied geologic processes, including volcanism, subsidence, weathering, and sedimentation. The Hawaiian Islands are sub-aerial peaks of large volcanic mountain ranges, most of which are submerged beneath the sea. The site contains steep rocky

ridges with exposed bedrock as well as valley areas with alluvial deposits from stream and landslide mechanisms. The Koʻolau Mountain Range is predominantly composed of basalt flows ranging from 1.7 to 2.5 million years old. These rocks, like all Hawaiʻi basalts, have an iron rich mineral mix which has been known to be an interference source identified during geophysical surveys. The Koʻolau rocks are noted for having higher silica content relative to most Hawaiian basalts (USACE, 2012a).

10.9.4 Soil

According to the U.S. Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS) Waikane silty clay, 25 to 40% slopes (WpE), is the predominant soil of the northern impact area. This soil is on steep terraces and alluvial fans. In a representative profile, the surface layer is dark brown silty clay about eight inches thick. The subsoil, about 52 inches thick, is dark reddish-brown silty clay that has subangular blocky structure. The substratum is soft, weathered, gravelly alluvium and colluvium. The soil is very strongly acidic in the surface layer and subsoil. Additional soils located within the removal area include Hanalei silty clay, 2 to 6% slopes (HnB); Waikane silty clay, 3 to 8% slopes (WpB); Waikane silty clay, 40 to 70% slopes (WpF); and Waikane silty clay, 40 to 70% slopes eroded (WpF2) (USDA NRCS, 2015).

10.9.5 Hydrology

The Waikane-Waikeʻekeʻe Stream system is the primary stream network passing through the former WTA MRA. The Waikane and Waikeʻekeʻe Streams originate at the Koʻolau Mountain Range and are fed by spillway tunnels associated with the Waiāhole Ditch Tunnel Network. The Waikane and Waikeʻekeʻe Streams combine and drain into Kāneʻohe Bay. The tunnel network was completed in 1916 to transport water to the leeward side of the island for irrigation. The area is well drained, generally to the east, with no wetlands except along the creek banks near the streams outlets (USACE, 2012b).

The Unnamed Stream runs through the southern boundary of the Southeastern Region MRS and passes through the southwestern portion of the 36-acre RA area (Figure 5). The Unnamed Stream is a seasonally flooded surface water that is present for extended periods especially early during the growing season but is absent by the end of the growing season in most years.

10.9.6 Hydrogeology

A single aquifer underlies the former WTA MRA. The aquifer is basal (fresh water in contact with seawater), unconfined (where the water table is the upper surface of the saturated aquifer), and is a dike (aquifer in dike compartments). The aquifer is used as a drinking water source, it is of fresh salinity (less than 250 milligrams per liter chloride), is irreplaceable, and has a high vulnerability to contamination (Mink and Lau, 1987).

The depth to groundwater has not yet been determined at the former WTA MRA. Two monitoring wells were located within the former WTA MRA during RI activities. Approximate depths of the wells based on a record review ranged from less than 12 to 250 ft bgs. However, confirmation of well depth was not possible due to a lack of access (USACE, 2012b).

Due to the steep terrain and underlying geology, it is assumed that infiltrated water along the slopes may accumulate in small pockets in the bedrock but generally flows towards Waikane Stream and is transported to the Pacific Ocean approximately one mile downstream from the former WTA MRA (USACE, 2012b).

10.9.7 Wildlife

Because of the unknown amounts of MEC still present, many parts of Waikane Valley have been closed to the public, and relatively few biological investigations that addressed rare, threatened, and endangered (RTE) species have been conducted. The majority of biological investigations that have been conducted have been prompted by DoD investigations. Several studies have been undertaken on or near the 36-acre RA area (refer to Table 1-1 *Biological Investigations Conducted in Waikane Valley* of Appendix E Environmental Protection Plan [EPP] for details).

10.9.7.1 Threatened & Endangered Species

No evidence of observation of any of the T&E species listed below, in available biological surveys of the area in and near the 36-acre RA area, was found. It was discussed in many of the studies that the two factors which limit the potential for RTE species at the 36-acre RA area include:

- A long and intense history of land disturbance through farming, military activity and other uses, which promotes the introduction and re-growth of non-native plants that outcompete native plant species and offer fewer food and shelter resources for native species; and
- Low elevations between 160 and 325 ft above sea level, in the elevational belt in which mosquitoes and the diseases they bear, limit the survival of native forest birds.

Based on review of these studies and analysis of previous and current land uses, a very limited range of RTE species would be anticipated to be even potentially present in or near the 36-acre RA area. These include:

1. The endemic, endangered Oʻahu subspecies of the ʻelepaio (*Chasiempis sandwichensis ibidis*) may occasionally use resources within a half mile of the project vicinity. Although the 36-acre RA area is well below the elevation normally associated with habitat for this bird, which does not appear to have ever been observed in or near the area, Unit 3 of the federally delineated Critical Habitat for this species (Figure 6 presented in U.S. Fish and Wildlife Service [USFWS], 2001) is located as close as 750 ft west (mauka) of the 36-acre RA area;
2. The endemic sub-species of the Short-eared Owl (*Asio flammeus sandwichensis*) may occasionally use resources present within the 36-acre RA area, although it is noted as much more likely to be present at higher elevations in ʻuluhe-dominated vegetation of the steep valley flanks (AECOS Inc., 2010). The Oʻahu population of this endemic Hawaiian sub-species of the near cosmopolitan species is listed as endangered by the State of

Hawaiʻi, but it is not listed under federal statutes (Department of Land and Natural Resources [DLNR], 1998; USFWS, 2015a);

3. The endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*), or ʻōpeʻapeʻa, is insectivorous and nocturnal. It feeds on a variety of native and non-native night-flying insects, including moths, beetles, crickets, mosquitoes, and termites (Menard, 2001). Its foraging habitat is also diverse, comprising forest and pasture boundaries, forest road corridors, streams, bays, and inlets. In 2010, the Kahuku Wind Power Habitat Conservation Plan (SWCA Environmental Consultants, 2010) documented the presence of low numbers of Hawaiian hoary bats within their survey areas adjacent to the Kahuku Training Area. Further surveys conducted for the military (U.S. Army Garrison Hawaiʻi and Pacific Cooperative Studies Unit, 2012) indicate that Hawaiian hoary bats are present in at least low numbers on two Army training areas in the Koʻolau Mountain Range. Surveys on six nights very near the 36-acre area, however, did not detect any bats (VanderWerf, 2013); and
4. The upper ʻuluhe-covered slopes of Waikane Valley represent typical nesting habitat used by the threatened Newell's Shearwater (*Puffinus auricularis newelli*) on other islands in the Hawaiian archipelago. Although there are no known nesting colonies of this species on Oʻahu, a small number of birds are downed annually on the island, most near the lighted entrances to the Pali Highway tunnel (AECOS Consultants, 2005; Maui Nui Seabird Recovery Project, 2015).

The following animal species proposed for listing may occur in the lowland mesic/wet forests at any elevation of the Koʻolau Mountain Range:

- Band-rumped Storm-petrel (*Oceanodroma castro*): When not at nesting sites, adult birds spend their time foraging on the open ocean. Adults visit the nest site after dark, where they can be detected by their distinctive calls. In Hawaiʻi, adults establish nesting sites in April or May, and the nesting season occurs during the summer months, with incubation lasting about 42 days. The USFWS identifies the species as potentially present on Oʻahu but no pairs are currently listed as nesting there;
- Four endangered Hawaiian damselflies are present on Oʻahu. They inhabit a wide range of stream, pond and estuarine habitats. The orangeblack Hawaiian damselfly (*Megalagrion xanthomelas*) was not historically collected from the Koʻolau Range and is currently known on Oʻahu only from a population near Tripler Hospital. This species would not be expected in Waikane Valley. The crimson Hawaiian damselfly (*Megalagrion leptodema*) is endemic to Oʻahu and is considered one of the rarest and most vulnerable of all endemic *Megalagrion* species in Hawaiʻi. *M. leptodemus* was found historically in both the Koʻolau and Waiʻanae Ranges but is currently restricted to scattered sites in four drainages in the Koʻolau Range, mostly on the leeward side of the range and not near Waikane Valley. The blackline Hawaiian damselfly subspecies (*Megalagrion nigrohamatum nigrolineatum*) is also endemic to Oʻahu and found historically in both the Koʻolau and Waiʻanae Ranges. It is currently known from 16 stream sites at higher elevations in the Koʻolau Range. Although not noted from Waikane Valley, it has been found nearby in Waiāhole Valley. However, it occurs in the

slow sections or pools along mid-reach and headwater sections of perennial upland streams and in seep-fed pools along overflow channels bordering such streams, a habitat not present in the RA area. The oceanic Hawaiian damselfly (*Megalagrion oceanicum*) is a comparatively large and robust species. The species now currently occupies 12 sites above 300 feet in elevation on the windward side of the Koʻolau Range. All sites are well north of Waikane Valley. All colonies of the crimson, blackline and oceanic Hawaiian damselflies are constrained to portions of streams not occupied by nonnative predatory fish. Such habitat is found only in stream portions above geologic or manmade barriers (e.g., waterfalls, steep gradients, dry stream mid-reaches, or constructed diversions). These habitats are not found in the RA area. A number of units of critical habitat for these three taxa have been designated in the Koʻolau Range. No critical habitat is present in the RA area, although Unit 3 of critical habitat for the crimson and blackline Hawaiian damselflies and Unit 4 for oceanic Hawaiian damselfly are located as close as a third of a mile mauka (Federal Register, 2012); and

- Three yellow-faced bees (*Hylaeus facilis*, *H. kuakea*, and *H. mana*): *H. facilis* prefers dry to mesic forest and shrubland and is known from only one mesic site on Oʻahu; *H. kuakea* is currently known on Oʻahu from only a few collections in the Waiʻanae range, although it may have originally occurred in other places as well; *H. mana* is known only from lowland mesic forest dominated by native koa located along the Manana Trail in the Koʻolau Mountain Range at 1,400 ft in elevation.

Based on the environmental requirements and extremely rare occurrences of each of these animals, none would be expected in the highly disturbed, lowland environment of the 36-acre RA area in Waikane Valley. None have been observed in any of the previous biological surveys.

10.9.7.2 Native and Non-Native Fauna

During previous biological surveys (Char and Associates, 1989; Nagata, 1988; Berger, 1988; AECOS Inc., 2010; Lau, 2013; VanderWerf, 2013) at the former WTA MRA, the non-native mammalian, avian, aquatic, and arthropod species identified were typical of the habitat located in the area. Many common non-native species are present. Four mammalian species – domestic dog (*Canis f. familiaris*), small Indian mongoose (*Herpestes a. auro punctatus*), domestic cat (*Felis catus*), and feral pig (*Sus s. scrofa*) – were observed. Fifteen (15) non-native species of birds from 11 separate families were observed. The findings of the avian survey were consistent with the habitat and altitude of the area. No native avian species were detected. A few native species of aquatic life were found in the middle and lower reaches of Waikane Stream, but were noted as not especially unusual or unique. Medically important species (e.g., centipedes, scorpions, widow spiders, western yellow jacket wasps, and common paper wasps) were not observed but may be present.

10.9.8 Vegetation

10.9.8.1 Threatened & Endangered Species

The PWS provided by USACE noted that “...the endangered *Cyrtandra kaulantha* is a plant that is endemic to windward side of the Koʻolau Mountains on the island of Oahu.” This species, which is very recognizable because of its large leaves (up to 24 inches wide) and basal cauliflorous inflorescences, has not been observed in any available botanical studies in the lower areas of Waikane Valley, although it has been observed in a high-elevation gulch between Waikane and Waiāhole Valley, and another individual that may belong to this species was observed high up in Waikēʻekeʻe Gulch, within Waikane Valley (Lau, 2013). The *Manual of the Flowering Plants of Hawaiʻi* (Wagner *et al.*, 1990), indicates an elevational range of about 700 to 1,000 ft, somewhat higher than the maximum of elevation found in the 36-acre RA area. It is found in streambeds and talus slopes, which do not appear to be present in the area. Thus, it would appear extremely unlikely to be present in the area.

In addition to the listed endangered plants that have been specifically searched for in previous biological studies of the lower Waikane Valley, 40 new plants have been proposed for listing in the Hawaiian Islands (Federal Register, Vol 80, No. 189, September 30, 2015, pp:58820-58909). Careful examination of the environments in which each of the plant species proposed for listing are found indicates that only a few may occur in the lowland mesic/wet forests at any elevation of the Koʻolau Mountain Range. These include the following:

- *Joinvillea ascendens ssp. Ascendens* (ohe): now found only above 1,000 ft exclusively in the northern Koʻolau Mountain Range;
- *Kadua fluviatilis* (no common name [NCN]): now found only above 1,000 ft exclusively in the northern Koʻolau Mountain Range;
- *Microlepidia strigosa var. mauiensis* (NCN): now found only above 1,400 ft in elevation;
- *Myrsine fosbergii* (kolea): typically found only above 2,200 ft in elevation, now found only on the summit ridge of the Koʻolau Mountain Range;
- *Pritchardia bakeri* (Baker’s loulou): typically found above 1,500 ft, windswept, and mostly exposed shrubby or grassy areas, sometimes on steep slopes;
- *Ranunculus mauiensis* (makou): formerly found above 3,500 ft in the Koʻolau Mountain Range, it has not been observed on Oʻahu since the 1800s;
- *Sicyos lanceoloideus* (anunu): occurs on ridges or spurs in mesic forest at 1,800 to 2,700 ft, no longer known and possibly never present in the Koʻolau Mountain Range; and
- *Stenogyne kaalae ssp. Sherffii* (NCN): found above 1,500 ft and no longer found in the Koʻolau Mountain Range.

Based on the environmental requirements and extremely rare occurrences of each of these plants, none would be expected in the highly disturbed, lowland environment of the 36-acre RA area in Waikane Valley. None have been observed in any of the previous biological surveys.

10.9.8.2 Native & Non-Native Flora

The former WTA MRA has been highly disturbed in the past such that only remnants of native vegetation remain. Native plant communities such as ʻOhiʻa Scrub and Koa/ʻUluhe Woodland occur on some of the ridges that extend to the northern ridge line. The ʻOhiʻa Scrub community occurs on the ridges at the north side of the former WTA MRA, and particularly on the eastern end. It is characterized by low and shrubby ʻohiʻa trees with dense clumps of the native fern palaʻa (*Sphenomeris chinensis*) between the shrubs. Koa/ʻUluhe Woodland dominates the northwestern portion of the former WTA MRA on the ridge leading up the hills that separate Waikane Valley from Kaʻaʻawa Valley. This plant community is predominantly comprised of ʻuluhe (*Dicranopteris linearis*).

The botanical study of the Waikane Nature Preserve property, which included the makai portion of 36-acre RA area, noted two distinct wetlands that may be present at the former WTA MRA (Nagata, 1988). The “Mixed Riparian Association,” comprises the vegetation along the flood plain of Waikane Stream (not part of the 36-acre RA area); and the “Unsurveyed Areas (2: Wetlands)” is associated with former taro fields and rice paddies, that are now dominated by facultative wet plants within the grass, sedge, rush and other groups. Maps provided with the report did not clearly indicate the presence of wetlands within the 36-acre RA area. Until the area is closely examined, it should be presumed that wetlands may be present, most likely riparian ones associated with the small Unnamed Stream.

Based on the results of the Char and Associates (1989) and AECOS Consultants (2003) biological surveys, a total of 104 vascular plant species were recorded. Of the 104 species, 17 are native but only five of the native species are endemic to Hawaiʻi: haupuʻuʻiʻi (*Cibotium chamissoi*), koa (*Acacia koa*), naupaka kuahiwi (*Scaevola gaudichaudiana*), ʻohiʻa lehua (*Metrosideros polymorpha*), and ʻakia (*Wikstroemia oahuensis*).

Two plant communities (*i.e.*, Managed Land Vegetation and Secondary Forest) found in most of the flat to sloping areas south of the hills on the northern portion of the former WTA MRA reflect extensive disturbance. Managed Land Vegetation exhibits the characteristics of abandoned agricultural clearings that cover large patches on the alluvial plain of the Waikane Stream, and the areas around the abandoned living sites. Most of the lowlands of the site are covered by Secondary Forest, which is a plant community almost entirely dominated by alien tree species. The most prevalent of these alien tree species is albizia (*Paraserianthes falcataria*), which is a huge, fast-growing tree with an open, spreading canopy.

10.10 Previous Investigations

The following sections summarize previous investigations that were conducted at the former WTA MRA.

10.10.1 1976 and 1984 Surface Clearance

Two EOD sweeps of artillery impact areas at the former WTA MRA have taken place; one in August 1976 and the other from February to April 1984. These clearances recovered as much as

40,000 lbs of demilitarized practice ordnance as well as the following MEC items which were destroyed (USACE, 2015a):

- 37mm HE Projectile, M63 or MKII;
- 75mm HE Projectile, M48;
- 60mm HE Mortar, M49A2/M49A3;
- 2.36-inch HEAT Rocket, M6A1;
- 3.5-inch HEAT Rocket, M28A2;
- HEAT Grenade, M28; and
- Rifle Grenade HEAT, M9A1.

10.10.2 1990 Archaeological Survey

In 1990, an archaeological survey was conducted south and west of the USMC property. Three MEC items were identified in what is now called the Southern Impact Region MRS (USACE, 2015a). The MEC and MD items recovered included unexploded mortar rounds, a grenade, and shrapnel (USACE, 1996).

10.10.3 Inventory Project Report 1996 and Supplement 2004

The Inventory Project Report (INPR) was approved in 1996, followed by an INPR Supplement in 2004. These documents established the former WTA MRA as FUDS eligible, established a site boundary, defined the past usage, and assigned the former WTA MRA FUDS Project Number H09HI0354. Based on the historic use of the site, the INPR recommended further action (USACE, 2015a).

10.10.4 2006 Engineering Evaluation/Cost Analysis

In 2006, an Engineering Evaluation/Cost Analysis (EE/CA) was conducted to evaluate the MEC hazard within the 933-acre former WTA MRA. Characterization of the former WTA MRA consisted of document review, visual ground reconnaissance, analog and DGM geophysical surveys, and intrusive investigation of geophysical anomalies. During the EE/CA, 150 grids and nine miles of transects were investigated. Seven MEC and 172 MD items were recovered during the EE/CA (Figure 6).

MEC recovered at the former WTA MRA included:

- 37mm HE Projectile, M63 or MKII;
- 60mm HE Mortar, M49A2/M49A3; and
- 81mm HE Mortar, M56 or M43A1/M43A1B1.

MD items recovered at the former WTA MRA included:

- 37mm APC-T Projectile, M51;
- 60mm HE Mortar, M49A2/M49A3;
- 81mm HE Mortar, M56 or M43A1/M43A1B1;
- 2.36-inch HEAT Rocket, M7A1;
- 3.5-inch HEAT Rocket, M28A2;
- Grenade Smoke, M18 and AN-M8;
- Grenade Training, MK1A1;
- Signal Illumination, M17/M19/M21/M51;
- Trip Flare, M48;
- Signal, Smoke and Illumination, AN-MK13 Mod 0;
- Firing Device, M1;
- Fuze PDSQ M48 and M51 Series; and
- Unidentifiable munitions fragments of varying sizes.

Five of the seven MEC items and 158 of the 172 MD items were recovered within the Southeastern Region MRS. MEC items recovered from the Southeastern Region MRS included:

- 60mm HE Mortar, M49A2/M49A3; and
- 81mm HE Mortar, M56 or M43A1/M43A1B1.

MD items recovered from the Southeastern Region MRS included:

- 37mm APC-T Projectile, M51;
- 60mm HE Mortar, M49A2/M49A3;
- 81mm HE Mortar, M56 or M43A1/M43A1B1;
- 2.36-inch HEAT Rocket, M7A1;
- Grenade Smoke, M18 or AN-M8;
- Grenade Training, MK1A1;
- Signal Illumination, M17/M19/M21/M51;
- Signal, Smoke and Illumination, AN-MK13 Mod 0;
- Firing Device, M1;
- Fuze PDSQ M48 and M51 Series; and
- Unidentifiable munitions fragments of varying sizes.

All MEC and MD items, with the exception of one item, were recovered in the Southeastern Region MRS between elevations of 110 and 385 ft at depths ranging from 4 to 16 inches bgs (average depth of 7 inches bgs). The one item found outside of the 4 to 16 inches bgs range was found at a depth of 40 inches bgs.

Based on the results of the EE/CA field investigation, the former WTA MRA was divided into the four regions (Southeastern, Southern Impact, Western, and Mountainous Regions) and a MEC risk impact assessment was performed to address the MEC hazards within each region. Based on the presence of MEC in the Southeastern and Southern Impact Regions, a high MEC exposure potential was determined to be present in these two regions while the Western and Mountainous Regions were determined to have a low MEC exposure potential based on the lack of MEC and MD found in these two regions. The Western and Mountainous Regions were combined into one MRS resulting in three recommended MRSs (*i.e.*, Southeastern Region MRS, Southern Impact Region MRS, and Western/Mountainous Region MRS) at completion of the EE/CA (USACE, 2008).

10.10.5 2008 Abbreviated Site Investigation

In 2008, an abbreviated Site Investigation (SI) was conducted by the USACE. The sampling team collected two multi-incremental (MI) soil samples in areas where MEC was found during the EE/CA, and collected two co-located surface water and sediment samples from Waikane Stream, downstream from the MEC locations. The samples were analyzed for Target Analyte Metals (TAL) metals and explosives. Resulting chemicals of potential concern (COPCs) identified in the SI were chromium, iron, vanadium, cobalt, mercury, and hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX) (USACE, 2015a).

10.10.6 2011 Non-Time Critical Removal Action

Based on the MEC and high concentration of MD observed during the EE/CA, an Action Memorandum (AM) was finalized for the NTCRA. The NTCRA was focused on two areas of concern (AOCs), AOC-1 (14.9 acres) located in the Southern Impact Region MRS and AOC-2 (26.2 acres) located in the Southeastern Region MRS. Due to the steep terrain and heavy vegetation (*i.e.*, exception areas), the AOC-1 acreage was reduced from 14.9 acres to 7.3 acres. The AOC-2 acreage was increased from 26.2 to 32.6 acres and an additional 0.5 acres of road surface area was cleared between the two AOCs. As a result, a total of 40.4 acres were cleared during the NTCRA (Figure 6).

Field activities performed during the NTCRA included vegetation clearance, geophysical surveys, removal of surface and subsurface MEC and MD, and offsite disposal. UXO teams utilized handheld metal detectors (*i.e.*, Minelab Explorer SE) to detect and remove MEC to a depth of 2 ft bgs. Forty-two (42) MEC items were recovered during the NTCRA, all of which were located within the Southeastern Region MRS (AOC-2). The MEC items found included:

- 37mm HE Projectile, M63;
- 75mm HE Projectile, M48;

- 3-inch HE Projectile, M42/M42A1;
- 58mm HE Mortar, Type 89;
- 60mm HE Mortar, M49A2/M49A3;
- 81mm HE Mortar, M56 or M43A1/M43A1B1;
- 2-inch Smoke Mortar, M3;
- 2.36-inch HEAT Rocket, M6A1;
- Grenade Frag, MKII;
- Grenade Smoke, M18;
- Grenade Smoke, AN-M8;
- Rifle Grenade HEAT, M9A1;
- Grenade Training, MK1A1;
- 0.50 lb TNT Block;
- Flare, Surface, M49A1;
- Simulator, M27A1B1;
- Artillery Flash Simulator, M110; and
- Fuze PD, M52;
- Fuze PD, M58;
- Fuze PDSQ, M48;
- Fuze PDSQ, M51; and
- Fuze PDSQ, M54.

All MEC items were recovered at depths ranging from 0 to 9 inches bgs (average depth of 2 inches bgs).

There was also abundant evidence of HE ordnance usage, as projectile fragmentation, fuze pieces, tail fins, base plates, and other MD were located throughout the area. All MEC items were destroyed by detonation. All MD was certified as Material Documented as Safe (MDAS) and was processed for release to a scrap metal dealer by performing thermal treatment and demilitarization (USACE, 2012a). MD items recovered from the former WTA MRA during the NTCRA included:

- 60mm Practice, M50A2/M50A3;
- 81mm Practice, M43A1;
- 2.36-inch Practice Rocket, M7A1; and
- 3.5-inch Practice Rocket, M29;

MD items recovered from the Southeastern Region MRS during the NTCRA included:

- 60mm Practice, M50A2/M50A3;
- 81mm Practice, M43A1; and
- 2.36-inch Practice Rocket, M7A1.

10.10.7 2011 Remedial Investigation

In 2011, USACE conducted a RI to characterize the nature and extent of MEC and MC contamination at the former WTA MRA. The RI field investigation was conducted on slopes of 30 degrees or less and excluded the NTCRA AOCs. The majority of the Western/Mountainous Region MRS was not investigated based on the Project Delivery Team (PDT)'s agreement that a complete MEC exposure pathway (*i.e.*, lack of MEC source, receptor, and receptor acting upon MEC item) was unlikely in this MRS.

Geophysical surveys were completed on approximately 6.47 acres and comprised over 17.8 miles of transect coverage. Based on the results of analog-and-dig transect surveys, an additional 0.82 acres were intrusively investigated. A total of 5,341 anomalies were identified and intrusively investigated. The items recovered included over 3,400 MD items but no MEC were found. Approximately 59 lbs of MDAS was shipped to a scrap processing facility in Columbus, Texas for shredding and smelting. The MD recovered from the former WTA MRA during the RI included:

- 37mm HE Projectile, M63 or MKII;
- 75mm HE Projectile, M48;
- 60mm HE Mortar, M49A2/M49A3;
- 81mm HE Mortar, M56 or M43A1/M43A1B1;
- 3.5-inch HEAT Rocket, M28A2;
- Grenade Frag, MKII;
- Rifle Grenade HEAT, M9A1;
- Trip Flare, M48;
- Expeded Fuzes;
- Small arms debris; and
- Other unidentifiable munitions fragments.

MD recovered from within the Southeastern Region MRS during the RI included:

- Mortar debris;
- HE fragments (small, medium, and large);

- Identifiable 60mm Practice, M50A2/M50A3;
- Identifiable 81mm Practice, M43A1;
- Signal Illumination, M17/M19/M21/M51; and
- Small arms debris.

The results of the EE/CA, NTCRA, and RI were evaluated to identify areas of anticipated MEC and MD presence within the three MRSs and expansion areas (*i.e.*, Unnamed Stream and potential 2.36-inch rocket firing point outside of the former WTA MRA boundary). No MEC and only very limited MD and small arms debris has been found within the Western/Mountainous Region MRS and expansion areas. Therefore, MEC are not anticipated to be present in these areas. These areas of minimal MD presence might still contain MEC; however, the amount of MEC anticipated to be present is not expected to pose significant explosive hazards.

The majority of MEC (47 items) were found in the Southeastern Region MRS at an average depth of 3.3 inches bgs while the remaining MEC (2 items) were found within the Southern Impact Region MRS at an average depth of 6.9 inches bgs. The MEC items consisted of a variety of types including mortars, rockets, grenades, projectiles, and flares. The majority of the MD was also found in the Southeastern Region MRSs. The MD consisted of debris from projectiles, shell casings, mortars, rockets, fuzes, flares, and practice grenades. Relatively moderate to high MD density was distributed along the southern half of the Southern Impact Region and Southeastern Region MRSs. The highest MD density was observed southwest of AOC-2 within the Southeastern Region MRS near the former WTA MRA boundary.

Because the potential for MEC was considered to be minimal in the Western/Mountainous Region MRS and RI expansion areas, a qualitative MEC Hazard Assessment (HA) was not conducted for these MRS or these areas. A MEC HA was conducted for the Southeastern Region and Southern Impact Region MRSs. The results of MEC HA assigned scores of between 370 and 420, which equates to a low potential explosive hazard for both MRSs. The results of the MEC HA were used as a baseline for the development of MEC response alternatives in the FS.

MC sampling consisting of MI surface soil, discrete subsurface soil, and discrete sediment samples were collected from the three MRSs. Surface and subsurface soil and sediment samples were collected and analyzed for explosives constituents and metals (*i.e.*, lead and copper). MI surface soil samples were collected in triplicate from 36 decision units (24 onsite and 12 background samples) at a depth of less than 2 inches bgs. Fifty-six (56) discrete subsurface samples (40 onsite and 16 background samples) were collected from a depth of approximately 12 inches bgs. The onsite soil samples were collected in areas of high MD density as determined by the results of analog-and-dig activities conducted during the RI; and collected in the vicinity of where MEC/MD items were recovered during the concurrent NTCRA within AOC-1 and AOC-2. Thirty-seven (37) sediment samples (22 onsite and 15 background samples) were collected from a depth of approximately 12 inches bgs from selected areas upstream and downstream of the respective MRSs.

Due to the steep terrain and underlying geology, groundwater was not expected to be a complete exposure pathway to receptors at this site, however, during the Technical Planning Process, the project team agreed that existing groundwater wells would be sampled for perchlorate if accessible and serviceable. During the RI, groundwater samples were not collected because existing groundwater wells located were either inaccessible (lack of ROE) or appeared were not serving as a current groundwater source. It was also determined by the project team that the necessity for surface water sampling would be controlled by the sediment sample results. The basis for this decision was supported by the fact that the project-specific COPCs would be a source of contamination to surface water if identified in sediment. Since all detected constituents were below HDOH Environmental Action Levels (EALs) in the sediment, no surface water samples were collected during the RI.

Soil samples were collected in areas of relatively high MD to bias towards the highest possible potential of contamination. The samples were analyzed for explosives constituents, including nitroglycerine and pentaerythritol tetranitrate (PETN) and select metals (*i.e.*, copper and lead). Metals were limited to copper and lead after a review of the Molecular Interactive Display and Simulation (MIDAS) database, determined that the entire suite of TAL metals were not representative of the actual munitions expected or found at the site. As a result, the certain metals identified in the abbreviated SI, including chromium, iron, vanadium, cobalt, and mercury were not analyzed.

Results of the soil screening indicated that copper (incremental samples), lead (incremental and discrete samples), nitroglycerine (discrete samples), 2-amino-4,6-dinitrotoluene (discrete samples), and 4-amino-4,6-dinitrotoluene (discrete samples) exceeded their respective screening levels (*i.e.*, HDOH EALs). The metals and explosive constituent exceedances all occurred in a localized area where MEC items were disposed of by intentional detonation during the NTCRA. No samples exceeded MC screening levels in sediment samples collected.

A risk assessment was conducted to determine the human health and ecological risks associated with potential MC exposure at the former WTA MRA. Based on the MC analytical results, the risk assessments concluded that the potential for adverse risks to human health or ecological receptors from exposure to MC is negligible. Therefore, MC does not pose an unacceptable risk to human health and the environment and no further action was recommended for MC (USACE, 2012b).

An Institutional Control Plan (ICP) in the RI Report presents specific institutional controls that may be used at the site as part of the LUCs. The ICP identifies the local, state, Federal, or private agencies, or individuals who will be involved in the implementation (USACE, 2012b).

10.10.8 2012 Feasibility Study

In 2012, a FS was conducted to provide project decision makers with the necessary data to develop potential remedial alternatives based on the potential MEC hazards posed to human health and the environment. The FS developed five different alternatives: No Action, LUCs, Surface MEC Removal and Implementation of LUCs, Surface and Subsurface MEC Removal

and Implementation of LUCs, and Subsurface Removal to Support Unlimited Use/Unlimited Exposure (UU/UE). Alternative 5 Subsurface Removal to Support UU/UE was eliminated from further evaluation during the initial screening of the alternatives because it was considered technically infeasible, would negatively impact ecological and culturally sensitive areas present across the MRS, and would be cost prohibitive compared to the other alternatives.

A brief description of the four alternatives retained for evaluation included:

- Alternative 1 - No Action: No further action would be conducted under this alternative;
- Alternative 2 - LUCs: LUCs would include a community MEC educational awareness program, and safety training. Educational awareness is an effective means of influencing behavior to reduce interaction with MEC;
- Alternative 3 - Surface MEC Removal and Implementation of LUCs: This alternative would include a visual inspection, aided by handheld instruments, with removal of MEC exposed at ground surface. LUCs would be used in conjunction with surface MEC removal and implemented as described in Alternative 2; and
- Alternative 4 - Surface and Subsurface MEC Removal and Implementation of LUCs: This alternative would include removal of surface and subsurface MEC, to a detectable depth that is protective of current and anticipated future land use. LUCs would be used in conjunction with surface and subsurface MEC removal and implemented as described in Alternative 2.

These four alternatives were evaluated individually and then compared against each other using the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) nine criteria. The Detailed Analysis of the four alternatives is discussed in the FS Report (USACE, 2013a).

10.10.9 Remedial Action Documents

10.10.9.1 Proposed Plan

At the conclusion of the FS, a Proposed Plan (PP) was prepared to facilitate public involvement in the remedy selection process for the Southeastern Region MRS. The USACE's Preferred Alternative presented in the PP for the Southeastern Region MRS was Alternative 4 – Surface and Subsurface MEC Removal and Implementation of LUCs. USACE released the PP for a 30-day public comment period from 19 June 2013 through 19 July 2013. The notice of the public meeting and the availability of the PP was published on 13 June 2013 in the Honolulu Star-Advertiser, military newspapers, and MidWeek Magazine, which all circulate in the City and County of Honolulu, State of Hawaiʻi. The PP was also presented at a public meeting on 19 June 2013 (USACE, 2013b).

10.10.9.2 Decision Document

A Decision Document (DD) was prepared to present the Selected Remedy for the Southeastern Region MRS. No comments were received on the PP; and no technical or legal issues were

identified during the public comment period. The Selected Remedy for the Southeastern Region MRS was determined to be Alternative 4 - Surface and Subsurface MEC Clearance and Implementation of educational LUCs which involves the following components:

- Detection, clearance, and disposal of MEC to depth of 2 ft bgs over 36 acres; and
- Implementation of educational LUCs in the form of community MEC awareness training and distribution of informational documents.

The Selected Remedy is necessary to protect the public health and welfare or the environment from potential interaction with MEC, if encountered, by removing surface and subsurface MEC down to 2 ft bgs. The areas identified for the RA include the 36-acre area, which is comprised of an expanded area around the previous NTCRA area (AOC-2) located in the Southeastern Region MRS. The area was selected based on the highest MEC and MD densities found during previous investigations and anticipated future land use activities (*e.g.*, residential, recreational, and agricultural). The completion of the MEC clearance would reduce MEC hazards; however, due to limitations in detection technology and because 100% coverage will not be possible in all areas of the site, it is possible that some munitions may be undetected. To reduce hazard associated with potential residual munitions, following the MEC removal, educational LUCs will be implemented at the site to make the public aware of the potential MEC hazards utilizing the 3 R's: Recognize, Retreat and Report (USACE, 2015a).

10.11 Conceptual Site Model and Exposure Assessment

The CSM is used to identify the potential for exposure to MEC or MC at the site. Included in the CSM are: known or suspected sources of contamination; chemicals of concern; primary release mechanisms; potential migration pathways; contaminant fate and transport; potential receptors and exposure pathways based on current and future land use; physical characteristics of the site (*e.g.*, geology, hydrogeology, and topography); and known or suspected extent of contamination. MEC and MC CSMs are presented in Figure 5-1 and Figure 5-2 of the RI Report, respectively (USACE, 2012b).

10.11.1 Munitions and Explosives of Concern Conceptual Site Model

MEC exposure analysis compiles information from previous investigations into an illustration of possible exposure pathways. The MEC CSM is comprised of four components: source, access, activity, and receptor.

10.11.1.1 Source

The source of MEC includes the munitions used during previous maneuvers, jungle training, small arms, artillery, and mortar firing activities at the former WTA MRA. MEC items recovered at the Southeastern Region MRS during the previous investigations include:

- 37mm HE Projectile, M63;
- 75mm HE Projectile, M48;

- 3-inch HE Projectile, M42/M42A1;
- 58mm HE Mortar, Type 89;
- 60mm HE Mortar, M49A2/M49A3;
- 81mm HE Mortar, M56 or M43A1/M43A1B1;
- 2-inch Smoke Mortar, M3;
- 2.36-inch HEAT Rocket, M6A1;
- 3.5-inch HEAT Rocket, M28A2;
- Rifle Grenade HEAT, M9A1;
- Grenade Frag, MKII;
- Grenade HEAT, M28;
- Grenade Smoke, M18 or AN-M8;
- Grenade Training, MK1A1;
- 0.50 lb TNT Block;
- Flare, Surface, M49A1;
- Simulator, M27A1B1;
- Artillery Flash Simulator, M110;
- Fuze PD, M52;
- Fuze PD, M58;
- Fuze PDSQ, M48;
- Fuze PDSQ, M51; and
- Fuze PDSQ, M54.

In addition, abundant evidence of HE ordnance usage, projectile fragmentation, fuze pieces, tail fins, base plates, and other MD were found throughout the former WTA MRA during the course of the EE/CA, NTCRA, and RI. MD items recovered at the Southeastern Region MRS during the previous investigations include:

- 37mm HE Projectile, M63 or MKII;
- 75mm HE Projectile, M48;
- 37mm APC-T Projectile, M51;
- 60mm HE Mortar, M49A2/M49A3;
- 81mm HE Mortar, M56 or M43A1/M43A1B1;
- 60mm Practice, M50A2/M50A3;
- 81mm Practice, M43A1;

- 2.36-inch HEAT Rocket, M6A1;
- 3.5-inch HEAT Rocket, M28A2;
- Rifle Grenade HEAT, M9A1;
- Grenade Frag, MKII;
- Grenade Smoke, M18 or AN-M8;
- Grenade Training, MK1A1;
- Signal Illumination, M17/M19/M21/M51;
- Trip Flare, M48;
- Signal, Smoke and Illumination, AN-MK13 Mod 0;
- Firing Device, M1;
- Fuze PD, M52;
- Fuze PD, M58;
- Fuze PDSQ, M48;
- Fuze PDSQ, M51;
- Fuze PDSQ, M54;
- Small arms debris; and
- Unidentifiable munitions fragments of varying sizes.

The Ordnance Technical Data Sheets for munitions anticipated to have been used in the Southeastern Region MRS are included in Appendix D.

10.11.1.2 Access

Access to the Southeastern Region MRS is limited in certain areas by dense vegetation, terrain, and a gated access road. However, the MRS remains relatively accessible to the public and can be accessed by unimproved roads, trails, paths, and streams along Kamehameha Highway.

10.11.1.3 Activity

MEC exposure is caused by direct contact as a result of human activity. MEC could be disturbed deliberately or inadvertently by persons who are present on the MRS. Current and reasonable future land use activities such as residential, agricultural, open space, nature preserve areas, and recreational activities such as hunting, motocross, and ATV riding could result in potential disturbances of MEC both at the surface and at the subsurface. Deliberate handling or inadvertent treading on surface MEC could occur while visiting or working in the MRS. Most site activities do not involve disturbance of the subsurface (hiking and hunting); however, activities related to motocross or ATV riding could result in intrusive activities in the shallow subsurface (up to 1 ft bgs). It is likely that the MRS will continue to be accessed and used for

recreational activities such as hiking, hunting, motocross, *etc.* Most residential activities involve only localized subsurface disturbance (*e.g.*, installing fence posts and gardening).

10.11.1.4 Receptors

Human receptors' exposure to MEC is determined by their ability to access the MRS and the activities they engage in that may result in contact with MEC. Possible human receptors at the MRS include residents, authorized contractors and visitors (*e.g.*, wildlife management workers and research scientists), agriculture or construction workers, and recreational users or trespassers (*e.g.*, hunters, hikers, and motocross and ATV enthusiasts). Biota are not considered receptors to MEC exposure, as their activities would not likely encounter surface or buried MEC that could harm them.

10.11.2 MEC Exposure Pathways Analysis and Conclusions

Human receptors with access to the MRS (*e.g.*, residents, authorized contractors and visitors, agriculture or construction workers, and recreational users or trespassers) have the potential to come into contact with surface and subsurface MEC based on the current and future land use activities (*e.g.*, residential, agricultural, and recreational). Therefore MEC exposure pathways are considered potentially complete (USACE, 2012b).

10.11.3 Munitions Constituents Conceptual Site Model

The information evaluated for the MC CSMs was used to identify all potentially complete or incomplete source receptor interactions for both current and reasonably anticipated future land uses at the Southeastern Region MRS. In order for exposure to an environmental contaminant to occur, one or more potentially complete exposure pathways must exist. Each complete MC pathway includes a source, a release mechanism, an exposure medium, an exposure route, and a receptor.

10.11.3.1 Source

The source of MC are from munitions used during previous maneuvers, jungle training, small arms, artillery, and mortar firing activities at the former WTA MRA. Soil, sediment, and surface water samples were collected during the abbreviated SI and RI (soil and sediment samples only) to determine if MC was present in soils above screening levels. Analytical results were compared against published HDOH EALs and the EPA Regional Screening Levels (RSLs) for Residential Soil (dated June 2011), the lower of the two criteria took precedent. During the abbreviated SI, the soil, sediment, and surface water samples were analyzed for TAL metals and explosives constituents. Two MI surface soil samples were collected in areas MEC was recovered during the EE/CA. Two co-located surface water and sediment samples were collected from the Waikane Stream, downstream of locations where MEC was found. Resulting COPC identified in the SI were chromium, iron, vanadium, cobalt, mercury, and RDX (USACE, 2012b).

Results of the soil screening indicate that lead, copper, and explosives constituents (*i.e.*, 2-amino-4,6-dinitrotoluene, 4-amino-4,6-dinitrotoluene, and nitroglycerine) exceeded applicable screening levels. No explosives were detected in the MI surface soil samples collected during the RI. Copper and lead in surface soil; and lead, 2-amino-4,6-dinitrotoluene, 4-amino-4,6-dinitrotoluene, and nitroglycerine in subsurface soil exceeded applicable screening levels in samples collected at locations where MEC items were identified and disposed of by intentional detonation during the concurrent NTCRA (AOC-2).

No analytes exceeded applicable screening levels in sediment samples. Since all detected constituents were below HDOH EALs in the sediment, no surface water samples were collected during the RI. The risk assessment concluded that the potential for adverse risks to human health or ecological receptors from exposure to MC in soil would be negligible at the former WTA MRA (USACE, 2012b).

10.11.3.2 Release Mechanism

In general, migration pathways involve movement via soil, air, surface water, sediment, and groundwater, and the interfaces between these media. After a chemical is released into the environment, it may be retained in one or more media or it may migrate to other media. Contaminants may move between media by a variety of transport mechanisms. Common transport mechanisms for impacted soil that may occur at the Southeastern Region MRS includes dust entrainment, erosion or runoff to surface water, leaching to groundwater, and uptake by plants or animals.

10.11.3.3 Exposure Medium

Environmental media at the Southeastern Region MRS that presents a potential for human exposure are surface soil, subsurface soil, and the food chain.

10.11.3.4 Exposure Route

Potential exposure routes per the site CSM include dermal contact, inhalation (vapor or dust), ingestion, vegetation, domestic animals, and game, fish, or prey.

10.11.3.5 MC Exposure Pathway Analysis

Humans who may access the Southeastern Region MRS (*e.g.*, residents, authorized contractors and visitors, agriculture or construction workers, and recreational users or trespassers) may all come into contact with surficial soil. Surface soil exposure pathways are potentially complete based on the presence of MC in surface soil. Exposure to subsurface soil is an incomplete pathway for authorized contractors and visitors because they are not expected to engage in intrusive activities. However, exposure to subsurface soil is considered potentially complete for residents, agriculture or construction workers, recreational users or trespassers, and ecological receptors.

Exposure directly to groundwater (via contact with saturated subsurface soil) and surface water or sediment is considered incomplete pathways for all receptors. No receptors are expected to engage in intrusive activities to a depth that would bring them into contact with groundwater. In addition, results of historical sampling at the MRS effluent points indicate that MC were not found in sediment above their respective screening levels. Without contamination in the sediment, it is considered unlikely that MC contamination is being transported to the surface water. Therefore, sediment and surface water are considered an incomplete exposure pathway for all receptors.

Finally, residents and ecological receptors are assumed to ingest vegetation and game, fish, or prey harvested from the MRS. Vegetation and game, fish, or prey can accumulate contaminants entrained in surface and subsurface soil. As a result, those exposure pathways are considered potentially complete (USACE, 2012b).

10.12 Contaminant Fate and Transport

10.12.1 MEC

Several factors influence the possible migration of MEC from the site. The possibility exists for human activity resulting in redistribution of MEC items. Another factor involves the movement of smaller MEC items by overland water flow, particularly in drainages and low-lying areas subject to periodic flooding. A related phenomenon involves ground movement resulting from erosion and landslides, which may unearth existing buried MEC items.

MEC may remain for long periods of time, as evidenced by the discovery of numerous World War II (WWII)-era MEC items during the 2006 EE/CA and 2011 NTCRA and RI.

10.12.2 MC

Weathered and eroded contaminants from munitions fragments can release MC into the environment. The fate and transport of metals in the environment is governed by a number of interrelated processes, including oxidation/reduction conditions, the degree of inorganic and organic complexation, and pH conditions of the soil and groundwater. Adsorption of metal cations has been correlated with such soil properties as pH, redox potential, clay and/or soil organic matter content, cation exchange capacity, iron and manganese oxides, and calcium carbonate content. Typically, as these soil properties increase, the adsorption capacity of cationic metals will also increase. Based upon the fate and transport processes of cationic metals as well as the distribution and concentration of the evaluated metals, it appears that these metals have adsorbed to soil particles and are bound to surface soil and near surface soil.

Explosives in soil and/or sediment are generally degraded over time by biotic transformations by bacteria, fungi, and other soil microbes. Degradation of explosives also occurs through abiotic transformations such as alkaline hydrolysis, photolysis, and reduction by iron. Given that several decades have passed since military operations ceased, it is expected that detections of explosives would be rare. During the RI, no explosives were detected in surface soil samples, explosives

were detected below applicable screening levels in only one subsurface soil sample, and no explosives were detected above applicable screening levels in sediment.

10.13 Nature and Extent of Contamination

10.13.1 MEC

During the course of the EE/CA, NTCRA, and RI, a total of 47 MEC items were recovered from the Southeastern Region MRS. A total of 158 MD items were recovered during the EE/CA and 1,457 lbs of MD was disposed of during the NTCRA. MEC recovered in the Southeastern Region MRS was detected at an average depth of 3.3 inches bgs. Table 10-1 presents the summary of previous investigation MEC and MD findings.

Table 10-1: Southeastern Region MRS Summary of MEC and MD Found During Previous Investigations

Previous Investigation	MEC Found	MD Found
EE/CA (2006)	5	158 ¹
NTCRA (2011)	42	1,457 ²
RI (2011)	0	3,405 ³

Notes:

¹ MD items discovered in the Southeastern Region MRS

² MD reported by weight in lbs discovered in the Southeastern Region MRS

³ MD items discovered throughout the former WTA

The NTCRA recovered 42 individual MEC items from the Southeastern Region MRS (AOC-2). The RI, conducted in areas outside of the NTCRA AOCs, recovered no MEC and relatively moderate to high MD density along the southern half of the Southeastern Region MRS. The highest MD density was observed southwest of AOC-2 within the Southeastern Region MRS near the former WTA MRA boundary.

10.13.2 MC

During the RI, MI surface soil samples (less than 2 inches bgs), discrete subsurface soil samples (approximately 12 inches bgs), and sediment sampling (approximately 12 inches bgs) were collected to determine the presence or absence of MC (*i.e.*, explosives constituents and metals). Soil samples were collected in areas of high MD density as determined by the results of analog-and-dig activities conducted during the RI; and collected in the vicinity of where MEC/MD items were recovered during the concurrent NTCRA within AOC-1 and AOC-2. Sediment samples were collected from selected areas upstream and downstream of the respective MRSs to adequately delineate potential MC. MI surface soil, discrete subsurface soil, and sediment analytical results were compared against published HDOH EALs and EPA RSLs for Residential Soil (dated June 2011), the lower of the two criteria took precedent. Analytical results were also compared to site-specific background levels. Copper and lead in surface soil; and lead, 2-amino-4,6-dinitrotoluene, 4-amino-4,6-dinitrotoluene, and nitroglycerine in subsurface soil exceeded their respective screening levels. No MC exceeded screening levels in

sediment samples collected. The metals and explosive constituent exceedances in surface and subsurface soil all occurred in a localized area of the Southeastern Region MRS where MEC items were identified and disposed of by intentional detonation during the NTCRA. However, the risk assessment concluded that the potential for adverse risks to human health or ecological receptors from exposure to MC in these media would be negligible.

Worksheet # 11: Data Quality Objectives

11.1 Step 1 – State the Problem

11.1.1 Purpose

Previous investigations (EE/CA, NTCRA, and RI) identified the presence of MEC and MD (e.g., 37mm, 75mm, 3-inch HE Projectile; 37mm APC-T Projectile; 58mm, 60mm, 81mm HE Mortar; 60mm and 81mm Practice; 2-inch Smoke Mortar; 2.36-inch and 3.5-inch HEAT Rockets; grenades [rifle, frag, HEAT, smoke, training]; 0.50 lb TNT Block; signals (illumination and smoke); flares [trip and surface]; simulators; Firing Device; fuzes [PD and PDSQ]; small arms debris; and unidentifiable munitions fragments of varying sizes) at the Southeastern Region MRS. The former WTA and Southeastern Region MRS were used by the DoD from 1942 to 1976 for various types of training such as maneuver, jungle training, small arms, artillery, rocket, and mortar firing. MEC presents an unacceptable risk from explosive hazards to human receptors based on the current and anticipated land use at the MRS.

11.1.2 Planning Team Members

Members of the planning team and communication pathways are presented in Worksheet #6. A summary of the planning sessions is presented within Worksheet #9.

11.1.3 Conceptual Site Model

The CSM is presented within Worksheet #10.

11.1.4 Exposure Scenarios

The MEC and MC exposure scenarios are presented as part of the CSM within Worksheet #10.

11.1.5 Available Resources and Constraints

All resources required to complete the MEC RA are currently allocated as described in the PWS presented in Appendix A. One potential project constraint is the ability to obtain ROE for all landowners within the MRS or whose properties are needed for access to get to the MRS. If a landowner does not allow access to their property, that portion of the MRS will be excluded from the field investigation. If a ROE is not obtained for a property, the team will not be allowed to travel through the property even though the owner provides verbal approval to do so. If certain parcel ROEs are not provided, decision on the path forward may potentially be impacted. In these cases, it may be necessary to delineate these parcels so that a decision on the MRS where the MEC RA was completed can be made. The ROE process is currently underway; ROEs will be accepted through the end of the planned field investigation. Any ROEs received after the completion of the field investigation will not be considered as part of the MEC RA. Any areas that have received ROE after the completion of the RA field investigation may be considered for evaluation during subsequent munitions response actions at the discretion of the USACE.

During the EE/CA, it was requested by local citizens that vegetation clearance be minimal and have no adverse impact to the ecological environment. Therefore, during the MEC RA, biological survey and monitoring will be conducted. Biological surveys will be conducted at the site to identify threatened or endangered species. If any sensitive area is identified, it will be marked and the field team will be given instruction on the activities that can or cannot be performed in those areas. Additionally, archaeological survey and monitoring will be conducted. Archaeological sites and other cultural resources and components (shrine/burial and heiau, *etc.*) will be identified and avoided during field activities.

11.2 Step 2 – Identify the Goals of the Study

11.2.1 Project Decision Statements

The following project decision statements (PDSs) have been developed:

- PDS#1: If MPPEH are found during the RA, these items will be inspected by qualified UXO Technicians to determine if an explosive hazard is present. Explosive disposal procedures will be implemented to safely eliminate explosive hazards, either by blow-in-place (BIP), or at a different location for consolidated detonation if the item is safe to move. All explosives operations including the movement of MEC will be IAW with the approved Explosives Safety Submission (ESS); and
- PDS#2: If an area does not contain any MPPEH, the absence of MPPEH will be documented utilizing the data generated during the RA. Data will include, but will not be limited to geophysical data, results of the interrogation of anomalies, visual observations, *etc.* The removal and absence of MPPEH will be documented within a Remedial Action Report (RAR).

11.3 Step 3 – Identify the Information Inputs

Information inputs are needed to assess potential hazards posed by MPPEH. Information inputs in support of decision making include the compilation of previously gathered site information and new data collected during the RA activities.

The previous investigations and site background information inputs summarized in Worksheet #10 include:

- *After Action Report; Waikane Valley Training Area.* Memorandum to the Commanding General, 1st Marine Brigade from the Brigade Explosive Ordnance Disposal Officer and Project Officer, Explosive Ordnance Disposal Team, Brigade Support Group. KWV:jwb 8027. 20 September (Berkey, 1976);
- *Explosive Ordnance Disposal (EOD) After Action Report of Ordnance Surface Clearance of Waikane Valley Training Area.* Memorandum to the Commanding Officer, Marine Corps Air Station, Kaneohe Bay from the Explosive Ordnance Disposal Officer, Station Operations and Maintenance Squadron. OMWE/SHN/sk 8027. 7 June (Negahnquet, 1984);

- *Intensive Archaeological Survey – Waikane Valley Fence Corridor, Land of Waikane, Koolaupoko District, Island of Oahu.* Prepared for Belt Collins & Associates. April (Rosendahl, 1990);
- *DERP-FUDS Inventory Project Report, Waikane Training Area, Waikane, Island of Oahu, Hawaii, Site No. H09HI035400.* May (USACE, 1996);
- *INPR Supplement, Waikane Training Area, FUDS Property Number: H09HI0354.* November (USACE, 2004);
- *Final Engineering Evaluation/Cost Analysis (EE/CA) Report, Former Waikane Valley Training Area, Island of Oʻahu, Hawaiʻi.* November (USACE, 2008);
- *Site Investigation Report, Pali Training Camp, Heeia Combat Training Area, and Waikane Training Area, Oʻahu, Hawaiʻi* (USACE, 2009a);
- *Final Site Specific Final Report, Munitions and Explosives of Concern (MEC) Removal Action and Supporting Functions, Waikane Training Area, Island of Oʻahu, Hawaiʻi.* July (USACE, 2012a);
- *Final Remedial Investigation (RI) Report, Former Waikane Training Area, Kaneohe, Oʻahu, Hawaiʻi.* August (USACE, 2012b);
- *Final Feasibility Study (FS) Report, Former Waikane Training Area, Kaneohe, Oʻahu, Hawaiʻi.* June (USACE, 2013a);
- *Final Proposed Plan, Western/Mountainous Region MRS and Southeastern Region MRS, Former Waikane Training Area, Kaneohe, Oʻahu, Hawaiʻi.* December (USACE, 2013b);
- *Decision Document, Southeastern Region MRS, RMIS ID: H09HI035401, Waikane Training Area, Kaneohe, Oʻahu, Hawaiʻi.* July (USACE, 2015a);
- CSM and MEC pathway analysis (Worksheet #10); and
- Aerial photograph analysis (historic and current) obtained from the USACE, U.S. Geological Survey (USGS) or other data sources to identify potential range features, current and abandoned roads, historic structures, *etc.*

The RA information inputs include:

- Biological and archaeological survey data;
- Recovered surface MEC and MD;
- Analog geophysical survey data for the detection of surface and subsurface metallic anomalies;
- Anomaly interrogation results from the analog surveys; and
- Recovered subsurface MEC and MD.

11.4 Step 4 – Define the Boundary of the Study

The RA spatial boundaries include the 36-acre area within the parent parcel (*i.e.*, 151 acre Southeastern Region MRS) as depicted in Figure 2 (Appendix C). Refer to Worksheet #10 for details on the selected RA area.

The vertical extent is surface (0 ft) to 2 ft bgs. The pass/fail criteria is removal of MEC and MD to depth of 2 ft bgs within the limitations in detection technology. The technology selected for the RA field investigation is anticipated to detect the majority of anomalies that could be munitions-related down to 2 ft bgs (refer to the Geophysical Prove-Out Letter Report, Appendix N of the Final Site Specific Final Report [USACE, 2012a]). An Instrument Verification Strip (IVS) Letter Report will also be prepared for the RA to document the rationale for the selected geophysical instrumentation.

The temporal boundaries for the field work are specifically limited to the period necessary to conduct the RA. The period includes all necessary preliminary logistical preparation and demobilization activities. The project schedule is included in Worksheet #14 & 16.

11.5 Step 5 – Develop the Analytic Approach/Decision Rule

The project analytic approach/decision rules listed in the table below were based on Selected Remedy identified in the DD:

Number	Analytic Approach/Decision Rule
1	Establish GPS survey control to accurately locate and track data collection activities
2	Establish IVS to select and verify geophysical instrument protocols and equipment functionality
3	Remove vegetation to facilitate analog geophysical surveys and anomaly investigations
4	Locate and identify all surface and subsurface metallic anomalies to 2 ft bgs within the limitations in detection technology
5	Determine the explosive safety status of all MPPEH encountered
6	Dispose of all MEC/Material Documented as an Explosive Hazard (MDEH) discovered and record location and characteristics (<i>e.g.</i> , type, depth)
7	Remove and properly certify and transfer all MD as MDAS
8	Address all environmental and cultural concerns

11.6 Step 6 – Specify Performance Acceptance Criteria

The purpose of Step 6 is to identify the potential sources of study error (*i.e.*, sampling and measurement error), describe how these potential errors will be minimized throughout the investigation (*i.e.*, acceptable error limits) and how decision errors will be managed during the project. Project-specific measurement performance criteria (MPC) are presented in

Worksheets #12 and #22, 24, & 25. In addition, data validation and verification will be required to evaluate data quality and usability as described in Worksheets #34, 35, & 36 and #37.

11.7 Step 7 – Developing the Plan for Obtaining Data

The RA sample design was developed to optimize resources and data collection processes in order to generate acceptable data and satisfy the project-specific DQOs. The sampling design is optimized through the review of site's CSM (Worksheet #10) and in the consultation with project stakeholders to identify an acceptable technical approach for the RA field effort. The sampling design and rationale are detailed in Worksheet #17 & 18.

This Page Intentionally Left Blank

Worksheet # 12: Measurement Performance Criteria

DFW	Inspection	Requirement	Reference	QC Action	Inspection Frequency	Acceptance Criteria ¹
1- Mobilization	Performance Requirement	<ul style="list-style-type: none"> ▪ All travel arrangements, hotel rooms, credit accounts, equipment, and vehicles have been arranged without error or impact to operations or personnel ▪ All equipment has been inspected, calibrated, and cleaned to prevent the spread of invasive species ▪ Contractor pre-screens candidates using E-Verify Program ▪ All human resources documents are completed, provided, and approved before mobilization ▪ All personnel receive site specific training: Health & Safety, Activity Hazard Analyses (AHAs), SOPs, Definable Features of Work (DFW) preparatory briefings, Ordnance Identification, Archaeological and Biological awareness and restrictions 	<ul style="list-style-type: none"> ▪ DDESB Technical Paper (TP) 18 ▪ EM 385-1-1 ▪ UFP-QAPP ▪ PWS (Appendix A) ▪ TMP (Appendix B) ▪ Figures (Appendix C) ▪ Ordnance Technical Data Sheets (Appendix D) ▪ EPP (Appendix E) ▪ Accident Prevention Plan (APP)/Site Safety and Health Plan (SSHP) (Appendix F) ▪ All SOPs (Appendix G) ▪ Archaeological Monitoring Plan (AMP) (Appendix H) ▪ Explosive Management Plan (EMP) (Appendix I) ▪ Waste Management Plan (WMP) (Appendix J) 	<p>UXOQCS will perform inspections to verify all procedural requirements have been completed to include, but not limited to:</p> <ul style="list-style-type: none"> ▪ Verify results and driver's license or waiver on hand for each person ▪ Inspect key personnel letter approval from the KO or COR ▪ Inspect and review all personnel qualification documentation and resumes, and maintain security information submission checklist/spreadsheet ▪ Confirm travel arrangements, hotel rooms, credit accounts, equipment, and vehicles have been 	<ul style="list-style-type: none"> ▪ Before the start of physical mobilization and/or fieldwork ▪ As new personnel are assigned 	<ul style="list-style-type: none"> ▪ All mobilization requirements are completed prior to starting RA activities ▪ Preliminary project documentation is organized and accessible to the PDT ▪ Required personnel signatures are on plans and documents and are completed and verified
	Personnel Requirements	<ul style="list-style-type: none"> ▪ All Field Personnel 				
	Documentation	<ul style="list-style-type: none"> ▪ Personnel resumes, certificates, qualifications ▪ Verify adequate personnel on 				

DFW	Inspection	Requirement	Reference	QC Action	Inspection Frequency	Acceptance Criteria ¹
1- Mobilization <i>(continued)</i>		<p>the company employee/possessor listing</p> <ul style="list-style-type: none"> ▪ Verify copies of explosive license are present ▪ OSHA physical conducted and or current within one year or two if stated by the Doctor ▪ Signed notice-to-proceed ▪ Key Personnel letter for all staff ▪ Site-specific training and preparatory briefings 		<p>arranged without error or impact to operations or personnel</p> <ul style="list-style-type: none"> ▪ Confirm site-specific training has been conducted to standard, and all personnel have read, understood, and acknowledged the project UFP-QAPP and APP/SSHP with signature 		
2- Site Preparation	Performance Requirement	<p><u>Site Setup:</u></p> <ul style="list-style-type: none"> ▪ Set up administrative facilities ▪ Set up support and hygiene facilities <p><u>Site Survey:</u></p> <p><i>Geodetic Survey:</i></p> <ul style="list-style-type: none"> ▪ Horizontal accuracy: Third Order Class I, 1:10,000 closure standard or 3 centimeter (cm) at 1.96 sigma ▪ Vertical accuracy (not required) 10 cm or better <p><i>Datum:</i></p> <ul style="list-style-type: none"> ▪ Horizontal: North American Datum (NAD) of 1983 (NAD83), PA11 realization, epoch 2010.0 	<ul style="list-style-type: none"> ▪ DDESB TP-18 ▪ Data Item Description (DID) MMRP-09-007 ▪ EM 385-1-1(Safety) ▪ EM 200-1-15 (IGD) ▪ EM 1110-1-1005 (Survey Control) ▪ EM 1110-1-2909 (Geospatial Data) ▪ EM 1110-1-1002 (Markers) ▪ Worksheet #17 & 18 ▪ Worksheet #22, 24, & 25 ▪ Worksheet #29 ▪ APP/SSHP (Appendix 	<p>UXOQCS will perform inspections to verify all procedural requirements have been completed to include, but not limited to:</p> <ul style="list-style-type: none"> ▪ Verify administrative facilities are operational ▪ Verify support and hygiene facilities are set up properly IAW requirements ▪ Verify IVS installed IAW SOP UXO-08 	<ul style="list-style-type: none"> ▪ Preparatory ▪ Initial ▪ Follow-Up Weekly ▪ Daily GPS accuracy checks each morning 	<ul style="list-style-type: none"> ▪ Administrative facilities are established and surveys conducted IAW UFP-QAPP specifications ▪ If an instrument fails testing requirement then equipment will be repaired or replaced. The TL will report the results any defective equipment to the SUXOS and UXOQCS on the Daily Operator

DFW	Inspection	Requirement	Reference	QC Action	Inspection Frequency	Acceptance Criteria ¹
2- Site Preparation <i>(continued)</i>		<ul style="list-style-type: none"> ▪ Vertical: msl (GEOID 12B) <i>Coordinate System:</i> ▪ Universal Transverse Mercator (UTM) Zone 4N (meters [m]) <i>Boundary Survey:</i> ▪ Verify MRS and investigation boundaries <i>Grid Survey:</i> ▪ Stake and record GPS grid locations ▪ Upload virtual grid locations <u>Instrument Checks:</u> ▪ Start of operations each day Real-Time Kinematic (RTK) GPS accuracy ± 30 cm, mapping grade GPS within ± 1 to 2 m of survey control point ▪ Start of operations each day, process analog geophysical instrument through IVS, pass or fail (anomaly avoidance) 	F) <ul style="list-style-type: none"> ▪ SOPs (Appendix G) <ul style="list-style-type: none"> – SOP G-1 Field Documentation – SOP G-2 Anomaly Avoidance – SOP G-3 Surveying and Mapping – SOP G-5 Project Quality Control – SOP UXO-08 IVS and Geophysical Survey Equipment 	<ul style="list-style-type: none"> ▪ Verify survey control points are within accuracy tolerances ▪ Verify boundary and grid surveys are completed and final grid coordinates are uploaded to project database ▪ Verify daily instrument checks are conducted and documented ▪ Verify field forms, logbooks and documentation are accurate, complete and consistent 		Test Report (DOTR)
	Personnel Requirements	<ul style="list-style-type: none"> ▪ Field Technicians ▪ State of Hawaiʻi Registered Professional Land Surveyor (PLS) ▪ UXO-qualified Technicians 				

DFW	Inspection	Requirement	Reference	QC Action	Inspection Frequency	Acceptance Criteria ¹
2- Site Preparation <i>(continued)</i>	Documentation	<ul style="list-style-type: none"> ▪ PLS Survey Report ▪ Field forms (<i>i.e.</i>, DOTR) ▪ Logbooks ▪ GPS data ▪ Photographs 				
3- Biological and Archaeological Surveys and Monitoring	Performance Requirement	<ul style="list-style-type: none"> ▪ Perform Archaeological and Biological Survey IAW Ecological Resources Plan (ERP) and EPP ▪ Brief field teams on culturally and biologically sensitive sites, awareness, restrictions, and reporting procedures ▪ Perform equipment inspections before use ▪ Start of operations each day, process analog geophysical instrument through IVS, pass or fail (anomaly avoidance) 	<ul style="list-style-type: none"> ▪ EM 200-1-15 ▪ 48 Federal Register 190:44716-44742 ▪ Worksheet #17 & 18 ▪ Worksheet #22, 24, & 25 ▪ Worksheet #29 ▪ AMP (Appendix H) ▪ ERP ▪ EPP (Appendix E) ▪ APP/SSHP (Appendix F) ▪ SOPs (Appendix G) <ul style="list-style-type: none"> – SOP G-1 Field Documentation – SOP G-2 Anomaly Avoidance – SOP G-3 Surveying and Mapping 	<p>UXOQCS will perform inspections to verify all procedural requirements have been completed to include, but not limited to:</p> <ul style="list-style-type: none"> ▪ Conduct surveillance on preparatory briefing ▪ Ensure PPE and UXO qualified escort, if field survey is necessary ▪ Verify proper reporting and marking of threatened or endangered species ▪ Verify anomaly 	<ul style="list-style-type: none"> ▪ Preparatory ▪ Initial ▪ Follow-up weekly 	<ul style="list-style-type: none"> ▪ Qualified Archaeologist and Qualified Botanist/Biologist verifies ▪ All identified protected species, sensitive habitats and/or critical habitat shall be fully and systematically described, plan mapped, and documented ▪ Project activities shall not damage nor remove, nor take any threatened or endangered species per
	Personnel Requirement	<ul style="list-style-type: none"> ▪ UXO qualified personnel required for escort ▪ Qualified Archaeologist ▪ Qualified Biologist/Botanist 				

DFW	Inspection	Requirement	Reference	QC Action	Inspection Frequency	Acceptance Criteria ¹
3- Biological and Archaeological Surveys <i>(continued)</i>	Documentation	<ul style="list-style-type: none"> ▪ Logbooks/Field Inspection/Field Notes ▪ AMP (Appendix H) ▪ Archaeological Final Report ▪ Biological survey report ▪ Photographs ▪ GPS data 	<ul style="list-style-type: none"> – SOP G-5 Project Quality Control – SOP UXO-08 IVS and Geophysical Survey Equipment 	<p>avoidance and metal detector on hand</p> <ul style="list-style-type: none"> ▪ Inspect equipment for checks and maintenance ▪ Verify field notes, logbooks and reports are accurate and in compliance ▪ Conduct surveillance on Site Specific Training of all field employees by Biological and Archaeological Consultants before any work 		<p>Endangered Species Act (16 United States Code 1538[a][1])</p> <ul style="list-style-type: none"> ▪ Principal Investigator and archaeological reconnaissance survey and monitoring personnel IAW the standards and guidelines set forth by Secretary of the Interior in 48 FR 190:44716-44742, 29 Sept. 1983
4-Vegetation Clearance	Performance Requirement	<ul style="list-style-type: none"> ▪ Perform equipment inspections before use ▪ Start of operations each day, process analog geophysical instrument through IVS, pass or fail (anomaly avoidance) ▪ Remove only brush and vegetation less than 3 inches in diameter that sufficiently allows for MEC clearance 	<ul style="list-style-type: none"> ▪ DDESB TP-18 ▪ EM 385-1-1 ▪ EM 385-1-97 ▪ Worksheet #17 & 18 ▪ Worksheet #21 & 23 ▪ Worksheet #22, 24, & 25 ▪ Worksheet #29 ▪ APP/SSHP (Appendix F) ▪ SOPs (Appendix G) 	<p>UXOQCS will perform inspections to verify all procedural requirements have been completed to include, but not limited to:</p> <ul style="list-style-type: none"> ▪ Verify equipment inspections are conducted ▪ Verify vegetation is sufficiently cleared to perform MEC 	<ul style="list-style-type: none"> ▪ Preparatory ▪ Initial ▪ Follow-Up weekly 	<ul style="list-style-type: none"> ▪ If an instrument fails testing requirement then equipment will be repaired or replaced. The TL will report the results of any defective equipment to the SUXOS and UXOQCS on the DOTR ▪ Personnel are

DFW	Inspection	Requirement	Reference	QC Action	Inspection Frequency	Acceptance Criteria ¹
4-Vegetation Clearance <i>(continued)</i>	Personnel Requirement	<ul style="list-style-type: none"> ▪ Forman/Supervisor ▪ UXO Technician II or Higher Escort/Safety Observer ▪ Slashbuster Operator ▪ Field Technician 	<ul style="list-style-type: none"> – SOP G-1 Field Documentation – SOP G-2 Anomaly Avoidance – SOP G-4 Vegetation Clearance – SOP G-5 Project Quality Control 	clearance. <ul style="list-style-type: none"> ▪ Verify all documentation is completed and correct, and it is consistent with requirements 		qualified to operate vegetation removal equipment <ul style="list-style-type: none"> ▪ Equipment is maintained and operated IAW manufacturer recommendations
	Documentation	<ul style="list-style-type: none"> ▪ Field forms (<i>e.g.</i>, DOTR and Inspection Checklists) ▪ Logbooks ▪ GPS data ▪ Photographs 	<ul style="list-style-type: none"> ▪ WMP (Appendix J) ▪ EPP (Appendix E) ▪ AMP (Appendix H) ▪ ERP 			
5- IVS	Performance Requirement	<p><u>IVS Installation:</u></p> <ul style="list-style-type: none"> ▪ Select representative location for IVS ▪ Install IVS IAW SOP UXO-08 IVS and Geophysical Equipment & SOP G-2 Anomaly Avoidance ▪ Ensure seeds are detectable by selected instrument. <p><u>Analog System Checks:</u></p> <ul style="list-style-type: none"> ▪ Start of operations each day RTK GPS accuracy ± 30 cm ▪ Process analog geophysical instrument through IVS, pass or fail and verify expected response ▪ Instrument operator must detect all blind seeds 	<ul style="list-style-type: none"> ▪ DDESB TP-18 ▪ DID MMRP-09-005 ▪ DID MMRP-09-007 ▪ EM 385-1-1(Safety) ▪ EM 200-1-15 (IGD) ▪ EM 1110-1-1005 (Survey Control) ▪ EM 1110-1-2909 (Geospatial Data) ▪ EM 1110-1-1002 (Markers) ▪ Worksheet #17 & 18 ▪ Worksheet #22, 24, & 25 ▪ Worksheet #29 ▪ APP/SSHP (Appendix F) 	UXOQCS and Project Geophysicist will perform inspections to verify all procedural requirements have been completed to include, but not limited to: <ul style="list-style-type: none"> ▪ Verify IVS installed IAW UXO SOP-08 ▪ Verify survey control points are within accuracy tolerances ▪ Verify boundary and seed locations recorded ▪ Verify daily 	<ul style="list-style-type: none"> ▪ Preparatory ▪ Initial ▪ Follow-up weekly ▪ Daily equipment and detection instrument checks at the start and end of each day ▪ IVS Letter Report will be reviewed by the PM and QCM before submittal 	<ul style="list-style-type: none"> ▪ All seeds are detectable by the selected geophysical instruments ▪ IVS Letter Report approved and accepted by Project and USACE Geophysicist ▪ If an instrument fails testing requirement then equipment will be repaired or replaced. The TL will report the results of any defective

DFW	Inspection	Requirement	Reference	QC Action	Inspection Frequency	Acceptance Criteria ¹
<p>5- IVS <i>(continued)</i></p>		<ul style="list-style-type: none"> ▪ Personnel test, noise cancelation and instrument settings checks ▪ Before IVS installation, perform function check and detection on small industry standard object (ISO) steel pipe nipple <p><u>DGM System Check:</u> <u>IVS & instrument repeatability tests:</u></p> <ul style="list-style-type: none"> ▪ Process geophysical instrument through DGM IVS and repeatability tests. <p><u>GPS Accuracy:</u></p> <ul style="list-style-type: none"> ▪ RTK GPS accuracy within ± 10 cm and mapping grade GPS within ± 1 m of survey control point <p><u>Equipment warm up:</u></p> <ul style="list-style-type: none"> ▪ At least 15 minutes <p><u>Static Background and Spike Repeatability:</u></p> <ul style="list-style-type: none"> ▪ Static Background: 95% of background readings within ± 5 millivolts (mV) ▪ Spike Test: Test jig with ISO attached to the electromagnetic coil. Response (mean static spike minus mean static background) within ± 10% of original value after background correction on selected electromagnetic 	<ul style="list-style-type: none"> ▪ SOPs (Appendix G) <ul style="list-style-type: none"> – SOP G-1 Field Documentation – SOP G-2 Anomaly Avoidance – SOP G-3 Surveying and Mapping – SOP G-5 Project Quality Control – SOP UXO-01 Surface and Subsurface Clearance – SOP UXO-08 Instrument Verification and Geophysical Survey Equipment ▪ EPP (Appendix E) ▪ AMP (Appendix H) ▪ ERP 	<p>instrument checks are conducted within parameters and documented</p> <ul style="list-style-type: none"> ▪ Verify field forms, logbooks and documentation are accurate, complete and consistent 		<p>equipment to the SUXOS and UXOQCS on the DOTR</p>

DFW	Inspection	Requirement	Reference	QC Action	Inspection Frequency	Acceptance Criteria ¹
5- IVS (continued)		<u>Personnel Test:</u> <ul style="list-style-type: none"> ▪ (Person Portable only): 95% of background readings within ± 5mV <u>Cable Shake Test:</u> <ul style="list-style-type: none"> ▪ 95% of background readings within ± 5mV <u>Dynamic Detection Repeatability:</u> <ul style="list-style-type: none"> ▪ Collect twice daily IVS tests and confirm anomaly response (signal amplitude greater than or equal to 65% of expected minimum value) and target location are within the project’s performance metrics <u>Dynamic Positioning Repeatability:</u> <ul style="list-style-type: none"> ▪ Positions of targets will be repeatable within 30 cm of original location for IVS seeds 				
	Personnel Requirements	<ul style="list-style-type: none"> ▪ Field Technicians ▪ Project Geophysicist ▪ UXO-qualified Technicians 		<ul style="list-style-type: none"> ▪ UXOQCS and PM verify proper qualifications IAW UFP-QAPP and Technical Paper (TP)-18 	<ul style="list-style-type: none"> ▪ 100% during Preparatory, Initial, and all new personnel 	<ul style="list-style-type: none"> ▪ Meets qualifications IAW UFP-QAPP and TP-18
	Documentation Requirements	<ul style="list-style-type: none"> ▪ IVS Letter Report ▪ Field forms (<i>i.e.</i>, DOTR) ▪ Logbooks ▪ GPS data ▪ Photographs 		<ul style="list-style-type: none"> ▪ UXOQCS will perform inspections to verify all documentation requirements have been completed to 	<ul style="list-style-type: none"> ▪ Preparatory ▪ Initial ▪ Follow-up weekly ▪ Daily 	<ul style="list-style-type: none"> ▪ IVS Letter Report and documentation are completed IAW UFP-QAPP and SOP UXO-08

DFW	Inspection	Requirement	Reference	QC Action	Inspection Frequency	Acceptance Criteria ¹
5- IVS <i>(continued)</i>				include, but not limited to: <ul style="list-style-type: none"> ▪ UXOQCS reviews IVS Letter Report ▪ Daily forms and logbooks 	equipment checks at the start of each morning	
6- Surface and Subsurface Clearance	Performance Requirement	<p><u>Equipment Checks:</u></p> <p><u>Daily Testing:</u></p> <ul style="list-style-type: none"> ▪ Process analog geophysical instrument through IVS & instrument repeatability tests, pass or fail and verify expected response ▪ Instrument operator must detect all blind seeds ▪ Personnel test, noise cancelation and instrument settings checks ▪ TL will emplace blind seeds for all team members daily and document results on DOTR. One seed per team member per day minimum <p><u>GPS Accuracy:</u></p> <ul style="list-style-type: none"> ▪ Start of operations each day, RTK GPS accuracy within ± 30 cm and mapping grade GPS within ± 1 to 2 m of survey control point <p><u>Clearance:</u></p> <ul style="list-style-type: none"> ▪ TL verifies sweep techniques and coverage (<i>e.g.</i>, overlap on 	<ul style="list-style-type: none"> ▪ EM 200-1-15 ▪ EM 385-1-1 ▪ EM 385-1-97 ▪ Explosives Safety Submission ▪ DID MMRP-09-004 & 09-007 ▪ Worksheet #17 & 18 ▪ Worksheet #21 & 23 ▪ Worksheet # 22, 24, & 25 ▪ Worksheet #29 ▪ APP/SSHP (Appendix F) ▪ SOPs (Appendix G) <ul style="list-style-type: none"> – SOP G-1 Field Documentation – SOP G-3 Surveying and Mapping – SOP G-5 Project Quality Control – SOP UXO-01 Surface and Subsurface 	UXOQCS and Project Geophysicist will perform inspections to verify all procedural requirements have been completed to include, but not limited to: <ul style="list-style-type: none"> ▪ Verify seeding results ▪ Verify daily testing of instruments and documented ▪ Verify team members are utilizing proper sweep techniques, including walking speed, coverage and lane width ▪ Verify all MEC/MPPEH is tracked for accountability purposes ▪ Verify proper 	<ul style="list-style-type: none"> ▪ Preparatory ▪ Initial ▪ Follow-up weekly ▪ Daily equipment checks at the start of each morning 	<ul style="list-style-type: none"> ▪ UXOQCS and Project Geophysicist verifies all geophysical survey requirements are followed by field personnel ▪ Any element not conforming to the specifications will be failed, corrected, resubmitted to QC ▪ If a failure criteria item, QC blind seed and/or TL seed is missed then the team will re-sweep the entire grid, a NCR and RCA will be performed and CA developed ▪ If an instrument fails testing requirement then

DFW	Inspection	Requirement	Reference	QC Action	Inspection Frequency	Acceptance Criteria ¹
6- Surface and Subsurface Clearance <i>(continued)</i>		<ul style="list-style-type: none"> swing and grid boundaries) ▪ TL reports all MEC to the SUXOS and HSM/UXOSO ▪ Record all MEC/MPPEH locations and disposition status ▪ Remove MD, range-related debris (RRD), and NMRD for inspection, segregation, transportation, and storage ▪ Record the quantity in lbs of MD, RRD, and NMRD removed from each grid ▪ MDAS containers marked IAW EM 385-1-97 ▪ Check a 2-ft radius around all anomalies ▪ All seeds detected and recovered 	<ul style="list-style-type: none"> Clearance – SOP UXO-02 Explosive Disposal Operations – SOP UXO-03 MMPH Management – SOP UXO-08 IVS and Geophysical Survey Equipment ▪ EMP (Appendix I) ▪ WMP (Appendix J) ▪ EPP (Appendix E) ▪ AMP (Appendix H) ▪ ERP 	<ul style="list-style-type: none"> handling of MPPEH, MD, RRD and NMRD ▪ UXOQCS will sample a minimum of 10% of each grid to verify all detectable anomalies have been investigated ▪ All grids will contain at least one QC emplaced blind seed item buried at depths up to 24 inches. 5% or more of the grids will contain additional seeds randomly placed throughout the grid ▪ Any missed seed items will result in a Non-conformance Report (NCR) and a root-cause analysis (RCA), which may include rework of the grid or additional CAs ▪ Verify anomalies have been resolved to depth ▪ Ensure all metal 		<ul style="list-style-type: none"> equipment will be repaired or replaced. The TL will report the results of any defective equipment to the SUXOS and UXOQCS on the DOTR ▪ Inspection of MPPEH is being conducted IAW UFP-QAPP and EM 385-1-97 ▪ Personnel are qualified to certify/verify MDAS ▪ Ensure all metal greater than or equal to the SMC are removed from the soil to a depth 2 ft bgs within the limitations in detection technology

DFW	Inspection	Requirement	Reference	QC Action	Inspection Frequency	Acceptance Criteria ¹
6- Surface and Subsurface Clearance <i>(continued)</i>				greater than or equal to the smallest munitions of concern (SMC) are removed to 2 ft bgs within the limitations in detection technology <ul style="list-style-type: none"> ▪ Verify all documentation is completed and correct 		
		<u>Coverage (Analog and DGM):</u> <ul style="list-style-type: none"> ▪ Analog Line Spacing: no more than 5 ft wide and all blind seeds will be detected and recovered ▪ Blind seeds will be placed at a sufficient frequency so that they can be used for daily quality checks at a rate of 1 per day per team required. 		<ul style="list-style-type: none"> ▪ UXOQCS and TL verify proper coverage by visual observations (analog) of ropes/flags, overlap and blind seeding 	<ul style="list-style-type: none"> ▪ TL-Daily ▪ UXOQCS-Prep, Initial and weekly Follow-up surveillance 	<ul style="list-style-type: none"> ▪ All coverage requirements meet project requirements ▪ All seeds recovered
		<u>Anomaly Detection/Selection:</u> <ul style="list-style-type: none"> ▪ Analog anomalies identified within project criteria as determined by the IVS test results ▪ Analog anomalies are excavated real time or flagged during analog surveys for subsequent investigation 		<ul style="list-style-type: none"> ▪ UXOQCS and/or TL observes geophysical instrument response ▪ UXOQCS performs blind seeding reconciliation and 10% acceptance sampling 	<ul style="list-style-type: none"> ▪ TL-Daily ▪ UXOQCS-Prep, Initial and weekly Follow-up surveillance and 100% QC Acceptance sampling of all 	<ul style="list-style-type: none"> ▪ All anomaly selection procedures will be reviewed for adherence to project criteria by Project Geophysicist ▪ All seeds

DFW	Inspection	Requirement	Reference	QC Action	Inspection Frequency	Acceptance Criteria ¹
6- Surface and Subsurface Clearance <i>(continued)</i>		<p><u>DGM Collection Checks:</u> <u>Along Line Density:</u></p> <ul style="list-style-type: none"> ▪ 98% of all electromagnetic data samples ≤25 cm along lines <p><u>DGM Data Processing:</u></p> <ul style="list-style-type: none"> ▪ Visual reviews of DGM maps for anomaly shape characteristics ▪ Verify sensor to positioning antenna offsets <p><u>Instrument Latency:</u></p> <ul style="list-style-type: none"> ▪ No zig-zag or chevron effects demonstrated in IVS <p><u>DGM Anomaly Selection:</u></p> <ul style="list-style-type: none"> ▪ DGM anomalies identified within project criteria as determined by the IVS test results ▪ Anomalies are selected according to project design, selection criteria, and classification scheme ▪ Visual review and/or automated verification of anomaly proximities ▪ Blind Seeds: Peak response greater than 65% of minimum expected response (as determine from the average of several passes of the IVS) 			grids	discovered <ul style="list-style-type: none"> ▪ Ensure all metal greater than or equal to the SMC are removed from the soil to a depth 2 ft bgs within the limitations in detection technology

DFW	Inspection	Requirement	Reference	QC Action	Inspection Frequency	Acceptance Criteria ¹
6- Surface and Subsurface Clearance <i>(continued)</i>		<p><u>DGM Anomaly Reacquisition and Resolution:</u> <u>Equipment Checks:</u></p> <ul style="list-style-type: none"> ▪ Process geophysical instrument through IVS, pass or fail and verify expected response ▪ RTK GPS accuracy within ± 10 cm of survey control point <p><u>Reacquisition:</u></p> <ul style="list-style-type: none"> ▪ Verify detected and selected anomalies are marked using a non-metallic pin flag labeled with unique anomaly identifier (ID) at selected anomaly locations for excavation ▪ Anomaly is marked within 30cm of Data Processor's anomaly location ▪ Intrusive metallic results coincide with anomaly amplitudes ▪ Anomalies with no metallic finds or results mismatch amplitude will be checked by original detection instrument or intrusively excavated to 2 ft ▪ All blind seeds are recovered ≤ 35 cm + $\frac{1}{2}$ line/sensor spacing 				
	Personnel Requirements	<ul style="list-style-type: none"> ▪ UXO-qualified personnel ▪ Project Geophysicist ▪ Field Technicians 				

DFW	Inspection	Requirement	Reference	QC Action	Inspection Frequency	Acceptance Criteria ¹
6- Surface and Subsurface Clearance <i>(continued)</i>		<ul style="list-style-type: none"> ▪ Field Geophysical Technicians ▪ Data Processor 				
	Documentation	<ul style="list-style-type: none"> ▪ Field forms filled out on tablets and imported into Access Database ▪ Data processing forms in Access Database including QC tables ▪ Geophysical maps of processed data and corresponding dig sheets with selected anomalies (DGM) ▪ All raw and processed geophysical data packages with initial “read-me” files ▪ Field forms (<i>e.g.</i>, DOTR and Grid Report Form) ▪ Logbooks ▪ GPS data ▪ Photographs 		<ul style="list-style-type: none"> ▪ SUXOS, UXOQCS and Project Geophysicists must review all field forms, and logbooks 	<ul style="list-style-type: none"> ▪ Daily- SUXOS and Project Geophysicist ▪ Weekly- UXOQCS and during review and QC sampling of each grid package 	<ul style="list-style-type: none"> ▪ All documentation requirements are followed by field personnel
7- Explosive Disposal Operations	Performance Requirement	<u>Safety:</u> <ul style="list-style-type: none"> ▪ Perform operational safety brief ▪ Perform communication checks ▪ Communicate safety warnings ▪ Perform vehicle inspections/checks <u>Explosive Disposal:</u> <ul style="list-style-type: none"> ▪ Ensure coordination and notifications are complete 	<ul style="list-style-type: none"> ▪ EM 385-1-97 ▪ ESS ▪ Worksheet #17 & 18 ▪ Worksheet #21 & 23 ▪ Worksheet #22, 24, & 25 ▪ Worksheet #29 ▪ Ordnance technical Data Sheets (Appendix 	UXOQCS will perform inspections to verify all procedural requirements have been completed to include, but not limited to: <ul style="list-style-type: none"> ▪ Verify communications 	<ul style="list-style-type: none"> ▪ Preparatory ▪ Initial ▪ Follow-up weekly ▪ Daily equipment checks at the start of each day ▪ Daily review 	<ul style="list-style-type: none"> ▪ All requirements are followed during explosive disposal activities ▪ All items safely and successfully identified and disposed of ▪ MEC Accountability

DFW	Inspection	Requirement	Reference	QC Action	Inspection Frequency	Acceptance Criteria ¹
7- Explosive Disposal Operations <i>(continued)</i>		<u>Post-Explosive Disposal:</u> <ul style="list-style-type: none"> ▪ 100% of MEC recorded ▪ 100% of all explosives used are accounted for ▪ Ensure proper receipt/turn-in of explosives ▪ MPPEH post-disposal inspection and segregation 	D) <ul style="list-style-type: none"> ▪ APP/SSHP (Appendix F) ▪ SOPs (Appendix G) <ul style="list-style-type: none"> – SOP G-1 Field Documentation – SOP G-3 Surveying and Mapping – SOP G-5 Project Quality Control – SOP UXO-02 Explosive Disposal Operations – SOP UXO-03 MPPEH Management – SOP UXO-04 Heavy Equipment and Earth Moving Machinery Operations – SOP UXO-07 X-Ray Operations ▪ EMP (Appendix I) ▪ WMP (Appendix J) ▪ ESS 	and safety warnings <ul style="list-style-type: none"> ▪ Verify vehicle checks completed ▪ Verify all pre-operational checks completed ▪ Verify evacuation and Exclusion Zone (EZ) establishment ▪ Verify proper handling of MPPEH to include field team inspection, segregation, and transportation ▪ Verify explosives inventories are being conducted (upon receipt and turnovers). Verify that a DS is utilized ▪ Verify proper handling of MEC or MPPEH 	by the SUXOS and PM of the MEC Accountability Log and Daily Activity Report (DAR)	Log accurate, current, and contains required data elements and GPS coordinate accuracy
	Personnel Requirements	<ul style="list-style-type: none"> ▪ UXO-qualified Technicians ▪ UXO-qualified Technician with Blaster License Hawaiʻi Certificate of Fitness (COF) 				
	Documentation	<ul style="list-style-type: none"> ▪ Field forms (<i>i.e.</i>, MEC Accountability Log) ▪ MEC Accountability Log contains GPS coordinates with accuracy of ± 30 cm ▪ Logbook ▪ GPS data ▪ Photographs 				

DFW	Inspection	Requirement	Reference	QC Action	Inspection Frequency	Acceptance Criteria ¹
8- MPPEH Management	Performance Requirement	<ul style="list-style-type: none"> ▪ 100% inspection by two UXO-qualified Technicians ▪ MPPEH will be vented/disposed and then re-inspected ▪ MDAS, once 100% visually inspected and deemed free of explosive hazard, will be segregated and transported to the collection area ▪ MDAS will be inspected, placed in storage container and secured ▪ 100% inspection, certification, and documentation by SUXOS with verification by USACE OESS or UXOQCS ▪ Non-munitions related items should be inspected and segregated from MDAS and MPPEH 	<ul style="list-style-type: none"> ▪ EM 200-1-15 ▪ EM 385-1-97 ▪ Worksheet #17 & 18 ▪ Worksheet # 29 ▪ APP/SSHP (Appendix F) ▪ SOPs (Appendix G) <ul style="list-style-type: none"> – SOP G-1 Field Documentation – SOP G-3 Surveying and Mapping – SOP G-5 Project Quality Control – SOP UXO-03 MPPEH Management – SOP UXO-05 Demilitarization Operations – SOP UXO-06 Batch Burner Thermal Treatment – SOP UXO-07 X-Ray Operations ▪ DDESB TP-18 ▪ EMP (Appendix I) ▪ WMP (Appendix J) ▪ ESS 	<p>UXOQCS will perform inspections to verify all procedural requirements have been completed to include, but not limited to:</p> <ul style="list-style-type: none"> ▪ Verify proper field inspection and handling procedures of MPPEH daily and record in the Daily Quality Control Report (DQCR) ▪ Conduct an inspection at least weekly on MPPEH/MDAS processing, storage and disposition to verify proper procedures and documentation and record results in a QC Inspection Report and the DQCR ▪ Verify field notes, logbooks and DoD Form 1348-1A documentation accurate, complete, 	<ul style="list-style-type: none"> ▪ Preparatory ▪ Initial ▪ Follow-up weekly ▪ Daily equipment checks before the start of work each day ▪ Daily checks by the SUXOS and/or UXOQCS of MDAS collection 	<ul style="list-style-type: none"> ▪ UXOQCS verifies all requirements are followed during MPPEH management activities ▪ If the chain-of-custody (COC) is broken or unverifiable, then 100% of the corresponding MDAS must be re-inspected and/or certified
	Personnel requirements	<ul style="list-style-type: none"> ▪ Two UXO-qualified Technicians (UXO Technician III and UXO Technician II) ▪ SUXOS ▪ UXOQCS ▪ USACE OESS 				
	Documentation	<ul style="list-style-type: none"> ▪ Field forms (<i>i.e.</i>, 1348-1A) ▪ Logbooks ▪ GPS data ▪ Photographs 				

DFW	Inspection	Requirement	Reference	QC Action	Inspection Frequency	Acceptance Criteria ¹
8- MPPEH Management <i>(continued)</i>				<ul style="list-style-type: none"> and consistent ▪ Ensure weights are recorded on each storage container with label information, locks, and final seals ▪ Certification Letter for Final Disposition and RAR 		
9- Data Management	Performance Requirement	<p><u>Data Input:</u></p> <ul style="list-style-type: none"> ▪ Upload electronic (<i>e.g.</i>, GPS) data daily into project GIS database ▪ Scan hard copy logbooks/field forms and upload to project database weekly <p><u>Data Verification:</u></p> <ul style="list-style-type: none"> ▪ All electronic and hard copy data are QC'd 	<ul style="list-style-type: none"> ▪ DID MMRP-09-007 ▪ EM 200-1-15 ▪ Worksheet #17 & 18 ▪ Worksheet # 29 ▪ All SOPs (Appendix G) 	<p>UXOQCS and GIS Manager will perform inspections to verify all procedural requirements have been completed to include, but not limited to:</p> <ul style="list-style-type: none"> ▪ Verify all project activities are properly documented in field logbooks and field forms ▪ Conduct daily/weekly QC of project data and verify upload to project database as appropriate 	<ul style="list-style-type: none"> ▪ GIS Technician and/or GIS Manager will review all data uploads daily ▪ PM, GIS Manager, and UXOQCS will review the GIS database, maps, and reporting weekly ▪ The QCM and GIS Manager will review the GIS database at least once during the project and at the end of data 	<ul style="list-style-type: none"> ▪ All electronic data loaded to project database (as appropriate) and QC'd ▪ All hard copy data loaded to project file and QC'd ▪ Data collection methods and Data Usability meet project data requirements
	Personnel Requirement	<ul style="list-style-type: none"> ▪ Field Technicians ▪ GIS Technicians ▪ GIS Manager ▪ UXOQCS ▪ PM ▪ Project Geophysicist ▪ QCM 				

DFW	Inspection	Requirement	Reference	QC Action	Inspection Frequency	Acceptance Criteria ¹
9- Data Management <i>(continued)</i>	Documentation	<ul style="list-style-type: none"> ▪ Field Forms ▪ Logbooks ▪ Project Status Reports and Maps 		<ul style="list-style-type: none"> ▪ Conduct weekly surveillance on project status reports and database 	collection during the data usability assessments	
11- Site Restoration	Performance Requirement	<ul style="list-style-type: none"> ▪ All excavations backfilled ▪ No unprotected open holes to remain overnight ▪ Grid and boundary stakes removed ▪ All contractor trash removed ▪ Any modifications to the work site deemed necessary restored to pre-existing conditions where possible 	<ul style="list-style-type: none"> ▪ Worksheet #17 & 18 ▪ APP/SSHP (Appendix F) ▪ EPP (Appendix E) ▪ SOPs (Appendix G) <ul style="list-style-type: none"> – SOP G-1 Field Documentation – SOP G-5 Project Quality Control ▪ WMP (Appendix J) 	UXOQCS will perform inspections to verify all procedural requirements have been completed to include, but not limited to: <ul style="list-style-type: none"> ▪ Verify all excavations are backfilled or properly barricaded ▪ Verify all temporary stakes and contractor trash are removed 	<ul style="list-style-type: none"> ▪ During QC acceptance sampling for each grid ▪ During final QC inspection walk through of project site 	<ul style="list-style-type: none"> ▪ UXOQCS verifies all requirements are followed for site restoration ▪ Site terrain is returned as close as possible to its original state with all project items and debris removed
	Documentation	<ul style="list-style-type: none"> ▪ Field forms (<i>e.g.</i>, DQCR) ▪ Logbooks 				

DFW	Inspection	Requirement	Reference	QC Action	Inspection Frequency	Acceptance Criteria ¹
11-Demobilization	Performance Requirement	<ul style="list-style-type: none"> ▪ All travel arrangements, equipment, work trailers, and vehicles have been arranged for demobilizing 	<ul style="list-style-type: none"> ▪ Worksheet #17 & 18 ▪ APP/SSHP (Appendix F) ▪ SOP G-1 Field Documentation (Appendix G) 	UXOQCS will perform inspections to verify all procedural requirements have been completed to include, but not limited to: <ul style="list-style-type: none"> ▪ Confirm travel arrangements, equipment, and vehicles have been arranged for demobilizing; and ▪ Inspect and review all Field documentation for the RAR 	<ul style="list-style-type: none"> ▪ When conducted 	<ul style="list-style-type: none"> ▪ All demobilization requirements are completed prior to ending fieldwork phase of RA
	Documentation	<ul style="list-style-type: none"> ▪ Field forms (<i>e.g.</i>, DQCR) ▪ Logbooks 				

Notes:

¹ Any element not conforming to the specifications will result in RCA and CAs being required. Where appropriate, a NCR will be issued and a RCA and Corrective Action Request (CAR) will be developed. If necessary, a stop work may be issued or individuals may not be allowed to work.

DFW - definable feature of work

This Page Intentionally Left Blank

Worksheet # 13: Secondary Data Uses and Limitations

Data Type	Data Source	How Data Will Be Used	Limitations on Data Use
INPR	USACE, 1996. <i>DERP-FUDS Inventory Project Report, Waikane Training Area, Waikane, Island of Oʻahu, Hawaiʻi, Site No. H09HI035400.</i> May.	This document provides site summary, findings and determination of eligibility, project summary, cost estimate, and sources of information and will be used as reference for planning activities.	None
INPR Supplement	USACE, 2004. <i>INPR Supplement, Waikane Training Area, FUDS Property Number: H09HI0354.</i> November.	This document provides information supplemental to the 1996 INPR and will be used as reference for planning activities.	None
EE/CA	USACE, 2008. <i>Final Engineering Evaluation/Cost Analysis (EE/CA) Report, Former Waikane Valley Training Area, Island of Oʻahu, Hawaiʻi.</i> November.	This document provides source, nature, and extent of MEC; summary of site conditions; response action alternatives; recommended alternatives; summary of recurring review plan; and costs information and will be used as reference for planning activities.	None
NTCRA	USACE, 2012a. <i>Final Site Specific Final Report, Munitions and Explosives of Concern (MEC) Removal Action and Supporting Functions, Waikane Training Area, Island of Oʻahu, Hawaiʻi.</i> July.	This document provides operational history, munitions data and disposal practices information and will be used as reference for planning activities.	None
RI	USACE, 2012b. <i>Final Remedial Investigation (RI) Report, Former Waikane Training Area, Kaneohe, Oʻahu, Hawaiʻi.</i> August.	This document provides operational history, characterization of MEC and MC, risk and MEC HA, and CSM information and will be used as reference for planning activities.	None
FS	USACE, 2013a. <i>Final Feasibility Study (FS) Report, Former Waikane Training Area, Kaneohe, Oʻahu, Hawaiʻi.</i> June.	This document presents the remedial alternatives evaluated for the Southeastern Region MRS and will be used as reference for planning activities.	None

Data Type	Data Source	How Data Will Be Used	Limitations on Data Use
PP	USACE, 2013b. <i>Final Proposed Plan, Western/Mountainous Region MRS and Southeastern Region MRS, Former Waikane Training Area, Kaneohe, Oʻahu, Hawaiʻi.</i> December.	This document presents the site background, site characteristics, scope and role of response action, summary of site risks, remedial action objectives, summary and evaluation of remedial alternatives, and the preferred alternative for the Southeastern Region MRS and will be used as reference for planning activities.	None
DD	USACE, 2015a. <i>Decision Document, Southeastern Region MRS, RMIS ID: H09HI035401, Waikane Training Area, Kaneohe, Oʻahu, Hawaiʻi.</i> July.	This document presents the selected remedial alternative for the Southeastern Region MRS and will be used as reference for planning activities.	None

Worksheet # 14 & 16: Project Tasks and Schedule

The implementation of the geophysical and intrusive investigation is divided into DFWs and the tasks required for completing each DFW. They are identified in the table below. Additional discussion about implementing these tasks is provided in Worksheets #12, #17 & 18, and #34, 35, & 36, and SOP G-5 *Project Quality Control*. Specific instructions are provided in the project SOPs listed in Worksheet #21 & 23 and provided in Appendix G.

14.1 Project Tasks

DFW	Tasks	Supporting Documentation
Mobilization	<ul style="list-style-type: none"> ▪ Planning documents (<i>e.g.</i>, ESS, UFP-QAPP, AMP) approved ▪ ROEs approved ▪ Personnel resumes and certificates approved ▪ Site orientation and training completed 	<ul style="list-style-type: none"> ▪ UFP-QAPP and all Appendices ▪ All SOPs (Appendix G)
Site Preparation^{1,2}	<ul style="list-style-type: none"> ▪ EZ and support zones established ▪ Survey control established by Hawaiʻi licensed PLS ▪ Boundary survey established ▪ Grid layout established 	<ul style="list-style-type: none"> ▪ SOP G-1 ▪ SOP G-2 ▪ SOP G-3 ▪ SOP G-5 ▪ SOP UXO-08 ▪ APP/SSHP (Appendix F)

DFW	Tasks	Supporting Documentation
Biological and Archaeological Surveys and Monitoring ^{1,2}	<ul style="list-style-type: none"> ▪ Biological and archaeological brief completed by Qualified personnel ▪ Biological and archaeological surveys conducted by Qualified personnel ▪ Biological and archaeological monitoring and avoidance, if required, performed by field personnel 	<ul style="list-style-type: none"> ▪ SOP G-1 ▪ SOP G-2 ▪ SOP G-3 ▪ SOP G-5 ▪ SOP UXO-08 ▪ EPP (Appendix E) ▪ APP/SSHP (Appendix F) ▪ AMP (Appendix H) ▪ ERP
Vegetation Clearance ^{1,2}	<ul style="list-style-type: none"> ▪ Grasses, small scrubby brush, and trees less than 3 inches in diameter removed 	<ul style="list-style-type: none"> ▪ SOP G-1 ▪ SOP G-2 ▪ SOP G-4 ▪ SOP G-5 ▪ EPP (Appendix E) ▪ APP/SSHP (Appendix F) ▪ AMP (Appendix H) ▪ WMP (Appendix J) ▪ ERP

DFW	Tasks	Supporting Documentation
IVS ^{2,3}	<ul style="list-style-type: none"> ▪ IVS installed ▪ Equipment testing performed ▪ Blind seeds installed in IVS ▪ IVS Letter Report prepared 	<ul style="list-style-type: none"> ▪ SOP G-1 ▪ SOP G-2 ▪ SOP G-3 ▪ SOP G-5 ▪ SOP UXO-01 ▪ SOP UXO-08 ▪ EPP (Appendix E) ▪ APP/SSHP (Appendix F) ▪ AMP (Appendix H) ▪ ERP
Surface and Subsurface Clearance ^{2,3}	<ul style="list-style-type: none"> ▪ Equipment functionality testing performed ▪ Survey lanes established ▪ Coverage seeding emplaced in grids ▪ Analog survey conducted ▪ Analog anomalies detected flagged and locations recorded in GPS ▪ Excavate anomalies ▪ Seeds recovered ▪ Record anomaly results in GPS and/or Grid Report Form ▪ MPPEH explosives safety status determination ▪ MEC/MDEH safe or unsafe to move determination and explosive disposal operations ▪ MDAS storage ▪ Submit for QC 	<ul style="list-style-type: none"> ▪ SOP G-1 ▪ SOP G-3 ▪ SOP G-5 ▪ SOP UXO-01 ▪ SOP UXO-02 ▪ SOP UXO-03 ▪ SOP UXO-08 ▪ EPP (Appendix E) ▪ APP/SSHP (Appendix F) ▪ AMP (Appendix H) ▪ EMP (Appendix I) ▪ WMP (Appendix J) ▪ ERP ▪ ESS

DFW	Tasks	Supporting Documentation
Explosive Disposal Operations	<ul style="list-style-type: none"> ▪ Conduct safety briefings ▪ Coordinate notifications and EZ control ▪ Accept and store explosives IAW the ESS (explosives and magazine will be supplied by the explosive vendor on a as needed basis) ▪ Prepare site for disposal operations (<i>e.g.</i>, construct engineering controls if required) ▪ Check remote firing device system ▪ Perform explosive disposal during time window and clear shot 	<ul style="list-style-type: none"> ▪ SOP G-1 ▪ SOP G-3 ▪ SOP G-5 ▪ SOP UXO-02 ▪ SOP UXO-03 ▪ SOP UXO-04 ▪ SOP UXO-07 ▪ Ordnance Technical Data Sheets (Appendix D) ▪ APP/SSHP (Appendix F) ▪ EMP (Appendix I) ▪ WMP (Appendix J) ▪ ESS
MPPEH Management²	<ul style="list-style-type: none"> ▪ MPPEH certification and verification process (two independent 100% inspections) ▪ Prepare and maintain COC for all MEC, MDEH, and MDAS items ▪ Establish controls to prevent comingling between MPPEH, MDAS, and MDEH ▪ MDAS packaging, storage, and transportation compliant with existing directives including restricted/secure area ▪ MDAS accountability and security and transfer to a qualified receiver compliant with existing directives 	<ul style="list-style-type: none"> ▪ SOP G-1 ▪ SOP G-3 ▪ SOP G-5 ▪ SOP UXO-03 ▪ SOP UXO-05 ▪ SOP UXO-06 ▪ SOP UXO-07 ▪ APP/SSHP (Appendix F) ▪ EMP (Appendix I) ▪ WMP (Appendix J) ▪ ESS

DFW	Tasks	Supporting Documentation
Data Management	<ul style="list-style-type: none"> ▪ Provide field team with required electronic and hard copy data (maps, GIS shapefiles) prior to going into the field ▪ Interface with GIS Manager to upload/download data ▪ Provide field team with maps and data files (<i>e.g.</i>, coordinates) for clearance operations ▪ Upload field data files (<i>e.g.</i>, field forms, photos, geophysical and sample data) onto project server and into project database as appropriate ▪ Verify that all field data files are accurate, complete and present on backup media on remote server prior to demobilization 	<ul style="list-style-type: none"> ▪ All SOPs (Appendix G)
Site Restoration	<ul style="list-style-type: none"> ▪ Backfill excavations (return excavated soil to the hole in reverse order) ▪ Remove temporary stakes ▪ Site cleanup 	<ul style="list-style-type: none"> ▪ SOP G-1 ▪ SOP G-5 ▪ EPP (Appendix E) ▪ APP/SSHP (Appendix F) ▪ WMP (Appendix J)
Demobilization	<ul style="list-style-type: none"> ▪ Equipment demobilization ▪ MDAS shipped ▪ Travel arrangements 	<ul style="list-style-type: none"> ▪ SOP G-1 ▪ APP/SSHP (Appendix F)

Notes:

¹ UXO Technician II escort provided for anomaly avoidance.

² If MPPEH is found, an explosives safety status determination will be made and documentation performed (as MEC/ MDEH or MDAS).

³ Whether geophysical surveys, surface clearance, subsurface clearance are done by the same team or on the same day will be depend on site conditions and the needs and discretion of operations. In all cases, DFWs will be completed IAW the MPCs and inspected by the UXOQCS.

This Page Intentionally Left Blank

14.2 Schedule

Task	Organization	Dates		Deliverable	Deliverable Due Date ^{1, 2}
		Anticipated Date of Initiation ¹	Anticipated Date of Completion ¹		
Kick Off Meeting	GSIP	October 2015	October 2015	Yes ³	October ³
Preliminary Planning and UFP-QAPP Development (including APP/SSHP)	GSIP	October 2015	December 2016	Yes	December 2016
ESS	GSIP	October 2015	December 2016	Yes	December 2016
AMP	SCS ⁴	October 2015	December 2016	Yes	December 2016
ERP	GSIP/GA ⁴	October 2015	December 2016	Yes	December 2016
Biological Survey and Monitoring	GA ⁴	January 2017	March 2017	Yes ⁵	June 2017 ⁵
Archaeological Survey and Monitoring	SCS ⁴	January 2017	March 2017	Yes ⁶	June 2017 ⁶
RA Field Activities	GSIP	January 2017	March 2017	Yes ⁷	June 2017 ⁷
RAR	GSIP	March 2017	June 2017	Yes	June 2017

Notes:

¹ As a living schedule, dates are subject to change.

² Date of Final version submittal.

³ Meeting minutes will be generated.

⁴ Managed and subcontracted by GISP as the prime contractor.

⁵ Results from the biological survey/monitoring will be included in the RAR.

⁶ Results from the archaeological surveying/monitoring will be included in an Archaeological Monitoring Report submitted separately to USACE POH.

⁷ Several field documents will be generated from the RA field activities and will be included in the RAR. Refer to Worksheet #29 for a list of documents.

This Page Intentionally Left Blank

Worksheet # 15: Project Action Limits and Laboratory-Specific Detection/Quantitation Limits

This worksheet is not applicable. MC sampling will not be conducted for this project.

This Page Intentionally Left Blank

Worksheet # 17 & 18: Sampling Design and Rationale

This Worksheet describes the project design and rationale for the MEC RA at the 36-acre area of the Southeastern Region MRS (Figure 2, Appendix C). All RA activities will be conducted IAW the approved UFP-QAPP, ESS, and other relevant guidance documents.

17.1 Removal Action Objectives

The objective of the RA is to remove the explosives safety hazard posed by MEC and MPPEH from the 36-acre RA area located in the Southeastern Region MRS. The objective will be achieved by:

- Locating and removing surface and subsurface MPPEH, MEC, MD, and RRD equal to or greater than the size of the SMC (*i.e.*, 37mm projectile), to a depth of 2 ft bgs within the limitations in detection technology;
- MPPEH processing and management;
- Conducting MEC explosive disposal operations; and
- MDAS management and disposal.

17.2 Data Quality Objectives

The DQO process will be followed to determine the quality of data and define the level of certainty required to support remedial decisions. The project DQOs are provided in Worksheet #11.

17.2.1 Quality Control

The UXOQCS will conduct continual inspections of operational processes in order to verify that field procedures are conducted IAW the project UFP-QAPP. SOP G-5 *Project Quality Control* outlines the QC requirements to be implemented to ensure that overall project activities are accomplished using a set of controls and systematic procedures to ensure quality of data and to ensure DQOs are achieved. The intent of such controls is to eliminate conflicts, errors, and omissions and to ensure the technical accuracy of deliverables. Specific topics covered in SOP G-5 include the project specific QC program, personnel, QC process (*e.g.*, three phase inspection process), equipment standardization and maintenance, deficiencies and noncompliance, CAs, and associated documentation and recordkeeping. Supplemental information related to the project QC requirements are presented in Worksheets #12 (*MPCs*), #22, 24, & 25 (*Field Equipment Calibration, Maintenance, Testing and Inspection*), #34, 35, & 36 (*Data Verification, Validation Inputs, and Procedures*) and #37 (*Data Usability Assessment*).

17.2.2 Quality Assurance

In addition to the QC activities performed by GSIP, the USACE PDT (*e.g.*, USACE PM, USACE Geophysicist, and USACE OESS) will provide onsite QA oversight during the RA field investigation. The amount and types of QA performed will be at the discretion of the USACE

PDT and Quality Assurance Surveillance Plan (QASP). The QASP includes the systematic methods used by the government to monitor the performance of the project team. The USACE will also provide QA by reviewing deliverables such as this UFP-QAPP prior to conducting fieldwork and other project related documents to ensure the work was completing IAW with the PWS requirements.

17.2.3 Data Incorporation into the Removal Action

The results of the RA will be documented in a RAR, which the project team will deliver upon completion of the fieldwork. The RAR will be completed IAW the Interim Guidance 06-04 (Engineer Pamphlet [EP] 1110-1-18) and additional requirements of DID MMRP-09-013, as appropriate.

17.3 Removal Action Plan

The Removal Action Plan outlines the personnel, field procedures, equipment, QC metrics, and safety protocols to be followed during the RA at the 36-acre area within the Southeastern Region MRS. The RA process will include the following steps:

- Mobilization and site preparation;
- Biological and archaeological surveys and monitoring;
- Vegetation clearance;
- IVS;
- Surface and subsurface MEC removal;
- Explosive disposal operations;
- MPPEH processing and management;
- MDAS processing, certification, and transfer;
- Data management;
- Site restoration; and
- Demobilization.

17.3.1 Mobilization

The project team will mobilize the necessary personnel and equipment to the site. Field personnel (including subcontractors) will be familiarized with the site and evaluate routes of ingress and egress. Before RA operations commence, all personnel will attend a site-specific orientation and safety training. The purpose of the orientation and training will be to review RA field activities and emergency response procedures as specified in the project UFP-QAPP and APP/SSHP (Appendix F). Course attendance sheets with attached curriculums will be used to document the completion of each session.

17.3.2 MEC and Safety Considerations

17.3.2.1 Anticipated MEC

The Southeastern Region MRS is within the former WTA. The Southeastern Region MRS was used from 1942 to 1976 by the DoD as a training and artillery impact area. The types of MEC/MD potentially present within the MRS based on previous investigations include:

- 37mm HE Projectile, M63 or MKII;
- 75mm HE Projectile, M48;
- 37mm APC-T Projectile, M51;
- 3-inch HE Projectile, M42/M42A1;
- 58mm HE Mortar, Type 89;
- 60mm HE Mortar, M49A2/M49A3;
- 81mm HE Mortar, M56 or M43A1/M43A1B1;
- 60mm Practice, M50A2/M50A3;
- 81mm Practice, M43A1;
- 2-inch Smoke Mortar, M3;
- 2.36-inch HEAT Rocket, M6A1;
- 3.5-inch HEAT Rocket, M28A2;
- Rifle Grenade HEAT, M9A1;
- Grenade Frag, MKII;
- Grenade HEAT, M28;
- Grenade Smoke, M18 or AN-M8;
- Grenade Training, MK1A1;
- 0.50 lb TNT Block;
- Signal Illumination, M17/M19/M21/M51;
- Signal, Smoke and Illumination, AN-MK13 Mod 0;
- Trip Flare, M48;
- Flare, Surface, M49A1;
- Simulator, M27A1B1;
- Artillery Flash Simulator, M110;
- Firing Device, M1;
- Fuze PD, M52;

- Fuze PD, M58;
- Fuze PDSQ, M48;
- Fuze PDSQ, M51;
- Fuze PDSQ, M54;
- Small arms debris; and
- Unidentifiable munitions fragments of varying sizes.

17.3.2.2 UXO Technicians

UXO personnel will meet or exceed the standards stated in EM 385-1-97 and DDESB TP-18. Each UXO team will follow composition standards as required for the RA collection activities:

- During activities that require anomaly avoidance (*e.g.*, geodetic survey), a minimum of one UXO Technician II will be present;
- During activities that require intrusive operations, a minimum of one UXO Technician III and one UXO Technician II will be present; and
- During MEC disposal or MPPEH venting activities, a minimum of one UXO Technician III and one UXO Technician II will be present with a current Hawaiʻi COF.

Oversight and site control will be maintained by the SUXOS, HSM/UXOSO, and the UXOQCS following team organizational standards.

17.3.2.3 MEC Identification

Only qualified UXO Technicians can identify and determine the explosive safety status of MPPEH found during RA activities. The SUXOS and HSM/UXOSO will make the final determination of the item's explosive safety status or classification as a "safe to move" or "BIP" item.

17.3.2.4 MEC Accountability

The discovery location of each MEC item will be recorded using RTK GPS or Total Station and photographed. All MEC will be tracked from discovery to disposal and included in the project files including the MEC Accountability Log, MDAS COC forms, and demilitarization (DEMIL) facility documentation. Detailed tracking and records management is described in Worksheet #29.

17.3.2.5 Munitions with the Greatest Fragmentation Distance

The Munitions with the Greatest Fragmentation Distance (MGFD) and associated minimum separation distances (MSDs) for the Southeastern Region MRS are presented in the ESS.

17.3.2.6 Minimum Separation Distances

For safety purposes, EZs will be established at the project site while RA activities are being conducted. MSDs will be established and maintained IAW the ESS. The HSM/UXOSO will ensure that appropriate MSDs for non-essential and essential personnel are properly established and maintained IAW the approved ESS. Prior to the start of MEC activities, the SUXOS and HSM/UXOSO will verify that the EZ is clear of all non-essential personnel. The EZ is dependent upon the MSD for the MGFDF for the Southeastern Region MRS and the activities being performed. Additional details are provided in SOP UXO-02 *Explosive Disposal Operations* (Appendix G).

17.3.3 Site Preparation

Site preparation activities consisting of establishing temporary administrative facilities, survey control, RA boundary and grid locations. The activities are described further in SOP G-3 *Surveying and Mapping* (Appendix G) and summarized in the following sections.

17.3.3.1 Administrative Facilities

A temporary field office will be established at the Heʻeia staging area located off of Kamehameha Highway. The facility will include modular storage/office space with electricity and internet, and a parking area. The field office will be outfitted with temporary/potable water service, and portable sanitary facilities. The field office will serve as the base of operations for site management, safety meetings, equipment storage/repair, battery charging, two-way radio communications with field teams, and coordination with local authorities for the fieldwork. The field office will be used to stage lockable storage units for MDAS awaiting processing and transfer off site for ultimate disposition and recycling.

17.3.3.2 Site Survey

Site surveys will be conducted to establish survey control, site boundaries, and grid locations using GPS or Total Station techniques. A grid system will be used to track progress and results during RA activities (*e.g.*, geophysical surveys, surface and subsurface removal). The following sections describe the GPS equipment, personnel and site survey procedures that will be utilized during the RA.

17.3.3.2.1 GPS Survey Equipment

The GSIP team will utilize various types of GPS equipment during the course of the RA. The types of GPS equipment are as follows:

- RTK GPS (cm precision positioning);
- Mapping grade GPS (+/-1 to 2 m precision positioning); and
- Recreational grade GPS (+/-4 m precision positioning).

RTK GPS equipment will be employed during the site preparation activities (*e.g.*, establishing survey control, site boundaries, and grid corners) and recording MEC locations. Handheld GPS (either mapping or recreational grade) units will be used for activities such as navigating to grids and logging features of interest.

QC procedures will be conducted to ensure the GPS equipment is functioning properly. At the start of each day, the field team will compare the position that the GPS receiver is reporting to a known control point location to ensure the GPS instrumentation is operating within the project accuracy specifications for each task. The results of the daily QC check for each serial numbered GPS unit will be recorded on the DOTR form and turned in to the SUXOS at the end of each day. RTK GPS will save a QC Check-in point at the beginning of the coordinate file and download at the end of each day.

Overhead vegetation cover, local topography, the elevation of the satellites in the sky, weather, and other factors can affect the quality of GPS location data. If the quality of the GPS location data is poor, locations will be determined and recorded by additional measures such as fixed point bearings and distance markings. Field MPCs and QC procedures are detailed in Worksheets #12 and #22, 24, & 25.

All site preparation data (*e.g.*, field forms, logbooks, and GPS data) will be reviewed by the UXOQCS and loaded to the project server for subsequent review by the personnel identified in Worksheet #34, 35, & 36. The documentation procedures are detailed in the Data Management Plan (DMP) (Worksheet #29) and SOPs G-1 *Field Documentation* and G-3 *Surveying and Mapping* (Appendix G).

17.3.3.2.2 Geodetic Survey

A UXO Technician II will escort a Hawaiʻi PLS during the establishment of geodetic survey control. Anomaly avoidance procedures will be utilized for placement of all control points. Primary survey control at the 36-acre RA area will be established utilizing GPS survey techniques IAW EM 1110-1-1002 and EM 1110-1-1005. The project datum and coordinate system will be the NAD83, PA11 realization, epoch 2010.0 projected to UTM Zone 4 coordinates utilizing meters. Vertical control will be referenced to msl. Vertical positions will be established utilizing GPS observations and a high resolution Geoid model (*i.e.*, National Geodetic Survey Geoid12B). The survey control points will be loaded to the GPS field units and uploaded to the GIS project database.

17.3.3.2.3 Boundary Survey

A boundary survey will be conducted by a UXO Technician II (or higher) for anomaly avoidance and verified by the PLS for the RA area. The boundary survey will be completed using a Trimble RTK GPS unit. Each boundary control point location (*i.e.*, exterior boundary of the RA site) will be GPS surveyed and a wooden stake with fluorescent flagging will mark the location of the spike. The wooden stake will have the unique boundary control point ID. If the boundary control point needs to be moved due to vegetation, terrain, or subsurface anomaly, the closest accessible removal action boundary location will be selected and the new location added to the

project GIS for tracking. The final boundary control points will be loaded to the GIS project database.

17.3.3.2.4 Grid Survey

Upon completion of the vegetation clearance (described in Section 17.3.6), the grid survey team will be escorted by a UXO Technician II or higher for anomaly avoidance to establish a 50 m by 50 m grid system using a Trimble RTK GPS unit. Grid corner locations will be marked with a wooden stake with fluorescent flagging denoted by a unique grid ID. The planned grid locations are shown on Figure 7 (Appendix C). The grid locations may be adjusted in the field due to site conditions determined during the boundary survey. The final grid locations will be loaded to the GPS field units for navigation and documentation purposes. In addition, the final grids will be loaded to the project GIS database for tracking and managing data generated during the RA activities.

17.3.4 Biological Survey and Monitoring

Prior to RA field operations, the field teams will be trained by a qualified botanist/biologist on how to identify sensitive plant and animal species. Biological surveys will be conducted at the site by a qualified botanist/biologist to identify threatened or endangered species. If sensitive areas are identified during RA activities, they will be marked by the field team and reported to the botanist/biologist and USACE. The field teams will be provided instruction on the types of activities that can be conducted to mitigate negative impacts to these sensitive areas. Results of the biological surveys will be included in the RAR. Biological surveys and monitoring will be conducted IAW the ERP.

17.3.5 Archaeological Survey and Monitoring

Prior to RA field operations, the field teams will be trained by a qualified archaeologist on how to identify sensitive archaeological sites. A qualified archaeologist will maintain a physical presence on site during the RA fieldwork. Archaeological surveys will be conducted at the site by a qualified archaeologist to identify significant cultural or archaeological sites. If a previously identified or unidentified potential archaeological site is found during RA activities, it will be immediately reported to the USACE and all clearance activity in that immediate vicinity will be halted until appropriate investigation and documentation can be conducted. Due to the sensitive nature, cultural findings cannot be released to the public. Results of the archaeological investigation will be presented in a separate report submitted to USACE POH. Archaeological surveys and monitoring will be conducted IAW the AMP (Appendix H).

17.3.6 Vegetation Clearance

A vegetation clearance will be conducted by UXO Teams to enable the surface and subsurface clearance in the 36-acre RA area. A qualified botanist/biologist will survey the 36-acre area for presence of RTE species prior to vegetation removal. The removal of these species will be prohibited until a biological consultation with the USACE is discussed. UXO Teams will remove only vegetation that will affect the RA work using hand tools or gas-powered machinery

while practicing anomaly avoidance techniques. Grasses, small scrubby brush, and trees less than 3 inches in diameter will be cut and left in place. Vegetation clearance activities will be conducted IAW SOP G-4 *Vegetation Clearance* (Appendix G). If MPPEH or MEC is found during vegetation clearance activities, it will be marked, avoided, and reported during anomaly avoidance. The SUXOS will assign a MEC Surface Clearance and/or Demolition Team to manage the MPPEH IAW SOP UXO-03 *Material Potentially Presenting an Explosive Hazard Management* and the ESS.

17.3.7 IVS and Geophysical Survey Equipment

An IVS will be installed and testing will be performed preceding the analog and DGM geophysical survey operations to determine geophysical protocols. An IVS Letter Report will detail the initial IVS findings and resulting geophysical protocols. The IVS Letter Report will be reviewed and approved by the USACE Project Geophysicist prior to the implementation. A verbal concurrence on equipment, procedures and threshold may be utilized to begin fieldwork while IVS Letter Report formal comments and edits are pending. A seeding program will be implemented to provide ongoing monitoring of the geophysical data collection quality. At the beginning of each day, the geophysical equipment will be checked to verify they are operating within the project specifications. All operators and their analog detection equipment will be processed through the IVS each morning before operations and the results of the daily test will be documented in the DOTR. Additional equipment and calibration checks are detailed in Worksheet #22, 24, & 25. Field MPCs and QC procedures for detection and coverage seeding are detailed in Worksheet #12, SOP G-5 *Project Quality Control*, and SOP UXO-08 *Instrument Verification Strip and Geophysical Survey Equipment* (Appendix G).

The geophysical surveys will be completed, tracked, and documented using a grid methodology described in Section 17.3.3.2.4. All geophysical data (*e.g.*, field forms, logbooks, GPS data, and photographs) will be reviewed by the Project Geophysicist and UXOQCS and loaded to the project server for subsequent review by the personnel identified in Worksheet #34, 35, & 36. The documentation procedures are detailed in the DMP (Worksheet #29) and SOP UXO-08 *Instrument Verification Strip and Geophysical Survey Equipment* (Appendix G).

17.3.8 Surface and Subsurface Clearance

The objective of the Surface and Subsurface Clearance is to detect surface and subsurface metallic anomalies that may be munitions related for subsequent investigation and removal efforts. The UXO Teams will complete the majority of the survey using handheld analog geophysical survey equipment, metal detectors (*i.e.*, Minelab Explorer or equivalent). In areas cluttered with metallic contamination, the EM61-MK2 detector will be used in analog mode of operation to reduce the number of small anomalies. Since the handheld analog instrument detects many very small metallic pieces, the EM61-MK2 (designed for larger item detection) will be used to focus detection and removal efforts. The EM61-MK2 will be utilized as a secondary application after the Minelab Explorer sweep teams have flagged anomalies and anomalous areas. In areas where the EM61-MK2 is utilized to reduce anomalies, DGM will be utilized after the initial removal efforts to verify that detector responses are below threshold.

Any remaining anomalies will be reacquired, investigated and resolved. Geophysical survey equipment will be used IAW SOP UXO-08 *Instrument Verification Strip and Geophysical Survey Equipment* (Appendix G).

The UXO Teams will remove MEC and MD equivalent to, or greater than the diameter of the SMC known to have been used/found on the MRS (*i.e.*, 37mm projectile), to a depth of 2 ft bgs within the limitations in detection technology. Based on the results of the geophysical surveys, real-time excavations or target lists (*i.e.*, digsheets) will be generated for subsequent excavation by the UXO Teams. For safety purposes, EZs will be established while surface and subsurface clearance activities are being conducted. The UXO Teams will carry an all-metals detectors, digital cameras, and GPS units, which will be uploaded with the pertinent information (*e.g.*, grid boundaries) and project data dictionary. As the UXO Teams traverse each grid, they will collect GPS data of pertinent items (*i.e.*, MEC) encountered. The surface and subsurface clearance activities will be performed IAW SOP UXO-01 *Surface and Subsurface Clearance* (Appendix G).

The surface and subsurface removal activities will be completed, tracked, and documented using a grid methodology. All removal data (*e.g.*, field forms, logbooks, GPS data, and photographs) will be reviewed by the UXOQCS and SUXOS and uploaded to the project server for subsequent review by the personnel identified in Worksheet #34, 35, & 36. The documentation procedures are detailed in the DMP (Worksheet #29) and SOP UXO-01 *Surface and Subsurface Clearance* (Appendix G).

17.3.9 Explosive Disposal Operations

Explosive disposal operations will be performed to eliminate the explosive safety hazard associated with MEC and/or MPPEH that are discovered during the RA. In some instances, explosive shape charges (perforators) will be utilized to vent (open) MPPEH to allow for proper inspection of internal cavities. Explosives will be delivered or picked up as needed and turned in daily to the explosive supplier's Type I magazine, located in Waikele, Oʻahu, Hawaiʻi. GSIP will control all the requisition, transportation, and use of explosives for disposal. All explosive disposal operations will be performed in IAW EM 385-1-97, ESS, SOP UXO-02 *Explosive Disposal Operations* (Appendix G), Hawaiʻi Administrative Rules Title §1926.900. Subpart U, and EMP (Appendix I).

17.3.10 MPPEH Management

MPPEH are managed in strict compliance with EM 385-1-97, Department of Defense Instruction (DODI) 4140.62, State of Hawaiʻi requirements, and SOP UXO-03 *Material Potentially Presenting an Explosive Hazard Management* (Appendix G). During performance of field operations, the project team will inspect, recover, and dispose of all MEC/MDEH. The terms MEC and MDEH are considered to be synonymous but with respect to the management of MPPEH the term MDEH will be used exclusively. MD, RRD, and NMRD discovered at the anomaly locations will be managed and disposed of IAW EM 385-1-97. All materials discovered during the RA are considered MPPEH until further inspection. MPPEH will be

100% inspected and 100% re-inspected, documented, and segregated into three categories: MDEH, MDAS, and NMRD. MDEH will be treated (*i.e.*, destroyed by explosives) until it or its constituents can be certified as MDAS.

DEMIL will be accomplished IAW SOP UXO-05 *Demilitarization Operations*, EM 385-1-97, and DoD 4160.62. MDAS will be, certified, verified, and documented IAW EM 385-1-97. MDAS will be stored and secured in appropriately marked containers within the work area awaiting transfer for final disposition. Transfer will be documented IAW EM 385-1-97. NMRD will be treated as municipal solid waste or sent to a recycling facility.

17.3.11 Waste Management

All wastes that are generated will be managed IAW the WMP (Appendix J) for the duration of the project tasks. The types of waste generated during the RA activities are anticipated to consist of solid waste trash (*e.g.*, plastic/paper bags), green waste (*e.g.*, grass, brush cuttings), and munitions-related waste (*i.e.*, metallic debris that has been certified as MDAS). No sampling activities are planned for the RA project therefore no sampling related investigation-derived waste (IDW) is anticipated.

17.3.12 Data Management

All electronic and hard copy data generated during the RA will be reviewed by designated onsite personnel and loaded to the project server for review the personnel identified in Worksheet #34, 35, & 36. Data management procedures are described in DMP located in Worksheet #29. Project records (*e.g.*, field forms, logbooks, GPS data, and photographs) will be consolidated and the information provided in the RAR.

17.3.13 Site Restoration

Anticipated site restoration include pulling stakes and backfilling any holes. Disturbed areas will be visually inspected immediately after completing site restoration and verified by the USACE before final acceptance. The EPP (Appendix E) provides detailed guidance for site restoration.

17.3.14 Demobilization

At the completion of the RA field activities, field equipment and work trailers will be demobilized. MDAS will be shipped for final disposition. Travel for site personnel will be arranged. All project files will be removed and remain in the possession of the contractor. Demobilization will only occur after approval by the USACE PM.

Worksheet # 19 & 30: Sampling Containers, Preservation, and Hold Times

This worksheet is not applicable. MC sampling will not be conducted for this project.

This Page Intentionally Left Blank

Worksheet # 20: Field Quality Control Summary

This worksheet is not applicable. MC sampling will not be conducted for this project.

This Page Intentionally Left Blank

Worksheet # 21 & 23: Standard Operating Procedures

The field activities will be performed IAW SOPs provided in Appendix G. Table 21-1 provides a list of applicable field SOPs.

21.1 Field SOP Reference Table

Reference Number	Title, Revision Date and/or Number	Originating Organization of SOP	Equipment Type (see SOP for full list)	Modified for Project Work? (Yes/No)
G-1	Field Documentation	GSIP	Logbooks, GPS, field forms, pens, digital camera	Yes
G-2	Anomaly Avoidance	GSIP	Handheld metal detector, logbooks, flagging, GPS, digital camera	Yes
G-3	Surveying and Mapping	GSIP	Handheld metal detector , RTK GPS (hand-carried receiver [<i>i.e.</i> , rover], data collector, base station with antenna, radio, Laser Robotic Total Station), mapping grade GPS, digital camera, ruler, stakes, flagging, paint, calculator	Yes
G-4	Vegetation Clearance	GSIP	Handheld metal detector, modified level D PPE, brush cutting equipment, slashbuster, excavator, logbooks, mesh face shield, safety chaps	Yes
G-5	Project Quality Control	GSIP	Field logbook, field forms, handheld analog geophysical sensor, GPS unit, laptop, camera, pens	Yes
UXO-01	Surface and Subsurface Clearance	GSIP	Field logbooks, digital camera, handheld detector (all metals), GPS, data logger, flagging, batteries, grid stakes, pin flags, hand tools, gloves	Yes
UXO-02	Explosive Disposal Operations	GSIP	See the explosive disposal equipment checklist (included in Attachment 2 of SOP UXO-02)	Yes
UXO-03	Material Potentially Presenting an Explosive Hazard Management	GSIP	Securable storage container(s), logbooks, field forms, tool pouches, buckets, leather gloves	Yes
UXO-04	Heavy Equipment and Earth Moving Machinery Operations	GSIP	Roll over protection system, back-up warning system; seat belts, communication devices, fire extinguisher, first aid kit, operators manual, proper PPE	Yes

Reference Number	Title, Revision Date and/or Number	Originating Organization of SOP	Equipment Type (see SOP for full list)	Modified for Project Work? (Yes/No)
UXO-05	Demilitarization Operations	GSIP	Chop Saw, Horizontal Miter Saw, generator, table vise, securable storage container, logbooks, emery cloth, oil	Yes
UXO-06	Batch Burner Thermal Treatment	GSIP	Batch Burner Thermal Treatment Unit; propane tank, wind screen, torch, EXPRAY kit, securable storage container, logbook, shovel, welder's gloves, aprons, hard hat with full-face shield, aprons	Yes
UXO-07	X-Ray Operations	GSIP	Golden Engineering Model XRS-3 x-ray kit, film processing equipment, dosimeter, film badges and radiation alert charger, nitro gloves, logbook, forms	Yes
UXO-08	Instrument Verification Strip and Geophysical Survey Equipment	GSIP	Handheld metal detector, EM61-MK2, GPS unit, camera, logbooks, flagging, batteries, grid stakes, pin flags, hand tools, gloves	Yes

Worksheet # 22, 24, & 25: Field Equipment Calibration, Maintenance, Testing, and Inspection

22.1 Field Equipment Calibration Table

Field Equipment	Calibration Activity	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	CAs	Responsible Personnel	SOP Reference
GPS (RTK and mapping grade) and Total Station	Data Positioning and Navigation Verification	Charge battery, store/transport in dry and dust free environment All cables and sensitive consoles deployed/transported with care. Software updated as required Follow user manual protocol	Daily occupy and measurement of a fixed control point with known coordinates	Visual inspection for external damage (e.g., tripods, rod, cables, indicator lights) Check of all rover and base station settings (e.g., transmit frequencies, local geodetic parameters)	Prior to use for each event	GPS accuracy within ± 30 cm (RTK) of known coordinates or ± 1 to 2 m (mapping grade) of known coordinates, zero deficiencies in instrument and settings to project standard	Re-check of equipment settings and deployment or replacement of equipment as needed Consultation with UXOQCS as appropriate	All Field Technicians performing geodetic surveys	G-3
Analog Metal Detector	Detection Verification	Charge battery, store/transport in dry and dust free environment Follow user manual protocol	IVS Monitoring and Instrument Functionality Testing	Survey IVS Visual inspection (e.g., screen dents, coil cracks) Check detector settings (e.g., sensitivity, audio levels)	Pre and Post Fieldwork	Audible detection of all metallic items in IVS, zero deficiencies in instrument and all settings to project standard	Replacement of instrument or coil Consultation with UXOQCS or Project Geophysicist as appropriate	Field detection personnel and TL	G-2, G-4, UXO-01, UXO-02, UXO-08

Field Equipment	Calibration Activity	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	CAs	Responsible Personnel	SOP Reference
EM61-MK2	Detection Verification	Charge battery, store/transport in dry and dust free environment Follow user manual protocol	IVS Monitoring	Survey IVS	Pre and Post Fieldwork	Notation of any spikes or abrupt changes in data	Replacement of instrument or coil. Consultation with UXOQCS or Project Geophysicist as appropriate	Field Technicians	UXO-01, UXO-08
	Functionality Test	Charge battery, store/transport in dry and dust free environment Follow user manual protocol	Instrument Functionality Testing	Static Test, Static Spike, Cable Shake Test, and Personnel Test	Pre and Post Fieldwork	Achieve metrics described in Worksheet #12 and SOPs	Replacement of instrument or coil Consultation with UXOQCS or Project Geophysicist as appropriate	Project Geophysicist	UXO-01, UXO-08
Slashbuster	General Operating Inspection	Follow user manual protocol	Check for damages, loose parts, hydraulic lines, etc.	Operational check using the Slashbuster Inspection Checklist	Prior to use for each day	No leaks, no broken parts and checklist completed	Conduct maintenance, consult with manufacturer or vendor Consult with HSM/UXOSO / SUXOS	Equipment Operator	G-4, UXO-04

Field Equipment	Calibration Activity	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	CAs	Responsible Personnel	SOP Reference
Backhoe	General Operating Inspection	Follow user manual protocol	Check oil level, coolant, coolant hoses, belts, <i>etc.</i>	Pre-operational check using the Operator's Equipment Inspection Report (SOP UXO-04, Appendix G)	Prior to use for each day	No leaks, all instruments operational and checklist completed	Conduct maintenance, consult with manufacturer or vendor Consult with HSM/UXOSO / SUXOS	Equipment Operator	UXO-02, UXO-03, UXO-04
Excavator	General Operating Inspection	Follow user manual protocol	Check oil level, coolant, coolant hoses, belts, <i>etc.</i>	Pre-operational check using the Operator's Equipment Inspection Report (SOP UXO-04, Appendix G)	Prior to use for each day	No leaks, all instruments operational and checklist completed	Conduct maintenance, consult with manufacturer or vendor Consult with HSM/UXOSO / SUXOS	Equipment Operator	G-4, UXO-04

Field Equipment	Calibration Activity	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	CAs	Responsible Personnel	SOP Reference
Remote Firing Device	Verification of function for explosive disposal operations	Charge battery, store/transport in dry and dust free environment Components deployed/transported with care. Factory calibration completed to manufacturer's specifications and frequency Follow user manual protocol	Bench test checks including auto-disarm, indicator lights and overall proper function	Visual inspection for external damage (e.g., console, connections, indicator lights)	Prior to use for each event	Bench test indicates proper function and zero deficiencies in instrument	Re-check of Equipment settings and deployment or replacement of Equipment as needed Consultation with SUXOS and UXOQCS as appropriate	DS and SUXOS	UXO-02
Chop Saw	General Operating Inspection	Follow user manual protocol	Check for damages, loose parts or cracks.	Visual inspection for external damage (e.g., frayed power cable, damaged vise or blade)	Prior to use for each event	No loose or broken parts and blade is in a serviceable condition	Conduct maintenance, consult with manufacturer or vendor Consult with HSM/UXOSO / SUXOS	Equipment Operator and DEMIL Supervisor	UXO-05

Field Equipment	Calibration Activity	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	CAs	Responsible Personnel	SOP Reference
Horizontal Miter Saw	General Operating Inspection	Follow user manual protocol	Check for damages, loose parts or cracks.	Visual inspection for external damage (e.g., frayed power cable, damaged vise or blade)	Prior to use for each event	No loose or broken parts and blade is in a serviceable condition	Conduct maintenance, consult with manufacturer or vendor Consult with HSM/UXOSO / SUXOS	Equipment Operator and DEMIL Supervisor	UXO-05
Generator	General Operating Inspection	Follow user manual protocol	Check the fuel level, damages, loose parts, cracks and frayed cables	Visual inspection for external damage and fuel (e.g., frayed power cable, damaged connectors)	Prior to use for each event	No loose or broken parts, has fuel, no frayed wires or connections	Conduct maintenance, consult with manufacturer or vendor Consult with HSM/UXOSO / SUXOS	Equipment Operator and DEMIL Supervisor	UXO-05
Batch Burner Thermal Treatment Unit	General Operating Inspection	Follow user manual protocol	Check for damages, loose parts, warping of the metal or cracks	Visual inspection for external and internal damage (e.g., cracks, warping of the metal)	Prior to use for each event	No loose, warping, cracks or broken parts	Conduct maintenance, consult with manufacturer or vendor Consult with HSM/UXOSO / SUXOS	Batch Burner Operator and DEMIL Supervisor	UXO-06

Field Equipment	Calibration Activity	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	CAs	Responsible Personnel	SOP Reference
Golden Engineering Model XRS-3 X-ray	Verification of the current Leakage Test Certification	Follow user manual protocol	Check for damages, defective parts	Visual inspection for external damage (e.g., x-ray tube, battery)	Prior to use for each event and after	No loose or broken parts, cracked tube	Consult with manufacturer Consult with Radiation Safety Officer (RSO)/ Radiation Safety Committee	Authorized User (AU)	UXO-07
PEN 200MR Dosimeter	Verification the use of the Radiation Alert Charger	Follow user manual protocol	Check scale through lens for damages	Visual inspection for external damage, view through the lens for internal damage	Prior to use for each event and after	No loose or broken parts, cracked lens, able to charge to zero out	Consult with manufacturer Consult with RSO/ Radiation Safety Committee	AU	UXO-07
Thermoluminescent dosimeter (TLD)	Verification through Authorized lab	Sent to Lab every quarter	Check for damages	Visual check for external damages	Prior to use for each event and after	No damage and current lab results	Consult with Lab Consult with RSO/ Radiation Safety Committee	RSO	UXO-07

Worksheet # 26 & 27: Sample Handling, Custody, and Disposal

This worksheet is not applicable. MC sampling will not be conducted for this project.

This Page Intentionally Left Blank

Worksheet # 28: Analytical Quality Control Samples and Corrective Action

This worksheet is not applicable. MC sampling will not be conducted for this project.

This Page Intentionally Left Blank

Worksheet # 29: Project Documents and Records

This worksheet describes the procedures for recording, tracking and managing both hard copy and electronic data generated during the course of the RA. In addition, the site-specific data management procedures required to create a holistic geospatial dataset are described. Data types that may be integrated into the geodatabase (GDB) include GPS, computer aided design and drafting (CADD), GIS, imagery (*e.g.*, aerial photographs) and any other forms of data that can be accessed by or imported into a GIS database.

The project team will collect, manage, and maintain project data in an Environmental System Research Institute (ESRI) GDB IAW DID MMRP-09-007, EM 200-1-15, EM 1110-1-2909, and applicable Spatial Data Standards for Facilities, Infrastructure, and Environment (SDSFIE) policy and guidance requirements. All data, including third party sources, will include metadata compliant with the Federal Geographic Data Committee (FGDC) metadata standards.

The following sections provides an overview of the types of data generated, data management procedures, survey data requirements, electronic submittal requirements utilized during the RA project. The Table in Section 29.4 details the types of records that will be generated for the RA.

29.1 Field and Technical Data

Objective and subjective data will be collected throughout the course of the RA. Examples of objective data include total number and types of MEC items disposed of, the number of observed geophysical anomalies, and the amount of MD recovered. Examples of subjective data include descriptions of MEC items, topographic features, and general site conditions.

Data generated will generally consist of the following categories of information:

- Geodetic survey observations and coordinates for site control;
- MEC identification, removal, and disposal data;
- Types and quantities of MD, RRD, and NMRD (grid basis);
- Operational, safety, and QC field logbooks and reports;
- Maps, site plans, sketches, and tables;
- Field notes;
- Local geologic and hydrologic data;
- Access or lack thereof to the MRS; and
- Observed receptors (human and biota).

These data are gathered from various sources during the completion of the project, and may either be stored in electronic files or archived as hard copies. Field records (*e.g.*, logbooks, field forms, photographs, and GPS files) will be reviewed and maintained on site by the SUXOS, UXOQCS, and HSM/UXOSO and will be loaded on a daily or weekly basis into the project's

main server located in Waimea, Hawaiʻi. All records will be stored such that they can be found using the project name, site ID number, date they were created, and the personnel who created them.

Project documentation will be checked for accuracy, consistency, and completeness by the field QC personnel (*e.g.*, UXOQCS), peer reviews (*e.g.*, GIS data review by GIS Manager), and by management personnel (*e.g.*, QCM) where appropriate, before being included in the project file. Details on data verification and validation procedures are described in Worksheet #34, 35, & 36.

29.2 Data Management

Project data files will be kept on site during field operations and on GSIP's server throughout the course of the project. The numbering system for files maintained for this project will include the project name and contract number with a subheading indicating the type of file. All relevant project related files will be provided at the end of the project with the final project deliverables. An outline of basic project file structure is presented below:

- Communications:
 - Internal; and
 - External.
- Management:
 - Contract and PWS;
 - Schedule;
 - Budget;
 - Invoices; and
 - Project status reports.
- Health and Safety:
 - Daily health and safety forms (*e.g.*, Tailgate Safety and Daily Safety Reports [DSRs]);
 - APP/SSHP acknowledgement;
 - Hazard communication files;
 - Training records;
 - Accident reports; and
 - Inspection/Assessment reports.

- QC and QA:
 - DQCR;
 - Inspection reports;
 - Field Change Request (FCR) forms; and
 - Deficiency Notice (DN), NCR, and CARs.
- Operations:
 - DARs;
 - Status maps;
 - Field data (*e.g.*, MEC status);
 - Field logbooks; and
 - Calculations/evaluations.
- GPS/Geophysical/GIS Data
 - Background GIS data (*e.g.*, shapefiles and GDBs);
 - Raw GPS data;
 - Processed GPS data (*e.g.*, survey control points);
 - Raw geophysical data (*e.g.*, EM61-MK2 raw files);
 - Processed geophysical data (*e.g.*, Geosoft files);
 - Processed GIS data (*e.g.*, transects, anomalies, munitions locations); and
 - ArcMap mxds.
- Documents:
 - Relevant publications (*e.g.*, guidance documents and previous investigation reports);
 - UFP-QAPP and associated plans; and
 - Reports.

29.3 Geospatial Data Requirements

The following sections describe the survey, GIS, mapping, and electronic submittals required for the RA.

29.3.1 Accuracy

Primary survey control will be established utilizing GPS techniques IAW EM 1110-1-1002. Survey control points will have the horizontal accuracy necessary to meet the requirements of the

project at a minimum of Class I, Third Order, 1:10,000 closure standard or +/- 3 cm at 1.96 sigma (95% confidence limit) whichever is greater IAW EM 1110-1-1005. Horizontal accuracy will be verified utilizing least squares techniques or as reported by a positioning service such as the National Geodetic Survey Online Positioning User System. Coordinates will be provided as grid and not modified to ground coordinates.

An UXO Technician II or above will escort the State of Hawaiʻi PLS during all surveying activities. Anomaly avoidance procedures will be utilized for placement of all stakes and control points. Installation of control points and monuments will meet minimum standards set forth in EM 1110-1-1002. Survey control monuments shall be set using at least a No. 5 rebar at least 24 inches long. Survey control will remain in place after the completion of the survey for future use. A minimum of three survey control points shall be established. Survey procedures are further described in SOP G-3, *Surveying and Mapping*, located in Appendix G.

29.3.2 Survey Datum and Units

The project survey datum and units will be defined prior to the commencement of any surveying related activities. At a minimum, the following information should be defined:

- Linear units;
- Angular units;
- Horizontal project datum;
- Horizontal datum realization;
- Combined scale factor (if utilizing a ground coordinate system or comingling total station measurements with GPS measurements);
- Projection;
- Vertical datum; and
- Geoid model (if utilizing GPS to establish elevations).

Survey control will be referenced to the following project datum and coordinate system:

- Horizontal Datum: NAD83;
- Realization: PA11 realization;
- Projection: UTM Zone 4N;
- Vertical Datum: msl; and
- Geoid Model: GEOID12B.

The preferred linear units are meters. If feet are utilized, the project surveyor will clearly state whether the U.S. Survey Foot or the International Foot is utilized. When reporting coordinates and measurements in feet, the U.S. Survey Foot will be utilized unless otherwise stated. Angular units should be reported in degrees minutes seconds.

29.3.3 Geographic Information System Incorporation

The project GIS GDB will be a living repository. The project GIS GDB will incorporate pre-existing data (*e.g.*, data generated during the RI) and data generated from the RA at the 36-acre area within the Southeastern Region MRS such as MEC, MPPEH, MD, RRD, geophysical data (*e.g.*, anomaly locations), and cultural and biological resources locations. Spatial data may be included as points, vectors, or areas (*i.e.*, polygons). Attributes will be included with spatial data and will vary depending on the type of data presented. For example, MEC items will include the GPS coordinates, date found, ID, digital photograph ID, condition, current status, and final disposition.

The field data will be uploaded into the project GDB on a daily or weekly basis and checked for accuracy and standards compliance to enable real-time use of the system as a project management and communications tool. All ArcGIS mapping products (*e.g.*, .mxd files) will have their own relative path so that maps can be reviewed in ArcGIS and edited at a later time.

All available existing data that is applicable to the project will be consolidated into the GDB and analyzed to relay pertinent information to the PDT. Survey control point coordinates will be presented in a certified letter or drawing, along with an electronic submittal and included as an appendix to the RAR.

29.3.4 Plotting

All of the control points recovered and/or established at the site will be plotted at the appropriate coordinate points on reproducible electronic or hard copy media for production of planimetric or topographic maps at scales appropriate for the parcel size being described. Parcels less than 10 acres shall be plotted at 1:200. Parcels 10 to 100 acres shall be plotted at 1:600 (1 inch = 50 ft). Parcels larger than 100 acres will be plotted at 1:2400 (1 inch = 200 ft). Area maps shall be provided for parcels of 100 acres, and shall show sheet breakdown for subsequent sheets required for the set.

29.3.5 Mapping

The location, ID, coordinates, and elevations or heights of all the control points established at the site will be plotted on reproducible media for planimetric or topographic maps at the scale specified in the task order. Each control point will be identified on the map by its name and number and the final adjusted coordinates and elevations or heights. A legend showing the standard symbols will be used for the mapping and a map index showing the site in relationship to all other sites within the boundary lines of the project area will be shown. Each map will include a grid north and a magnetic north arrow with the angular difference between them shown. Grid lines or tic marks at systematic intervals with their grid values will be shown on the edges of the map. The maps will identify the datum, realization, coordinate system, and measurement system.

Electronic status maps will be provided to the PDT on an as needed basis (*e.g.*, included in Project Status Reports) and for project management. The GIS database will enable detailed

spatial analysis of the Southeastern Region MRS, including distribution of specific munitions related items, item densities, and non-munitions related features. Surface features or structures (e.g., roads, property boundaries) will also be used as reference points to those acquired as part of RA field activities.

29.3.6 Final Electronic Submittals

All final document files (e.g., reports and associated figures and tables) generated will be submitted in PC-compatible Microsoft Office 2000[®] Suite or higher software and in Adobe Portable Document Format (PDF). All final GIS data generated will be submitted IAW DID MMRP-09-004, MMRP-09-007, EM 200-1-15, EM 1110-1-2909 in a non-proprietary Spatial Data Transfer Standard (SDTS) format at the close of the project, as well as in the ESRI data format. All formal GIS data submittals will be made on compact disk (CD) and provided to USACE.

Spatial data created for the project will be provided in ESRI GDB format. Raster data will be provided in tagged image file format (TIFF) or MrSID compliant format. Supporting tabular data will be provided in Microsoft Excel and/or Microsoft Access database format. In addition, all ESRI map documents (.mxd) shall be provided with the accompanying spatial data. All data shall conform to the SDSFIE and as outlined in the PWS. The final GDB will include all spatially-related GIS-specific electronic data created, developed, or modified during the RA and will be submitted to the USACE as part of the final data deliverables. All in-progress and field GIS data, design drawings, GPS survey data, relational databases, geophysical data, spreadsheets, text files and other related data may be required to be available to the Government by File Transfer Protocol (FTP) download as specified for the project.

All data will be submitted electronically on Microsoft Windows 7 compatible digital versatile disc (DVD)-Read Only Memory (ROM) or USACE Information Technology-approved external hard drive. All data items will be delivered, and the specific timeframe for delivery will be specified within the PWS. Each DVD or external hard drive required for a complete electronic submittal shall be labeled appropriately with Project Name, Project Number, effective date of submittal, Contractor Name, and appropriate disk number or sequential reference. At a minimum, one copy of the Final Electronic Submittal will be made to the USACE and a separate, single copy of the Final Electronic Submittal will be made to the POH TIB for archival and loading into existing USACE POH GIS.

29.4 Project Records

Record	Generation	Verification
Project Planning Documents		
UFP-QAPP	Technical Staff	HSM/UXOSO QCM/Senior PM/PM
APP/SSHP	HSM/UXOSO	CHSM/Senior PM/PM
ESS	Technical Staff	SUXOS/Senior PM/PM
AMP	SCS ¹	Senior PM/PM
ERP	GA ¹ /Technical Staff	PM
Schedule (Living)	GSIP PM	Senior PM
Field Documents		
<i>Safety Documents</i>		
APP/SSHP Acknowledgement	HSM/UXOSO	CHSM
Daily Safety Brief	HSM/UXOSO	CHSM
Tailgate Safety Brief	TL	HSM/UXOSO
DSR	HSM/UXOSO	PM/CHSM
Safety and Health Deficiency Tracking Log	HSM/UXOSO	CHSM
Monthly Exposure Report	HSM/UXOSO	PM
Supervisor's Employee Injury/Illness Report Form	HSM/UXOSO	CHSM
Vehicle Accident Report	HSM/UXOSO	CHSM
Equipment, Property Damage, and General Liability Loss Report	HSM/UXOSO	CHSM
Incident Investigation Report	HSM/UXOSO	CHSM

Record	Generation	Verification
Injured Employee Statement	HSM/UXOSO	CHSM
Employee Witness Statement	HSM/UXOSO	CHSM
Accident Review Board Report	HSM/UXOSO	CHSM
Training Forms (Documentation of Training and Training Log)	HSM/UXOSO	CHSM
Medical Forms	HSM/UXOSO	CHSM
USACE Accident Investigation Report (ENG Form 3394)	HSM/UXOSO	CHSM
Weekly Safety Inspection Log	HSM/UXOSO	CHSM
Operator's Equipment Inspection Report	UXO Technicians	HSM/UXOSO
Slashbuster Inspection Checklist	UXO Technicians	HSM/UXOSO
Excavation/Trench Inspection Form	Excavation/Trench Competent Person	HSM/UXOSO
Near Miss Report Form (<i>Incident Investigation Report form is used to document Near Misses</i>)	HSM/UXOSO	CHSM
Site Visitor's Log	HSM/UXOSO	CHSM
<i>Operational Records</i>		
IVS Letter Report	Project Geophysicist	PM
Site Specific Training Forms	UXOQCS	QCM
Daily Activity Report	SUXOS	PM/QCM
Grid Report	UXO Technicians	UXOQCS
Field Logbook	UXO Technicians	UXOQCS
Photograph Log	UXO Technicians	UXOQCS
GPS/Geophysical/GIS Data	PLS ¹ / UXO Technicians	UXOQCS/GIS Manager/Project Geophysicist/QCM

Record	Generation	Verification
Site Maps	GIS Technician	GIS Manager/ PM/QCM
Project Status Report	PM	Senior PM
<i>Quality Control and Transfer Records</i>		
DQCR	UXOQCS	PM/QCM
NCR	UXOQCS	QCM
DN	UXOQCS	QCM
CAR Form	UXOQCS	QCM
Lesson Learned Report	UXOQCS	QCM
CAR/DN/NCR Status Log	UXOQCS	QCM
QC Inspection/Surveillance Log	UXOQCS	QCM
Preparatory Phase Inspection Report	UXOQCS	QCM
Initial Phase Inspection Report	UXOQCS	QCM
Follow-Up Inspection/Surveillance Report	UXOQCS	QCM
Seeding Checklist/Log	UXOQCS	QCM
FCR Form	UXOQCS	PM
FCR Status Log	UXOQCS	PM
DOTR	UXO Technicians/Project Geophysicist	UXOQCS
QA Submittal	UXOQCS	QCM
DD Form 1348-1A: Issue Release/Receipt Document	SUXOS	UXOQCS or USACE OESS
MDAS Final Certification/Transfer Letter	UXOQCS	QCM
Process and Treatment Record for MDAS	DEMIL Supervisor (TL)	UXOQCS
<i>Explosive Disposal and Explosives Records</i>		
Explosive Disposal Plan	SUXOS or DS	SUXOS and UXOQCS

Record	Generation	Verification
Explosive Disposal Safety Brief	SUXOS or DS	SUXOS and UXOQCS
Disposal Team Daily Journal	SUXOS or DS	SUXOS and UXOQCS
MEC Accountability Log	DS	SUXOS and UXOQCS
Explosive Manifest	DS	SUXOS and UXOQCS
DD Form 626	SUXOS or DS	SUXOS and UXOQCS
ATF Form 5400: Report Of Theft Or Loss – Explosive Material	SUXOS or DS	SUXOS and UXOQCS

Note:

¹ Managed and subcontracted by GISP as the prime contractor.

Data are and will be securely stored on site and within a specified project directory on a secure private network located at the GSIP datacenter on the Big Island, Hawaiʻi. Project data are currently stored on a central server storage system configured to handle single failure redundancy. Project data is also backed up off site on a daily basis for disaster recovery.

Worksheet # 31, 32, & 33: Assessments and Corrective Action

31.1 Assessments

Assessment Type	Frequency	Internal or External	Organization Performing Assessment	Person(s) Responsible for Performing Assessment	Person(s) Responsible for Responding to Assessment Findings	Person(s) Responsible for Identifying and Implementing CA	Person(s) Responsible for Monitoring Effectiveness of CA
Project Review	Monthly	Internal	GSIP	PM and QCM	Program Manager	Senior PM	PM, Senior PM, and QCM
Readiness Review	Once, prior to mobilization	Internal	GSIP	SUXOS, UXOQCS, and HSM/UXOSO	PM	PM	Senior PM and QCM
Health and Safety and training	Full audit at least once during fieldwork and daily	Internal	GSIP	HSM/UXOSO and UXOQCS	HSM and PM	CHSM and Senior PM	HSM/UXOSO/UXOQCS/QCM
Site Preparation and Vegetation Clearance	Three phase inspections and weekly	Internal	GSIP	UXOQCS and Project Geophysicist	SUXOS and PM	SUXOS and PM	PM and UXOQCS
Biological and Archaeological Surveys	Following biological and archaeological surveys	Internal	GSIP	UXOQCS	PM and Qualified Biologist and Qualified Archeologist	PM	UXOQCS and Qualified Biologist and Qualified Archeologist
IVS and Seeding	Following IVS set up and seed emplacement	Both	GSIP and USACE	UXOQCS, Project Geophysicist, USACE Geophysicist, and USACE OESS	UXOQCS, Project Geophysicist, and PM	UXOQCS and Project Geophysicist	UXOQCS, Project Geophysicist, USACE Geophysicist, and USACE OESS

Assessment Type	Frequency	Internal or External	Organization Performing Assessment	Person(s) Responsible for Performing Assessment	Person(s) Responsible for Responding to Assessment Findings	Person(s) Responsible for Identifying and Implementing CA	Person(s) Responsible for Monitoring Effectiveness of CA
Review Field Instrument Functionality Tests	Daily and weekly	Both	GSIP and USACE	Daily-SUXOS/TL Weekly-UXOQCS and Project Geophysicist USACE OESS and USACE Geophysicist	SUXOS and PM	SUXOS and TL	UXOQCS, Project Geophysicist, and SUXOS
Surface and Subsurface Clearance	Three phase inspections, weekly and per grid completion	Both	GSIP and USACE	UXOQCS and Project Geophysicist Per Grid-USACE OESS	SUXOS and PM	SUXOS and PM	UXOQCS/QCM
Surface and Subsurface Clearance (intrusive results)	Three phase inspections and weekly	Internal	GSIP	Project Geophysicist and UXOQCS	SUXOS and PM	PM and Project Geophysicist	Project Geophysicist and UXOQCS/QCM
Explosive Disposal Operations and MPPEH Management	Three phase inspections and weekly	Both	GSIP and USACE	UXOQCS or USACE OESS	SUXOS and PM	SUXOS and PM	UXOQCS and QCM
Data Management Assessment	Daily and weekly	Internal	GSIP	GIS Manager and UXOQCS	PM and GIS Manager	PM and GIS Manager	GIS Manager and UXOQCS/QCM
Site Restoration and Demobilization	Following site restoration and prior to demobilization	Internal	GSIP	UXOQCS	SUXOS and PM	SUXOS and PM	UXOQCS/QCM

Assessment Type	Frequency	Internal or External	Organization Performing Assessment	Person(s) Responsible for Performing Assessment	Person(s) Responsible for Responding to Assessment Findings	Person(s) Responsible for Identifying and Implementing CA	Person(s) Responsible for Monitoring Effectiveness of CA
Review RA Field Activities	See QASP	External	USACE	Applicable USACE PDT Members	PM, SUXOS, and UXOQCS	SUXOS and UXOQCS	PM and USACE PDT Members
Review Geospatial Data	See QASP	External	USACE	Applicable USACE PDT Members	GIS Manager and UXOQCS	PM and UXOQCS	GIS Manager and USACE PDT Members
Review Intrusive Results	See QASP	External	USACE	Applicable USACE PDT Members	PM and GIS Manager	GIS Manager	PM
Review Status Reports	See QASP	External	USACE	Applicable USACE PDT Members	PM	PM	PM

This Page Intentionally Left Blank

31.2 Assessment Findings and Corrective Action Responses

Assessment Type	Nature of Deficiencies Documentation	Individual(s) Notified of Findings	Timeframe of Notification	Nature of CA Response Documentation	Individual(s) Receiving CA Response	Timeframe for Response
Project Review	Email and internal meetings	PM	3-5 Business Days	Email	Senior PM	3-5 Business Days
Readiness Review	Email	PM	3-5 Business Days	Email	Senior PM	3-5 Business Days
Health and Safety and Training	Verbal communication and written report	HSM/UXOSO and QCM	3-5 Business Days	Email and CA section of NCR/DN report completed	SUXOS, UXOSO, PM, and CHSM	24 hours after notification
Site Preparation and Vegetation Clearance	Verbal communication and written report	SUXOS, UXOQCS and PM	1-3 Business Days	Email and CA section of NCR/DN report completed	PM and QCM	24 hours after notification
Biological and Archeological Surveys	Verbal communication and written report	Qualified Biologist, Qualified Archaeologist and PM	1-3 Business Days	Email and CA section of NCR/DN report completed	PM and QCM	24 hours after notification
IVS and Seeding	Verbal communication and written report or ENG Form 6048	Project Geophysicist and UXOQCS	1-3 Business Days	Email and CA section of NCR/DN report or ENG Form 6048 completed	SUXOS, UXOQCS, and QCM and/or USACE OESS and USACE Geophysicist	24 hours after notification
Review Field Instrument Functionality Tests	Verbal communication and written report or ENG Form 6048	SUXOS and UXOQCS	1 Business Days	Email and CA section of NCR/DN report or ENG Form 6048 completed	SUXOS, UXOQCS, and QCM or USACE OESS and USACE Geophysicist	24 hours after notification
Surface and Subsurface Clearance	Verbal communication and written report or ENG Form 6048	SUXOS, QCM and PM	1 Business Days	Email and CA section of NCR/DN report or ENG Form 6048 completed	SUXOS, UXOQCS, and QCM and/or USACE OESS and USACE Geophysicist	24 hours after notification

Assessment Type	Nature of Deficiencies Documentation	Individual(s) Notified of Findings	Timeframe of Notification	Nature of CA Response Documentation	Individual(s) Receiving CA Response	Timeframe for Response
Surface and Subsurface Clearance (intrusive results)	Verbal communication and written report or ENG Form 6048	SUXOS and UXOQCS	1 -3 Business Days	Email and CA section of NCR/DN report completed	SUXOS, UXOQCS, and QCM	24 hours after notification
Explosive Disposal Operations and MPPEH Management	Verbal communication and written report	SUXOS, QCM and PM	1 Business Day	Email and CA section of NCR/DN report or ENG Form 6048 completed	SUXOS, UXOQCS, and QCM	24 hours after notification
Data Management	Verbal communication and written report	GIS Manager, QCM and PM	3-5 Business Days	Email and CA section of NCR/DN report completed	UXOQCS, GIS Manager and QCM	1-3 Business Days
Site Restoration and Demobilization	Verbal communication and written report	SUXOS, QCM and PM	1-3 Business Days	Email and CA section of NCR/DN report completed	SUXOS, UXOQCS, and QCM	24 hours after notification
Review RA Field Activities	Corrective Action Requests, ENG Form 6048 and Memorandum for Record	PM and QCM	1-5 Business Days (immediately if serious deficiency)	Email and CA response section of ENG Form 6048 completed	SUXOS, UXOQCS, and QCM	1-3 Business Days
Review Geospatial Data	Corrective Action Requests, ENG Form 6048 and Memorandum for Record	PM and QCM	14 Calendar Days	Email	SUXOS, UXOQCS, and QCM	1-3 Business Days

Assessment Type	Nature of Deficiencies Documentation	Individual(s) Notified of Findings	Timeframe of Notification	Nature of CA Response Documentation	Individual(s) Receiving CA Response	Timeframe for Response
Review Intrusive Results	Corrective Action Requests, ENG Form 6048 and Memorandum for Record	PM and QCM	1-5 Business Days (immediately if serious deficiency)	Email	SUXOS, UXOQCS, and QCM	1-3 Business Days
Review Status Reports	Email	PM and QCM	1 Week	Email	Senior PM and QCM	1-3 Business Days

This Page Intentionally Left Blank

31.3 *Quality Assurance Management Reports Table*

Type of Report	Frequency	Projected Delivery Date(s)	Person(s) Responsible for Report Preparation	Report Recipient(s)
IVS Letter Report	Following completion of IVS data collection	7 Business Days	Project Geophysicist	USACE Geophysicist
Three Phase Inspections	Daily (as needed)	Following Monday	UXOQCS	PM and QCM
DN/NCR/CAR	As needed	Following Business Day	UXOQCS	SUXOS, PM, and QCM
DQCR	Daily	Following Business Day	UXOQCS	PM and QCM
DSR	Daily	Following Business Day	HSM/UXOSO	PM and/or CHSM
DAR	Daily	Following Business Day	SUXOS	PM and QCM
Project Status	Weekly	Following Monday	GSIP PM	USACE PM
QA Submittal	Per grid package after QC inspection/sampling results	Following Business Day	UXOQCS	USACE OESS, SUXOS, and GIS Manager
Data Usability	Once after all data are generated and validated	14 Business Days	UXOQCS	PM
RAR	Once field activities are completed and data are validated	See Project Schedule (Worksheet # 14 &16)	PM and Technical Staff	USACE and recipients listed in Worksheet #3& 5

This Page Intentionally Left Blank

Worksheet # 34, 35, & 36: Data Verification and Validation Inputs and Procedures

34.1 Verification and Validation Inputs

Description	Step I – Verification (completeness)	Step II – Validation (conformation to specifications)
Planning Documents/Records		
Contract	X	
UFP-QAPP	X	X
ESS	X	X
AMP	X	X
ERP	X	X
Field Records		
IVS Letter Report	X	X
DARs	X	X
DQCRs	X	X
DSRs	X	X
Project Status	X	X
Logbooks	X	X
DOTRs	X	X
Equipment Calibration and Maintenance Records	X	X
Safety Briefs	X	X
Training Forms	X	X
Three Phase Inspections Reports	X	X
SOP Checklists/Forms	X	X
Status Maps	X	X
Tracking Spreadsheets (DFW status)	X	X
GPS/GIS Data	X	X

Description	Step I – Verification (completeness)	Step II – Validation (conformation to specifications)
Photo Log	X	X
Grid Report	X	X
Seeding Log	X	X
MEC Accountability Log	X	X
Disposal Team Daily Journal	X	X
QA Submittal	X	X
FCRs	X	X
Field Audits	X	X
Field DN, NCR, RCA, and CARs	X	X
DD Form 1348-1A: Issue Release/Receipt Document	X	X
MDAS Transfer Letter	X	X
ENG Form 6048	X	X
DD Form 626	X	X
ATF Form 5400: Report Of Theft Or Loss – Explosive Material	X	X
Data Usability	X	X
Other Reports		
RAR	X	X

34.2 Definable Features of Work and Verification/Validation Procedures

DFW	Supporting Data Documentation and Description	Responsible for Verification/Validation
Mobilization	<ul style="list-style-type: none"> ▪ All planning documents listed in Worksheet #29 are approved; and ▪ HSM/UXOSO, UXOQCS, and PM verify and/or validates all training, certifications and documentation is present in the project file. 	UXOQCS, GSIP HSM/UXOSO, GSIP PM, GSIP
Site Preparation	<ul style="list-style-type: none"> ▪ PLS and UXO Technicians follow Worksheets (#12, #17 & 18, #22, 24, & 25, and #29), APP/SSHP (Appendix F), SOPs G-1, G-2, G-3, G-5, UXO-08 (Appendix G); and records data in GPS units, logbooks and field forms; ▪ UXOQCS observes site survey procedures and verifies data; ▪ Data is loaded to project database daily/weekly and verified and validated by the GIS Manager, PM, and QCM; and ▪ PLS provides survey data (<i>i.e.</i>, control points) and PLS stamped report to GSIP PM. 	PLS, IHS UXOQCS, GSIP GIS Manager, GSIP PM, GSIP QCM, GSIP
Biological and Archaeological Surveys and Monitoring	<ul style="list-style-type: none"> ▪ UXO Technicians, Biologist, and Archaeologist follow Worksheets (#12, #17 & 18, and #29), EPP (Appendix E), APP/SSHP (Appendix F), SOPs G-1, G-2, G-3, G-5, UXO-08 (Appendix G), ERP, and AMP (Appendix H); and records data in GPS units, logbooks and field forms; ▪ UXOQCS observes biological and archaeological survey and monitoring procedures; ▪ Qualified Biologist and Qualified Archaeologist verifies data; ▪ Data is loaded to project database daily/weekly and verified and validated by the PM; and ▪ Senior Archaeologist and Natural Resources Specialist verifies and validates data. 	UXOQCS, GSIP PM, GSIP Senior Archaeologist, USACE Natural Resources Specialist, USACE
Vegetation Clearance	<ul style="list-style-type: none"> ▪ UXO Technicians follow Worksheets (#12, #17 & 18, #22, 24, & 25, and #29), EPP (Appendix E), APP/SSHP (Appendix F), SOPs G-1, G-2, G-4, G-5 (Appendix G), ERP, AMP (Appendix H), and WMP (Appendix J); and records data in GPS units, logbooks and field forms; ▪ UXOQCS observes vegetation removal procedures; ▪ SUXOS verifies data; and ▪ Data is loaded to project database daily/weekly and verified and validated by the QCM and PM. 	UXOQCS, GSIP SUXOS, GSIP QCM, GSIP PM, GSIP

DFW	Supporting Data Documentation and Description	Responsible for Verification/Validation
IVS	<ul style="list-style-type: none"> ▪ UXO Technicians follow Worksheets (#12, #17 & 18, #22, 24, & 25, and #29), EPP (Appendix E), APP/SSHP (Appendix F), SOPs G-1, G-2, G-3, G-5, UXO-01, UXO-08 (Appendix G), AMP (Appendix H), and ERP; and records data in GPS units, logbooks and field forms; ▪ Project Geophysicist and UXOQCS observes IVS installation, instrument verification results, and daily testing procedures and verifies and validates data; and ▪ USACE Geophysicist verifies and validates the IVS Letter Report. 	UXOQCS, GSIP Project Geophysicist, GSIP Geophysicist, USACE
Surface and Subsurface Clearance	<ul style="list-style-type: none"> ▪ UXO Technicians follow Worksheets (#12, #14 & 16, #17 & 18, #22, 24, & 25, and #29), EPP (Appendix E), APP/SSHP (Appendix F), SOPs G-1, G-3, G-5, UXO-01, UXO-02, UXO-03, UXO-08 (Appendix G), EMP (Appendix I), WMP (Appendix J), AMP (Appendix H), and ESS; and records data in GPS units, logbooks and field forms; ▪ TL, UXOQCS, and USACE OESS observes surface and subsurface clearance procedures; ▪ UXOQCS, SUXOS, and USACE OESS verifies and validates data; and ▪ Data is loaded to project database daily/weekly and verified and validated by the QCM, PM, and/or Senior PM. 	UXOQCS, GSIP SUXOS, GSIP QCM, GSIP PM, GSIP Senior PM, GSIP OESS, USACE
Explosive Disposal Operations	<ul style="list-style-type: none"> ▪ UXO Technicians follow Worksheets (#12, #14 & 16, #17 & 18, #22, 24, & 25, and #29), EMP (Appendix E), APP/SSHP (Appendix F), SOPs G-1, G-3, G-5, UXO-02, UXO-03, UXO-04, UXO-07 (Appendix G), and WMP (Appendix J), and ESS; and records data in GPS, logbooks and field forms; ▪ HSM/UXOSO, UXOQCS, SUXOS, and USACE OESS observes explosive disposal procedures; ▪ UXOQCS, SUXOS, and USACE OESS verifies and validates data; and ▪ Data is loaded to project database daily/weekly and verified and validated by the QCM, PM and/or Senior PM. 	HSM/UXOSO, GSIP UXOQCS, GSIP SUXOS, GSIP QCM, GSIP PM, GSIP Senior PM, GSIP OESS, USACE
MPPEH Management	<ul style="list-style-type: none"> ▪ UXO Technicians follow Worksheets (#12, #17 & 18, and #29), APP/SSHP (Appendix F), SOPs G-1, G-3, G-5, UXO-03, UXO-05, UXO-06, UXO-07 (Appendix G), EMP (Appendix I), WMP (Appendix J), and ESS; and records data in logbooks and field forms; ▪ UXOQCS, SUXOS, and USACE OESS verifies and validates data; and ▪ Data is loaded to project database daily/weekly, verified and validated by the QCM, PM and/or Senior PM. 	UXOQCS, GSIP SUXOS, GSIP QCM, GSIP PM, GSIP Senior PM, GSIP OESS, USACE

DFW	Supporting Data Documentation and Description	Responsible for Verification/Validation
Data Management	<ul style="list-style-type: none"> ▪ UXO Technicians follow Worksheets (#12, #17 & 18, #22, 24, & 25, and #29), APP/SSHP (Appendix F), and all SOPs (Appendix G); and records data in GPS, logbooks and field forms; ▪ UXOQCS verifies and validates data; and ▪ Data is loaded to project database daily/weekly and verified and validated by the PM, Project Geophysicist, QCM, and GIS Manager. 	UXOQCS, GSIP PM, GSIP Project Geophysicist, GSIP QCM, GSIP GIS Manager, GSIP
Site Restoration	<ul style="list-style-type: none"> ▪ UXO Technicians follow Worksheets (#12, #17 & 18, #22, 24, & 25, and #29), SOP G-1, G-5 (Appendix G), WMP (Appendix J), EPP (Appendix E); ▪ SUXOS and UXOQCS verifies and validates data; and ▪ Data is loaded to project database daily/weekly and verified by the PM. 	SUXOS, GSIP UXOQCS, GSIP PM, GSIP
Demobilization	<ul style="list-style-type: none"> ▪ UXO Technicians follow Worksheets (#12, #17 & 18, #22, 24, & 25, and #29) APP/SSHP (Appendix F), and SOP G-1 (Appendix G). ▪ SUXOS and UXOQCS verifies and validates data; and ▪ Data is loaded to project database daily/weekly and verified by the PM. 	SUXOS, GSIP UXOQCS, GSIP PM, GSIP

This Page Intentionally Left Blank

Worksheet # 37: Data Usability Assessment

The data usability assessment will be performed at the conclusion of field activities using the outputs from data verification and validation. It involves a qualitative and quantitative evaluation of the collected data to determine if the project data are of the right type, quality, and quantity to support the decisions that need to be made. It involves a retrospective review of the systematic planning process to evaluate whether underlying assumptions are supported, sources of uncertainty have been managed appropriately, data are representative of the population of interest, and the results can be used as intended, with the acceptable level of confidence.

There are three distinct evaluative steps that are used to ensure that project data quality needs are met. These data review steps are required for all data, all aspects of data generation (including collection), and all data used in the RA.

Step I: Verification (review for completeness) – Confirmation by examination and provision of objective evidence that the specified requirements (sampling and analytical) have been completed.

Step II: Validation – Confirmation by examination and provision of objective evidence that the particular requirements for a specific intended use are fulfilled. Validation is a sampling and analytical process that includes evaluating compliance with method, procedure, or contract requirements and extends to evaluating against criteria based on the quality objectives developed in the UFP-QAPP (*e.g.*, Worksheet #12). The purpose of validation is to assess the performance of the sampling and analysis processes to determine the quality of specified data. It is divided into two subparts:

- Step IIa assesses and documents compliance with methods, procedures, and contracts; and
- Step IIb assesses and documents a comparison with MPC in the UFP-QAPP.

Step III: Usability Assessment – Determination of the adequacy of data, based on the results of validation and verification, for the decisions being made. The usability step involves assessing whether the process execution and resulting data meet project quality objectives documented in the UFP-QAPP.

37.1 Usability Assessment Process

Data gaps may be present if (1) data are not collected of sufficient quantity and quality, (2) data are not evaluated with regard to the meeting the required MPCs, or (3) data are determined to be unusable. The need for further investigation or CA will be determined on a case-by-case basis, depending on whether data can be recovered, extrapolated from other data, and/or whether the missing data are needed based on the results of other recorded data. The data usability assessment for the RA data will follow a five-step process:

- Step 1 - Review the project's objectives and sampling design:

- Are the DQOs (Worksheet #11) and MPCs (Worksheet #12) still applicable?
- If the DQOs or MPCs have been changed, have the changes been documented (e.g., FCR)?
- Is the sampling design consistent with project objectives and contract requirements?
- Step 2 - Review the data verification and data validation outputs:
 - Have the data been verified as described on Worksheet #34, 35, & 36?
 - Have the data been validated as described on Worksheet #34, 35, & 36?
- Step 3 - Verify the assumptions of the selected statistical method:
 - Are the original inputs to statistical tools still valid?
 - If not, have assumptions been revised appropriately?
- Step 4 - Implement the statistical method:
 - Have adequate data been collected to support use of selected statistical tools?
- Step 5 - Document data usability and draw conclusions:
 - Have the DQOs been achieved?
 - Can the data be used as intended?
 - Are there limitations on data use?

The personnel listed in Table 37-1 will review project data to ensure that the collected data achieve the DQOs and MPCs specified in this UFP-QAPP. During data validation (Worksheet #34, 35, & 36), NCRs and CAs will be documented as described in Worksheet #31, 32, & 33 and the SOP G-5 *Project Quality Control*, and data will be qualified accordingly. All data are usable as qualified by the relevant GSIP personnel, with the exception of rejected data. The data are considered usable if the relevant MPCs are achieved and both the verification and validation steps are considered to have yielded acceptable data. During verification and validation steps, data may be qualified by the person validating the data. Qualifiers are typically intended to indicate minor QC deficiencies, which will not affect the usability of the data. All qualifiers will be documented in the Data Usability Report and RAR. When major QC deficiencies are encountered, data will be rejected and, in most cases, will not be considered usable for making project decisions. Where applicable, project data will be checked to ensure that values and any relevant qualifiers are appropriately transferred to the project electronic database. These checks include comparison of hard copy data and qualifiers to the electronic database. Once data have been uploaded into the electronic database, another check will be performed to ensure that data were loaded accurately. Deviations from the UFP-QAPP will be reviewed to assess whether CA is warranted and to assess impacts on achievement of DQOs.

Table 37-1: Personnel Responsible for Participating in the Data Usability Assessment Preparation or Review

Name	Title	Organization	Role in Usability Assessment
Kevin Pien	PM	USACE POH	Reviewer
Uyen Tran	Technical Lead/COR	USACE POH	Reviewer
Harmon Slappy	USACE OESS	USACE POH	Reviewer
Gary Wolover	USACE OESS	USACE POH	Reviewer
Kanalei Shun	Senior Archaeologist	USACE POH	Reviewer
Kevin Nishimura	Natural Resource Specialist	USACE POH	Reviewer
Kim Meacham	Technical Manager	USAESCH	Reviewer
Debra Edwards	Independent Geophysicist	USAESCH	Reviewer
TBD	TBD	HDOH	Reviewer
Brian Stepp	Senior PM	GSIP	Preparation
Dan Wolf	PM	GSIP	Preparation
Dan Haines	QCM	GSIP	Preparation
Robert Cook	HSM/UXOSO	GSIP	Preparation
Benjamin Konshak	Project Geophysicist	GSIP	Preparation
Matt Rosete	GIS Manager	GSIP	Preparation
Courtney deVries	Senior Scientist	GSIP	Preparation

37.2 Usability Assessment Documentation

All results will be reported for an overall quality assessment in the Data Usability Report (Table 37-2), which will be completed at the end of the field data collection and included in the RAR. The Data Usability Report will document the Usability Assessment based on the five-step process described above. The assessment will include whether each MEC-related data element has been verified and validated according to Worksheet #34, 35, & 36, whether the DQOs (Worksheet #11) have been attained, and whether the data can be used as intended. The Data Usability Report will also identify the location in the RAR where that data element is discussed or otherwise referenced.

This Page Intentionally Left Blank

Table 37-2: Data Usability Report

Step 1: Project Objectives and Sampling Design

<i>Evaluation</i>	<i>Yes/No</i>	<i>Comments</i>
Are the DQOs (Worksheet #11) and MPCs (Worksheet #12) still applicable?		
If the DQOs or MPCs have been changed, have the changes been documented?		
Is the sampling design consistent with project objectives and contract requirements?		

Step 2: Review the Data Verification and Data Validation Outputs

<i>Data Input</i>	<i>Verified (Yes/No)</i>	<i>Validated (Yes/No)</i>	<i>Comments</i>
IVS Letter Report			
DARs			
DQCRs			
DSRs			
Project Status Report			
Logbooks			
DOTRs			
Equipment Calibration and Maintenance Records			
Safety Briefs			
Training Forms			
Three Phase Inspections Reports			
SOP Checklists/Forms			
Status Maps			
Tracking Spreadsheets (DFW status)			
GPS/GIS Data			
Photo Log			
Grid Report			
Seeding Log			
MEC Accountability Log			
Disposal Team Daily Journal			
QA Submittal			
FCRs			

Step 2: Review the Data Verification and Data Validation Outputs

<i>Data Input</i>	<i>Verified (Yes/No)</i>	<i>Validated (Yes/No)</i>	<i>Comments</i>
Field Audits			
Field DN, NCR, RCA and CARs			
DD Form 1348-1A: Issue Release/Receipt Document			
MDAS Transfer Letter			
ENG Form 6048			
DD Form 626			
ATF Form 5400: Report Of Theft Or Loss – Explosive Material			

Step 3: Verify the Assumption of the Statistical Methods

<i>Evaluation</i>	<i>Yes/No</i>	<i>Comments</i>
Are the original inputs to statistical tools still valid?		
If not, have assumptions been revised appropriately?		

Step 4: Implement Statistical Method(s)

<i>Evaluation</i>	<i>Yes/No</i>	<i>Comments</i>
Have adequate data been collected to support use of selected statistical tools?		

Step 5: Document Data Usability and Draw Conclusions

<i>Evaluation</i>	<i>Yes/No</i>	<i>Comments</i>
Have the DQOs been achieved?		
Can the data be used as intended?		
Are there limitations on data use?		

Note:

The comments field presents a brief explanation of any data verification or validation issues. Note that any such issues will be further explained in the RAR and the reference to the explanation will be included in this Report

References

- AECOS Consultants, 2003. *Biological Resources Report for a Proposed Marine Corps Jungle Warfare Training Area in Waikane Valley on Windward Oʻahu*. September.
- AECOS Consultants (Guinther, E.B., David, R., and Montgomery, S.J.), 2005. *Biological Assessment Support for OE/UXO Efforts at the Waikane Training Area, Kahaluʻu, Windward Oʻahu*. Prep. for Donaldson Enterprises Inc. AC050.
- AECOS Inc. (Guinther, E.B., David, R., and Montgomery, S.J.), 2010. *Natural Resources Surveys in Advance of an Explosives Ordnance Disposal Operation in the Waikane Valley Impact Area, MCBH*. AECOS No. 1229B.
- Berger, A.J., 1988. *Revised Environmental Impact Statement for the Proposed Waikane Golf Course Project: Terrestrial Vertebrates, Appendix O*. 1989, Group 70. Honolulu.
- Berkey, K. W., 1976. *After Action Report; Waikane Valley Training Area*. Memorandum to the Commanding General, 1st Marine Brigade from the Brigade Explosive Ordnance Disposal Officer and Project Officer, Explosive Ordnance Disposal Team, Brigade Support Group. KWV:jwb 8027. 20 September.
- DDESB, 2015. *TP-18. Minimum Qualifications for Personnel Conducting Munitions and Explosives of Concern-Related Activities*. 1 September.
- DLNR, 1998. *Indigenous Wildlife, Endangered and Threatened Wildlife and Plants, and Introduced Wild Birds*. DLNR. State of Hawaiʻi. Administrative Rule Section (§)13-134-1 through §13-134-10, dated March 02, 1998.
- DoD, 2014. DoDI 4140.62, *Material Potentially Presenting an Explosive Hazard*. 25 November 2008; Change 1, 19 February 2014.
- EPA, 2002. EPA QA/G-5. *Guidance for Quality Assurance Project Plans*. December.
- _____, 2005. *Uniform Federal Policy for Quality Assurance Project Plans: Evaluating, Assessing, and Documenting Environmental Data Collection and Use Programs. Part 1: UFP-QAPP Manual*. EPA: EPA-505-B-04-900A. March.
- _____, 2011. Chief Information Officer 2106-G-05. *Guidance on Quality Assurance Plans*. September.
- Federal Register, 2012. *Part II. Department of the Interior Fish and Wildlife Service 50 CFR Part 17 Endangered and Threatened Wildlife and Plants; Endangered Status for 23 Species on Oahu and Designation of Critical Habitat for 124 Species; Final Rule*. Vol. 77: 181.
- Hawaiʻi Administrative Rules 1926.900. Subpart U. *Blasting and the Use of Explosives*.

- Lau, J., E, 2013. "Waikāne Valley Botanical Survey Oʻahu, Hawaiʻi". Appendix B in *Draft Environmental Assessment for ʻŌhulehule Forest Conservancy Cacao Farm*. Prepared By Townscape for Paul Zweng.
- Maui Nui Seabird Recovery Project, 2015. Accessed at <http://www.mauinuisseabirds.org/newells-shearwater/>. Accessed October 2015.
- Menard, T., 2001. *Activity Patterns of the Hawaiian Hoary Bat (Lasiurus cinereus semotous) in Relation to Reproductive Time Periods*. Thesis. University of Hawaiʻi. Department of Zoology (Ecology, Evolution, and Conservation Biology).
- Mink, J. F. and Lau, S., 1987. *Aquifer Identification and Classification for Oahu: Groundwater Protection Strategy for Hawaiʻi*. Water Resources Research Center, University of Hawaiʻi, Technical Report 179. November 1987 (Revised 1990).
- Nagata, K.M., 1988. *Revised Environmental Impact Statement for the Proposed Waikane Golf Course Project: Botanical Survey: Waikane Project Area, Koʻolaupoko, Oʻahu, Appendix N*. 1989, Group 70. Honolulu.
- Negahnquet, S. H., 1984. *Explosive Ordnance Disposal (EOD) After Action Report of Ordnance Surface Clearance of Waikane Valley Training Area*. Memorandum to the Commanding Officer, Marine Corps Air Station, Kaneohe Bay from the Explosive Ordnance Disposal Officer, Station Operations and Maintenance Squadron. OMWE/SHN/sk 8027. 7 June.
- Rosendahl, Paul H. Ph.D., Inc 1990. *Intensive Archaeological Survey – Waikane Valley Fence Corridor, Land of Waikane, Koolaupoko District, Island of Oahu*. Prepared for Belt Collins & Associates. April.
- SWCA Environmental Consultants, 2010. *Kahuku Wind Power Habitat Conservation Plan*. Prep. for Kahuku Wind Power LLC.
- USACE, 1996. *DERP-FUDS Inventory Project Report, Waikane Training Area, Waikane, Island of Oʻahu, Hawaiʻi, Site Number (No.) H09HI035400*. May.
- _____, 2004a. *INPR Supplement, Waikane Training Area, FUDS Property Number: H09HI0354*. November.
- _____, 2008. *Final Engineering Evaluation/Cost Analysis (EE/CA) Report, Former Waikane Valley Training Area, Island of Oʻahu, Hawaiʻi*. November.
- _____, 2009a. *Site Investigation Report, Pali Training Camp, Heeia Combat Training Area, and Waikane Training Area, Oʻahu, Hawaiʻi*.
- _____, 2009b. DID MMRP-09-004. *Geophysics*. 19 August.
- _____, 2009c. DID MMRP-09-005. *Accident Prevention Plan*. 19 August.

- _____, 2009d. DID MMRP-09-007. *Geospatial Information and Electronic Submittals*. 19 August.
- _____, 2009e. DID MMRP-09-013. *Site Specific Final Report*. 19 August.
- _____, 2012a. *Final Site Specific Final Report, MEC Removal Action and Supporting Functions, Waikane Training Area, Island of Oʻahu, Hawaiʻi*. July.
- _____, 2012b. *Final Remedial Investigation (RI) Report, Former Waikane Training Area, Kāneʻohe, Oʻahu, Hawaiʻi*. August.
- _____, 2012c. EM 1110-1-2909. *Engineering and Design Geospatial Data and Systems*. September.
- _____, 2012d. EM 1110-1-1002. *Survey Markers and Monumentation*. 01 March.
- _____, 2013a. *Final Feasibility Study (FS) Report, Former Waikane Training Area, Kāneʻohe, Oʻahu, Hawaiʻi*. June.
- _____, 2013b. *Final Proposed Plan, Western/Mountainous Region Munitions Response Site (MRS) and Southeastern Region MRS, Former Waikane Training Area, Kāneʻohe, Oʻahu, Hawaiʻi, Contract: W912DY-04-D-0007, Task Order: 0025*. Prepared for: U.S. Army Engineering and Support Center, Huntsville and USACE, Honolulu District. Prepared by: Zapata. December.
- _____, 2013c. EM 385-1-97. *Explosives - Safety and Health Requirements Manual*. 17 May.
- _____, 2014. EM 385-1-1. *Safety and Health Requirements Manual*. 30 November.
- _____, 2015a. *Decision Document, Southeastern Region MRS, Risk Management Information System (RMIS) Identification (ID): H09HI035401, Waikane Training Area, Kāneʻohe, Oʻahu, Hawaiʻi*. Prepared for USACE, Honolulu District. July.
- _____, 2015b. EM 200-1-15. *Environmental Quality Technical Guidance for Military Munitions Response Actions*. 30 October.
- U.S. Army Garrison, Hawaiʻi and Pacific Cooperative Studies Unit, 2012. *2012 Status Report for the Makua and Oʻahu Implementation Plans*. Schofield Barracks, Oʻahu, Hawaiʻi.
- U.S. Code §9601-1105. *Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)*.
- USDA NRCS, 2015. *Soil Data Viewer Access Database*. Accessed at <http://websoilsurvey.nrcs.usda.gov>. Accessed October 10, 2015.

- USFWS, 2001. *Endangered and Threatened Wildlife and Plants; Determination of Critical Habitat for the Oʻahu ʻElepaio (Chasiempis sandwichensis ibidis); Final Rule*. Federal Register, 66 (237; Monday, December 10, 2001): 63752-63782.
- _____, 2015a. *USFWS Threatened and Endangered Species System (TESS)*. Accessed at http://ecos.fws.gov/tess_public/.
- _____, 2015b. *Status for 49 Species from the Hawaiian Islands*. Federal Register, 80 (189; Wednesday, September 30, 2015): 58820-58909.
- VanderWerf, E, 2013. “Waikane Valley Faunal Surveys – Final Report”. Appendix C in *Draft Environmental Assessment for ʻŌhulehule Forest Conservancy Cacao Farm*. Prepared By Townscape for Paul Zweng.
- Wagner, W.L., Herbst, D.R., and Sohmer, S.H., eds., 1990. *Manual of the Flowering Plants of Hawaiʻi*. Two volumes. Honolulu: University of Hawaiʻi Press.
- Western Regional Climate Center, 2015. *Climate Summaries*. Accessed at <http://www.wrcc.dri.edu>. Accessed October 22, 2015.

Appendix A
Performance Work Statement

This Page Intentionally Left Blank

Section C - Descriptions and Specifications

PERFORMANCE WORK STATEMENT

Performance Work Statement
for
**MUNITIONS & EXPLOSIVES OF CONCERN (MEC) REMEDIAL ACTION
FORMER WAIKANE TRAINING AREA
SOUTHEASTERN REGION MUNITIONS RESPONSE SITE
KANEHOE, OAHU, HAWAII
RMIS ID: H09HI035401**

3 August 2015

1. Project Objective
2. General Project Requirements
3. Background and History
4. Description of Services
 - Task 1- Project Management and Coordination with POH
 - Task 2- Preparation of Plans and Relating Documents
 - Task 3- Base Mapping and GIS
 - Task 4- Natural and Cultural Resources
 - Task 5- Perform MEC Remediation at Former Waikane Training Area (~36 acres)
 - Task 6 - Prepare and Submit Remedial Action Report
5. Period of Contract and Schedule
6. Submittals
7. Other Requirements
8. Government Furnished
9. Payment
10. Contractor's Release
11. Release of Information
12. Performance Metrics
13. Incentives and Disincentives

1. PROJECT OBJECTIVE

The objective of this Performance Work (PWS) is to perform a remedial action to remove and dispose of MEC and munitions debris (MD) found at the Former Waikane Training Area (WTA).

MEC include unexploded ordnance (UXO), discarded military munitions (DMM), and munitions constituents (MC) that are present in sufficient concentration to constitute an explosive hazard.

A detailed description of the project site under this contract is included in Task 4 of this PWS. All data gathered shall be used to update and maintain the GIS database for the WTA.

2. GENERAL PROJECT REQUIREMENTS.

The work required under this PWS falls under the Defense Environmental Restoration Program for Formerly Used Defense Sites (DERP-FUDS). MEC exist as a result of previous Department of Defense activities. MEC are a safety hazard and may constitute an imminent and substantial endangerment to the local populace and site personnel.

2.1 This is a performance-based firm fixed price contract. The performance and subsequently the Government's evaluation of the Contractor shall be based on certain performance metrics to be discussed in section 12 and throughout pertinent portions of this PWS.

2.2 The remedial action work proposed in this PWS was approved by the public and HQUSACE as the selected remedy via the Proposed Plan dated May 2014. The work is being conducted pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended, and, to the extent practicable, the National Contingency Plan (NCP) (40 CFR Part 300).

2.3 All activities involving work in areas potentially containing MEC hazards shall be conducted in full compliance with 29 CFR 1910.120 and all applicable Department of Defense (DoD), Department of the Army (DA), and US Army Corps of Engineers (USACE) requirements regarding personnel, equipment, and procedures.

2.3 Due to the inherent risks associated with munitions response activities, night time (dusk to dawn) work is not allowed; and personnel performing UXO activities that present an explosive risk shall be limited to 40 hours of hazard duty per work week, with no individual workday exceeding 10 hours total, unless specifically authorized by the Contracting Officer (CO) or Contracting Officer's Representative (COR).

2.4 Chemical Warfare Materiel (CWM). Based on archival records, no evidence of the potential existence of CWM or CWM byproducts at the Former Waikane Area was discovered. However, if the Contractor identifies or suspects unknown liquid filled munitions during any phase of field activities, the Contractor shall immediately withdraw upwind from the work area and contact the responsible COR and the appropriate U.S. Army Corps of Engineers, Honolulu Engineer District's (POH) field

representative identified in the Project Work Plan (PWP)/Accident Prevention Plan (APP). The contractor shall secure the area (e.g. through the construction of blast mitigation controls) and provide a minimum two personnel located upwind of the suspect CWM to prevent unauthorized access until relieved by the DA emergency response personnel. Additional reporting instructions are contained in EP 75-1-3 *Explosives-Chemical Warfare Materiel Response* http://64.78.11.86/uxofiles/enclosures/EP75-1-3_RCWM.pdf and CEMP-CE Memorandum: *Interim Guidance-Notification Procedures for Discovery of Recovered Chemical Warfare Materiel (RCWM) during USACE Projects, dated 23 April 2004.*

2.5 Permits. Pursuant to 40 CFR 300.400(e), no federal, state, or local permits are required for any work under this contract conducted entirely on-site. For all response activities conducted off-site, the Contractor shall, as part of this contract and its price, be responsible for obtaining any necessary licenses and permits, and for complying with any federal, state, and municipal laws, codes, and regulations applicable to the performance of the work. All permit acquisition and requirements shall be coordinated with the Government personnel, unless specifically necessary for the operations of the Contractor.

2.6 Notice to Airmen (NOTAM). The Contractor shall coordinate with the Federal Aviation Administration (FAA) and provide the FAA with the information necessary for the FAA to determine whether to issue a NOTAM.

3. BACKGROUND AND HISTORY

3.1 Site History. The Former Waikane Training Area, Island of Oahu, Hawaii consists of approximately 933 acres located on the coastal plain adjacent to Kaneohe Bay and on the slopes of the Koolau Mountain Range. In 1942, the Department of the Army entered into a lease agreement with Lincoln L. McCandless heirs and the Waiahole Water Company, Ltd. This lease established the right to use approximately 1,061 acres in Waikane Valley for advanced offensive warfare training due to the valley's geographical location and terrain. Between 1943 and 1953, the Army used this property for maneuvers, jungle training, and small arms, artillery, and mortar firing. Authorization for the Army to use Waikane Valley continued until July 1953, when the Marine Corps was substituted as lessee. USMC training consisted of small arms fire, 3.5" rockets, and possibly medium artillery fire. Due to fire hazards, incendiaries were prohibited and all artillery in excess .50 caliber to be fired into a designated impact area. The Marine Corps continued use of the area until 1976. The Waikane Valley was formerly used as a training and artillery impact area from 1942 to 1976. Of the 1,061 acres, only 873.64 were considered eligible under DERP-FUDS. During the Engineering Evaluation/Cost Analysis (EE/CA) investigation, the Munitions Response Sites (MRS) were refined and acreage increased to 933 acres.

3.2 History of MEC at the site.

In 1944 four people were injured, two fatally, when a 60-mm High Explosives (HE) mortar discovered in Waikane Valley accidentally detonated. Later in 1963 three children were injured in

when a rifle grenade reportedly discovered in Waikane Valley exploded after it was thrown against a wall. Portions of the site are accessible to the public for hunting, hiking, and moto-cross/ATV riding. There are several dirt roads in the FUDS that provide accessibility across the area.

During the 2006 EE/CA field investigation, seven unexploded ordnance (UXO) items were recovered; two 81mm HE mortar rounds, three 60mm HE mortar rounds, and two 37mm HE projectiles. There was also abundant forensic evidence of HE ordnance usage, as projectile fragmentation, fuze pieces, tail fins, base plates, and other munitions debris (MD) were located throughout the valley. The EE/CA report indicated that the MEC items were mostly found in the southeastern portion the former WTA. Based on the findings, the EE/CA report split the former WTA into four regions and three MRSs requiring follow on response actions.

In 2011, a Non-Time Critical Removal Action (NTCRA) was conducted in the Southern Impact Region MRS and Southeastern Region MRS. The Site Specific Final Report (SSFR) indicated that MEC and high concentration of MD were found and removed in accordance with contract requirements.

Also in 2011, a Remedial Investigation/Feasibility Study (RI/FS) was conducted at the former WTA to determine the nature and extent of MEC and MC contamination then evaluate the effective remedial alternatives based on data and information gathered during fieldwork. The RI/FS discovered more than 3,400 pieces of MD. Subsequently, the results and findings of the RI/FS were presented in the Proposed Plan (PP) which was made available for public review and comments in March 2014. The PP, approved in May 2014, selected surface and subsurface MEC clearance and implementation of land use controls as the response action to address munitions and explosives of concern hazards at the former WTA.

4. DESCRIPTION OF SERVICES

The following sections describe the remedial action process required under this contract. The Contractor is required to furnish all plans, labor, materials, and equipment necessary to meet the requirements of the contract.

4.1 Task 1-Project Management and Coordination with the Government

4.1.1. The Contractor shall assign a **Senior Project Manager (SPM)** and a **Project Manager (PM)** from its staff to regularly coordinate the progress of the Contractor's contractual and field activities with the Government. The SPM and PM shall be proposed by the Contractor when submitting the fee proposal, and as part of the technical approach. These 2 disciplines are considered key personnel and shall meet the experiences and qualifications as specified in section 7.2 of this PWS.

The Government's points of contact for this project include, but are not limited to, the following:

Project Manager (PM): Mr. Kevin Pien 808-835-4091

Kevin.C.Pien@usace.army.mil

Technical Lead (TL)/Contracting Officer's Rep (COR): Ms. Uyen Tran 808-835-4096

Uyen.Tran@usace.army.mil

Ordnance and Explosives Safety Specialist (OESS): Mr. Mike Mullen 808-835-4092

Michael.K.Mullen@usace.army.mil

OESS: Mr. Gary Wolover 808-315-6449

Gary.J.Wolover@usace.army.mil

Senior Archaeologist; Mr. Kanalei Shun 808-835-4097

Kanalei.Shun@usace.army.mil

Natural Resources Specialist; Mr. Kevin Nishimura 808-835-4086

Kevin.H.Nishimura@usace.army.mil

Contract Specialist (CS): Mr. Graeme Silva 808-835-4380

Graeme.L.Silva@usace.army.mil

Contracting Officer (KO): Ms. Joan Kaimikaua 808-835-4376

Joan.F.Kaimikaua@usace.army.mil

In addition, the Contractor shall coordinate with other individual(s) from the Government as specified by the PM/TL after contract award.

4.1.2. Meetings and Briefings.

4.1.2.1. Kick off meeting. The Contractor shall organize and propose agenda for the project kick-off meeting to be held no later than 30 days after the award of a contract. The purpose of the meeting is to discuss the specific role and responsibilities of each of the team members during project execution. In attendance shall be the project delivery team (PDT) comprising of the Contractors, and subcontractors, if any, the Government, and any Government contractors that are working at WTA under different projects. The Contractor shall be responsible to take minutes of the meeting and send out for review to the team members within 2 working days after the meeting.

4.1.2.2 In-progress Review (IPR) Meetings and Project Status Reports. The Contractor shall provide regular feedback to the Government on the progress of its work through face-to-face meetings, telephone conversations, and project status reports. Project Status Reports shall be prepared in accordance with IAW DID MR-085 and include other pertinent items listed throughout this PWS.

The Contractor shall keep a record of each phone conversation, written correspondence, and meeting minutes IAW DID MR-055 and DID MR-045. A copy of these records shall be attached to the Project Status Reports for submittal to POH.

In addition, the Contractor (SPM or PM) shall provide daily status of the fieldwork to the Government's on-site representative [Ordnance Explosive Safety Specialist (OESS)] either orally or by written reports; and weekly GIS updates via maps and data reports.

4.1.2.3 Community events and Public meetings Support

As part of project management, the Contractor shall support the Project Manager and other Government representatives for meetings, presentations, and events. Support would include, but not limited to, preparation of appropriate presentation material including visual displays, video recordings; logistic support during the meetings; and presentation of the work being performed under this contract. It is anticipated all these meeting and community events would take place on the Island of Oahu.

4.1.3 Army Contractor Manpower Reporting

4.1.3.1 Implementation. The Office of the Assistant Secretary of the Army (Manpower & Reserve Affairs) operates and maintains a secure Army data collection site where the Contractor will report Contractor manpower information (including subcontractor manpower information) required for performance of this contract. The Contractor shall submit all the information required in the format specified at the following web address: <https://cmra.army.mil/default.aspx>

4.1.3.2 The Contractors shall fill in the required information on the website, fields are shown below:

- Contract Number
- Requiring Activity Unit Identification Code (UIC)
- Command
- Contractor Contact Information
- Federal Service Code (FSC)
- Direct Labor Hours
- Direct Labor Dollars
- Location Information (where Contractor and subcontractors (if applicable) performed the services)

4.1.3.3 Reporting period will be the period of performance not to exceed 12 months ending September 30 of each Government fiscal year and must be reported by 15 October of each calendar year.

4.1.3.4 If your particular contract crosses fiscal years, 2 entries must be made to capture the data for the contract period; for example if the contract start date is 1 January 2007 and ends 31

December 2007, the data for the period from 1 January 2007 through 30 September 2007 shall be entered not later than 15 October 2007 and the period 1 October 2007 through 31 December 2007 shall be entered not later than 15 January 2008.

4.1.4 Other Coordination.

The Contractor shall assist the Government in coordination with other federal and state agencies as necessary. In addition, the Contractor may be asked to communicate with other environmental consultant firms working at the WTA under contract with the Government.

4.2 Task 2- Preparation of Work Plan (WP)/Uniform Federal Policy for Quality Assurance Project Plan (UFP-QAPP); Accident Prevention Plan (APP)/Site Safety and Health Plan (SSHP); and Explosive Safety Submission (ESS).

All plans listed in this section and throughout pertinent sections of this PWS shall be submitted in draft form for the Government's review and comment. Then the Contractor shall finalize the plans by incorporating the received comments. The Contractor may not mobilize to the site or begin field work until the Project Work Plan (PWP), the Accident Prevention Plan (APP)/Site Safety and Health Plan (SSHP), and other plans mentioned in this section or other pertinent sections of this PWS have been accepted by the Government.

4.2.1 WP/UFP-QAPP. The Contractor shall prepare, submit, and obtain the Government's approval of, and stakeholder's input on a detailed and comprehensive WP/UFP-QAPP that covers all aspects of MEC remedial activities at the MRS. The WP shall include, but not be limited to, the Contractor's proposed methodology for accomplishing the project's objectives in accordance with (IAW) [WERS Data Item Description \(DID\) TEMPLATES](#) latest version (MMRP-09-001), and EM 200-1-15, EM 385-1-1, EM 385-1-97, and Uniform Federal Policy (UFP)-Quality Assurance Project Plan (QAPP), and ER 5-1-11. The Contractor shall establish a method of disposal for all MEC per approved ESS and Ammunition and Explosives Safety Standards, DA Pamphlet 385-64. The WP/UFP-QAPP shall propose the disposal and/or disposition of MEC/MPPEH IAW Chapter 14, EM 1110-1-4009, 15 June 2007 and Errata Sheet No. 2, 7 November 2007.

4.2.1.1 The WP/UFP-QAPP shall include Project Schedule IAW DID MR-085 *Project Status Report*.

4.2.1.2 Instrument Verification Strip (IVS). During the preparation of the WP/UFP QAPP, the Contractor shall work closely with the Project Delivery Team (PDT) to establish an IVS location at WTA. The IVS is a geophysical system selection (geophysical instrumentation test plots) to ensure that a particular geophysical system will work at a particular project site. The PDT will collectively decide on the size, location, and simulant parameters for the IVS. This planning process shall be performed IAW EM 1110-1-4009, dated 15 June 2007, and Errata sheet No.2, dated 7 November 2007; and DID MR-005-05.01.

4.2.1.3 Remedial Design Report. The information and discussion presented in government-approved WP/UFP QAPP may be used by POH as the project's Remedial Design Report to document the plan of action for implementation of the selected response.

4.2.2 Accident Prevention Plan (APP)/Site Safety and Health Plan (SSHP). The Contractor shall prepare an APP/SSHP IAW DID MR-005-06, and address all the requirements listed in EM 385-1-1 and EP-385-1-95a. The APP/SSHP shall promote safe and efficient operations while limiting potential exposure to a minimum number of personnel for a minimum time and to the minimum amount of MEC. The plan shall list the names of all personnel who would participate in the field removal action, including personnel performing the archaeological monitoring. The Contractor may not mobilize to the site or begin field work until the Government has accepted the APP/SSHP. Appropriate personal protection equipment as designated by the Contractor's site safety officer shall be worn when performing fieldwork within the project sites.

The APP/SSHP may be submitted as a separate chapter/appendix in the WP/UFP-QAPP, or as a stand-alone document.

4.2.3 Explosive Safety Submission (ESS).The Contractor shall prepare the ESS IAW DID MR-060. The ESS shall be a stand-alone document to be reviewed by the Government, specifically the Department of Defense Explosive Safety Board (DDESB). The purpose of the ESS is to ensure that all applicable DoD and Army regulations regarding safe and secure handling of MEC is followed. A copy of the accepted ESS shall be maintained at the project site, and the Contractor shall adhere to the terms listed in the ESS when performing MEC work.

The Contractor shall note that MEC fieldwork may not begin until the APP, and ESS have been approved.

4.3 Task 3-GeoSpatial Data

4.3.1 The contractor shall utilize Geographic Information System (GIS) in the development of maps and maintain and manage all projects and geospatial data IAW DID WERS-007.01, EM 200-1-2, EM 200-1-15 and most recent versions of applicable guidance

NOTE: Federal Acquisition Regulations 52.227-17 are applicable to all data the contractor collects under this PWS. Accordingly, archeological data may not be used for purposes outside the scope of work and may not be released to anyone outside the Contractor's organization without the Contracting Officer's prior written approval.

4.3.2 The Contractor shall provide electronic versions of all geospatial data and report figures for each site in conformance to the most recent versions of the following specifications: ESRI ArcGIS geodatabase in v. 10 using Spatial Data Standards for Facilities, Infrastructure, and Environment, v. 2.6 accompanied by Federal Geographic Data Committee (FGDC) compliant metadata. Projection is UTM Zone 4, meters, and datum is NAD83 PA11. For GIS information that is collected from other sources, the Contractor shall incorporate the Government provided GIS

information as is practical in defining the project's existing conditions. Further information on geospatial products, including available data, imagery, GPS data dictionaries, and metadata templates from the Corps of Engineers, shall be defined by USACE. All geospatial products shall comply with EM 1110-1-2909. The GIS data and submittals shall be coordinated with the Honolulu District Technical Integration Branch GIS Specialist.

4.4 Task 4- Natural Resources and Cultural Resources

For matters relating to natural resources, the Contractor shall coordinate with POH's Natural Resources Specialist, Mr. Kevin Nishimura. Any necessary coordination shall occur immediately following the initial kickoff meeting, during fieldwork, and after fieldwork, as appropriate.

4.4.1 Natural Resources

4.4.1.1 Ecological Resources Plan (ERP).

After contract award, the Contractor shall gather existing data regarding the various flora and fauna known to inhabit the project area. Based on archival, library, and background research, the draft ERP shall minimally include a description of Federal and State-listed protected, threatened or endangered species, critical habitats and other sensitive habitats (e.g. wetlands) that are likely to be encountered in the project area and how these resources shall be afforded the proper protection under CERCLA regulations.

Surveys of the site conducted by Char and Associates (1989) and AECOS Consultants (2003) found no federally listed threatened or endangered plant species and no plants proposed for listing. However, the endemic Hawaiian sub-species of the short-eared owl may use resources present within the site, especially in the higher elevations of the valley wall. Typical nesting habitat for the threatened Newell's shearwater is also found on the upper slopes, but there are no known colonies of this species on Oahu. Additionally, the endangered *Cyrtandra kaulantha* is a plant that is endemic to windward side of the Koolau Mountains on the island of Oahu.

The ERP shall include identification and qualifications of key project personnel; lines of communication; methodology and procedures to identify, protect and ensure that any action will not result in a "take" of a protected species or adversely modify critical and sensitive habitats (e.g. avoidance /minimization), post-BIP evaluations, as necessary, and record and report findings in accordance with EM 200-1-15; proposed milestone and completion schedule; and descriptions of the types and kind of reporting necessary for the project.

Three copies of the draft ERP shall be submitted as a stand-alone document to the Government PM. Three copies of the final ERP and 3 CD's shall be submitted to the Government. Fieldwork for this project may not begin until the Government has accepted the ERP.

4.4.1.2 Survey and Monitoring during Fieldwork.

The Contractor shall ensure that a qualified biologist or ecologist meeting the qualifications stated in EM 200-1-15 (4.7.11.6) manages all ecological resource survey and/or monitoring efforts. This individual shall meet the necessary educational and institutional qualifications, supervision and performance experience, and general familiarity and knowledge of the project area to ensure appropriate protection of natural resources for this task during these CERCLA activities. The Contractor shall not damage nor remove, nor take any threatened or endangered species while conducting the work required under this PWS. As used in this PWS, the term “take” has the same meaning as it does in the Endangered Species Act (16 USC 1538(a)(1)). The Contractor shall record and take a point-shot GPS coordinate of any previously mentioned species encountered during the fieldwork. In addition, ecological survey and monitoring, recording, and mapping where protected species, sensitive habitats and/or critical habitat are identified shall be oriented so as to obtain the most data available on the nature, and location. All identified protected species, sensitive habitats and/or critical habitat shall be fully and systematically described, plan mapped, and documented. Ecological survey and monitoring activities shall be performed in a manner so as to minimize impact to the ongoing MEC work

4.4.1.3 Documentation and Reporting.

All stages of the ecological survey and monitoring shall be fully documented in daily log and photographic form. In addition, if protected species, sensitive habitats and/or critical habitat are identified, thorough documentation and fields surveys or monitoring, avoidance measures may be required. The Contractor shall use standardized and accepted field survey protocols and techniques for ecological resources data recording methods and terminology. The results of all ecological surveys and monitoring shall be documented as an appendix in the Remedial Action Report.

4.4.2 Cultural Resources

For matters relating to cultural resources, the Contractor shall coordinate with POH’s Senior Archaeologist, Mr. Kanalei Shun. Any necessary coordination shall occur immediately following the initial kickoff meeting, during fieldwork, and after fieldwork, as appropriate.

4.4.2.1 Archaeological Monitoring Plan (AMP). A thorough AMP is required to ensure that sites are properly protected during the MEC remediation process, the Contractor shall review pertinent files, records, reports, and conduct interview with experts as necessary to develop an AMP specific to the activities listed under Task 4 of this PWS. The plan shall include discussion on the project location background history and environment, site type found in a similar environmental ecosystem, a minimal research design, and the proposal for performing the monitoring with minimal impact to the ongoing MEC work, and the steps to be taken in the event of expected or inadvertent discovery of human remains or significant cultural resources.

Five copies of the draft AMP shall be submitted as a stand-alone document to the Government PM. Ten copies of the final AMP and 10 CD's shall be submitted to the Government. Fieldwork for this project may not begin until the Government has accepted the AMP.

4.4.2.2 Reconnaissance and Monitoring during Fieldwork. An appropriate level of archaeological reconnaissance survey and monitoring during excavations shall be required for all fieldwork taking place under this PWS. The Contractor shall provide a Principal Investigator and archaeological reconnaissance survey and monitoring personnel in accordance with the standards and guidelines set forth by Secretary of the Interior in 48 FR 190:44716-44742, 29 Sept. 1983. The reconnaissance survey and monitoring shall be conducted in accordance with the Government approved AMP discussed in section 4.5.2.1 above and shall be performed during surface and subsurface MEC operations including, but not limited to, sweeping, removal and earth-disturbing activities, and implementing other protection measures for sites to be affected by clearance activities.

Archaeological reconnaissance survey and monitoring, recording, mapping and sampling during fieldwork where surface and subsurface cultural features are identified shall be oriented so as to obtain the most data available on the nature, location, and age of extant cultural deposits and other cultural features. All identified surface cultural remains and features shall be fully and systematically described, plan mapped, and documented. All subsurface cultural remains shall also be fully and systematically described, and where feasible, sampled. Archaeological reconnaissance survey and monitoring activities shall be performed in a manner so as to minimize impact to the ongoing MEC work.

4.4.2.3 Documentation. All stages of the archaeological reconnaissance survey and monitoring shall be fully documented in daily log and photographic form. In addition, if subsurface archaeological features are identified, thorough documentation and sampling of the potential prehistoric and historic cultural remains and features may also be required. The Contractor shall use standardized and accepted field survey protocols and techniques for cultural resources data recording methods and terminology including documentation of wall profiles of all excavations containing cultural layer(s) using Munsell Soil and Color notations.

4.4.2.4 Reports. The results of all archaeological reconnaissance survey and monitoring, including excavation results performed under this contract shall be documented in archaeological reports. Based on the usual sensitive nature of archaeological, cultural and historic resources, the Contractor shall coordinate with the Government to ensure that, where necessary, individual archaeological reports for each TMK and/or property owner would be prepared. Draft reports shall be reviewed by the Government then finalized by the Contractor incorporating the review comments. Three (3) hard copies and 3 CD copies of each of the draft and final report shall be submitted to the Government for review and records, respectively.

4.5 Task 5- Perform MEC Remedial Action at WTA (~ 36 acres)

The Contractor shall supply all personnel, tools, equipment, communications, transportation, materials, and supervision to integrate, manage, and safely execute the destruction and/or disposal of MEC and MD at approximately 36 acres of WTA to a depth of two feet below ground surface. See Figure 1 for overall site location and Figure 2 for the 36 acre MEC remediation area.

To the extent necessary, the Contractor shall coordinate and communicate with other federal, state agencies and the public to ensure safe and timely MEC operations.

4.5.1 Geophysical Systems Verification.

The Contractor shall establish the Instrument Verification Strip (IVS) with blind seeding as specified in the government-approved WP/UFP-QAPP for geophysical instrumentation testing and calibration before the start of fieldwork. The Contractor shall prepare an IVS Letter Report after establishing the IVS. The IVS Letter Report shall document the approach and methods used to install the IVS and the rationale for the selected geophysical instrumentation.

4.5.2 MEC Remediation and Disposal. The Contractor shall conduct the remedial action IAW the methodology outlined in the PWP. The MEC items previously found in WTA are listed in Section 3 of this PWS. All ferrous objects similar in size and mass to the MEC items listed in Section 3 of this PWS shall be removed. When a MEC item or MD is found, the Contractor shall immediately notify the Government's on-site OESS. The Contractor shall be responsible for the destruction and disposal of all MEC and MD found at the project sites. No intrusive or demolition operation shall be carried out without the presence of a Government OESS on-site.

4.5.3 Backfilling Excavations. Each excavation created by the investigation of an anomaly and each detonation hole created by the destruction of a MEC item shall be cleared and back-filled.

4.5.4 MEC Accountability. The Contractor shall maintain a detailed accounting of all MEC and MEC components encountered. This accounting shall include the amounts of MEC, nomenclature, the identification and condition to include classification IAW DA Memo *Munitions Response Terminology* dated 21 April 2005, location and depth of MEC, and disposition. This accounting shall be a part of the GIS and shall be included in all draft and final reports. The accounting system shall also account for all demolition materials used to detonate MEC. The Contractor shall take a digital photograph of each identifiable MEC item found during field activities. If a scenario is encountered that precludes the Contractor from detonating a UXO in-place, such as an unidentifiable UXO is located, or unknown filler is encountered, the Contractor shall notify the Government's on-site OESS.

4.5.5 Disposal/Disposition of Material Potentially Presenting an Explosive Hazard (MPPEH): All MPPEH shall be handled in accordance with Chapter 14, EM 1110-1-4009, dated 15 June 2007, and Errata Sheet No. 2, dated 7 November 2007.

4.5.6 Quality Assurance (QA) and Quality Control (QC).

4.5.6.1 The Government OESS will perform QA checks of all phases of the Contractor's work. Special emphasis will be on the established working grids, e.g. 100 meters by 100 meters. If any ferrous object is found that is similar in size and mass to the MEC expected in that area, within the depth of detection, that grid will be failed, and shall be completely re-swept by the Contractor at no cost to the Government. A workmanship or safety deficiency will also result in grid failure, and grids failed for these reasons shall also be completely re-swept by the Contractor at no cost to the Government.

4.5.6.2 The Contractor shall administer a QC Program in accordance with DID MR 005-11 to manage, control, and document its own and any subcontractor's activities. The methodology to accomplish this effort shall be proposed in the PWP, and adhered to in the field. The QC activities shall be documented and included in the Remedial Action Report (section 4.6 of this PWS)

4.5.6.3 The Contractor shall appoint an UXO QC Specialist who shall be responsible for QC documentation and will periodically ensure elements of the work, such as detection, recovery, storage, transport, and disposal of UXO, are carried out in conformance with the approved PWP and contract provisions. The UXO QC Specialist (UXOQCS) shall not be involved in any of the ordnance removal tasks.

Minimum qualifications of the UXOQCS is listed in section 7.2 of this PWS.

4.5.7 Site Security. The Contractor shall provide site physical security (e.g., fencing or guard service) as required. At a minimum, the Contractor shall maintain all areas to minimize the risk of injury or accident. Work on or near roadways shall be marked with lights and barricades meeting State and local regulations. Where such regulations are not applicable or adequate, the Contractor shall minimize the risk of an accident. Special consideration shall be given to site security/safety needs near residential areas where there may be children.

4.6 Task 6- Prepare and Submit Remedial Action Report (RAR).

It is assumed that the RAR would include pertinent requirements as specified in DID MR-030 (Draft and Final Remedial Action Report). The Contractor shall submit a draft and final RAR summarizing the remedial activities implemented to address the MEC hazards at the former WTA. A CD that includes all data and maps produced during field operations, and the associated Final RAR, shall be delivered with each copy of the report.

The Contractor shall work closely with the PDT on the format of the RAR. As a minimum, the RAR shall include the discussion of the major categories listed below:

- Executive Summary
 - Introduction
 - Site Background and Foreseeable Future Use
 - Remedial Action Activities
- Decision Document Requirements

Nature and Extent of Contamination

Description of Technology Used

Disposition of MEC items found (with certificates as applicable)

- Land Use Controls recommendations
- Appendices
- References
- Supporting Documentation

5. PERIOD OF CONTRACT SCHEDULE

5.1 The performance period shall be 600 calendar days from contract award. The following schedule shall be used to complete this single award contract, and as a guideline to submit invoices for partial payment. The tentative award date is 23 September 2015.

PROJECT MILESTONE	MAXIMUM (cal) DAYS AFTER AWARD	ESTIMATED % OF WORK COMPLETED
Kick off meeting	30	0.25 %
Submit draft WP, UFP-QAPP, APP, AMP, ESS, etc. (Task 2)	90	2%
Government completes review of Plans *	180	10%
Submit final WP, UFP-QAPP, APP, AMP, ESS, etc. (Task 2)	200	15%
IVS Implementation	235	16%
Start Field Activities (Task 4)	240	20%
Finish Field Activities w/prelim results	380	80%
Submit Draft RAR	440	90%
Government review of draft RAR	510	95%
Submit Final RAR	570	98%
Government Acceptance of Final RAR	600	100%

* Note: Timeline of Plans maybe be delayed due to ESS processing

6. SUBMITTALS

6.1 All final text files generated by the Contractor and subcontractors under this Contract shall be furnished to the Contracting Officer in Word 6.0 or higher software, IBM PC compatible format. Formal submittals shall be in a format and media that will permit their loading, storage, and use without modification or additional software on the U.S. Corps Army Corps of Engineers, Honolulu District (POH) GIS workstations. Tables will be in MS Excel spreadsheet format. A CD that includes all data shall be delivered with each copy of the report. The Contractor shall furnish copies of the plans, maps, and reports to each addressee listed below in the quantities indicated. The Contractor shall use express mail services for delivering these plans and reports. Following each submittal, comments generated as a result of their review shall be incorporated.

ADDRESSEE	COPIES
US Army Engineer District, Honolulu ATTN: CEPOH-PP-E (Mr. Kevin Pien/Ms Uyen Tran) Building 230 Fort Shafter, Hawaii 96858-5440	20

6.2 Timeline for submittals shall adhere to the following Data Item Description (DID) as appropriate:

DID-MR-005-01	Draft Work Plan
DID-MR-005-01	Final Work Plan
DID-MR-005-02	Technical Management Plan
DID-MR-005-03	Explosives Management Plan
DID-MR-005-04	Explosives Siting Plan
DID-MR-005-05.01	Geophysical Investigation Plan
DID-MR-005-05.01	Geophysical Prove-Out (GPO) Plan and Report
DID-MR-005-06	Accident Prevention Plan
DID-MR-005-07.01	Geospatial Information and Electronics Submittals
DID-MR-005-08	Work, Data, and Cost Management Plan
DID-MR-005-09	Property Management Plan
DID-MR-005-10	Munitions Constituents Chemical Data Quality Deliverables
DID-MR-005-11	Quality Control Plan
DID-MR-005-12	Environmental Protection Plan
DID-MR-005-13	Investigative Derived Waste Plan
DID-MR-005-15	Accident Prevention Plan for Recovered Chemical Warfare Material (RCWM) Projects
DID-MR-005-16	Interim Holding Facility (IHF) Siting Plan for Recovered Chemical Warfare Material (RCWM) Projects
DID-MR-005-17	Physical Security Plan for Recovered Chemical Warfare Material (RCWM) Project Sites
DID-MR-015	Accident/Incident Reports
DID-MR-025	Personnel Qualification Certification Letters
DID-MR-030	Draft Site Specific Report
DID-MR-030	Final Site Specific Report

DID-MR-045	Report / Minutes, Record of Meeting
DID-MR-055	Telephone Conversation/Correspondence Records
DID-MR-060	Conventional Explosives Safety Submission (ESS)
DID-MR-070	Recovered Chemical Warfare Material Safety Submission (ESS)
DID-MR-080	Monthly Status Report
DID-MR-085	Project Status Report
DID-MR-100	Institutional Analysis and Institutional Control Plan

In the event of conflict in timelines from the DID and the Table for Period of Contract Schedule (above), the Contractor shall follow the DID.

7. OTHER REQUIREMENTS.

7.1 APPLICABLE GUIDELINES AND REGULATIONS

- 7.1.1 AR 385-40 with USACE Supplements, Accident Investigation and Reporting Records.
- 7.1.2 EM 385-1-1 USACE Safety and Health Requirement Manual.
- 7.1.3 Department of Defense Explosives Safety Board (DDESB) Technical Paper 18
- 7.1.4 DOD Regulation 6055.9 STD DOD Ammunition and Explosive Safety Standards.
- 7.1.5 DA Pam and AR 385-64 Ammunition and Explosive Standards.
- 7.1.6 EP 385-1-95a Basic Safety Concepts and Considerations for OE Operations, 29 June 2001.
- 7.1.7 DOD 4160.21-M Defense Reutilization and Marketing Manual.
- 7.1.8 DOD 4160.21-M-1 Defense Demilitarization Manual.
- 7.1.9 EM 1110-1-4009, Engineering and Design – Ordnance and Explosives Response, 15 June 2007
- 7.1.10 29 CFR 1910.120 Hazardous Waste Operations and Emergency Response – Occupational Safety and Health Administration
- 7.1.11 EM 200-1-15 Technical Guidance for Military Munitions Response Actions. Interim Guidance Document (IGD), 30 October 2013.

7.2 KEY PERSONNEL

The contractor and subcontractor personnel shall be experienced and competent in the tasks for which they are responsible for, and currently possess any required certifications, registrations, or licenses required under federal, state, and/or local laws and regulations. The minimum required personnel qualifications are as follows, but not limited to:

- **Senior Project Manager (PM)** shall be responsible for directing day-to-day operations in the field, assembling clearance teams and directing work associated with range clearance and ordnance remediation procedures, environmental, and compliance projects. Ensuring that elements of project plans can be implemented within schedule and within budget, recommending and justifying change orders, developing or modifying a method for tracking resources,

coordinating work accomplished by subcontractors, monitoring and controlling costs, and complying with normal safety procedures, as well as regulatory requirements.

Minimum qualifications include the following: graduate of the U.S Naval Explosive Ordnance Disposal (EOD), Indian Head, MD, and/or U.S. Army Bomb Disposal School, Aberdeen Proving Ground, MD or equivalent; a minimum of fifteen years (15) in EOD/UXO experiences with a minimum of five (5) years of which as field operations manager working on, clearance and disposal of MEC

- **Project Manager (PM)** shall be responsible for implementing specific work under this contract. He/she shall evaluate the requirements of the contract and shall develop and implement a plan to meet those requirements. The PM shall be the primary point-of-contact for the contract.

Minimum qualifications include the following: graduate of the U.S Naval Explosive Ordnance Disposal (EOD), Indian Head, MD, and/or U.S. Army Bomb Disposal School, Aberdeen Proving Ground, MD or Bachelor's degree from an accredited school in a technically related field such as geophysics, environmental engineering, environmental science, geology, hydrology, environmental chemistry etc; a minimum of ten (10) years experiences as a PM, with minimum of five (5) years experience managing environmental or munitions projects at the field operational level.

- **Senior UXO Supervisor (SUXOS)** shall be responsible for supervising all UXO related site work. Duties include scheduling and coordinating UXO operations, routine performance inspections, and submitting reports and schedules to the PM.

Minimum qualifications include the following: graduate of the U.S Naval EOD, Indian Head, MD, and/or U.S. Army Bomb Disposal School, Aberdeen Proving Ground, MD or equivalent; 15 years of UXO experience of which five (5) years would be in the supervision of personnel working with unexploded ordnance; experienced in handling multi-team tasking for UXO remediation or range clearance operations; must be able to fully perform all of the functions enumerated for UXO Sweep Personnel and UXO Technicians I, II, and III. In addition, the SUXOS has the ability to perform the following functions is a requirement for the SUXOS: planning, coordinating, and supervising all contractor on-site OE activities; preparing standing operating procedures (SOPs) for MEC operations, ensuring compliance with DOD directives as well as local, state, and Federal statutes and codes; and certification of Ammunition, Explosives, and Dangerous Articles (AEDA) and/or range scrap as ready for turn-in or disposal in accordance with current policies. The SUXOS must also be fully capable of supervising multiple project teams which may be performing OE and OE-related activities: e.g., vegetation removal; land surveying; reconnaissance and classification of MEC, pyrotechnic items, and military explosives and demolition materials; locating surface and subsurface MEC; destroying UXO and MEC by burning or detonation; and/or transporting and storing MEC and demolition material.

- **UXO Quality Control Specialist (UXOQCS)** shall be responsible for developing, maintaining, and enforcing the QC program during field activities.

Minimum qualifications include the following: graduate of the U.S Naval EOD, Indian Head, MD, and/or U.S. Army Bomb Disposal School, Aberdeen Proving Ground, MD or equivalent; certification by American Society for Quality as a Certified Quality Auditor (CQA), or Certified Quality Manager (CQMgr), or Manager of Quality/Organizational Excellence (CMQ/OE), or Six Sigma Green or Black Belt; or Documented training in auditing of Quality Systems such as ISO9000; eight (8) years experience in UXO field; five (5) years experience or training to develop, implement and monitor the Quality System for the Contract; knowledge of munitions and explosive safety QC requirements and documented experience in projects similar to the Contract; experienced in evaluation of the functions required of UXO Technicians I, II, III, and SUXOS;

8. GOVERNMENT FURNISHED.

8.1 Right-of-Entry.

8.2 Decision Document (2015)

8.3 Pertinent EOD Technical publications as required.

8.4 Pertinent Engineering Evaluation/Cost Analysis sampling data and historic data.

8.5 Data Item Descriptions.

The following references are available on the CEHNC Web Page at

<http://www.hnc.usace.army.mil/Missions/Engineering.aspx>

8.6 Remedial Investigation (RI) Report Former Waikane Training Area, Kaneohe, Oahu, Hawaii. Zapata Incorporated, Aug 2012

8.7 Decision Document-Former Waikane Training Area, Southeastern Region MRS, Kaneohe, Oahu, Hawaii, RMIS ID: H09HI035401

9. INVOICING

The majority of the project cost would incur during the actual MEC removal; therefore, it is acceptable for the Contractor's billings to be submitted by the 1st and 15th of each month during fieldwork (Task 5). For all other contractual activities, the Contractor shall submit invoices no more frequently than monthly, and shall follow paragraph 5.1 in developing the amounts. A summary of work during the billing period shall accompany each invoice.

10. CONTRACTOR'S RELEASE

The Contractor is required to submit its written and signed "Release of Claims" form to the Contracting Officer with its final invoice for service rendered under the terms of this contract.

11. RELEASE OF INFORMATION.

The information and data developed, gathered, and assembled in fulfillment of the contract requirements as defined or related to this PWS will become the complete property of POH and shall, therefore, not be used by the Contractor, its consultants, its subcontractors or their associates for any purpose at any time without the written consent of the Contracting Officer or his/her designee.

The Contractor shall not make available or publicly disclose any data generated or reviewed under this contract or any subcontract unless specifically authorized by the contracting officer and the

Government Public Affairs Officer (PAO). When approached by any person or entity requesting information about the subject of this contract, the Contractor shall defer to PAO for response. Reports and data generated under this contract shall become the property of the Government, and distribution to any other source by the Contractor is prohibited unless authorized by the Contracting Officer.

12. PERFORMANCE METRICS.

The performance and subsequently the evaluation of the Contractor shall be based on certain performance metrics. The metrics include safety, quality, schedule, cost, and customer (POH) satisfaction. Evaluations of the Contractor's performance may be done at any time during the course of this contract. The Contractor will be allowed to provide input to specific performance metrics on this contract; however, the Government will make the final determination of specific performance metrics. Some performance metrics may include but are not limited to the following.

12.1. Quality:

12.1.1 Conformance with PWS with minimal Contractor's rework.

12.1.2 Government reviewers do not find it necessary to make extensive and/or repetitive comments, correspondence or other communication regarding issues of which the Contractor should have thorough knowledge.

12.2 Schedule:

12.2.1 Timely and complete submission of draft and final deliverables IAW PWS.

12.2.2 Timely commencement and completion of PWS-specified work.

12.2.3 Factors that may result in changed schedule are identified to the COR and USACE project manager, in writing, in a timely manner.

12.3 Controls:

12.3.1 No unauthorized work. This fixed price contract requires the contractor to perform the work described in the contract, at the awarded price.

12.3.2 Monthly progress reports accurate and submitted IAW PWS.

12.3.3 Factors that may result in the need for a modification to the contract, are identified to the COR and USACE project manager, in writing, in a timely manner.

12.4 Business Relations:

12.4.1 Met contractual obligations.

12.4.2 The customer (e.g. local Corps District, local installation representative, etc.) has overall satisfaction with the work performed.

12.5 Management of Key Personnel:

12.5.1 Key personnel were highly qualified, responsive and cooperative.

12.5.2 Key personnel were able to manage their resources efficiently.

12.5.3 Key Personnel were knowledgeable and effective in their areas of responsibility.

12.6 Safety:

12.6.1 No Class A Accidents.

12.6.2 No major safety violations.

12.6.3 Minor safety violations uncommon.

12.6.4 No pattern of non-compliance with project safety standards.

13. INCENTIVES AND DISINCENTIVES.

Incentives may be awarded to the Contractor in the form of an excellent overall performance evaluation rating, if achieved, on this contract. By the same token, disincentives exist in the form of a less than satisfactory performance evaluation, and may be issued as well.

13.1 Incentives. Incentives for excellent performance may include a very good/excellent CPARS rating which may enable future work with the Department of Defense. An excellent rating may result in letters/certificates of Commendation presented in public ceremonies by high level USACE or U.S. Army Engineering Support Center Huntsville (USAESCH) officials; write-ups in USACE or USAESCH publications; featuring project success stories at UXO conferences, forums and seminars, etc.

13.2 Disincentives. Disincentives for less than satisfactory performance may include, but are not limited to, poor or unsatisfactory performance ratings in CPARS, which may impair future work with the Department of Defense. A disincentive may also include re-doing unsatisfactory work at no cost to the Government, etc.

--- END OF PERFORMANCE WORK STATEMENT---

Figure 1- Site Location

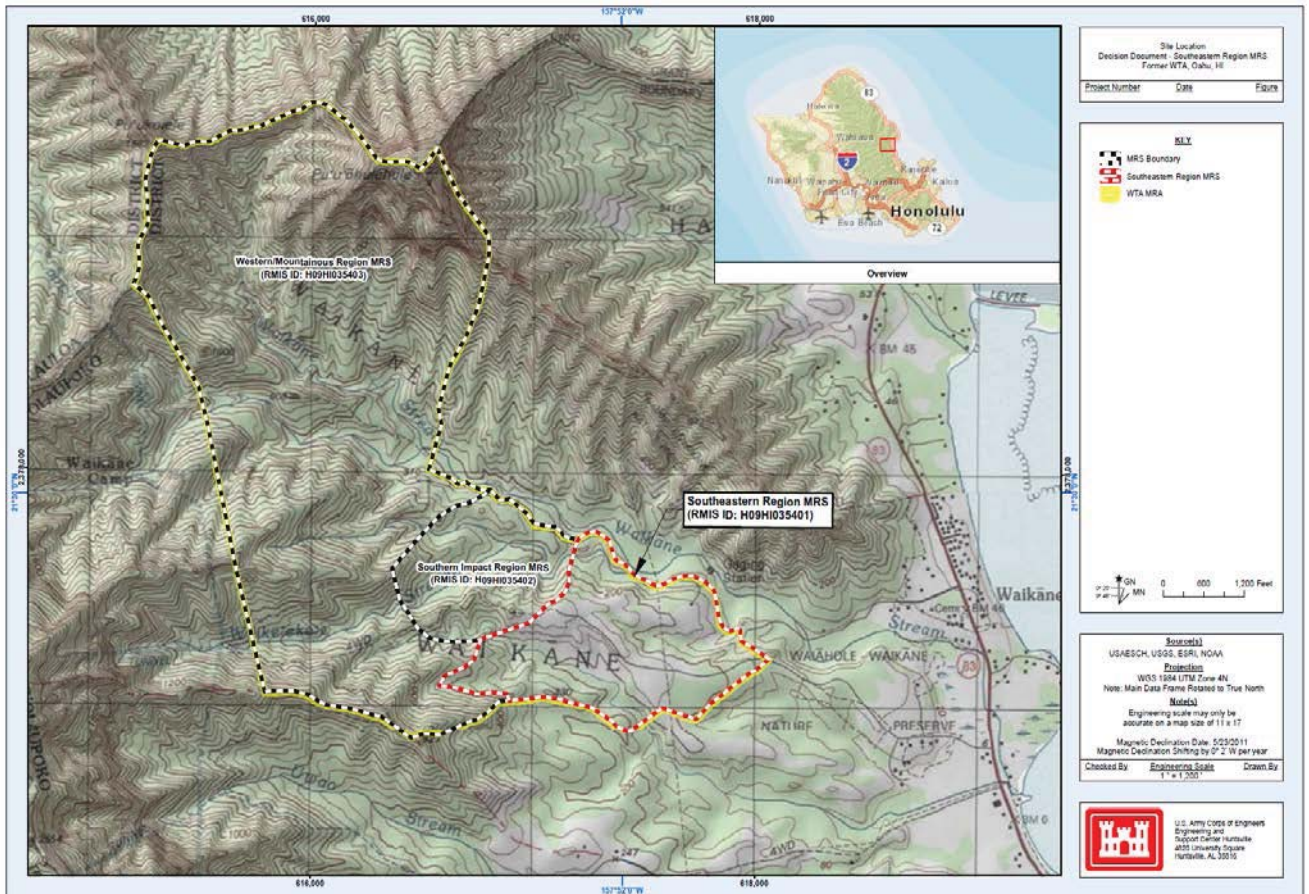
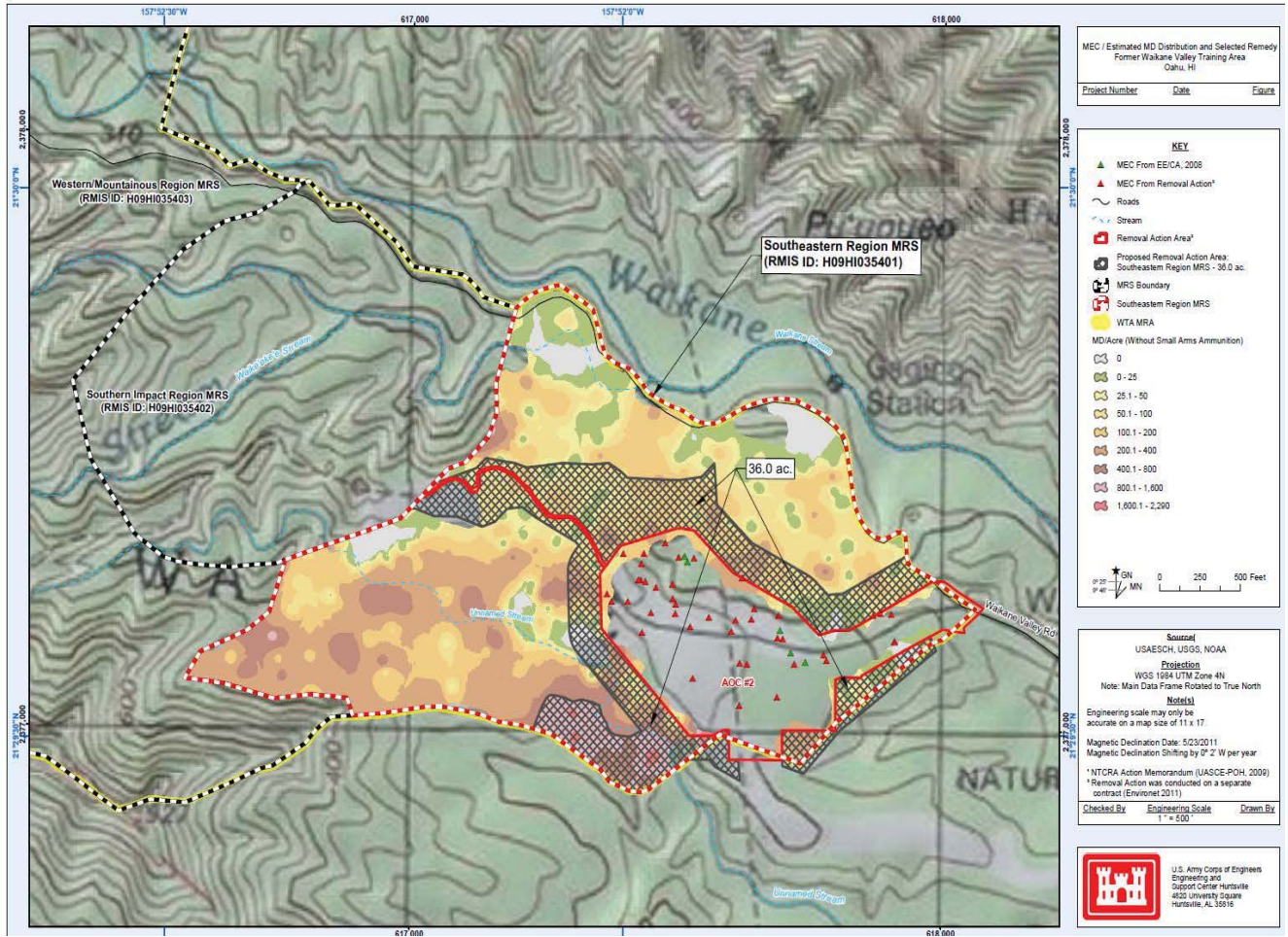


Figure 2-MEC Estimated MD Distribution and Selected Remedy (36 Acres)



Section E - Inspection and Acceptance

INSPECTION AND ACCEPTANCE TERMS

Supplies/services will be inspected/accepted at:

CLIN	INSPECT AT	INSPECT BY	ACCEPT AT	ACCEPT BY
0001	N/A	N/A	N/A	Government
0002	N/A	N/A	N/A	Government

CLAUSES INCORPORATED BY FULL TEXT

52.246-4 INSPECTION OF SERVICES--FIXED-PRICE (AUG 1996)

- (a) Definitions. "Services," as used in this clause, includes services performed, workmanship, and material furnished or utilized in the performance of services.
- (b) The Contractor shall provide and maintain an inspection system acceptable to the Government covering the services under this contract. Complete records of all inspection work performed by the Contractor shall be maintained and made available to the Government during contract performance and for as long afterwards as the contract requires.
- (c) The Government has the right to inspect and test all services called for by the contract, to the extent practicable at all times and places during the term of the contract. The Government shall perform inspections and tests in a manner that will not unduly delay the work.
- (d) If the Government performs inspections or tests on the premises of the Contractor or a subcontractor, the Contractor shall furnish, and shall require subcontractors to furnish, at no increase in contract price, all reasonable facilities and assistance for the safe and convenient performance of these duties.
- (e) If any of the services do not conform with contract requirements, the Government may require the Contractor to perform the services again in conformity with contract requirements, at no increase in contract amount. When the defects in services cannot be corrected by reperformance, the Government may (1) require the Contractor to take necessary action to ensure that future performance conforms to contract requirements and (2) reduce the contract price to reflect the reduced value of the services performed.
- (f) If the Contractor fails to promptly perform the services again or to take the necessary action to ensure future performance in conformity with contract requirements, the Government may (1) by contract or otherwise, perform the services and charge to the Contractor any cost incurred by the Government that is directly related to the performance of such service or (2) terminate the contract for default.

(End of clause)

Section F - Deliveries or Performance

DELIVERY INFORMATION

CLIN	DELIVERY DATE	QUANTITY	SHIP TO ADDRESS	UIC
0001	POP 15-SEP-2015 TO 07-MAY-2017	N/A	N/A FOB: Destination	
0002	POP 15-SEP-2015 TO 07-MAY-2017	N/A	N/A FOB: Destination	

CLAUSES INCORPORATED BY FULL TEXT

52.242-15 STOP-WORK ORDER (AUG 1989)

(a) The Contracting Officer may, at any time, by written order to the Contractor, require the Contractor to stop all, or any part, of the work called for by this contract for a period of 90 days after the order is delivered to the Contractor, and for any further period to which the parties may agree. The order shall be specifically identified as a stop-work order issued under this clause. Upon receipt of the order, the Contractor shall immediately comply with its terms and take all reasonable steps to minimize the incurrence of costs allocable to the work covered by the order during the period of work stoppage. Within a period of 90 days after a stop-work is delivered to the Contractor, or within any extension of that period to which the parties shall have agreed, the Contracting Officer shall either--

(1) Cancel the stop-work order; or

(2) Terminate the work covered by the order as provided in the Default, or the Termination for Convenience of the Government, clause of this contract.

(b) If a stop-work order issued under this clause is canceled or the period of the order or any extension thereof expires, the Contractor shall resume work. The Contracting Officer shall make an equitable adjustment in the delivery schedule or contract price, or both, and the contract shall be modified, in writing, accordingly, if--

(1) The stop-work order results in an increase in the time required for, or in the Contractor's cost properly allocable to, the performance of any part of this contract; and

(2) The Contractor asserts its right to the adjustment within 30 days after the end of the period of work stoppage; provided, that, if the Contracting Officer decides the facts justify the action, the Contracting Officer may receive and act upon the claim submitted at any time before final payment under this contract.

(c) If a stop-work order is not canceled and the work covered by the order is terminated for the convenience of the Government, the Contracting Officer shall allow reasonable costs resulting from the stop-work order in arriving at the

termination settlement.

(d) If a stop-work order is not canceled and the work covered by the order is terminated for default, the Contracting Officer shall allow, by equitable adjustment or otherwise, reasonable costs resulting from the stop-work order.

(End of clause)

Section G - Contract Administration Data

ACCOUNTING AND APPROPRIATION DATA

AA: 21520200000 088120 32304B9L4B49300824000 ENVR 94626

AMOUNT: [REDACTED]

CIN WX3JR9525137470001: [REDACTED]

CIN WX3JR9525137470002: [REDACTED]

Section H - Special Contract Requirements

AT/OPSEC

"All contract employees, including subcontractor employees who are not in possession of the appropriate security clearance, will be escorted in areas where they may be exposed to classified and/or sensitive materials and/or sensitive or restricted areas."

"The Contractor must pre-screen Candidates using the E-verify Program (<http://www.dhs.gov/E-Verify>) website to meet the established employment eligibility requirements. The Vendor must ensure that the Candidate has two valid forms of Government issued identification prior to ensure the correct information is entered into the E-verify system. An initial list of verified/eligible Candidates must be provided to the COR no later than 3 business days after the initial contract award."

CLAUSES INCORPORATED BY FULL TEXT

S-19 SAFETY STANDARDS

The successful offeror will be required to comply with Chapter 396 of the Hawaii Occupational Safety and Health Act (OSHA) standards and Title 12 Department of Labor and Industrial Relations, Subtitle 8 Division of Occupational Safety and Health, Part 2 General Industry Standards as well as with the Corps of Engineers Manual 385-1-1, Safety and Health Requirements Manual. [Title 29, CFR, Chap 18, Part 1910 (OSHA)]

[End of Statement]

CLAUSES INCORPORATED BY FULL TEXT

S-19A U.S. ARMY CORPS OF ENGINEERS SAFETY AND HEALTH REQUIREMENTS MANUAL, EM 385-1-1 (AUG 2002)

This paragraph applies to contracts and purchase orders that require the contractor to comply with EM 385-1-1 (e.g., contracts that include the Accident Prevention clause at FAR 52.236-13 and/or other safety provisions.) EM 385-1-1 and its changes are available at the following web site:

http://www.publications.usace.army.mil/Portals/76/Publications/EngineerManuals/EM_385-1-1.pdf

The Contractor shall be responsible for complying with the current edition and all changes posted on the web as of the effective date of this solicitation.

Per EM 385-1-1 (latest version) Contractors shall ensure timely accident reporting is strictly adhered to. PODR 265 will be completed within 24 hours of all accidents (excluding first aid injuries). ENG 3394 forms will be completed within 5 days of lost time accident and forwarded to the Contracting Officer or Contracting Officer Representative. All accidents will be reported through the Honolulu Engineer District Safety Office, (808) 438-1316 within 24 hours of the incident.

[End of Statement]

CLAUSES INCORPORATED BY FULL TEXT

S-36.7 IDENTIFICATION OF EMPLOYEES

The Contractor shall be responsible for furnishing to each employee and for requiring each employee engaged on the work to display such identification as may be approved and directed by the Contracting Officer. All prescribed identification shall immediately be delivered to the Contracting Officer for cancellation upon the release of any employee. When required by the Contracting Officer, the Contractor shall obtain and submit fingerprints of all persons employed or to be employed on the project.

[End of Statement]

Section I - Contract Clauses

SCA WAGE RATES

WD 05-2153 (Rev.-20) was first posted on www.wdol.gov on 07/14/2015

REGISTER OF WAGE DETERMINATIONS UNDER | U.S. DEPARTMENT OF LABOR
THE SERVICE CONTRACT ACT | EMPLOYMENT STANDARDS ADMINISTRATION
By direction of the Secretary of Labor | WAGE AND HOUR DIVISION
WASHINGTON D.C. 20210

Wage Determination No.: 2005-2153
Daniel W. Simms Division of | Revision No.: 20
Director Wage Determinations | Date Of Revision: 07/08/2015

Note: Executive Order (EO) 13658 establishes an hourly minimum wage of \$10.10 for 2015 that applies to all contracts subject to the Service Contract Act for which the solicitation is issued on or after January 1, 2015. If this contract is covered by the EO, the contractor must pay all workers in any classification listed on this wage determination at least \$10.10 (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract. The EO minimum wage rate will be adjusted annually. Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

States: American Samoa, Hawaii

Area: American Samoa Statewide
Hawaii Statewide

OCCUPATION NOTE:

STEVEDORING AND LONGSHOREMEN: Wage rates and fringe benefits can be found on Wage Determination 2000-0085

****Fringe Benefits Required Follow the Occupational Listing****

OCCUPATION CODE - TITLE	FOOTNOTE	RATE
01000 - Administrative Support And Clerical Occupations		
01011 - Accounting Clerk I	14.20	
01012 - Accounting Clerk II	15.93	
01013 - Accounting Clerk III	17.40	
01020 - Administrative Assistant	26.48	
01040 - Court Reporter	18.59	
01051 - Data Entry Operator I	13.16	
01052 - Data Entry Operator II	14.36	
01060 - Dispatcher, Motor Vehicle	17.10	
01070 - Document Preparation Clerk	13.15	
01090 - Duplicating Machine Operator	13.79	
01111 - General Clerk I	12.53	
01112 - General Clerk II	13.67	
01113 - General Clerk III	15.45	

01120 - Housing Referral Assistant	23.77
01141 - Messenger Courier	12.47
01191 - Order Clerk I	13.18
01192 - Order Clerk II	14.38
01261 - Personnel Assistant (Employment) I	15.79
01262 - Personnel Assistant (Employment) II	17.88
01263 - Personnel Assistant (Employment) III	19.68
01270 - Production Control Clerk	18.86
01280 - Receptionist	15.40
01290 - Rental Clerk	15.79
01300 - Scheduler, Maintenance	19.05
01311 - Secretary I	19.05
01312 - Secretary II	21.31
01313 - Secretary III	23.77
01320 - Service Order Dispatcher	14.05
01410 - Supply Technician	25.82
01420 - Survey Worker	17.10
01531 - Travel Clerk I	14.78
01532 - Travel Clerk II	15.97
01533 - Travel Clerk III	17.12
01611 - Word Processor I	14.36
01612 - Word Processor II	16.11
01613 - Word Processor III	18.03
05000 - Automotive Service Occupations	
05005 - Automobile Body Repairer, Fiberglass	22.19
05010 - Automotive Electrician	22.43
05040 - Automotive Glass Installer	22.00
05070 - Automotive Worker	22.00
05110 - Mobile Equipment Servicer	18.99
05130 - Motor Equipment Metal Mechanic	24.41
05160 - Motor Equipment Metal Worker	22.00
05190 - Motor Vehicle Mechanic	25.65
05220 - Motor Vehicle Mechanic Helper	17.39
05250 - Motor Vehicle Upholstery Worker	20.80
05280 - Motor Vehicle Wrecker	22.00
05310 - Painter, Automotive	23.19
05340 - Radiator Repair Specialist	22.00
05370 - Tire Repairer	13.78
05400 - Transmission Repair Specialist	24.37
07000 - Food Preparation And Service Occupations	
07010 - Baker	14.87
07041 - Cook I	13.17
07042 - Cook II	15.29
07070 - Dishwasher	12.05
07130 - Food Service Worker	11.14
07210 - Meat Cutter	18.70
07260 - Waiter/Waitress	12.01
09000 - Furniture Maintenance And Repair Occupations	
09010 - Electrostatic Spray Painter	17.41
09040 - Furniture Handler	11.71
09080 - Furniture Refinisher	19.15
09090 - Furniture Refinisher Helper	14.19
09110 - Furniture Repairer, Minor	16.63

09130 - Upholsterer	17.41
11000 - General Services And Support Occupations	
11030 - Cleaner, Vehicles	10.89
11060 - Elevator Operator	12.89
11090 - Gardener	16.40
11122 - Housekeeping Aide	14.00
11150 - Janitor	14.00
11210 - Laborer, Grounds Maintenance	13.55
11240 - Maid or Houseman	14.49
11260 - Pruner	12.13
11270 - Tractor Operator	16.43
11330 - Trail Maintenance Worker	13.55
11360 - Window Cleaner	15.25
12000 - Health Occupations	
12010 - Ambulance Driver	20.70
12011 - Breath Alcohol Technician	20.70
12012 - Certified Occupational Therapist Assistant	19.67
12015 - Certified Physical Therapist Assistant	18.41
12020 - Dental Assistant	14.80
12025 - Dental Hygienist	30.34
12030 - EKG Technician	26.02
12035 - Electroneurodiagnostic Technologist	26.02
12040 - Emergency Medical Technician	22.19
12071 - Licensed Practical Nurse I	18.51
12072 - Licensed Practical Nurse II	20.70
12073 - Licensed Practical Nurse III	23.09
12100 - Medical Assistant	14.83
12130 - Medical Laboratory Technician	19.74
12160 - Medical Record Clerk	17.82
12190 - Medical Record Technician	19.93
12195 - Medical Transcriptionist	19.74
12210 - Nuclear Medicine Technologist	31.72
12221 - Nursing Assistant I	11.39
12222 - Nursing Assistant II	12.81
12223 - Nursing Assistant III	13.98
12224 - Nursing Assistant IV	15.69
12235 - Optical Dispenser	20.03
12236 - Optical Technician	14.91
12250 - Pharmacy Technician	17.19
12280 - Phlebotomist	15.69
12305 - Radiologic Technologist	29.04
12311 - Registered Nurse I	29.29
12312 - Registered Nurse II	35.82
12313 - Registered Nurse II, Specialist	35.82
12314 - Registered Nurse III	43.34
12315 - Registered Nurse III, Anesthetist	43.34
12316 - Registered Nurse IV	51.94
12317 - Scheduler (Drug and Alcohol Testing)	25.66
13000 - Information And Arts Occupations	
13011 - Exhibits Specialist I	19.61
13012 - Exhibits Specialist II	23.29
13013 - Exhibits Specialist III	28.49
13041 - Illustrator I	20.71

13042 - Illustrator II	25.67	
13043 - Illustrator III	31.40	
13047 - Librarian	28.71	
13050 - Library Aide/Clerk	14.17	
13054 - Library Information Technology Systems Administrator		21.89
13058 - Library Technician	17.36	
13061 - Media Specialist I	15.86	
13062 - Media Specialist II	17.74	
13063 - Media Specialist III	19.78	
13071 - Photographer I	14.00	
13072 - Photographer II	16.54	
13073 - Photographer III	19.61	
13074 - Photographer IV	23.99	
13075 - Photographer V	28.99	
13110 - Video Teleconference Technician		20.30
14000 - Information Technology Occupations		
14041 - Computer Operator I	17.54	
14042 - Computer Operator II	19.62	
14043 - Computer Operator III	22.80	
14044 - Computer Operator IV	24.81	
14045 - Computer Operator V	27.45	
14071 - Computer Programmer I	(see 1)	27.62
14072 - Computer Programmer II	(see 1)	
14073 - Computer Programmer III	(see 1)	
14074 - Computer Programmer IV	(see 1)	
14101 - Computer Systems Analyst I	(see 1)	
14102 - Computer Systems Analyst II	(see 1)	
14103 - Computer Systems Analyst III	(see 1)	
14150 - Peripheral Equipment Operator	17.54	
14160 - Personal Computer Support Technician		24.81
15000 - Instructional Occupations		
15010 - Aircrew Training Devices Instructor (Non-Rated)		30.83
15020 - Aircrew Training Devices Instructor (Rated)		37.30
15030 - Air Crew Training Devices Instructor (Pilot)		43.09
15050 - Computer Based Training Specialist / Instructor		30.83
15060 - Educational Technologist	25.80	
15070 - Flight Instructor (Pilot)	43.09	
15080 - Graphic Artist	22.97	
15090 - Technical Instructor	19.66	
15095 - Technical Instructor/Course Developer		24.05
15110 - Test Proctor	19.47	
15120 - Tutor	19.47	
16000 - Laundry, Dry-Cleaning, Pressing And Related Occupations		
16010 - Assembler	11.72	
16030 - Counter Attendant	11.72	
16040 - Dry Cleaner	14.51	
16070 - Finisher, Flatwork, Machine	11.72	
16090 - Presser, Hand	11.72	
16110 - Presser, Machine, Drycleaning	11.72	
16130 - Presser, Machine, Shirts	11.72	
16160 - Presser, Machine, Wearing Apparel, Laundry		11.72
16190 - Sewing Machine Operator	15.45	

16220 - Tailor	16.27	
16250 - Washer, Machine		12.67
19000 - Machine Tool Operation And Repair Occupations		
19010 - Machine-Tool Operator (Tool Room)		24.08
19040 - Tool And Die Maker	30.25	
21000 - Materials Handling And Packing Occupations		
21020 - Forklift Operator	20.84	
21030 - Material Coordinator	21.89	
21040 - Material Expediter	21.89	
21050 - Material Handling Laborer	16.89	
21071 - Order Filler	13.51	
21080 - Production Line Worker (Food Processing)		20.84
21110 - Shipping Packer	15.22	
21130 - Shipping/Receiving Clerk	14.69	
21140 - Store Worker I	13.23	
21150 - Stock Clerk	18.58	
21210 - Tools And Parts Attendant	20.84	
21410 - Warehouse Specialist	20.84	
23000 - Mechanics And Maintenance And Repair Occupations		
23010 - Aerospace Structural Welder	28.74	
23021 - Aircraft Mechanic I	27.03	
23022 - Aircraft Mechanic II	28.74	
23023 - Aircraft Mechanic III	30.43	
23040 - Aircraft Mechanic Helper	19.51	
23050 - Aircraft, Painter	25.27	
23060 - Aircraft Servicer	22.63	
23080 - Aircraft Worker	24.16	
23110 - Appliance Mechanic	21.94	
23120 - Bicycle Repairer	15.16	
23125 - Cable Splicer	28.39	
23130 - Carpenter, Maintenance	30.99	
23140 - Carpet Layer	24.86	
23160 - Electrician, Maintenance	28.25	
23181 - Electronics Technician Maintenance I	26.83	
23182 - Electronics Technician Maintenance II	28.69	
23183 - Electronics Technician Maintenance III	30.56	
23260 - Fabric Worker	20.95	
23290 - Fire Alarm System Mechanic	23.46	
23310 - Fire Extinguisher Repairer	19.40	
23311 - Fuel Distribution System Mechanic	27.68	
23312 - Fuel Distribution System Operator	21.58	
23370 - General Maintenance Worker	18.45	
23380 - Ground Support Equipment Mechanic	27.03	
23381 - Ground Support Equipment Servicer	22.63	
23382 - Ground Support Equipment Worker	24.16	
23391 - Gunsmith I	19.40	
23392 - Gunsmith II	22.51	
23393 - Gunsmith III	25.64	
23410 - Heating, Ventilation And Air-Conditioning Mechanic		24.07
23411 - Heating, Ventilation And Air Contditioning Mechanic (Research Facility)		25.52
23430 - Heavy Equipment Mechanic	28.29	

23440 - Heavy Equipment Operator	34.11
23460 - Instrument Mechanic	29.96
23465 - Laboratory/Shelter Mechanic	24.07
23470 - Laborer	16.49
23510 - Locksmith	23.45
23530 - Machinery Maintenance Mechanic	24.70
23550 - Machinist, Maintenance	24.58
23580 - Maintenance Trades Helper	14.93
23591 - Metrology Technician I	29.96
23592 - Metrology Technician II	31.76
23593 - Metrology Technician III	33.49
23640 - Millwright	25.64
23710 - Office Appliance Repairer	21.56
23760 - Painter, Maintenance	25.29
23790 - Pipefitter, Maintenance	27.69
23810 - Plumber, Maintenance	25.71
23820 - Pneudraulic Systems Mechanic	25.64
23850 - Rigger	25.64
23870 - Scale Mechanic	22.51
23890 - Sheet-Metal Worker, Maintenance	28.46
23910 - Small Engine Mechanic	20.91
23931 - Telecommunications Mechanic I	27.52
23932 - Telecommunications Mechanic II	28.05
23950 - Telephone Lineman	24.18
23960 - Welder, Combination, Maintenance	25.04
23965 - Well Driller	25.14
23970 - Woodcraft Worker	25.64
23980 - Woodworker	17.67
24000 - Personal Needs Occupations	
24570 - Child Care Attendant	11.62
24580 - Child Care Center Clerk	15.14
24610 - Chore Aide	11.40
24620 - Family Readiness And Support Services Coordinator	16.19
24630 - Homemaker	20.11
25000 - Plant And System Operations Occupations	
25010 - Boiler Tender	26.42
25040 - Sewage Plant Operator	21.94
25070 - Stationary Engineer	26.42
25190 - Ventilation Equipment Tender	19.25
25210 - Water Treatment Plant Operator	21.94
27000 - Protective Service Occupations	
27004 - Alarm Monitor	18.69
27007 - Baggage Inspector	12.13
27008 - Corrections Officer	21.67
27010 - Court Security Officer	23.28
27030 - Detection Dog Handler	15.35
27040 - Detention Officer	21.67
27070 - Firefighter	23.69
27101 - Guard I	12.13
27102 - Guard II	15.35
27131 - Police Officer I	23.97
27132 - Police Officer II	26.64

28000 - Recreation Occupations		
28041 - Carnival Equipment Operator	12.47	
28042 - Carnival Equipment Repairer	13.26	
28043 - Carnival Equipment Worker	9.93	
28210 - Gate Attendant/Gate Tender	15.40	
28310 - Lifeguard	15.84	
28350 - Park Attendant (Aide)	17.23	
28510 - Recreation Aide/Health Facility Attendant		13.19
28515 - Recreation Specialist	21.44	
28630 - Sports Official	13.72	
28690 - Swimming Pool Operator	17.14	
30000 - Technical Occupations		
30010 - Air Traffic Control Specialist, Center (HFO) (see 2)		35.77
30011 - Air Traffic Control Specialist, Station (HFO) (see 2)		24.66
30012 - Air Traffic Control Specialist, Terminal (HFO) (see 2)		27.16
30021 - Archeological Technician I	16.98	
30022 - Archeological Technician II	19.43	
30023 - Archeological Technician III	24.08	
30030 - Cartographic Technician	24.08	
30040 - Civil Engineering Technician	21.55	
30061 - Drafter/CAD Operator I	16.86	
30062 - Drafter/CAD Operator II	19.43	
30063 - Drafter/CAD Operator III	21.67	
30064 - Drafter/CAD Operator IV	26.66	
30081 - Engineering Technician I	15.91	
30082 - Engineering Technician II	18.64	
30083 - Engineering Technician III	22.50	
30084 - Engineering Technician IV	29.74	
30085 - Engineering Technician V	32.60	
30086 - Engineering Technician VI	39.41	
30090 - Environmental Technician	22.21	
30210 - Laboratory Technician	23.01	
30240 - Mathematical Technician	25.78	
30361 - Paralegal/Legal Assistant I	18.66	
30362 - Paralegal/Legal Assistant II	23.13	
30363 - Paralegal/Legal Assistant III	28.30	
30364 - Paralegal/Legal Assistant IV	34.23	
30390 - Photo-Optics Technician	25.78	
30461 - Technical Writer I	22.86	
30462 - Technical Writer II	27.96	
30463 - Technical Writer III	33.84	
30491 - Unexploded Ordnance (UXO) Technician I		22.74
30492 - Unexploded Ordnance (UXO) Technician II		27.51
30493 - Unexploded Ordnance (UXO) Technician III		32.97
30494 - Unexploded (UXO) Safety Escort	22.74	
30495 - Unexploded (UXO) Sweep Personnel	22.74	
30620 - Weather Observer, Combined Upper Air Or	(see 2)	21.67
Surface Programs		
30621 - Weather Observer, Senior	(see 2)	24.08
31000 - Transportation/Mobile Equipment Operation Occupations		
31020 - Bus Aide	12.94	
31030 - Bus Driver	18.43	
31043 - Driver Courier	14.10	

31260 - Parking and Lot Attendant	9.16
31290 - Shuttle Bus Driver	14.98
31310 - Taxi Driver	11.77
31361 - Truckdriver, Light	14.98
31362 - Truckdriver, Medium	17.26
31363 - Truckdriver, Heavy	18.27
31364 - Truckdriver, Tractor-Trailer	18.27
99000 - Miscellaneous Occupations	
99030 - Cashier	10.93
99050 - Desk Clerk	18.46
99095 - Embalmer	22.34
99251 - Laboratory Animal Caretaker I	12.41
99252 - Laboratory Animal Caretaker II	17.67
99310 - Mortician	24.57
99410 - Pest Controller	17.33
99510 - Photofinishing Worker	13.86
99710 - Recycling Laborer	19.19
99711 - Recycling Specialist	23.10
99730 - Refuse Collector	17.18
99810 - Sales Clerk	14.39
99820 - School Crossing Guard	15.03
99830 - Survey Party Chief	24.01
99831 - Surveying Aide	13.13
99832 - Surveying Technician	17.99
99840 - Vending Machine Attendant	12.64
99841 - Vending Machine Repairer	15.06
99842 - Vending Machine Repairer Helper	12.64

ALL OCCUPATIONS LISTED ABOVE RECEIVE THE FOLLOWING BENEFITS:

HEALTH & WELFARE: (Hawaii): \$1.69 per hour, or \$67.60 per week, or \$292.93 per month hour for all employees on whose behalf the contractor provides health care benefits pursuant to the Hawaii prepaid Health Care Act. For those employees who are not receiving health care benefits mandated by the Hawaii prepaid Health Care Act, the new health and welfare benefit rate will be \$4.27 per hour.

VACATION: 2 weeks paid vacation after 1 year of service with a contractor or successor; 3 weeks after 10 years, and 4 after 15 years. Length of service includes the whole span of continuous service with the present contractor or successor, wherever employed, and with the predecessor contractors in the performance of similar work at the same Federal facility. (Reg. 29 CFR 4.173)

HOLIDAYS: A minimum of ten paid holidays per year, New Year's Day, Martin Luther King Jr's Birthday, Washington's Birthday, Memorial Day, Independence Day, Labor Day, Columbus Day, Veterans' Day, Thanksgiving Day, and Christmas Day. (A contractor may substitute for any of the named holidays another day off with pay in accordance with a plan communicated to the employees involved.) (See 29 CFR 4174)

THE OCCUPATIONS WHICH HAVE NUMBERED FOOTNOTES IN PARENTHESES RECEIVE THE FOLLOWING:

1) **COMPUTER EMPLOYEES:** Under the SCA at section 8(b), this wage determination does not apply to any employee who individually qualifies as a bona fide executive, administrative, or professional employee as defined in 29 C.F.R. Part 541. Because most Computer System Analysts and Computer Programmers who are compensated at a rate not less than \$27.63 (or on a salary or fee basis at a rate not less than \$455 per week) an hour would likely qualify as exempt computer professionals, (29 C.F.R. 541.400) wage rates may not be listed on this wage determination for all occupations within those job families. In addition, because this wage determination may not list a wage rate for some or all occupations within those job families if the survey data indicates that the prevailing wage rate for the occupation equals or exceeds \$27.63 per hour conformances may be necessary for certain nonexempt employees. For example, if an individual employee is nonexempt but nevertheless performs duties within the scope of one of the Computer Systems Analyst or Computer Programmer occupations for which this wage determination does not specify an SCA wage rate, then the wage rate for that employee must be conformed in accordance with the conformance procedures described in the conformance note included on this wage determination.

Additionally, because job titles vary widely and change quickly in the computer industry, job titles are not determinative of the application of the computer professional exemption. Therefore, the exemption applies only to computer employees who satisfy the compensation requirements and whose primary duty consists of:

- (1) The application of systems analysis techniques and procedures, including consulting with users, to determine hardware, software or system functional specifications;
- (2) The design, development, documentation, analysis, creation, testing or modification of computer systems or programs, including prototypes, based on and related to user or system design specifications;
- (3) The design, documentation, testing, creation or modification of computer programs related to machine operating systems; or
- (4) A combination of the aforementioned duties, the performance of which requires the same level of skills. (29 C.F.R. 541.400).

2) **AIR TRAFFIC CONTROLLERS AND WEATHER OBSERVERS - NIGHT PAY & SUNDAY PAY:** If you work at night as part of a regular tour of duty, you will earn a night differential and receive an additional 10% of basic pay for any hours worked between 6pm and 6am. If you are a full-time employed (40 hours a week) and Sunday is part of your regularly scheduled workweek, you are paid at your rate of basic pay plus a Sunday premium of 25% of your basic rate for each hour of Sunday work which is not overtime (i.e. occasional work on Sunday outside the normal tour of duty is considered overtime work).

HAZARDOUS PAY DIFFERENTIAL: An 8 percent differential is applicable to employees employed in a position that represents a high degree of hazard when working with or in close proximity to ordinance, explosives, and incendiary materials. This includes work such as screening, blending, dying, mixing, and pressing of sensitive ordinance, explosives, and pyrotechnic compositions such as lead azide, black powder and photoflash powder. All dry-house activities involving propellants or explosives.

Demilitarization, modification, renovation, demolition, and maintenance operations on sensitive ordnance, explosives and incendiary materials. All operations involving regrading and cleaning of artillery ranges.

A 4 percent differential is applicable to employees employed in a position that represents a low degree of hazard when working with, or in close proximity to ordnance, (or employees possibly adjacent to) explosives and incendiary materials which involves potential injury such as laceration of hands, face, or arms of the employee engaged in the operation, irritation of the skin, minor burns and the like; minimal damage to immediate or adjacent work area or equipment being used. All operations involving, unloading, storage, and hauling of ordnance, explosive, and incendiary ordnance material other than small arms ammunition. These differentials are only applicable to work that has been specifically designated by the agency for ordnance, explosives, and incendiary material differential pay.

**** UNIFORM ALLOWANCE ****

If employees are required to wear uniforms in the performance of this contract (either by the terms of the Government contract, by the employer, by the state or local law, etc.), the cost of furnishing such uniforms and maintaining (by laundering or dry cleaning) such uniforms is an expense that may not be borne by an employee where such cost reduces the hourly rate below that required by the wage determination. The Department of Labor will accept payment in accordance with the following standards as compliance:

The contractor or subcontractor is required to furnish all employees with an adequate number of uniforms without cost or to reimburse employees for the actual cost of the uniforms. In addition, where uniform cleaning and maintenance is made the responsibility of the employee, all contractors and subcontractors subject to this wage determination shall (in the absence of a bona fide collective bargaining agreement providing for a different amount, or the furnishing of contrary affirmative proof as to the actual cost), reimburse all employees for such cleaning and maintenance at a rate of \$3.35 per week (or \$.67 cents per day). However, in those instances where the uniforms furnished are made of "wash and wear" materials, may be routinely washed and dried with other personal garments, and do not require any special treatment such as dry cleaning, daily washing, or commercial laundering in order to meet the cleanliness or appearance standards set by the terms of the Government contract, by the contractor, by law, or by the nature of the work, there is no requirement that employees be reimbursed for uniform maintenance costs.

The duties of employees under job titles listed are those described in the "Service Contract Act Directory of Occupations", Fifth Edition, April 2006, unless otherwise indicated. Copies of the Directory are available on the Internet. A links to the Directory may be found on the WHD home page at <http://www.dol.gov/esa/whd/> or through the Wage Determinations On-Line (WDOL) Web site at <http://wdol.gov/>.

REQUEST FOR AUTHORIZATION OF ADDITIONAL CLASSIFICATION AND WAGE RATE {Standard Form 1444 (SF 1444)}

Conformance Process:

The contracting officer shall require that any class of service employee which is

not listed herein and which is to be employed under the contract (i.e., the work to be performed is not performed by any classification listed in the wage determination), be classified by the contractor so as to provide a reasonable relationship (i.e., appropriate level of skill comparison) between such unlisted classifications and the classifications listed in the wage determination. Such conformed classes of employees shall be paid the monetary wages and furnished the fringe benefits as are determined. Such conforming process shall be initiated by the contractor prior to the performance of contract work by such unlisted class(es) of employees. The conformed classification, wage rate, and/or fringe benefits shall be retroactive to the commencement date of the contract. {See Section 4.6 (C)(vi)} When multiple wage determinations are included in a contract, a separate SF 1444 should be prepared for each wage determination to which a class(es) is to be conformed.

The process for preparing a conformance request is as follows:

- 1) When preparing the bid, the contractor identifies the need for a conformed occupation(s) and computes a proposed rate(s).
- 2) After contract award, the contractor prepares a written report listing in order proposed classification title(s), a Federal grade equivalency (FGE) for each proposed classification(s), job description(s), and rationale for proposed wage rate(s), including information regarding the agreement or disagreement of the authorized representative of the employees involved, or where there is no authorized representative, the employees themselves. This report should be submitted to the contracting officer no later than 30 days after such unlisted class(es) of employees perform any contract work.
- 3) The contracting officer reviews the proposed action and promptly submits a report of the action, together with the agency's recommendations and pertinent information including the position of the contractor and the employees, to the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, for review. (See section 4.6(b)(2) of Regulations 29 CFR Part 4).
- 4) Within 30 days of receipt, the Wage and Hour Division approves, modifies, or disapproves the action via transmittal to the agency contracting officer, or notifies the contracting officer that additional time will be required to process the request.
- 5) The contracting officer transmits the Wage and Hour decision to the contractor.
- 6) The contractor informs the affected employees.

Information required by the Regulations must be submitted on SF 1444 or bond paper.

When preparing a conformance request, the "Service Contract Act Directory of Occupations" (the Directory) should be used to compare job definitions to insure that duties requested are not performed by a classification already listed in the wage determination. Remember, it is not the job title, but the required tasks that determine whether a class is included in an established wage determination. Conformances may not be used to artificially split, combine, or subdivide classifications listed in the wage determination.

CLAUSES INCORPORATED BY REFERENCE

52.203-3	Gratuities	APR 1984
52.203-5	Covenant Against Contingent Fees	MAY 2014
52.203-6	Restrictions On Subcontractor Sales To The Government	SEP 2006
52.203-7	Anti-Kickback Procedures	MAY 2014
52.203-8	Cancellation, Rescission, and Recovery of Funds for Illegal or Improper Activity	MAY 2014
52.203-10	Price Or Fee Adjustment For Illegal Or Improper Activity	MAY 2014
52.203-12	Limitation On Payments To Influence Certain Federal Transactions	OCT 2010
52.203-16	Preventing Personal Conflicts of Interest	DEC 2011
52.203-17	Contractor Employee Whistleblower Rights and Requirement To Inform Employees of Whistleblower Rights	APR 2014
52.204-4	Printed or Copied Double-Sided on Postconsumer Fiber Content Paper	MAY 2011
52.204-9	Personal Identity Verification of Contractor Personnel	JAN 2011
52.204-10	Reporting Executive Compensation and First-Tier Subcontract Awards	JUL 2013
52.209-6	Protecting the Government's Interest When Subcontracting With Contractors Debarred, Suspended, or Proposed for Debarment	AUG 2013
52.209-10	Prohibition on Contracting With Inverted Domestic Corporations	DEC 2014
52.215-2	Audit and Records--Negotiation	OCT 2010
52.215-8	Order of Precedence--Uniform Contract Format	OCT 1997
52.215-10	Price Reduction for Defective Certified Cost or Pricing Data	AUG 2011
52.215-12	Subcontractor Certified Cost or Pricing Data	OCT 2010
52.215-15	Pension Adjustments and Asset Reversions	OCT 2010
52.215-17	Waiver of Facilities Capital Cost of Money	OCT 1997
52.215-21	Requirements for Certified Cost or Pricing Data and Data Other Than Certified Cost or Pricing Data -- Modifications	OCT 2010
52.215-23	Limitations on Pass-Through Charges	OCT 2009
52.219-8	Utilization of Small Business Concerns	OCT 2014
52.219-14	Limitations On Subcontracting	NOV 2011
52.222-3	Convict Labor	JUN 2003
52.222-4	Contract Work Hours and Safety Standards- Overtime Compensation	MAY 2014
52.222-17	Nondisplacement of Qualified Workers	MAY 2014
52.222-21	Prohibition Of Segregated Facilities	APR 2015
52.222-26	Equal Opportunity	APR 2015
52.222-35	Equal Opportunity for Veterans	JUL 2014
52.222-36	Equal Opportunity for Workers with Disabilities	JUL 2014
52.222-37	Employment Reports on Veterans	JUL 2014
52.222-41	Service Contract Labor Standards	MAY 2014
52.222-50	Combating Trafficking in Persons	MAR 2015
52.222-54	Employment Eligibility Verification	AUG 2013
52.223-6	Drug-Free Workplace	MAY 2001

52.225-13	Restrictions on Certain Foreign Purchases	JUN 2008
52.227-1	Authorization and Consent	DEC 2007
52.228-5	Insurance - Work On A Government Installation	JAN 1997
52.229-3	Federal, State And Local Taxes	FEB 2013
52.232-1	Payments	APR 1984
52.232-8	Discounts For Prompt Payment	FEB 2002
52.232-11	Extras	APR 1984
52.232-33	Payment by Electronic Funds Transfer--System for Award Management	JUL 2013
52.232-39	Unenforceability of Unauthorized Obligations	JUN 2013
52.232-40	Providing Accelerated Payments to Small Business Subcontractors	DEC 2013
52.233-1	Disputes	MAY 2014
52.233-3	Protest After Award	AUG 1996
52.233-4	Applicable Law for Breach of Contract Claim	OCT 2004
52.236-13 Alt I	Accident Prevention (Nov 1991) - Alternate I	NOV 1991
52.237-3	Continuity Of Services	JAN 1991
52.242-13	Bankruptcy	JUL 1995
52.243-1 Alt I	Changes--Fixed Price (Aug 1987) - Alternate I	APR 1984
52.244-5	Competition In Subcontracting	DEC 1996
52.244-6	Subcontracts for Commercial Items	APR 2015
52.246-25	Limitation Of Liability--Services	FEB 1997
52.249-2	Termination For Convenience Of The Government (Fixed-Price)	APR 2012
52.249-8	Default (Fixed-Price Supply & Service)	APR 1984
52.253-1	Computer Generated Forms	JAN 1991

CLAUSES INCORPORATED BY FULL TEXT

52.202-1 DEFINITIONS (NOV 2013)

When a solicitation provision or contract clause uses a word or term that is defined in the Federal Acquisition Regulation (FAR), the word or term has the same meaning as the definition in FAR 2.101 in effect at the time the solicitation was issued, unless--

- (a) The solicitation, or amended solicitation, provides a different definition;
- (b) The contracting parties agree to a different definition;
- (c) The part, subpart, or section of the FAR where the provision or clause is prescribed provides a different meaning;
or
- (d) The word or term is defined in FAR Part 31, for use in the cost principles and procedures.

(End of clause)

52.219-28 POST-AWARD SMALL BUSINESS PROGRAM REREPRESENTATION (JULY 2013)

(a) Definitions. As used in this clause--

Long-term contract means a contract of more than five years in duration, including options. However, the term does not include contracts that exceed five years in duration because the period of performance has been extended for a cumulative period not to exceed six months under the clause at 52.217-8, Option to Extend Services, or other appropriate authority.

Small business concern means a concern, including its affiliates, that is independently owned and operated, not dominant in the field of operation in which it is bidding on Government contracts, and qualified as a small business under the criteria in 13 CFR part 121 and the size standard in paragraph (c) of this clause. Such a concern is "not dominant in its field of operation" when it does not exercise a controlling or major influence on a national basis in a kind of business activity in which a number of business concerns are primarily engaged. In determining whether dominance exists, consideration shall be given to all appropriate factors, including volume of business, number of employees, financial resources, competitive status or position, ownership or control of materials, processes, patents, license agreements, facilities, sales territory, and nature of business activity.

(b) If the Contractor represented that it was a small business concern prior to award of this contract, the Contractor shall rerepresent its size status according to paragraph (e) of this clause or, if applicable, paragraph (g) of this clause, upon the occurrence of any of the following:

(1) Within 30 days after execution of a novation agreement or within 30 days after modification of the contract to include this clause, if the novation agreement was executed prior to inclusion of this clause in the contract.

(2) Within 30 days after a merger or acquisition that does not require a novation or within 30 days after modification of the contract to include this clause, if the merger or acquisition occurred prior to inclusion of this clause in the contract.

(3) For long-term contracts--

(i) Within 60 to 120 days prior to the end of the fifth year of the contract; and

(ii) Within 60 to 120 days prior to the date specified in the contract for exercising any option thereafter.

(c) The Contractor shall rerepresent its size status in accordance with the size standard in effect at the time of this rerepresentation that corresponds to the North American Industry Classification System (NAICS) code assigned to this contract. The small business size standard corresponding to this NAICS code can be found at <http://www.sba.gov/content/table-small-business-size-standards>.

(d) The small business size standard for a Contractor providing a product which it does not manufacture itself, for a contract other than a construction or service contract, is 500 employees.

(e) Except as provided in paragraph (g) of this clause, the Contractor shall make the representation required by paragraph (b) of this clause by validating or updating all its representations in the Representations and Certifications section of the System for Award Management (SAM) and its other data in SAM, as necessary, to ensure that they reflect the Contractor's current status. The Contractor shall notify the contracting office in writing within the timeframes specified in paragraph (b) of this clause that the data have been validated or updated, and provide the date of the validation or update.

(f) If the Contractor represented that it was other than a small business concern prior to award of this contract, the Contractor may, but is not required to, take the actions required by paragraphs (e) or (g) of this clause.

(g) If the Contractor does not have representations and certifications in SAM, or does not have a representation in SAM for the NAICS code applicable to this contract, the Contractor is required to complete the following rerepresentation and submit it to the contracting office, along with the contract number and the date on which the rerepresentation was completed:

The Contractor represents that it () is, () is not a small business concern under NAICS Code - assigned to contract number .

(Contractor to sign and date and insert authorized signer's name and title).

(End of clause)

52.222-42 STATEMENT OF EQUIVALENT RATES FOR FEDERAL HIRES (MAY 2014)

In compliance with the Service Contract Labor Standards statute and the regulations of the Secretary of Labor (29 CFR part 4), this clause identifies the classes of service employees expected to be employed under the contract and states the wages and fringe benefits payable to each if they were employed by the contracting agency subject to the provisions of 5 U.S.C. 5341 or 5332.

THIS STATEMENT IS FOR INFORMATION ONLY: IT IS NOT A WAGE DETERMINATION
Employee Class Monetary Wage-Fringe Benefits

TITLE	GS EQUIVALENT	HOURLY PAY
MEC Senior Project Manager	GS-14	\$48.23
MEC Project Manager	GS-13	\$40.82
UXO QC Manager	GS-13	\$40.82
UXO Safety Manager	GS-13	\$40.82
UXO QC Specialist	GS-12	\$34.33
Senior UXO Supervisor	GS-12	\$34.33
UXO Tech III	GS-12	\$34.33
UXO Tech II	GS-09	\$23.67
UXO Tech I	GS-07	\$19.35
UXO Safety Officer	GS-12	\$34.33
UXO Safety Specialist	GS-12	\$34.33
GIS Manager	GS-12	\$34.33
GIS Specialist/Technician	GS-05	\$15.62
Sr. Geophysicist	GS-12	\$34.33
CR-Field Crew Supervisor	GS-12	\$34.33
NR-Biologist Personnel	GS-12	\$34.33
Admin Assistant	GS-09	\$23.67
Contracting Manager	GS-14	\$48.23
Contracting Specialist	GS-12	\$34.33

(End of clause)

52.232-9 LIMITATION ON WITHHOLDING OF PAYMENTS (APR 1984)

If more than one clause or Schedule term of this contract authorizes the temporary withholding of amounts otherwise

payable to the Contractor for supplies delivered or services performed, the total of the amounts withheld at any one time shall not exceed the greatest amount that may be withheld under any one clause or Schedule term at that time; provided, that this limitation shall not apply to--

- (a) Withholdings pursuant to any clause relating to wages or hours of employees;
- (b) Withholdings not specifically provided for by this contract;
- (c) The recovery of overpayments; and
- (d) Any other withholding for which the Contracting Officer determines that this limitation is inappropriate.

(End of clause)

52.232-25 PROMPT PAYMENT (JULY 2013)

Notwithstanding any other payment clause in this contract, the Government will make invoice payments under the terms and conditions specified in this clause. The Government considers payment as being made on the day a check is dated or the date of an electronic funds transfer (EFT). Definitions of pertinent terms are set forth in sections 2.101, 32.001, and 32.902 of the Federal Acquisition Regulation. All days referred to in this clause are calendar days, unless otherwise specified. (However, see paragraph (a)(4) of this clause concerning payments due on Saturdays, Sundays, and legal holidays.)

(a) Invoice payments--(1) Due date. (i) Except as indicated in paragraphs (a)(2) and (c) of this clause, the due date for making invoice payments by the designated payment office is the later of the following two events:

(A) The 30th day after the designated billing office receives a proper invoice from the Contractor (except as provided in paragraph (a)(1)(ii) of this clause).

(B) The 30th day after Government acceptance of supplies delivered or services performed. For a final invoice, when the payment amount is subject to contract settlement actions, acceptance is deemed to occur on the effective date of the contract settlement.

(ii) If the designated billing office fails to annotate the invoice with the actual date of receipt at the time of receipt, the invoice payment due date is the 30th day after the date of the Contractor's invoice, provided the designated billing office receives a proper invoice and there is no disagreement over quantity, quality, or Contractor compliance with contract requirements.

(2) Certain food products and other payments. (i) Due dates on Contractor invoices for meat, meat food products, or fish; perishable agricultural commodities; and dairy products, edible fats or oils, and food products prepared from edible fats or oils are--

(A) For meat or meat food products, as defined in section 2(a)(3) of the Packers and Stockyard Act of 1921 (7 U.S.C. 182(3)), and as further defined in Pub. L. 98-181, including any edible fresh or frozen poultry meat, any perishable poultry meat food product, fresh eggs, and any perishable egg product, as close as possible to, but not later than, the 7th day after product delivery.

(B) For fresh or frozen fish, as defined in section 204(3) of the Fish and Seafood Promotion Act of 1986 (16 U.S.C. 4003(3)), as close as possible to, but not later than, the 7th day after product delivery.

(C) For perishable agricultural commodities, as defined in section 1(4) of the Perishable Agricultural Commodities Act of 1930 (7 U.S.C. 499a(4)), as close as possible to, but not later than, the 10th day after product delivery, unless another date is specified in the contract.

(D) For dairy products, as defined in section 111(e) of the Dairy Production Stabilization Act of 1983 (7 U.S.C. 4502(e)), edible fats or oils, and food products prepared from edible fats or oils, as close as possible to, but not later than, the 10th day after the date on which a proper invoice has been received. Liquid milk, cheese, certain processed cheese products, butter, yogurt, ice cream, mayonnaise, salad dressings, and other similar products, fall within this classification. Nothing in the Act limits this classification to refrigerated products. When questions arise regarding the proper classification of a specific product, prevailing industry practices will be followed in specifying a contract payment due date. The burden of proof that a classification of a specific product is, in fact, prevailing industry practice is upon the Contractor making the representation.

(ii) If the contract does not require submission of an invoice for payment (e.g., periodic lease payments), the due date will be as specified in the contract.

(3) Contractor's invoice. The Contractor shall prepare and submit invoices to the designated billing office specified in the contract. A proper invoice must include the items listed in paragraphs (a)(3)(i) through (a)(3)(x) of this clause. If the invoice does not comply with these requirements, the designated billing office will return it within 7 days after receipt (3 days for meat, meat food products, or fish; 5 days for perishable agricultural commodities, dairy products, edible fats or oils, and food products prepared from edible fats or oils), with the reasons why it is not a proper invoice. The Government will take into account untimely notification when computing any interest penalty owed the Contractor.

(i) Name and address of the Contractor.

(ii) Invoice date and invoice number. (The Contractor should date invoices as close as possible to the date of the mailing or transmission.)

(iii) Contract number or other authorization for supplies delivered or services performed (including order number and contract line item number).

(iv) Description, quantity, unit of measure, unit price, and extended price of supplies delivered or services performed.

(v) Shipping and payment terms (e.g., shipment number and date of shipment, discount for prompt payment terms). Bill of lading number and weight of shipment will be shown for shipments on Government bills of lading.

(vi) Name and address of Contractor official to whom payment is to be sent (must be the same as that in the contract or in a proper notice of assignment).

(vii) Name (where practicable), title, phone number, and mailing address of person to notify in the event of a defective invoice.

(viii) Taxpayer Identification Number (TIN). The Contractor shall include its TIN on the invoice only if required elsewhere in this contract.

(ix) Electronic funds transfer (EFT) banking information.

(A) The Contractor shall include EFT banking information on the invoice only if required elsewhere in this contract.

(B) If EFT banking information is not required to be on the invoice, in order for the invoice to be a proper invoice, the Contractor shall have submitted correct EFT banking information in accordance with the applicable solicitation provision (e.g., 52.232-38, Submission of Electronic Funds Transfer Information with Offer), contract clause (e.g.,

52.232-33, Payment by Electronic Funds Transfer--System for Award Management, or 52.232-34, Payment by Electronic Funds Transfer--Other Than System for Award Management), or applicable agency procedures.

(C) EFT banking information is not required if the Government waived the requirement to pay by EFT.

(x) Any other information or documentation required by the contract (e.g., evidence of shipment).

(4) Interest penalty. The designated payment office will pay an interest penalty automatically, without request from the Contractor, if payment is not made by the due date and the conditions listed in paragraphs (a)(4)(i) through (a)(4)(iii) of this clause are met, if applicable. However, when the due date falls on a Saturday, Sunday, or legal holiday, the designated payment office may make payment on the following working day without incurring a late payment interest penalty.

(i) The designated billing office received a proper invoice.

(ii) The Government processed a receiving report or other Government documentation authorizing payment, and there was no disagreement over quantity, quality, or Contractor compliance with any contract term or condition.

(iii) In the case of a final invoice for any balance of funds due the Contractor for supplies delivered or services performed, the amount was not subject to further contract settlement actions between the Government and the Contractor.

(5) Computing penalty amount. The Government will compute the interest penalty in accordance with the Office of Management and Budget prompt payment regulations at 5 CFR part 1315.

(i) For the sole purpose of computing an interest penalty that might be due the Contractor, Government acceptance is deemed to occur constructively on the 7th day (unless otherwise specified in this contract) after the Contractor delivers the supplies or performs the services in accordance with the terms and conditions of the contract, unless there is a disagreement over quantity, quality, or Contractor compliance with a contract provision. If actual acceptance occurs within the constructive acceptance period, the Government will base the determination of an interest penalty on the actual date of acceptance. The constructive acceptance requirement does not, however, compel Government officials to accept supplies or services, perform contract administration functions, or make payment prior to fulfilling their responsibilities.

(ii) The prompt payment regulations at 5 CFR 1315.10(c) do not require the Government to pay interest penalties if payment delays are due to disagreement between the Government and the Contractor over the payment amount or other issues involving contract compliance, or on amounts temporarily withheld or retained in accordance with the terms of the contract. The Government and the Contractor shall resolve claims involving disputes and any interest that may be payable in accordance with the clause at FAR 52.233-1, Disputes.

(6) Discounts for prompt payment. The designated payment office will pay an interest penalty automatically, without request from the Contractor, if the Government takes a discount for prompt payment improperly. The Government will calculate the interest penalty in accordance with the prompt payment regulations at 5 CFR part 1315.

(7) Additional interest penalty. (i) The designated payment office will pay a penalty amount, calculated in accordance with the prompt payment regulations at 5 CFR part 1315 in addition to the interest penalty amount only if--

(A) The Government owes an interest penalty of \$1 or more;

(B) The designated payment office does not pay the interest penalty within 10 days after the date the invoice amount is paid; and

(C) The Contractor makes a written demand to the designated payment office for additional penalty payment, in accordance with paragraph (a)(7)(ii) of this clause, postmarked not later than 40 days after the invoice amount is paid.

(ii)(A) The Contractor shall support written demands for additional penalty payments with the following data. The Government will not request any additional data. The Contractor shall--

(1) Specifically assert that late payment interest is due under a specific invoice, and request payment of all overdue late payment interest penalty and such additional penalty as may be required;

(2) Attach a copy of the invoice on which the unpaid late payment interest is due; and

(3) State that payment of the principal has been received, including the date of receipt.

(B) If there is no postmark or the postmark is illegible--

(1) The designated payment office that receives the demand will annotate it with the date of receipt, provided the demand is received on or before the 40th day after payment was made; or

(2) If the designated payment office fails to make the required annotation, the Government will determine the demand's validity based on the date the Contractor has placed on the demand, provided such date is no later than the 40th day after payment was made.

(iii) The additional penalty does not apply to payments regulated by other Government regulations (e.g., payments under utility contracts subject to tariffs and regulation).

(b) Contract financing payment. If this contract provides for contract financing, the Government will make contract financing payments in accordance with the applicable contract financing clause.

(c) Fast payment procedure due dates. If this contract contains the clause at 52.213-1, Fast Payment Procedure, payments will be made within 15 days after the date of receipt of the invoice.

(d) Overpayments. If the Contractor becomes aware of a duplicate contract financing or invoice payment or that the Government has otherwise overpaid on a contract financing or invoice payment, the Contractor shall--

(1) Remit the overpayment amount to the payment office cited in the contract along with a description of the overpayment including the--

(i) Circumstances of the overpayment (e.g., duplicate payment, erroneous payment, liquidation errors, date(s) of overpayment);

(ii) Affected contract number and delivery order number if applicable;

(iii) Affected contract line item or subline item, if applicable; and

(iv) Contractor point of contact.

(2) Provide a copy of the remittance and supporting documentation to the Contracting Officer.

(End of clause)

52.252-2 CLAUSES INCORPORATED BY REFERENCE (FEB 1998)

This contract incorporates one or more clauses by reference, with the same force and effect as if they were given in full text. Upon request, the Contracting Officer will make their full text available. Also, the full text of a clause may be accessed electronically at this/these address(es):

<http://farsite.hill.af.mil/vffara.htm>

(End of clause)

52.252-6 AUTHORIZED DEVIATIONS IN CLAUSES (APR 1984)

(a) The use in this solicitation or contract of any Federal Acquisition Regulation (48 CFR Chapter 1) clause with an authorized deviation is indicated by the addition of "(DEVIATION)" after the date of the clause.

(b) The use in this solicitation or contract of any [Defense Federal Acquisition Regulation Supplement](#) (48 CFR [Chapter 2](#)) clause with an authorized deviation is indicated by the addition of "(DEVIATION)" after the name of the regulation.

(End of clause)

252.201-7000 CONTRACTING OFFICER'S REPRESENTATIVE (DEC 1991)

(a) "Definition. Contracting officer's representative" means an individual designated in accordance with subsection 201.602-2 of the Defense Federal Acquisition Regulation Supplement and authorized in writing by the contracting officer to perform specific technical or administrative functions.

(b) If the Contracting Officer designates a contracting officer's representative (COR), the Contractor will receive a copy of the written designation. It will specify the extent of the COR's authority to act on behalf of the contracting officer. The COR is not authorized to make any commitments or changes that will affect price, quality, quantity, delivery, or any other term or condition of the contract.

(End of clause)

252.203-7000 REQUIREMENTS RELATING TO COMPENSATION OF FORMER DOD OFFICIALS (SEP 2011)

(a) Definition. Covered DoD official, as used in this clause, means an individual that--

(1) Leaves or left DoD service on or after January 28, 2008; and

(2)(i) Participated personally and substantially in an acquisition as defined in 41 U.S.C. 131 with a value in excess of \$10 million, and serves or served--

(A) In an Executive Schedule position under subchapter II of chapter 53 of Title 5, United States Code;

(B) In a position in the Senior Executive Service under subchapter VIII of chapter 53 of Title 5, United States Code; or

(C) In a general or flag officer position compensated at a rate of pay for grade O-7 or above under section 201 of Title 37, United States Code; or

(ii) Serves or served in DoD in one of the following positions: Program manager, deputy program manager, procuring contracting officer, administrative contracting officer, source selection authority, member of the source selection evaluation board, or chief of a financial or technical evaluation team for a contract in an amount in excess of \$10 million.

(b) The Contractor shall not knowingly provide compensation to a covered DoD official within 2 years after the official leaves DoD service, without first determining that the official has sought and received, or has not received after 30 days of seeking, a written opinion from the appropriate DoD ethics counselor regarding the applicability of post-employment restrictions to the activities that the official is expected to undertake on behalf of the Contractor.

(c) Failure by the Contractor to comply with paragraph (b) of this clause may subject the Contractor to rescission of this contract, suspension, or debarment in accordance with 41 U.S.C. 2105(c).

(End of clause)

252.203-7001 PROHIBITION ON PERSONS CONVICTED OF FRAUD OR OTHER DEFENSE-CONTRACT-RELATED FELONIES (DEC 2008)

(a) Definitions. As used in this clause—

(1) “Arising out of a contract with the DoD” means any act in connection with—

(i) Attempting to obtain;

(ii) Obtaining, or

(iii) Performing a contract or first-tier subcontract of any agency, department, or component of the Department of Defense (DoD).

(2) “Conviction of fraud or any other felony” means any conviction for fraud or a felony in violation of state or Federal criminal statutes, whether entered on a verdict or plea, including a plea of nolo contendere, for which sentence has been imposed.

(3) “Date of conviction” means the date judgment was entered against the individual.

(b) Any individual who is convicted after September 29, 1988, of fraud or any other felony arising out of a contract with the DoD is prohibited from serving--

(1) In a management or supervisory capacity on this contract;

(2) On the board of directors of the Contractor;

(3) As a consultant, agent, or representative for the Contractor; or

(4) In any other capacity with the authority to influence, advise, or control the decisions of the Contractor with regard to this contract.

(c) Unless waived, the prohibition in paragraph (b) of this clause applies for not less than 5 years from the date of conviction.

(d) 10 U.S.C. 2408 provides that the Contractor shall be subject to a criminal penalty of not more than \$500,000 if convicted of knowingly--

(1) Employing a person under a prohibition specified in paragraph (b) of this clause; or

(2) Allowing such a person to serve on the board of directors of the contractor or first-tier subcontractor.

(e) In addition to the criminal penalties contained in 10 U.S.C. 2408, the Government may consider other available remedies, such as—

(1) Suspension or debarment;

(2) Cancellation of the contract at no cost to the Government; or

(3) Termination of the contract for default.

(f) The Contractor may submit written requests for waiver of the prohibition in paragraph (b) of this clause to the Contracting Officer. Requests shall clearly identify—

(1) The person involved;

(2) The nature of the conviction and resultant sentence or punishment imposed;

(3) The reasons for the requested waiver; and

(4) An explanation of why a waiver is in the interest of national security.

(g) The Contractor agrees to include the substance of this clause, appropriately modified to reflect the identity and relationship of the parties, in all first-tier subcontracts exceeding the simplified acquisition threshold in Part 2 of the Federal Acquisition Regulation, except those for commercial items or components.

(h) Pursuant to 10 U.S.C. 2408(c), defense contractors and subcontractors may obtain information as to whether a particular person has been convicted of fraud or any other felony arising out of a contract with the DoD by contacting The Office of Justice Programs, The Denial of Federal Benefits Office, U.S. Department of Justice, telephone 301-937-1542; www.ojp.usdoj.gov/BJA/grant/DPFC.html.

(End of clause)

252.203-7002 REQUIREMENT TO INFORM EMPLOYEES OF WHISTLEBLOWER RIGHTS (SEP 2013)

(a) The Contractor shall inform its employees in writing, in the predominant native language of the workforce, of contractor employee whistleblower rights and protections under 10 U.S.C. 2409, as described in subpart 203.9 of the Defense Federal Acquisition Regulation Supplement.

(b) The Contractor shall include the substance of this clause, including this paragraph (b), in all subcontracts.

(End of clause)

252.204-7002 PAYMENT FOR SUBLINE ITEMS NOT SEPARATELY PRICED (DEC 1991)

(a) If the schedule in this contract contains any contract subline items or exhibit subline items identified as not separately priced (NSP), it means that the unit price for that subline item is included in the unit price of another, related line or subline item.

(b) The Contractor shall not invoice the Government for any portion of a contract line item or exhibit line item which contains an NSP until --

(1) The Contractor has delivered the total quantity of all related contract subline items or exhibit subline items; and

(2) The Government has accepted them.

(c) This clause does not apply to technical data.

(End of clause)

252.204-7003 CONTROL OF GOVERNMENT PERSONNEL WORK PRODUCT (APR 1992)

The Contractor's procedures for protecting against unauthorized disclosure of information shall not require Department of Defense employees or members of the Armed Forces to relinquish control of their work products, whether classified or not, to the contractor.

(End of clause)

252.204-7006 BILLING INSTRUCTIONS (OCT 2005)

When submitting a request for payment, the Contractor shall--

(a) Identify the contract line item(s) on the payment request that reasonably reflect contract work performance; and

(b) Separately identify a payment amount for each contract line item included in the payment request.

(End of clause)

252.205-7000 PROVISION OF INFORMATION TO COOPERATIVE AGREEMENT HOLDERS (DEC 1991)

(a) Definition.

"Cooperative agreement holder" means a State or local government; a private, nonprofit organization; a tribal organization (as defined in section 4(c) of the Indian Self-Determination and Education Assistance Act (Pub. L. 93-

268; 25 U.S.C. 450 (c)); or an economic enterprise (as defined in section 3(e) of the Indian Financing Act of 1974 (Pub. L. 93-362; 25 U.S.C. 1452(e))) whether such economic enterprise is organized for profit or nonprofit purposes; which has an agreement with the Defense Logistics Agency to furnish procurement technical assistance to business entities.

(b) The Contractor shall provide cooperative agreement holders, upon their request, with a list of those appropriate employees or offices responsible for entering into subcontracts under defense contracts. The list shall include the business address, telephone number, and area of responsibility of each employee or office.

(c) The Contractor need not provide the listing to a particular cooperative agreement holder more frequently than once a year.

(End of clause)

252.209-7004 SUBCONTRACTING WITH FIRMS THAT ARE OWNED OR CONTROLLED BY THE GOVERNMENT OF A COUNTRY THAT IS A STATE SPONSOR OF TERRORISM (DEC 2014)

(a) Unless the Government determines that there is a compelling reason to do so, the Contractor shall not enter into any subcontract in excess of \$30,000 with a firm, or a subsidiary of a firm, that is identified in the Exclusions section of the System for Award Management System (SAM Exclusions) as being ineligible for the award of Defense contracts or subcontracts because it is owned or controlled by the government of a country that is a state sponsor of terrorism.

(b) A corporate officer or a designee of the Contractor shall notify the Contracting Officer, in writing, before entering into a subcontract with a party that is identified, in SAM Exclusions, as being ineligible for the award of Defense contracts or subcontracts because it is owned or controlled by the government of a country that is a state sponsor of terrorism. The notice must include the name of the proposed subcontractor and the compelling reason(s) for doing business with the subcontractor notwithstanding its inclusion in SAM Exclusions.

(End of clause)

252.215-7000 PRICING ADJUSTMENTS (DEC 2012)

The term "pricing adjustment," as used in paragraph (a) of the clauses entitled "Price Reduction for Defective Certified Cost or Pricing Data - Modifications," "Subcontractor Certified Cost or Pricing Data," and "Subcontractor Certified Cost or Pricing Data - Modifications," means the aggregate increases and/or decreases in cost plus applicable profits.

(End of clause)

252.215-7002 COST ESTIMATING SYSTEM REQUIREMENTS (DEC 2012)

(a) Definitions.

Acceptable estimating system means an estimating system that complies with the system criteria in paragraph (d) of this clause, and provides for a system that--

- (1) Is maintained, reliable, and consistently applied;
- (2) Produces verifiable, supportable, documented, and timely cost estimates that are an acceptable basis for negotiation of fair and reasonable prices;
- (3) Is consistent with and integrated with the Contractor's related management systems; and
- (4) Is subject to applicable financial control systems.

Estimating system means the Contractor's policies, procedures, and practices for budgeting and planning controls, and generating estimates of costs and other data included in proposals submitted to customers in the expectation of receiving contract awards.

Estimating system includes the Contractor's--

- (1) Organizational structure;
- (2) Established lines of authority, duties, and responsibilities;
- (3) Internal controls and managerial reviews;
- (4) Flow of work, coordination, and communication; and
- (5) Budgeting, planning, estimating methods, techniques, accumulation of historical costs, and other analyses used to generate cost estimates.

Significant deficiency means a shortcoming in the system that materially affects the ability of officials of the Department of Defense to rely upon data and information produced by the system that is needed for management purposes.

(b) General. The Contractor shall establish, maintain, and comply with an acceptable estimating system.

(c) Applicability. Paragraphs (d) and (e) of this clause apply if the Contractor is a large business and either--

(1) In its fiscal year preceding award of this contract, received Department of Defense (DoD) prime contracts or subcontracts, totaling \$50 million or more for which certified cost or pricing data were required; or

(2) In its fiscal year preceding award of this contract--

(i) Received DoD prime contracts or subcontracts totaling \$10 million or more (but less than \$50 million) for which certified cost or pricing data were required; and

(ii) Was notified, in writing, by the Contracting Officer that paragraphs (d) and (e) of this clause apply.

(d) System requirements.

(1) The Contractor shall disclose its estimating system to the Administrative Contracting Officer (ACO), in writing. If the Contractor wishes the Government to protect the data and information as privileged or confidential, the Contractor must mark the documents with the appropriate legends before submission.

(2) An estimating system disclosure is acceptable when the Contractor has provided the ACO with documentation that--

(i) Accurately describes those policies, procedures, and practices that the Contractor currently uses in preparing cost proposals; and

(ii) Provides sufficient detail for the Government to reasonably make an informed judgment regarding the acceptability of the Contractor's estimating practices.

(3) The Contractor shall--

(i) Comply with its disclosed estimating system; and

(ii) Disclose significant changes to the cost estimating system to the ACO on a timely basis.

(4) The Contractor's estimating system shall provide for the use of appropriate source data, utilize sound estimating techniques and good judgment, maintain a consistent approach, and adhere to established policies and procedures. An acceptable estimating system shall accomplish the following functions:

(i) Establish clear responsibility for preparation, review, and approval of cost estimates and budgets.

(ii) Provide a written description of the organization and duties of the personnel responsible for preparing, reviewing, and approving cost estimates and budgets.

(iii) Ensure that relevant personnel have sufficient training, experience, and guidance to perform estimating and budgeting tasks in accordance with the Contractor's established procedures.

(iv) Identify and document the sources of data and the estimating methods and rationale used in developing cost estimates and budgets.

(v) Provide for adequate supervision throughout the estimating and budgeting process.

(vi) Provide for consistent application of estimating and budgeting techniques.

(vii) Provide for detection and timely correction of errors.

(viii) Protect against cost duplication and omissions.

(ix) Provide for the use of historical experience, including historical vendor pricing data, where appropriate.

(x) Require use of appropriate analytical methods.

(xi) Integrate data and information available from other management systems.

(xii) Require management review, including verification of compliance with the company's estimating and budgeting policies, procedures, and practices.

(xiii) Provide for internal review of, and accountability for, the acceptability of the estimating system, including the budgetary data supporting indirect cost estimates and comparisons of projected results to actual results, and an analysis of any differences.

(xiv) Provide procedures to update cost estimates and notify the Contracting Officer in a timely manner throughout the negotiation process.

(xv) Provide procedures that ensure subcontract prices are reasonable based on a documented review and analysis provided with the prime proposal, when practicable.

(xvi) Provide estimating and budgeting practices that consistently generate sound proposals that are compliant with the provisions of the solicitation and are adequate to serve as a basis to reach a fair and reasonable price.

(xvii) Have an adequate system description, including policies, procedures, and estimating and budgeting practices, that comply with the Federal Acquisition Regulation and Defense Federal Acquisition Regulation Supplement.

(e) Significant deficiencies.

(1) The Contracting Officer will provide an initial determination to the Contractor, in writing, of any significant deficiencies. The initial determination will describe the deficiency in sufficient detail to allow the Contractor to understand the deficiency.

(2) The Contractor shall respond within 30 days to a written initial determination from the Contracting Officer that identifies significant deficiencies in the Contractor's estimating system. If the Contractor disagrees with the initial determination, the Contractor shall state, in writing, its rationale for disagreeing.

(3) The Contracting Officer will evaluate the Contractor's response and notify the Contractor, in writing, of the Contracting Officer's final determination concerning--

(i) Remaining significant deficiencies;

(ii) The adequacy of any proposed or completed corrective action; and

(iii) System disapproval, if the Contracting Officer determines that one or more significant deficiencies remain.

(f) If the Contractor receives the Contracting Officer's final determination of significant deficiencies, the Contractor shall, within 45 days of receipt of the final determination, either correct the significant deficiencies or submit an acceptable corrective action plan showing milestones and actions to eliminate the significant deficiencies.

(g) Withholding payments. If the Contracting Officer makes a final determination to disapprove the Contractor's estimating system, and the contract includes the clause at 252.242-7005, Contractor Business Systems, the Contracting Officer will withhold payments in accordance with that clause.

(End of clause)

252.219-7009 SECTION 8(A) DIRECT AWARD (SEP 2007)

(a) This contract is issued as a direct award between the contracting office and the 8(a) Contractor pursuant to the Partnership Agreement between the Small Business Administration (SBA) and the Department of Defense. Accordingly, the SBA, even if not identified in Section A of this contract, is the prime contractor and retains responsibility for 8(a) certification, for 8(a) eligibility determinations and related issues, and for providing counseling and assistance to the 8(a) Contractor under the 8(a) Program. The cognizant SBA district office is:

U.S. Small Business Administration
Hawaii District Office
500 Ala Moana Boulevard, Suite 1-306
Honolulu, Hawaii 96813

(b) The contracting office is responsible for administering the contract and for taking any action on behalf of the Government under the terms and conditions of the contract; provided that the contracting office shall give advance notice to the SBA before it issues a final notice terminating performance, either in whole or in part, under the contract. The contracting office also shall coordinate with the SBA prior to processing any novation agreement. The contracting office may assign contract administration functions to a contract administration office.

(c) The 8(a) Contractor agrees that--

(1) It will notify the Contracting Officer, simultaneous with its notification to the SBA (as required by SBA's 8(a) regulations at 13 CFR 124.308), when the owner or owners upon whom 8(a) eligibility is based plan to relinquish ownership or control of the concern. Consistent with Section 407 of Pub. L. 100-656, transfer of ownership or control shall result in termination of the contract for convenience, unless the SBA waives the requirement for termination prior to the actual relinquishing of ownership and control; and

(2) It will not subcontract the performance of any of the requirements of this contract without the prior written approval of the SBA and the Contracting Officer.

(End of Clause)

252.219-7010 ALTERNATE A (JUN 1998)

(a) Offers are solicited only from small business concerns expressly certified by the Small Business Administration (SBA) for participation in the SBA's 8(a) Program and which meet the following criteria at the time of submission of offer--

(1) The Offeror is in conformance with the 8(a) support limitation set forth in its approved business plan; and

(2) The Offeror is in conformance with the Business Activity Targets set forth in its approved business plan or any remedial action directed by the SBA.

(b) By submission of its offer, the Offeror represents that it meets all of the criteria set forth in paragraph (a) of this clause.

(c) Any award resulting from this solicitation will be made directly by the Contracting Officer to the successful 8(a) offeror selected through the evaluation criteria set forth in this solicitation.

(d)(1) Agreement. A small business concern submitting an offer in its own name shall furnish, in performing the contract, only end items manufactured or produced by small business concerns in the United States or its outlying areas. If this procurement is processed under simplified acquisition procedures and the total amount of this contract does not exceed \$25,000, a small business concern may furnish the product of any domestic firm. This paragraph does not apply to construction or service contracts.

(2) GSI Pacific Inc. will notify the Department of the Army, Corps of Engineers Contracting Officer in writing immediately upon entering an agreement (either oral or written) to transfer all or part of its stock or other ownership interest to any other party.

(End of clause)

252.219-7011 NOTIFICATION TO DELAY PERFORMANCE (JUN 1998)

The Contractor shall not begin performance under this purchase order until 2 working days have passed from the date of its receipt. Unless the Contractor receives notification from the Small Business Administration that it is ineligible for this 8(a) award, or otherwise receives instructions from the Contracting Officer, performance under this purchase order may begin on the third working day following receipt of the purchase order. If a determination of ineligibility is issued within the 2-day period, the purchase order shall be considered canceled.

(End of clause)

252.223-7002 SAFETY PRECAUTIONS FOR AMMUNITION AND EXPLOSIVES (MAY 1994)

(a) Definition. "Ammunition and explosives," as used in this clause --

(1) Means liquid and solid propellants and explosives, pyrotechnics, incendiaries and smokes in the following forms:

- (i) Bulk,
- (ii) Ammunition;
- (iii) Rockets;
- (iv) Missiles;
- (v) Warheads;
- (vi) Devices; and
- (vii) Components of (i) through (vi), except for wholly inert items.

(2) This definition does not include the following, unless the Contractor is using or incorporating these materials for initiation, propulsion, or detonation as an integral or component part of an explosive, an ammunition or explosive end item, or of a weapon system --

- (i) Inert components containing no explosives, propellants, or pyrotechnics;
- (ii) Flammable liquids;
- (iii) Acids;
- (iv) Powdered metals; or
- (v) Oxidizers;
- (vi) Other materials having fire or explosive characteristics.

(b) Safety requirements.

(1) The Contractor shall comply with the requirements of the DoD Contractors' Safety Manual for Ammunition and Explosives, DoD 4145.26-M hereafter referred to as "the manual", in effect on the date of the solicitation for this contract. The Contractor shall also comply with any other additional requirements included in the schedule of this contract.

(2) The Contractor shall allow the Government access to the Contractor's facilities, personnel, and safety program documentation. The Contractor shall allow authorized Government representatives to evaluate safety programs, implementation, and facilities.

(c) Noncompliance with the manual.

(1) If the Contracting Officer notifies the Contractor of any noncompliance with the manual or schedule provisions, the Contractor shall take immediate steps to correct the noncompliance. The Contractor is not entitled to reimbursement of costs incurred to correct noncompliances unless such reimbursement is specified elsewhere in the contract.

(2) The Contractor has 30 days from the date of notification by the Contracting Officer to correct the noncompliance and inform the Contracting Officer of the actions taken. The Contracting Officer may direct a different time period for the correction of noncompliances.

(3) If the Contractor refuses or fails to correct noncompliances within the time period specified by the Contracting Officer, the Government has the right to direct the Contractor to cease performance on all or part of this contract. The Contractor shall not resume performance until the Contracting Officer is satisfied that the corrective action was effective and the Contracting Officer so informs the Contractor.

(4) The Contracting Officer may remove Government personnel at any time the Contractor is in noncompliance with any safety requirement of this clause.

(5) If the direction to cease work or the removal of Government personnel results in increased costs to the Contractor, the Contractor shall not be entitled to an adjustment in the contract price or a change in the delivery or performance schedule unless the Contracting Officer later determines that the Contractor had in fact complied with the manual or schedule provisions. If the Contractor is entitled to an equitable adjustment, it shall be made in accordance with the Changes clause of this contract.

(d) Mishaps. If a mishap involving ammunition or explosives occurs, the Contractor shall --

(1) Notify the Contracting Officer immediately;

(2) Conduct an investigation in accordance with other provisions of this contract or as required by the Contracting Officer; and

(3) Submit a written report to the Contracting Officer.

(e) Contractor responsibility for safety. (1) Nothing in this clause, nor any Government action or failure to act in surveillance of this contract, shall relieve the Contractor of its responsibility for the safety of --

(i) The Contractor's personnel and property;

(ii) The Government's personnel and property; or

(iii) The general public.

(2) Nothing in this clause shall relieve the Contractor of its responsibility for complying with applicable Federal, State, and local laws, ordinances, codes, and regulations (including those requiring the obtaining of licenses and permits) in connection with the performance of this contract.

(f) Contractor responsibility for contract performance. (1) Neither the number or frequency of inspections performed by the Government, nor the degree of surveillance exercised by the Government, relieve the Contractor of its responsibility for contract performance.

(2) If the Government acts or fails to act in surveillance or enforcement of the safety requirements of this contract, this does not impose or add to any liability of the Government.

(g) Subcontractors. (1) The Contractor shall insert this clause, including this paragraph (g), in every subcontract that involves ammunition or explosives.

(i) The clause shall include a provision allowing authorized Government safety representatives to evaluate subcontractor safety programs, implementation, and facilities as the Government determines necessary.

(ii) Note: The Government Contracting Officer or authorized representative shall notify the prime Contractor of all findings concerning subcontractor safety and compliance with the manual. The Contracting Officer or authorized representative may furnish copies to the subcontractor. The Contractor in turn shall communicate directly with the subcontractor, substituting its name for references to "the Government". The Contractor and higher tier subcontractors shall also include provisions to allow direction to cease performance of the subcontract if a serious uncorrected or recurring safety deficiency potentially causes an imminent hazard to DoD personnel, property, or contract performance.

(2) The Contractor agrees to ensure that the subcontractor complies with all contract safety requirements. The Contractor will determine the best method for verifying the adequacy of the subcontractor's compliance.

(3) The Contractor shall ensure that the subcontractor understands and agrees to the Government's right to access to the subcontractor's facilities, personnel, and safety program documentation to perform safety surveys. The Government performs these safety surveys of subcontractor facilities solely to prevent the occurrence of any mishap which would endanger the safety of DoD personnel or otherwise adversely impact upon the Government's contractual interests.

(4) The Contractor shall notify the Contracting Officer or authorized representative before issuing any subcontract when it involves ammunition or explosives. If the proposed subcontract represents a change in the place of performance, the Contractor shall request approval for such change in accordance with the clause of this contract entitled "Change in Place of Performance - Ammunition and Explosives".

(End of clause)

252.226-7001 UTILIZATION OF INDIAN ORGANIZATIONS AND INDIAN-OWNED ECONOMIC ENTERPRISES, AND NATIVE HAWAIIAN SMALL BUSINESS CONCERNS (SEP 2004)

(a) Definitions. As used in this clause--

Indian means--

(1) Any person who is a member of any Indian tribe, band, group, pueblo, or community that is recognized by the Federal Government as eligible for services from the Bureau of Indian Affairs (BIA) in accordance with 25 U.S.C. 1452(c); and

(2) Any "Native" as defined in the Alaska Native Claims Settlement Act (43 U.S.C. 1601 et seq.).

Indian organization means the governing body of any Indian tribe or entity established or recognized by the governing body of an Indian tribe for the purposes of 25 U.S.C. chapter 17.

Indian-owned economic enterprise means any Indian-owned (as determined by the Secretary of the Interior) commercial, industrial, or business activity established or organized for the purpose of profit, provided that Indian ownership constitutes not less than 51 percent of the enterprise.

Indian tribe means any Indian tribe, band, group, pueblo, or community, including native villages and native groups (including corporations organized by Kenai, Juneau, Sitka, and Kodiak) as defined in the Alaska Native Claims Settlement Act, that is recognized by the Federal Government as eligible for services from BIA in accordance with 25 U.S.C. 1452(c).

Interested party means a contractor or an actual or prospective offeror whose direct economic interest would be affected by the award of a subcontract or by the failure to award a subcontract.

Native Hawaiian small business concern means an entity that is--

(1) A small business concern as defined in section 3 of the Small Business Act (15 U.S.C. 632) and relevant implementing regulations; and

(2) Owned and controlled by a Native Hawaiian as defined in 25 U.S.C. 4221(9).

(b) The Contractor shall use its best efforts to give Indian organizations, Indian-owned economic enterprises, and Native Hawaiian small business concerns the maximum practicable opportunity to participate in the subcontracts it awards, to the fullest extent consistent with efficient performance of the contract.

(c) The Contracting Officer and the Contractor, acting in good faith, may rely on the representation of an Indian organization, Indian-owned economic enterprise, or Native Hawaiian small business concern as to its eligibility, unless an interested party challenges its status or the Contracting Officer has independent reason to question that status.

(d) In the event of a challenge to the representation of a subcontractor, the Contracting Officer will refer the matter to--

(1) For matters relating to Indian organizations or Indian-owned economic enterprises: U.S. Department of the Interior, Bureau of Indian Affairs, Attn: Chief, Division of Contracting and Grants Administration, 1849 C Street NW, MS-2626-MIB, Washington, DC 20240-4000. The BIA will determine the eligibility and will notify the Contracting Officer.

(2) For matters relating to Native Hawaiian small business concerns: Department of Hawaiian Home Lands, PO Box 1879, Honolulu, HI 96805. The Department of Hawaiian Home Lands will determine the eligibility and will notify the Contracting Officer.

(e) No incentive payment will be made--

(1) While a challenge is pending; or

(2) If a subcontractor is determined to be an ineligible participant.

(f)(1) The Contractor, on its own behalf or on behalf of a subcontractor at any tier, may request an incentive payment in accordance with this clause.

(2) The incentive amount that may be requested is 5 percent of the estimated cost, target cost, or fixed price included in the subcontract at the time of award to the Indian organization, Indian-owned economic enterprise, or Native Hawaiian small business concern.

(3) In the case of a subcontract for commercial items, the Contractor may receive an incentive payment only if the subcontracted items are produced or manufactured in whole or in part by an Indian organization, Indian-owned economic enterprise, or Native Hawaiian small business concern.

(4) The Contractor has the burden of proving the amount claimed and shall assert its request for an incentive payment prior to completion of contract performance.

(5) The Contracting Officer, subject to the terms and conditions of the contract and the availability of funds, will authorize an incentive payment of 5 percent of the estimated cost, target cost, or fixed price included in the subcontract awarded to the Indian organization, Indian-owned economic enterprise, or Native Hawaiian small business concern.

(6) If the Contractor requests and receives an incentive payment on behalf of a subcontractor, the Contractor is obligated to pay the subcontractor the incentive amount.

(g) The Contractor shall insert the substance of this clause, including this paragraph (g), in all subcontracts exceeding \$500,000.

(End of clause)

252.231-7000 SUPPLEMENTAL COST PRINCIPLES (DEC 1991)

When the allowability of costs under this contract is determined in accordance with part 31 of the Federal Acquisition Regulation (FAR), allowability shall also be determined in accordance with part 231 of the Defense FAR Supplement, in effect on the date of this contract.

(End of clause)

252.232-7003 ELECTRONIC SUBMISSION OF PAYMENT REQUESTS AND RECEIVING REPORTS (JUNE 2012)

(a) Definitions. As used in this clause—

(1) Contract financing payment and invoice payment have the meanings given in section 32.001 of the Federal Acquisition Regulation.

(2) Electronic form means any automated system that transmits information electronically from the initiating system to all affected systems. Facsimile, e-mail, and scanned documents are not acceptable electronic forms for submission of payment requests. However, scanned documents are acceptable when they are part of a submission of a payment request made using Wide Area WorkFlow (WAWF) or another electronic form authorized by the Contracting Officer.

(3) Payment request means any request for contract financing payment or invoice payment submitted by the Contractor under this contract.

(4) Receiving report means the data required by the clause at 252.246-7000, Material Inspection and Receiving Report.

(b) Except as provided in paragraph (c) of this clause, the Contractor shall submit payment requests and receiving reports using WAWF, in one of the following electronic formats that WAWF accepts: Electronic Data Interchange,

Secure File Transfer Protocol, or World Wide Web input. Information regarding WAWF is available on the Internet at <https://wawf.eb.mil/>.

(c) The Contractor may submit a payment request and receiving report using other than WAWF only when--

(1) The Contracting Officer administering the contract for payment has determined, in writing, that electronic submission would be unduly burdensome to the Contractor. In such cases, the Contractor shall include a copy of the Contracting Officer's determination with each request for payment;

(2) DoD makes payment for commercial transportation services provided under a Government rate tender or a contract for transportation services using a DoD-approved electronic third party payment system or other exempted vendor payment/invoicing system (e.g., PowerTrack, Transportation Financial Management System, and Cargo and Billing System);

(3) DoD makes payment for rendered health care services using the TRICARE Encounter Data System (TEDS) as the electronic format; or

(4) When the Governmentwide commercial purchase card is used as the method of payment, only submission of the receiving report in electronic form is required.

(d) The Contractor shall submit any non-electronic payment requests using the method or methods specified in Section G of the contract.

(e) In addition to the requirements of this clause, the Contractor shall meet the requirements of the appropriate payment clauses in this contract when submitting payments requests.

(End of clause)

252.232-7010 LEVIES ON CONTRACT PAYMENTS (DEC 2006)

(a) 26 U.S.C. 6331(h) authorizes the Internal Revenue Service (IRS) to continuously levy up to 100 percent of contract payments, up to the amount of tax debt.

(b) When a levy is imposed on a payment under this contract and the Contractor believes that the levy may result in an inability to perform the contract, the Contractor shall promptly notify the Procuring Contracting Officer in writing, with a copy to the Administrative Contracting Officer, and shall provide--

(1) The total dollar amount of the levy;

(2) A statement that the Contractor believes that the levy may result in an inability to perform the contract, including rationale and adequate supporting documentation; and

(3) Advice as to whether the inability to perform may adversely affect national security, including rationale and adequate supporting documentation.

(c) DoD shall promptly review the Contractor's assessment, and the Procuring Contracting Officer shall provide a written notification to the Contractor including--

(1) A statement as to whether DoD agrees that the levy may result in an inability to perform the contract; and

(2)(i) If the levy may result in an inability to perform the contract and the lack of performance will adversely affect national security, the total amount of the monies collected that should be returned to the Contractor; or

(ii) If the levy may result in an inability to perform the contract but will not impact national security, a recommendation that the Contractor promptly notify the IRS to attempt to resolve the tax situation.

(d) Any DoD determination under this clause is not subject to appeal under the Contract Disputes Act.

(End of clause)

252.243-7001 PRICING OF CONTRACT MODIFICATIONS (DEC 1991)

When costs are a factor in any price adjustment under this contract, the contract cost principles and procedures in FAR part 31 and DFARS part 231, in effect on the date of this contract, apply.

(End of clause)

252.243-7002 REQUESTS FOR EQUITABLE ADJUSTMENT (DEC 2012)

(a) The amount of any request for equitable adjustment to contract terms shall accurately reflect the contract adjustment for which the Contractor believes the Government is liable. The request shall include only costs for performing the change, and shall not include any costs that already have been reimbursed or that have been separately claimed. All indirect costs included in the request shall be properly allocable to the change in accordance with applicable acquisition regulations.

(b) In accordance with 10 U.S.C. 2410(a), any request for equitable adjustment to contract terms that exceeds the simplified acquisition threshold shall bear, at the time of submission, the following certificate executed by an individual authorized to certify the request on behalf of the Contractor:

I certify that the request is made in good faith, and that the supporting data are accurate and complete to the best of my knowledge and belief.

(Official's Name)

(Title)

(c) The certification in paragraph (b) of this clause requires full disclosure of all relevant facts, including--

(1) Certified cost or pricing data if required in accordance with subsection 15.403-4 of the Federal Acquisition Regulation (FAR); and

(2) Data other than certified cost or pricing data, in accordance with subsection 15.403-3 of the FAR, including actual cost data and data to support any estimated costs, even if certified cost or pricing data are not required.

(d) The certification requirement in paragraph (b) of this clause does not apply to----

- (1) Requests for routine contract payments; for example, requests for payment for accepted supplies and services, routine vouchers under a cost-reimbursement type contract, or progress payment invoices; or
- (2) Final adjustment under an incentive provision of the contract.

252.244-7000 SUBCONTRACTS FOR COMMERCIAL ITEMS (JUN 2013)

- (a) The Contractor is not required to flow down the terms of any Defense Federal Acquisition Regulation Supplement (DFARS) clause in subcontracts for commercial items at any tier under this contract, unless so specified in the particular clause.
- (b) While not required, the Contractor may flow down to subcontracts for commercial items a minimal number of additional clauses necessary to satisfy its contractual obligation.
- (c) The Contractor shall include the terms of this clause, including this paragraph (c), in subcontracts awarded under this contract, including subcontracts for the acquisition of commercial items.

(End of clause)

Appendix B
Technical Management Plan

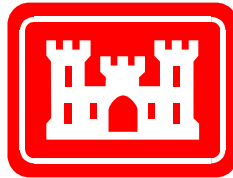
This Page Intentionally Left Blank

FINAL
TECHNICAL MANAGEMENT PLAN

**Munitions and Explosives of Concern Remedial Action
Former Waikane Training Area
Southeastern Region Munitions Response Site
Kāneʻohe, Oʻahu, Hawaiʻi**

RMIS ID: H09HI035401

Prepared for:



**U.S. Army Corps of Engineers
Honolulu District
Building 230
Fort Shafter, Hawaiʻi
96858-5440**

December 2016

This Page Intentionally Left Blank

Table of Contents

<i>Acronyms and Abbreviations</i>	<i>iii</i>
<i>Section 1 Introduction</i>	<i>1-1</i>
1.1 Project Objectives	1-1
<i>Section 2 Project Organization and Personnel</i>	<i>2-1</i>
2.1 Project Organization and Personnel	2-1
2.2 Contractor Personnel.....	2-1
<i>Section 3 Project Communication and Reporting</i>	<i>3-1</i>
3.1 Project Communication.....	3-1
3.2 Project Planning	3-1
3.3 Progress Reporting	3-1
3.4 Periodic Reporting	3-1
3.5 Project Schedule.....	3-1
3.6 Project Deliverables	3-2
3.7 Project Public Relations Support	3-2
3.8 Subcontractor Management	3-3
3.9 Management of Field Operations.....	3-3
<i>Section 4 References</i>	<i>4-1</i>

List of Figures

Figure 2-1: Project Organizational Chart.....	2-5
---	-----

This Page Intentionally Left Blank

Acronyms and Abbreviations

APP	Accident Prevention Plan
bgs	Below Ground Surface
CD-ROM	Compact Disc-Read Only Memory
CFR	Code of Federal Regulations
CHSM	Corporate Health and Safety Manager
COR	Contracting Officer's Representative
DDESB	Department of Defense Explosives Safety Board
DID	Data Item Description
DMM	Discarded Military Munitions
DOH	State of Hawaiʻi Department of Health
DQCR	Daily Quality Control Report
EZ	Exclusion Zone
GSIP	GSI Pacific Inc.
IAW	In Accordance With
MC	Munitions Constituent
MD	Munitions Debris
MDAS	Material Documented as Safe
MEC	Munitions and Explosives of Concern
MPPEH	Material Potentially Presenting an Explosive Hazard
MRS	Munitions Response Site
OSHA	Occupational Safety and Health Administration
PM	Project Manager
POH	Honolulu District
PWS	Performance Work Statement
QC	Quality Control
QCM	Quality Control Manager
RA	Remedial Action
RAR	Remedial Action Report
SSHP	Site Safety and Health Plan
SUXOS	Senior UXO Supervisor
TMP	Technical Management Plan
TP	Technical Paper
UFP-QAPP	Uniform Federal Policy Quality Assurance Project Plan
U.S.	United States
USACE	U.S. Army Corps of Engineers
UXO	Unexploded Ordnance
UXOSO	UXO Safety Officer
UXOQCS	UXO Quality Control Specialist
WTA	Waikane Training Area

This Page Intentionally Left Blank

Section 1 Introduction

This Technical Management Plan (TMP) has been developed to document the approach and procedures by the project team required to execute the tasks described in the Firm Fixed Price Performance Work Statement (PWS) (Appendix A of the project Uniform Federal Policy Quality Assurance Project Plan [UFP-QAPP]).

1.1 Project Objectives

This project includes a Remedial Action (RA) at the 36-acre area within the Southeastern Region Munitions Response Site (MRS), former Waikane Training Area (WTA), Kāneʻohe, Oʻahu, Hawaiʻi.

The objective of the RA is to remove and dispose of munitions and explosives of concern (MEC) and munitions debris (MD) found within the 36-acre RA area. MEC includes unexploded ordnance (UXO), discarded military munitions (DMM), and munitions constituents (MCs) that are present in sufficient concentration to constitute an explosive hazard. The RA field activities include:

- A biological survey will be conducted by qualified botanist/biologist prior to RA field activities to identify sensitive plant and animal species. The botanist/biologist will conduct biological resources awareness training for the field teams on how to identify important species and habitats. During field activities, the botanist/biologist will be notified and will investigate any findings;
- An archaeological survey will be conducted prior to RA field activities to identify sensitive archaeological sites. A qualified archaeologist will maintain a physical presence on site during the RA fieldwork;
- Vegetation clearance to facilitate the analog geophysical surveys and surface and subsurface clearance activities. Vegetation less than 3 inches in diameter will be cut and left in place;
- A surface clearance will be completed to remove metal from the surface so that an effective analog geophysical survey can be performed to locate anomalies for investigation during the subsurface clearance;
- Analog Geophysical surveys will be performed using handheld analog metal detectors to locate anomalies for investigation during the subsurface clearance;
- A subsurface clearance will be completed through anomaly investigations that will identify and remove all MEC, MD, and metal equal to or greater than the mass and diameter of a 37mm projectile to a depth of 2 ft bgs within the limitations in detection technology;
- In areas cluttered with metallic contamination, an analog EM61-MK2 detector may be utilized to reduce the number of small anomalies to focus investigation efforts. In these areas, EM61-MK2 digital geophysical mapping and anomaly investigation will be utilized to verify detector responses are below anomaly threshold;

- Explosive disposal operations may be required to dispose of any Material Potentially Presenting an Explosive Hazard (MPPEH)/MEC discovered; and
- MPPEH/Material Documented as Safe (MDAS) processing and management will be conducted as required for safe disposition and transfer to a metal recycler.

Section 2 Project Organization and Personnel

2.1 Project Organization and Personnel

2.1.1 Project Organization

The following organizations have major roles in this investigation:

- **United States (U.S.) Army Corps of Engineers (USACE), Honolulu District (POH)** - USACE POH is the District responsible for project oversight, providing right of entry, community relations support, regulatory liaison, and other critical support and guidance to this project. Mr. Kevin Pien is the USACE POH Project Manager (PM) overseeing this work;
- **Regulators** - State of Hawaiʻi Department of Health (DOH) will be provided the opportunity to review all work plans and reports completed for the project; and
- **GSI Pacific Inc. (GSIP)** - As the prime contractor to USACE POH, GSIP will provide overall technical support and services for implementation of the RA activities. GSIP is responsible for performing the activities detailed in the PWS and included in the project UFP-QAPP.

2.2 Contractor Personnel

The GSIP project team will consist of personnel experienced in RA activities. Key project team members will include the Senior PM, PM, Quality Control (QC) Manager (QCM), and Corporate Health and Safety Manager (CHSM).

Field and support personnel will include the Senior UXO Supervisor (SUXOS), UXO QC Specialist (UXOQCS), UXO Safety Officer (UXOSO), UXO Technicians, Scientists, and Engineers. Essential personnel will be available at the site for inspection or verification, as required.

2.2.1 Key Personnel

The roles and responsibilities of key project personnel are detailed in the following sections.

2.2.1.1 Senior Project Manager

The GSIP Senior PM is Mr. Brian Stepp. The Senior PM has overall responsibility for the activities conducted for this project. The Senior PM is responsible for supporting GSIP's PM with personnel and other resources, providing performance oversight, and for QC and safety. Additional responsibilities include maintaining formal communications with the Contracting Officer and Contracting Officer's Representative (COR), contract changes, guidance on resolving problems which may arise during project execution, communication of program status and problems encountered to the COR, and overall client satisfaction. The Senior PM provides support for the USACE and has complete management authority and responsibility for all work

performed under this contract. The Senior PM has the responsibility for managing GSIP's entire MEC RA project, estimating cost, managing budgets, and maintaining control of all project activities.

2.2.1.2 Project Manager

The GSIP PM is Mr. Daniel Wolf. The PM has day-to-day management and responsibility for planning, scheduling, cost control, implementation of project tasks, technical reports, and documents. The PM will monitor project personnel, direct technical resources, and provides responsibility for safety, quality, schedule, approval of project deliverables, and achieving the performance-based milestones. The PM reports to the GSIP Senior PM.

2.2.1.3 Quality Control Manager

The GSIP QCM is Mr. Daniel Haines. The QCM is responsible for developing and implementing GSIP's Quality Program. The QCM is responsible for assuring that the UFP-QAPP procedures are implemented during the field activities. The QCM will serve as an advisor to the UXOQCS in evaluating the QC concerns with respect to activities associated with the MEC-specific sections of the QC Program for all MEC-related QC activities. The QCM will perform evaluations in accordance with (IAW) the PWS and project UFP-QAPP, and communicate the results of these evaluations to the UXOQCS and PMs. The QCM will confirm that the final project deliverables are based on defensible and documented data, manage the control of records during project performance, and address foreseeable data collection, management and QC problems in updates to the project UFP-QAPP.

2.2.1.4 Corporate Health and Safety Manager

The GSIP CHSM is Mr. Mike Coyle. The CHSM is responsible for developing and implementing GSIP's Safety Program. The CHSM will serve as an advisor to the UXOSO in evaluating health and safety concerns with respect to hazardous, toxic, and radioactive waste issues and general (non-MEC) work practices. In addition, the CHSM may conduct safety evaluations to determine whether operations are being conducted IAW the Accident Prevention Plan (APP)/Site Safety and Health Plan (SSHP), requirements, and Occupational Safety and Health Administration (OSHA) regulations. The CHSM will have the authority to take immediate steps to correct unsafe or unhealthful conditions, including the stoppage of fieldwork when deemed necessary.

2.2.1.5 Senior Unexploded Ordnance Supervisor

The SUXOS is Mr. Marco Beltran. The SUXOS controls operations of all field teams performing MEC activities and will monitor performance and assist in achieving maximum operational safety and efficiency. The SUXOS reports directly to the PM. The SUXOS will implement the approved plans in the field and must review and approve any changes. The SUXOS will supervise all personnel employed by GSIP and their subcontractors involved in the project. The SUXOS is authorized to temporarily stop work to correct an unsafe condition or

procedure. The SUXOS will meet or exceed the requirements as stated in Department of Defense Explosives Safety Board (DDESB) Technical Paper (TP)-18 (DDESB, 2015).

2.2.1.6 Unexploded Ordnance Quality Control Specialist

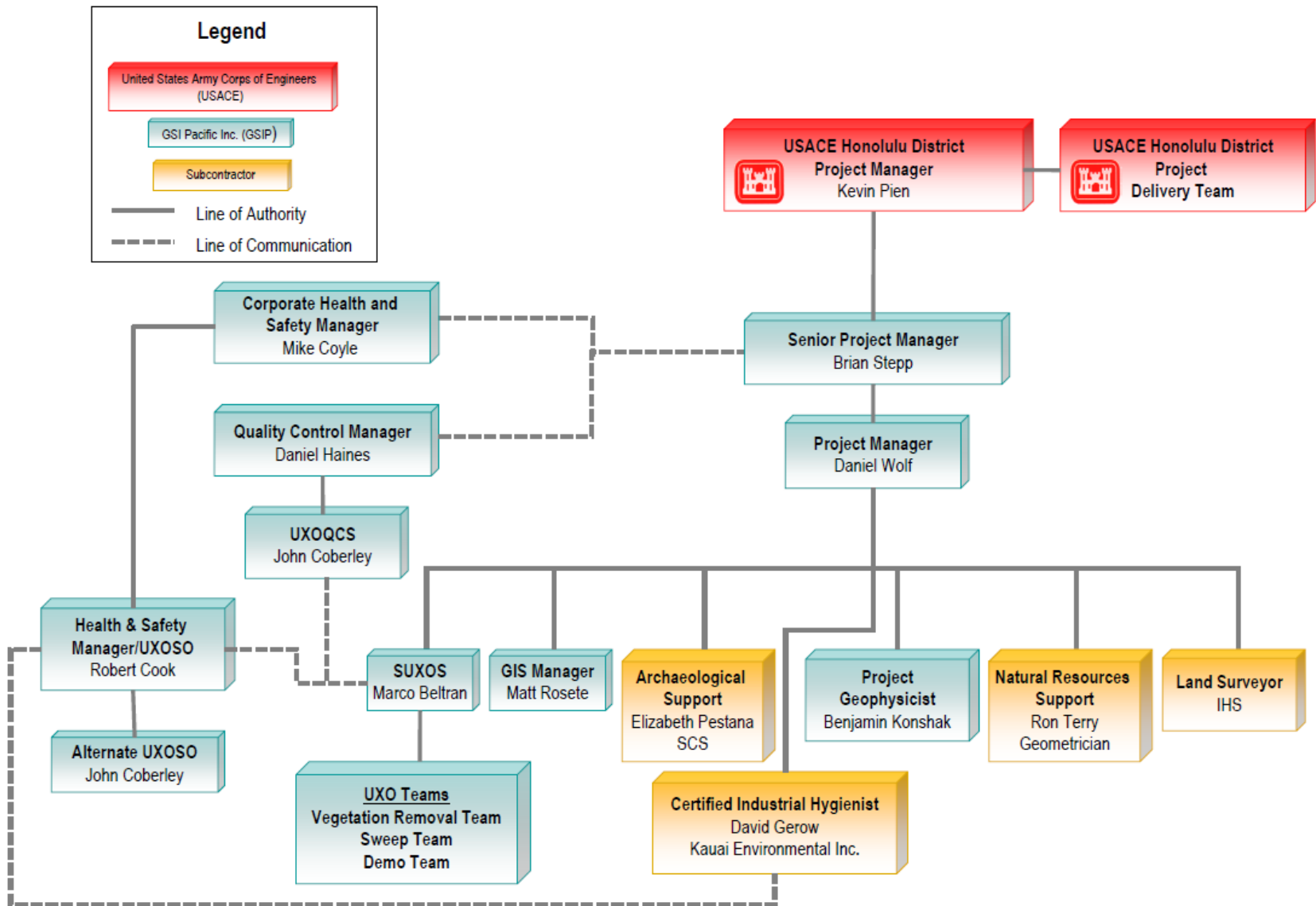
The UXOQCS is Mr. John Coberly. The UXOQCS works independently of project management and will be advised by the QCM. The UXOQCS implements all MEC-related QC activities, conducts QC inspections of all MEC and explosives operations for compliance with established procedures, and directs and approves all corrective actions to ensure all MEC-related work complies with contractual requirements. The UXOQCS has the authority to temporarily stop work to correct an unsafe condition or procedure. The UXOQCS will meet or exceed the requirements as stated in DDESB TP-18 (DDESB, 2015).

2.2.1.7 Unexploded Ordnance Safety Officer

The UXOSO is Mr. Robert Cook. The UXOSO works independently of project management and will be advised by the CHSM. The UXOSO analyzes MEC and explosives operational risks, hazards, and safety requirements; establishes and ensures compliance with all site-specific safety requirements for MEC and explosives operations; enforces personnel limits and Exclusion Zones (EZs) for MEC clearance operations, MEC and explosives transportation, storage, and destruction; conducts safety inspections to ensure compliance with MEC and explosives safety codes; conducts Daily Tailgate briefings. The UXOSO is authorized to temporarily stop work to correct an unsafe condition or procedure. The UXOSO will meet or exceed the requirements as stated in DDESB TP-18 (DDESB, 2015).

This Page Intentionally Left Blank

Figure 2-1: Project Organizational Chart



This Page Intentionally Left Blank

Section 3 Project Communication and Reporting

3.1 Project Communication

All communication to stakeholders and regulators will be coordinated with USACE POH. GSIP will keep a record of phone conversations and written correspondence affecting decisions relating to the performance of this RA. GSIP will prepare and submit minutes of all significant meetings and teleconferences attended.

3.2 Project Planning

The kick-off meeting will involve representatives from the USACE POH and the GSIP team. The purpose of the kick-off meeting is to brief appropriate entities/personnel concerning the scope of activities, proposed schedule, operational procedures, safety issues, support requirements, emergency planning, and identification of stakeholders.

3.3 Progress Reporting

All communication to stakeholders and regulators will be coordinated with USACE POH. GSIP will keep a record of phone conversations and written correspondence affecting decisions relating to the performance of this RA.

3.4 Periodic Reporting

3.4.1 Monthly Progress Reports

GSIP will provide monthly progress reports in accordance with Data Item Description (DID) MMRP-09-016 *Periodic Status Reports* (note, progress reports will be submitted on a weekly basis during the field activities). The monthly report will provide summarized cost and performance information (*e.g.*, completed milestones), including percent complete for project management purposes. In addition, conference calls to include any interested stakeholders, may be arranged to update project status.

3.4.2 Field Status Reports

GSIP will prepare and submit Daily QC Reports (DQCRs) and daily safety reports during field activities to document field activities completed and planned. The reports will be delivered electronically via e-mail to the USACE on a weekly basis.

3.5 Project Schedule

The schedule for the RA at the Southeastern Region MRS is provided in Worksheet #14 & 16 of the project UFP-QAPP. The schedule provides the proposed start date and duration for each milestone; the scheduling items are presented chronologically.

3.6 Project Deliverables

The UFP-QAPP and Report shall be issued in draft, draft final, and final versions. The draft is typically for USACE review and comment only. Following USACE approval of the draft version, the draft final version will then be submitted for regulatory (*i.e.*, DOH) review and comment. The final version will be submitted to all the stakeholders and may be accessible for public viewing following approval by the USACE.

All final major submittals will be submitted in both hard copy and electronic (compact disc-read only memory [CD-ROM]) format. The CD-ROM will include, all data, maps produced, and will be delivered with each copy of the report.

3.6.1 Remedial Action Report

The results of the RA will be documented in a Remedial Action Report (RAR), which GSIP will deliver upon completion of the fieldwork. GSIP will submit a draft, draft final, and final versions of the RAR. The RAR will be completed IAW DID MMRP-09-013. GSIP will work closely with USACE POH on the format of the RAR. Per the PWS (Appendix A of the project UFP-QAPP), as a minimum, the RAR will include discussion of the following categories:

- Executive Summary;
- Introduction;
- Site Background and Foreseeable Future Use;
- RA Activities:
 - Decision Document Requirements;
 - Nature and Extent of Contamination;
 - Description of Technology Used; and
 - Disposition of MEC Items Found.
- Land Use Controls Recommendations;
- Appendices;
- References; and
- Supporting Documentation.

3.7 Project Public Relations Support

GSIP's PM will support the USACE POH PM and other Government representatives for meetings, presentations, and events. Support would include, but is not limited to, preparation of appropriate presentation materials including visual displays, video recordings, logistic support during meetings, and presentation of the work to be performed during this RA. It is anticipated that all of these meetings and community events would take place on the Island of Oʻahu.

3.8 *Subcontractor Management*

Each subcontractor working on the project site will be required to comply with the APP/SSHP and will be subject to the same training and medical surveillance requirements as GSIP personnel depending on job activity. All activities involving the potential for exposure to hazardous waste materials will require medical and training certification as mandated by Title 29 Code of Federal Regulations (CFR) Sections 1910.120 and 1926.65.

3.9 *Management of Field Operations*

Fieldwork will be coordinated within the GSIP Honolulu, Hawaiʻi office. Field teams may be composed of GSIP staff from the Big Island and Oʻahu offices. Such resources, as well as any necessary subcontractor support, will be managed by the PM and SUXOS. The PM, SUXOS, and Technical Leads will be responsible for identifying appropriate field staff and will confirm that proposed project personnel have the necessary experience and required training for the project.

This Page Intentionally Left Blank

Section 4 References

29 CFR 1910.120. *Hazardous Waste Operations and Emergency Response*.

29 CFR 1926. Subpart P, Appendix F, *Safety and Health Requirements for Construction*.

DDESB, 2015. TP-18. *Minimum Qualifications for Personnel Conducting Munitions and Explosives of Concern-Related Activities*. 1 September.

USACE, 2009a. DID MMRP-09-013. *Site Specific Final Report*. 19 August.

_____, 2009b. DID MMRP-09-016. *Periodic Status Reports*. 19 August.

This Page Intentionally Left Blank

Appendix C
Figures

This Page Intentionally Left Blank

List of Figures included in this appendix:

Figures:

- Figure 1: Site Location;
- Figure 2: Munitions Response Site;
- Figure 3: Property Ownership;
- Figure 4: Land Use;
- Figure 5: Topography and Hydrography;
- Figure 6: Previous Investigation Results; and
- Figure 7: RA Grid Locations.

This Page Intentionally Left Blank

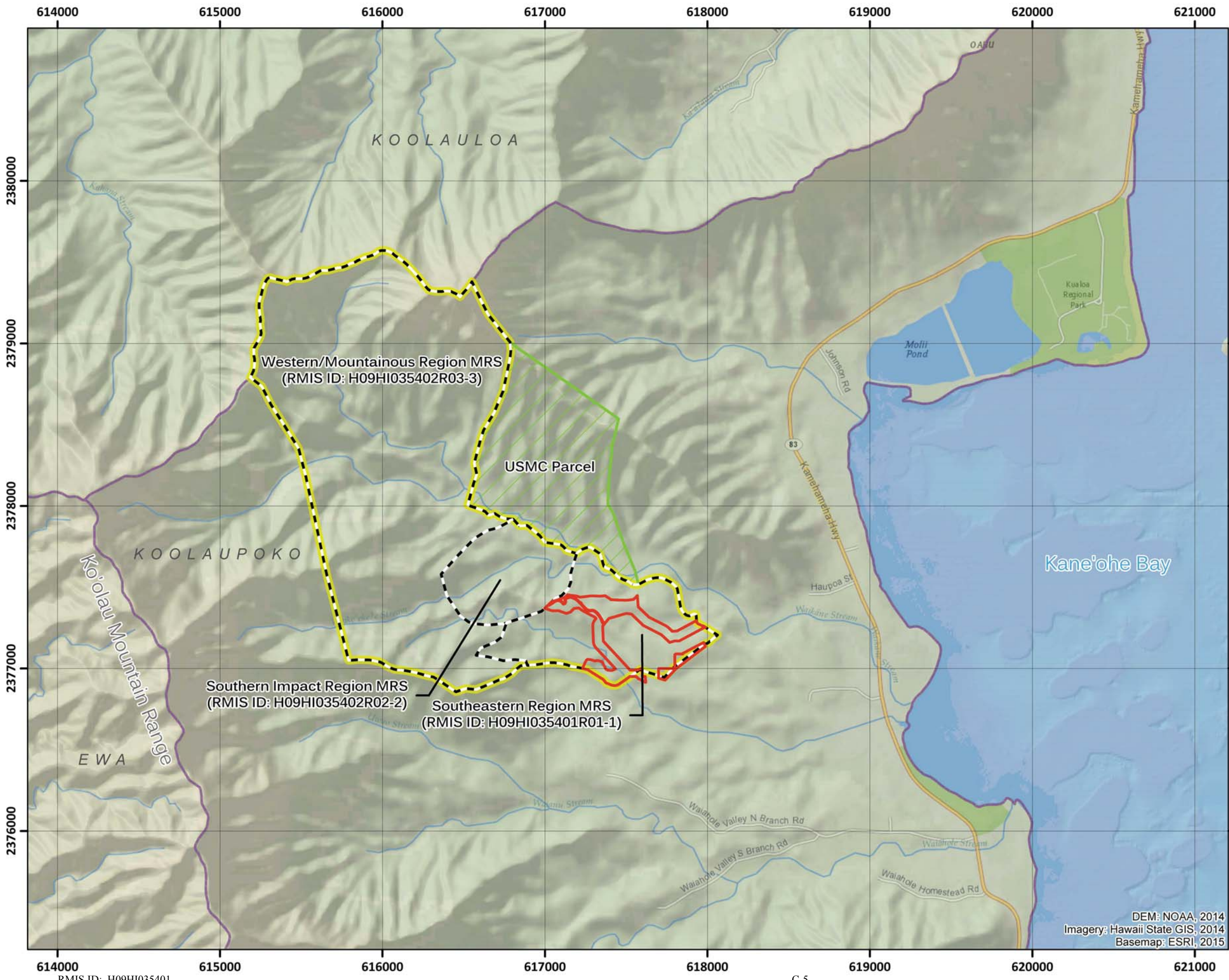



Figure 1 - Site Location
Southeastern Region MRS
(RMIS ID: H09HI035401)
MEC Remedial Action
Former Waikane Training Area
O'ahu, Hawai'i
Prepared For: USACE










0 250 500 750 1,000
 Meters

0 1,000 2,000 3,000 4,000
 Feet


N
 W I E
 S

Grid North
 0° 25' 12" W
 2015 Magnetic Declination
 9° 35' 00" E


 Datum: NAD83 PA11
 Coordinate System: UTM Zone 4N
 Map Units: Meters
 Scale: 1:24,000

-  Stream
-  Highway
-  Street
-  Regional Park
-  District Boundary
-  USMC Parcel (Non-DERP FUDS)
-  Remedial Action Area (36 ac)
-  MRS Boundary
-  Former WTA MRA Boundary

Island of O'ahu

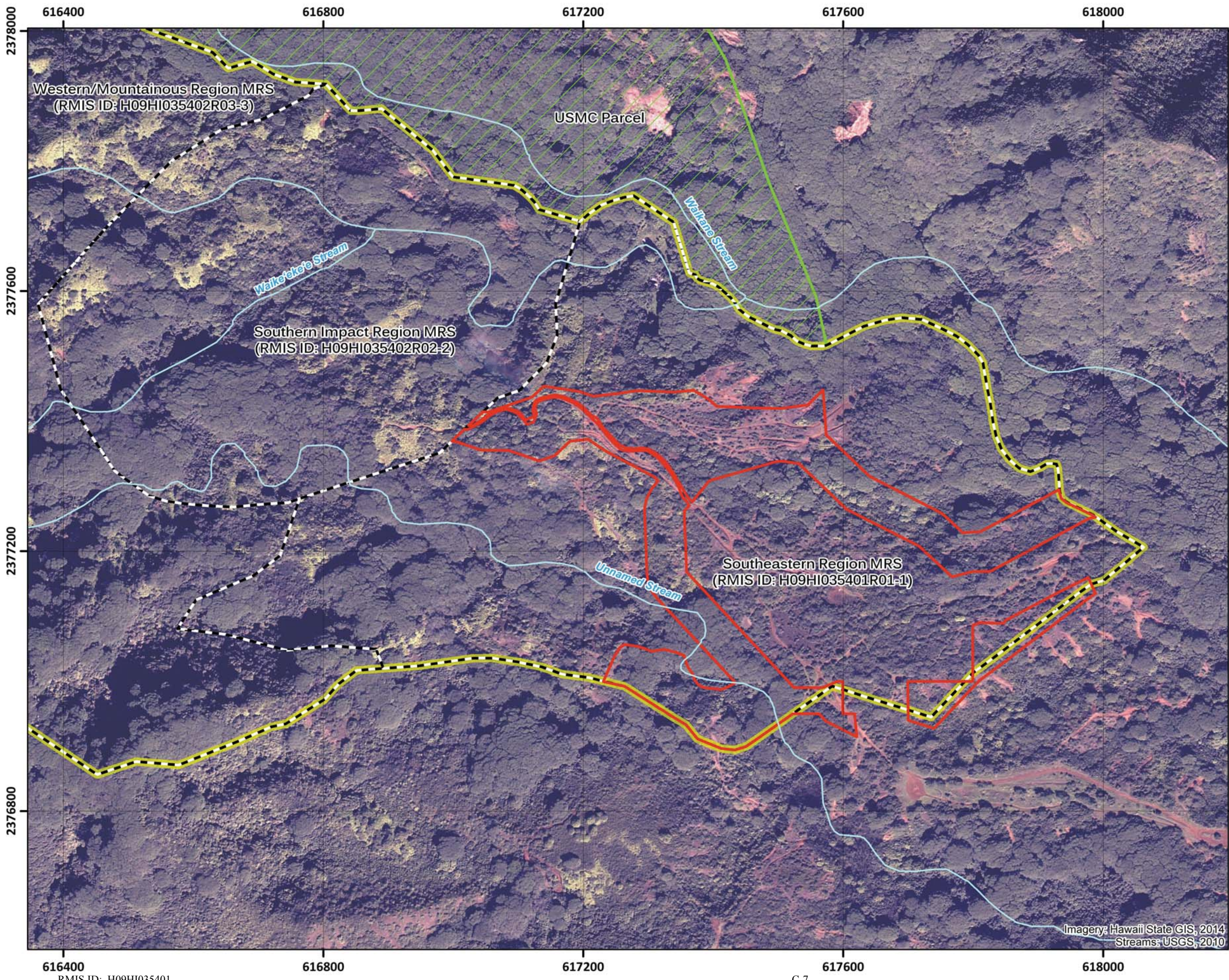


Area of Detail

R:\Waikane\UFP-QAPP\Figure_1_Site_Location_Map_R3.mxd
 11 x 17 landscape Figure_1_Site_Location_Map_R3.pdf

Drawn By: CBriggs Date: 30 November 2015






This Page Intentionally Left Blank

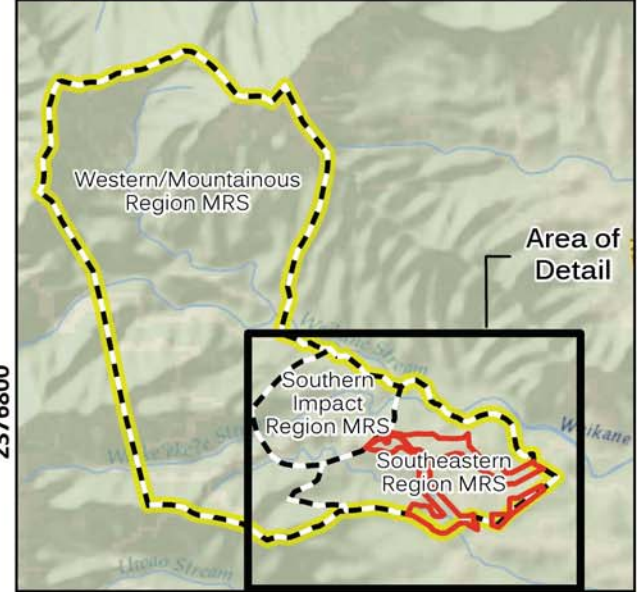


**Figure 2 - Munitions Response Site
Southeastern Region MRS
(RMIS ID H09HI035401)
MEC Remedial Action
Former Waikane Training Area
O'ahu, Hawai'i
Prepared For: USACE**



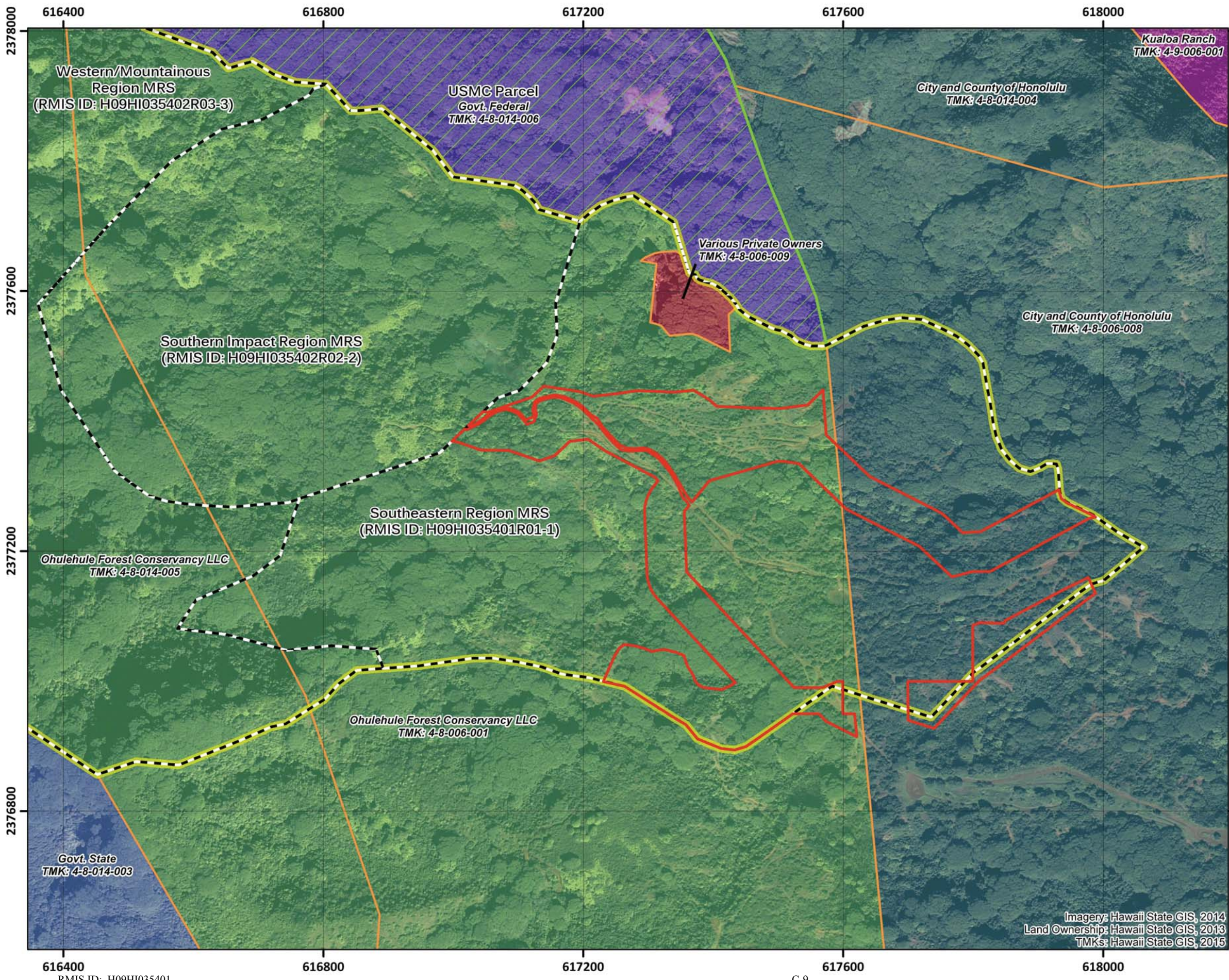

Datum: NAD83 PA11
Coordinate System: UTM Zone 4N
Map Units: Meters
Scale: 1:6,000

-  Stream
-  USMC Parcel (Non-DERP FUDS)
-  Remedial Action Area (36 ac)
-  MRS Boundary
-  Former WTA MRA Boundary



R:\Waikane\UFP-QAPP\Figure_2_Munitions_Response_Site_R5.mxd
11 x 17 landscape Figure_2_Munitions_Response_Site_R5.pdf
Drawn By: CBriggs Date: 30 November 2015

This Page Intentionally Left Blank



**Figure 3 - Property Ownership
Southeastern Region MRS
(RMIS ID H09HI035401)
MEC Remedial Action
Former Waikane Training Area
O'ahu, Hawai'i
Prepared For: USACE**

0 100 200 300 400
Meters

0 300 600 900 1,200
Feet

N
W E
S

Grid North
0° 25' 12" W
2015 Magnetic Declination
9° 35' 00" E

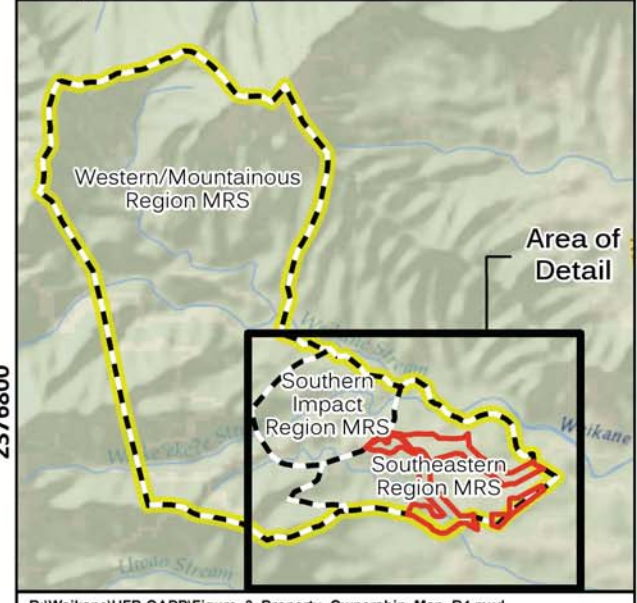
Datum: NAD83 PA11
Coordinate System: UTM Zone 4N
Map Units: Meters
Scale: 1:9,000

Legend:

- TMK Boundary
- USMC Parcel (Non-DERP FUDS)
- Remedial Action Area (36 ac)
- MRS Boundary
- Former WTA MRA Boundary

Land Owner

- City and County of Honolulu
- Govt. Federal
- Govt. State
- Kualoa Ranch
- Ohulehule Forest Conservancy LLC
- Private



R:\Waikane\UFP-QAPP\Figure_3_Property_Ownership_Map_R4.mxd
11 x 17 landscape Figure_3_Property_Ownership_Map_R4.pdf

Drawn By: CBriggs Date: 30 November 2015

This Page Intentionally Left Blank

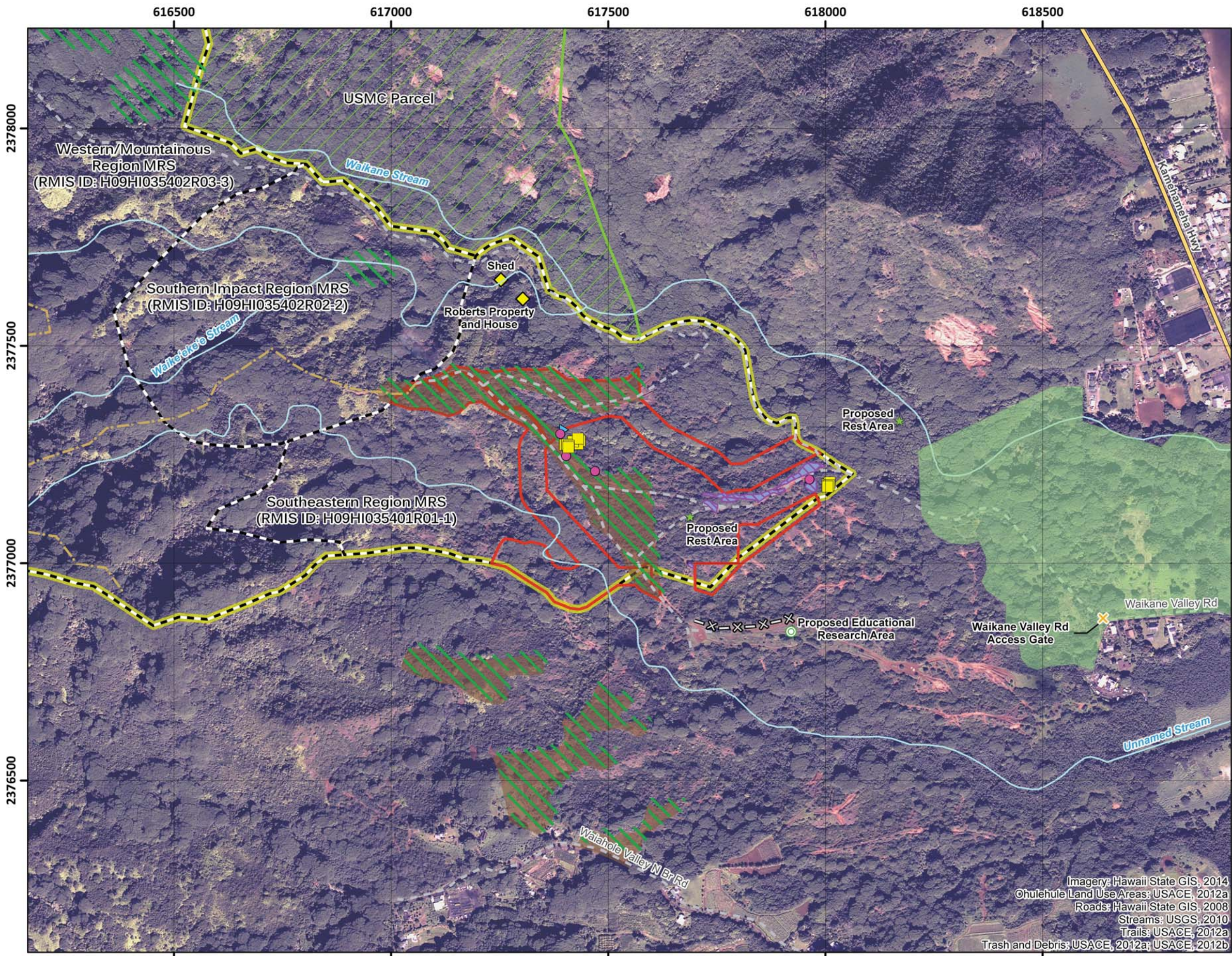


Figure 4 - Land Use
Southeastern Region MRS
(RMIS ID H09HI035401)
MEC Remedial Action
Former Waikane Training Area
O'ahu, Hawai'i
Prepared For: USACE

0 125 250 375 500
 0 400 800 1,200 1,600
 Meters
 Feet

N
 W E
 S
 Grid North
 0° 25' 12" W
 2015 Magnetic Declination
 9° 35' 00" E

Datum: NAD83 PA11
 Coordinate System: UTM Zone 4N
 Map Units: Meters
 Scale: 1:9,000

- Waikane Valley Rd Access Gate
- Structure
- Stove
- Car
- Trash Pit
- Trash Area
- Deteriorated Fence Line
- Stream
- Kamehameha Hwy
- Unimproved Road
- Trail
- Ohulehule Forest Conservation Area
- Ohulehule Cacao Farming Area
- USMC Parcel (Non-DERP FUDS)
- Remedial Action Area (36 ac)
- MRS Boundary
- Former WTA MRA Boundary

Waikane Valley Nature Park

- Proposed Educational Research Area
- Proposed Rest Area
- Proposed Park Facilities Area

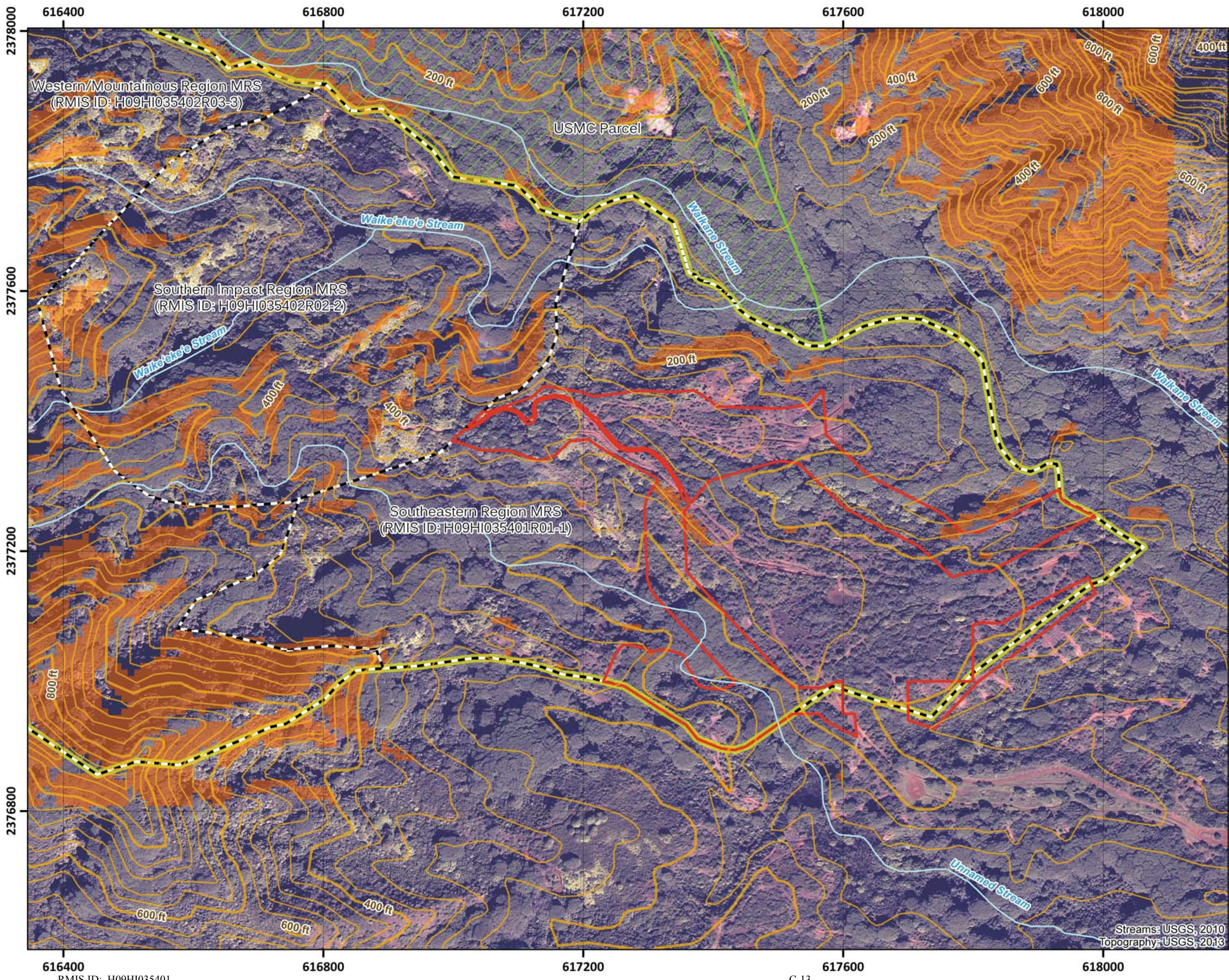
Western/Mountainous Region MRS
 Kamehameha Hwy
 Area of Detail
 MOKO'I'I ISLAND
 Kaneohe Bay
 Southern Impact Region MRS
 Southeastern Region MRS

Imagery: Hawaii State GIS, 2014
 Ohulehule Land Use Areas: USACE, 2012a
 Roads: Hawaii State GIS, 2008
 Streams: USGS, 2010
 Trails: USACE, 2012a
 Trash and Debris: USACE, 2012a; USACE, 2012b

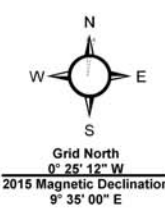
R:\Waikane\UFP-QAPP\Figure_4_Land_Use_R1.mxd
 11 x 17 landscape Figure_4_Land_Use_R1.pdf

Drawn By: CBriggs Date: 30 November 2015








This Page Intentionally Left Blank

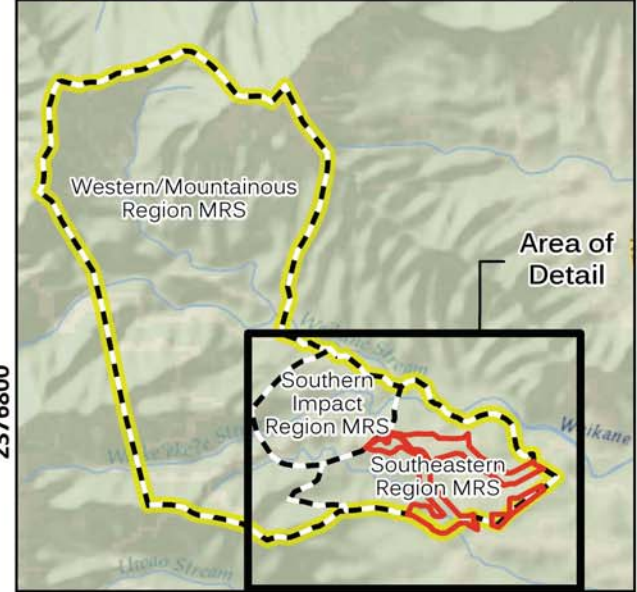


**Figure 5 - Topography and Hydrography
Southeastern Region MRS
(RMIS ID H09HI035401)
MEC Remedial Action
Former Waikane Training Area
O'ahu, Hawai'i
Prepared For: USACE**




Datum: NAD83 PA11
Vertical Datum: Local Mean Sea Level
Coordinate System: UTM Zone 4N
Map Units: Meters
Scale: 1:6,000

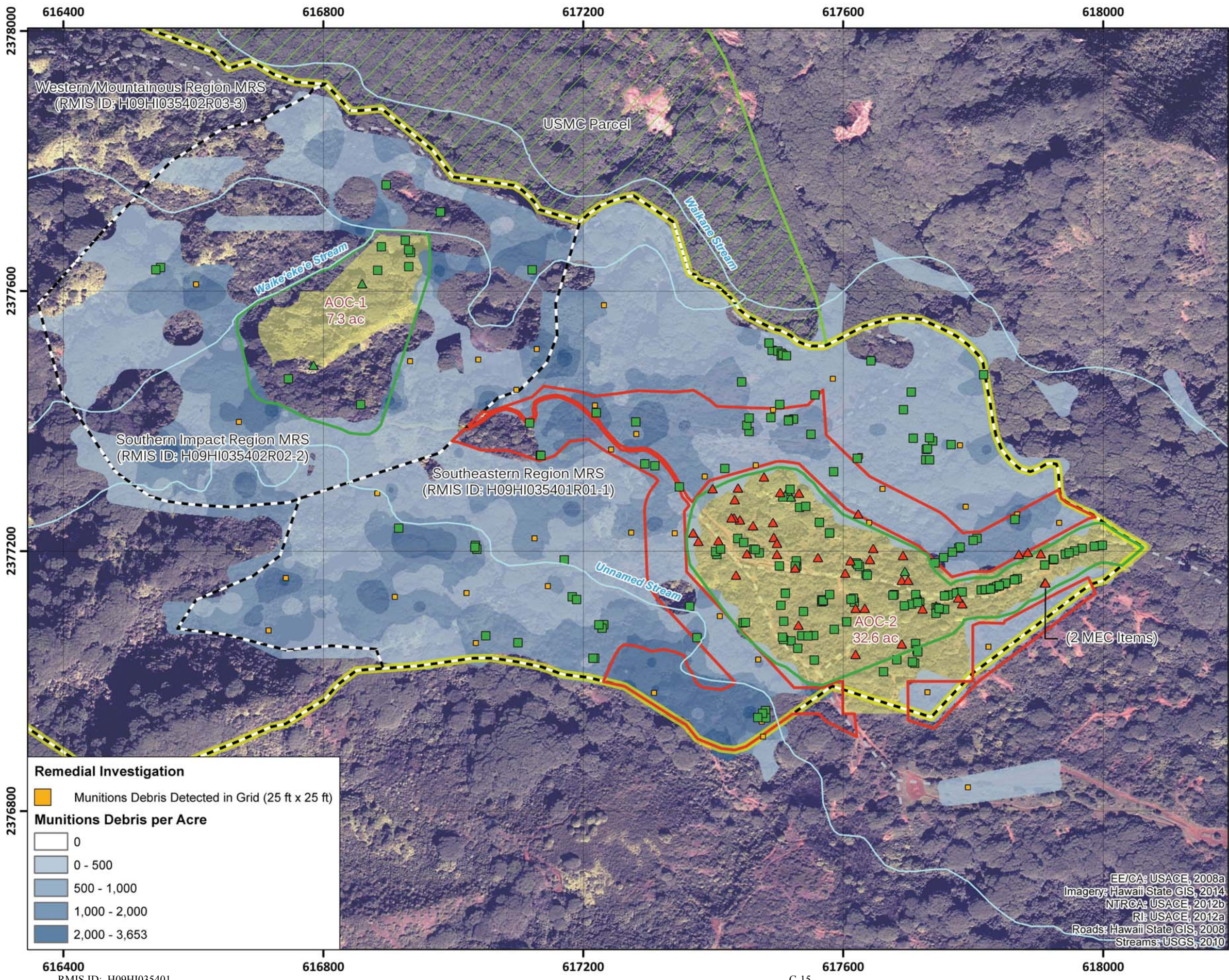
-  40 ft Topographic Contour
-  Stream
-  Slopes > 30 degrees
-  USMC Parcel (Non-DERP FUDS)
-  Remedial Action Area (36 ac)
-  MRS Boundary
-  Former WTA MRA Boundary



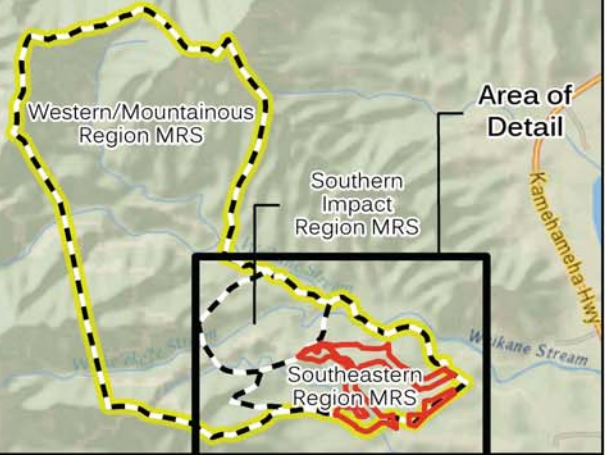
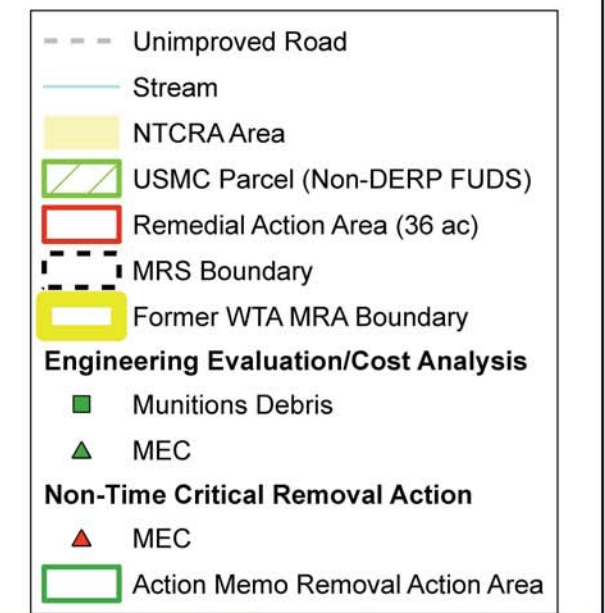
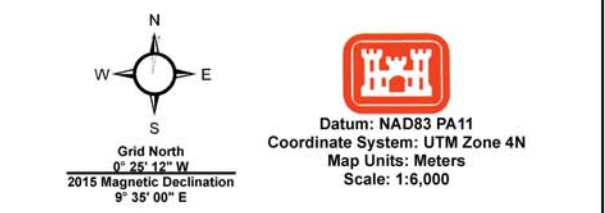
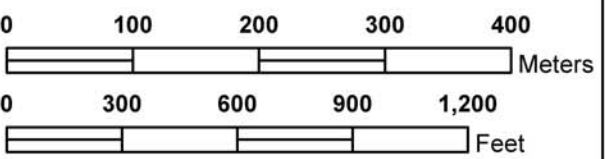
R:\Waikane\UFP-QAPP\Figure_5_Topo_Hydro_R1.mxd
11 x 17 landscape Figure_5_Topo_Hydro_R1.pdf
Streams: USGS, 2010
Topography: USGS, 2013

Drawn By: CBriggs Date: 30 November 2015

This Page Intentionally Left Blank



**Figure 6 - Previous Investigation Results
Southeastern Region MRS
(RMIS ID H09HI035401)
MEC Remedial Action
Former Waikane Training Area
O'ahu, Hawai'i
Prepared For: USACE**



R:\Waikane\UFP-QAPP\Figure_6_Previouse_Investigation_Results_R2.mxd
11 x 17 landscape Figure_6_Previouse_Investigation_Results_R2.pdf
Drawn By: CBriggs Date: 30 November 2015

This Page Intentionally Left Blank

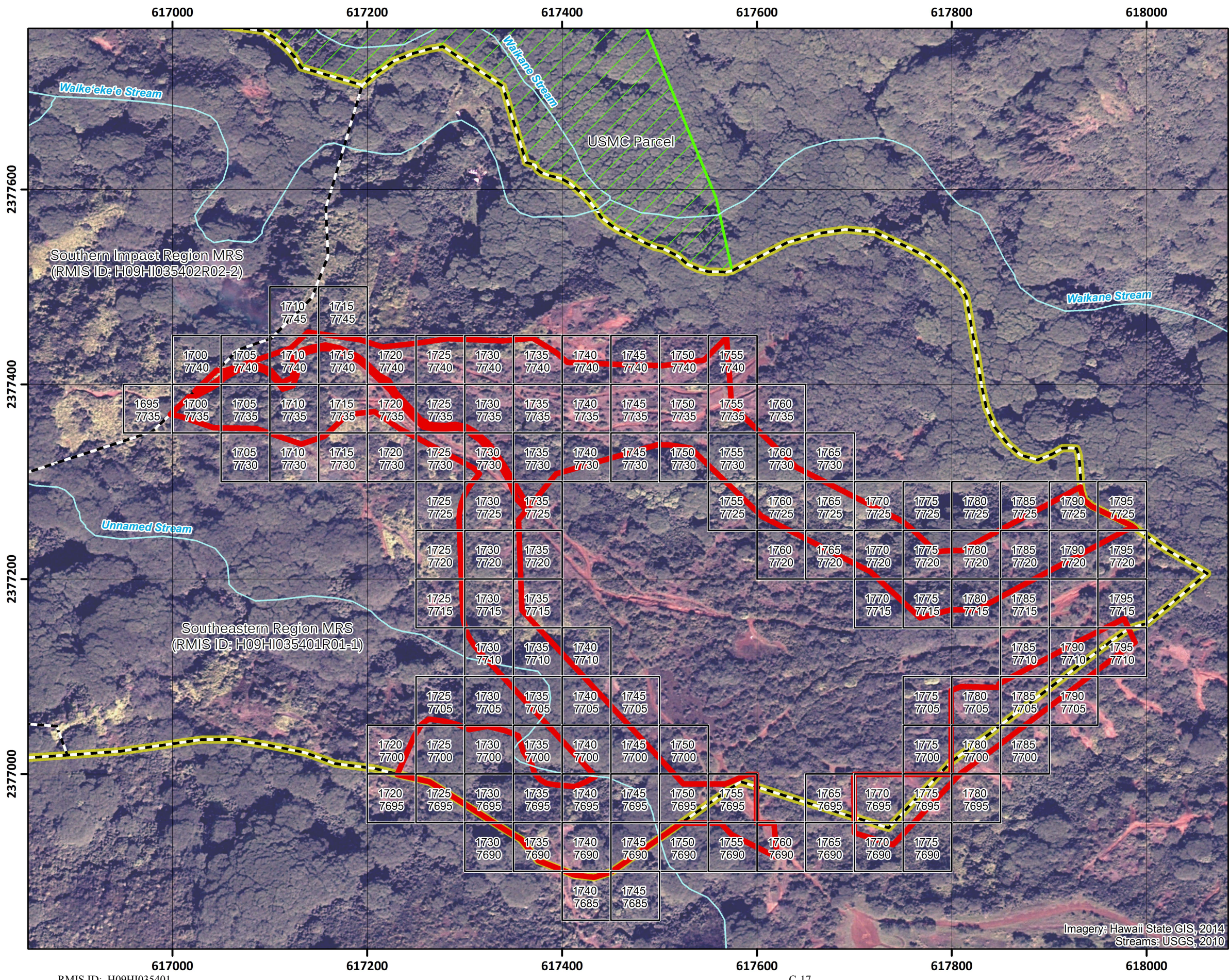


Figure 7 - RA Grid Locations
Southeastern Region MRS
 (RMIS ID H09HI035401)
MEC Remedial Action
Former Waikane Training Area
 O'ahu, Hawai'i
 Prepared For: USACE

0 50 100 150 200
 Meters

0 200 400 600 800
 Feet

N
 W E
 S

Grid North
 0° 25' 12" W
 2015 Magnetic Declination
 9° 35' 00" E

Datum: NAD83 PA11
 Coordinate System: UTM Zone 4N
 Map Units: Meters
 Scale: 1:4,000

- Stream
- Grid Area (50 m x 50 m)
- USMC Parcel (Non-DERP FUDS)
- Remedial Action Area (36 ac)
- MRS Boundary
- Former WTA MRA Boundary

Western/Mountainous Region MRS
 Southern Impact Region MRS
 Southeastern Region MRS
 Area of Detail

R:\Waikane\UFP-QAPP\Figure_7_RA_Grid_Locations_R1.mxd
 11 x 17 landscape Figure_7_RA_Grid_Locations_R1.pdf

Drawn By: wshontell Date: 30 November 2015

Imagery: Hawaii State GIS, 2014
 Streams: USGS, 2010

This Page Intentionally Left Blank

Appendix D
Ordnance Technical Data Sheets

This Page Intentionally Left Blank

List of ordnance technical data sheets included in this appendix:

Ordnance Technical Data Sheets:

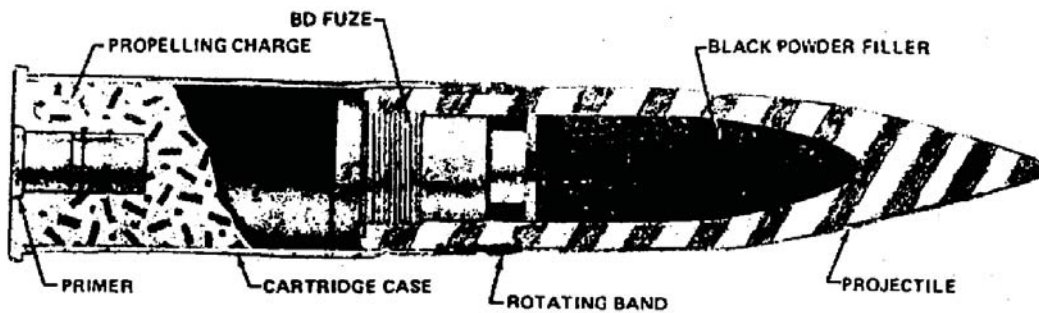
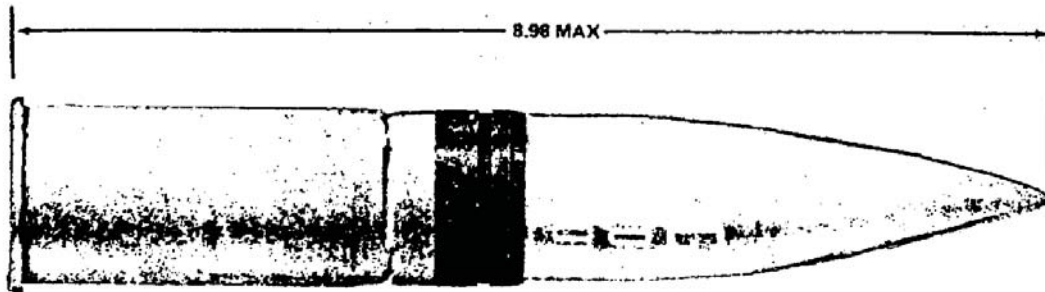
- 37mm HE Projectile, M63;
- 37mm APC-T Projectile, M51;
- 37mm HE Projectile MKII;
- 75mm HE Projectile, M48;
- 3-inch HE Projectile, M42/M42A1;
- Fuze BD, M58;
- Fuze PDSQ, M48;
- Fuze PDSQ, M51;
- Fuze PDSQ, M54;
- 58mm HE Mortar, Type 89;
- 60mm HE Mortar, M49A2/M49A3;
- 60mm Practice, M50A2/M50A3;
- 81mm Practice, M43A1;
- 81mm HE Mortar, M43A1/M43A1B1;
- 81mm HE Mortar, M56;
- Fuze PD, M52;
- 2.36-inch HEAT Rocket, M6A1;
- 2.36-inch Practice Rocket, M7A1;
- 3.5-inch HEAT Rocket, M28A2;
- 3.5-inch Practice Rocket, M29;
- Grenade Training, MK1A1;
- Grenade Frag, MKII;
- Grenade Smoke, M18;
- Grenade Smoke, AN-M8;
- Rifle Grenade HEAT, M9A1;
- Rifle Grenade Practice, M29;
- Trip Flare, M48;
- Flare, Surface, M49A1;
- Artillery Flash Simulator, M110;
- Signal Illumination, M17/M19/M21/M51;

List of ordnance technical data sheets included in this appendix:

- Signal, Smoke and Illumination, AN-MK13 Mod 0;
- Simulator, M27A1B1;
- Firing Device, M1;
- 2-inch Smoke Mortar, M3; and
- Grenade HEAT, M28.

Note: The supplied technical data sheets are representative of the types of munitions anticipated to have been used in the area.

37mm, High Explosive, M63



Use.

Description.

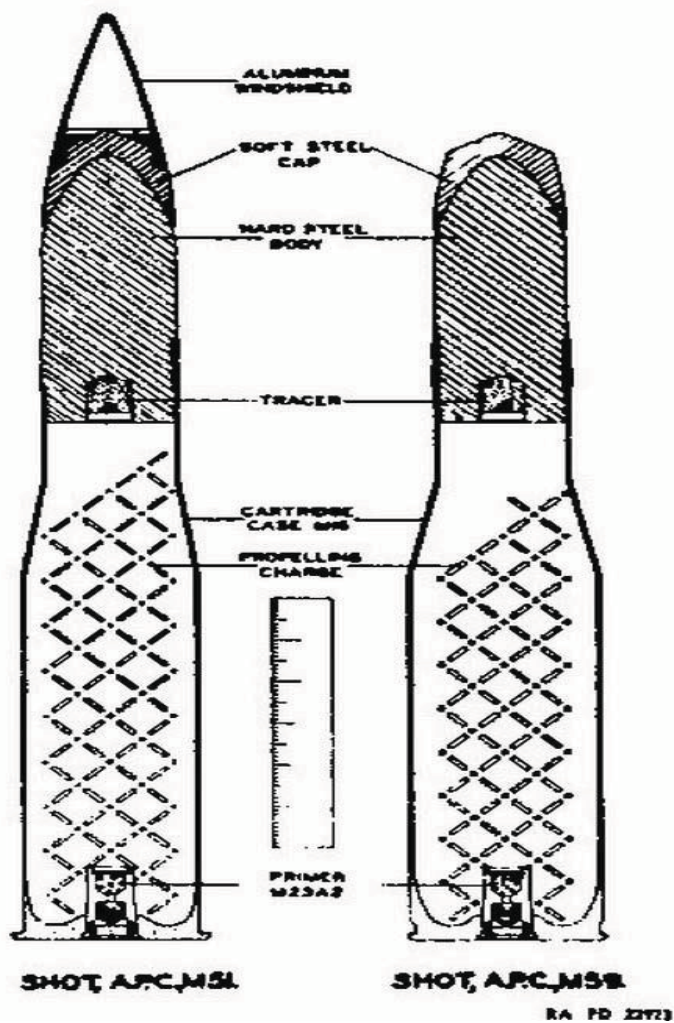
Weight	1.61 pound
Length	5.92 inch
Filler	TNT
Filler weight	0.085 pound
Cartridge case	M16
Propellant	0.44 lbs. FNH powder

Color.....Olive Drab with Yellow
stenciling

Fuze Base Detonating M58

Reference: TM 43-0001-28, *Army Ammunition Data Sheets Artillery
Ammunition*, April 1977

37mm APC-T Projectile, M51



The complete round may be identified for the M3 and M3A1 (antitank) and M5 and M6 (tank) Guns by the length (8.75 inches) and extracting flange of the cartridge case.

It can be distinguished as the A.P.C. M51 Round by the aluminum windshield or, if the windshield is not assembled, by the threads on the armor-piercing cap. The complete round is 14.53 inches long and weighs 3.41 pounds. Since the projectile is inert, it is painted black and stenciled in white. However, there is a tracer element in the rear of the projectile. This round has all of the features of an ideal armor-piercing shot, and is effective against all types of armor plate.

The term A.P.C. in the nomenclature of armor-piercing projectiles stands for armor-piercing, capped.

The shot depends for effect upon the force of its impact and penetration; the use of an armor-piercing cap especially adapts it for combating face-hardened plate. There is no bursting charge, the projectile being solid except for a small cavity in the base. This holds a red tracer composition which burns for approximately 3 seconds, equivalent.

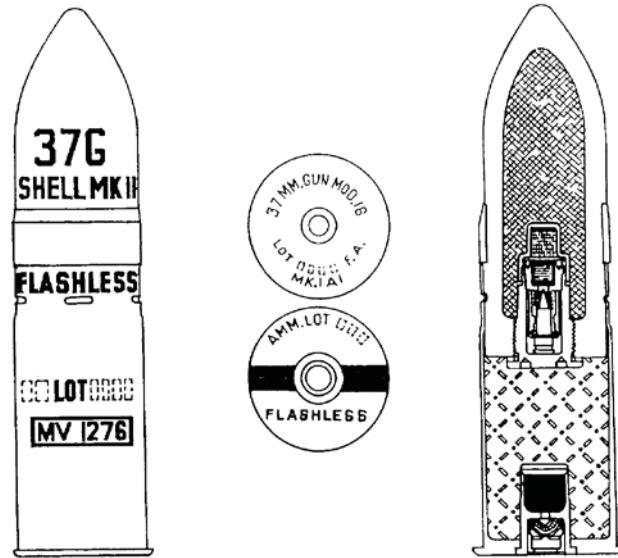
DATA

Weight of complete round.....	3.41 lb	Maximum range (at 45 deg elevation):
Length of complete round	14.53 in.	In M3, M3A1, and
Length of projectile.....	6.36 in.	M6 Guns
Length of cartridge case.....	8.75 in.	12,850 yd
Width of rotating band.....	0.74 in.	In M5 and M5A1 Guns....
Type of base.....	Square	12,725 yd
Radius of ogive (false ogive)	8.96 cal.	Penetration (in. at 0-deg
Muzzle velocity:		obliquity of face-hardened
In M3, M3A1, and		plate at 1,000 yd).....
M6 Guns	2,900 ft per sec*	2.1
In M5 and M5A1		Penetration (in. at 0-deg
Guns	2,855 ft per sec*	obliquity of homogeneous
		plate at 1,000 yd).....
		2.3

*—For rounds with brass cartridge cases: 2,800 feet per second for rounds with steel cases. Rounds of earlier manufacture have muzzle velocity of 2,600 feet per second. Identification provided by marking on packing boxes.

Reference: TM 9-1901, Artillery Ammunition, September 1950

SHELL, 37mm, HE, FIXED, MK II



Use. M1916 Gun

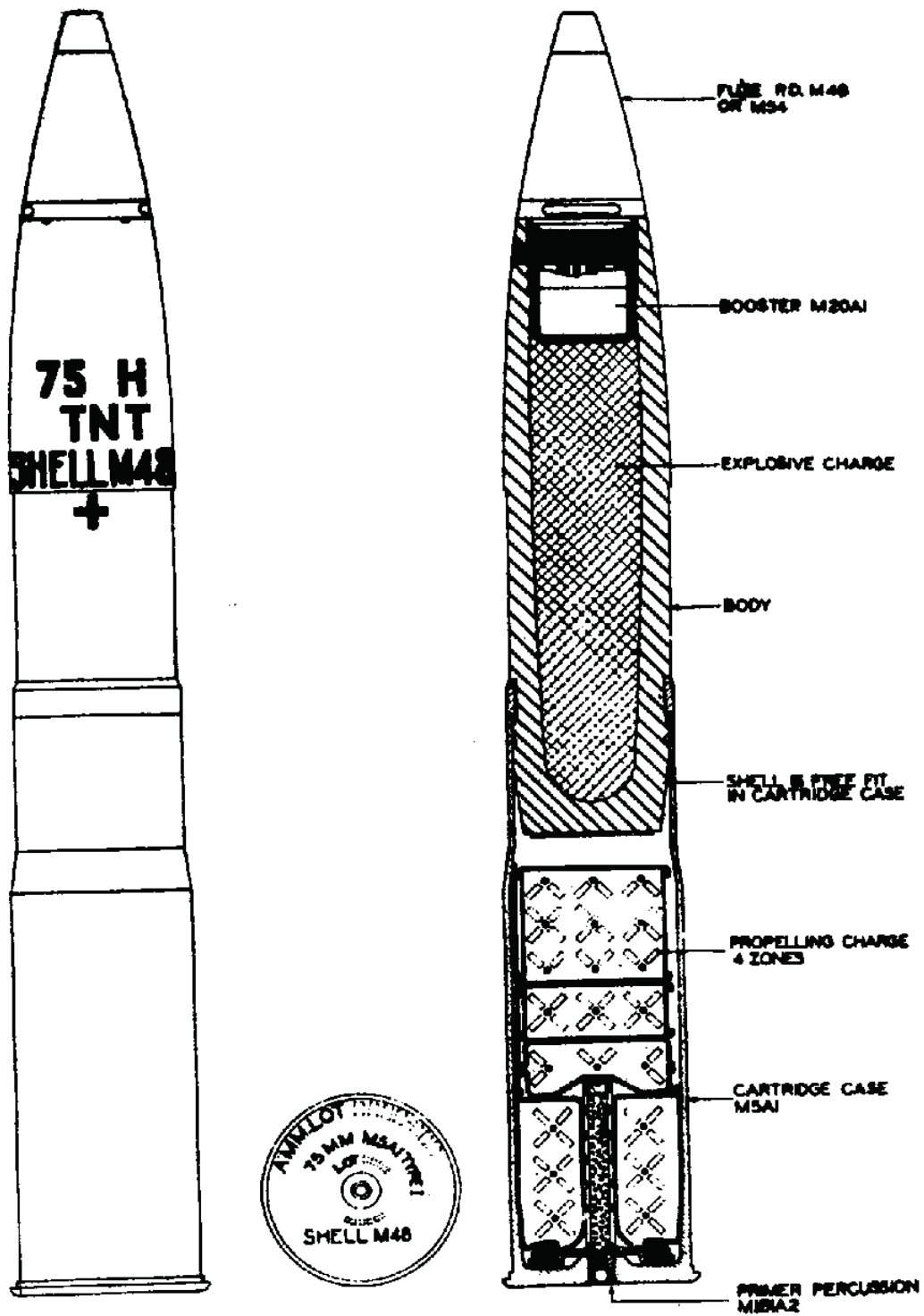
Description. The Mk II High-explosive Shell is standard for issue and manufacture although it is not widely used for infantry support. The Mk IA2 Cartridge Case with M23A2 Primer is standard for the high-explosive shell. However, older rounds may be found with the Mk IA2 or Mk IA1 Cartridge case and M23A1 Primers, or possibly with Mk I Cartridge Cases and M23A1 Primers. Approximately 550 grains of FNH powder is poured loosely into the cartridge case. The projectile is made of bar steel and has an explosive charge of 0.06 pounds of TNT. It is 4.45 inches long and has an ogive radius of 2.25 calibers. Since it is adapted for a base detonating fuze, the nose is continued to a rounded point. The total weight of the projectile with fuze and bursting charge is about 1 pound. The complete round is 6.92 inches long and weighs approximately 1.61 pounds The M38A1 Fuze is standard, replacing the M38, (modification to the detonator assembly) for the Mk II round. It is a typical nondelay fuze, being located in the base of the projectile and having no delay between the firing pin and the detonator. There is no positive separation between the detonating elements and the booster, so the fuze is not boresafe. On impact, the firing pin is carried forward by inertia and initiates the explosive train of detonator consisting of priming mixture, lead azide and tetryl. The projectile is painted olive drab and stenciled in yellow.

Length (projectile)	4.45 inch
Over-all length w/cartridge case	6.92 inch
Diameter	37 mm
Weight, complete round	1.61 pounds
Filler	TNT
Fuze	M38, M38A1

Reference: TM 9-1904, *Ammunition Inspection Guide*, March 1944

This Page Intentionally Left Blank

75mm HE Projectile, M48



General. The complete round with the exception of cartridge case, primer, propelling charge, and markings is similar to the gun Round M48.

Description. This projectile is streamlined with a 9° tapered or boat-tailed base and a 7.5-caliber radius of ogive. The projectile is made of forged steel; it has a rotating band of gilding metal, a fringing groove; and a steel base cover spot welded to its base. It is also provided with a single groove, between the fringing groove and the boat-tail, for stab crimping of the cartridge case. The booster and fuze assemble directly to the nose of the shell, the booster being tightened in place by a set screw, and the fuze by staking into notches cut in the rim of the nose. The standard bursting charge consists of 1.49 pounds of TNT. The projectile is painted lusterless olive drab and is stenciled in yellow with the designation of weapon (75H), the designation of filler (TNT), and the complete round designation (Shell M48).

Filler	TNT
Filler weight	1.49 pounds
Cartridge Case	M5, M5A1B1
Propellant	FNH (15.55 oz. max)
Primer	M1B1A2
Fuze	M48, M48A1, M54
Painting and markings	Olive drab w/ yellow markings

Reference: TM 9-1904, Ammunition Inspection Guide, March 1944

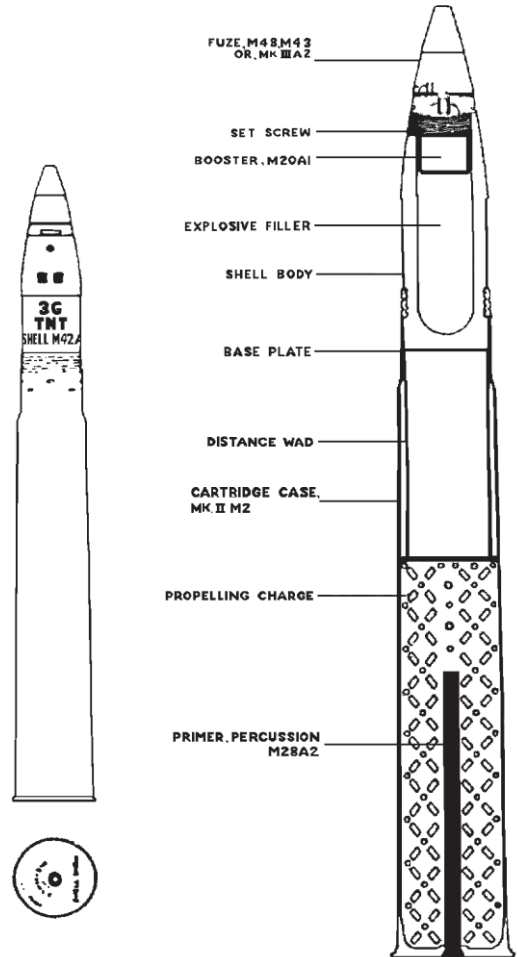
SHELL, FIXED, 3-INCH, HE, M42 AND M42A1

General. this shell is essentially designed to replace the SHELL, HE, Mk IX, to take the M20 booster directly without use of an adapter.

Projectile. is of one piece steel construction and has the same length and contour as the Mk IX combined with its adapter. The nose is threaded to receive the M20 Booster. The radius of ogive, rotating band, and base plate are also identical to that of the Mk IX Shell. The filler is 0.86 pound of TNT. The variation in shell weights gives three zone weights. The M42 Projectile has been modified to the M42A1, and will be manufactured as such in the future. The modification consists of changing the inside cavity at the base of the projectile from flat to a hemispherical contour.

Components. The complete round consists of the M42 Projectile loaded with TNT, having a bakelite cup in the nose to receive the M20-series Booster, and fuzed with the Mechanical Time, M43 fuze (all models) or the 21-second Powder Time-train Fuze Mk IIIA2. The above projectile is crimped to the Mk IM2 or Mk IIM2 cartridge Case with its propelling charge of NH smokeless powder, distance wad, and the M28A2 Primer.

Guns. The M42 HE Round can be used in all models of fixed or mobile mounted guns, providing the cartridge case corresponds with the proper weapon.

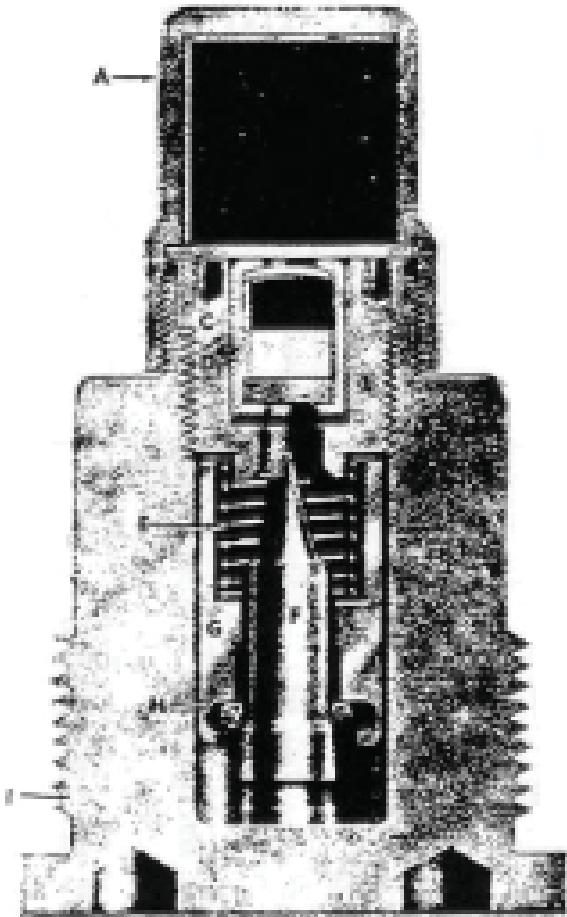


Length (projectile)	12.4 inches
Diameter	3.04 inches
Weight	12.81 pounds
Filler	TNT
Weight of filler	0.86 pounds
Fuze	Mechanical Time M48, M43 , or Powder Time Mk IIIA2
Propellant	NH Powder, 5 pounds (approx.)

Reference: TM 9 -1904, *Ammunition Inspection Guide*, March 1944

This Page Intentionally Left Blank

Fuze BD, M58



FUZE, B.D., M58

General: This fuze is used with the M63 HE Shell for 37-mm Guns, M3, M3A1, and M6.

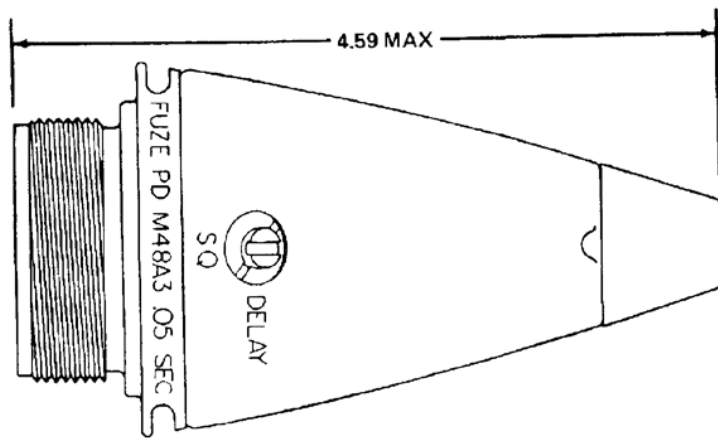
Data: Over-all length, 2.02 inches; weight, 0.30 pound.

Description: The fuze consists of: a brass or steel body (I) containing the firing pin (F) and sleeve (G) assembly; a brass detonator holder (C) which holds the primer mixture and intermediate detonating charges (D); and a brass or steel closing cup (A). The closing cup holds the booster pellet (B), the final charge in the fuze explosive train. There are no bore safety arrangements or external safety devices, the striker being held in the unarmed position prior to firing by a resistance ring (H) which holds the firing pin at the rear of the sleeve and away from the detonator.

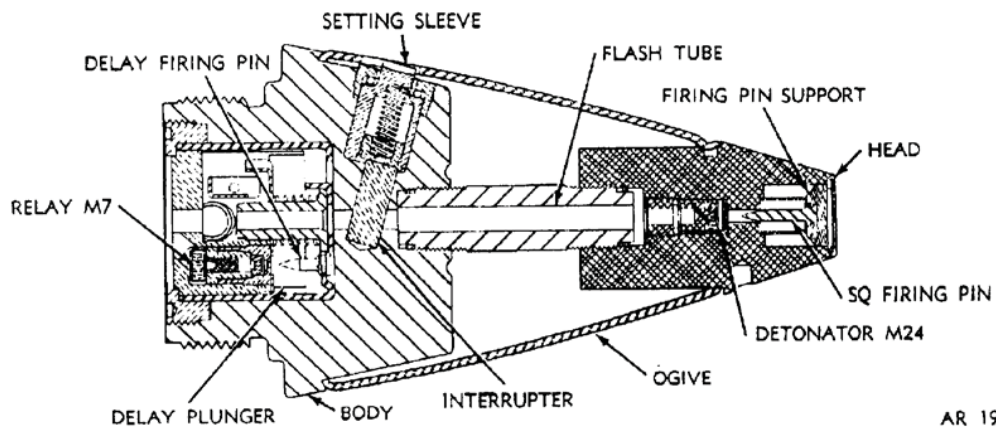
Functioning: Upon firing, set-back forces the ring back over the shoulder of the firing pin and into the groove near the flat end of the firing pin, locking the pin in a more forward position in the sleeve. During the flight of the projectile, the combined pin sleeve assembly moves forward against the restraint of the spring and the firing pin strikes the primer, initiating the explosive train.

Reference: TM 9-1901, Artillery Ammunition, 29 June 1944.

Fuze PDSQ, M48



AR199987



AR 199986

These are centrifugally armed, impact- or impact-inertia-fired point-detonating projectile fuzes. Super quick is in the nose. Delay is in base, usually will function the fuze if SQ fails in soft soil or off angle impact.

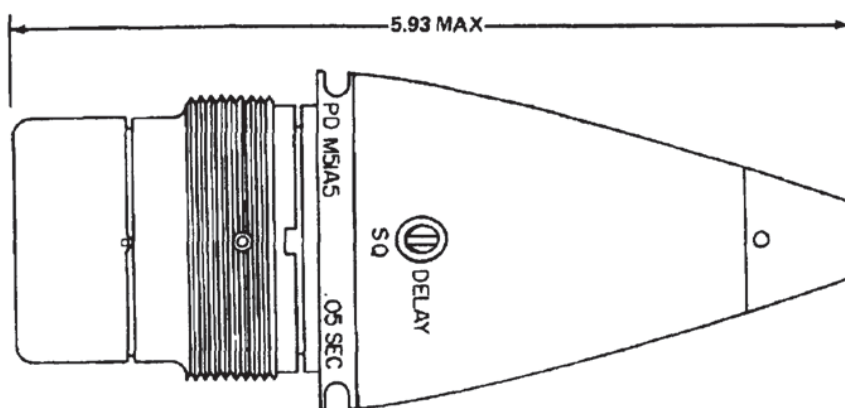
Use: The M48 series point detonating fuzes offer selection between superquick or 0.05 second delay action, and are used primarily to detonate Smoke, WP ammunition in calibers 75mm, 90mm and 4.2-inch.

Description: The M48 series fuzes have a PD head assembly containing a firing pin held in position by a firing pin support which prevents initiation of Detonator M24 until impact. The fuze body contains an M1 delay plunger assembly and an interrupter assembly with a setting sleeve which provides a means of setting or selecting fuze PD (Super Quick Action) or delay functioning. The delay plunger assembly includes a firing pin and Delay Element M2. The delay element includes Primer M54, a black powder delay charge and Relay M7. The delay plunger assembly of the M48A2 fuze comes with delay times of 0.05 seconds or 0.15 seconds, the time delay being stamped on the fuze body. The head assembly is attached to the body by means of the flash tube which also positions the fuze windshield or ogive. The ogive is a thin-walled steel stamping utilized to provide an aerodynamic shape to the fuze. Before the projectile loaded for firing, the selector is set on SQ or DELAY. After it is fired, centrifugal force moves the interrupter outward to clear the flash channel if the fuze is set on SQ. Simultaneously, centrifugal force moves the plunger pins outward, and pivots the plunger pin lock to lock the pins in the outward position. This leaves the plunger held rearward only by the creep spring. On fuze impact, the super quick firing pin is driven rearward, crushing the crush cup, to initiate the detonator. If the fuze is set on SQ, the flash from the detonator passes through the cleared flash channel to initiate the explosive train. Simultaneously on fuze impact, the plunger slides forward, driving the delay element primer onto the delay firing pin. If the fuze is set on DELAY and the flash channel is blocked, or if the super quick firing components should fail, the explosive train will be initiated by the delay element.

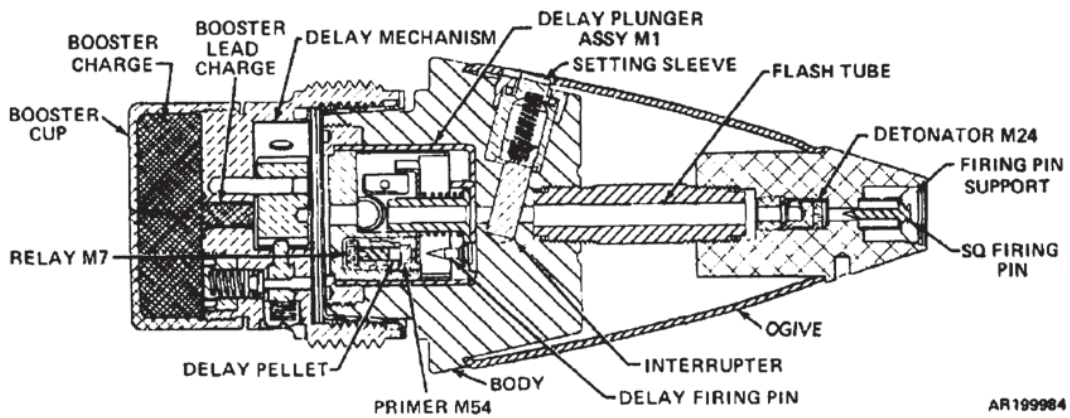
Each fuze contains a detonator and a delay element consisting of a primer, delay charge, and relay, each weighing less than 1 gram. The booster contains approximately 22 grams of Tetryl or Composition A-5/RDX.

Reference: TM 43-0001-28, Army Ammunition Data Sheets, April 1977

Fuze PDSQ, M51



AR199985



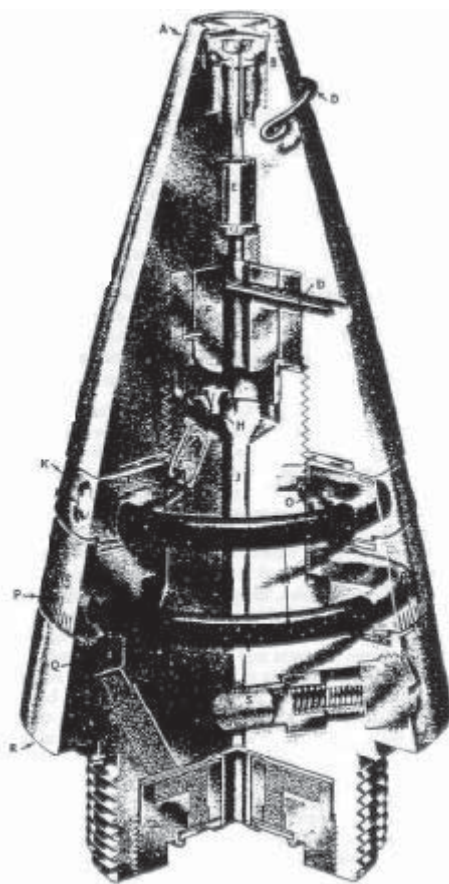
AR199984

Use: Point Detonating Fuze M51A5 is a selective, superquick or 0.05 second delay impact fuze used to detonate HE ammunition in calibers 75mm through 105mm.

Description: The M51A5 fuze consists of Fuze M48A3 assembled with the M21A4 booster. The fuze PD head assembly contains a firing pin held in position by a firing pin support which prevents initiation of Detonator M24 until impact. The fuze body contains an M1 delay plunger assembly and an interrupter assembly with a setting sleeve which provides a means of setting or selecting fuze PD (Super Quick Action) or delay functioning. The delay plunger assembly includes a firing pin and Delay Element M2. The delay element includes Primer M54, a black powder delay charge and Relay M7. The head assembly is attached to the body by means of the flash tube which also positions the fuze windshield or ogive. The ogive is a thin-walled steel stamping utilized to provide an aerodynamic shape to the fuze. The M21A4 booster consists of a brass booster body having external (male) threads to fit projectiles having 2-inch diameter, 12 threads per inch and internal (female) threads to receive fuzes having 1.7- inch diameter, 14 threads per inch. An aluminum booster cup containing a 340-grain tetryl booster pellet is threaded to the booster body. The M21A4 booster internal configuration is that of an eccentric rotor containing an M17 detonator held in an unarmed (out of line) position by centrifugal and setback lock ins. On firing, the locking mechanisms are released and the rotor becomes aligned with the booster lead charge and the fuze flash tube when set for PD action or the fuze delay plunger relay charge when set for “delay” action.

Reference: TM 43-0001-28, Army Ammunition Data Sheets, April 1977

Fuze PDSQ, M54



FUZE, T5Q, M54

General: The M54 is a selective superquick or time-action (to 25 sec) type. The fuze is usually used in conjunction with the M20 booster, which is made a manufacturing component of the shell when the fuze is to be assembled thereto. The M54 is of the same size, shape and weight as the M48, which is used with shell in the calibers for impact functioning, and has the same ballistic values.

Data: Length, visible, 3.76 inches, over-all, 4.57 inches; weight, 1.42 pounds.

Description: The fuze consist of three major parts: a closing cap or head (A) containing the superquick impact element (B, C, E) and the time action plunger (F); two time rings, one fixed (K) to the body and the other moveable (P); and a body (R) containing a time-action striker (H) and primer (I), a magazine charge (T), and an interrupter (S). The superquick action is identical in construction and functioning with that of the M48 fuze except that the interrupter incorporated in the body of the fuze has no setting sleeve, being automatic and always operative regardless of fuze setting. Hence, the fuze will function on impact unless prior functioning has been caused by the time action. The time action is typical of powder-train types and is initiated upon firing by the time action plunger under set-back. The fixed upper and moveable lower time rings have a tunnel-shape slot or groove in their lower surfaces which is filled with compressed black powder (N). One end of the lower-ring powder train is connected by a pellet (O) to the upper ring train; one end of the upper train is connected by a pellet (L) to the time-action primer. Movement of the lower ring in relation to fixed upper ring and a pellet (Q) in the body determines the time of functioning. Counterclockwise turning of the lower ring (viewed from the point of the fuze) lengthens the time by increasing the amount of powder which must burn in the upper and lower rings before the flame reaches the pellet in the body and is transmitted thereby to the body and magazine charges. For setting purposes, the lower ring is graduated to 25 seconds, with 0.2-second graduations, and a register line is engraved on the body.

Reference: TM 9-1901, Artillery Ammunition, 29 June 1944.

58mm HE Mortar, Type 89

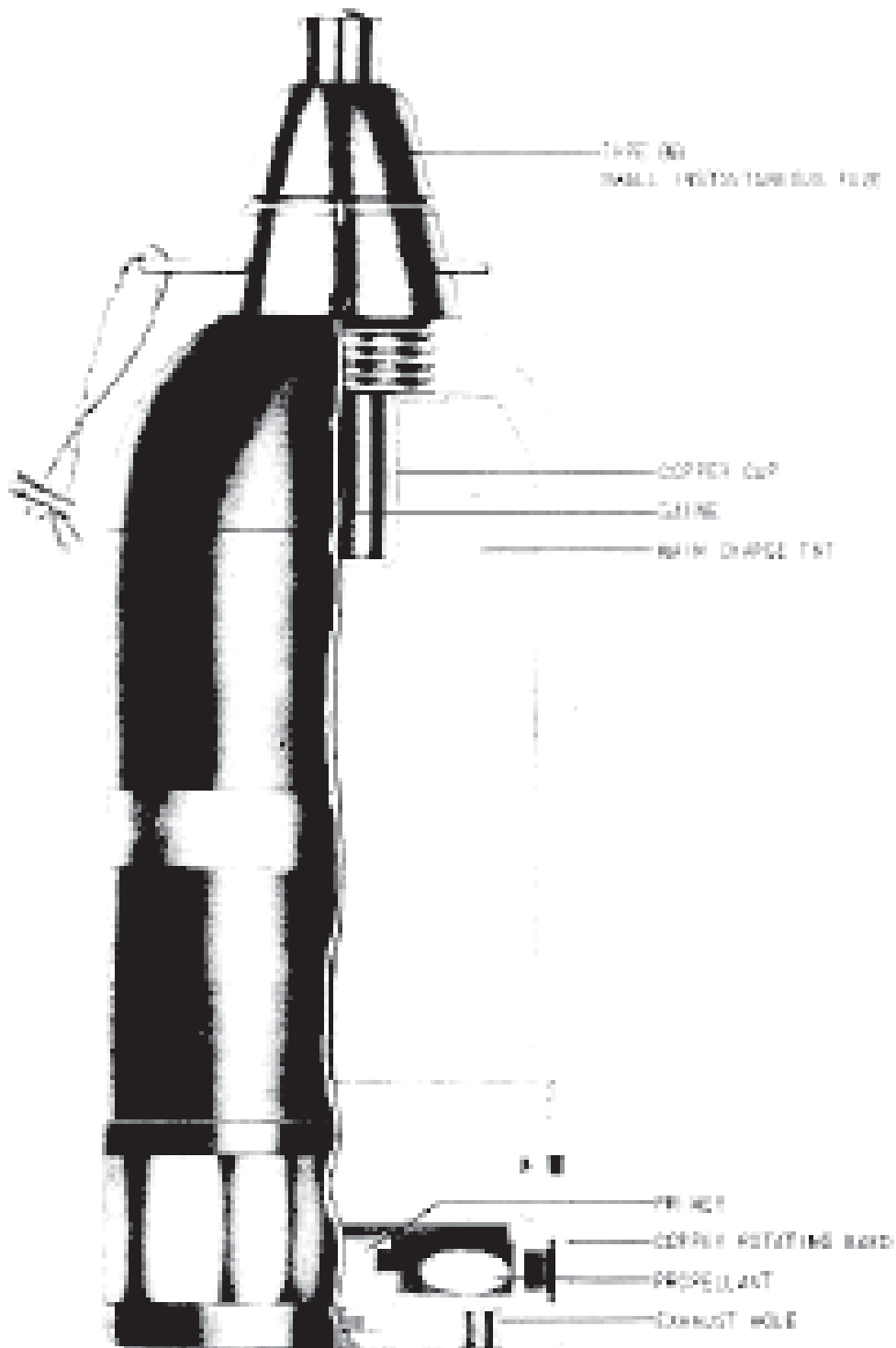


Figure 296—Type 89 58-mm High-Explosive Mortar.

Type 89 58-mm H. E. Mortar

Weight complete round: 1.6 pound.

Weight main charge: 5.4 ounces.

Explosive components:

Main charge: TNT.

Propellant: Nitrocellulose diphenylamine flaked powder.

Over all length (without fuze): 4.33 inches.

Maximum diameter: 1.97 inches (50 mm).

Color:

1. Black over all with red band at nose, and
 - a. Yellow band below the bourrelet and white band forward of rotating band,
 - b. Or, yellow band midway on the shell.
2. Maroon color over all for Navy use.
3. Green nose, black body with yellow and white bands.

Fuzing: Type 88 small instantaneous fuze.

Weapon in which used: Type 89 grenade discharger.

Description: The body of this shell is made of three parts. The propellant base housing houses the propellant container and the percussion primer. The main shell base cover is threaded to the top section on one end and to the propellant housing on the other. The top section has an opening in the top to receive the fuze.

On firing, the gases generated blow through the ports in the base housing, expanding the copper rotating band into the rifling of the discharger giving a gas seal and imparting rotation to the shell.

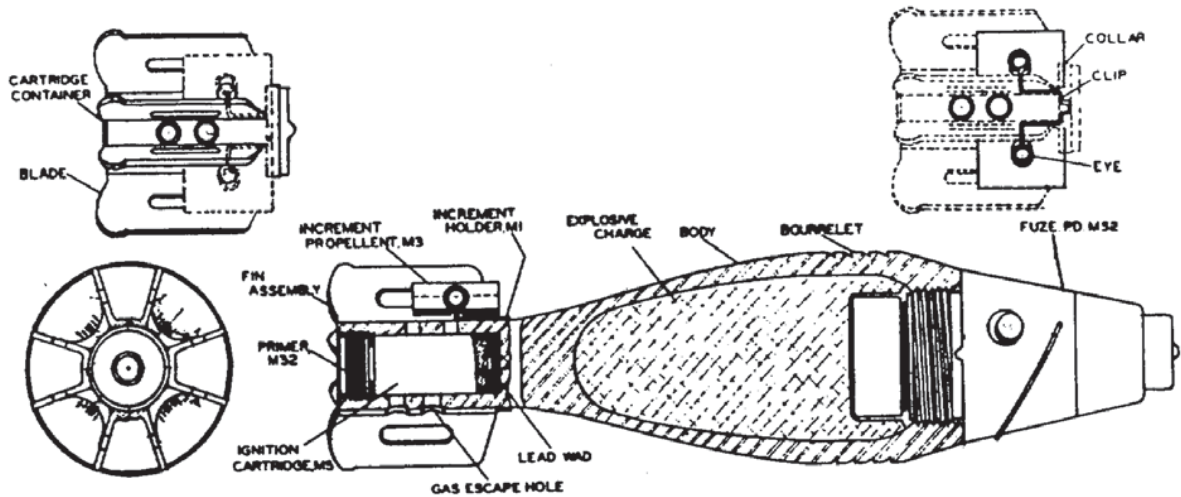
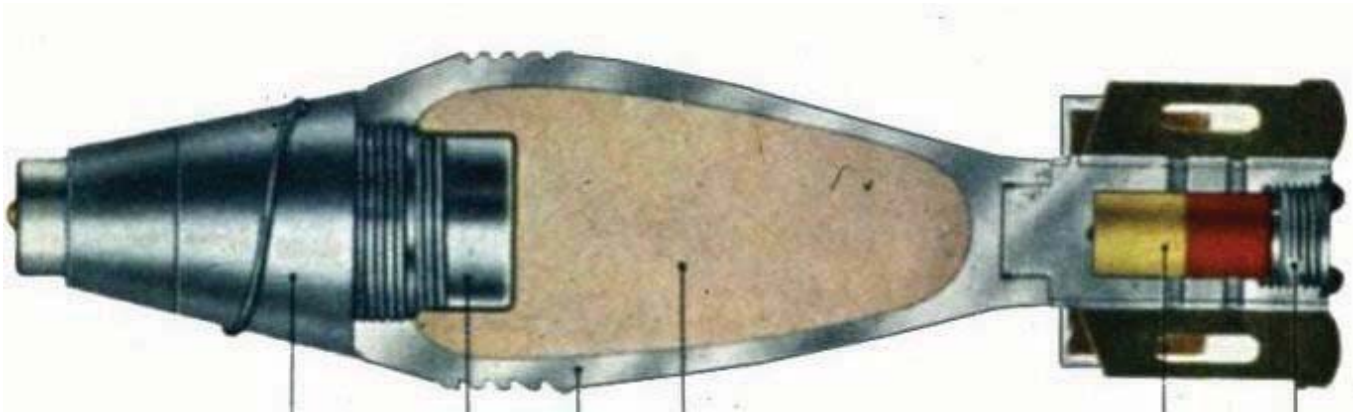
Remarks: The Navy version of this shell is exactly the same in construction as the Army version; the only variation being in the color scheme. Two minor variations of construction have been found.

1. The nose portion screws on (LH) the body directly below the bourrelet. The base is solid instead of being closed with a base plate.

2. Similar to the first variation except the threads are right hand.

Reference: NAVSEA OP 1667, Japanese Explosive Ordnance, 14 June 1946

60mm HE Mortar, M49A2/ M49A3

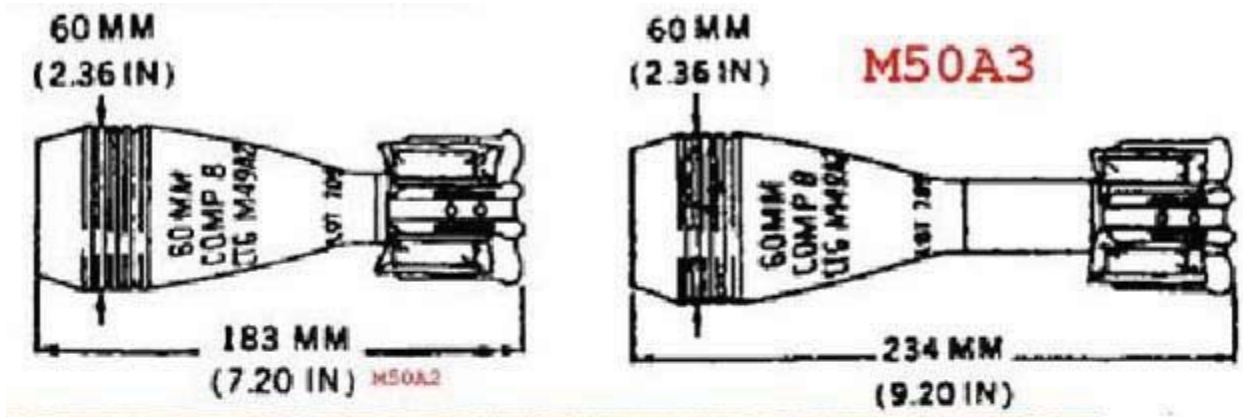


Description. The body of this shell may be constructed of forged steel, cupped-rolled, plate-welded longitudinally, or a machined casting. It is tear-dropped in shape, having a blunt nose and tapered tail. Near the nose end of the shell is a machined bourrelet which acts as a forward bearing surface and as a gas check. The nose is threaded to receive the fuze directly. The fuze used is the Point-detonating Fuze M525A2 which has a superquick action. The tail end is closed and internally threaded to receive the stabilizer assembly. The shell filler is 0.34 pounds of flake TNT. The ignition cartridge M5A1, contains 40 grains of double base powder. The propellant increments, M3, consists of square strips of double base powder sewn together. Each increment has 35 grains of finely granulated double base powder. The shell body is painted olive drab and stenciled in yellow. Shell, Practice, M50A2. This shell is identical to the service round. It differs in that the filler consists of 0.05 pounds of black powder to act as a spotting charge, and 0.29 pounds of inert filler. The body is painted blue with white stenciling.

Over-all Length	9.5 inch
Diameter (body)	2.34 inch
Total Weight	2.94 pound
Filler	TNT (flaked)
Filler weight	0.34 pounds
Propellant	ballistite
Fuze	M52 PD
	M525A1 PD
Painting and markings	Olive drab w/ yellow markings

Reference: TM 9-1904, Ammunition Inspection Guide, March 1944, TM 9-1300-205, Ammunition for Mortars, September 1960

60mm Practice, M50A2/ M50A3



Most of this projectile is inert filler but it does have a 26-Gram (0.9-OZ) black powder spotting pellet, fuze, and fuze booster. NEW .9 Ounces of Black Powder.

Use. This shell is a practice round provided for the 60mm mortars.

Description. Components of the M50A2 practice round are the same as used in the M49A2 service round except for the high-explosive shell filler. The M50A2 projectile has a filler of inert material (plaster of paris and stearic acid, and a black powder pellet (0.05-lb), adjacent to the booster of the M52A1 fuze. The M52A1 or M52A1B1 fuze is a superquick fuze and causes the shell to function upon impact. The black powder pellet and booster charge provide a spotting charge for observation purposes. The shell is loaded to the same weight as the service round, thereby providing for the same ballistic values. The M52A1B1 fuze is approximately 0.13 pounds lighter than the M52A1 fuze.

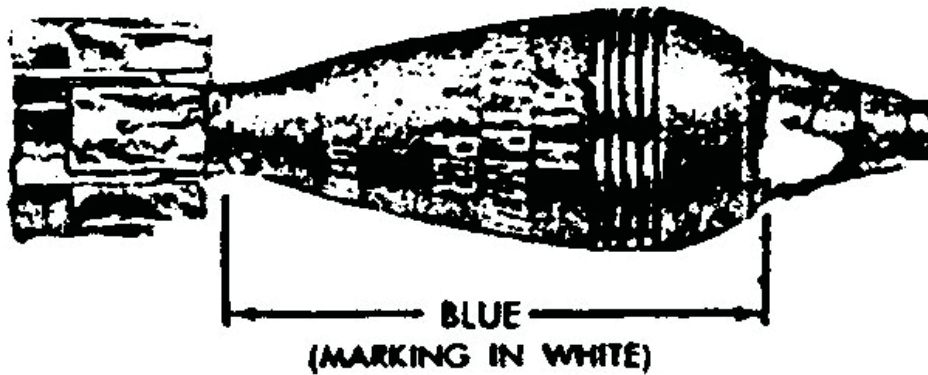
Weight assembled.....3.07 pounds
Length assembled9.59 inches
Filler.....INERT with black powder pellet
FuzeM52 series
Color.....Blue w/White markings

Muzzle Velocity/Maximum Range

Charge 0.....189 fps/332 yds
Charge 1.....292 fps/784 yds
Charge 2.....377 fps/1,204 yds
Charge 3.....449 fps/1,594 yds
Charge 4.....518 fps/1,990 yds

Reference: TM 9-1901, Artillery Ammunition, September 1950

MORTAR, 81mm, PRACTICE, M43A1



RA PD 80775B

Use. This is a practice round to simulate Shell, HE, M43A1.

Description. It is an adaptation of the M43A1 service round for practice purposes, accomplished by changing the shell filler. All other components are the same as for the service round, and construction and assembly of these in the round are the same. For practice purposes, the shell cavity is filled with an inert material (plaster of paris and stearic acid) except for a 0.05-pound black powder pellet. The black powder is loaded at the front end of the cavity, adjacent to the rear wall of the booster casing when the fuze is assembled to the shell. The fuze booster charge and black powder pellet provide a spotting charge for observation of fire. Ballistic properties are the same as for M43A1 service round.

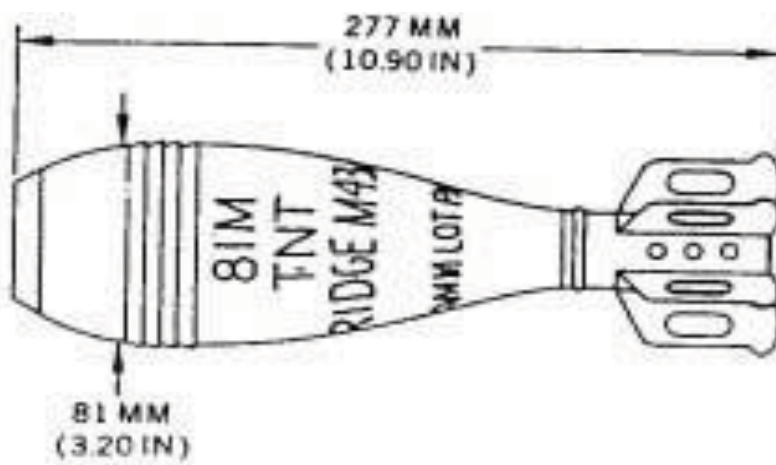
Weight assembled	7.28 pounds
Length assembled	13.32 inches
Filler	INERT with black powder pellet
Fuze	M52 series
Color	Blue w/White markings
Muzzle Velocity/Maximum Range	
Charge 0	235 fps/541 yds
Charge 1	332 fps/1,020 yds
Charge 2	419 fps/1,502 yds
Charge 3	499 fps/2,042 yds
Charge 4	572 fps/2,517 yds
Charge 5	638 fps/2,963 yds

Reference: TM 9-1901, *Artillery Ammunition*, September 1950

This Page Intentionally Left Blank

81mm HE Mortar, M43A1/ M43A1B1

body and fins are steel.



Shell, HE, M43A1, Shell Body. It is constructed of forged steel. It is tear-dropped in shape; that is, blunt nose and tapered tail. It has a bourrelet machined near the nose of the shell consisting of several annular grooves which serves to act as a forward bearing surface and a gas check. The nose is machined and threaded to receive an adapter. The adapter is threaded and acts as a bushing for a bakelite fuze well cup and the fuze. The fuze used is the Point-detonating Fuze M45. This fuze has a selective element and can be set for either superquick or delay action. The shell filler is 1.22 pounds of TNT. The total weight of the completely assembled round is 7.05 pounds. Entire length of the fuzed shell is 13 1/4 inches.

Fin assembly. The fin assembly consists of a machined cartridge container with six stationary fins. One end is threaded and screwed on to the body of the shell. The other end is machined and hollow inside so as to receive the ignition cartridge. Several holes leading from the interior to the exterior periphery of the cartridge container serve to conduct the flames from the ignition cartridge to the propellant increments which are seated in the fins.

Shell, Practice, M43A1. The shell body, components used, and packing are identical to the shell previously described. It differs in that the filler consists of 0.16 pound of black powder to act as a spotting charge, and 1.06 pounds of inert filler such as wax, talcum, or rosin. The body is painted blue with white stencil to indicate a practice shell.

Over-all Length.....13.25 inches

Diameter (body).....3.16 inches

Total Weight.....7.05 pounds

Filler

HETNT, 1.22 pound

PracticeBlack powder, 0.16 pound Propellant
Ballistite

FuzeM45, point-detonating

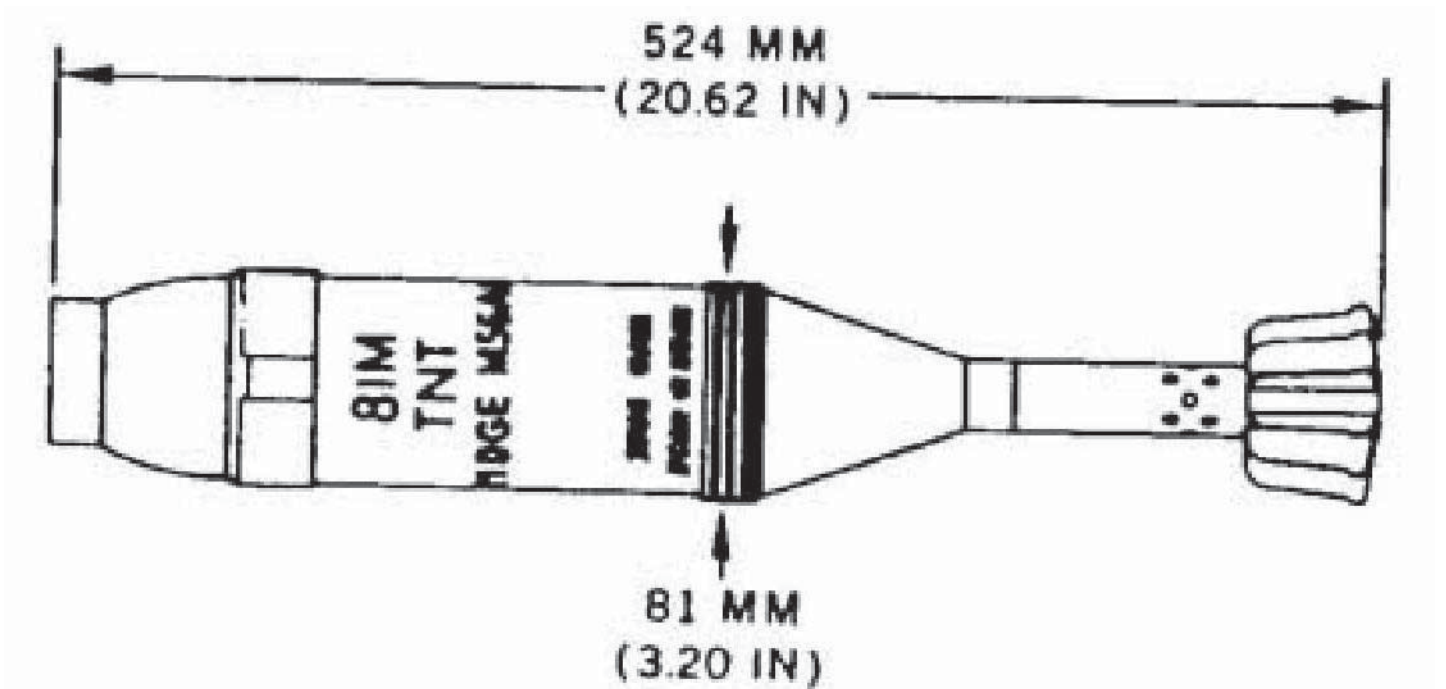
Painting and markings

HEOlive drab, yellow markings

PracticeBlue, white markings

Reference: TM 9-1904, Ammunition Inspection Guide, March 1944

81mm HE Mortar, M56

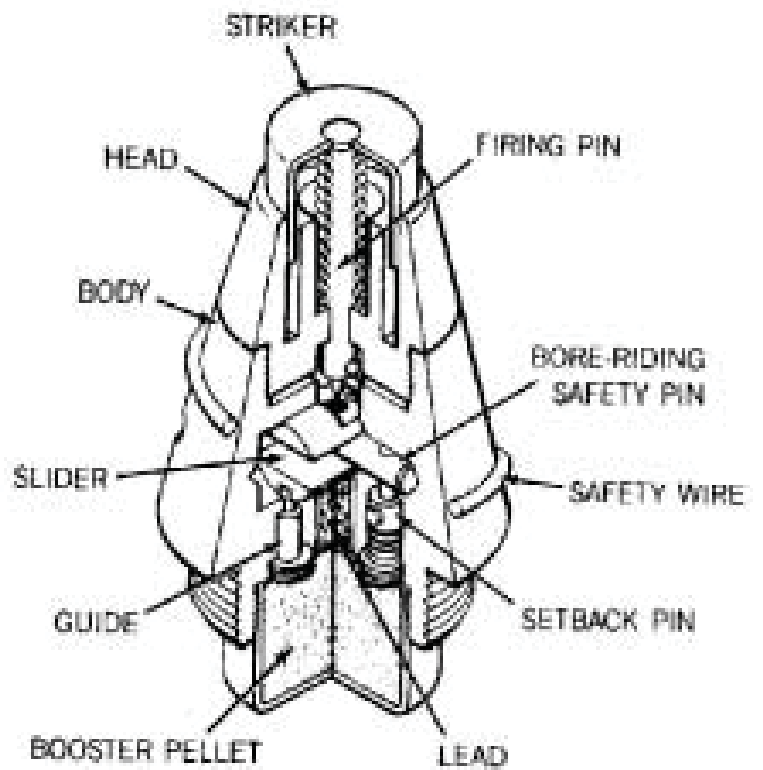
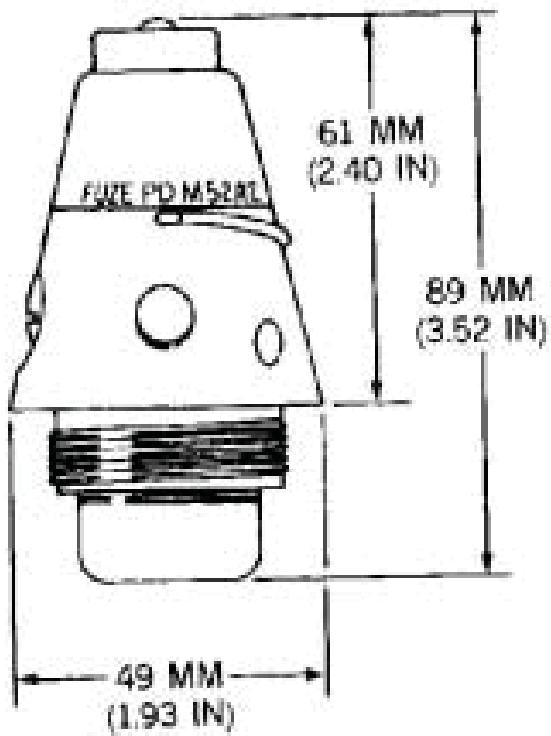


Description: Shell, HE, M56, 81mm Mortar, is the heavy type of the two current rounds for fragmentation and blast effect. The complete round consist of six components: the M56 shell, a fuze, a fin assembly, an M2 Propelling Charge, an M6 Ignition Cartridge, and an M34 Percussion Primer. The projectile is made up of a 4.3-pound high explosive charge (TNT or alternative) held in a thin wall shell made of steel tubing. The shell casing is formed to a long cylindrical shape with a long tapered (boat-tailed) base and a short ogival nose. The nose is threaded to hold an adapter into which the fuze with its booster is screwed and staked after the shell is loaded. The tapered base is drilled and threaded to hold the fin assembly. The fin assembly is an aluminum alloy die casting with 12 blades seated on a hollow cylindrical shaft. The shaft acts as a sleeve for a steel liner which is threaded at the front end to screw into the shell base. The rear of the liner is hollow and holds the ignition cartridge and primer, the latter screwing in and holding the cartridge in position. The shaft is vented to permit transmission of the ignition of the flash cartridge to the propelling increments. The M2 Propelling Charge comprises four increments or bundles of propelling powder in the form of square flakes or sheets. The flakes have a hole through the center and a slit from the center to edge to permit seating on, and removal from, the fin shaft. The increments are held against the front edges of the fin blades by a spring clip arrangement.

Weight of complete round10.82 pounds
Diameter (body)81mm
Length of complete round.....22.89 inches

Reference: TM 9-1901, Artillery Ammunition, 29 June 1944.

Fuze PD, M52



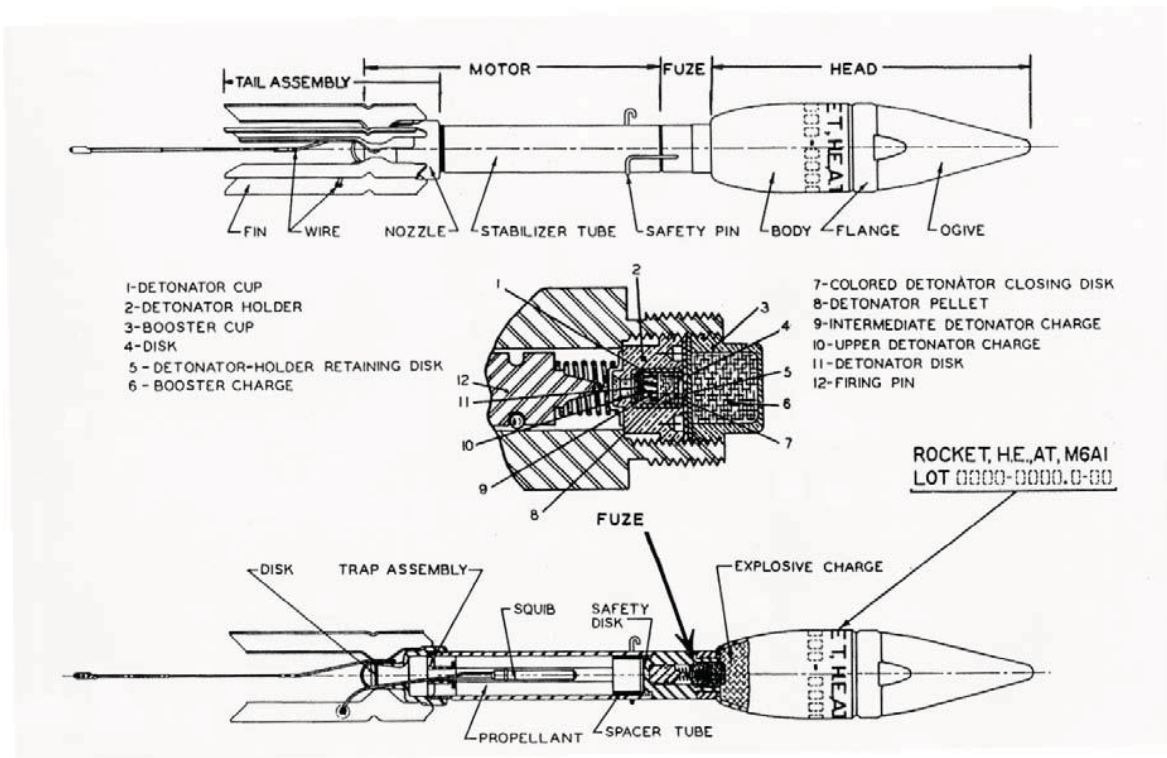
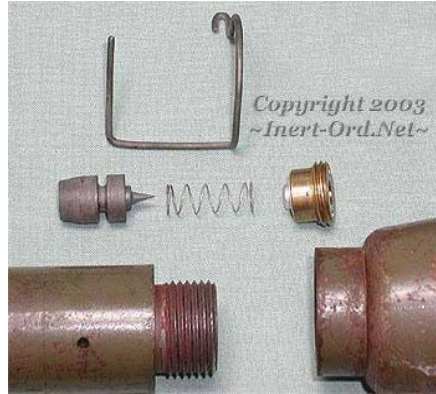
These are setback-armed, impact-fired point-detonating (PD) mortar projectile fuzes. The fuzes are unpainted. Designation and manufacturing information are stamped on the fuzes. The striker is aluminum; the body is aluminum or plastic; and the head is aluminum, plastic, brass, or zinc. Used on both 60mm and 81mm mortars.

FUNCTIONING: The safety wire is removed before firing. On projectile firing, setback drives the setback pin rearward against its spring. This frees the spring-loaded bore-riding safety pin, which is forced outward until it strikes the inner wall of the mortar tube. As the fuze emerges from the mortar tube, the safety pin is ejected. This frees the slider, which is driven by the slider spring until the detonator is aligned with the firing pin. Impact forces the striker rearward, driving the firing pin into the detonator to initiate the explosive train.

HAZARDOUS COMPONENTS: Each fuze contains a detonator and a tetryl lead weighing less than 1 gram, a tetryl booster weighing approximately 2 grams. The tetryl auxiliary booster pellets and tetryl booster pellet in the fuze adapter of the M519 and M716 fuzes weigh a total of 40 grams (1.4 ounces).

Reference: TM 9-1901, Artillery Ammunition, 29 June 1944

2.36-inch HEAT Rocket, M6A1



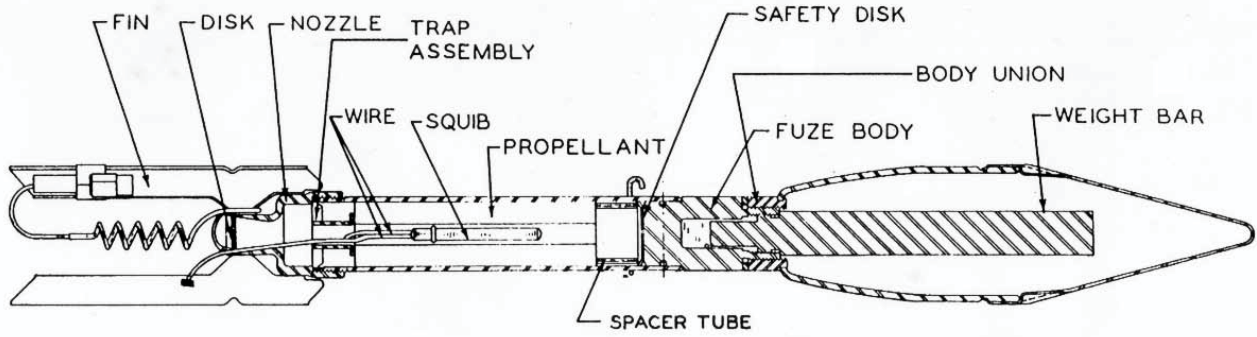
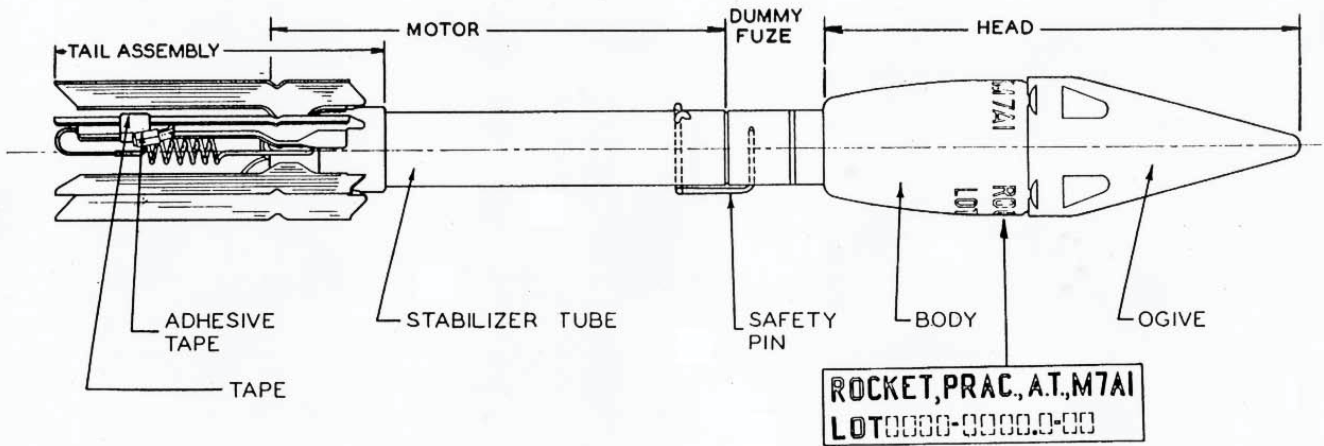
Use. Pill boxes, tanks, and armored vehicles are prime targets. The rocket can also be used in a stationary emplacement for demolition or as an anti-tank mine or booby trap.

Description. The Rocket is 21½ inches long and weighs 3½ pounds. The rocket consists of the high-explosive head, the stabilizer tube and the fin assembly. The head contains a shape-charge containing a composition, which is mainly 50/50 pentolite with a 10/90 pentolite booster surround. The stabilizer tube consists of the fuze body, which contains the fuze mechanism, and the powder tube contains the propellant charge. The fuze consists of a steel firing pin, which slips into the central cavity of the fuze body, where it is held in a rearward position by the firing-pin spring. When the safety pin is removed, the firing pin will overcome the spring and detonate the rocket if dropped over four feet. The fin assembly consists of the nozzle, the trap and six metal fins. The rocket is painted lusterless olive drab and stenciled in yellow.

Over-all Length	21.6 inches
Diameter (body)	2.23 inches
Total Weight	3.5 pounds
Filler	Pentolite
Propellant	ballistite
Fuze	M400
Painting and markings	M6A1- olive drab w/ yellow markings, M7A1- black w/ white markings

References: TM 9-1904, *Ammunition Inspection Guide*, March 1944; OS 9-69, *Ordnance School Text, Rockets & Launchers*, February 1944

2.36-inch Practice Rocket, M7A1

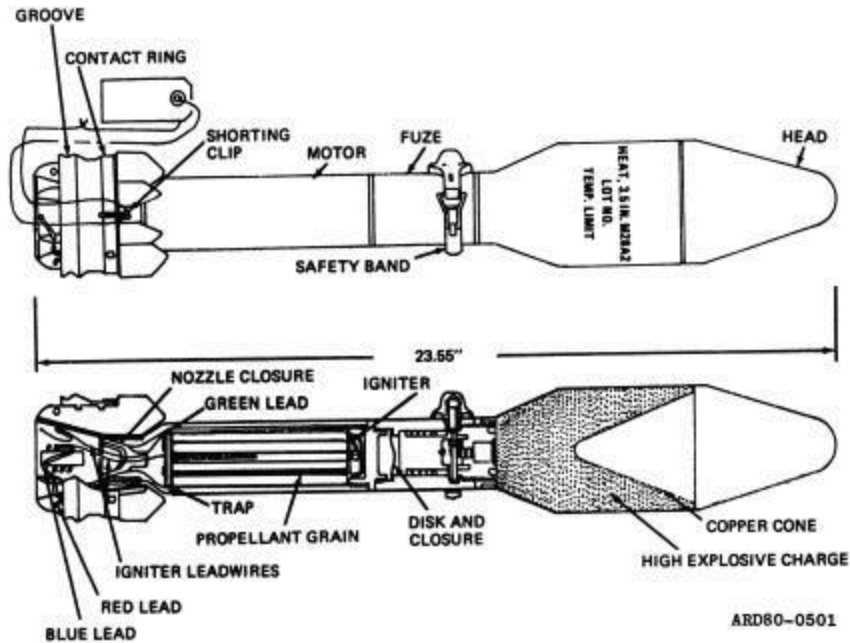


Description. The M7A1 rocket is similar in design and construction to the M6A1 rocket, lacking only an explosive charge. The head is inert and no fuze is provided, however it is provided with a live propellant. It has the same dimensions, weight, and trajectory as the service round. A steel rod, fitted into the fuze body, makes up for the weight of the explosive charge and fuse present in the M6A1 rocket. All other components of the M7A1 practice round are similar to the components of the M6A1 rocket. A safety pin passes through the stabilizer to simulate realism during training. The rocket is painted blue and stenciled in white.

Over-all Length	21.6 inches
Diameter (body)	2.23 inches
Total Weight	3.5 pounds (approx.)
Filler	None
Propellant	5 sticks of ballistite
Weight (average)	61.5 grams
Fuze	None
Painting and markings	Blue w/ white markings

References: TM 9-1904, *Ammunition Inspection Guide*, March 1944; OS 9-69, *Ordnance School Text, Rockets & Launchers*, February 1944

ROCKET, HEAT, 3.5 INCH, M28A2



Description. This is a high-explosive antitank rocket. The complete round is an assembly consisting of a

head, fuze, motor, nozzle and fin assembly.

Head. The head, which contains the explosive charge (composition B, 1.82 lb.), is of light steel construction.

It is cylindrical in shape, 3.5 inches in diameter, with a conically shaped ogive, and tapers to 2 inches in diameter at the rear. It contains an internal cone, which provides for shaping the explosive charge. The rear

of the head is threaded internally for attachment of base detonating fuze.

Fuze. The base-detonating fuze is of the simple inertia type which functions with non-delay action upon

impact. The explosive train includes a detonator and a booster. An ejection pin, which passes through the

fuze body and prevents movement of the internal parts, is provided to preclude accidental functioning during

shipment, handling, and firing. The safety band covers the head of the ejection pin and prevents it from

moving shipping and handling.

Motor. The motor consists of a body, closure, trap and spacer assembly, propellant, igniter with electric

squib and leads, nozzle closure, and nozzle and fin assembly.

Over-all length23.67 inches

Diameter.....3.5 inches

Weight8.61 pounds

FillerComp B

Filler weight1.82 pound

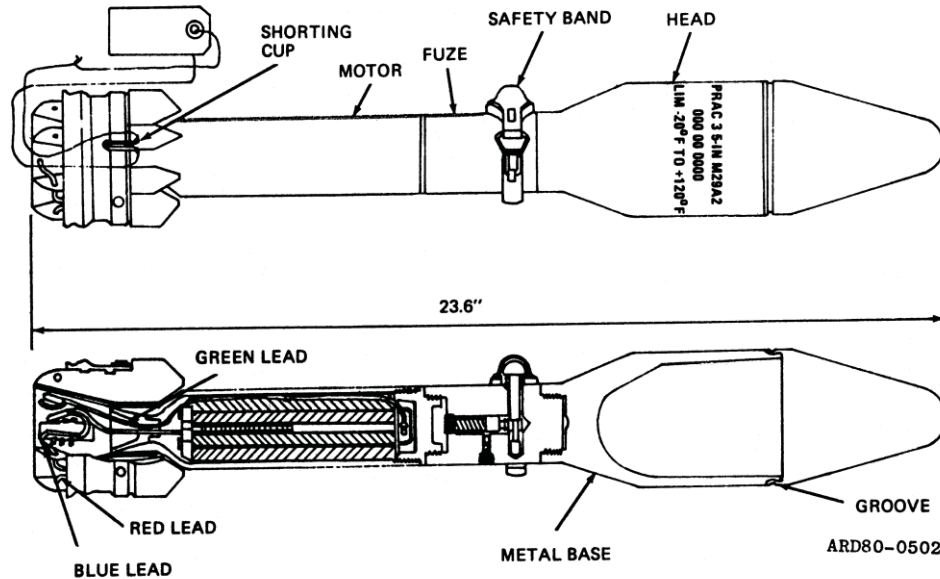
Propellant.....M7 propellant powder

Propellant weight.....12 grains

Igniter.....M20

Reference: TM 9-1950, *Rockets*, July 1950, TM 43-0001-30, *Army Data Sheets, Rockets, Rockets Systems, Rocket fuzes, Rocket Motors*, December 1981

ROCKET, PRACTICE, 3.5-INCH, M29



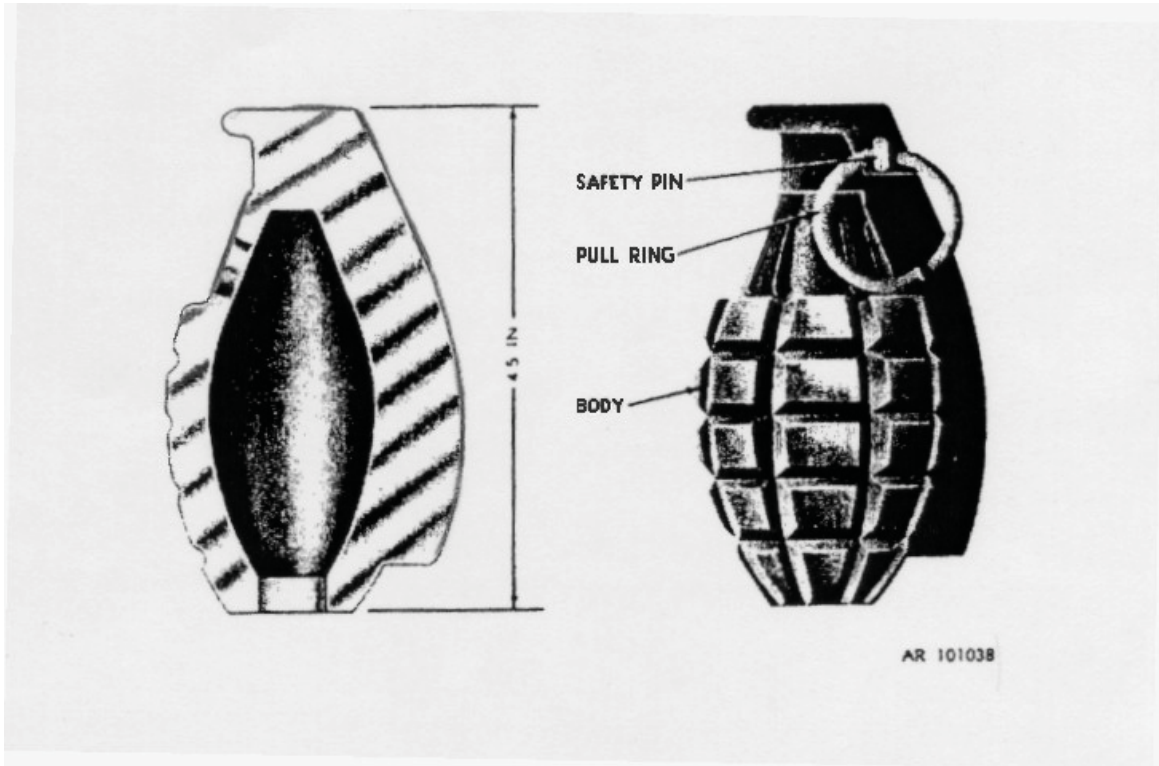
Description. This rocket generally is similar to the M28 High-explosive rocket except that it is provided with an inert bursting charge and the inert dummy fuze M405. The head is of light steel construction. It is cylindrical in shape, 3.5 inches in diameter, with a conically shaped ogive, and tapers to 2 inches in diameter at the rear. The rear of the head is threaded internally for attachment of dummy fuze M405. The rear of the fuze is threaded internally to receive the motor. The inert charge (plaster of paris and stearic acid) weighs 1.82 pounds. The motor consists of a body, closure, trap and spacer assembly, propellant, igniter with electric squib (cap) and leads, nozzle closure (blow out plug), and nozzle and fin assembly. Other characteristics are the same as for the M28.

Over-all Length	23.67 inch
Diameter	3.5 inch
Weight	8.61 pound
Filler	Plaster of paris/stearic acid
Propellant	M7 propellant powder
Propellant weight	12 grains
Igniter	M20

Reference: TM 9-1950, *Rockets*, July 1950, TM 43-0001-30, *Army Data Sheets, Rockets, Rockets Systems, Rocket fuzes, Rocket Motors*, December 1981

This Page Intentionally Left Blank

GRENAD, HAND, TRAINING, Mk IA1



Description and Use. The Mk1A1 training grenade is made of cast iron and is approximately the same shape, size, and weight as a loaded fragmentation Hand Grenade Mk II. A projection is cast on the top and side to represent the fuze assembly. The A1 modification consists of the addition of a cotter pin and pull ring to a hole drilled in appropriate position through this projection. The training hand grenade is used for preliminary practice in grenade throwing.

Painting and Markings. This grenade is painted black and that its only distinctive markings

Length 4.5 inches
Diameter 2.25 inches
Weight 21 ounces
Color Black

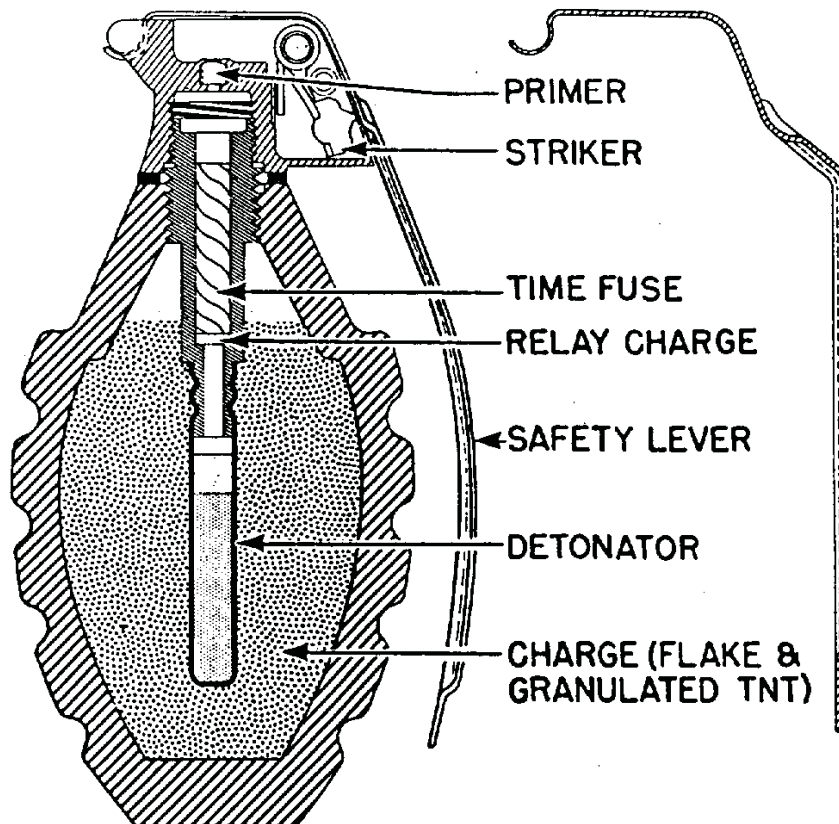
Reference: TM 9-1904, *Ammunition Inspection Guide*, March 1944

This Page Intentionally Left Blank

Grenade Frag, MKII



Weight is 1.4 lbs Filler is 1.75 oz of TNT
Fuze delay is 4 to 5 seconds



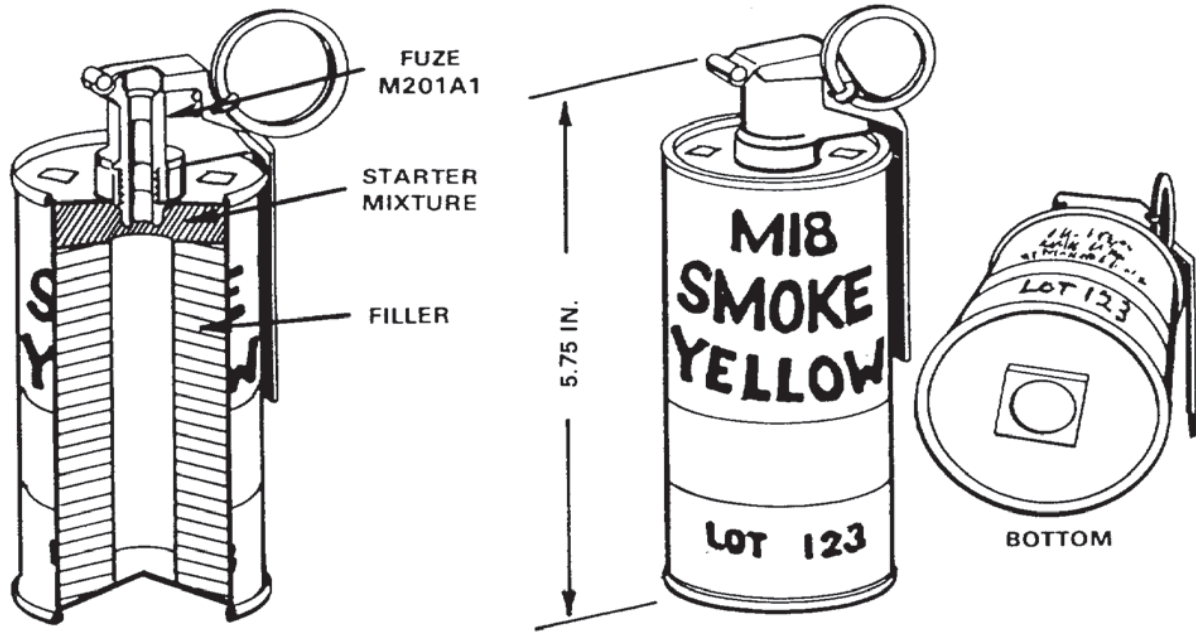
Description. Mk II. The grenade has a serrated cast-iron body of the familiar "pineapple" design. The grooves run both horizontally and vertically to assist in the formation of uniform fragments of effective size. The grenade is issued with Igniting Fuze M204.

Mk IIA1. Identical to the Mk II except for the Fuze M10A3. The only external difference is that the safety lever fits over rather than under the lip of the fuze body.

DODAC	1330-G890
Length	4.5 inches
Diameter	2.25 inches
Color	Olive Drab, with or without yellow band
Weight	21 ounces
Filling	TNT, Flaked or granular, older models used E.C. Blank Smokeless Powder
Weight of filling	2 ounces
Fuze	M204A1, M204A2

References: TM 43-0001-29, Ammunition Data Sheets for Grenades, October 1977; TM 9-1904, Ammunition Inspection Guide, March 1944; NAVSEA OP 1664 Volume 1&2 w/change 1, U.S. Explosive Ordnance, February 1954

Grenade Smoke, M18



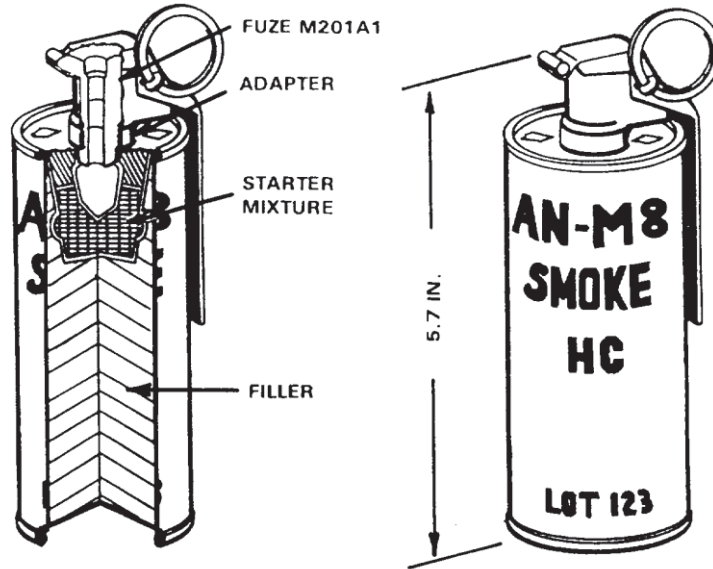
Description. These grenades may be filled with any one of seven smoke colors; red, orange, blue, green, black, violet, and yellow. The grenade body is of thin sheet metal and filled with a smoke composition. Emission ports are covered with small squares of adhesive tape and vary in quantity and location depending on the year of manufacturing.

The Fuze M201 and M201A1 is a pyrotechnic delay-igniting fuze. The body contains a primer, first fire mixture, pyrotechnic delay column, and ignition mixture.

Length	5.75 inches
Diameter	2.5 inches
Color	Blue gray or light green with black markings
Weight	19 ounces
Filler	Smoke composition
Weight of filler	11.5 ounces
Fuze	M201A1

Reference: TM 43-0001-29 w/change 11, Ammunition Data Sheets for Grenades, October 1977; NAVSEA OP 1664, U.S. Explosive Ordnance, May 47

GRENADE, HAND, SMOKE, HC, AN-M8



Use. The HC Smoke Hand Grenade AN-M8 is a burning type grenade used to generate white smoke for screening activities of small units. It is also used for ground-to-air signaling.

Description. The grenade body is a cylinder of thin sheet metal. It is filled with HC smoke mixture with a starter mixture directly under the fuze opening. The duration of the smoke screen or signal is 105 to 150 seconds.

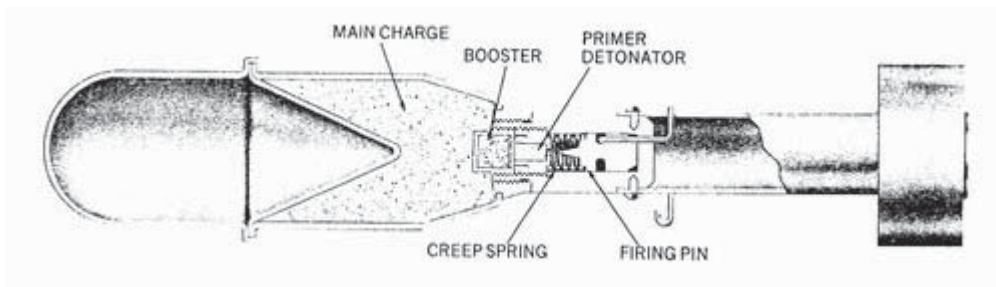
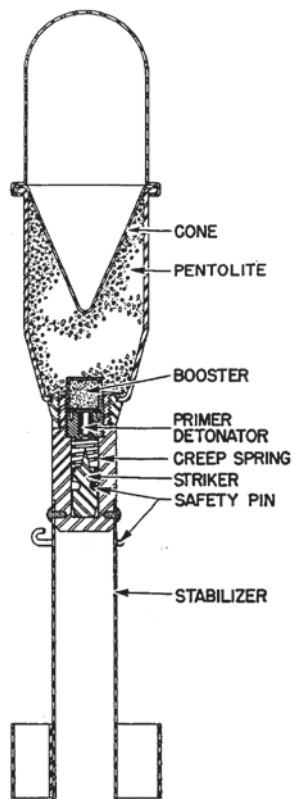
The Fuze M201 and M201A1 is a pyrotechnic delay-igniting fuze. The body contains a primer, first fire mixture, pyrotechnic delay column, and ignition mixture. Assembled to the body are a striker, striker spring, safety lever and safety pin with pull ring.

DODAC	1330-G930
Length	5.7 inches
Diameter	2.5 inches
Color	Blue gray or light green with black markings
Weight	24 ounces
Filler	Hexachlorethane-zinc (HC)
Weight of filler	19 ounces

Reference: TM 43-0001-29 w/change 11, *Ammunition Data Sheets for Grenades*, October 1977;
NAVSEA OP 1664 Volume 2, *U.S. Explosive Ordnance*, May 47

This Page Intentionally Left Blank

Rifle Grenade HEAT, M9A1

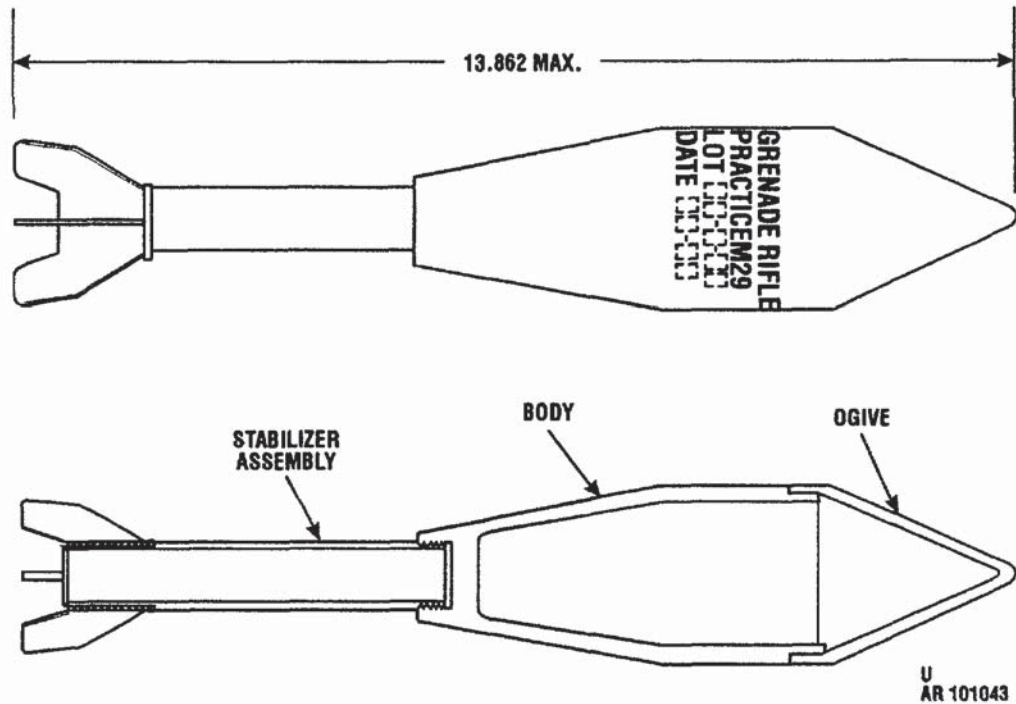


Description. Anti-Tank Grenade M9A1 consists of a body, a stabilizer assembly, and a fin. The body is cylindrical, the two pieces joined in the middle with rounded ends. The stabilizer is a hollow tube that screws into the base of the body and fits over the launcher. The body is made of cast metal. The impact fuze, which consists of a striker held away from the detonator by a creep spring and a safety pin, is assembled integrally with the stabilizer assembly. The safety pin projects through the fuze body and clamps around the stabilizer tube. When the pin is withdrawn, a drop of two feet, nose first, to a hard surface will cause the fuze to function.

- Length**.....11.24 inches
- Diameter**2.25 inches
- Color**Olive drab
- Weight**.....1.23 pounds
- Filler**.....Pentolite or TNT
- Weight of filler**4 ounces

Reference: NAVSEA OP 1664 Volume 1&2, U.S. Explosive Ordnance, February 1954

PRACTICE, AT RIFLE GRENADE, M29



Type Classification:

Obs. MSR 11756003

Use:

A practice AT rifle grenade.

Description:

Practice AT rifle grenade M29 consists of two parts: a body and a stabilizer tube-fin assembly of steel. A separately issued stabilizer tube-fin assembly is available for replacement purposes.

The M29 grenade may be fired at a target without danger to the target other than from impact. The grenade has a maximum range of approximately 150 meters.

Tabulated Data:

Model ----- M29
 Type ----- Practice AT
 Weight ----- 1.5 lb

Dimensions:

Diameter ----- 3.0 in.
 Height ----- 14.5 in.
 Charge ----- None
 Body ----- Cast iron
 Fuze ----- None
 Color ----- Black w/white markings or blue w/white markings

Federal Supply Code:

NSN ----- 1330-00-028-5920
 DODAC ----- 1330-G980

Unit of Issue:

Each grenade packed ----- 1 per container; 20 containers per packing box.

Packing Data:

Packing box:
 Weight (w/contents) ----- 66.5 lb
 Dimensions ----- 20.75 in. x 15.75 in. x 17.15 in.
 Cube ----- 3.3 cu ft

Shipping and Storage Data:

Hazard class/division and storage compatibility group ----- Not required
 UNO serial number ----- Not required
 UNO proper shipping name ----- Not required
 DOT class----- Not required
 DOT marking w/o cartridge----- Not required
 DOT marking w/ cartridge----- SMALL ARMS AMMUNITION

Functioning:

None.

References:

TM 9-1330-200
 TM 9-1330-200-12
 TM 9-1330-200-34
 FM 23-30

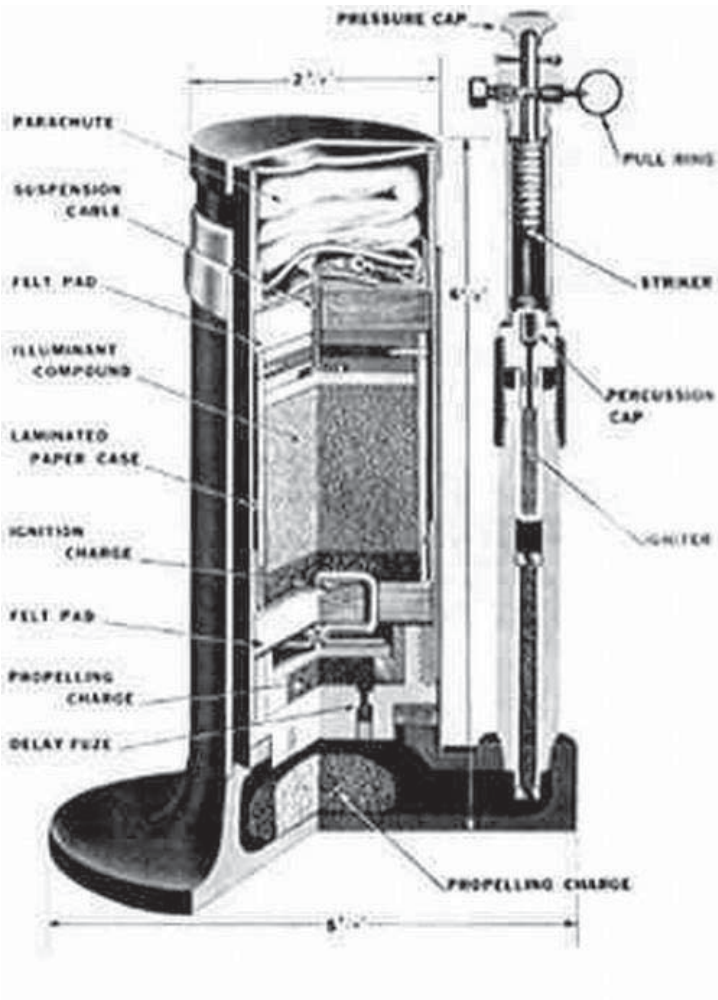
Drawings:

Assembly----- 8864102
 Fuze ----- None used
 Packing (inner) ----- 8864704
 Packing (outer) ----- 8864705

Remarks:

Grenade M29 may be used repeatedly if the stabilizer tube fin assembly is replaced when it becomes damaged.

Trip Flare, M48



The top of the base plate has “M48 Signal Flare” in raised lettering. Flare is used for training, signaling, and in the field for monitoring pathways against troop movements. Most flares were green. Very similar to the M2 antipersonnel mine, which has “Mine Antipersonnel, M2A1” in raised lettering on the top of the base plate.

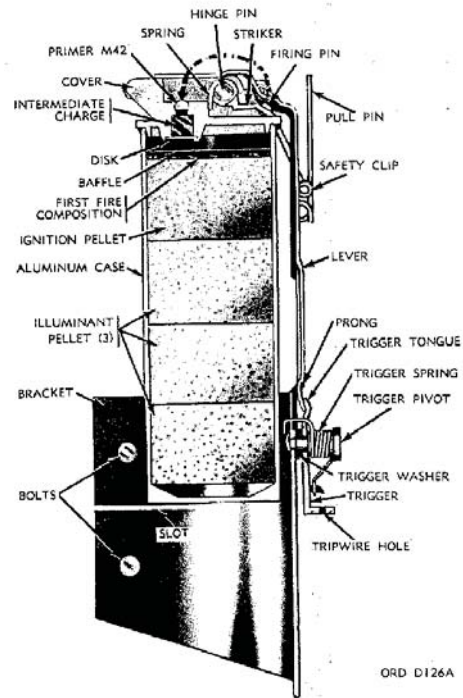
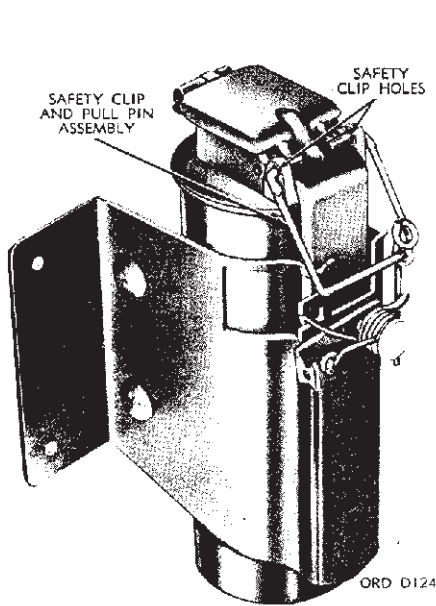
Use: The flare is used to give warning of enemy marauders or infiltrating hostile troops; also for illuminating or signaling.

Description: This is a mortar-type parachute flare similar in appearance to the M2 series of anti-personnel mine. The flare consists of a 1/4 – inch pipe and steel tube approximately 2.5 inches in inside diameter, which are attached to a base plate that contains a 75-grain propelling charge. The steel tube contains a delay fuse, an expelling charge, a candle, and a parachute assembly. The 0.25-inch pipe and the firing mechanism are joined by a coupling, and the pipe is threaded to the base plate. The firing train is composed of a primer, an igniter, and a relay charge. The firing mechanism contains the pressure cap, pull ring and pin, safety screw, safety cotter pin, and spring-loaded firing pin.

Diameter of flare tube, inches	2.5 inches
Height of trajectory	300-500 feet
Burning time, seconds	20
Intensity, candlepower	100,000
Color	White to yellowish
Effective illumination	Circle 300 yards radius

Reference: NAVSEA OP 1664 Volume 1&2, *U.S. Explosive Ordnance*, May 47

SURFACE TRIP FLARE, M49A1



Use. To give warning of infiltrating troops by illuminating the field of the advancing enemy.

Description. The trip flare consists of an illuminant assembly; cover loading assembly, and mounting bracket assembly. The illuminating assembly is an aluminum case containing an ignition increment and three illuminant increments. The waterproof cover loading assembly contains a percussion primer, intermediate charge and a spring-loaded striker. The mounting bracket holds the illuminant assembly in the position desired. The lever is hinged to the cover and is held in position by the safety clip when armed. Attaching a trip wire to either the trigger or pull pin arms the flare.

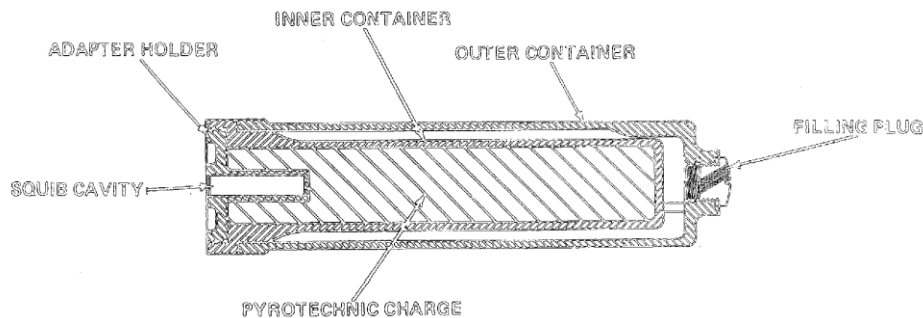
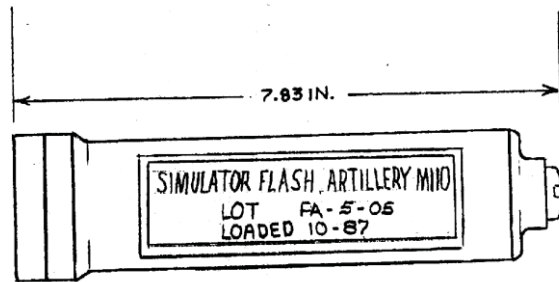
Functioning. A pull on the trip wire causes either the trigger tongue or pull pin to release the lever, which in turn permits the firing pin to strike the primer. The primer sets off the intermediate charge, which ignites the first-fire composition on the ignition increment of the flare. The flare will provide a light intensity exceeding 35,000 candlepower for approximately one minute.

Length	4.85 inches
Diameter	3.10 inches
Weight loaded	0.75 pounds
Pyrotechnic charge	Illuminant composition, 5 oz
Primer	Percussion M42
Color	Olive drab w/black markings

Reference: TM 9-43-0001-37, *Military Pyrotechnics*, February 1977

This Page Intentionally Left Blank

SIMULATOR, FLASH, ARTILLERY, M110



General. To effect battle conditions in artillery maneuvers and as a decoy in forward combat areas. Its flash closely resembles those of the 90-mm Gun M2 series and the 155-mm Howitzer M1 series.

Description. The simulator consists of an inner container and an outer container, both of black plastic. The inner container, containing the pyrotechnic charge, is closed at one end and internally threaded at the base to receive the adapter holder. The outer container seats upon the shoulder of the inner container at the base and is internally threaded to accept a filling plug at the other end. A commercial squib S93 is shipped with each round. Preparation for firing includes installation of the squib into the adapter holder, and pouring 70 cubic centimeters of gasoline through the filler hole into the space between the inner and outer containers.

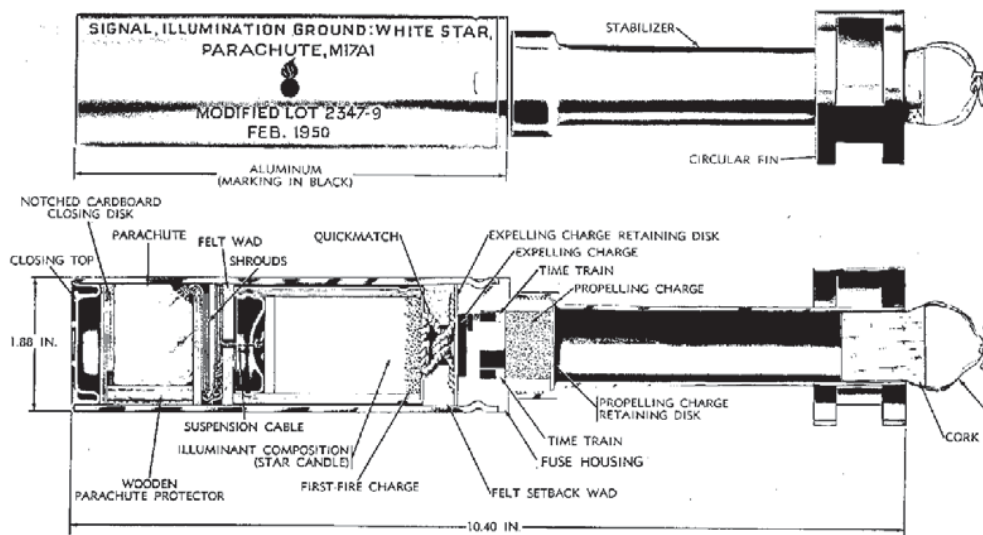
Functioning. The simulator is electrically activated and discharged in a locally fabricated steel firing tube. A minimum current of 2 ampere is required for actuation of the squib and the current source may be a battery or a blasting machine. The electric squib ignites the pyrotechnic charge and the gasoline. The simulator flash lasts slightly longer than that of the actual weapon. Its report is loud, but not comparable to the actual weapon report.

Weight	0.76 pounds
Length	7.81 inches
Diameter	1.88 inches
Pyrotechnic charge	3.0 ounce Flash Composition
Body Material	Plastic
Color	Black with white label

Reference: TM 43-0001-37, *Military Pyrotechnics*, February 1977

This Page Intentionally Left Blank

Signal Illumination, M17/ M18/M21/M51



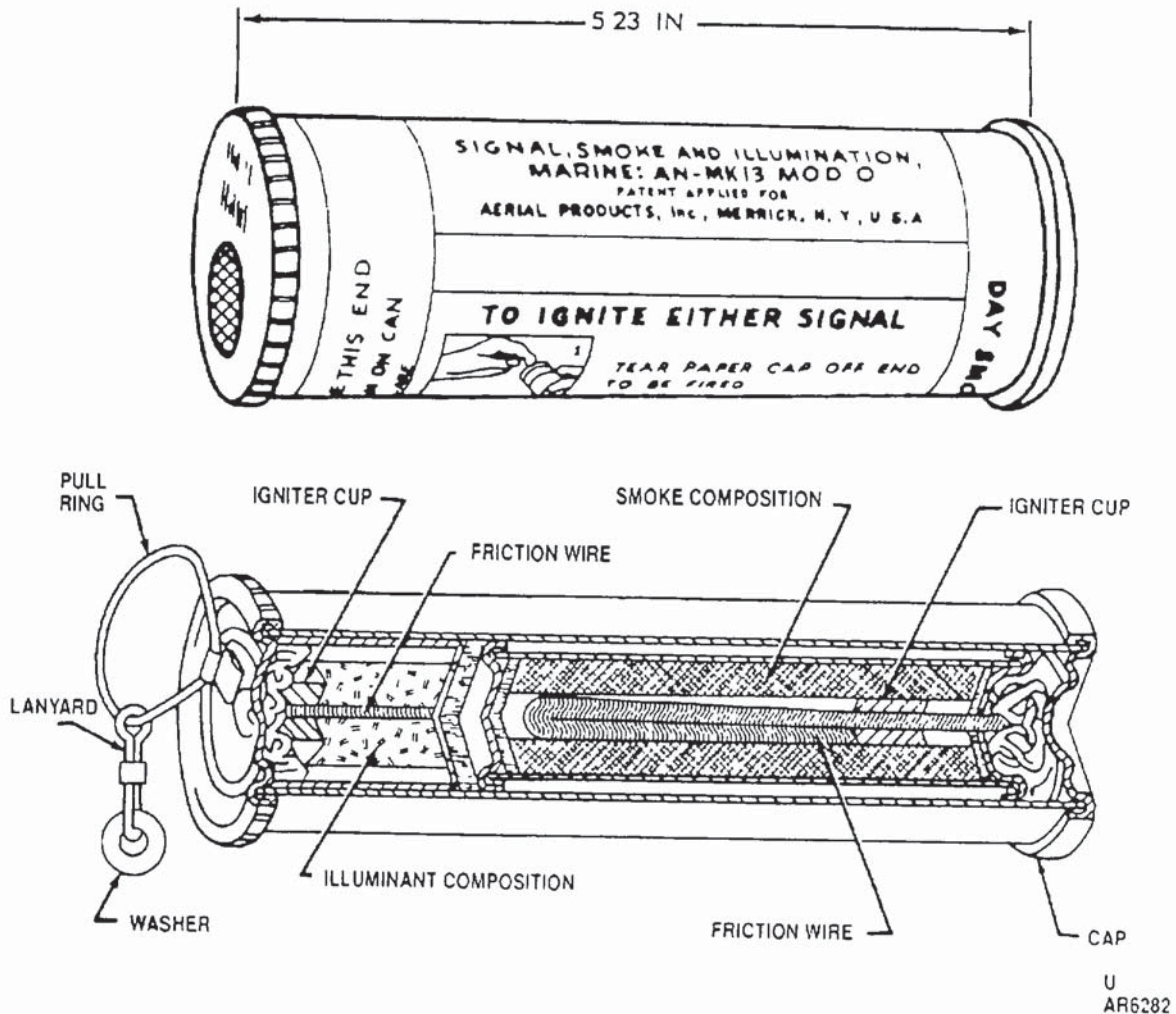
Use: This signal produces a single parachute-supported star. It is fired from a rifle grenade launcher of the M7 series attached to a rifle firing a caliber .30 grenade cartridge M3.

Description: The signal case is a drawn aluminum body (steel for A1B2 and A2B2 signals) secured at one end to an aluminum fuse housing (time train block) by four crimps. This fuse housing is chambered to hold smokeless powder propelling charge. A retaining disk holds the charge in place. The stabilizer is located at this end. It is a hollow tube with a circular fin at one end and threaded to the fuze housing at the other end. A cork plug with tape for removing it closes the finned end of the stabilizer. The fuse housing contains a circular time train groove housing filled with black powder and covered with an aluminum ring seal, except for the expelling charge connected to the fuse powder train by means of a flash hole in the fuse housing. The candle case is of cardboard with the end nearest the expelling charge colored by a perforated aluminum cap. A strip of quickmatch is inserted into the cap. The ignition charge follows the quickmatch and is followed by the first-fire charge and the illumination composition. All models are similar except for the different color star.

Length	10.40 inches
Diameter (body)	1.88 inches
Pyrotechnic charge	Illumination composition
Expelling charge	Black powder, 1.03 grams
Propelling charge	M9 1.69 grams
Color	Black markings, with the color of the signal on the top

References: TM 9-1370-200, *Military Pyrotechnics*, September 1966; TM 43-0001-37, *Army Ammunition Data Sheets Military Pyrotechnics*, April 1977

SIGNAL, SMOKE AND ILLUMINATION, MARINE: AN-MK 13 MOD O



Type Classification:

Navy Item not classified in Army System.

Use:

For day or night use by aircraft crewmen downed at sea.

Description:

The signal is a metal cylinder filled with illuminant composition in one end and smoke composition in the other. Each end is fitted with a plastic protective cap covering a pull ring and lanyard. The cap on the flare end has three molded protrusions or beads on the face for night identification. The smoke end cap is smooth. The lanyard on the flare end pull ring has a washer tied

to the end for further identification in the darkness. Each pull ring is connected to a friction wire extending through the internal igniter cup containing ignition composition. A label around each end and provides precise instructions for use.

Functioning:

When the ring on either end is pulled, the friction wire sparks the ignition compound in the igniter cap to initiate combustion of either the illuminant or the smoke composition. The smoke composition produces smoke for 18 seconds for daytime use and the nighttime illuminant candle will burn with a red flame for 18 to 20 seconds with a minimum of 3000 candle-power. Use of either end does not impair the future usefulness of the other.

Tabulated Data:

NSN 1370-00-309-5028
Weight loaded 0.40 lb
Length 5.37 in.
Diameter 1.63 in.
Method of actuation Manual
Body material Steel
Color Gray w/black markings on
decal
Pyrotechnic charge:
 Type Smoke and illuminant
Weight:
 Flare comp 1 oz
 Smoke comp 2 oz
Primer Friction
Performance:
 Delay..... 0 sec
 Burning time Light 18-20 sec; smoke
 18 sec
 Candlepower 3,000 (min)
*Packing 108 per box; 12 per inner
 pack
*Packing Box:
 Weight 80 lb

Dimensions 28 x 8-5/8 x 22-9/16 in.
Cube 3.2 cu ft

*NOTE: See SC 1340/98 IL for complete packing data including NSN's.

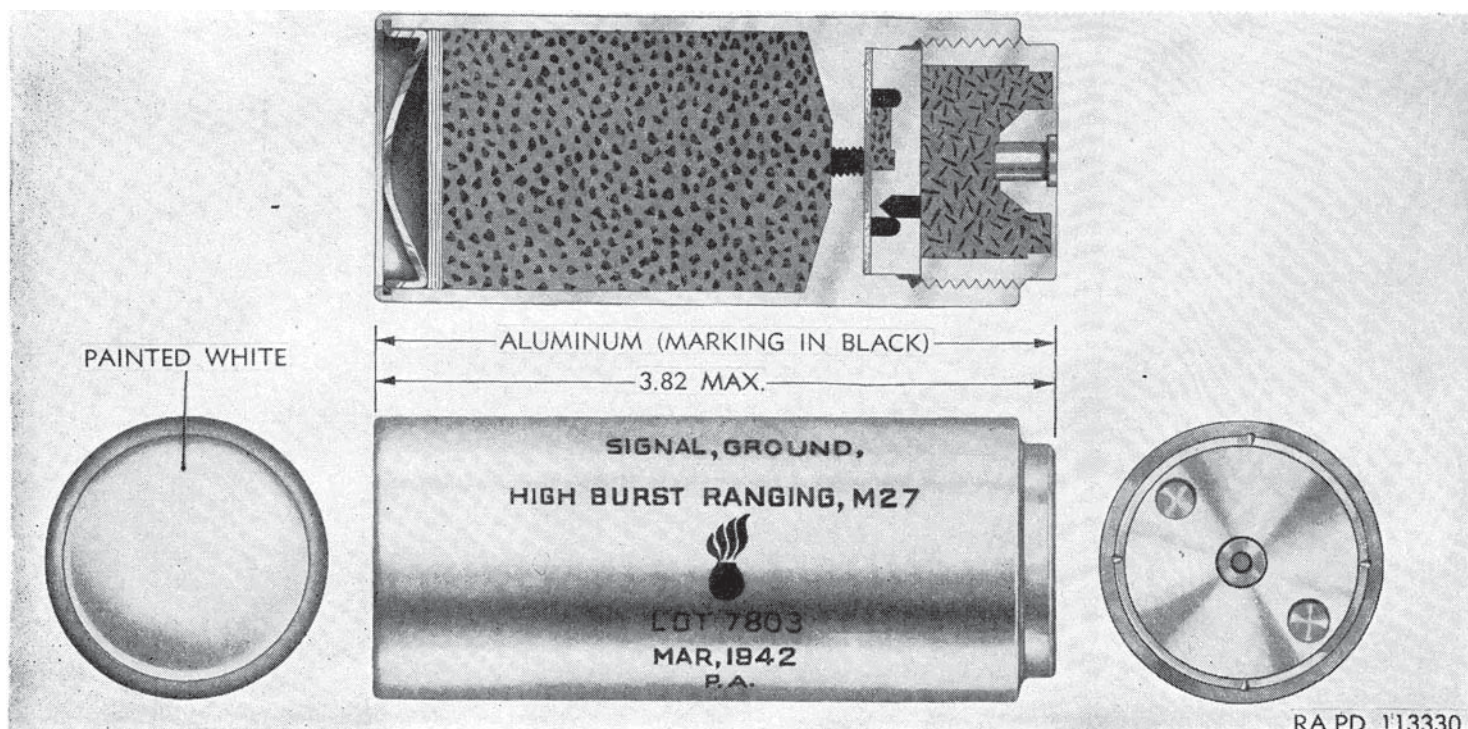
Shipping and Storage Data:

Quantity-distance class..... 2
Storage compatibility
 group N
DOT shipping class EXPLOSIVE B
DOT designation SPECIAL FIREWORKS
HANDLE CAREFULLY
KEEP FIRE AWAY
DODAC..... 1370-L275
Drawing number 712793

References:

AMC-P 700-3-5
TM 9-1370-203-20&P
TM 9-1370-203-34&P
TM 9-1370-206-10

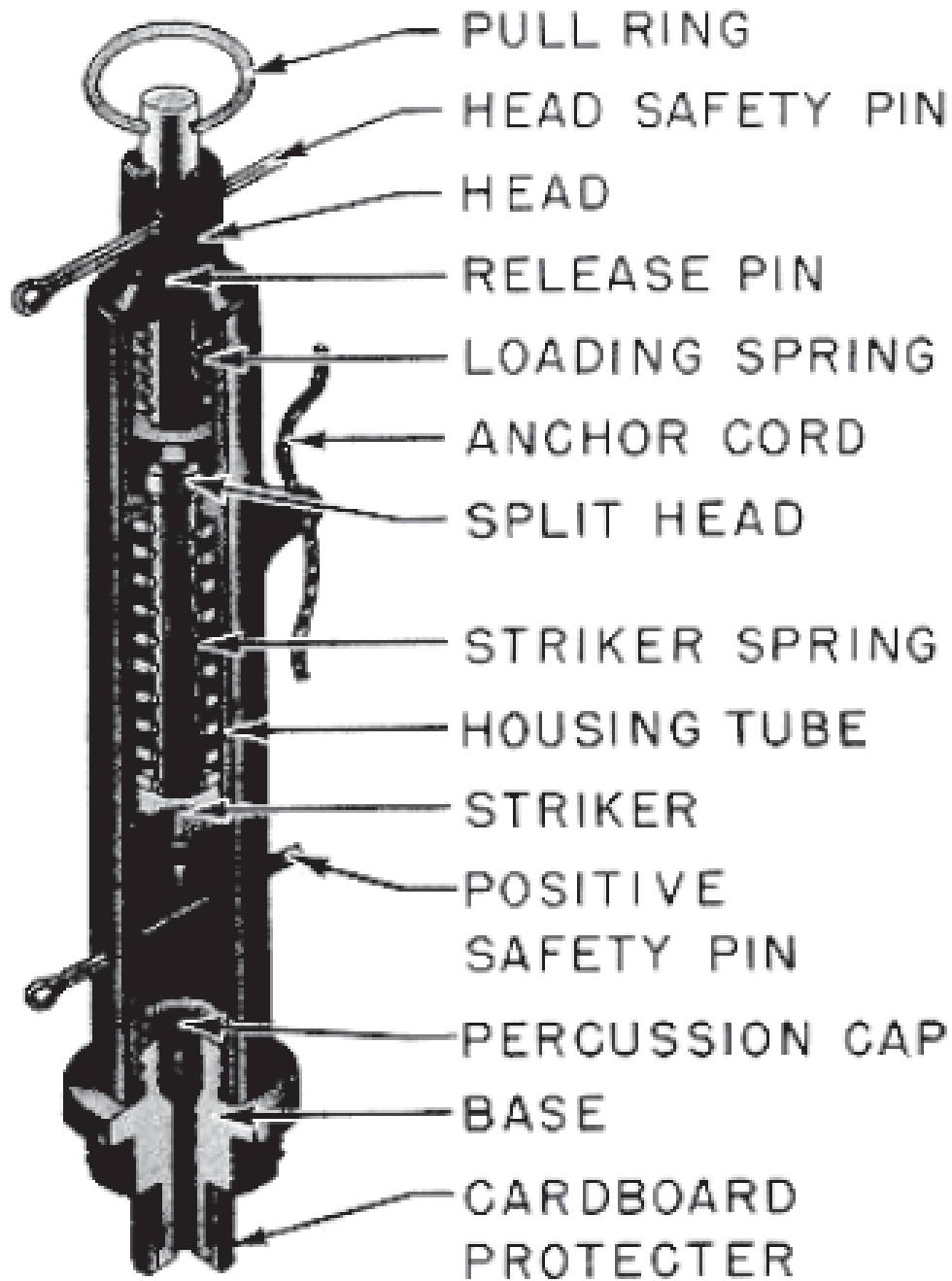
Simulator, M27A1B1



Description. The signal consists of a one-piece aluminum body threaded internally at one end. At this end the breech cap assembly containing the percussion primer new No. 4 and the 31.6-grain propellant powder screws into the body and holds in place the time train ring assembly. The body of the signal is filled with the smoke charge of 2 ounces black powder and 0.2 ounce aluminum. An inner charge of 5 grains of black powder connects the time train ring and the smoke charge.

Reference: TM 09-1981

Firing Device, M1



Pull Firing Device M1

General: It is a mechanical device designed for firing charges by a trip wire. A direct pull of three to five pounds applied to the ring actuates the device. A spring-driven firing pin sets off the percussion cap, which in turn, sets off the non-electric cap crimped to the base. The new model has two safety pins; the old model did not have the positive safety pin.

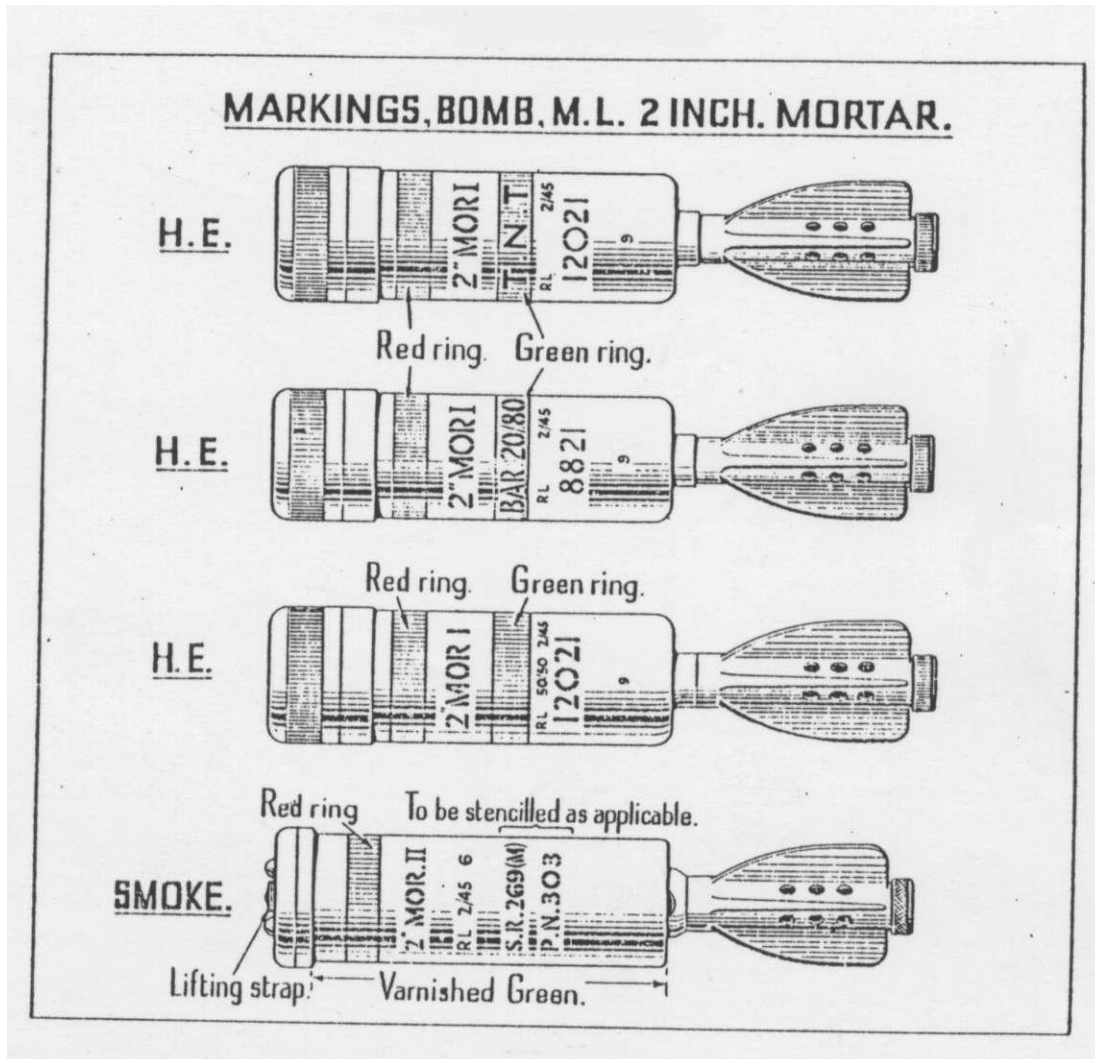
Description: The principle parts are the body, release pin, washer, firing pin, and standard nipple base. The split head of the firing pin is forced against pressure of the striker spring through a small opening formed by the shoulders inside the body. The release pin enters into and expands the split head of the firing pin against these shoulders, thus preventing its return. The release pin is held into position by the loading spring. Holes in the main head and the release pin permit insertion of a safety pin to prevent accidental movement of the release pin. The main head or upper body is threaded onto the lower body. A short piece of wire is attached at the side to be used in anchoring the device.

The new Model differs in that the positive safety pin was added just below the striker: water-proofing material was added around the nipple of the base; and an anchor cord is used in place of the wire. The head of the body differs slightly in construction, and the joint is soldered to prevent disassembly.

Reference: NAVSEA OP 1664 Volume 1&2, *U.S. Explosive Ordnance*, May 47

FIXED AND SEMIFIXED ROUNDS AND SEPARATE-LOADING PROJECTILES

BOMB, SMOKE MK 1/1, 2" MORTAR, M3 COMPLETE



FIXED AND SEMIFIXED ROUNDS AND SEPARATE-LOADING PROJECTILES

BOMB, SMOKE MK 1/1, 2" MORTAR, M3 COMPLETE

Consists of a steel cylinder approximately 5.8 inches long which contains the smoke filler. The head of the cylinder has a slightly larger diameter than the body, and serves as the front bourrelet. The base end of the cylinder is crimped over a tinned steel adapter and a thin diaphragm of tinned brass. The adapter has a threaded projection onto which the fin assembly of zinc alloy is screwed. A set screw secures the fin assembly to the adapter. The fins, in addition to serving as a stabilizer in flight, also serve to center the round in the mortar, hence act as a rear bourrelet. A metal lifting strap, spot-welded to the head of

the bomb, aids in removing a round placed in the mortar, should it be desired not to fire it. Upon pulling the trigger, the firing pin strikes the primer of the blank cartridge in the base of the fin initiating the burning of the propellant powder. The hot gases formed are emitted through the holes in the fin assembly, after burning through the paper walls of the blank cartridge. In addition to propelling the round in the barrel forward, the hot gases break through the thin brass diaphragm held in place by the adapter, and ignite the smoke filler in the steel cylinder

Data

Weight of complete round.....	2.11	Range:	
Length of complete round.....	9.38 in.	Short.....	20 yds
Weight of round as fired (approx).....	2.0 lb	Medium.....	60 yds
		Long.....	120 yds

Reference: TM 9-1901, Artillery Ammunition, 1944

Grenade, Rifle, Anti-tank, M28

M28, US, Grenade, Rifle, HEAT
T41 & T41E1, US, Grenade, Rifle, HEAT
Energra, US, Grenade, Rifle, HEAT

DATA (E2US000086)



Diameter: 75mm
Length: 393.7mm
Weight: 1.5 Lbs
Filler: RDX-TNT
NEW: 1.0 Lbs
Fuzing: PIBD
Transport: **Blow in Place.**

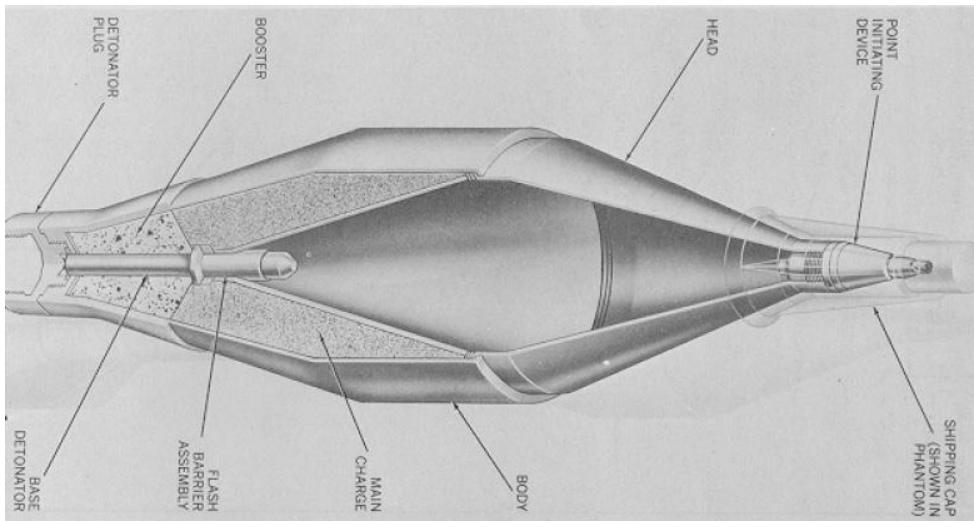
Warning: Always consider the grenade armed.

Description: Always consider this rifle grenade to be armed. The flash barrier has been known to function during handling and shipment.

Construction: The grenade is made of light metal.

Difference between Models: The grenade maybe assembled with either an inertia type or a driven striker type point initiating device. In either device the setback sleeve moves rearward.

Markings: The grenade is painted black or OD with yellow markings. The fuze nose is slate gray. Note: do not rely on the color code to distinguish between the HEAT round and the Practice round.



Reference: https://en.wikipedia.org/wiki/ENERGA_anti-tank_rifle_grenade

This Page Intentionally Left Blank

Appendix E
Environmental Protection Plan

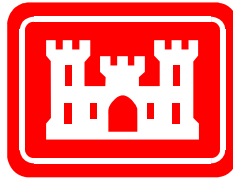
This Page Intentionally Left Blank

FINAL
ENVIRONMENTAL PROTECTION PLAN

Munitions and Explosives of Concern Remedial Action
Former Waikane Training Area
Southeastern Region Munitions Response Site
Kāne‘ohe, O‘ahu, Hawai‘i

RMIS ID: H09HI035401

Prepared for:



U.S. Army Corps of Engineers
Honolulu District
Building 230
Fort Shafter, Hawai‘i
96858-5440

December 2016

This Page Intentionally Left Blank

Table of Contents

Acronyms and Abbreviations*..... *iii

Section 1 Environmental Protection Plan* *1-1

 1.1 Introduction 1-1

 1.2 Rare, Threatened, and Endangered Species 1-1

 1.3 Hydrological Resources 1-6

 1.3.1 Watersheds and Groundwater 1-6

 1.3.2 Wetlands 1-6

 1.4 Wilderness Areas 1-7

 1.5 Cultural, Archaeological, and Historical Resources 1-7

 1.6 Coastal Zones Within the Project Site 1-7

 1.7 Vegetation Removal..... 1-7

 1.8 Waste Disposal..... 1-8

 1.9 Proposed Mitigation Measures..... 1-8

 1.9.1 Waste Disposal..... 1-8

 1.9.2 Burning Activities 1-9

 1.9.3 Dust and Emission Control 1-9

 1.9.4 Noise Control and Prevention..... 1-9

 1.9.5 Spill Control and Prevention..... 1-9

 1.9.6 Spill Response..... 1-10

 1.9.7 Storage Areas and Temporary Facilities..... 1-10

 1.9.8 Access Routes 1-10

 1.9.9 Vegetation Protection and Restoration 1-10

 1.9.10 Water Run-on and Run-off Control 1-11

 1.9.11 Equipment Decontamination and Disposal..... 1-11

 1.9.12 Minimization of Disturbed Area 1-11

 1.9.13 Air Monitoring..... 1-11

 1.9.14 Post-Activity Cleanup..... 1-12

 1.9.15 Ecological Resources Plan 1-12

Section 2 References*..... *2-1

List of Tables

Table 1-1: Biological Investigations Conducted at Waikane Valley 1-2

This Page Intentionally Left Blank

Acronyms and Abbreviations

AMP	Archaeological Monitoring Plan
APP	Accident Prevention Plan
BMP	Best Management Practice
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CZM	Coastal Zone Management
DID	Data Item Description
DLNR	Department of Land and Natural Resources
DOT	Hawaiʻi Department of Transportation
EM	Engineer Manual
EMP	Explosives Management Plan
EPA	U.S. Environmental Protection Agency
EPP	Environmental Protection Plan
ERP	Ecological Resources Plan
IDW	Investigation-Derived Waste
MCBH	Marine Corps Base Hawaii
MD	Munitions Debris
MEC	Munitions and Explosives of Concern
MPPEH	Materials Potentially Presenting an Explosive Hazard
MRS	Munitions Response Site
NCN	No Common Name
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NRM	Natural Resources Monitoring
NTCRA	Non-Time Critical Removal Action
NWI	National Wetlands Inventory
PM	Project Manager
POH	Honolulu District
PPE	Personal Protective Equipment
PWS	Performance Work Statement
RA	Remedial Action
RTE	Rare, Threatened, and Endangered
SARA	Superfund Amendments and Reauthorization Act of 1986
SSHP	Site Safety and Health Plan
SUXOS	Senior Unexploded Ordnance Supervisor
UFP-QAPP	Uniform Federal Policy Quality Assurance Project Plan
U.S.	United States
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UXO	Unexploded Ordnance
WTA	Waikane Training Area
WVIA	Waikane Valley Impact Area

This Page Intentionally Left Blank

Section 1 Environmental Protection Plan

1.1 Introduction

This Environmental Protection Plan (EPP) has been developed for the Remedial Action (RA) to be conducted at the 36-acre area within the Southeastern Region Munitions Response Site (MRS), former Waikane Training Area (WTA), Kāneʻohe, Oʻahu, Hawaiʻi.

This is a firm fixed price, performance-based contract issued under the United States (U.S.) Army Corps of Engineers (USACE). This project includes a RA to be conducted in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), and 40 Code of Federal Regulations (CFR) Part 300. The work includes removal and disposal of munitions and explosives of concern (MEC) and munitions debris (MD).

The purpose of this EPP is to describe the approach, methods, and procedures to be employed by the project team and its subcontractors to protect the natural and cultural environments during performance of tasks associated with the RA. Specifically, this EPP describes the procedures and methods that will be implemented during the RA activities at the MRS to minimize pollution, protect and conserve natural resources, restore damaged areas, and control noise and dust within reasonable limits. This EPP was prepared in accordance with Data Item Description (DID) MR-005-12, *Environmental Protection Plan*¹ (USACE, 2003). In addition, an Ecological Resources Plan (ERP) has been prepared for this project as a separate stand alone document. The ERP was prepared in accordance with Engineer Manual (EM) 200-1-15 (USACE, 2015a) to identify methodologies and procedures to identify and protect sensitive species and habitats.

The project team will exceed the guidance in the project Performance Work Statement (PWS) that requires a qualified biologist or ecologist to assist in managing ecological resource planning efforts and to participate in any field mitigation efforts. Refer to the ERP for qualifications of individuals involved in the ecological resource planning efforts.

1.2 Rare, Threatened, and Endangered Species

This RA is focused on a 36-acre area of the Southeastern Region MRS located within the former WTA (See Figure 2 presented in Appendix C of the project Uniform Federal Policy Quality Assurance Project Plan [UFP-QAPP]). This area forms an irregularly shaped and sized collar surrounding the previous Non-Time Critical Removal Action (NTCRA) area in the Southeastern Region MRS. It straddles two different properties. The eastern or makai property is owned by the City and County of Honolulu and is often referred to as the Waikane Nature Preserve parcel. The western or mauka property is privately owned by the ʻŌhulehule Forest Conservancy LLC. Publicly presented future land development plans for the highest elevations of the ʻŌhulehule Forest Conservancy LLC mauka property include restoring and preserving the native forest; protecting the only known ʻelepaio (*Chasiempis ibidis*) nesting grounds; re-establishing taro farming along Waikane Stream and lower portions of Waikēʻekeʻe Stream; growing high-quality

¹ MMRP DID was not available, therefore, DID MR-005-12 *Environmental Protection Plan* was utilized.

organic cacao in the areas closest to the 36-acre RA area; and building a single-home residence for the owners personal use (USACE, 2015b).

Because of the unknown amounts of unexploded ordnance (UXO) still present, many parts of Waikane Valley have been closed to the public, and relatively few biological investigations that addressed rare, threatened, and endangered (RTE) species have been conducted. The majority of biological investigations that have been conducted have been prompted by military investigations. Nevertheless, several studies have been undertaken on or near the 36-acre RA area. Development of the makai property into a golf course was considered during the 1980s (Group 70, 1989), and as a result two separate botanical and avian investigations were conducted (Nagata, 1988 and Berger, 1988). Three investigations by teams of researchers from AECOS Inc./AECOS Consultants (2003, 2005, and 2010) were conducted for the adjacent and higher in elevation Marine Corps Base Hawaii (MCBH), Waikane Valley Impact Area (WVIA). In 2012, a very general and brief assessment of the 39.3 acres of the former WTA cleared during the NTCRA was conducted (LaGrande, 2012). Biological reports prepared for certain discrete areas within the ʻŌhulehule Forest Conservancy LLC property were prepared in 2012 to 2013 (Lau, 2013; VanderWerf, 2013). Some of these investigations were focused only on plant species, but most had the goals of recording and sometimes mapping the vegetation types and plant species, providing a qualitative description of the vegetation and a checklist of species present, and assessing the probability of any usage of the survey area by RTE animal species based on the habitats currently present. Literature and field surveys that were able to be accessed and reviewed are listed in Table 1-1.

Table 1-1: Biological Investigations Conducted at Waikane Valley

Survey Date	Taxa Covered	Surveyor / Client	Area	RTE Species Noted as Present or Possible
1988	Plants	K. Nagata for Group 70	Waikane Nature Preserve property and nearby properties (505 acres)	None
1988	Vertebrate Fauna	A. Berger for Group 70	Waikane Nature Preserve property and nearby properties (505 acres)	Hawaiian hoary bat (possible)
2003	Plants, Vertebrates, Invertebrates, and Aquatic Biota	AECOS Consultants	Portion of 187-acre WVIA	Short-eared Owl (possible) and Newell's Shearwater (possible overflight only)
2005	Plants, Vertebrates, and Invertebrates	AECOS Consultants	Portion of 187-acre WVIA	Short-eared Owl, ʻElepaio (possible) and Newell's Shearwater (possible overflight only)
2010	Plants, Vertebrates, and Invertebrates	AECOS Inc.	Portion of 187-acre WVIA	Short-eared Owl, ʻElepaio (possible), and Newell's Shearwater (possible overflight only)
2012	General	M. LaGrande	Portion of the 933-acre Former WTA	ʻElepaio (possible)

Survey Date	Taxa Covered	Surveyor / Client	Area	RTE Species Noted as Present or Possible
2013	Plants	J. Lau	ʻŌhulehule Forest Conservancy LLC Property	None
2013	Birds, Bats	E. VanderWerf	ʻŌhulehule Forest Conservancy LLC Property	ʻElepaio (only above 1,000 feet elevation)

Note:

Full citations for studies are included in Chapter 2 References.

As discussed in many of these surveys, two factors limit the potential for RTE species:

- A long and intense history of land disturbance through farming, military activity, and other uses, which promotes the regrowth of non-native plants that outcompete native plant species and offer fewer food and shelter resources for native species; and
- Low elevations between 160 and 325 feet above sea level, in the elevational belt in which mosquitos and the diseases they bear limit the survival of native forest birds.

Based on review of these studies and analysis of previous and current land uses, a very limited range of RTE species would be anticipated to be even potentially present in or near the 36-acre RA area. These include:

1. The endemic, endangered Oʻahu sub-species of the ʻelepaio (*Chasiempis sandwichensis ibidis*) may occasionally use resources within a half mile of the project vicinity. Although the 36-acre RA area is well below the elevation normally associated with habitat for this bird, which does not appear to have ever been observed in or near the area, Unit 3 of the federally delineated Critical Habitat for this species (Figure 6 presented in U.S. Fish and Wildlife Service [USFWS], 2001) is located as close as 750 feet west (mauka) of the 36-acre RA area;
2. The endemic sub-species of the Short-eared Owl (*Asio flammeus sandwichensis*) may occasionally use resources present within the site, although it is noted as much more likely to be present at higher elevations in ʻuluhe-dominated vegetation of the steep valley flanks (AECOS Inc., 2010). The Oʻahu population of this endemic Hawaiian sub-species of the near cosmopolitan species is listed as endangered by the State of Hawaiʻi, but it is not listed under Federal statutes (Department of Land and Natural Resources [DLNR], 1998 and USFWS, 2015b);
3. The endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*), or ʻōpeʻapeʻa, is insectivorous and nocturnal. It feeds on a variety of native and non-native night-flying insects, including moths, beetles, crickets, mosquitoes, and termites (Menard, 2001). Its foraging habitat is also diverse, comprising forest and pasture boundaries, forest road corridors, streams, bays, and inlets. In 2010, the Kahuku Wind Power Habitat Conservation Plan (SWCA Environmental Consultants, 2010) documented the presence of low numbers of Hawaiian hoary bats within their survey areas adjacent to the Kahuku Training Area. Further surveys conducted for the military (U.S. Army Garrison, Hawaiʻi and Pacific Cooperative Studies Unit, 2012) indicate that Hawaiian hoary bats are present

in at least low numbers on two Army training areas in the Koʻolau Mountain Range. Surveys on six nights very near the 36-acre area, however, did not detect any bats (VanderWerf, 2013); and

4. The upper ʻuluhe-covered slopes of Waikane Valley represent typical nesting habitat used by the threatened Newell's Shearwater (*Puffinus auricularis newelli*) on other islands in the Hawaiian archipelago. Although there are no known nesting colonies of this species on Oʻahu, a small number of birds are downed annually on the island, most near the lighted entrances to the Pali Highway tunnel (AECOS Consultants, 2005 and Maui Nui Seabird Recovery Project, 2015).

It is important to reiterate that no evidence of observation of any of the above species in available biological surveys of the area in and near the 36-acre RA area was found.

The PWS noted that "...the endangered *Cyrtandra kaulantha* is a plant that is endemic to windward side of the Koʻolau Mountains on the island of Oahu." This species, which is very recognizable because of its large leaves (up to 24 inches wide) and basal cauliflorous inflorescences, has not been observed in any available botanical studies in the lower areas of Waikane Valley, although it has been observed in a high-elevation gulch between Waikane and Waiāhole Valley, and another individual that may belong to this species was observed high up in Waikēʻekeʻe Gulch, within Waikane Valley (Lau, 2012). The *Manual of the Flowering Plants of Hawaiʻi* (Wagner *et al.*, 1990), indicates an elevational range of about 700 to 1,000 feet, somewhat higher than the maximum of 260 feet found in the 36-acre RA area. It is found in streambeds and talus slopes, which do not appear to be present in the area. Thus, it would appear extremely unlikely to be present in the area.

In addition to the listed endangered plants that have been specifically searched for in previous biological studies of the lower Waikane Valley, 40 new plants and 10 new animals have been proposed for listing in the Hawaiian Islands (Federal Register, Vol 80, No. 189, September 30, 2015, pp:58820-58909). Careful examination of the environments in which each of the plant species proposed for listing are found indicates that only a few may occur in the lowland mesic/wet forests at any elevation of the Koʻolau Mountain Range. These include the following:

- *Joinvillea ascendens ssp. ascendens* (ohe): now found only above 1,000 feet exclusively in the northern Koʻolau Mountain Range;
- *Kadua fluviatilis* (no common name [NCN]): now found only above 1,000 feet exclusively in the northern Koʻolau Mountain Range;
- *Microlepidia strigosa var. mauiensis* (NCN): now found only above 1,400 feet in elevation;
- *Myrsine fosbergii* (kolea): typically found only above 2,200 feet in elevation, now found only on the summit ridge of the Koʻolau Mountain Range;
- *Pritchardia bakeri* (Baker's loulu): typically found above 1,500 feet, windswept, and mostly exposed shrubby or grassy areas, sometimes on steep slopes;

- *Ranunculus mauiensis* (makou): formerly found above 3,500 feet in the Koʻolau Mountain Range, it has not been observed on Oʻahu since the 1800s;
- *Sicyos lanceoloideus* (anunu): occurs on ridges or spurs in mesic forest at 1,800 to 2,700 feet, no longer known and possibly never present in the Koʻolau Mountain Range; and
- *Stenogyne kaalae ssp. sherffii* (NCN): found above 1,500 feet and no longer found in the Koʻolau Mountain Range.

Based on the environmental requirements and extremely rare occurrences of each of these plants, none would be expected in the highly disturbed, lowland environment of the 36-acre RA area in Waikane Valley. None have been observed in any of the biological surveys.

The following animal species proposed for listing may occur in the lowland mesic/wet forests at any elevation of the Koʻolau Mountain Range:

- Band-rumped Storm-petrel (*Oceanodroma castro*): When not at nesting sites, adult birds spend their time foraging on the open ocean. Adults visit the nest site after dark, where they can be detected by their distinctive calls. In Hawaiʻi, adults establish nesting sites in April or May, and the nesting season occurs during the summer months, with incubation lasting about 42 days. The USFWS identifies the species as potentially present on Oʻahu but no pairs are currently listed as nesting there;
- Four endangered Hawaiian damselflies are present on Oʻahu. They inhabit a wide range of stream, pond and estuarine habitats. The orangeblack Hawaiian damselfly (*Megalagrion xanthomelas*) was not historically collected from the Koʻolau Range and is currently known on Oʻahu only from a population near Tripler Hospital. This species would not be expected in Waikane Valley. The crimson Hawaiian damselfly (*Megalagrion leptodema*) is endemic to Oʻahu and is considered one of the rarest and most vulnerable of all endemic *Megalagrion* species in Hawaiʻi. *M. leptodemus* was found historically in both the Koʻolau and Waiʻanae Ranges but is currently restricted to scattered sites in four drainages in the Koʻolau Range, mostly on the leeward side of the range and not near Waikane Valley. The blackline Hawaiian damselfly subspecies (*Megalagrion nigrohamatum nigrolineatum*) is also endemic to Oʻahu and found historically in both the Koʻolau and Waiʻanae Ranges. It is currently known from 16 stream sites at higher elevations in the Koʻolau Range. Although not noted from Waikane Valley, it has been found nearby in Waiāhole Valley. However, it occurs in the slow sections or pools along mid-reach and headwater sections of perennial upland streams and in seep-fed pools along overflow channels bordering such streams, a habitat not present in the RA area. The oceanic Hawaiian damselfly (*Megalagrion oceanicum*) is a comparatively large and robust species. The species now currently occupies 12 sites above 300 feet in elevation on the windward side of the Koʻolau Range. All sites are well north of Waikane Valley. All colonies of the crimson, blackline and oceanic Hawaiian damselflies are constrained to portions of streams not occupied by nonnative predatory fish. Such habitat is found only in stream portions above geologic or manmade barriers (e.g., waterfalls, steep gradients, dry stream mid-reaches, or constructed diversions). These habitats are not found in the RA area. A number of units of critical

habitat for these three taxa have been designated in the Koʻolau Range. No critical habitat is present in the RA area, although Unit 3 of critical habitat for the crimson and blackline Hawaiian damselflies and Unit 4 for oceanic Hawaiian damselfly are located as close as a third of a mile mauka (Federal Register, 2012); and

- Three yellow-faced bees (*Hylaeus facilis*, *H. kuakea*, and *H. mana*): *H. facilis* prefers dry to mesic forest and shrubland and is known from only one mesic site on Oʻahu; *H. kuakea* is currently known on Oʻahu from only a few collections in the Waiʻanae Mountain Range, although it may have originally occurred in other places as well; *H. mana* is known only from lowland mesic forest dominated by native koa located along the Manana Trail in the Koʻolau Mountain Range at 1,400 feet in elevation.

Based on the environmental requirements and extremely rare occurrences of each of these animals, none would be expected in the highly disturbed, lowland environment of the 36-acre RA area in Waikane Valley. None have been observed in any of the biological surveys.

1.3 Hydrological Resources

1.3.1 Watersheds and Groundwater

The MRS is located within the Waiāhole Stream-Kahaluʻu Stream sub-watershed part of the larger Windward Oʻahu watershed (200600000204) which is a frontal hydrologic unit that flows into Kāneʻohe Bay (U.S. Geological Survey [USGS], 2015). According to Mink and Lau (1987), one aquifer designated by code 30603212 (11111) underlies the former WTA. The aquifer is located in the Koʻolaupoko aquifer system within the larger Windward aquifer sector and is basal (fresh water in contact with seawater), unconfined (where the water table is the upper surface of the saturated aquifer), and is a dike (aquifer in dike compartments). The aquifer is in current use, is drinking water, is of fresh salinity (less than 250 milligrams per liter chloride), is irreplaceable, and has a high vulnerability to contamination. Based on the site topography, the groundwater flow is likely to the east toward Kāneʻohe Bay.

1.3.2 Wetlands

Maps of wetlands from the USFWS's National Wetlands Inventory (NWI) (USFWS, 2015a) provide a first-cut assessment of wetlands in the area. The maps were developed by trained image analysts who identified and classified wetlands and deepwater habitats from aerial imagery using the NWI classification scheme (Cowardin *et al.*, 1979).

The maps show a R3UBH (riverine, upper perennial, unconsolidated bottom, permanently flooded) wetland located coincident with the Waikane Stream streambed which runs along the northern boundary of the Southeastern Region MRS. Water covers the streambed surface throughout the year. The maps also show a PFO3C (palustrine, forested, broad-leaved evergreen, seasonally flooded) wetland located coincident with an unnamed stream which runs along the southern boundary of the Southeastern Region MRS. This is a seasonally flooded surface water that is present for extended periods especially early during the growing season but is absent by the end of the growing season in most years.

The botanical study of the Waikane Nature Preserve property, which include the makai portion of 36-acre RA area, divided the area into vegetation types (Nagata, 1988). Wetlands may be found in two of the four vegetation types. The “Mixed Riparian Association,” was said to comprise the vegetation along the flood plain of Waikane Stream (not part of the 36-acre RA area). The “Unsurveyed Areas (2: Wetlands)” was said to be associated with former taro fields and rice paddies, now dominated by facultative wet plants within the grass, sedge, rush and other groups. Maps provided with the report do not clearly indicate the presence of wetlands. Until the area is closely examined, it should be presumed that wetlands may be present, most likely riparian ones associated with the small unnamed stream.

Wetlands in this part of Oʻahu are generally dominated by invasive species and are unlikely to support endangered plants. They may offer habitat for native waterbirds, and have other values in terms of temporary flood storage and sediment and other pollutant filtration.

1.4 *Wilderness Areas*

The MRS is not located within a designated Wilderness Area (Wilderness Institute, 2015).

1.5 *Cultural, Archaeological, and Historical Resources*

As part of the RA, an Archaeological Monitoring Plan (AMP) will be prepared in coordination with USACE Honolulu District (POH)’s Senior Archaeologist, Mr. Kanalei Shun at (808) 835-4097. An appropriate level of archaeological reconnaissance survey and monitoring shall be required for all RA field work including survey and monitoring, recording, mapping, and sampling conducted in accordance with the AMP. All identified surface cultural remains shall be fully and systematically described, and where feasible, sampled. All stages of the archaeological reconnaissance survey and monitoring shall be fully documented in daily log and photographic form. Due to the sensitivity of information on cultural and archaeological resources, the Archaeological Monitoring Report will be submitted directly to POH.

1.6 *Coastal Zones Within the Project Site*

The MRS is within a designated Coastal Zone Management (CZM) area which encompasses the entire State of Hawaiʻi, as no point of land is more than 30 miles from the ocean. Thus, the MRS is protected under the Federal CZM program.

1.7 *Vegetation Removal*

Vegetation removal to be conducted at the MRS will consist of the following:

- A qualified botanist/biologist will survey the 36-acre RA area for presence of RTE species prior to vegetation removal;
- The removal of these any RTE species will be prohibited until a biological consultation with the USACE is discussed;

- UXO Teams will remove only vegetation that will affect the RA work using hand tools or gas-powered machinery while practicing anomaly avoidance techniques; and
- Grasses, small scrubby brush, and trees less than 3 inches in diameter will be cut and left in place.

Section 1.9.9 details what mitigation measures would be taken if vegetation removal occurs at the MRS. Vegetation removal activities will be conducted in accordance with SOP G-4 *Vegetation Clearance* (Appendix G of the project UFP-QAPP). If MPPEH or MEC is found during vegetation removal activities, it will be properly inspected and managed in accordance with SOP UXO-03 *Material Potentially Presenting an Explosive Hazard Management* (Appendix G of the project UFP-QAPP) and EM 385-1-97.

1.8 Waste Disposal

Investigation-derived waste (IDW) generated during the surface and subsurface clearance field activities will be disposed of as described in the Waste Management Plan (Appendix J of the project UFP-QAPP).

1.9 Proposed Mitigation Measures

The following sections detail proposed environmental protection mitigation measures to be implemented during the RA.

1.9.1 Waste Disposal

Site preparation and vegetation clearance activities require the use of hazardous substances such as diesel fuel, gasoline, motor oil, or other regulated liquids for equipment operation. These substances may be present in contained conditions as part of internal combustion engines or in designated containers (*e.g.*, labeled gas cans). Disposal of diesel fuel or gasoline is not anticipated as most will be consumed during equipment use. However, if the need to dispose of these materials should arise, the Senior UXO Supervisor (SUXOS) will coordinate with the Project Manager (PM) and ensure that the waste is handled, stored, treated, packaged, and/or transported in accordance with Federal, state, and local laws, policies, and regulations. The only exception would be Materials Potentially Presenting an Explosive Hazard (MPPEH); refer to the Explosives Management Plan (EMP) and SOP UXO-03 *Material Potentially Presenting an Explosive Hazard Management* for detailed discussion of certification, treatment, and final disposition (Appendix I and Appendix G of the project UFP-QAPP, respectively).

Appropriate onsite housekeeping practices (*e.g.*, rubbish) will be maintained during the course of the project. All RA-generated wastes will be collected and disposed properly off site. Refer to the Waste Management Plan (Appendix J of the project UFP-QAPP) for details.

1.9.2 Burning Activities

Open fires will not be permitted during performance of this project due to high fire risk. Smoking will not be allowed on site due to fire risk. Fire prevention measures and emergency response plans for fire control are discussed in the Accident Prevention Plan (APP)/Site Safety and Health Plan (SSHP) (Appendix F of the project UFP-QAPP).

1.9.3 Dust and Emission Control

Equipment combustion emission sources will include automobiles, some heavy equipment, and vegetation clearance equipment. All potential emission sources will be maintained properly and will meet applicable vehicle emissions standards. Permits for air pollution control are not anticipated to be required for this project.

Excavation is expected to involve heavy equipment. Dust suppression will consist of water application to exposed surface soils from an approved water source. Water will be applied to prevent soil migration to nearby drainage pathways.

1.9.4 Noise Control and Prevention

It is expected that this project will generate one primary source of noise: noise from mechanical equipment (*e.g.*, trucks). To minimize noise resulting from mechanical equipment, the equipment will be powered off when not in use and the project team will ensure that the manufacturer's noise control equipment is in place and functioning (*e.g.*, mufflers). Additional noise abatement procedures may be implemented if concerns of residents, site workers, or recreational users of the former WTA result in such a requirement.

As noise generated by project activities are not expected to be excessive or for a long duration, the project team does not anticipate adverse impacts to resident fauna. It is expected that fauna will temporarily avoid the areas where noise is being generated until the activities have ceased.

1.9.5 Spill Control and Prevention

The RA activities will be performed in accordance with the USACE Spill Prevention Control and Countermeasures Plan. Refueling of vehicles will occur at offsite commercial filling stations. Gasoline and diesel fuel for equipment fueling may be stored in vehicles or in U.S. Environmental Protection Agency (EPA)-approved portable fuel containers of less than five gallons. As a precaution, spill containment equipment will be stored in the field equipment office and will be on hand during all phases of the field work in locations where petroleum, oil, and lubricants are present. If a spill occurs, containment and preventive measures will be implemented immediately in accordance with the APP/SSHP (Appendix F of the project UFP-QAPP).

1.9.6 Spill Response

Due to the nature of the operations, the potential for a spill of chemicals during operations is low. The highest probability would occur in the event that a vehicle would need to be fueled on site. If this occurs, a catchment pan will be placed under the vehicle. Additionally, the project team will be equipped with spill kits on site for immediate cleanup if a petroleum product is inadvertently spilled. In the event of a spill, the following measures will be taken:

- The spill area will be isolated and any standing product will be taken up in absorbent materials;
- The PM will be notified;
- The affected soil will be shoveled into a double-bagged plastic bag, and subsequently placed into a Hawaiʻi Department of Transportation (DOT)-approved shipping container;
- Each container will be properly labeled; and
- Each container will be shipped off site and disposed of at a permitted facility in accordance with 40 CFR 260-270 (EPA, 2014).

1.9.7 Storage Areas and Temporary Facilities

Temporary facilities, such as an office trailer and temporary waste staging areas will be staged to minimize disturbance of native vegetation or interference with investigation areas. The project team will coordinate the locations of these temporary facilities with the USACE prior to mobilizing them to the field. All temporary storage and facilities will be removed upon completion of RA activities.

1.9.8 Access Routes

It is not expected that field operations will require the construction of new access roads. However, in the event that additional access or modification to existing roads is required, the contractor will coordinate these activities with USACE prior to initiating vegetation and/or soil disturbance.

1.9.9 Vegetation Protection and Restoration

Vegetation clearance will be required in certain areas to facilitate the RA activities. Large-scale vegetation removal, clearing, or other activities that would create erosion conditions, are not anticipated. Some vegetation disturbance may occur near temporary facilities. Clearing activities at the MRS will be minimized to the extent possible to allow for the execution of work. To further minimize environmental impacts, the following special protection measures will be implemented:

- The project team will consult with USACE prior to commencing fieldwork that will disturb any ecological or cultural resources or vegetation clearing;

- A biological survey will be conducted by a biologist/botanist prior to the start of field work;
- Locations of temporary facilities will be approved and coordinated with USACE;
- Vegetation clearance will be minimized to only vegetation that will hamper a safe MEC removal action to reduce the possibility of the influx of non-native, noxious weeds. Clearance will be conducted following approval from USACE;
- No woody vegetation over 15 feet high will be trimmed or cut from 1 June to September in order to minimize impacts to Hawaiian hoary bats during their roosting season;
- Clothing, equipment, tools, and other items brought to the MRS will be inspected for the presence of foreign items that could impact the former WTA (*e.g.*, exotic slugs/snails, plants, and seeds). Equipment and tools will be cleaned prior to being used at the MRS; and
- Due the rural site location, no vegetation restoration is planned for the project.

1.9.10 Water Run-on and Run-off Control

Vegetation clearance will be limited to the surface, and therefore no significant excavation is anticipated. However, best management practices (BMPs) will be implemented, if necessary, to prevent the discharge of chemicals into the surrounding environment. Examples of BMPs may include the use of staked straw wattles, emplacement of silt control fencing, or other methods that would prevent erosion or migration of water.

1.9.11 Equipment Decontamination and Disposal

Waste may be generated as a result of decontamination and disposal of equipment or other material; however, hazardous waste outside of diesel fuel, gasoline, motor oil, or other regulated liquids for equipment operation is not anticipated for this project. Any used equipment or components such as batteries or used personal protective equipment (PPE) that must be disposed, will be placed in a suitable storage area pending accumulation of suitable quantities and will be disposed of as municipal waste in an appropriate manner. Refer to the project Waste Management Plan in Appendix J of the project UFP-QAPP.

1.9.12 Minimization of Disturbed Area

To minimize the impacts of vehicles and other equipment within the Southeastern Region MRS, vehicles will remain on existing roads to the extent practicable. All detonation holes shall be, to the greatest extent feasible, filled and returned to their previous state.

1.9.13 Air Monitoring

Air monitoring is not necessary for the activities planned during the RA. In the case that airborne contaminants are suspected, occupational exposure action levels will be monitored. If air emissions exceed action levels, respirators will be used.

1.9.14 Post-Activity Cleanup

Following completion of fieldwork activities, investigation-related debris created during the project will be removed. Site restoration is expected to be minimal (*e.g.*, pulling stakes, backfilling any holes, and removing equipment). Disturbed areas will be visually inspected immediately after completing site restoration and verified by USACE before final acceptance.

1.9.15 Ecological Resources Plan

The ERP for this project is provided as a separate stand alone document.

Section 2 **References**

- AECOS Consultants (Guinther, E. B., A. Whistler, R. David, S. Montgomery, and S. Burr), 2003. *Biological resources report for a proposed Marine Corps Jungle Warfare Training Area in Waikāne Valley on windward Oʻahu*. AC039.
- _____, (Guinther, E.B., R. David, and S. J. Montgomery), 2005. *Biological assessment support for OE/UXO efforts at the Waikane Training Area, Kahaluʻu, Windward Oʻahu*. Prepared for Donaldson Enterprises Inc. AC050.
- AECOS Inc. (Guinther, E.B., R. David, and S. J. Montgomery), 2010. *Natural resources surveys in advance of an explosives ordnance disposal operation in the Waikane Valley Impact Area, MCBH*. AECOS No. 1229B.
- Berger, A.J., 1988. “Terrestrial Vertebrates.” Appendix O of *Revised Environmental Impact Statement for the Proposed Waikane Golf Course Project*, 1989, Group 70. Honolulu.
- Cowardin, L.M., Carter, V., Golet, F.C., and E.T. LaRoe, 1979. *Classification of Wetlands and Deepwater Habitats of the United States*. Prepared for USFWS. FWS/OBS-79/31.
- DLNR, 1998. Indigenous Wildlife, Endangered and Threatened Wildlife and Plants, and Introduced Wild Birds. Department of Land and Natural Resources.” State of Hawaii. Administrative Rule §13-134-1 through §13-134-10, dated March 02, 1998.
- EPA, 2014. *40 CFR 260-270. Hazardous Waste*.
- Federal Register, 2012. *Part II. Department of the Interior Fish and Wildlife Service 50 CFR Part 17 Endangered and Threatened Wildlife and Plants; Endangered Status for 23 Species on Oahu and Designation of Critical Habitat for 124 Species; Final Rule*. Vol. 77: 181.
- Group 70, 1989. *Revised Environmental Impact Statement for the Proposed Waikane Golf Course Project*. Prepared for Waikane Development Company. Honolulu.
- LaGrande, M., 2012. “Biological Survey Report.” Appendix O of *Final Site Specific Final Report Munitions and Explosives of Concern (MEC) Removal Action and Supporting Functions Waikane Training Area, Island of Oʻahu, Hawaiʻi*. Prepared by Environet Inc.
- Lau, J., E, 2013. “Waikāne Valley Botanical Survey Oʻahu, Hawaiʻi”. Appendix B in *Draft Environmental Assessment for ʻŌhulehule Forest Conservancy Cacao Farm*. Prepared By Townscape for Paul Zweng.
- Maui Nui Seabird Recovery Project, 2015. Accessed at: <http://www.mauinuseabirds.org/newells-shearwater/>. Accessed in October 2015.

- Menard, T., 2001. *Activity patterns of the Hawaiian hoary bat (Lasiurus cinereus semotous) in relation to reproductive time periods*. Thesis. University of Hawaii. Department of Zoology (Ecology, Evolution, and Conservation Biology).
- Mink, J. F. and Lau, S., Oʻahu: 1987. *Aquifer Identification and Classification for Hawaiʻi: Groundwater Protection Strategy for Hawaiʻi*. Water Resources Research Center, University of Hawaiʻi, Technical Report 179. November 1987 (Revised 1990).
- Nagata, K.M., 1988. “Botanical survey: Waikane project area, Koolaupoko, Oahu.” Appendix N of *Revised Environmental Impact Statement for the Proposed Waikane Golf Course Project*, 1989, Group 70. Honolulu.
- SWCA Environmental Consultants, 2010. *Kahuku Wind Power Habitat Conservation Plan*. Prep. for Kahuku Wind Power LLC.
- USACE, 2003. DID MR-005-12, *Environmental Protection Plan*. 1 December.
- _____, 2015a. EM 200-1-15. *Environmental Quality Technical Guidance for Military Munitions Response Actions*. 30 October.
- _____, 2015b. *Decision Document, Southeastern Region MRS, RMIS ID: H09HI035401, Waikane Training Area, Kaneohe, Oʻahu, Hawaiʻi*. July.
- U.S. Army Garrison, Hawaiʻi and Pacific Cooperative Studies Unit, 2012. *2012 Status Report for the Makua and Oahu Implementation Plans*. Schofield Barracks, Oʻahu, Hawaiʻi.
- USFWS, 2001. “Endangered and Threatened Wildlife and Plants; Determination of Critical Habitat for the Oahu Elepaio (*Chasiempis sandwichensis ibidis*); Final Rule.” *Federal Register*, 66 (237; Monday, December 10, 2001): 63752-63782.
- _____, 2015a. *National Wetlands Inventory*. Available at: <http://www.fws.gov/wetlands/nwi/Overview.html>.
- _____, 2015b. *USFWS Threatened and Endangered Species System (TESS)*. Available at URL: http://ecos.fws.gov/tess_public/.
- USGS, 2015. *National Water Information System: Mapper*. Available at: <http://maps.waterdata.usgs.gov/mapper/index.html>. Accessed 10/15/2015.
- VanderWerf, E, 2013. “Waikane Valley Faunal Surveys – Final Report”. Appendix C in *Draft Environmental Assessment for ʻŌhulehule Forest Conservancy Cacao Farm*. Prepared By Townscape for Paul Zweng.
- Wilderness Institute, 2015. *Wilderness.net*. College of Forestry and Conservation University of Montana. Available at: <https://www.wilderness.net>. Accessed 10/15/2015.
- W.L. Wagner, D.R. Herbst, and S.H. Sohmer, eds., 1990. *Manual of the Flowering Plants of Hawaiʻi*. 2 vols. Honolulu: University of Hawaiʻi Press.

Appendix F
Accident Prevention Plan/Site Safety and Health Plan

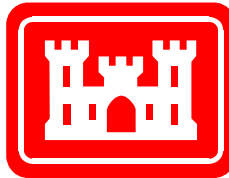
This Page Intentionally Left Blank

FINAL
ACCIDENT PREVENTION PLAN

**Munitions and Explosives of Concern Remedial Action
Former Waikane Training Area
Southeastern Region Munitions Response Site
Kāneʻohe, Oʻahu, Hawaiʻi**

RMIS ID: H09HI035401

Prepared for:



**U.S. Army Corps of Engineers
Honolulu District
Building 230
Fort Shafter, Hawaiʻi
96858-5440**

December 2016

This Page Intentionally Left Blank

Accident Prevention Plan Acknowledgment

I have read, understand, and agree to abide by the provisions as detailed in this Accident Prevention Plan prepared by GSI Pacific Inc. Failure to comply with these provisions may lead to disciplinary action and/or my dismissal from the work site.

Printed Name	Company	Signature	Date

This Page Intentionally Left Blank

Table of Contents

<i>Acronyms and Abbreviations</i>	<i>vii</i>
<i>Section 1 Signature Sheet</i>	<i>1-1</i>
<i>Section 2 Background Information</i>	<i>2-1</i>
2.1 Project Authorization	2-1
2.2 Introduction	2-1
2.3 Project and Work Description.....	2-2
2.4 Project Hazards	2-3
2.5 Anticipated Phases of Work.....	2-4
2.6 Contractor Accident Experience Modification Rate	2-6
<i>Section 3 Statement of Safety and Health Policy</i>	<i>3-1</i>
3.1 Health and Safety Policies	3-1
3.2 Program Goals.....	3-2
3.3 Program Objectives.....	3-2
3.4 Accident Experience Goal	3-2
<i>Section 4 Responsibilities and Lines of Authority</i>	<i>4-1</i>
4.1 Statement of Employer’s Responsibility.....	4-1
4.2 Identification of Personnel Responsible for Safety.....	4-1
4.3 Competent Person	4-3
4.4 Qualified Person.....	4-4
4.5 Pre-Task Safety and Health Analysis.....	4-4
4.6 Non-compliance, Disciplinary Actions, and Company’s Safety Incentive Programs ..	4-5
4.7 Lines of Authority.....	4-5
4.8 Management Accountability for Safety	4-5
<i>Section 5 Subcontractors and Suppliers</i>	<i>5-1</i>
5.1 Overview	5-1
5.2 Identification of Subcontractors and Suppliers	5-1
5.3 Control and Coordination of Subcontractors and Suppliers	5-1
5.4 Safety Responsibilities of Subcontractors and Suppliers.....	5-2
5.5 Subcontractor Safety Plans	5-2
5.6 Project Repository and Administrative Record	5-2
<i>Section 6 Training</i>	<i>6-1</i>
6.1 General	6-1
6.2 Safety Indoctrination.....	6-1
6.3 Mandatory Training and Certifications.....	6-2
6.4 Periodic Safety and Health Training	6-2
6.5 Requirements for Emergency Response Training	6-3
<i>Section 7 Safety and Health Inspections</i>	<i>7-1</i>
7.1 Specific Assignments of Responsibilities	7-1
7.2 Inspections/Audit Frequency	7-1
7.3 Deficiency Tracking.....	7-1

7.4	External Inspections/Certifications	7-2
Section 8 Mishap Reporting and Investigation		8-1
8.1	Exposure Data (man-hours worked)	8-1
8.2	Accident Reporting	8-1
8.3	Accident Investigations, Reports, and Logs.....	8-1
8.4	Immediate Accident Notification.....	8-2
Section 9 Plans, Programs, and Procedures Required by EM 385-1-1.....		9-1
Section 10 Medical Support.....		10-1
10.1	On-Site Medical Support	10-1
10.2	Off-Site Medical Support.....	10-1
10.3	Directions and Map to Nearest Hospital	10-2
10.4	First Aid and CPR Training	10-2
10.5	Medical Surveillance.....	10-3
Section 11 Personal Protective Equipment.....		11-1
11.1	Hazard Assessments.....	11-1
11.2	When Hazard Assessments Will Be Conducted	11-1
11.3	How Hazard Assessments Will Be Conducted	11-1
11.4	Personal Protective Equipment Training	11-2
11.5	Identifying Employee Training.....	11-2
Section 12 Site-Specific Hazards and Controls		12-1
Section 13 References.....		13-1

List of Figures

Figure 4-1: Project Organizational Chart, including Health and Safety Lines of Authority	4-7
--	-----

List of Tables

Table 2-1: Project Tasks	2-4
Table 2-2: GSIP’s EMR.....	2-6
Table 4-1: Project Safety Team	4-1
Table 4-2: Key Responsibilities.....	4-2
Table 4-3: Competent Person Requirements	4-4
Table 5-1: Subcontractors and Suppliers	5-1
Table 7-1: Inspections/Audit Frequency.....	7-1
Table 9-1: Plans Required by EM 385-1-1	9-1
Table 10-1: Emergency Contact Numbers.....	10-1
Table 10-2: First Aid and CPR Certification Expiration Dates	10-3
Table 11-1: Current Key Site Personnel Training/Certifications	11-3

Attachments

Attachment A	Maps
Attachment B	Site Safety and Health Plan
Attachment C	Certifications
Attachment D	Activity Hazard Analyses (AHAs)
Attachment E	OSHA 300 Form
Attachment F	Incident Reporting and Investigation Procedures
Attachment G	Forms

This Page Intentionally Left Blank

Acronyms and Abbreviations

%	Percent
AHA	Activity Hazard Analysis
ANSI	American National Standards Institute
APP	Accident Prevention Plan
ASP	Associate Safety Professional
CDL	Commercial Driver's License
CFR	Code of Federal Regulations
CHST	Construction Health and Safety Technician
CIH	Certified Industrial Hygienist
COC	Chain-of-Custody
COR	Contracting Officer's Representative
CPR	Cardiopulmonary Resuscitation
CSP	Certified Safety Professional
DDESB	Department of Defense Explosives Safety Board
DERP-FUDS	Defense Environmental Restoration Program for Formerly Used Defense Site
DID	Data Item Description
DOD	Department of Defense
DOT	Department of Transportation
DQCR	Daily Quality Control Report
EHS	Environmental Health and Safety
EM	Engineer Manual
EMR	Experience Modification Rate
EMS	Emergency Medical Services
EMT	Emergency Medical Technician
ENG	Engineer
EOD	Explosive Ordnance Disposal
EPA	U.S. Environmental Protection Agency
ER	Engineer Regulation
ESS	Explosives Safety Submission
EZ	Exclusion Zone
FAR	Federal Acquisition Regulation
FUDS	Formerly Used Defense Site
GIS	Geographic Information System
GPS	Global Positioning System
GSIP	GSI Pacific Inc.
H&S	Health & Safety
HAZCOM	Hazard Communication
HAZWOPER	Hazardous Waste Operations and Emergency Response
HTRW	Hazardous, Toxic, and Radioactive Waste
IATA	International Air Transport Association
IAW	In accordance with
IVS	Instrument Verification Strip
KO	Contracting Officer

MD	Munitions Debris
MDAS	Material Documented as Safe
MDEH	Material Documented as an Explosive Hazard
MEC	Munitions and Explosives of Concern
MPPEH	Material Potentially Presenting an Explosive Hazard
MRA	Munitions Response Area
MRS	Munitions Response Site
NTCRA	Non-Time Critical Removal Action
OESS	Ordnance and Explosives Safety Specialist
OHP	Occupational Health Program
OSHA	Occupational Safety and Health Administration
OSWER	Office of Solid Waste and Emergency Response
PM	Project Manager
PPE	Personal Protective Equipment
QC	Quality Control
RA	Remedial Action
RAC	Risk Assessment Code
RCRA	Resource Conservation and Recovery Act
ROE	Right-of-Entry
SOH	Safety and Occupational Health
SOP	Standard Operating Procedure
SSHP	Site Safety and Health Plan
SUXOS	Senior UXO Supervisor
TP	Technical Paper
UFGS	Unified Facilities Guide Specifications
UFP-QAPP	Uniform Federal Policy Quality Assurance Project Plan
U.S.	United States
USACE	U.S. Army Corps of Engineers
USMC	U.S. Marine Corps
UXO	Unexploded Ordnance
UXOQCS	UXO Quality Control Specialist
UXOSO	UXO Safety Officer
WTA	Waikane Training Area


Section 1 Signature Sheet

**Munitions and Explosives of Concern Remedial Action
Former Waikane Training Area
Southeastern Region Munitions Response Site
Kāneʻohe, Oʻahu, Hawaiʻi**

RMIS ID: H09HI035401

GSI Pacific Inc. (GSIP) has developed this Accident Prevention Plan (APP) for the above referenced project. This document with its attachments has been developed for the United States (U.S.) Army Corps of Engineers (USACE) in support of the Munitions and Explosives of Concern (MEC) Remedial Action (RA), Former Waikane Training Area (WTA) Southeastern Region Munitions Response Site (MRS) Kāneʻohe, Oʻahu, Hawaiʻi. The individuals referenced below have reviewed and approved this APP. Procedures for the submission, approval, integration, and implementation of changes to this APP are discussed within the body of the APP and will be followed whenever a change will significantly impact the safety of site personnel, the environment, or offsite personnel.


Plan Prepared by:



Robert W. Cook, CSP, ASP, CHST
Health and Safety Manager
Phone: (808) 354-3783

11/22/16
Date

Plan Approved by:



Mike Coyle, CSP
Corporate Health and Safety Manager
Phone: (808) 349-3178




11/23/16
Date



David Gerow, CIH
Certified Industrial Hygienist
Phone: (808) 651-3977

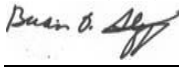
11/23/16
Date

Plan Reviewed and Concurred by:



Daniel Wolf
Project Manager
Phone: (808) 895-7815

11/22/16
Date



Brian Stepp
Senior Project Manager
Phone: (808) 754-1914

11/28/16
Date

This Page Intentionally Left Blank

Section 2 Background Information

2.1 Project Authorization

Contractor and Address: GSI Pacific Inc.
181 South Kukui Street, First Floor
Honolulu, HI 96813

Contract No.: W9128A-15-C-0006

Project Name: Munitions and Explosives of Concern Remedial Action,
Former Waikane Training Area, Southeastern Region
Munitions Response Site, Kāneʻohe, Oʻahu, Hawaiʻi

2.2 Introduction

This APP presents the minimum requirements for health and safety (H&S) that must be met by personnel engaged in the MEC RA at the former WTA, Southeastern Region MRS, Kāneʻohe, Oʻahu, Hawaiʻi.

This APP does not in any way relieve site personnel, contractors, or subcontractors from responsibility for the safety and health of their personnel. Contractors are required to review project site conditions and the work to be performed and determine specific safety and health requirements for their personnel. Visitors to the site will receive a safety briefing by the Unexploded Ordnance (UXO) Safety Officer (UXOSO) or designee prior to gaining entry to the work area and an onsite visitor log will be maintained. The UXOSO will provide all visitors appropriate personal protective equipment (PPE) and the Senior UXO Supervisor (SUXOS) will provide an UXO escort while on site.

The APP is the interface with GSIP's Corporate Environmental Health and Safety (EHS) program and the project specific field team. It is prepared to be consistent with all applicable Army, Federal, state, and local H&S requirements, which include the following:

- 29 Code of Federal Regulations (CFR) 1904, 1910, and 1926 (Occupational Safety and Health Administration [OSHA] General Industry and Construction Standards, respectively);
- U.S. Environmental Protection Agency (EPA) Standard Operating Safety Guides, Office of Solid Waste and Emergency Response (OSWER), June 1992;
- Resource Conservation and Recovery Act (RCRA) of 1976;
- 49 CFR – U.S. Department of Transportation (DOT) Commercial Driver's License (CDL) and Shipping;
- Engineer Manual (EM) 385-1-1, USACE Safety and Health Requirements Manual, 30 November 2014;
- USACE EM 385-1-97 Explosives-Safety and Health Manual, 17 May 2013;

- Federal Acquisition Regulation (FAR) 52.236-13;
- Engineer Regulation (ER) 385-1-95 Safety and Health Requirements for Operations and Activities Involving MEC;
- Unified Facilities Guide Specifications (UFGS), 01 35 26, Safety and Occupational Health (SOH) requirements, 2012; and
- Data Item Description (DID) MMRP-09-005, APP 19 August 2009.

Accident prevention is a key program element to achieve compliance and strive towards our ultimate goal of zero safety incidents. Personnel active in site operations will be thoroughly familiar with the programs and procedures outlined in this APP before conducting work at the site. All site personnel, including the project team and subcontractors, who may be covered by this APP must review or be provided a detailed briefing on the contents of this document and sign the APP Acknowledgement before performing work on the project site.

The measures presented here are in effect for the duration of the project. The procedures and guidelines contained herein are based upon the best available information at the time of the plan's preparation. Any revisions to this plan will be made with the knowledge and approval of the USACE.

2.3 *Project and Work Description*

The USACE has contracted GSIP to perform a MEC RA at the 36-acre area within the Southeastern Region MRS, former WTA, Kāneʻohe, Oʻahu, Hawaiʻi. A site map is attached (Figure A-1, Attachment A).

The former WTA Munitions Response Area (MRA), a Formerly Used Defense Sites (FUDS) Property Number H09HI0354, is located on the coastal plain adjacent to Kāneʻohe Bay and on the slopes of the Koʻolau Mountain Range in the District of Koʻolaupoko, Island of Oʻahu, Hawaiʻi. The former WTA MRA (933 acres) is a portion of the Waikane Valley Training Area (1,061 acres) that was used from 1942 to 1976 by the Department of Defense (DoD) as a training and artillery impact area. The remainder of the Waikane Valley Training Area (128 acres) is currently owned by the U.S. Marine Corps (USMC) and is therefore not an eligible property under the Defense Environmental Restoration Program for Formerly Used Defense Sites (DERP-FUDS) program.

Based on the previous investigation conducted at the site, the former WTA MRA was divided into three regions (Southeastern Region MRS [151 acres], Southern Impact Region MRS [90 acres], and Western/Mountainous Region MRS [692 acres]) (USACE, 2013b).

The Southeastern Region MRS (RMIS ID H09HI035401) consists of approximately 151 acres and is bordered by the Southern Impact Region MRS to the west, the USMC parcel to the north, and the City and County of Honolulu property to the south and east. The MRS is characterized by dense vegetation, steep terrain, and an unimproved dirt access road leading into and out of the area. The terrain in the MRS is comprised mostly of rolling hills with areas of steep slopes in

excess of 58 percent (%) grade. The access road has a gated and locked entrance; and extends off of Waikane Valley Road.

This MEC RA is focused on approximately 36 acres of the Southeastern Region MRS. The 36 acres identified for the RA includes an expanded area around the previous Non-Time Critical Removal Action (NTCRA) area in the Southeastern Region MRS; in focused areas where anticipated future land use includes intrusive activities; and in areas where the highest munitions debris (MD) density was identified (USACE, 2015).

2.4 Project Hazards

The hazards associated with this MEC RA include but are not limited to the following: MEC present due to past uses as a target range, walking on uneven surfaces, heat stress, severe weather, explosive disposal operations, and exposure to biological hazards. The biological hazards include exposure to toxic and irritant plants and exposure to stinging and biting insects. An Activity Hazard Analysis (AHA) has been prepared for all the definable features of work. The AHA includes the anticipated hazards, proposed hazard mitigation strategies, and a Risk Assessment Code (RAC) for each hazard (Attachment D). All definable features of work have been assessed as a medium risk after controls are implemented.

The former WTA is located on the coastal plain adjacent to Kāneʻohe Bay and on the slopes of the Koʻolau Mountain Range in the District of Koʻolaupoko, Island of Oʻahu, Hawaiʻi. There are established emergency response services, including firefighting, ambulance service, water rescue, and air ambulance. The remoteness of the site requires additional planning for emergency response, which is addressed in the Emergency Recognition and Response Procedures (Section 15) of the Site Safety and Health Plan (SSHP).

Tasks to be performed include, but are not limited to the following:

- Mobilization;
- Site Preparation;
- Biological and Archaeological Surveys and Monitoring;
- Vegetation Clearance;
- Instrument Verification Strip (IVS);
- Surface and Subsurface Clearance;
- Explosive Disposal Operations;
- Material Potentially Presenting an Explosive Hazard (MPPEH) Management;
- Data Management;
- Site Restoration; and
- Demobilization.

2.5 *Anticipated Phases of Work*

This project shall be executed during work hours from is 0630 – 1700 Monday through Thursday (note that only eight hours per day will be considered performing hazardous duty meeting the 40 hour per week limit). Extended work hours, weekend work, and holiday work shall be requested and coordinated through the Project Manager (PM) and approved by the Contracting Officer (KO) if needed. The definable features of work are provided in Table 2-1 below.

Table 2-1: Project Tasks

Definable Features of Work	Tasks
Mobilization	<ul style="list-style-type: none"> ▪ Planning documents (<i>e.g.</i>, Explosives Safety Submission [ESS], Uniform Federal Policy Quality Assurance Project Plan [UFP-QAPP], and Archaeological Monitoring Plan approved ▪ Rights-of-Entry (ROEs) approved ▪ Personnel resumes and certificates approved ▪ Site orientation and training completed
Site Preparation	<ul style="list-style-type: none"> ▪ Exclusion Zone (EZ) and support established ▪ Survey control established by Hawaiʻi licensed Professional Land Surveyor ▪ Boundary survey established ▪ Grid layout established
Biological and Archaeological Surveys and Monitoring ¹	<ul style="list-style-type: none"> ▪ Biological and archaeological brief completed by Qualified personnel ▪ Biological and archaeological surveys conducted by Qualified personnel ▪ Biological and archaeological monitoring and avoidance, if required, performed by field personnel
Vegetation Clearance	<ul style="list-style-type: none"> ▪ Grasses, small scrubby brush, and trees less than 3 inches in diameter will be cut using a slashbuster mounted on an excavator
IVS	<ul style="list-style-type: none"> ▪ Equipment functionality testing performed ▪ IVS installed ▪ Blind seeds installed in IVS Analog survey conducted ▪ Analog anomalies detected flagged and locations recorded in GPS ▪ IVS Letter Report documents selected instruments and results ▪ IVS is utilized for daily testing of the selected instruments during anomaly avoidance and surface and subsurface clearance

Definable Features of Work	Tasks
Surface and Subsurface Clearance	<ul style="list-style-type: none"> ▪ Equipment functionality testing performed ▪ Survey lanes established ▪ Coverage/blind seeding emplaced in grids ▪ Analog survey conducted ▪ Analog anomalies detected flagged and locations recorded in Global Positioning System (GPS) ▪ Excavate anomalies ▪ Seeds recovered ▪ Record anomaly results in GPS and/or grid sheet ▪ MPPEH explosives safety status determination ▪ MEC/Material Documented as an Explosive Hazard (MDEH) safe or unsafe to move determination and explosive disposal operations ▪ Material Documented as Safe (MDAS) storage ▪ Submit for quality control (QC)
Explosive Disposal Operations	<ul style="list-style-type: none"> ▪ Conduct safety briefings ▪ Coordinate notifications and EZ control ▪ Accept and store explosives in accordance with (IAW) the ESS (explosives and magazine will be supplied by the subcontractor on a as needed basis) ▪ Prepare site for disposal operations (<i>e.g.</i>, construct engineering controls if required) ▪ Check remote firing device system ▪ Perform explosive disposal during time window and clear shot
MPPEH Management	<ul style="list-style-type: none"> ▪ MPPEH certification and verification process (two independent 100% inspection) ▪ Prepare and maintain Chain-of-Custody (COC) for all MEC, MDEH, and MDAS items ▪ Establish controls to prevent comingling between MPPEH, MDAS, and MDEH ▪ MDAS packaging, storage, and transportation compliant with existing directives including restricted/secure area ▪ MDAS accountability and security and transfer to a qualified receiver compliant with existing directives
Data Management	<ul style="list-style-type: none"> ▪ Provide field team with required electronic and hard copy data (maps, Geographic Information System [GIS] shapefiles) prior to going into the field ▪ Interface with GIS Manager to upload/download data ▪ Provide field team with maps and data files (<i>e.g.</i>, coordinates) for clearance operations ▪ Upload field data files (<i>e.g.</i>, field forms, photos, geophysical and sample data) into project database ▪ Verify that all field data files are accurate, complete and present on backup media on remote server prior to demobilization
Site Restoration	<ul style="list-style-type: none"> ▪ Backfill excavations (return excavated soil to the hole in reverse order) ▪ Remove temporary stakes ▪ Site cleanup

Definable Features of Work	Tasks
Demobilization	<ul style="list-style-type: none"> ▪ Equipment demobilization ▪ MDAS shipped ▪ Travel arrangements

2.6 Contractor Accident Experience Modification Rate

GSIP’s Intrastate Accident Experience Modification Rate (EMR) since 2013 is presented in Table 2-2. The EMR is calculated by measuring the difference between a company’s actual past workers’ compensation claims as compared to the average expected claims experience for companies performing the same type of work. An EMR is calculated using a rolling three-year period.

Table 2-2: GSIP’s EMR

Year	EMR
2015	0.71
2014	0.82
2013	1.00

Section 3 Statement of Safety and Health Policy

3.1 Health and Safety Policies

The management of GSIP is committed to ensuring the health, safety, and well-being of our employees and the communities in which we work, to enhancing and protecting the environment, and to providing quality services to our clients. The RA project team employees consist of field managers, safety personnel, and subcontractors. All team employees will adhere to the corporate safety policy as well as operate and foster a work environment where safety is the highest priority and, at no time, will it be compromised for productivity. It is GSIP's corporate policy to pursue every reasonable effort to provide a safe and healthy working environment. The GSIP's policy on H&S emphasizes several key points:

- GSIP operates with a expectation of working safely 100% of the time (employees and subcontractors) with the goal of zero incidents that result in injuries, illnesses, property damage or environmental damage or contamination;
- All managers and workers assume a safety leadership role and acknowledge that they are responsible for their actions and those subordinate to them;
- All managers and workers take action for safety, coach peers in safe practices, and share experiences, successes, and failures;
- Workers are involved in the identification and control of workplace hazards during work planning, work execution, and feedback activities;
- All workers acknowledge and understand that they have stop work authority at any time that a safety challenge arises;
- Management is committed to a work environment that allows free and open expression of safety concerns, and where workers fear no reprisals or retaliation; and
- Workers are our most important asset to GSIP and are the critical resources for establishing, implementing, and observing safe work practices.

3.1.1 100% Safe Work and Stop Work Policy Statement

For each activity and contract under which GSIP performs work, a policy is implemented clearly stating that GSIP employees have the responsibility and right to stop or curtail any work they perceive to be unsafe (a threat to public health, the safety and health of workers, or the environment). Employees must be free to voice concerns about H&S without fear of reprisal, retaliation, or harassment.

To support the GSIP expectation of all employees and subcontractors working safely 100% of the time, all managers will utilize every available resource to maintain safe, hazard-controlled work environments characterized by a vigorous emphasis on accident prevention. Standards, requirements, and best practices will be implemented in a manner that maximizes the prevention of accidents. Managers will ensure that all employees are knowledgeable of those standards, requirements, and best practices that pertain to their safety.

GSIP managers and supervisors are held directly accountable for the H&S of their employees, subcontractor activities, and other resources employed to maintain employee H&S, and the continual communication of hazards and hazard controls to the workforce.

3.2 Program Goals

GSIP has implemented a shared safety responsibility program where employees assume a safety leadership role and are responsible for the safety of coworkers, team members, visitors, and stakeholders. As part of this program, all employees create high-quality integrated connections with one another, team members, and stakeholders to foster an active, caring culture. Commitment is absolute. Ideas and safety concerns will be discussed each day during the safety meeting on how these program goals can be strengthened and hazards controlled.

3.3 Program Objectives

EHS staff, resources, and procedures are provided as necessary and used in an efficient and cost-effective manner to establish a safe work environment for the GSIP employees, subcontractors, clients, and the general public. This is the responsibility of the entire project team.

Compliance with environmental H&S regulations is assured, and risk is managed and minimized for all employees, as well as the corporation.

Requirements of management and individual commitment, teamwork, and implementation of the EHS program are followed.

Clear lines of reporting, authorities, responsibilities, and performance expectations are established.

Maintain zero incident expectations. This means error-free execution of work: no injuries, illnesses, damage to property or equipment, adverse impacts to the community or the environment, or deviations from plans or procedures.

3.4 Accident Experience Goal

GSIP gathers information on all incidents to assess trends and causes of incidents. By learning from past experience (lessons learned), we can plan to avoid recurrence of incidents. This information is used in training as well as in the development of APPs, SSHPs, and AHAs. This is in keeping with GSIP's goal of maintaining a zero incident expectation.

Section 4 *Responsibilities and Lines of Authority*

In order to carry out the tasks associated with a successful project, many individuals will be involved including the GSIP management team, field crews, and additional subcontractors. The PM shall have the overall responsibility of the project while the SUXOS shall have the responsibility for the site. The UXOSO shall have responsibility for the overall safety related tasks during the MEC RA, including but not limited to: daily tailgate safety meetings, training the project team on the APP and AHAs, emergency communications, and safety inspections. While the UXOSO reports to the Corporate H&S Manager and the PM, the expectation is the UXOSO will make all safety related decisions in the field. This includes maintaining safety standards and requiring all subcontractors to abide by safety requirements when on site. If at any time an unsafe condition exists the UXOSO or any personnel has the authority to stop work and determine a safe course of action.

4.1 *Statement of Employer’s Responsibility*

As the prime contractor, GSIP is ultimately responsible for the implementation of the EHS Program through enforcing the H&S for this project as stated in this APP and the SSHP (see Attachment B of this APP). The GSIP’s senior and corporate management is committed to operating projects in a manner consistent with controlling EHS legislative, regulatory, and client requirements, and other applicable requirements administered by federal agencies. The responsibilities, organizational structure, recordkeeping requirements, and evaluation of the EHS Program are discussed below.

4.2 *Identification of Personnel Responsible for Safety*

Table 4-1 presents the key project personnel responsible for Safety Program implementation for this project. Resumes for key project team safety personnel are included as an attachment to the project UFP-QAPP. Key responsibilities of each position are provided in Table 4-2.

Table 4-1: Project Safety Team

Name	Position	Telephone Numbers ¹
Daniel Wolf	PM	(808) 895-7815
Brian Stepp	Senior PM	(808) 754-1914
Mike Coyle, CSP	Corporate H&S Manager	(808) 349-3178
Robert Cook, CSP, ASP, CHST	H&S Manager/UXOSO	(808) 354-3783
John Coberley	UXO QC Specialist (UXOQCS)/Alternate UXOSO	(808) 887-1131
David Gerow, CIH	CIH	(808) 651-3977
Marco Beltran	SUXOS	(808) 960-3362
Daniel Haines	QC Manager	(808) 896-9845

Notes:

¹ Telephone numbers shall be confirmed/revised prior to field mobilization and revised as necessary.

ASP - Associate Safety Professional

CHST - Construction Health and Safety Technician

CIH - Certified Industrial Hygienist

CSP - Certified Safety Professional

Table 4-2: Key Responsibilities

Position	Description of Key Responsibilities
PM: Daniel Wolf	<ul style="list-style-type: none"> ▪ Responsible and accountable for project safety; ▪ Ensure development and implementation of the project APP and SSHP and indicate concurrence with final plans after required H&S reviews; ▪ Ensure project personnel meet applicable safety certification requirements; ▪ Ensure project support is acquired from appropriately qualified safety personnel such as the H&S Manager, and UXOSO; ▪ Ensure project personnel comply with applicable H&S requirements and corporate or client procedures; ▪ Halt any project work activities that represent an imminent hazard; ▪ Ensure appropriate safety equipment and materials are provided to the project; ▪ Ensure timely and accurate reporting and investigation of incidents, accident, or injuries involving project personnel, with support from the risk management department; ▪ Ensure corrective actions are implemented completely; ▪ Ensure proper response and internal notification regarding inspections by regulatory agencies; and ▪ Ensure all project personnel have met the site-specific experience and training requirements.
Corporate H&S Manager: Mike Coyle, CSP	<ul style="list-style-type: none"> ▪ Approve and ensure the implementation of the GSIP Corporate EHS Program, the APP, SSHP, and any amendments; ▪ Conduct field audits to assess the effectiveness and implementation of the APP and SSHP; and ▪ Evaluate and authorize changes to the APP and SSHP based on field and occupational exposure, as necessary.
H&S Manager: Robert Cook, CSP, ASP, CHST	<ul style="list-style-type: none"> ▪ Provide support to the Corporate EHS Program and to the implementation of the APP, SSHP, and any amendments; ▪ Serve as a technical safety advisor and provides technical assistance and support; ▪ Conduct field audits to assess the effectiveness and implementation of the APP and SSHP; and ▪ Review the APP and SSHP and modify as necessary.
UXOSO: Robert Cook, CSP, ASP, CHST	<ul style="list-style-type: none"> ▪ Oversee and maintain the GSIP Corporate H&S Program, the APP, SSHP, and any amendments; ▪ Conduct site audits to identify the effectiveness of the APP and SSHP; ▪ Serve as a technical safety advisor and provides technical assistance and support; ▪ Assist the Corporate H&S Manager and H&S Manager with development of the APP and SSHP and modify as necessary; ▪ Responsible for implementing the APP and SSHP by ensuring that all project personnel, including subcontractors, follow the requirements of the APP and SSHP; ▪ Be present during UXO operations and ensure the implementation of the ESS and other guidance; ▪ Directly communicate with and report any incidents that occur on site to the SUXOS, PM, and H&S leadership; ▪ Conduct daily safety meetings for site personnel to discuss the day’s activities, associated hazards, and UXO safety; ▪ Review site personnel training and experience documentation to ensure compliance with the APP and SSHP;

Position	Description of Key Responsibilities
	<ul style="list-style-type: none"> ▪ Coordinate changes/modifications to the APP and SSHP with the appropriate site personnel. ▪ Conduct or coordinate project-specific training; ▪ Implement safety corrective actions through training and reinforced awareness; ▪ Maintain exposure data; and ▪ Has stop-work authority for all safety issues.
Alternate UXOSO: John Coberley	<ul style="list-style-type: none"> ▪ Will assume all UXOSO duties in the event that the UXOSO is unavailable.
UXOQCS: John Coberley	<ul style="list-style-type: none"> ▪ Monitor all activities during removal activities; ▪ Ensure that procedures are being carried out IAW established requirements and protocols; ▪ Understand the project’s quality-related requirements and the plans and procedures for implementing them; ▪ Perform a QC check of all grids completed by the UXO Teams; ▪ Perform Quality Inspections of safety compliance; ▪ Prepare the Daily QC Report (DQCR); and ▪ Communicate directly with the Quality Control Manager.
SUXOS: Marco Beltran	<ul style="list-style-type: none"> ▪ Monitor all activities during removal activities; ▪ Ensure that procedures are being carried out IAW established requirements and protocols; and ▪ Understand the project’s quality-related requirements and the plans and procedures for implementing them.

4.3 *Competent Person*

According to OSHA Regulation 29 CFR 1926.32, site personnel will include a Competent Person. No work shall be performed without a Competent Person on site. A list of competent person requirements and regulatory references is presented in Table 4-3. Mr. Robert Cook meets these requirements and has been approved by the GSIP’s Corporate H&S Management.

Mr. Cook is a competent person as stated in OSHA 29 CFR 1926.32. As required by EM 385-1-1, Mr. Cook has at least five years of applicable safety experience and has successfully completed the OSHA 30-hour construction safety course (or equivalent course). Mr. Cook has performed work on a site(s) of similar hazard, risk, and complexity to the task assignment, and is certified in first aid and cardiopulmonary resuscitation (CPR). Mr. Cook also has at least two years of experience implementing SOH procedures and experience conducting exposure monitoring to select and adjust PPE; however, it is unlikely that such adjustments will be needed.

The qualifications of site-specific personnel will be maintained on site. The certifications and overall qualifications of all GSIP personnel are maintained (see Attachment C).

Table 4-3: Competent Person Requirements

Competent Person Requirement	Regulatory Reference	Person Designated
UXOSO	EM 385-1-1 Sec. 01.A.17; Department of Defense Explosives Safety Board (DDESB) Technical Paper (TP)-18	Mr. Robert Cook
Hazardous Waste Operations and Emergency Response (HAZWOPER)	EM 385-1-1.28 29 CFR 1926.65	Mr. Robert Cook
General Inspections of Construction Sites	EM 385-1-1.01.A.12 29 CFR 1926.20	Mr. Robert Cook
Unsanitary Conditions	EM 385-1-1.02 29 CFR 1926.27	Mr. Robert Cook
Hearing Protection	EM 385-1-1.05.C 29 CFR 1926.101	Mr. Robert Cook

4.4 *Qualified Person*

Site personnel will also include a Qualified Person. GSIP will permit only those employees qualified by training or experience to conduct UXO operations, or operate equipment and machinery such as vehicles, and gators, in compliance with DDESB TP-18 and OSHA 29 CFR 1926.20(b)(4). According to OSHA 29 CFR 1926.32, “qualified” means one who, by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training, and experience, has successfully demonstrated the ability to solve or resolve problems relating to the subject matter, the work, or the project. The qualified person for the MEC RA at the Southeastern Region MRS will be Mr. Robert Cook.

The SUXOS, UXOSO, UXOQCS, and UXO Technicians III and II will meet the requirements of the DDESB TP-18 for the positions assigned. The qualifications of all site-specific personnel will be maintained on site. The certifications and overall qualifications of all project team personnel are maintained in a database supported by the project team. Documentation will be reviewed and maintained by the UXOSO, and is available for USACE review upon request.

4.5 *Pre-Task Safety and Health Analysis*

Pre-Task Safety and Health Analysis begins for the project team at the proposal phase utilizing available documentation and site visits. The process continues through development of the APP, AHAs, JSAs during tailgate meetings, and the SSHP (Attachment B).

GSIP has extensive experience in UXO removal actions throughout the Pacific Islands and on the U.S. Mainland and has used this knowledge in developing the AHAs. The PM or SUXOS will ensure that a survey is conducted for each work area during mobilization to identify sources of all types of hazards and confirm that the APP, AHAs, and SSHP address these hazards. If necessary, the AHAs (provided in Attachment D) will be updated to reflect any additional hazards identified.

4.6 Non-compliance, Disciplinary Actions, and Company's Safety Incentive Programs

4.6.1 Non-compliance

Although non-compliance is not expected, H&S program violations can and will result in disciplinary action up to and including dismissal. All employees understand that safety is of the utmost importance to GSIP. All personnel understand the importance of compliance with all applicable regulations and project requirements. For subcontractors, immediate dismissal from the project will be implemented for willful non-compliance.

4.6.2 Disciplinary Actions

Personnel violating safety procedures are subject to dismissal/removal from the project site.

4.6.3 Incentive Programs

Project-specific financial and other incentive plans are developed and integrated with safety and health goals as an overriding component. Safety incentive programs are developed for large projects or programs. The incentive programs are site and contract specific. An incentive program has not been developed for this project; however, the PM has the option of nominating employees who perform exemplar work for incentive awards.

4.6.4 Safety Observer Program

Safety Observer Program is a program that provides the GSIP's employees positive opportunities to become engaged in the H&S Program. Employees are encouraged to utilize the Safety Observer Program to report near incidents or to identify workplace hazards and their proposed solutions. The submitted Safety Observations are evaluated, and the authors of the most highly regarded observations are recognized and may be eligible for incentives.

4.7 Lines of Authority

Lines of authority are provided in Figure 4-1.

4.8 Management Accountability for Safety

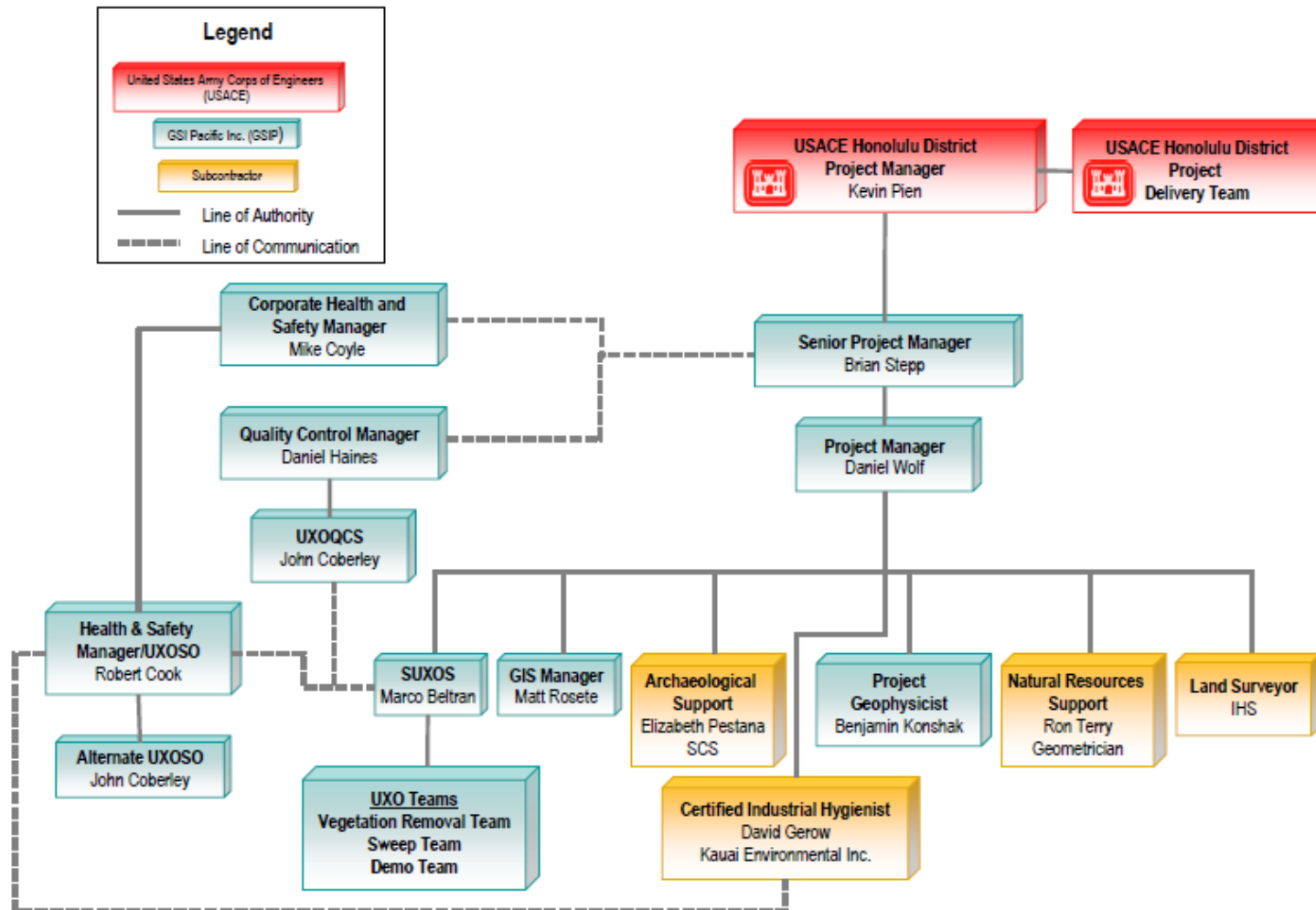
GSIP managers and supervisors are held directly accountable for the H&S of their employees, for subcontractor activities, and for the continual communication of hazards and hazard controls to the workforce. The H&S Manager will assess the safety and health performance of employees. This same requirement and expectation is expected from all subcontractors as well.

The accountability of supervisors and managers for the implementation of the H&S program is ensured through project reviews with senior management and through annual employee performance evaluations.

This Page Intentionally Left Blank

Figure 4-1: Project Organizational Chart, including Health and Safety Lines of Authority

Project Organizational Chart



This Page Intentionally Left Blank

Section 5 Subcontractors and Suppliers

5.1 Overview

GSIP will provide oversight and coordinate onsite/field activities to ensure the successful execution of tasks described within this APP. Each subcontractor is responsible for providing supervision of its employees (as defined by 29 CFR 1910) and will provide qualified personnel and/or competent persons as, and where, required by law or regulation. The UXOSO, in coordination with each subcontractor, will be responsible for managing and recording any injury or incident involving its employees as required by OSHA or other applicable laws and regulations. All injuries or incidents shall be reported to the UXOSO immediately. In cases where a site has multiple employers that may be impacted by site activities, coordination with each affected employer will be required. At a minimum, a copy of the APP and the applicable AHAs shall be offered to, and discussed with, each affected employer at a preparatory meeting. The purpose of the meeting will be to coordinate work activities and share pertinent emergency response information.

A record of the meeting will be maintained in the project file on site. Unless project conditions change that warrant communication to discuss work activities, it shall be the employer's responsibility to share relevant information regarding site activities to affected personnel.

5.2 Identification of Subcontractors and Suppliers

Subcontractors currently known and anticipated to work on the project are identified in Table 5-1 below. Suppliers (*e.g.*, roll-off delivery/pickup, explosives delivery) will be used and will comply with all applicable safety requirements while on site. It is unlikely any suppliers will head out to the work locations due to ground conditions. Deliveries and pickups will be coordinated with the supplier as to a location best suited for both parties.

Table 5-1: Subcontractors and Suppliers

Service	Subcontractor
Archaeologist	SCS Hawaii
Cultural and Natural Resources Support	Geometrician
Surveyor	Independent Hawaii Surveyor
Certified Industrial Hygienist	Kauai Environmental Inc.

5.3 Control and Coordination of Subcontractors and Suppliers

GSIP is ultimately responsible for ensuring subcontractor and supplier compliance with the APP and SSHP for this project. The subcontractor will assign a Site Safety Representative who will be responsible for coordinating projects and safety responsibilities for their personnel as designated and directed by the GSIP's UXOSO. Non-compliance with this plan will result in a stop work order, as determined by the UXOSO.

5.4 Safety Responsibilities of Subcontractors and Suppliers

The Site Safety Representative will interact with the UXOSO to ensure compliance with this APP by updating information on site conditions, upcoming activities, and any newly observed safety hazards. Safety Representatives will also take part in the daily safety meetings. Subcontractor employees are expected to comply with this APP, USACE EM 385-1-1, and other applicable regulations governing their safety while on the project. In the event of a conflict, the more stringent requirements will apply. Any changes in key project personnel will be coordinated with the USACE and prior approval from the USACE KO or the Contracting Officer's Representative (COR) will be obtained. The Site Safety Representative will:

- Attend all H&S briefings;
- Address worker issues and immediately stop work if unsafe acts/conditions exist or if uncertainty associated with how a task is to be performed exists;
- Coordinate corrective action with the UXOSO prior to resuming operations;
- Participate in any incident investigations alongside the UXOSO;
- Inspect operations and work areas daily, in conjunction with the UXOSO;
- Ensure subcontract workers have the proper PPE; and
- Control all hazardous material brought on site.

5.5 Subcontractor Safety Plans

This APP may not address all of the specific hazards that may be associated with the subcontractor's scope of work. When a subcontractor's work is not addressed by the APP, the subcontractor will be required to develop and implement their own H&S Plan/AHA.

5.6 Project Repository and Administrative Record

Subcontractor employees working on this project are covered by this APP and will be required to sign the Acknowledgement Form in both this APP and the SSHP indicating that they have read, understand, and agree to follow the requirements in these documents. The UXOSO will obtain and verify the subcontractor personnel training records prior to subcontracted work activities commencing.

Section 6 Training

6.1 General

This section describes general training, safety meetings, site-specific training, hazard communication, first aid, CPR, and other additional training and/or certifications needed to work on the site. The majority of the training will occur before mobilization to the project site and is typical of training required for work on an environmental clean-up site and MRS.

Personnel assigned to this project shall be required to receive the required training. Records of the required training and certifications will be maintained in the GSIP Corporate Office and records of required training will be available on site at all times.

6.2 Safety Indoctrination

When hired, GSIP staff members are required to complete H&S training appropriate to their role and responsibility level, which often involves hazardous, toxic, and radioactive waste (HTRW) and/or UXO. New hires that have previously completed such training are required to provide documentation of training.

New employees also participate in the project team's orientation training program. All personnel receive training on the project team's H&S policies, including environmental aspects, emergency action plans, security plans, ergonomics, incident-reporting procedures, Safety Observer, and site/job specific training.

The site specific safety indoctrination training will be vital for the staff and for the success of the project. This site specific safety indoctrination training will occur before mobilization onto the project site. The UXOSO, SUXOS, and UXOQCS will present training material on the specific hazards of the site, the AHAs, and the emergency response protocols. Oʻahu, Hawaiʻi has well-established emergency response services, which are specific to the project location. The UXOSO shall ensure the project team clearly understands and can safely execute the emergency response plan documented in this APP.

Additional site-specific training topics will include:

- Accident prevention;
- Accident reporting (how and to whom);
- Medical facilities for emergency treatment and/or assistance;
- Safe work/stop work responsibilities;
- Reporting and correcting unsafe conditions;
- Job hazards/hazard control;
- Site-specific biological, physical, chemical, and or ionizing/non-ionizing radiation hazards as listed in the AHA;

- Company safety policies;
- Site briefings conducted prior to being granted site access;
- Site layout;
- Hazard control;
- Emergency response and notification;
- Hearing conservation;
- PPE;
- Buddy system;
- Spill prevention;
- Fire prevention;
- Hazard communication;
- Visitor access; and
- Any specific training required by regulations.

6.3 *Mandatory Training and Certifications*

Listed below are the training and certifications required for the MEC RA at the Southeastern Region MRS. Additional details of this site-specific training are presented in Section 5 of the SSHP (Attachment B).

- UXO training certification for UXO technicians as documented in DDESB TP-18;
- 40-hour HAZWOPER;
- 8-hour HAZWOPER Refresher;
- 24-hour on-the-job training IAW 29 CFR 1910.120 (e)(3)(i);
- OSHA 30-hour Construction Safety Training – at a minimum the UXOSO;
- 8-hour OSHA Supervisor Training for the SUXOS and UXOSO; and
- First-Aid/CPR/Bloodborne Pathogens – At a minimum two people.

Table 11-1 presents the training and certifications for site personnel.

6.4 *Periodic Safety and Health Training*

The UXOSO will present daily site safety briefings to onsite personnel prior to the start of the work shift. The purpose of the briefings is to assist personnel in safely conducting the scheduled work activities. The briefings will include the following:

- Tasks to be performed;

- Work method;
- General description of job scope;
- Work location;
- Equipment usage;
- Control of hazards;
- Weather conditions;
- Emergency response review;
- Applicable PPE; and
- Daily MEC training.

The briefings provide an opportunity for individuals to share observed safety deficiencies and recognitions. Attendance at these daily safety briefings is mandatory and will be documented by the UXOSO.

Additionally a tailgate safety briefing will be conducted and documented by each individual team covering applicable safety hazards, precautions, and mitigating factors for task-specific activities.

6.5 Requirements for Emergency Response Training

At least two site personnel will have current training in first aid and CPR. All site personnel will be trained in the use of fire extinguishers to provide emergency response. In the event specialized/elevated care is necessary, either the project team or the local on-call emergency medical technician (EMT)/ambulance service located in Kahaluʻu or Kāneʻohe will transport the injured person to the appropriate medical facility.

Outside assistance will be requested as detailed in the Emergency Response Plans included in the SSHP.

All site personnel will be trained in emergency response procedures during initial indoctrination training discussed above as well as continual training throughout the project. During this training, personnel will be briefed on the Hazard Communication (HAZCOM) Program, emergency equipment, and first aid procedures, as described in the SSHP. Personnel will also be briefed on emergency recognition and response procedures presented in Section 15 of the SSHP, which include:

- Pre-Emergency Planning;
- Personnel and Lines of Authority for Emergency Situations;
- Criteria and Procedures for Emergency Recognition and Site Evacuation;
- Decontamination and Medical Treatment of Injured Personnel (offsite or onsite treatment);

- Emergency Medical Facilities and Telephone Numbers for Responders;
- Criteria for Alerting Local Community Responders (ambulance or helicopter necessary);
- Fire Prevention, Protection, and Response; and
- Spills.

This training will be documented and will also involve a rehearsal of the emergency response procedures prior to the start of onsite activities. During this training, the route to and location of the evacuation point and the location of medical support will be discussed with each staff member.

Section 7 *Safety and Health Inspections*

7.1 *Specific Assignments of Responsibilities*

The UXOSO will conduct and document daily and weekly safety and health inspections. The certifications of the inspector (*i.e.*, the UXOSO) are provided as Attachment C of this APP. In addition, the UXOQCS, as part of the QC responsibilities, will conduct and document SOH inspections as prescribed in standard operating procedure (SOP) G-5 *Project Quality Control*.

Additionally, the UXOSO will ensure that project personnel are conducting daily vehicle inspections, heavy equipment inspections (when applicable), communication equipment checks, *etc.*

7.2 *Inspections/Audit Frequency*

The frequency at which inspections and audits will be conducted is provided below in Table 7-1.

Table 7-1: Inspections/Audit Frequency

Inspected by	Item	Daily	Weekly	Monthly	Quarterly
UXOSO	First Aid Kits			X	
UXOSO	Fire Extinguishers			X	
UXOSO	Vehicles (Trucks & Gators)	X			
UXOSO	Emergency Communications	X			
UXOSO	Environmental Health and Safety Inspection Checklist		X		
CSP or Designee	Site Audit				X

7.3 *Deficiency Tracking*

A Safety and Health Deficiency Tracking Log form presented in Attachment G will be used to document unacceptable work practices. The deficiency tracking form lists and monitors the status of safety and health deficiencies in chronological order; displays the type and description of the deficiency; the corrective action taken and the projected resolution date; date resolved; and the person responsible for the corrective action. The deficiency tracking system will be updated daily and posted on the safety bulletin board or a notice on the bulletin board shall state the location where it may be accessed by all workers upon request. In most cases discrepancies are corrected within 24 hours, those of greater severity are corrected immediately.

When a deficiency is identified, the UXOSO will follow-up by updating the deficiency tracking form to indicate the specific corrective action, the person(s) responsible for the correction, and the date by which the action needs to be accomplished. The UXOSO will also follow up by ensuring that the corrective action is accomplished in the timeframe indicated. During H&S audits, the deficiency log is reviewed to ensure that the corrective action process has been

implemented. The information from the deficiency tracking form is presented in daily safety meetings and monthly supervisor meetings so that lessons learned are disseminated.

7.4 External Inspections/Certifications

Although no external inspection is expected, regulatory agencies do conduct inspections from time to time. An inspector shall be treated as a professional and with courtesy. The regulatory agency inspector should introduce himself/herself to the manager in charge of the operation and present credentials to verify that he/she is representing a recognized regulatory agency, such as OSHA, DOT/International Air Transport Association (IATA), or EPA. Personnel who cannot demonstrate their affiliation with a recognized regulatory agency should not be allowed access to the project site or office. The project team must follow procedures listed in EM 385-1-97, Paragraph I.2.L.01 for an OSHA inspection. Guidance for DDESB visits are contained in EM 385-1-97, Paragraph I.2.M.01.

Any pre-inspection conference will be attended by the SUXOS and UXOSO, at a minimum. At that time, the scope of the inspection should clearly be described by the inspector. If the inspector has not described the scope of the inspection during the pre-inspection conference, the inspector will be asked to provide such description.

Prior to taking the inspector on site or into the office trailer, it is necessary to contact the PM, USACE, and either the Division Safety Officer or Corporate EHS Manager. The inspector will perform the inspection with the SUXOS and the UXOSO, which may include a walk-through inspection of the work-site or a targeted file/records review. The site or office inspection typically ends with a close-out conference during which the inspector may provide tentative findings. In some cases the inspector may forego the close-out conference and issue a written citation after leaving the site. On occasion, inspections may require more than one day.

Most regulatory agency inspectors seldom issue citations during the inspection; however, if an OSHA or EPA inspector observes an imminent hazard, he/she can order a work stoppage.

It is GSIP's practice to cooperate with all inspections. Information that is requested should be provided; however, requests for copies of documents, H&S plans, and training records should not be provided without first obtaining approval from GSIP's Corporate Management. Under no circumstances should any attempt be made to mislead the inspector.

Coordination of any regulatory agency inspection is the responsibility of the UXOSO who will accompany the inspector during all stages of the inspection.

Section 8 Mishap Reporting and Investigation

8.1 Exposure Data (man-hours worked)

The PM will track man-hours on a spreadsheet-type form and timesheets. The hours will be presented as a spreadsheet compilation of onsite project team personnel hours (including subcontractor hours) worked, any reportable accidents that occurred during the month, and also those that have occurred since the start of the project. The spreadsheet can also be used to calculate the OSHA Recordable Incident Rate. This spreadsheet will be maintained and be present at the project site either electronically or as a hard copy.

8.2 Accident Reporting

GSIP has an established Incident Reporting, Investigation, and Review (Attachment F), which lays out the steps required by the UXOSO and the GSIP management team on how to document and investigate an incident. During the site field work the UXOSO will document all incidents, including on-site first aid, IAW the procedure. Examples of incidents that require internal reporting and investigation include:

- Work-related injury or illness;
- Suspected hazardous substance exposure over the allowable exposure limit;
- Automobile or vehicle-related incidents;
- Significant property or equipment damage;
- Fire or explosion (unplanned);
- A spill or release (including air releases) to the environment; and
- Incidents at the discretion of the management team.

In addition to GSIP's internal incident reporting requirements, in the event of an OSHA recordable injury, or an at-fault vehicle incident, or equipment or property damage greater than \$5,000.00, the UXOSO shall be responsible for notifying the PM and Corporate H&S Manager immediately. The USACE Engineer (ENG) Form 3394 Accident Investigation Report (see Attachment G), POD 265-E, and the project team incident reporting and notification must be submitted to the Corporate H&S Manager within 24 hours of the incident. All recordable incidents will be reported to the KO/COR as soon as possible but not more than 24 hours after the incident to be followed within five days with a completed USACE ENG Form 3394, except for incidents requiring immediate notice, then follow procedures described in Section 8.4 of this APP.

8.3 Accident Investigations, Reports, and Logs

The project team will investigate all incidents, including near incidents or "near misses." No supervisor will decline to accept a report of injury from a subordinate. Investigation findings, along with appropriate corrective actions, will be reported verbally to the KO/COR as soon as

possible, but no later than 24 hours following the injury, and in writing within five days. Implementation of corrective actions will occur as soon as reasonably possible.

8.4 Immediate Accident Notification

GSIP will notify OSHA within eight hours of any fatality. All work-related inpatient hospitalizations of one or more employees, all work-related amputations, and all work-related losses of an eye will be reported within 24 hours of learning about it.

The following incidents require immediate notification, no later than one hour, to the KO/COR, or designee. The written follow-up to the KO/COR will utilize USACE Form 3394 Accident Investigation Report (see Attachment G):

- Fatal injury/occupational illness;
- Permanently disabling injury/occupational illness;
- Permanent partially disabling injury/occupational illness;
- Hospitalization of three or more people resulting from a single occurrence; and
- Property damage of \$500,000 or more.

Section 9 Plans, Programs, and Procedures Required by EM 385-1-1

Plans, programs, and procedures required by EM 385-1-1 and their disposition in the APP or SSHP are shown in Table 9-1.

Table 9-1: Plans Required by EM 385-1-1

Plan, Program or Procedure	Document Location
1. Fatigue Management Plan (01.A.20)	SSHP Section 10.7
2. Emergency Plans (01.E)	SSHP Section 15
(a) Procedures and tests (01.E.01)	Found under Criteria and Procedures for Emergency Recognition and Site Evacuation in SSHP Section 15.3
(b) Spill plans (01.E.01, 06.A.02)	SSHP Section 15.8
(c) Firefighting Plan (01.E.01, 19.A.04)	Found under Fire Prevention, Protection and Response in SSHP Section 15.7
(d) Posting of emergency telephone numbers (01.E.05)	APP Section 10.2, Table 10-1 and SSHP Section 15.6, Table 15-1; Posted in Field Office Trailer
3. Site Sanitation/Housekeeping Plan (02.B)	SSHP Section 10.10
4. Medical Support Agreement (03.A.01; 03.A.03)	APP Section 10
5. Blood-Borne Pathogen Program (03.A.05)	SSHP Section 14.1.3
6. Exposure Control Plan (03.A.05)	This plan is not required because there are no activities or known chemical hazards at the site that would be a possible exposure hazard.
7. Automatic External Defibrillator (AED) Program (03.B.04)	SSHP Section 14
8. Site Layout Plan (04.A)	This plan uses site maps found in Attachment A of this APP.
9. Access/Haul Road Plan (04.B)	This plan is not required because no haul road activities are anticipated. SSHP Section 10.8.1 discusses access into the work areas.
10. Hearing Conservation Program (05.C)	SSHP Section 5.8
11. Respiratory Protection Plan (05.G)	This plan is not required because no respiratory protection is anticipated. If respiratory protection is needed a separate Respiratory Protection Plan will be submitted.
12. Health Hazard Control Program (06.A)	This plan is not required because no health hazards are anticipated.
13. Hazard Communication Program (06.B.01)	SSHP Section 10.12 Maintained on site by the UXOSO.
14. Process Safety Management Program (06.B.04)	This plan is not required because no highly hazardous chemicals shall be used on site.
15. Lead Compliance Plan (06.C.02 & specifications)	This plan is not required because no lead operations will be conducted.
16. Asbestos Abatement Plan (06.C.03 & specifications)	This plan is not required because no asbestos abatement operations will be conducted.

Plan, Program or Procedure	Document Location
17. Radiation Safety Program (06.F)	SSHP Section 3.5
18. Abrasive Blasting Procedures (06.I.01)	This plan is not required because no abrasive blasting operations will be conducted.
19. Heat Stress Monitoring Plan (06.J.02)	SSHP Section 9
20. Cold Stress Monitoring Plan (06.J.04)	SSHP Section 9
21. Indoor Air Quality Management (06.L)	This plan is not required because no indoor air quality management will be conducted.
22. Mold Remediation Plan (06.L.04)	This plan is not required because mold remediation operations will not be conducted.
23. Chromium (VI) Exposure Evaluation (06.M)	This plan is not required because it is not anticipated that any exposure to Chromium VI will take place.
24. Crystalline Silica Evaluation (06.N.02)	This plan is not required because no work is anticipated to result in exposure to crystalline silica.
25. Lighting Plan for Night Operations (07.A.06)	This plan is not required because no night operations will be conducted.
26. Traffic Control Plan (08.C.05)	This plan is not required because there will be no active traffic control at the site.
27. Fire Prevention Plan (09.A.01)	SSHP Section 15.7
28. Wild Land Fire Management Plan (09.L)	SSHP Section 15.7.1
29. Arc Flash Hazard Analysis (11.B)	This plan is not required because no electrical work operations with the potential of arc flash will be conducted.
30. Hazardous Energy Control Program & Procedures (12.A.01)	This plan is not required because no hazardous energy operations will be conducted.
31. Standard Pre-Lift Plan – Load Handling Equipment (16.A.03)	This plan is not required because no standard lift operations will be conducted.
32. Critical Lift Plan – Load Handling Equipment (16.H)	This plan is not required because no critical lift operations will be conducted.
33. Naval Architectural Analysis – Load Handling Equipment (Floating) (16.L)	This plan is not required because float load handling equipment operations will not be conducted.
34. Floating Plant Inspection and Certification (19.A.01)	This plan is not required because no floating plant operations will be conducted.
35. Severe Weather Plan for Marine Activities (19.A.03)	This plan is not required because no marine activities will be conducted.
36. Emergency Plan for Marine Activities (19.A.04)	This plan is not required because no marine activities will be conducted.
37. Man Overboard/Abandon Ship Procedures (19.A.04)	This plan is not required because no marine activities will be conducted.
38. Float Plan for Launches, Motorboats, and Skiffs (19.F.04)	This plan is not required because no marine activities will be conducted.
39. Fall Protection and Prevention Plan (21.D)	This plan is not required because no work at elevation requiring a fall protection plan is anticipated.

Plan, Program or Procedure	Document Location
40. Demolition/Renovation Plan (to include engineering survey)	This plan is not required because no demolition or renovation operations will be conducted.
41. Rope Access Work Plan (24.H)	This plan is not required because no climbing equipment will be used.
42. Excavation/Trenching Plan (25.A.01)	This plan is not required because no excavation/trenching operations will be conducted.
43. Fire Prevention and Protection Plan for Underground Construction (26.I.01)	This plan is not required because no underground construction operations will be conducted.
44. Compressed Air Work Plan for Underground Construction (26.I.01)	This plan is not required because no underground construction operations will be conducted.
45. Erection and Removal Plan for Formwork and Shoring (27.C)	This plan is not required because no formwork or shoring will be used.
46. Precast Concrete Plan (27.D.01)	This plan is not required because no precast concrete operations will be conducted.
47. Lift-Slab Plans (27.E)	This plan is not required because no lift-slab operations will be conducted.
48. Masonry Bracing Plan (27.F.01)	This plan is not required because no masonry bracing operations will be conducted.
49. Steel Erection Plan (28.B)	This plan is not required because no steel erection operations will be conducted.
50. Explosives Safety Site Plan (29.A)	See ESS
51. Blasting Plan Non-UXO (29.A; 26.J)	This plan is not required because no blasting activities as covered by Section 29 and 26 of EM385-1-1 will be conducted. Demolition of MEC/UXO is addressed in the project UFP-QAPP and the ESS.
52. Dive Operations Plan (30.A.14, 30.A.16)	This plan is not required because no diving activities will be conducted.
53. Safe Practices Manual for Diving Activities (30.A.15)	This plan is not required because no diving activities will be conducted.
54. Emergency Management Plan for Diving (30.A.18)	This plan is not required because no diving activities will be conducted.
55. Tree Felling and Maintenance Program (31.A.01)	This plan is not required because no tree felling operations will be conducted.
56. Aircraft/Airfield Construction Safety & Phasing Plan (32.A.02)	This plan is not required because no work will be conducted on an aircraft or on an airfield.
57. Aircraft/Airfield Safety Plan Compliance Document (32.A.02)	This plan is not required because no work will be conducted on an aircraft or on an airfield.
58. Site Safety and Health Plan for HTRW (33.B)	Attachment B of this APP.
59. Confined Space Entry Procedures (34.A.05)	This plan is not required because no confined space operations will be conducted.
60. Confined Space Program (34.A.06)	This plan is not required because no confined space operations will be conducted.

This Page Intentionally Left Blank

Section 10 Medical Support

10.1 On-Site Medical Support

In the event specialized/elevated care is necessary while out on the former WTA, either the project team or the local on-call EMT/ambulance service will transport the injured person to the Castle Medical Hospital. The local Fire and Emergency Medical Services (EMS) Department can be notified of emergency situations by using the telephone numbers listed in Table 10-1. There will be less than 100 people on site; therefore, onsite medical support will not be provided.

The UXOSO will have a five-person trauma kit in his truck and one will be located in the Demolition Truck. Each team truck and the office trailer will have an American National Standards Institute (ANSI) approved first aid kit.

A first aid kit complying with the criteria contained in ANSI Z308.1-2014 will be provided on site. For minor injuries, routine first aid procedures will be used; and for major injuries, an ambulance will be called immediately, and the appropriate first aid administered while awaiting the arrival of the ambulance. Due to the remoteness of the project site and terrain it is unlikely that an ambulance would be able to make it to the work locations. The UXOSO will designate a meeting location that is accessible to EMS for emergency pickup. Individuals needing medical attention will be evaluated and moved to said pickup location if stable enough to move.

Trained personnel will use approved measures for treatment based on the training they have received.

10.2 Off-Site Medical Support

Table 10-1: Emergency Contact Numbers

Organization/Point of Contact	Telephone Number	Comment(s)
Ambulance Police/Security Medical Evacuation Fire	911	
GSIP Office	(808) 834-4631	
Castle Medical Center 640 Ulukahiki St. Kailua, HI 96734	(808) 263-5500	
24-hr Medical Emergency & Toxicological	(888) 478-0798	Will reach answering service; leave number to call back.
Spill Response – CHEMTREC	(800) 424-9300	
National Response Center	(800) 424-8802	
Poison Control Center	(800) 962-1253	
USACE Honolulu District PM – <i>Kevin Pien</i>	(808) 835-4091	

Organization/Point of Contact	Telephone Number	Comment(s)
USACE Ordnance and Explosives Safety Specialist (OESS) – <i>Harmon Slappy</i>	(808) 202-7459	
EPA Region 1 Environmental Emergency Response	(888) 372-7341	
Call-Down: after 911, call as soon as possible		
Senior PM – <i>Brian Stepp</i>	(808) 754-1914	
PM – <i>Daniel Wolf</i>	(808) 895-7815	
Corporate H&S Manager – <i>Michael Coyle</i>	(808) 349-3178	
H&S Manager/UXOSO – <i>Robert Cook</i>	(808) 354-3783	
Alternate UXOSO – <i>John Coberley</i>	(808) 887-1131	
SUXOS – <i>Marco Beltran</i>	(808) 960-3362	

10.3 Directions and Map to Nearest Hospital

10.3.1 Hospital Route

The medical center identified for this project is the Castle Medical Center located in Kailua, Hawaiʻi. The facility is approximately 13 miles southeast of the site, and travel time is approximately 25 minutes. Maps showing the route to the hospital will be posted in all site vehicles and included in Attachment A as Figure A-2. Driving directions to the Castle Medical Center from the project site are as follows:

- Exit Waikane Work Area;
- Head east on Waikane Valley Road;
- Turn right onto Kahekili Highway;
- Turn left on Likelike Highway;
- Turn right onto Kamehameha Highway;
- Turn left onto Pali Highway;
- Turn left onto Ulakahiki Street; and
- Turn left into Castle Medical Center – End.

10.4 First Aid and CPR Training

Table 10-2 provides information relating to first aid and CPR certifications for site personnel. Certifications can be found in Attachment C.

Table 10-2: First Aid and CPR Certification Expiration Dates

Name	First Aid (Expiration Date)	CPR (Expiration Date)
Daniel Wolf	10/2017	10/2017
Robert Cook	07/2018	07/2018
John Coberley	07/2018	07/2018
Marco Beltran	10/2017	10/2017

10.5 Medical Surveillance

Since its creation, GSIP has utilized a comprehensive Occupational Health Program (OHP) that complies with all OSHA and USACE requirements. Site personnel and subcontractors who enter the site during operations that are being conducted must comply with a comparable OHP. Additional medical surveillance information is found in the SSHP located in Attachment B.

10.5.1 Occupational Health Program

To comply with OSHA requirements, the project team maintains health records for each employee participating in field operations including a baseline physical and subsequent annual physicals. The purpose of the OHP is to ensure suitable job placement of employees, to monitor the health effects of hazards encountered in the work place, and to maintain and promote good health through preventive measures. Medical examination criteria are established in compliance with 29 CFR 1910.120.

This Page Intentionally Left Blank

Section 11 Personal Protective Equipment

11.1 Hazard Assessments

During the completion of the MEC RA at the Southeastern Region MRS, the Corporate H&S Manager and the UXOSO are responsible for overseeing development and implementation of the PPE Program. Once on site, the UXOSO is responsible for ensuring that a Site Safety Hazard assessment is conducted for each work area to identify sources of hazards, including impact, penetration, compression, chemicals, heat, dust, electrical sources, material handling, and light radiation. Surveys will be documented in the Safety field logbook and addressed to all project personnel.

11.2 When Hazard Assessments Will Be Conducted

Hazard assessments are conducted during the site walk and document review. During the initial PPE decision-making process, the APP and SSHP preparer reviewed available site information and established the level of protection to be worn by site personnel for each task. Additional hazard assessments will be conducted periodically and when field activities or site conditions change.

11.3 How Hazard Assessments Will Be Conducted

Selection of the most appropriate level of protection depends on the following:

- Hazards, known or potential;
- Properties such as toxicity, radioactivity, route of exposure and matrix (*e.g.*, air, soil, water) in which the contaminants are known or suspected;
- Type and measured concentrations of contaminants;
- Potential for exposure based upon task;
- Physical hazards;
- Biological hazards; and
- Chemical hazards.

Once the hazards of a workplace have been identified, the UXOSO (in consultation with the appropriate safety professionals) will evaluate the suitability of the PPE that was initially selected. New or additional PPE will be selected as conditions change to ensure a level of protection that will protect the employees from the hazards. Care will be taken to recognize the possibility of multiple and simultaneous exposure to a variety of hazards.

The levels of personal protection and the procedures specified in this plan are based on the best information available from reference documents and current site data. Therefore, these recommendations represent the minimum safety and health requirements to be observed by personnel engaged in this project. Unforeseeable site conditions or changes may warrant a reassessment of protection levels and controls stated. Adjustments to this APP must have prior approval by the Corporate H&S Manager and USACE.

11.4 Personal Protective Equipment Training

In accordance with OSHA 29 CFR 1910, Subpart I, PPE will be provided, used, and maintained in a sanitary and reliable condition. PPE will be of the construction, design, and material to provide employees protection against known or anticipated hazards. PPE will be selected that properly and appropriately fits the employee. Project personnel have been provided training in accordance with OSHA. Any concerns regarding the use of appropriate PPE will be brought to the attention of the UXOSO, who is directed to contact the Corporate H&S Manager for assistance in evaluation of PPE, as necessary.

Field activities at the MRS will be completed in Modified Level D PPE. If higher levels of protection are required, an addendum to the APP and SSHP will be drafted and approved by the Corporate H&S Manager and USACE.

Any worker required to wear PPE shall receive training in the proper use and care of PPE. Periodic retraining will be offered by the Corporate H&S Manager or designee to both the personnel and supervisors, as needed. The training shall include, but not necessarily be limited to, the following subjects:

- When PPE is necessary to be worn;
- Type of PPE that is necessary;
- How to properly don, doff, adjust, and wear PPE;
- The limitations of PPE; and
- The proper care, maintenance, useful life, and disposal of PPE.

Typical delivery of training is through formal programs such as HAZWOPER training, refresher training, or specific hazard training. Additional training is offered through routine site training and site-specific training. After the training, personnel shall demonstrate that they understand the components of the PPE Program and how to use PPE properly, or they shall be retrained.

For activities involving heavy equipment operations, hard hats and Class Two safety vests will be issued and worn. Additionally, for work activities alongside roadways, employees will be provided with Class Three traffic-rated safety vests. This however is not anticipated at this time.

11.5 Identifying Employee Training

Project personnel will have appropriate training as determined by the Corporate H&S Manager. Required training and certifications are reviewed internally as part of the APP and SSHP development prior to the start of the project. GSIP can track the current H&S status of project team personnel assigned to each project. Safety officers use file sharing to update H&S contact information, view H&S personnel training certifications, and view medical clearances. To prevent individuals that are not trained or certified to perform work from entering the site, the UXOSO will verify each person's H&S status prior to the start of work and will periodically perform reviews for updates. Key site personnel training/certifications are provided in Table 11-1.

Table 11-1: Current Key Site Personnel Training/Certifications

Personnel	Position	Medical Clearances (expires)	EOD Certificate	40-Hour HAZWOPER	8-Hour HAZWOPER Refresher (expires)	30-Hour Construction Safety	HAZWOPER Supervisor Training	First-Aid/CPR (expires)
Robert Cook	UXOSO	10/2017	05/2001	05/2002	10/2017	03/2013	10/2017	07/2018
Marco Beltran	SUXOS	01/2016	10/2002	12/2003	10/2016	08/2011	10/2016	10/2017
John Coberley	UXOQCS/ Alternate UXOSO	05/2018	12/1976	06/2011	8/2017	07/2012	01/2015	07/2018

Note:
EOD - Explosive Ordnance Disposal

This Page Intentionally Left Blank

Section 12 Site-Specific Hazards and Controls

The AHAs presented in Attachment D define the activities to be performed for the RA at the Southeastern Region MRS and identify the sequence of work, the specific hazards anticipated, site-specific conditions, equipment and materials, and the control measures to be implemented to eliminate or reduce each hazard to an acceptable level of risk. Reviews of the project-associated hazards will occur periodically and updated when field activities or conditions change.

This Page Intentionally Left Blank

Section 13 References

29 CFR Section 1904. *Recording and Reporting Occupational Injuries and Illness*

29 CFR Section 1910.120. *Hazardous Waste Operations and Emergency Response.*

29 CFR Section 1926. *Occupational Safety and Health Administration.*

49 CFR – U.S. Department of Transportation (DOT) Commercial Driver’s License (CDL) and Shipping.

ANSI/ISEA Z308.1-2014. American National Standard – Minimum Requirements for Workplace First Aid Kits and Supplies

DDESB, 2015. TP-18. *Minimum Qualifications for Personnel Conducting Munitions and Explosives of Concern-Related Activities.* 1 September

EPA, 1992 *Standard Operating Safety Guides, Office of Solid Waste and Emergency Response (OSWER).* June.

FAR 52.236-13.

RCRA Transport/Disposal.

UFGS, 01 35 26, SOH requirements, 2012.

USACE, 2004. EP 75-1-3. *Explosives - Recovered Chemical Warfare Materiel (RCWM) Response Process.* November.

_____, 2007. ER 385-1-92. *Safety and Occupational Health Requirements for Hazardous, Toxic, and Radioactive Waste (HTRW) Activities.* 1 May.

_____, 2009. DID MMRP-09-005. *Accident Prevention Plan.* 19 August.

_____, 2013. EM 385-1-97. *Explosives - Safety and Health Requirements Manual.* 17 May.

_____, 2014. EM 385-1-1. *Safety and Health Requirements Manual.* 30 November.

This Page Intentionally Left Blank

Attachment A
Maps

This Page Intentionally Left Blank

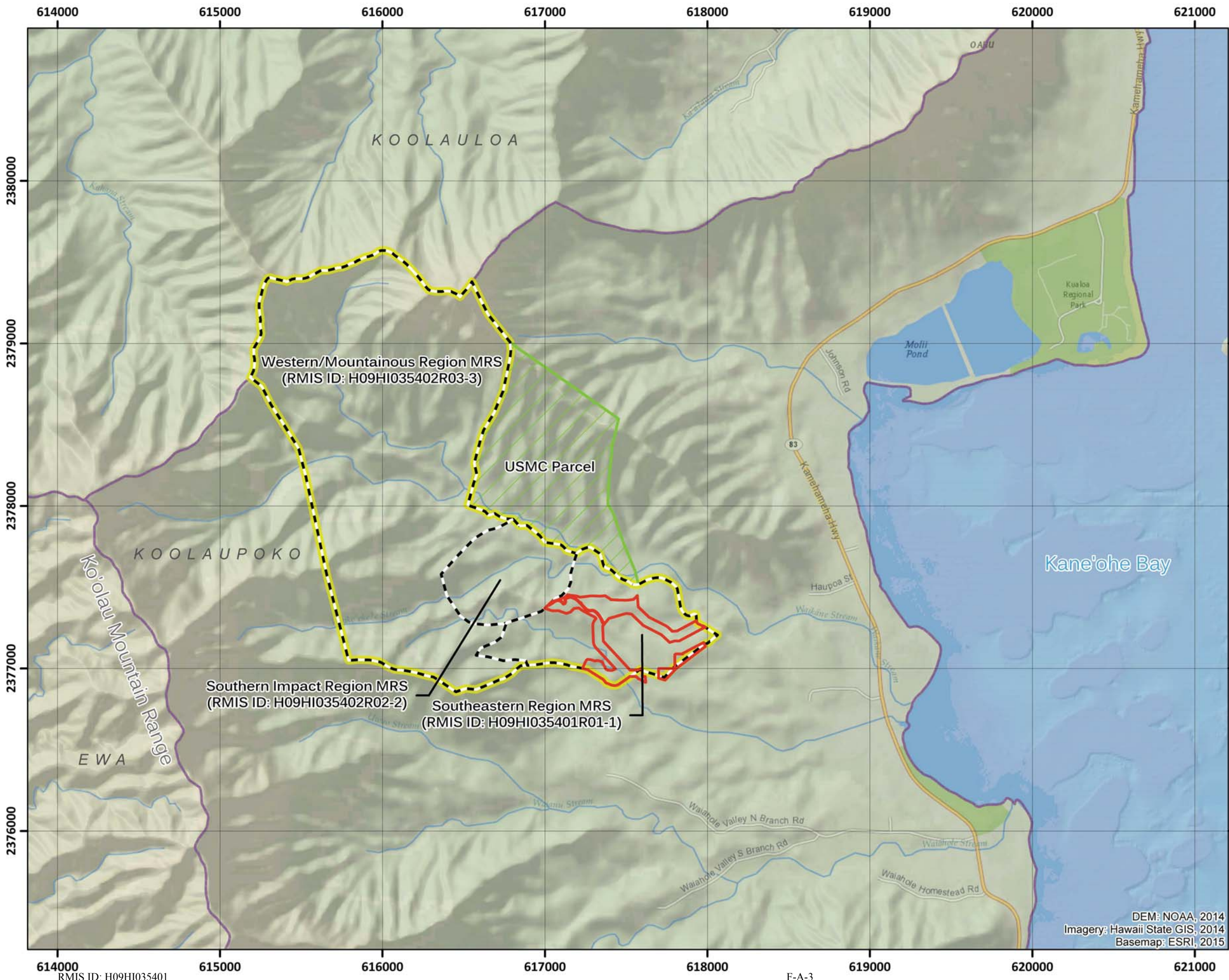


Figure A-1 - Site Location
Southeastern Region MRS
(RMIS ID: H09HI035401)
MEC Remedial Action
Former Waikane Training Area
O'ahu, Hawai'i
Prepared For: USACE

0 250 500 750 1,000
 Meters

0 1,000 2,000 3,000 4,000
 Feet

N
 W E
 S

Grid North
 9° 25' 12" W
 2015 Magnetic Declination
 9° 35' 00" E

Datum: NAD83 PA11
 Coordinate System: UTM Zone 4N
 Map Units: Meters
 Scale: 1:24,000

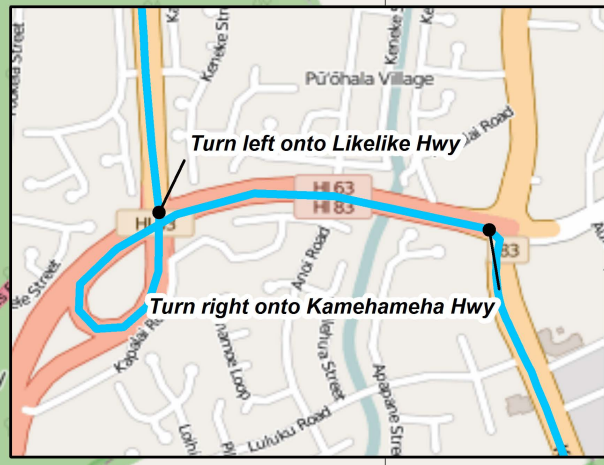
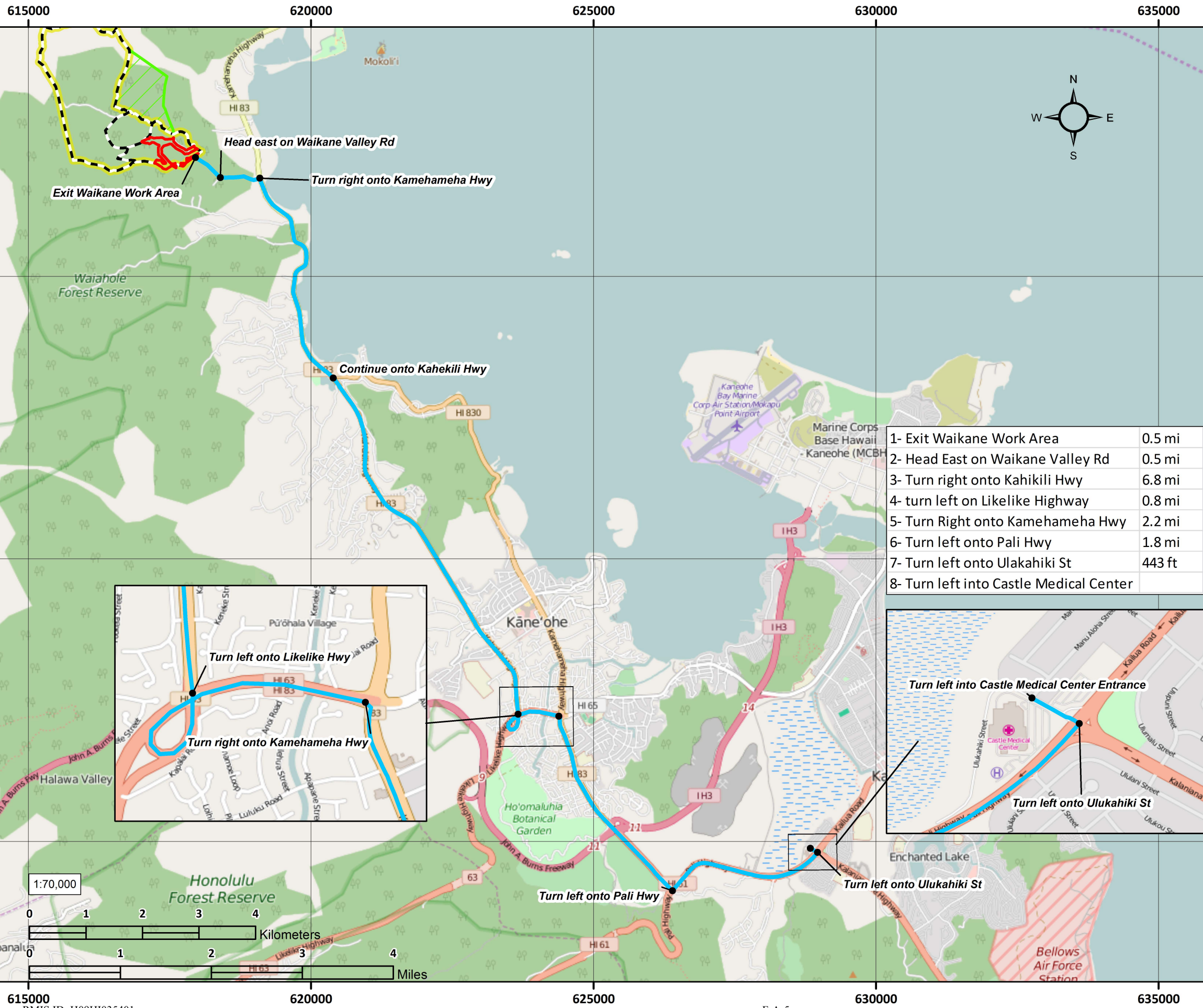
- Stream
- Highway
- Street
- Regional Park
- District Boundary
- USMC Parcel (Non-DERP FUDS)
- Remedial Action Area (36 ac)
- MRS Boundary
- Former WTA MRA Boundary

Island of O'ahu
 Area of Detail

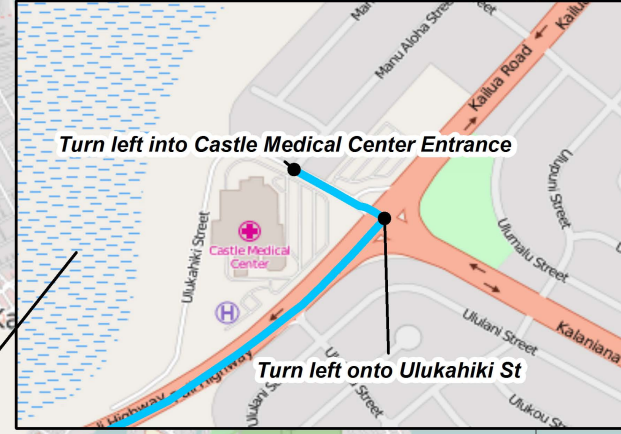
R:\Waikane\APPIAPP-Figure_A-1_Site_Location_Map.mxd
 11 x 17 landscape APP-Figure_A-1_Site_Location_Map.pdf

Drawn By: CBriggs Date: 07 December 2015

This Page Intentionally Left Blank



1- Exit Waikane Work Area	0.5 mi
2- Head East on Waikane Valley Rd	0.5 mi
3- Turn right onto Kahikili Hwy	6.8 mi
4- turn left on Likelike Highway	0.8 mi
5- Turn Right onto Kamehameha Hwy	2.2 mi
6- Turn left onto Pali Hwy	1.8 mi
7- Turn left onto Ulukahiki St	443 ft
8- Turn left into Castle Medical Center	



**Figure A-2 - Hospital Route
Southeastern Region MRS
(RMIS ID: H09HI035401)
MEC Remedial Action
Former Waikane Training Area
O'ahu, Hawai'i
Prepared For: USACE**

0 1 2 3 4
Kilometers

0 0.5 1 1.5 2
Miles

Datum: NAD83 PA11
Coordinate System: UTM Zone 4N
Map Units: Meters
Scale: 1:24,000

- Route Points
- Hospital Route
- ▭ Remedial Action Area (36 ac)
- ▭ USMC Parcel (Non-DERP FUDS)
- - - MRS Boundary
- ▭ Former WTA MRA Boundary

Island of O'ahu

Area of Detail

R:\Waikane\APP\APP-Figure_A-2_Hospital_Route_Map.mxd
11 x 17 landscape APP-Figure_A-2_Hospital_Route_Map.pdf

Drawn By: wshontell Date: 07 December 2015

This Page Intentionally Left Blank

Attachment B
Site Safety and Health Plan

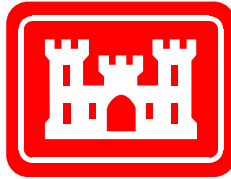
This Page Intentionally Left Blank

FINAL
ATTACHMENT B
SITE SAFETY AND HEALTH PLAN

Munitions and Explosives of Concern Remedial Action
Former Waikane Training Area
Southeastern Region Munitions Response Site
Kāneʻohe, Oʻahu, Hawaiʻi

RMIS ID: H09HI035401

Prepared for:



U.S. Army Corps of Engineers
Honolulu District
Building 230
Fort Shafter, Hawaii
96858-5440

December 2016

This Page Intentionally Left Blank

Table of Contents

<i>Acronyms and Abbreviations</i>	v
<i>Chapter 1 Introduction</i>	1-1
<i>Chapter 2 Site Description and Contamination Characterization</i>	2-1
2.1 Site Background/History	2-1
2.2 Site Physical Characterization	2-1
2.3 Contamination Characterization	2-2
<i>Chapter 3 Activity Hazard Analysis</i>	3-1
3.1 Project Task Hazard Analysis	3-1
3.2 Physical Hazards	3-2
3.3 Chemical Hazards	3-5
3.4 Biological Hazards	3-5
3.5 Ionizing Radiation Hazards.....	3-11
<i>Chapter 4 Staff Organization, Qualifications, and Responsibilities</i>	4-1
4.1 Project Personnel.....	4-1
4.2 Personnel Assigned to the Project.....	4-1
4.3 Competent Person	4-1
4.4 Qualified Person.....	4-1
<i>Chapter 5 Training</i>	5-1
5.1 New Hire Safety Orientation and Indoctrination	5-1
5.2 UXO Personnel Training	5-2
5.3 OSHA HAZWOPER Training.....	5-2
5.4 OSHA Construction Training	5-2
5.5 First-Aid and CPR Training.....	5-2
5.6 Bloodborne Pathogen Training	5-2
5.7 HAZCOM Training.....	5-3
5.8 Project Site-Specific Safety and Health Training	5-3
<i>Chapter 6 Personnel Protective Equipment</i>	6-1
<i>Chapter 7 Medical Surveillance</i>	7-1
7.1 Medical Support Functions	7-1
<i>Chapter 8 Exposure Monitoring/Air Sampling</i>	8-1
<i>Chapter 9 Heat and Cold Stress</i>	9-1
9.1 Heat Stress.....	9-1
9.2 Cold Stress	9-4
<i>Chapter 10 Standard Operating Safety Procedures, Engineering Controls, and Work Practices</i>	10-1
10.1 Site Rules/Prohibitions.....	10-1
10.2 Work Permits	10-2
10.3 Material Handling Procedures	10-2
10.4 Treatment Technology Employed at Site.....	10-2

10.5	Traffic.....	10-3
10.6	Drug Awareness and Drug-Free Workplace.....	10-3
10.7	Fatigue Management Plan.....	10-3
10.8	Security Plan	10-11
10.9	Motor Vehicle Safety.....	10-11
10.10	Sanitation	10-13
10.11	Severe Weather	10-13
10.12	HAZCOM	10-14
Chapter 11 Site Control.....		11-1
Chapter 12 Personal Hygiene and Decontamination.....		12-1
12.1	Personal Hygiene	12-1
Chapter 13 Equipment Decontamination		13-1
13.1	Hazardous/Toxic Waste Site Characteristics	13-1
13.2	Equipment Decontamination.....	13-1
Chapter 14 Emergency Equipment and First-Aid.....		14-1
14.1	First-Aid and Bloodborne Pathogens.....	14-1
14.2	Emergency Equipment.....	14-3
Chapter 15 Emergency Recognition and Response Procedures.....		15-1
15.1	Pre-Emergency Planning.....	15-1
15.2	Personnel and Lines of Authority for Emergency Situations	15-1
15.3	Criteria and Procedures for Emergency Recognition and Site Evacuation	15-1
15.4	Decontamination and Medical Treatment of Injured Personnel	15-7
15.5	Emergency Medical Facilities and Phone Numbers for Responders	15-7
15.6	Criteria for Alerting Local Community Responders.....	15-7
15.7	Fire Prevention, Protection, and Response	15-8
15.8	Spills.....	15-11
Chapter 16 Logs, Reports, Audits, Inspections, and Recordkeeping.....		16-1
16.1	Safety Log	16-1
16.2	Training Log	16-1
16.3	Site Control Log.....	16-1
16.4	Inspection Forms.....	16-1

List of Tables

Table 3-1: Dangerous Spider Descriptions 3-7
Table 3-2: Lesser Brown Scorpion Description..... 3-9
Table 6-1: Minimum Level of Protection Requirements 6-1
Table 9-1: Percent Sunshine Factors Heat Stress Prevention and Monitoring 9-4
Table 9-2: Physiological Monitoring Schedule Heat Stress Prevention and Monitoring..... 9-4
Table 14-1: Contents for Class B First Aid Kit 14-1
Table 14-2: Emergency Equipment 14-2
Table 15-1: General Hand Signals 15-5
Table 15-2: Emergency Signals 15-6
Table 15-3: Emergency Contact Numbers..... 15-8

This Page Intentionally Left Blank

Acronyms and Abbreviations

°C	Degrees Celsius
°F	Degrees Fahrenheit
ACGIH	American Conference of Governmental Industrial Hygienists
AHA	Activity Hazard Analysis
AM/FM	Amplitude Modulation/Frequency Modulation
ANSI	American National Standards Institute
APC-T	Armor Piercing Capped-Tracer
APP	Accident Prevention Plan
ASTM	American Society for Testing and Materials
BBP	Bloodborne Pathogen
CDC	Center for Disease Control and Prevention
CFR	Code of Federal Regulations
CGI	Combustible Gas Indicator
CHEMTREC	Chemical Transportation Emergency Center
COR	Contracting Officer's Representative
CPR	Cardiopulmonary Resuscitation
CRZ	Contamination Reduction Zone
CWM	Chemical Warfare Materiel
DA	Department of the Army
dBA	A-Weighted Sound Level
DDESB	Department of Defense Explosives Safety Board
DEET	Diethyltoluamide
DFARS	Defense Acquisition Regulations System
DID	Data Item Description
DOH	State of Hawai'i Department of Health
EC	Emergency Coordinator
EM	Engineer Manual
EMM	Earth Moving Machinery
EPA	U.S. Environmental Protection Agency
ER	Engineer Regulation
ESS	Explosives Safety Submission
EZ	Exclusion Zone
FMP	Fatigue Management Plan
ft	feet (or foot)
GSIP	GSI Pacific Inc.
H&S	Health & Safety
HAZCOM	Hazard Communication
HAZWOPER	Hazardous Waste Operations and Emergency Response
HBV	Hepatitis B Virus
HCV	Hepatitis C Virus
HE	High Explosive
HEAT	High Energy Anti-Tank
HIV	Human Immunodeficiency Virus

HnB	Hanalei Silty Clay, 2 to 6 percent slopes
HTRW	Hazardous, Toxic, and Radioactive Waste
in.	Inch/Inches
ISEA	International Safety Equipment Association
LZ	Landing Zone
MD	Munitions Debris
MEC	Munitions and Explosives of Concern
MEDEVAC	Medical Evacuation
MGFD	Munitions with the Greatest Fragmentation Distance
mm	Millimeter
MPPEH	Material Potentially Presenting an Explosive Hazard
MRS	Munitions Response Site
MSD	Minimum Separation Distance
MSL	Mean Sea Level
N/A	Not Applicable
NRC	Nuclear Regulatory Commission
NRCS	Natural Resource Conservation Service
OESS	Ordnance and Explosives Safety Specialist
OHS	Occupational Health Services
OSHA	Occupational Safety and Health Administration
PD	Point Detonating
PDSQ	Point Detonating Impact Super Quick
PM	Project Manager
PPE	Personal Protective Equipment
PWS	Performance Work Statement
QCS	Quality Control Specialist
RA	Remedial Action
RCRA	Resource Conservation and Recovery Act
SDS	Safety Data Sheet
SOP	Standard Operating Procedure
SSHP	Site Safety and Health Plan
SUXOS	Senior UXO Supervisor
SZ	Support Zone
TNT	Trinitrotoluene
TP	Technical Paper
TWA	Time-Weighted Average
U.S.	United States
UFP-QAPP	Uniform Federal Policy Quality Assurance Project Plan
USACE	United States Army Corps of Engineers
USDA	U.S. Department of Agriculture
USMC	U.S. Marine Corps
UXO	Unexploded Ordnance
UXOSO	UXO Safety Officer
WBGTT	Wet-Bulb, Globe Temperature
WpB	Waikane Silty Clay, 3 to 8 percent slopes

WpE	Waikane Silty Clay 25 to 40 percent slopes
WpF	Waikane Silty Clay, 40 to 70 percent slopes
WpF2	Waikane Silty Clay, 40 to 70 percent slopes eroded
WTA	Waikane Training Area

This Page Intentionally Left Blank

Chapter 1 Introduction

This Site Safety and Health Plan (SSHP) is developed as an attachment to the project Accident Prevention Plan (APP), Appendix F to the project Uniform Federal Policy Quality Assurance Project Plan (UFP-QAPP) for the Munitions and Explosives of Concern (MEC) Remedial Action (RA), former Waikane Training Area (WTA), Southeastern Region Munitions Response Site (MRS), Kāneʻohe, Oʻahu, Hawaiʻi.

This SSHP is developed in accordance with the requirements of 29 Code of Federal Regulations (CFR) 1910.120, 29 CFR 1926, Engineer Regulation (ER) 385-1-92, ER 385-1-95 (31 December 2014 edition), Engineer Manual (EM) 385-1-1 (30 November 2014 edition), Data Item Description (DID) MMRP-09-005 *Accident Prevention Plan* 19 August 2009, Department of the Army (DA), Pamphlet 385-30, Mishap Risk Management (2 December 2014 edition), any other applicable Federal, state, and local safety and occupational health laws and regulations, and the Corporate Health and Safety (H&S) Program. Where requirements of various applicable laws, criteria, ordinances, regulations, and referenced documents vary, the most stringent requirements will apply to the project. The SSHP addresses all elements required by 29 CFR 1910.120(b)(4)(ii), 29 CFR 1926.65(b)(4)(ii), and ER 385-1-92, DID MMRP-09-005, and EM 385-1-1. The level of detail provided is tailored to the type of work, complexity of operations to be accomplished, and the hazards anticipated. This SSHP addresses those elements that are specific to the former WTA MRS and have the potential for negative effects on the safety and health of workers.

GSI Pacific Inc. (GSIP) has an extensive Corporate H&S Program in place, which has the full support of the project team staff. The Corporate H&S Program is reviewed and updated annually to ensure that it remains current with regulatory requirements.

This Page Intentionally Left Blank

Chapter 2 Site Description and Contamination Characterization

2.1 Site Background/History

The work to be performed is a RA at the 36-acre area within Southeastern Region MRS, former WTA, Kāneʻohe, Oahu, Hawaiʻi. In 1942, the DA entered into a lease agreement with Lincoln L. McCandless heirs and Waiahole Water Company, Ltd. for the right to use approximately 1,061 acres in Waikane Valley for advanced offensive warfare training and air-to-ground practice bombing due to the valley's geographical location and terrain. Between 1943 and 1953, the Army used this property for maneuvers, jungle training, and small arms, artillery, and mortar firing. Authorization for the Army to use Waikane Valley continued until July 1953, when the United States (U.S.) Marine Corps (USMC) was substituted as lessee. USMC training consisted of small arms fire, 3.5-inch (In.) rockets, and possibly medium artillery fire. Due to fire hazards, incendiaries were prohibited and all ammunition in excess of .50 caliber was to be fired into the two designated impact areas. The two designated impact areas are located within what are now the Southern Impact Region MRS and the USMC property. The USMC leased the WTA from 1953 until 1976.

In 1944, while the site was an active training area, a 60 millimeter (mm) High Explosive (HE) mortar was discovered in Waikane Valley. Two individuals were injured and two individuals were killed, when that mortar accidentally detonated. Three children were injured in 1963 when a souvenir rifle grenade, reportedly discovered in Waikane Valley, exploded after it was thrown against a wall. There are no other reports of fatalities or injuries attributable to MEC discovered at Waikane Valley.

Live fire at the former WTA reportedly ceased in the early 1960s, but numerous types of munitions have since been recovered from the site.

2.2 Site Physical Characterization

2.2.1 Site Location

2.2.1.1 Topography

The former WTA is located on the coastal plain near Kāneʻohe Bay and on the slopes of the Koʻolau Mountain Range. Elevation ranges from 90 feet (ft.) to 2,090 ft. above mean sea level (msl). Most of the former WTA is covered with dense jungle vegetation, including the forested coastal plain and thick grasses and shrubs in the higher elevations. There are several gulches and canyons with sheer cliffs throughout the area as well as areas with steep slopes.

2.2.1.2 Soil Description

According to the U.S. Department of Agricultural (USDA) Natural Resource Conservation Service (NRCS) Waikane silty clay, 25 to 40 percent slopes (WpE), is the predominant soil of the northern impact area. This soil is on steep terraces and alluvial fans. In a representative profile, the surface layer is dark brown silty clay about 8 in. thick. The subsoil, about 52 in. thick, is dark reddish-brown silty clay that has subangular blocky structure. The substratum is soft, weathered, gravelly alluvium and colluvium. The soil is very strongly acid in the surface

layer and subsoil. Additional soils located within the removal area include Hanalei silty clay, 2 to 6 percent slopes (HnB); Waikane silty clay, 3 to 8 percent slopes (WpB); Waikane silty clay, 40 to 70 percent slopes (WpF); and Waikane silty clay, 40 to 70 percent slopes eroded (WpF2).

2.2.1.3 Hydrology

The Waikane-Waikeekē Stream system is the primary stream network passing through the former WTA. The Waikane and Waikēʻekeʻe Streams originate at the Koʻolau Mountain Range and are fed by spillway tunnels associated with the Waiahole Ditch Tunnel Network. The Waikane and Waikēʻekeʻe Streams combine and drain into Kāneʻohe Bay. The tunnel network was completed in 1916 to transport water to the leeward side of the island for irrigation. The area is well drained, generally to the east, with no wetlands except along the creek banks near the streams outlets.

2.2.1.4 Site Climate

According to the Western Regional Climate Center, the former WTA area receives an average of 144.1 inches of precipitation each year, with most of this rainfall occurring in October through March. The average maximum temperature for this area is 84.2 degrees Fahrenheit (°F) and the average minimum temperature is 71.4°F (Western Regional Climate Center, 2015).

2.3 Contamination Characterization

2.3.1 Chemical Warfare Materiel Contamination

Due to the historical use of the site, encountering on site chemical warfare materiel (CWM) contamination during site operations is not anticipated.

Archival research indicates that no CWM production, testing, live fire, or disposal operations were conducted at the site. However, if suspect CWM is encountered during any phase of site activities, all work will immediately cease. The Field Team Leader will immediately notify the Unexploded Ordnance (UXO) Safety Officer (UXOSO). Project personnel will withdraw along cleared paths upwind from the discovery. A team consisting of a minimum of two personnel will secure the area to prevent unauthorized access. Personnel should position themselves as far upwind as possible while still maintaining security of the area. The UXOSO will notify the U.S. Army Corps of Engineers (USACE) Ordnance and Explosives Safety Specialist (OESS).

2.3.2 Hazardous Substance Contamination

By definition, hazardous substances are those materials that can threaten human health and/or environmental well-being if released into the environment. This describes those hazardous substances or chemical contaminants present in soil that pose a threat to the environment, and as such may pose a threat to site personnel and the public during removal actions.

There are no current records that indicate the presence of hazardous substances. Following proper personal protective equipment (PPE) protocol, the potential for a hazardous substance to adversely impact site personnel during the contract will be mitigated.

Chapter 3 Activity Hazard Analysis

The phases of work for this project are as follows:

- Activity 1: Mobilization;
- Activity 2: Site Preparation;
- Activity 3: Biological and Archaeological Surveys and Monitoring;
- Activity 4: Vegetation Clearance;
- Activity 5: Instrument Verification Strip;
- Activity 6: Surface and Subsurface Clearance;
- Activity 7: Explosive Disposal Operations;
- Activity 8: Material Potentially Presenting an Explosive Hazard (MPPEH) Management;
- Activity 9: Data Management;
- Activity 10: Site Restoration; and
- Activity 11: Demobilization.

Refer to Table 2-1 of the APP for Project Tasks associated with each phase.

3.1 Project Task Hazard Analysis

3.1.1 Major Tasks and Activity Hazard Analysis

Individual hazard analyses have been performed for each major phase at the project site. The potential hazards have been identified, control measures have been outlined, training requirements and PPE requirements have been established, and equipment inspection procedures have been established. Should new operations be introduced to this site, the UXOSO will perform an Activity Hazard Analysis (AHA). Should operations change significantly during the course of this project, the hazard analysis will be updated to accommodate these changes. The H&S Manager will approve any changes in the AHAs, PPE, or safe operating procedures. As stated in the project APP, approval of such changes shall be requested, in writing, to the government's Contracting Officer prior to implementing any changes.

The AHAs created for this project include the following activities and are presented in Attachment D:

- Mobilization;
- Site Preparation;
- Biological and Archaeological Surveys and Monitoring;
- Vegetation Clearance;
- Instrument Verification Strip;

- Surface and Subsurface Clearance;
- Explosive Disposal Operations;
- MPPEH Management;
- Site Restoration; and
- Demobilization.

3.2 Physical Hazards

Exposure to physical hazards may include:

- UXO;
- Manual lifting;
- Slips, trips, falls;
- Heat and cold stress;
- Hand tools (manual and power);
- Terrain or vegetation; uneven walking surfaces;
- Weather hazards; and
- Poor visibility.

Additional physical hazards common while performing loading/unloading activities include:

- Hands or fingers caught between objects;
- Electrical hazards;
- Caught in/between/struck by or against an object; and
- Traffic.

Due to the nature of planned site operations, the potential risk for exposure to safety hazards is moderate. Safety hazards (*e.g.*, explosive, physical, and biological hazards), which may be encountered during site activities, and precautions to be followed, are listed below and in individual AHAs.

3.2.1 Slips, Trips, and Fall Hazards

Site conditions consist of moderate to steep terrain and light to heavy brush, which make the possibility of slips, trips, and fall hazards high during the MEC escort, survey, and general operational activities. Site personnel shall be instructed to make themselves aware of the placement of their feet at all times to avoid site conditions, which attribute to slips, trips, and falls.

3.2.2 Cuts/Laceration Hazard from Handling Sharp Tools

Project personnel should expect a high likelihood of cuts/lacerations if proper care is not taken. During all field activities, personnel shall wear leather/protective work gloves to prevent injury to hands.

3.2.3 Pinched/Crushed Fingers and Toes from Handling and Loading Equipment

Loading and unloading equipment poses a light to moderate hazard to fingers and toes. The mishandling of even light materials can cause injuries to site personnel. All site personnel are required to wear American National Standards Institute (ANSI) approved leather work boots and gloves while activities are being conducted. Personnel shall utilize proper lifting techniques and when appropriate, shall use additional personnel or material handling equipment for heavy objects.

3.2.4 Heavy Equipment Hazard

Operating or moving heavy equipment incorrectly can cause serious injury. Operating and safety procedures will be in accordance with excerpts from Section 18 of EM 385-1-1, Machinery and Mechanized Equipment and the applicable AHA. Attachment D of the project APP contains copies of the AHAs, which include applicable heavy equipment operating activities. All equipment used on site will be inspected, operated and maintained in accordance with the manufacturer's operating recommendations. All personnel participating in the operation or maintenance of heavy equipment will be trained on the specific equipment to be used in accordance with the manufacturer recommended guidelines. Heavy equipment utilized on site will be operated under strict adherence to the applicable Occupational Safety and Health Administration (OSHA) regulations found in OSHA 29 CFR 1910; OSHA 29 CFR 1926; the requirements of USACE EM 385-1-1, Section 18; and this SSHP.

The *Heavy Equipment and Earth Moving Machinery Operations* Standard Operating Procedure (SOP) provides the minimum procedures, safety, and health requirements applicable to the operation of heavy equipment and earth moving machinery (EMM) and can be found in Appendix G of the project UFP-QAPP.

3.2.5 Material Lifting Hazard

The lifting and handling of equipment can have a high probability of causing back strain, pulled muscles, and tendons. Personnel will utilize proper lifting techniques when moving site materials. Proper lifting technique training will be given as part of the site specific training, daily safety brief, and weekly supervisor safety brief. When required for heavier items to move, additional personnel or material handling equipment shall be used.

3.2.6 Noise Hazard

The operation of heavy equipment and explosive disposal operations may create a noise hazard to site personnel. Site personnel working with or near heavy equipment, powered hand tools, or

explosive disposal operations will wear hearing protection as directed by the UXOSO. Noise monitoring will be conducted by the UXOSO with a decibel meter if a new piece of equipment is introduced into the project in order to determine if hearing protection is needed.

3.2.7 Inclement Weather

Inclement weather is considered hazardous if it impairs a workers ability to conduct operations (*e.g.*, winds and raised dust clouds or fog and heavy rain causing reduced visibility to see work area). Personnel will not continue operations if visibility is greatly affected. During heavy rain, personnel can be at risk due to flash floods, visibility, and instability while walking. The UXOSO will make recommendations to the Senior UXO Supervisor (SUXOS) to determine risk hazards. Thunder/lightning storms are a high-risk hazard to all site personnel especially during disposal operations. All activities shall be suspended when an electrical storm approaches to within 6 miles of the site. Site personnel, in the open, are at great risk and shall be moved to safe sheltered locations until the storm has passed. Local weather forecasts or visual determinations will serve as notice that potential inclement weather is approaching.

The UXOSO will monitor weather as a requirement and will have cell phone and/or radio connectivity with the SUXOS at all times. When there is a potential for severe weather, the UXOSO will monitor the Civil Defense website, the National Weather Service website, and local amplitude modulation/frequency modulation (AM/FM) radio stations. If possible, the UXOSO will monitor local AM/FM radio in which civil defense broadcasts severe weather alerts, earthquakes, major traffic accidents, *etc.* Should conditions deteriorate to an unsafe condition, the UXOSO will advise the SUXOS to cease work until conditions improve and notify the USACE OESS of such action. In the event of lightning detection by the field crew/managers, work will cease and will not resume until a minimum of 30 minutes after the last bolt of lightning was observed and the last clap of thunder was heard.

For site conditions where personnel are working in Level D PPE, and the ambient temperature is greater than 75°F, the UXOSO may obtain Wet-Bulb, Globe Temperature (WBGT) readings to determine current and potential work site conditions and to assist in controlling the potential for site workers experiencing heat related adverse health effects. Additionally, the UXOSO may use a Portable Thermal Environment and Heat Stress Monitor or suitable substitute to determine the work/rest schedule to be implemented. The values outlined in Table 9-2 are recommendations and are designed such that nearly all acclimatized, fully clothed workers with adequate water and electrolyte replacement liquids intake will be able to function without their body temperatures exceeding 100.4°F.

3.2.8 Site-Specific Hazards

3.2.8.1 Remote Terrain

Due to the remote location of the Southeastern Region MRS, there will be additional hazards unique to this project. Specifically, project team field team members may be working in separate locations within the MRS during the project work. During these times, project team field crews will maintain contact with one another using cell phones and two-way radios, if necessary.

Project team field crews, under guidance of the UXOSO, will also determine an emergency “rendezvous” point(s), should radio and/or telephone contact be broken.

3.2.8.2 Flammable Hazards from Fueling and Maintenance of Site Vehicles

The chance of fire and/or explosion during vehicle refueling and maintenance is high if proper procedures are not followed. All site vehicles will be equipped with a 1A:10B:C fire extinguisher readily available to fight a fire. Prior to any refueling operations, all vehicles or equipment engines will be turned off. Individuals shall take care when involved in refueling operations to prevent spills. If a spill occurs, spill kits are provided with equipment and are located in designated refueling areas to assist in the cleanup.

3.3 Chemical Hazards

The use of chemicals on site during field operations creates a potential exposure of chemical hazards to personnel through inhalation, ingestion, or absorption. Site preparation and related site work may require the use of concentrated chemicals for proper equipment operation. Such chemicals may include the following:

- Diesel fuel;
- Gasoline;
- Propane; and
- Oil and grease.

Site personnel will comply with the storage, handling, and use requirements stated on the Safety Data Sheet (SDS) for each chemical brought on site by the project team or its subcontractors. All chemicals brought on site will be properly labeled. An inventory of all chemicals brought on site and an SDS for each will be maintained at the site. Project subcontractors shall inform the project team of any chemical materials brought on site, and the location of their SDSs. In case of conflicts between American Conference of Governmental Industrial Hygienists (ACGIH) and other standards on the SDS, the more stringent standard will prevail.

3.4 Biological Hazards

Biological hazards, which can be found on site, include biting insects, mosquitoes, spiders, and stinging insects (bees and wasps), scorpions, hazardous plants, dangerous animals, and microorganisms. Project team awareness and adherence to the safe work practices outlined in the following sections should reduce the risks associated with these hazards.

3.4.1 Mosquitoes

Mosquitoes are a threat to human health and well-being. Mosquitoes need water to complete their life cycle and there is the potential for rapid population development especially following rains that leave behind standing water (*e.g.*, ponds, puddles). Potential mosquito-breeding sites are often created during construction activities. This occurs for example, as equipment and

vehicles leave ruts and dips for water to collect, and also when normal runoff routes are disrupted, impeding drainage.

Female mosquitoes bite to feed, and while they are feeding, they may transmit disease-causing organisms to humans and animals which include encephalitis and dengue fever. These viruses are potential threats at the project site. To avoid the threat of mosquitoes at the work site, check to be sure containers are not left to collect water, avoid leaving severe depressions in the ground, and fix or report any clogged drainage ways or ditches.

For mosquito bite prevention, follow the steps below:

- Apply insect repellent on exposed skin and clothing (if using sunscreen as well, the sunscreen should be applied first);
- Select an insect repellent with the active ingredients recommended by Center for Disease Control and Prevention (CDC) and the U.S. Environmental Protection Agency (EPA), such as diethyltoluamide (DEET), picaridin, IR3535, or plant-based oil of lemon eucalyptus; and
- Cover up as much as you can without influencing required PPE.

3.4.2 Spiders

A large variety of spiders may be encountered during site activities. Most spider bites merely cause localized pain, swelling, reddening, and in some cases, tissue damage; however, there are a few spiders that are dangerous due to the severity of the physiological effects caused by their venom. These species include the black widow spider and the brown or violin (recluse) spiders. Table 3-1 provides a description of the black widow and brown recluse spiders.

Victims of a black widow bite may exhibit the following signs or symptoms:

- The sensation of a pin prick or minor burning at the time of the bite;
- The appearance of small punctures (but sometimes none are visible); and
- After 15 to 60 minutes, intense pain is felt at the site of the bite, which spreads quickly, and is followed by profuse sweating, rigid abdominal muscles, muscle spasms, breathing difficulty, slurred speech, poor coordination, dilated pupils, and generalized swelling of the face and extremities.

Victims of a brown recluse, or violin, spider bite may exhibit the following signs or symptoms:

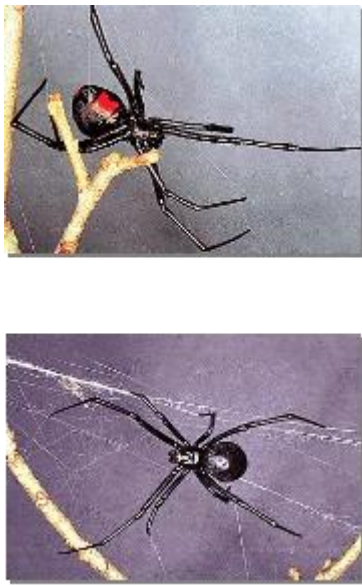

- Blistering at the site of the bite, followed by a local burning at the site 30 to 60 minutes after the bite;
- Formation of a large, red, swollen, postulating lesion with a bull's-eye appearance;
- Systemic effects may include a generalized rash, joint pain, chills, fever, nausea, and vomiting; and

- Pain may become severe after eight hours, with the onset of tissue necrosis.

There is no effective first-aid treatment for either of these bites. Except for very young, very old or weak victims, these spiders' bites are not considered to be life-threatening; however, medical treatment must be sought immediately to reduce the extent of damage caused by the injected toxin.

The UXOSO will brief site personnel as to the identification and avoidance of the black widow and brown recluse spiders. As with other spiders, site personnel will report to the UXOSO if they locate this spider on site or notice any type of bite while involved in site activities.

Table 3-1: Dangerous Spider Descriptions

Name	Photograph	Description
Black Widow		<p>The black widow is a coal-black bulbous spider 3/4 to 1 1/2 in. in length, with a bright red hourglass on the underside of the abdomen.</p> <p>The black widow is usually found in dark moist locations, especially under rocks, rotting logs and may even be found in outdoor toilets where they inhabit the underside of the seat.</p> <p>Victims of a black widow bite may exhibit the following signs or symptoms:</p> <ul style="list-style-type: none"> ▪ Sensation of pinprick or minor burning at the time of the bite; ▪ Appearance of small punctures (but sometimes none are visible); and ▪ After 15 to 60 minutes, intense pain is felt at the site of the bite which spreads quickly, and is followed by profuse sweating, rigid abdominal muscles, muscle spasms, breathing difficulty, slurred speech, poor coordination, dilated pupils, and generalized swelling of face and extremities.
Brown Recluse		<p>The brown recluse or violin spider is brownish to tan in color, rather flat, 1/2 to 5/8 in. long with a dark brown "violin" shape on the top.</p> <p>Victims of a brown recluse bite may exhibit the following signs or symptoms:</p> <ul style="list-style-type: none"> ▪ Blistering at the site of the bite, followed by a local burning at the site 30 to 60 minutes after the bite; ▪ Formation of a large, red, swollen, postulating lesion with a bull's-eye appearance; ▪ Systemic effects may include a generalized rash, joint pain, chills, fever, nausea, and vomiting; and ▪ Pain may become severe after eight hours, with the onset of tissue necrosis.

3.4.3 Bees and Wasps

There are several types of bees and wasps, which may be encountered during site activities. These include the common yellow jacket, paper wasps, and honeybees. Bees are generally not as aggressive as wasps. Most stinging insects are relatively safe to be near, even in large numbers, so long as they are not aggravated. However, dozens of people die each year from insect stings, mostly due to anaphylactic shock, some as a direct result of the toxins. However, bee venom appears to contain more proteins than wasp venom and therefore there is a greater likelihood of being allergic to bees than wasps. The sting of bees and wasps are quite different. The wasp may sting a victim multiple times and still live. The bee will sting once, tearing itself away leaving the stinger embedded and still connected to the venom sac, which continues to pump venom into the victim for up to a minute from the time of insertion.

3.4.3.1 Prevention of Bee and Wasp Stings

The following precautions will be taken during field activities for the prevention of stings from bees and wasps:

- Be aware of the presence of bees and wasps while you are working especially in the vicinity of flowers. Bees tend to sting if they feel threatened or are disturbed, so use caution;
- Keep sources of water under control in work areas as bees are attracted to open water sources or leaking water containers;
- Avoid wearing floral patterns or using floral scents, which will attract bees;
- Personnel that are sensitive to bees must make the UXOSO aware of this and should carry a bee sting kit with them;
- If bees or wasps get trapped inside your vehicle while you are driving, pull off to the shoulder lane and let the creature escape before you continue driving;
- Only strike a wasp if you are sure to kill it. If you strike or kill a bee you will set off its defense pheromone, which will attract other bees to attack; and
- In the event of a massive sting attack, try to stay calm, cover your head if possible. Get into anything that is sealed in such a way as not to allow insect entry, such as a vehicle.

Treatment of Normal Insect Stings. All bee stings include an alarm pheromone, which incites their mates to attack, so the primary response for treatment of a normal bee sting is to get away from a nest/hive with all speed. Scrape or pull out stingers as soon as possible. A honeybee sting has a pump attached that continues to introduce venom for one minute after stinging. A wasp does not leave its stinger. A stung victim should apply an ice pack to minimize swelling and pain while lifting the limb to heart level to reduce swelling.

Treatment of Severe Reaction to Insect Stings. If the victim has been stung multiple times, is young or old, or is experiencing anaphylactic shock, seek immediate medical help. Signs of anaphylactic shock may include:


- Localized swelling and redness at sting area;
- Headache;
- Fever;
- Nausea;
- Vomiting;
- Swelling of the tongue or throat;
- Difficulty in breathing;
- Increased heart beat rate;
- Drowsiness; and/or
- Unconsciousness.

Personnel with known sensitivity to stings and who have an EpiPen[®] should have it administered, followed by an ice pack and transit to the hospital. Employees on the site who know they are allergic to bee stings are required to make the UXOSO and co-workers aware of that fact, and should have their EpiPen[®] with them at all times. Co-workers should know where the kit is located and how to administer it in an emergency.

3.4.4 Scorpion (Lesser Brown)

Hawaiʻi has one form of scorpion, the Lesser Brown. Its Hawaiian name is *Kopiana*. Its sting is not considered dangerous, about the intensity of a bee sting. Its distribution is on the islands of Oʻahu, Maui, Kauaʻi, and the Island of Hawaiʻi, and therefore may be seen in the MRS.

Table 3-2: Lesser Brown Scorpion Description

Name	Photograph	Description
Lesser Brown Scorpion (<i>Isometrus maculatus</i>)		<ul style="list-style-type: none"> ▪ Long curved tail with stinger and 10 legs. ▪ Smaller than Emperor scorpion; under 3 inches at their largest. ▪ Found in Hawaii since 1880. <p>Scorpions prefer to live in warm areas. They are nocturnal creatures. They hunt and feed during the night while they rest during the day, hiding beneath loose rocks, loose bark of fallen trees, boards, piles of lumber, floors of outbuildings, and debris. Despite its appearance, this is not a deadly enemy. It has a painful sting but it does not have a neurotoxin like some of its mainland cousins, so the sting is more like that of a bee.</p> <ul style="list-style-type: none"> ▪ The poison of the non-deadly species of scorpions is local in effect and causes swelling and discoloration of the tissues in the area of the puncture. There will be intense pain at the site of the sting but very little inflammation or swelling but these symptoms usually disappear after 24 hours. In Hawaiʻi, there have been no reported fatalities due to scorpion stings.

3.4.5 Hazardous Plants

During the RA field activities, the number and variety of hazardous plants that may be encountered are few. The plants with the greatest degree of risk to site personnel (*e.g.*, potential for contact versus effect produced), are those which produce skin reactions and skin and tissue injury.

Some poisonous plants that maybe encountered could include apple of Sodom (*Solanum sodomium*), black-eyed susan (*Arbus precatorius*), castor bean plant (*Ricinus communis*), coral plant (*Jatropha multifidi*), crown flower (*Calotropis gigantean*), Jimson weed (*Datura stamonium*), oleander (*Nerium oleander*), pencil plant (*Euphorbia tirucalli*), physic nut (*Jatropha curcas*), poionsettia (*Euporbia pulcherrima*), and Star-of-Bethlehem (*Hippobroma longiflora*).

The best method to reduce reaction to the poisonous plant is to avoid contact. If, however, exposure to these plants causes skin irritation, first clean the exposed skin with generous amounts of isopropyl alcohol, then wash skin with water and follow with a regular shower with soap and water. Finally, while wearing disposable gloves, clean any clothes, shoes or tools that may have been in contact with the plants.

3.4.6 Plants Causing Skin and Tissue Injury

Contact with splinters, thorns, and sharp leaf edges is of special concern to site personnel, as is the contact with the pointed surfaces found on branches, limbs, and small trunks left by site clearing and grubbing crews. Punctures, cuts, and even minor scrapes caused by accidental contact may result in non-infectious skin lesions and the introduction of fungi, or bacteria, through the skin. Personnel receiving any of the injuries listed above, even minor scrapes, will report immediately to the UXOSO for initial and continued observation and care of the injury.

3.4.7 Rats/Mice

Rats and mice may be found at the site. Hantaviruses are transmitted by mice, but have not been associated with the species of mice present in Hawaiʻi. Employees are to avoid all contact with rodents, their nests and their droppings.

3.4.8 Mongooses and Bats

Mongooses and bats are known vectors of rabies in other areas, a disease that has not entered the State by virtue of the Department of Agriculture's animal quarantine program for incoming pets. However, a mongoose or a bat could inflict a bite. Employees are to avoid all contact with mongooses or bats.

3.4.9 Snakes

There are no native snakes species associated with the Hawaiian Islands. With the very rare exception of possibly encountering a brown tree snake (an alien snake species that periodically

invades Hawaiian Islands from Guam), there is virtually no potential for site personnel to encounter a snake during site operations. In the highly unlikely event that any snakes are encountered, by onsite personnel, the location of the snake will be recorded and the UXOSO will be notified immediately.

3.5 *Ionizing Radiation Hazards*

In accordance with SOP UXO-7, a portable X-ray machine may be used to assist in determining the filler contents of certain munitions when external positive identification is not possible.

The only radiation source authorized and licensed at this time is the Golden XRS-3. The XRS-3 is a light-duty X-ray machine that does not contain radioactive material, and therefore is not regulated by the Nuclear Regulatory Commission (NRC). The State of Hawaiʻi Department of Health (DOH) regulates and licenses radiation producing machines, such as X-ray devices.

3.5.1 Non-Ionizing Radiation

The most likely exposure to non-ionizing radiation is the sun. Personnel will receive instruction in using appropriate hydration, PPE and/or procedures to follow in the event that non-ionizing radiation creates a concern and requires the use of sunscreen and hats. Other forms of non-ionizing radiation hazards such as lasers, are not anticipated within the project area.

This Page Intentionally Left Blank

Chapter 4 *Staff Organization, Qualifications, and Responsibilities*

GSIP is ultimately responsible for the implementation of the Corporate H&S Program, APP, and SSHP. All site personnel including subcontractors, having the potential for exposure to site hazards are subject to the requirements of this SSHP. Work shall not be performed in a manner that conflicts with the health, safety, or environmental precautions outlined in the APP or this SSHP. Personnel violating safety procedures are subject to dismissal from the project site.

4.1 *Project Personnel*

The key project safety team personnel and their roles and responsibilities are presented in Chapter 4 of the project APP. Certifications for key safety personnel are presented in Attachment C of the APP.

4.2 *Personnel Assigned to the Project*

All project team, USACE, subcontract personnel, and visitors, who will be involved in onsite activities, are responsible for the following:

- Taking all reasonable precautions to prevent injury to site personnel and being alert to potentially harmful situations;
- Performing only those tasks that can be done safely with proper training provided. All onsite personnel have stop-work authority when imminent safety or environmental hazards are found or identified;
- Notifying the UXOSO of any special medical conditions (*e.g.*, allergies, contact lenses, diabetes) that may be impacted by site operations;
- Notifying the UXOSO of any prescription and/or nonprescription medication that a worker may be taking that might cause drowsiness, anxiety, or other unfavorable side effects;
- Preventing spillage and splash of materials to the greatest extent possible;
- Practicing good housekeeping by keeping the work area neat, clean, and in order;
- Reporting immediately all injuries, no matter how minor, to the UXOSO; and
- Complying with the UXOSO and all safety and health recommendations and precautions, and properly using PPE as determined by the UXOSO.

4.3 *Competent Person*

Refer to Section 4.3 of the project APP for competent person identification, requirements, and responsibilities.

4.4 *Qualified Person*

Refer to Section 4.4 of the project APP for qualified person identification, requirements, and responsibilities.

This Page Intentionally Left Blank

Chapter 5 Training

5.1 New Hire Safety Orientation and Indoctrination

New employees participate in the project team's orientation program. All personnel receive training on the project team's Corporate H&S Program policy including environmental aspects, and site-specific/job-specific training. Training will be performed before work is to begin and be conducted by the UXOSO. New employees will not be permitted to work at any site until they have received proper project training for their specific role. Training will include the following site-specific topics:

- Accident prevention;
- Accident reporting (how and to whom);
- Medical facilities for emergency treatment and/or assistance;
- Reporting and correcting unsafe conditions;
- Safe work/stop work responsibility;
- Job hazards/hazard control;
- Site-specific biological, physical, chemical, and or ionizing/non-ionizing radiation hazards as listed in the AHA;
- Site-specific UXO and explosive disposal procedures;
- Company safety policies;
- Site briefings conducted prior to being granted site access;
- Site layout;
- Emergency response and notification;
- Hearing conservation;
- PPE;
- Buddy system;
- Spills;
- Fires;
- Inclement weather;
- Hazard Communication (HAZCOM);
- Visitor access; and
- Any specific training required by regulations.

Note: The SSHP will be provided to all employees for review and signature prior to work.

5.2 *UXO Personnel Training*

All UXO personnel assigned to positions as UXO Technician I and above will meet the qualification requirements detailed in DID MMRP-09-005, and Department of Defense Explosives Safety Board (DDESB) Technical Paper (TP) 18. A copy of their certificates of graduation will be kept on file at Corporate Headquarters and on site. Qualified UXO personnel will have knowledge and experience in military ordnance, ordnance components, and explosives location, identification, recovery/removal, transportation, and disposal safety precautions. UXO personnel will have the knowledge and experience to effect safe handling and transportation of found ordnance items.

Non-qualified UXO personnel working or visiting the MEC sites will receive a site-specific MEC recognition briefing from the UXOSO. This site-specific training will be used to familiarize non-qualified UXO personnel with the appearance of ordnance type items that may be found on site. Non-qualified UXO personnel will not touch any MEC-related items unless they have been inspected first by qualified UXO personnel and determined to be munitions debris (MD) or inert MEC.

5.3 *OSHA HAZWOPER Training*

General site workers will attend the 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) training course and have three days of field experience under the direct supervision of a trained, experienced supervisor. Onsite management personnel (SUXOS, UXOSO, and UXO Quality Control Specialist [UXOQCS]) will have an additional eight hours of specialized supervisory training. All workers must have initial training completed or refresher training (eight hours) within the past 12 months. All training is documented.

5.4 *OSHA Construction Training*

In compliance with USACE Health and Safety Requirements Manual (EM 385-1-1), 30 November 2014, the UXOSO, at a minimum, will have completed the 30-hour OSHA construction safety class or equivalent training, and complete a minimum of 24 hours of formal safety course work every four years.

5.5 *First-Aid and CPR Training*

A minimum of two project personnel certified in first-aid/cardiopulmonary resuscitation (CPR) will be on site to provide immediate response to an accident situation until medical assistance arrives on the site. During Daily Safety Meetings, the names of these individuals will be briefed to employees.

5.6 *Bloodborne Pathogen Training*

Personnel trained in First Aid and expected to administer First Aid will receive training in controlling exposures to bloodborne pathogens (BBPs). This training will address the following topics:

- The BBP standards;
- Description of the risks of exposure and how BBP are transmitted;
- Management and employee responsibilities;
- Protection methods against exposure and decontamination procedures;
- Post-exposure procedures; and
- Labeling and color-coding of infectious waste.

5.7 HAZCOM Training

HAZCOM training will include discussion of the following topics:

- Potential safety/health effects of exposure to chemicals used (*e.g.*, gasoline/diesel);
- Labeling of containers;
- Current inventory of hazardous chemicals;
- Location/use of SDSs;
- Procedures to inform employee when a new chemical is brought on site;
- Current quantities of hazardous chemicals; and
- Location of chemical on site.

5.8 Project Site-Specific Safety and Health Training

5.8.1 Chemical and Physical Hazard Training

Site-specific H&S hazard training will be conducted prior to field activities at the site. This training will be in addition to the indoctrination training at the start of the project. In particular, the training will stress emergency response procedures and will cover the chemical and physical hazards of the site and site operations.

The UXOSO will be required to document that personnel have read and thoroughly understand the information contained in the AHA.

5.8.2 Site-Specific UXO Procedures Training

UXO personnel will receive training on the site specific UXO. Anticipated UXO based on previous investigations consists of the following:

- 37mm HE Projectile, M63 or MKII;
- 37mm Armor Piercing Capped-Tracer (APC-T Projectile), M51;
- 75mm HE Projectile, M48;
- 3-inch HE Projectile, M42/M42A1;
- 58mm HE Mortar, Type 89;

- 60mm HE Mortar, M49A2/M49A3;
- 81mm HE Mortar, M56 or M43A1/M43A1B1;
- 60mm Practice, M50A2/M50A3;
- 81mm Practice, M43A1,
- 2-inch Smoke Mortar, M3;
- 2.36-inch High Energy Anti-Tank (HEAT) Rocket, M6A1;
- 3.5-inch HEAT Rocket, M28A2;
- Rifle Grenade HEAT, M9A1;
- Grenade Frag, MKII;
- Grenade HEAT, M28;
- Grenade Smoke, M18 or AN-M8;
- Grenade Training, MK1A1;
- 0.50-pound Trinitrotoluene (TNT) Block;
- Signal Illumination, M17/M19/M21/M51;
- Signal, Smoke and Illumination, AN-MK13 Mod 0;
- Flare, Surface, M49A1;
- Trip Flare, M48;
- Simulator, M27A1B1;
- Artillery Flash Simulator, M110;
- Firing Device, M1;
- Fuze Point Detonating (PD), M52;
- Fuze PD, M58;
- Fuze Point Detonating Impact Super Quick (PDSQ), M48;
- Fuze PDSQ, M51;
- Fuze PDSQ, M54;
- Small arms debris; and
- Unidentifiable munitions fragments of varying sizes.

5.8.3 Hearing Conservation Training

Site personnel exposed to noise levels exceeding 85 A-weighted sound level (dBA) over an eight-hour time-weighted average (TWA) will be provided with training, which addresses the following topics:

- Physical and psychological effects of high noise exposure;

- Noise exposure limits;
- Elements of the Hearing Conservation Program; and
- Selection, use, and limitations of hearing protection devices.

Sources of noise potentially above 85 dBA at the site are not expected.

5.8.4 Instrument Calibration Training

It is not anticipated that real-time monitoring equipment will be used on site based on the risk assessment and hazard characterization.

UXO technicians will receive training on the use and procedures for functionality and quality control testing of all UXO survey instruments used on site.

5.8.5 Buddy System Training

All work will be performed using the buddy system. Team members will keep in visual contact with each other at all times. Team members will be made aware of any slip, trip, and lifting hazards along with heat or cold stress, and general hazards within their work area.

5.8.6 Visitor Training

Visitors will receive site-specific training to ensure that potential hazards and risks are identified. This training will consist of a safety briefing by the UXOSO that will include the following:

- Location and description of potential hazards and risks;
- Required PPE;
- Areas of the site that are closed to visitors;
- The site evacuation plan and emergency procedures; and
- Other topics as deemed appropriate.

This Page Intentionally Left Blank

Chapter 6 Personnel Protective Equipment

PPE to be used for this work is described below. Personnel performing operations on site shall be required to use the appropriate level of protection. The minimum level of protection required to begin each activity of this project is shown in Table 6-1. The effectiveness of the PPE program will be evaluated by the UXOSO. If additional hazards are identified requiring a higher level of protection and changes to the program are necessary, the UXOSO will inform the Corporate H&S Manager and amend the PPE requirements.

Table 6-1: Minimum Level of Protection Requirements

Work Phase	Level of PPE Protection
Activity 1: Mobilization	Level D
Activity 2: Site Preparation	Level D
Activity 3: Biological and Archaeological Surveys and Monitoring	Level D
Activity 4: Vegetation Clearance	Level D
Activity 5: Instrument Verification Strip	Level D
Activity 6: Surface and Subsurface Clearance	Level D
Activity 7: Explosive Disposal Operations	Level D
Activity 8: MPPEH Management	Level D
Activity 9 Site Restoration	Level D
Activity 10: Demobilization	Level D

Level D PPE consists of:

- Work clothes such as coveralls, long pants, and shirts with sleeves;
- Clothing under coveralls;
- Work gloves – leather or cotton as necessary for physical hazards;
- American Society for Testing and Materials (ASTM) F2413-compliant safety boots (non-metallic toe boots will be used when operating geophysical equipment during terrestrial activities);
- ANSI Z87.1-compliant safety glasses or safety goggles; and
- ANSI Z89.1-compliant hard hat (required when staff are working around heavy equipment).

In accordance with OSHA 29 CFR 1910, Subpart I, PPE will be provided, used, and maintained in a sanitary and reliable condition. All PPE will be of the construction, design, and material to provide employees with protection against known or anticipated hazards. PPE will be selected that properly and appropriately fits the employee. Project team employees have received OSHA-compliant training. Any concerns regarding the use of appropriate PPE will be brought to the attention of the UXOSO, who will contact the H&S Manager for assistance in evaluation of PPE as necessary.

This Page Intentionally Left Blank

Chapter 7 *Medical Surveillance*

Medical surveillance of UXO technicians and subcontractor employees will be conducted in accordance with the requirements of OSHA 29 CFR 1910.120(f) and 29 CFR 1910.95(f), and the Corporate H&S Program. All employees working at the former WTA Southeastern Region MRS are on the Project Medical Surveillance Program. A baseline health assessment is conducted in accordance with EM 385-1-97. Prior to assigning any employee to work at the site, that employee's records will be checked to ensure that the medical surveillance physical is current and will remain in effect for the duration of the assignment. Current and updated medical clearance certification will be maintained on site with the UXOSO.

Radiological contamination is not expected to be present in the former WTA Southeastern Region MRS where work will be performed. Therefore radiological monitoring is not planned for this project.

7.1 *Medical Support Functions*

7.1.1 Occupational Health Services

The project team provides occupational health services (OHS) for its employees, which includes the following:

- Initial and Periodic Medical Testing and Certification – Upon assignment to field work and periodically, in general annually, as appropriate. As determined by the project team's Corporate H&S Manager, project team employees will be examined at qualified medical facilities and certified as able to work on hazardous sites. Copies of certifications will be maintained by the UXOSO. Subcontractors are required to provide certifications proving employees have medical clearance to work at a hazardous waste site; and
- Supplemental Examination – Any worker receiving a potentially harmful level of exposure to hazardous chemical/biological material or exhibiting signs or symptoms of possible exposure will undergo a supplemental examination. The physician will certify in writing that the employee is fit to return to work. If necessary, activity restrictions will also be specified in writing. Additional tests will be conducted if contaminants/potential exposures so dictate and will be determined by the examining physician.

7.1.2 Health Care Administrative Services

Medical records will be established and maintained by the project team in support of the Medical Monitoring Program. These records will be treated as private and confidential information and will be complete enough to provide data for use in health maintenance, treatment, and epidemiologic studies, and in helping the project team with program evaluation and improvement. The medical record will contain sufficient information to identify the patient, support the diagnosis, justify the treatment, and document additional follow-up treatment or referrals. The physician's written opinion for all medical examinations will be as specified in 29 CFR 1910.120, Subpart (f)(7).

This Page Intentionally Left Blank

Chapter 8 Exposure Monitoring/Air Sampling

Based on the hazard/risk assessment of the site and the nature of the work at the former WTA Southeastern Region MRS, it is not expected that any airborne contaminants or nuisance dust level exposure limits will be exceeded. As a result, no air monitoring or air sampling will be performed. If conditions change, the AHAs and SSHP will be amended. Subsequently, the project team would perform required monitoring to evaluate the effectiveness of prescribed PPE and evaluate potential work exposure. Any amendment to the plan will be reviewed and approved by the Corporate H&S Manager and accepted by USACE.

This Page Intentionally Left Blank

Chapter 9 Heat and Cold Stress

9.1 Heat Stress

One of the most common types of stress that can affect field personnel is heat stress. Heat stress can be a serious hazard to workers at project sites because of the PPE required. The UXOSO is responsible for evaluating the conditions, work tasks, and requirements for PPE, and for implementing the emergency response procedures. The following subsections describe the signs and symptoms, monitoring requirements, prevention and treatment procedures for heat rash, heat cramps, heat exhaustion, and heat stroke. These requirements and procedures will be followed at all times.

9.1.1 Heat Stress Symptoms and Treatment

9.1.1.1 Heat Rash

Heat rash, also known as prickly heat, may occur in hot and humid environments where sweat is not easily removed from the surface of the skin by evaporation and is aggravated by chafing clothes. When extensive or complicated by infection, heat rash can be so uncomfortable that it inhibits sleep and impairs a worker's performance.

Symptoms - Mild red rash, especially in areas of the body that come into contact with protective gear.

Treatment - Decrease amount of time spent working in protective gear and provide body powder to help absorb moisture and decrease chafing. Heat rash can be prevented by showering, resting in a cool place, and allowing the skin to dry.

9.1.1.2 Heat Cramps

Heat cramps are caused by inadequate electrolyte intake. The individual may be receiving an adequate amount of water; however, if not combined with an adequate supply of electrolytes, the blood can thin to the point where it seeps into the active muscle tissue, causing cramping.

Symptoms - Acute painful spasms of voluntary muscles, most notably the abdomen and extremities.

Treatment - Move the victim to a cool area and loosen clothing. Have the victim drink one to two cups of cool potable water or diluted commercial electrolyte solution (*e.g.*, Gatorade, Quench) immediately, and then every 20 minutes thereafter until symptoms subside. Electrolyte supplements can enhance recovery; however, it is best to double the amount of water required by the dry mix package directions or add water to the liquid form.

9.1.1.3 Heat Exhaustion

Heat exhaustion is a state of weakness or exhaustion caused by the loss of fluids from the body. Heat exhaustion is not as dangerous as heat stroke, but if not properly managed in the field, it may lead to heat stroke.

Symptoms - Pale, clammy, and moist skin, profuse perspiring, and extreme weakness. Body temperature is normal, pulse is weak and rapid, and breathing is shallow. The person may have a headache, may vomit, may feel dizzy, and may be irritable or confused.

Treatment - Move the victim to a cool, air-conditioned or temperature-controlled area, loosen clothing, place in a position with the head lower than the feet (shock prevention), and allow the victim to rest. Consult a physician. Ensure that the victim is not nauseated or vomiting. If not nauseated or vomiting, give the victim small sips of cool water or diluted electrolyte replenishment solution (one to one dilution with water, or if mixing from powder, double the water added). If this is tolerated, have the victim drink one to two cups of fluid immediately, and every 20 minutes thereafter until symptoms subside. Seek medical attention at the advice of the consulting physician.

9.1.1.4 Heat Stroke

Heat stroke is an acute and dangerous reaction to heat stress caused by a failure of the body's heat regulating mechanisms (*e.g.*, the individual's temperature control system [sweating] stops working correctly). Body temperature rises so high that brain damage and death may result if the person is not cooled quickly.

Symptoms - Red, hot, dry skin (although the person may have been sweating earlier); nausea, dizziness, confusion, extremely high body temperature (*e.g.*, 104°F or greater as measured with an oral thermometer), rapid respiratory and pulse rate, seizures or convulsions, unconsciousness or coma.

Treatment - Immediately call for emergency medical assistance. Remove the victim from the source of heat and cool the victim quickly. If the body temperature is not brought down quickly, permanent brain damage or death may result. Remove all PPE and as much personal clothing as decency permits. Fan the person while sponging or spraying with cool or tepid water. Apply ice packs (if available) to the back of the neck, armpits, groin area, or behind the knees. Place the victim flat on their back or with head and shoulders slightly elevated. If conscious, and not nauseated or vomiting, the victim may be provided sips of cool water. Do not give the victim coffee, tea, or alcoholic beverages. Emergency medical personnel will take over treatment when they arrive.

9.1.2 Heat Stress Prevention

The following measures should be followed to prevent heat stress:

- Most importantly, provide adequate fluid intake;
- Workers should drink 1/2 to one quart of liquids per hour in high heat conditions. Most of this liquid should be water;
- Provide a shaded area for rest breaks;
- Ensure that adequate shelter is available to protect personnel against heat and direct sunlight. When possible, shade the work area;

- Discourage the intake of caffeinated drinks during working hours;
- Monitor for signs of heat stress;
- Encourage workers to maintain a good diet during these periods. In most cases, a balanced diet and lightly salted foods should help maintain the body's electrolyte balance. Bananas are especially good for maintaining the body's potassium level;
- If utilizing commercial electrolyte mixes, double the amount of water called for in the package directions. Indications are that "full-strength" preparations taken under high heat stress conditions may actually decrease the body's electrolytes;
- Acclimate workers to site work conditions by slowly increasing workloads (*e.g.*, do not begin work activities with extremely demanding tasks);
- Encourage workers to wear lightweight, light-colored, loose-fitting clothing;
- In extremely hot weather, conduct field activities in the early morning and evening;
- Good hygienic standards must be maintained by frequent showering and changes of clothing; and
- Clothing should be permitted to dry during rest periods.

9.1.3 Sun Exposure Prevention

Personnel will receive instruction in avoiding direct exposure to sunlight for extended periods of time, using appropriate hydration, and PPE and/or procedures to follow in the event that sun exposure creates a concern and requires the use of sunscreen and hats.

9.1.4 Heat Stress Monitoring and Work Cycle Management

When strenuous field activities are part of ongoing site work conducted in hot weather, the following guidelines should be used to monitor the body's physiological response to heat, and to manage the work cycle, even if workers are not wearing impervious clothing. These procedures should be instituted when the temperature exceeds 70°F and the tasks/risk analysis indicates an increased risk of heat stress problems. Consult the safety professional (*e.g.*, Corporate H&S, UXOSO) if questions arise as to the need for specific heat stress monitoring. In all cases, the site personnel must be aware of the signs and symptoms of heat stress and provide adequate rest breaks and proper aid as necessary. The UXOSO will conduct heat stress monitoring. The UXOSO will use a tympanic thermometer as well as a standard thermometer for body and ambient temperature, respectively.

NOTE: For purposes of this operating practice, a break is defined as a 15-minute period. A physiological monitoring schedule is determined by following the steps below:

- Measure the air temperature with a standard thermometer;
- Estimate the fraction of sunshine by judging what percent the sun is out (refer to Table 9-1);

- Calculate the adjusted temperature based on the following formula:

Adjusted Temperature = Actual Temperature + 13 X (where X = sunshine fraction from Table 9-1); and

- Using Table 9-2, determine the physiological monitoring schedule for fit and acclimated workers for the calculated adjusted temperature.

The length of the work period is governed by the frequency of physiological monitoring (Table 9-2). As noted above, the rest period will be set at 15 minutes in duration. To check the heart rate, count the radial pulse for 30 seconds at the beginning of the rest period. If the heart rate exceeds 110 beats per minute, shorten the next work period by one third and maintain the same rest period. Oral temperature can be checked with a clinical thermometer after work but before the employee drinks water. If the oral temperature taken under the tongue exceeds 99.7°F, shorten the next work cycle by one third. These adjustments of the work period based on heart rate and oral temperature were recommended in OSHA Technical Manual TED 01-00-015, January 1999, Section III: Chapter 4, Heat Stress.

Table 9-1: Percent Sunshine Factors Heat Stress Prevention and Monitoring

Percent Sunshine	Cloud Cover	Sunshine Fraction
100	No cloud cover	1.0
50	50 percent cloud cover	0.5
0	Full cloud cover	0.0

Table 9-2: Physiological Monitoring Schedule Heat Stress Prevention and Monitoring

Adjusted Temperature	Level D (Permeable clothing)	Level C, B, or A (Non-permeable clothing)
90°F (32.2°C) or above	After each 45 minutes of work	After each 15 minutes of work
87.5°F (30.8° - 32.2°C)	After each 60 minutes of work	After each 30 minutes of work
82.5° - 87.5°F (28.1° - 32.2°C)	After each 90 minutes of work	After each 60 minutes of work
77.5° - 82.5°F (25.3° - 28.1°C)	After each 120 minutes of work	After each 90 minutes of work
72.5° - 77.5°F (22.5° - 25.3°C)	After each 150 minutes of work	After each 120 minutes of work

Note:
°C – degrees Celsius

9.2 Cold Stress

Due to the climate and location of the project site, cold stress is not anticipated to be a factor in later months and associated with work.

Chapter 10 *Standard Operating Safety Procedures, Engineering Controls, and Work Practices*

10.1 *Site Rules/Prohibitions*

Using common sense, operating under the “buddy system” (or two-person rule), and following safe practices can reduce hazards due to normal project activities. In addition to the general site safety procedures contained in the GSIP Corporate H&S field operating procedures guide, the following procedures will be used:

- No running or horseplay will be allowed;
- UXO technicians will make every effort to identify a suspect UXO item. UXO will be visually examined for markings and other external features such as shape, size, and external fittings. If an unknown UXO item is encountered, the onsite USACE representative will be notified immediately. Under no circumstances will any fuzed UXO be moved in an attempt to make a definitive identification;
- Only UXO-qualified personnel (per DDESB TP-18) will handle UXO, and only during daylight hours. Personnel who will be handling UXO will not wear outer or inner garments having static-electricity-generating characteristics such as nylon;
- The project team and subcontractor personnel engaged in field operations will be thoroughly trained and capable of recognizing the specific hazards associated with UXO. All field personnel will be under the supervision of a UXO Technician III or higher; and
- General UXO safety guidelines are included below.
 - Projectiles containing fuzes are to be considered armed if the round is fired;
 - Arming wires and pop-out pins on unarmed fuzes should be secured prior to moving UXO;
 - Do not depress plungers, turn vanes, or rotate spindles, levers, setting rings, or other external fittings on UXO;
 - Do not attempt to remove or dismantle any components of UXO;
 - UXO personnel are not authorized to render inert any UXO found on site;
 - UXO will not be taken from the site;
 - Consider UXO, which may have been exposed to fire and detonation, as extremely hazardous;
 - Do not rely on the color-coding of munitions for definitive identification;
 - Assume that a practice munitions contains a live charge until investigation proves otherwise; and
 - Do not approach smoking munitions.

10.1.1 Buddy System

Work at the site will be performed using the buddy system. Team members will keep in visual contact with each other at all times. Team members will be made aware of any slip, trip, and lifting hazards along with any potential exposure to chemical substances, heat or cold stress, and general hazards within their work area.

10.1.2 Designated Eating/Break Areas

Eating/break areas will be located away from the active work area. No food or beverages will be allowed in any toxic work environments.

10.1.3 Designated Smoking Areas

Regulations governing approved areas for smoking and spark generation will be strictly followed. Smoking is prohibited except in designated smoking areas and not within the MRSs. The UXOSO or SUXOS will identify designated smoking areas. Discarding tobacco materials other than into designated tobacco receptacles is considered littering and is subject to fines.

10.2 Work Permits

10.2.1 Hot Work, Sources of Ignition, Fire Protection/Prevention, and Electrical Safety Procedures

Under the Performance Work Statement (PWS) and activities anticipated for this tasking, there are no requirements for hot work. All site personnel, to eliminate the hazards from ignition sources, will utilize the general, fire safety precautions and procedures outlined in Section 15.7.

10.3 Material Handling Procedures

All loading trucks shall be equipped with Falling Objects Protection Systems and back-up alarms. Work areas and means of access will be maintained safely and orderly. Tools, materials, extension cords, hoses or debris will not cause tripping or other hazards. Storage and construction sites will be kept free from the accumulation of combustible materials. There are no anticipated radioactive materials present on site. Spill contingencies are listed in Section 15.8. If forklifts are to be used on site the operator will be trained and certified.

10.4 Treatment Technology Employed at Site

10.4.1 UXO and MD Removal

GSIP has performed calculations in the former WTA Southeastern Region MRS Explosives Safety Submission (ESS) to establish minimum separation distances (MSDs) that must be maintained between MEC investigation/disposal activities and the public. All MEC specialists will conduct these operations in accordance with USACE procedures.

The Exclusion Zone (EZ) is the MSD as determined by specific parameters in each area/field work phase. The MSDs determined for each area are based on the munitions with the greatest

fragmentation distance (MGFD), type of field work activity, hazard mitigation engineering controls, and affected party (public or project personnel). The EZ is not continuous during the field work day. During periods when the team is not performing active intrusive investigation or MEC disposal, an EZ is not required.

10.5 Traffic

The site is remote, with restricted vehicle access. However, traffic hazards may be encountered commuting to the work site. While access is limited, care must be taken to avoid motor vehicle accidents at all times. Seat belts will be worn when driving and all posted traffic signs will be adhered to.

10.6 Drug Awareness and Drug-Free Workplace

GSIP fully supports all aspects of the Drug-Free Workplace Act of 1988. As such, the project team has implemented a Drug-Free Workplace policy. This policy is in accordance with Defense Acquisition Regulations System (DFARS) subpart 252.223-7004. Strict disciplinary actions are enforced for any violation of the project team's Drug-Free Workplace policy. All project team employees, as a condition of employment, have documented understanding and receipt of this policy.

Employees will not use or be under the influence of alcohol, narcotics, intoxicants, or similar mind-altering substances while on duty. Employees found to be under the influence of or consuming such substances will be immediately removed from the job site. Contractors will enforce the project team's drug-free workplace requirements.

Any employee under a physician's treatment and taking prescribed narcotics or any medication, including over the counter, that may prevent a person from being ready, willing, and able to safely perform his/her duties will provide a medical clearance statement to their supervisor from the attending physician.

The project team's policy and practice emphasizes supervisor training, a provision for self-referral to treatment, and maximum respect for individual confidentiality as well as a provision for identifying and dealing with illegal drug users, including testing. The project team's practice also provides for education, counseling, rehabilitation, and coordination with available community resources.

10.7 Fatigue Management Plan

The purpose of this Fatigue Management Plan (FMP) is to provide guidance in the assessment of the causes of fatigue and mitigate the related hazards during the execution of all associated tasks, operations, and work beyond the typical 10-hour operations shift period. The FMP is a chance for GSIP to allow long or demanding work hours when needed but ensures that fatigue is considered as a risk factor.

GSIP has an obligation to minimize risk due to fatigue on employees, subcontractors, and visitors whilst at the workplace. Where the effects of fatigue and/or the nature of the work being

performed induces fatigue causing impairment to a person's health and safety, GSIP will ensure that appropriate and reasonable management action, consistent with this management plan, is taken.

The project will follow a typical industry work schedule and is not anticipated to exceed USACE EM 385-1-1 guidance. If extended periods of working long hours are required, the UXOSO and/or SUXOS will monitor employees for outward signs of fatigue. Employee rotations may need to be adjusted to allow for individual differences in how fatigue-related stress is handled and for employee-specific roles on the project.

When employees are working extended hours, employee travel time to and from work will be minimized to allow for sufficient rest and should be taken into account in determining hours per day and per week limits. Group transportation to and from the work location and lodging will be used to address this situation. Consideration should be given to "awake" time and not just the hours logged on a timesheet.

10.7.1 Personnel Responsibilities

The management of fatigue is considered a shared responsibility between GSIP and its employees. GSIP is responsible for providing a safe system of work which includes the development, implementation and management of working time schedules, workload and the establishment of a safe work environment and work practice. Employees are responsible for ensuring they are fit for duty by taking into account their lifestyle and medical factors that could influence fatigue, and managing these appropriately.

All personnel active in site operations will be thoroughly familiar with the information outlined in the FMP before conducting work at the site. All site personnel, including GSIP and subcontractors, must review and be provided a detailed briefing on the contents of this document and sign the APP Acknowledgement before performing work on the project site.

Compliance with fatigue management requirements must be assessed weekly for the first month of work and then monthly thereafter to ensure controls are in place and operating effectively. Deficient controls must be remedied in a timely manner.

10.7.1.1 Senior Site Management

- Assist supervisors in the implementation of this procedure;
- Approve extended work hours;
- Process requested variances to the FMP through the GSIP H&S Manager; and
- Attend FMP training.

10.7.1.2 UXOSO

- Conduct fatigue risk assessments and review effectiveness of existing control methods;
- Ensure compliance with the FMP and conduct periodic effectiveness reviews;

- Ensure fatigue related incidents are reported and documented;
- Consider fatigue factors in accident/incident investigations;
- Coordinate and assist the FMP training; and
- Investigate any instances of non-compliance of FMP and review with Project Manager (PM).

10.7.1.3 Supervisors

- Ensure all employees under their supervision are aware and compliant with the FMP;
- Ensure applicable work schedules comply with the FMP;
- Monitor personnel for signs and symptoms of fatigue;
- Implement controls for mitigating and managing fatigue;
- Perform reviews of fatigue related incidents and validity of existing control actions as necessary;
- Report all fatigue related incidents to the UXOSO;
- Seek approval for extended shift hours; and
- Attend FMP training.

10.7.1.4 Site Workers

- Comply with the FMP;
- Maintain fit for work readiness at the beginning and throughout ones shift;
- Notify supervisor if at any time personal readiness is less than fit for work;
- Monitor for signs and symptoms of fatigue in themselves and co-workers; and
- Attend FMP training.

10.7.2 Understanding Fatigue

Fatigue can be defined as a state of impairment that can include physical and/or mental elements, associated with decreased alertness and reduced performance related to sleep deprivation and/or physical/mental exertion. Employees experiencing fatigue are likely to have increased incidents of accidents and injury. As well as these immediate problems, chronic fatigue can lead to long-term health problems.

10.7.2.1 Contributing Factors

Some of the factors that contribute to employee fatigue are rooted within the workplace such as shift schedules, work environment, and production demands. While other factors occurring outside of the workplace (lifestyle, personal health, family issues), have an equally important impact on employee fatigue in the workplace.

Fatigue can contribute to accidents by impairing performance and in extreme cases causing people to fall asleep. Fatigue related “micro sleeps” are very hard to predict or prevent and can place the individual and others safety at risk.

10.7.2.2 Fatigue in Co-workers

Symptoms of fatigue that are easily recognizable may include long eye blinks, repeated yawning, frequent blinking, bloodshot eyes, poor reaction time, slow speech, loss of energy, and an inability to concentrate.

If you notice a co-worker experiencing symptoms of fatigue you should notify your supervisor immediately. Other actions that may be appropriate include:

- Utilize stop work authority;
- Alternate tasks;
- Alternate schedules; and
- Reduce high stress task frequency.

10.7.2.3 Avoiding Fatigue

Rest is the most important control measure for managing fatigue. Time spent away from the immediate work environment allows workers to recover from fatigue, thereby improving work performance, vigilance, safety and efficiency.

Conditions for restful sleep must be provided and breaks must be taken during the work shift and not be traded for an early finish time for the shift. Studies demonstrate most adults need seven to eight hours of sleep in every 24 hours to feel well rested.

Quality and quantity of sleep plays a major role in fatigue. Regular bedtime routines; ensuring the bedroom is dark, cool and comfortable; and getting treatment for sleeping disorders, if necessary, can help improve sleep. Make sleep a priority.

10.7.3 Work Hour Limitations

GSIP’s work hours for the former WTA Southeastern Region MRS is anticipated to be four 10-hour days totaling 40 hours a week. Currently the work schedules planned do not exceed the USACE EM 385-1-1 guidance below:

- 10 hours a day for more than four consecutive days;
- 50 hours in a seven day work week;
- 12 hours a day for more three consecutive days; and
- 58 hours a week for sedentary (to include office) work.

If the site dictates a changes in the planned work schedule such as longer hours or additional days all site personnel shall observe the following specifications for technician/support activities work hour limitations:

- The UXOSO and/or the SUXOS will monitor employees for outward signs of fatigue;
- Employee rotations may need to be adjusted to allow for individual differences in how fatigue-related stress is handled and for employee-specific roles on the project;
- When employees are working extended hours, employee travel time to and from work will be minimized to allow for sufficient rest and should be taken into account in determining hours per day and per week limits.

10.7.3.1 Equipment Operators

Equipment operations during field activities will be limited. At no time will a heavy equipment operator be allowed to operate equipment longer than 12-hours in any 24-hour period. This would include time worked at any other site as well. A minimum of eight consecutive hours of rest between shifts in a 24-hour period is required.

10.7.3.2 Motor Vehicle Operators

Operators of motor vehicles, while on duty, shall not operate vehicles for a continuous period of more than 10 hours in any 24-hour period; moreover, no employee, while on duty, may operate a motor vehicle after being in a duty status for more than 12 hours during any 24-hour period. A minimum of eight consecutive hours shall be provided for rest in each 24-hour period.

10.7.4 Fatigue Risk Assessment

Risk management is important in an effective FMP. This involves hazard identification and risk assessment, control of the risks and evaluation of the effectiveness of the process. A fatigue risk assessment must identify the impact of fatigue risk factors, taking into account relevant local regulations. Work related risk factors shall be addressed as they may reduce physical performance, impact on psychological factors such as judgment, concentration, vision, and decision-making processes. Fatigue risk factors will be assessed as LOW, MEDIUM, or HIGH:

- LOW - Controls in place are adequate to mitigate the risks and do not need active management;
- MEDIUM - Controls require active management while tasks are being performed; and
- HIGH - Must be addressed with additional controls and reassessed.

Examples of some fatigue risk factors are listed below:

- Working without a rest break to meet critical deadlines/milestones;
- Sleep patterns affected by frequent call outs over a limited period and extended hours of work;

- Work tasks or activities requiring concentration or high levels of muscular exertion for extended periods of time;
- Tedious and monotonous work;
- Heavy or exhausting physical activity;
- Working in high risk situations;
- Working successive shifts; or
- Working in high heat or cold temperatures or humid conditions.

10.7.5 Identification of Fatigue

Fatigue identification can be accomplished by observing many different signs and symptoms. Some common signs and symptoms are listed below:

Physical:

- Lacking energy;
- Yawning;
- Heavy eyelids;
- Eye-rubbing;
- Head drooping; and
- Micro sleeps.

Mental:

- Difficulty concentrating on a task;
- Lapses in attention;
- Difficulty remembering what you are doing;
- Failure to communicate important information;
- Failure to anticipate events or actions;
- Doing the wrong thing (error); and
- Not doing the right thing (omission).

Emotional:

- More quiet than usual;
- Mood changes;
- Decreased tolerance; and
- Emotional outbursts of aggression or rage.

10.7.6 Project Specific Risks Leading to Fatigue

During the completion of the RA, the most likely activities or factors leading to workplace fatigue are listed below:

- Excessive walking;
- Weather conditions;
- Repetitive motion activities;
- Heat stress or cold stress;
- Difficult jobsite terrain;
- Diving operations; and
- Possibility of longer hours of work.

These factors leading to risk have been addressed in the project specific APP and in the project AHAs. Frequent breaks, cooling methods, and temperature monitoring are just a few of the controls implemented to prevent fatigue.

10.7.7 Assessment and Effectiveness

Control effectiveness can be reviewed by examining reports of fatigue and mishaps where fatigue is a factor. Effectiveness of controls can also be monitored by examining personnel and circumstances where extended shifts need to be worked. Compliance with fatigue management requirements must be assessed to ensure controls are in place and operating effectively. Deficient controls must be remedied in a timely manner. Any risks deemed HIGH must be addressed with additional controls which allow a reassessment of LOW or MEDIUM. Completed assessments must not contain risks assessed as HIGH.

The risk assessment and management plan must be documented and reviewed when work schedules or job roles are significantly modified.

10.7.8 Worksite Controls

GSIP recognizes controls to mitigate hazards that cause fatigue can be different for different jobs, positions, and even individuals. Through understanding the nature of fatigue, work hour limitations, fatigue risk assessments, and employee training, GSIP shall implement controls for mitigating fatigue. The number of employees at risk and the level of risk must be considered when implementing controls.

The hazard of fatigue and the controls have also been addressed in the project specific APP and AHAs. The following are a few examples of controls to reduce or eliminate fatigue:

10.7.8.1 Personal Controls

- Routine bedtime;
- Sleep in quiet, comfortable area;

- Ensure quality and quantity of sleep;
- Seek medical attention for sleep disorders;
- Avoid alcohol consumption; and
- Avoid stimulants like coffee and tea at bed time.

10.7.8.2 Administrative Controls

- Alternate work tasks;
- Rotating jobs to prevent repetitive work tasks;
- Allow for more frequent or longer breaks;
- Alternate transportation for long commutes;
- Schedule high risk tasks when most alert;
- Breaks at critical times in the work cycle; and
- Limit or eliminate night shifts.

10.7.8.3 Workplace Controls

- Work assistance in lifting and holding;
- Good ventilation or environmental factors (cooling);
- Ability to move around;
- Use of PPE; and
- Use of buddy-system.

10.7.9 Driver Fatigue

Driver fatigue may be due to a lack of adequate sleep, extended work hours, strenuous work or non-work activities, or a combination of other factors. Driver drowsiness may impair a driver's response time to potential hazards, increasing the chances of being in an accident.

10.7.10 Operator Controls

- Be sure to get an adequate amount of sleep each night;
- If possible, you should take a nap when feeling drowsy or less alert or switch out with another vehicle operator;
- Avoid medications that may make you drowsy if you plan to get behind the wheel;
- Recognize the signs of drowsiness;
- Behaviors such as smoking, turning up the radio, drinking coffee, opening the window, and other "alertness tricks" are not real cures for drowsiness and may give you a false sense of security; and

- Rotate driving responsibilities with other operators.

10.8 Security Plan

10.8.1 Site Access

UXO personnel will monitor the work areas where UXO operations are in progress to ensure that no unauthorized personnel access the work locations. Signage will be used where practical.

Site control procedures will be established to ensure site access to unauthorized personnel is limited. This will prevent persons who may be unaware of site conditions from being exposed to inherent hazards. MD will be containerized and secured in a central storage area to prevent unauthorized tampering. Any field equipment that may cause potential injury when left unattended will be removed from the site or otherwise rendered non-dangerous. Field team leaders will be responsible to ensure that the specific work areas are secure during nonworking hours.

10.8.2 Site Control

The work area is located within land controlled by various owners. The 36-acre RA area is owned by the ʻŌhulehule Forest Conservancy Limited Liability Company and the City and County of Honolulu.

10.8.3 Theft

No equipment or valuable items will be kept inside vehicles. If it is necessary that equipment remain inside a vehicle, it will be kept out of obvious sight, and the vehicle will be secured (all vehicle doors locked and all windows closed). Personnel will secure vehicles, even if parking for only brief periods, and will carry vehicle keys with them at all times. The jobsite trailer located off site at the baseyard will be locked when not in use.

In the event a theft does occur, local authorities will be promptly notified and appropriate project team personnel will be notified.

10.8.4 Personal Confrontation

Personnel will be observant of their surroundings. They should ensure their own safety, the safety of their co-workers, and the safety of the public by not confronting or challenging aggressive perpetrators. Authorities should be contacted if they observe any unusual circumstances.

10.9 Motor Vehicle Safety

Safety is of utmost importance for GSIP and the project team. Employees must act responsibly every day to ensure the safety of themselves and others. This safety commitment also applies when driving vehicles. All employee drivers are required to operate vehicles safely, obeying federal, state, and local laws, and company policies. Driving is a privilege, not a right.

10.9.1 Employee Requirements/Responsibilities

Drivers of project team vehicles must possess a current, valid driver's license of the appropriate class required for their driving needs. Driving duties and functions are to be performed in a safe, legal, and professional manner. Project team personnel are to attend periodic defensive driving training and other driver safety meetings as scheduled throughout the year through their local H&S Officers. Driver orientation program and/or driving evaluation tests may be required of drivers to assess overall driving skills.

Driving requires a high level of skill and alertness. When fatigue, illness, or medication impact alertness, reflexes, and decision-making capabilities, an employee driver should cease driving until the situation improves or is corrected and contact his/her manager to discuss the situation.

Compliance with all Federal, state, and local laws is expected. Unsafe vehicles and related equipment will be reported and repaired. Unsafe vehicles are not to be driven on project team business.

10.9.2 Compliance Issues/Driving Practices

10.9.2.1 Speed Limits

Drivers are required to obey posted speed limits and other traffic laws. Fines for any traffic violations are the employee's responsibility. Drivers not following traffic laws will be removed from the project team's driver list.

10.9.2.2 Seat Belts

Project team drivers and their passengers are required to wear seat belts at all times while the vehicle is in operation.

10.9.2.3 Distracted Driving

It is recognized that distracted driving can contribute to accidents. Accordingly, project team employees are to exercise caution and good judgment when driving. Reading maps, eating, placing or receiving a call or entering data (*e.g.*, text, email, internet search) on a mobile phone, and other activities may contribute to an accident. Mobile phone use while driving, including the use of hands-free devices, creates distraction and driver inattention. The following basic guidelines should always be observed:

- Make outgoing calls, text messages, and email after you have pulled over to a safe area;
- Let incoming calls go to voice mail, or if answering the phone is necessary, drivers are to pull over to make sure the caller knows you are driving and keep the call short and attempt to use the hands free option/speaker phone option if available; and
- At all times, drivers are to operate vehicles in a safe, legal, and professional manner.

10.9.2.4 Transporting Weapons, Alcohol, or Drugs

Transporting weapons (such as firearms, large knives) or dangerous property (significant or placardable quantities of regulated hazardous materials or substances) as well as any alcohol or drugs is prohibited.

10.10 Sanitation

Employers shall establish and maintain hygienic sanitation provisions for all employees in all places of employment. General housekeeping activities will occur daily.

10.10.1 Drinking Water

An adequate supply of potable water (bottled) shall be provided in all places of employment, for both drinking and personal cleansing. Non-potable water shall be identified with markings and be kept separate from potable water.

Cool drinking water shall be provided during hot weather. Only approved potable water systems may be used for the distribution of drinking water. Due to the remoteness of the site, temporary potable water will be provided by a licensed potable water contractor. “Reclaimed water” (treated wastewater) use in potable systems is strictly prohibited.

10.10.2 Toilets

Toilets are required to be present in all places of employment. All toilet facilities are in compliance with EM 385-1-1 02.E.02.

10.10.3 Procedures for Vermin Control

The site will be kept clean and organized. Organics such as foods will be wrapped and then discarded to avoid attracting pests.

10.10.4 Waste Disposal

All sweepings, solid or liquid wastes, refuse, and garbage will be removed in a manner that avoids creating a menace to health and should be discarded as often as necessary or appropriate to maintain sanitary conditions in the place of employment. All waste will be disposed of in accordance with the Waste Management Plan (Appendix J of the project UFP-QAPP).

10.11 Severe Weather

It is possible to experience severe weather during this project. In the event a storm threatens the area through observation (lightning observation and thunder) of a storm system, halt all field work and listen for weather service bulletins and civil defense messages on local radio and television stations (if available in an adjacent building). The UXOSO will determine through visual observations and weather updates (gathered through the radio or television) when it is necessary to halt work and when to re-start field activities, which include observing the “30-30” rule that states:

- If you see lightning and thunder is heard within 30 seconds (approximately six miles), seek shelter;
- If you hear thunder, but did not see the lightning, you can assume that lightning is within six miles and you will seek shelter; and
- Remain in the shelter for 30 minutes following the last lightning strike.

Additionally, when wind speed exceeds gusts of 40 miles per hour, the following actions will be taken:

- Follow manufacturer instructions in assessing the limitations associated with field equipment;
- Shut down outdoor activities involving work at elevation;
- Move mobile items stored outside to indoor locations;
- Secure any items that cannot be moved inside;
- Be careful opening exterior doors;
- Stay away from power lines; and
- Be cautious about downed power lines, tree limbs, and debris on roads.

If weather remains unstable for more than one hour, the UXOSO will monitor weather bulletins to further assess changing conditions.

10.12 HAZCOM

HAZCOM procedures will be kept on site. The project team and subcontractors will provide the location of SDSs, records of contractor employee training, and inventory of hazardous materials (including approximate quantities and a site map) that will be brought on site.

Chapter 11 Site Control

The UXOSO coordinates access control and security on site. Because of the hazardous nature of UXO, the UXOSO will establish an EZ during work activities in accordance with the approved Explosives Management Plan (Appendix I of the project UFP-QAPP), ESS, and the UFP-QAPP. The EZ is the work site and will encompass an area large enough to prevent personnel injuries from fragmentation resulting from unintentional or intentional detonations. Only essential personnel are allowed in the EZ during UXO operations. Authorized personnel are those who have completed the required training and meet medical requirements.

During onsite operations, the SUXOS will order operations to cease if nonessential personnel are observed within the site. To ensure safety, site controls include the following:

- Eating, drinking, and smoking are prohibited except in designated areas;
- Operations cease if nonessential personnel are present;
- The SUXOS, UXOSO, or their designee, will escort authorized site visitors;
- All personnel entering the site, including visitors, shall wear the proper PPE and sign in and out on the Site Visitors' Log;
- The UXOSO maintains the Site Control Log to ensure accurate accountability of personnel on site;
- The UXOSO provides a safety briefing to all personnel entering the site to inform them of potential site hazards. All personnel must acknowledge this briefing by signing the safety log; and
- In case of an emergency, personnel will exit the site and move to a designated safe area. The UXOSO will determine the designated safe area that is located upwind of the site outside of the fragmentation area. The SUXOS will notify the USACE OESS and PM if an emergency warrants site evacuation.

The Support Zone (SZ) will be established as the area outside the EZ, and is the location of the administrative and other support functions such as material and equipment staging. The SZ includes facilities such as the change area, lunch and break areas, office spaces, and supply storage areas. Specific areas within the SZ will be designated for smoking, eating, and drinking. The potential of cross contamination is not applicable to this project based on the project characterization; therefore, a Contamination Reduction Zone (CRZ) will not be required.

This Page Intentionally Left Blank

Chapter 12 Personal Hygiene and Decontamination

12.1 Personal Hygiene

Every project employee and site visitor will take normal personal hygiene precautions during activities being conducted on site. Specific personal decontamination will be in accordance with the assigned task being performed.

Adequate sanitation facilities will be provided at each work site to ensure proper personal hygiene. Site sanitation will be established and maintained in accordance with OSHA 29 CFR 1910.120(n) and USACE EM 385-1-1, Section 2. All personnel will be expected to maintain onsite personal hygiene.

If site conditions change or unanticipated hazardous contamination is encountered, work will be suspended. The USACE OESS will be notified, and the appropriate procedures will be developed and submitted for approval before work is resumed.

This Page Intentionally Left Blank

Chapter 13 *Equipment Decontamination*

13.1 *Hazardous/Toxic Waste Site Characteristics*

Hazardous, toxic, radiological waste (HTRW) is not anticipated to be generated during site activities at the former WTA Southeastern Region MRS. The site is not suspected to contain CWM.

13.2 *Equipment Decontamination*

Equipment decontamination procedures will be in accordance with the Resource Conservation and Recovery Act (RCRA) and OSHA standards, and applicable AHAs.

Based on the analysis of hazards of concern presented by each task, on site history and AHAs prepared for this site, no equipment decontamination is required at this time.

If site conditions change or unanticipated hazardous contamination is encountered, work will be suspended; the USACE OESS will be notified; and the appropriate procedures will be developed and submitted for approval before work is resumed.

All equipment, working surfaces and non-working surfaces will be decontaminated after contact with potentially infectious materials. A solution of 10 parts water to one part bleach, or equally effective material, will be used to clean contaminated areas (*e.g.*, accumulated rodent/bird droppings).

General decontamination procedures that might apply to a given situation for equipment decontamination when exiting the EZ include:

- Any equipment leaving the site will be inspected and if needed, will be cleaned with soap and water to remove any visible contamination;
- Contaminated, sharp objects will be cleaned up using mechanical means, such as a brush and dustpan. Sharp objects will not be picked up directly with the hands;
- Two pairs of gloves, inner surgical gloves and outer utility gloves will be worn for cleaning contaminated surfaces. A smock or apron and eye protection will also be worn;
- Only those workers directly involved with the decontamination efforts will be allowed in the work area while cleaning is taking place; and
- All cleaning equipment will be disinfected or disposed of in accordance with this section.

This Page Intentionally Left Blank

Chapter 14 *Emergency Equipment and First-Aid*

14.1 *First-Aid and Bloodborne Pathogens*

14.1.1 *First-Aid Kits*

First-aid kits are assigned and approved by the UXOSO. Table 14-1 lists the contents needed for a Class B First Aid kit; the minimum standard of first aid kits that will be kept in each operational vehicle, each team, and the site office. The size and number of first-aid kits shall be sufficient to accommodate the maximum number of people on site at any given time.

Table 14-1: Contents for Class B First Aid Kit

Description	Quantity	Description
Adhesive Bandage	50	1 x 3 in.
Adhesive Tape	2	2.5 yards
Antibiotic Application	25	0.14 fluid ounces
Antiseptic	50	0.14 fluid ounces
Breathing Barrier	1	N/A
Burn Dressing (gel soaked)	2	4 x 4 in.
Burn Treatment	25	1/32 ounces
Cold Pack	2	4 x 5 in.
Eye covering, with means of attachment	2	2.9 square in.
Eye/skin Wash	1	4 fluid ounces total
First Aid Guide	1	N/A
Hand Sanitizer	10	1/32 ounce
Medical Exam Gloves	4 pairs	N/A
Roller Bandage	2	2 in. x 4 yards
	1	4 in. x 4 yards
Scissors	1	N/A
Splint	1	2.5 x 24 in.
Sterile Pad	4	3x3 in.
Tourniquet	1	1 in. (width)
Trauma Pad	4	5 x 9 in.
Triangular Bandage	2	40 x 40 x 56 in.

Note:

N/A – not applicable

14.1.2 *Medical Supplies*

Medical supplies required to be on site are listed in Table 14-2. At a minimum, the requirements for a Class B First Aid Kit, as specified in ANSI/International Safety Equipment Association (ISEA) Z308.1-2014 and EM 385-1-1 (USACE, 2014), will be met. In addition, the UXOSO will have a five-person trauma kit in his/her truck and one will be located in the explosive disposal truck.

Table 14-2: Emergency Equipment

Emergency Equipment	Quantity	Location Used/Stored	Operation Requiring Equipment
First-Aid Kit	1	Each Vehicle	All operations
Biohazard Kit	1	Each Team	All operations
Portable Eye Wash Kit	1	Each Team	All operations
Large Medical Kit with Trauma supplies	1	UXOSO Vehicle	All operations
Portable Stretcher	1	UXOSO Vehicle	All operations
Fire Extinguisher	1	Each Vehicle Applicable Field Operations	All operations
Spill Containment Supplies	1	Field refueling operations	Operations involving Hazardous Materials

14.1.3 Bloodborne Pathogens

BBPs are pathogenic microorganisms that are present in human blood and can cause disease in humans. These pathogens include, but are not limited to, Hepatitis B Virus (HBV), Hepatitis C Virus (HCV), and Human Immunodeficiency Virus (HIV). Personnel administering care must have successfully completed BBPs training in accordance with section 5.6 and must implement exposure control measures.

PPE is the first line of defense against BBPs. The following protective equipment will be available on site for personnel administering first aid:

- Surgical Gloves – must be worn when hand contact with blood or other body fluids is possible or the care provider has non-intact skin areas on his/her hands;
- Masks/Eye Protection/Face Shields – will be worn when slashes, sprays, or droplets of blood or body fluids are likely to occur and contaminate the eyes, nose, or mouth of the care provider; and
- Coveralls/Jacket – will be donned if the possibility exists for contamination of the body of the care provider.

To ensure that equipment is used effectively, employees will adhere to the following practices when using PPE:

- Any garments penetrated by blood or other suspect infectious materials are to be removed immediately, or as soon as feasible;
- All personal protective clothing/equipment shall be removed prior to leaving the site and placed in a suitable container for decontamination and/or disposal;
- Disposable gloves are to be replaced as soon as practical after contamination or if they are torn, punctured, or otherwise lose their ability to function as an “exposure barrier;” and

- Potential exposure to the body of the care provider will require donning a coat or coveralls to provide protection.

14.2 Emergency Equipment

14.2.1 Emergency Kits

Table 14-2 lists emergency equipment, which will be maintained on site and available for use during site operations. Emergency equipment shall be maintained in proper working order and checked by assigned personnel daily. It will be the responsibility of the UXOSO to maintain the site emergency equipment in good working order. The UXOSO will inspect all emergency equipment at least weekly to ensure completeness and proper working condition. Any time that emergency equipment is used, it will be reported to the UXOSO so that those items used can be replaced immediately. Site operations shall not be allowed to continue if the required emergency equipment is not immediately available on site.

This Page Intentionally Left Blank

Chapter 15 Emergency Recognition and Response Procedures

Site topography and prevailing weather conditions are addressed in Section 2.2.1.1 of this SSHP. Emergency response procedures will be rehearsed to permit evaluating the effectiveness of the planned response capabilities. The UXOSO will cease all operations in the case of an emergency. Appropriate individuals, authorities, and/or health-care facilities will be notified of the activities and hazards of the emergency.

To prepare for an emergency and to minimize the impacts, the UXOSO will:

- Review emergency procedures with affected employees;
- Conduct a test of the emergency plan in the form of a drill to ensure effectiveness;
- Ensure the roster of all employees and subcontractors is updated daily;
- Ensure that an eyewash station, first aid supplies, and fire extinguishers are available at the site;
- Have working knowledge of all safety equipment available at the site; and
- Ensure that a map detailing the most direct route to the hospital is kept in each site vehicle, complete with all necessary telephone numbers.

15.1 Pre-Emergency Planning

Castle Medical Center is the designated offsite medical facility. It is located at 640 Ulukahiki Street, Kailua, Hawaiʻi. Travel time is approximately 25 minutes. A map showing the route to the hospital will be in each site vehicle, and a written description of the route will be attached to the map. The hospital route will be verified prior to work initiation.

An emergency evacuation drill will be performed prior to starting field operations.

Field team leaders will identify an adequate landing zone (LZ) in the event of casualties requiring medical evacuation (MEDEVAC) via helicopter if service is available. The UXOSO will have a roster of individuals on site so that they can be accounted for in the event of an emergency.

15.2 Personnel and Lines of Authority for Emergency Situations

The UXOSO will be appointed as an Emergency Coordinator (EC) and a system will be implemented to provide a common framework within which people can work together effectively.

15.3 Criteria and Procedures for Emergency Recognition and Site Evacuation

15.3.1 Medical Emergency and Personal Injury

The first worker who notices that a medical emergency or personal injury has occurred shall immediately make a subjective decision whether the emergency is life-threatening and/or

otherwise serious and will then proceed as described in the following subsections. Because there are no contaminants of concern on site, emergency decontamination of personnel will not be required.

15.3.1.1 Life-Threatening and/or Otherwise Serious Incident

If a life-threatening incident occurs, emergency medical assistance will be immediately requested. If an apparent life-threatening and/or otherwise serious incident has occurred, the first person who identifies the situation will summon the UXOSO or SUXOS. The SUXOS will assume the role of EC until the UXOSO arrives on scene. The EC shall be apprised of the situation and told where the injured person(s) is/are located. As the EC proceeds to the accident scene, communications channels shall be opened and kept on standby until the EC has surveyed the scene and performed a primary survey of the injured person.

The EC shall then determine whether emergency assistance should be summoned and the information that must be relayed, and shall provide emergency action principles that are consistent with the injury. The EC shall appoint a staff person or persons who will meet the emergency responders and take them quickly to the injured person. If necessary, decontamination of the individual shall be performed at the direction of the EC.

15.3.1.2 Non-Life-Threatening Incident

If it is determined that no threat to life is present, the worker shall assist the injured person to a safe location and contact the UXOSO. The injured person will then be treated and monitored in accordance with standard first aid procedures and this SSHP.

15.3.2 First-aid Procedures

A first-aid kit will be provided on site complying with the criteria contained in ANSI/ISEA Z308.1-2014. A list of items contained in the kit is presented in Table 14-1.

Trained personnel will use approved measures for treatment. For minor injuries, routine first aid procedures will be used. For major injuries, an ambulance will be called immediately and the appropriate first aid administered while awaiting the arrival of the ambulance.

In the event that a helicopter MEDEVAC is necessary for a medical emergency/trauma, the EC will ensure the area is safe to enter, render first aid as necessary, call 911, and describe the event to the operator and request MEDEVAC transport. The EC will monitor and direct helicopter approach to a safe landing location and direct unaffected team members to avoid the aircraft. The site will be secured until accident investigation is conducted.

15.3.3 Worker Injury or Illness

The UXOSO will be responsible for monitoring the general health of site workers. Site illnesses, conditions, or injuries that can be expected given the working conditions include heat stress, exposure to chemicals found at the site, construction-related injuries, insect bites, and injuries caused by slips, trips, and falls.

These conditions will be prevented by properly training site workers in the appropriate use of H&S equipment, dressing appropriately, monitoring the breathing zone atmosphere, and maintaining good housekeeping procedures. These activities are discussed in more detail throughout this SSHP.

The specific response to an injury or illness will depend on its type and severity, but in general, first aid will be administered in the field by the UXOSO, who will be trained in first aid and CPR. The worker may then be transported to the hospital designated in this SSHP. General guidelines for first aid are as follows:

- For minor injuries, routine first aid procedures will be used;
- For major injuries, an ambulance will be called immediately and the appropriate first-aid administered while awaiting arrival of the ambulance; and
- Trained personnel will use approved measures to administer treatment.

15.3.4 Emergency Response

During an emergency, the following actions will be taken, with some actions conducted concurrently. No one will attempt emergency response/rescue until the situation has been assessed and the appropriate response outlined. Field activities will cease, personnel will be warned, and the area isolated.

The minimum actions taken will be as follows:

- All work will cease;
- All affected employees and subcontractors will be warned/notified of the emergency;
- The area will be isolated; and
- Appropriate notifications will be made.

Rescue/response may include the following:

- **Assessment:** Assess existing and potential hazards to site personnel and the offsite population;
- **Determine:**
 - Whether and how to respond;
 - The need for evacuation of site personnel and offsite population; and
 - The resources needed for evacuation and response.
- **Survey Casualties:**
 - Locate all injured persons and assess their condition; and
 - Determine resources needed for stabilization and transport.

- **Request Aid:** Contact the required offsite/onsite personnel or facilities, such as the ambulance, fire department, and/or police;
- **Allocate Resources:** Allocate onsite personnel and equipment to rescue and initiate incident response operations;
- **Extricate:** Remove or assist injured persons from the area, using appropriate PPE equipment and procedures;
- **Control:** As trained, and as determined safe, assist in bringing the hazardous situation under complete or temporary control and use measures to prevent the spread of the emergency;
- **Decontaminate:** Not necessary;
- **Stabilize:** Administer any medical procedures that are necessary before the injured person(s) can be moved. Stabilize or permanently fix the hazardous condition. Attend to what caused the emergency and anything damaged or endangered by the emergency;
- **Transport:** No contamination of the transport vehicle, ambulance, and hospital personnel is anticipated;
- **Casualty Logging:** Record who, time, destination, and condition upon transport;
- **Evacuate;**
 - Move site personnel to a safe distance upwind of the incident; and
 - Monitor the incident for significant changes. The hazards may diminish, permitting personnel to reenter the site, or hazards may increase and require public evacuation.
- **Casualty Tracking:** Record disposition, condition, and location; and
- **Notification:** Notify appropriate individuals/entities.

15.3.4.1 Evacuation Routes and Procedures

Personnel shall exit the site by the nearest means of egress during accidents requiring evacuation. Once off-site, personnel shall assemble at the location designated by the UXOSO and be accounted for. Any missing personnel shall be brought to the attention of the responders.

15.3.4.2 Emergency Alarm Systems

Portable telephones and/or two-way radios will be available for site and emergency communications (PM, SUXOS, UXOSO, and field staff). In addition, equipment spotters will be provided with emergency air horns to alert all personnel to stop work immediately. Emergency communications and signals are described in the tables below. All field personnel will be trained regarding site emergency signals. Cell serves has been confirmed for the project site location.

Emergency service personnel (police/fire/ambulance) will be summoned by requesting support from the Department of Emergency Services personnel.

15.3.4.3 Hand Signal Communications

It is essential that workers have a means of communicating rapidly and effectively during heavy equipment operations, construction, hazardous waste operations, and other types of activities. Communication while wearing PPE can be extremely difficult. Table 15-1 presents guidance for uniform communication protocols to be used, as needed, in field operations.

Table 15-1: General Hand Signals

Signal	Meaning
Point index finger toward self	I; me
Point index finger toward object	It; them
Point index finger toward person	You; them
Circle index finger at group	We; us; all of us
Pointed finger on extended arm	Look in that direction
Beckon with index finger	Come here
Point with thumb in a particular direction	Move this way; go this way
Hold index finger up near head	Wait
Slowly ease palm face down	Relax; slow down
Put palm over brow	Scout it out; check it out
Move hand far away from body	Stay away
Hands on top of head	Need assistance
Grip partner's wrist or place both hands around partner's arm	Leave area immediately
Thumbs up	OK; I'm all right
Thumbs down	No; negative; bad; not OK
Hand gripping throat	Cannot breathe; out of air
Wave hands over head from side-to-side	Attention; stand-by for the next signal
Swing hand from direction of person receiving signal to directly overhead and through in circle	Come here
Clenched fist of extended arm	Stop motion/hold position
Draw index finger across front of throat	Shut off engine; cut off power; quit
Place palm face down and rotate from side to side	Unsure; can't decide
Form a circle with thumb and index finger	OK; I understand; agree
Military salute	I understand and will comply

15.3.4.4 Emergency Signals

Emergency signals (Table 15-2) are critical for alerting workers of danger and to maintain site control during an emergency. Bullhorns, radios, air horns, and similar devices will be used as described above for emergency communications. Emergency hand signals should be used as a secondary means of communication.

Table 15-2: Emergency Signals

Signal	Meaning
One long sound/blast of the emergency alarm signal, air horn, siren, whistle	Emergency situation, face safety watch and watch or listen for directions
Pause; followed by a number of short sounds, 1, 2, 3, or 4	Evacuate to the pre-designated emergency meeting place indicated by the number of sounds
Two long blasts of the emergency alarm signal, air horn, siren, whistle	All clear
Point one arm in direction of evacuation, make a large circling motion with the other arm in direction of evacuation	Evacuate the area
Hand clutching throat	Cannot breathe; out of air
Grip partner's wrist or place both hands around partner's arm	Leave area immediately

15.3.4.5 Radio Communications

When radio communication is used, personnel will be instructed in the use of the radio, which channel should be used, and in the following radio guidelines. Personnel will use the radio only for necessary work-related communication.

- Speak clearly;
- Call the name or call sign of the individual or unit you are trying to reach and identify yourself (*e.g.*, “Team One; this is Safety”);
- Wait for acknowledgement (*e.g.*, “Safety, this is Team One”) before you continue transmission;
- Proceed with your transmission. When finished, say “Over” when you expect a response. When transmission is complete and no response is expected, say “Out”;
- When receiving a radio call, acknowledge the call immediately unless doing so would interfere with safety;
- If a transmission is incomplete or not understood, request clarification;
- Emergency calls should begin with the words “Emergency, Emergency, Emergency.” Give absolute priority to emergency communication. Unless answering or aiding the emergency call, do not use the radio until certain it will not interfere with further emergency communication;
- Ensure that radios are charged and tested prior to each work shift and as necessary thereafter;
- Malfunctioning radios must not be used and must be replaced immediately;
- Do not transmit false information or unidentified communication; and
- Profanity and indecent language are prohibited. Transmittal of sensitive information over the radio is prohibited.

15.4 Decontamination and Medical Treatment of Injured Personnel

Since there is no known contamination on site, decontamination of site personnel will not be required.

15.5 Emergency Medical Facilities and Phone Numbers for Responders

Castle Medical Center is the designated offsite medical facility. It is located at 640 Ulukahiki Street, Kailua, Hawaiʻi.

Driving directions to the Castle Medical Center from the former WTA Southeastern Region MRS are as follows:

- Exit Waikane Work Area;
- Head east on Waikane Valley Road;
- Turn right onto Kahekili Highway;
- Turn left on Likelike Highway;
- Turn right onto Kamehameha Highway;
- Turn left onto Pali Highway;
- Turn left onto Ulukahiki Street; and
- Turn left into Castle Medical Center – End.

Refer to the project APP Attachment A, Figure A-2 for the Hospital Route Map.

The emergency telephone numbers listed in Table 15-3 shall be prominently posted in project team vehicles. The emergency telephone numbers, along with the APP, OSHA 300 Log (Attachment E of the APP), deficiency tracking system documents, safety and health promotional posters, date of last work day injury, and OSHA Safety and Health poster, will be kept unobstructed and readily available to the workers.

15.6 Criteria for Alerting Local Community Responders

In the event of an emergency requiring outside emergency services, project team personnel will immediately dial 911 to contact the appropriate organization. Following the phone call, project team personnel will contact onsite personnel to inform them that emergency service personnel and equipment will be entering the work area. Subsequent to these notifications, appropriate project team personnel will be contacted and informed regarding the situation.

Table 15-3: Emergency Contact Numbers

Organization/Point of Contact	Telephone Number	Comment(s)
Ambulance Police/Security Medical Evacuation Fire	911	
GSIP Office	(808) 834-4631	
Castle Medical Center 640 Ulukahiki Street Kailua, Hawaiʻi 96734	(808) 263-5500	
24-hr Medical Emergency & Toxicological	(888) 478-0798	Will reach answering service; leave number to call back.
Spill Response – Chemical Transportation Emergency Center (CHEMTREC)	(800) 424-9300	
National Response Center	(800) 424-8802	
Poison Control Center	(800) 962-1253	
USACE PM – <i>Kevin Pien</i>	(808) 835-4091	
USACE COR – <i>Uyen Tran</i>	(808) 835-4096	
EPA Region 9 Environmental Emergency Response	(415) 972-3063	
Call-Down: after 911, call ASAP		
PM – <i>Daniel Wolf</i>	(808) 895-7815	
Corporate H&S Manager – <i>Michael Coyle</i>	(808) 349-3178	
H&S Manager/UXOSO – <i>Robert Cook</i>	(808) 354-3783	
Alternate UXOSO – <i>John Coberley</i>	(808) 887-1131	
SUXOS – <i>Marco Beltran</i>	(808) 960-3362	

15.7 Fire Prevention, Protection, and Response

Potential sources of fuel include diesel, gasoline, and combustible loads such as paper and leaves. Sources of ignition include combustion engines and electrical sources. Flammable liquids will be properly stored in safety cans and/or flammable cabinets. Housekeeping will be performed daily to limit fuel loads. Types of fire suppression systems include multipurpose ABC portable fire extinguishers. In case of fire, evacuate the area immediately. Activate fire alarms and/or dial 911 or the established Fire Emergency Number from a safe location. Indicate what is happening, the location of the fire, and whether there are injuries. Comply with requests from the 911 operator for information. Do not hang up until told to do so by the operator, or allow the operator to hang up first. Upon completion of the emergency phase, comply with incident notification procedures.

If the fire is small and manageable with fire-extinguishing equipment at hand, and you are trained in the use of this equipment, you may make the decision to use this equipment while waiting for advanced assistance. Never place yourself in danger, always have a plan for escape, and never attempt to fight a fire if there are any doubts about the type of fire or your ability to successfully fight the fire. Never allow the fire to get between you and your escape route.

In the event of a fire or unplanned detonation, if possible, site personnel will try to put out the fire if no MEC is involved. If unable to do so, site personnel will notify the local fire department listed in Table 15-3.

NOTE: No attempt will be made to fight a fire if UXO or disposal explosives may be present. If this occurs, all personnel will evacuate and call the local fire department listed in Table 15-3.

15.7.1 Wildfires

15.7.1.1 Prevention

Site personnel should practice smart fire safety habits and watch out for hazardous conditions. If conditions are dry, wildfires can pose a threat—not only because there is plenty of fuel to burn, but also because rural areas and remote locations often do not have easy access for firefighters. There also is a chance that embers from a fire a mile or more away may fall onto nearby vegetation and cause them to catch fire.

Fire is a hazard during explosive disposal operations. Explosive disposal fire suppression practices, such as vegetation removal in sandbag barricade footprint, covering detonation priming cord with sand, shielding caps, and post disposal inspection for possible ignition points, shall be utilized. Other procedures are detailed in SOP *UXO-02 Explosive Disposal Operations*.

The following preventive measure will be observed:

- Smoke only in designated areas and not within the MRS;
- Avoid driving through high grass or areas where vehicle exhaust or hot engine surfaces could cause fires;
- Keep a fire extinguisher handy;
- Be extra cautious during the dry season and observe warnings and prohibitions established by Forestry Service or other agencies;
- Be aware of wild fires in neighboring areas; and
- Ensure that chain saws and other grubbing equipment are equipped with serviceable spark-arresting mufflers.

15.7.1.2 Awareness and Response

Wildfires can spread quickly and without warning. A subtle shift in the wind could send the flames in your direction even though authorities may have deemed your area safe. Make sure you have a plan in place:

- Be aware of wildfires in neighboring areas;
- Do not attempt to fight forest fires. If a fire or smoke is observed, notify all site personnel, initiate evacuation, and report the fire to the designated emergency agencies;
- Designate a place to meet if there is a fire; and

- Identify multiple places you could evacuate to outside the danger zone.

It is very easy to panic, but if you remain calm and prepare for emergency situations, you will increase your chances of making a safe evacuation. If you are driving:

- Roll up your windows and close your air vents;
- Drive slowly and turn on your headlights; and
- Do not drive through heavy smoke.

15.7.2 Fire Extinguishing Equipment

Fire extinguishing equipment meeting 29 CFR Part 1926, Subpart F, shall be on hand and ready for use to control fires.

- Flammable and Combustible Materials (liquids, gases):
 - Flammable materials must be properly labeled, stored, handled, and used;
 - No smoking or use of open flame-producing devices within 50 feet of flammable and combustible materials;
 - Obtain SDSs for all flammable materials in use and ensure all personnel are aware of hazards;
 - All containers are to be properly labeled with contents, the word “Flammable”, and in accordance with HAZCOM requirements;
 - Store materials in well-ventilated areas that are free of ignition sources and flame or sparks;
 - Ensure that incompatible materials are stored in remote locations from each other (*e.g.*, keep flammables from oxidizers);
 - Limit quantities to minimum required;
 - Store cylinders in upright and secure positions;
 - Bond and ground containers as (and where) necessary;
 - Use proper storage cabinets for flammable and combustible materials. Contact H&S Staff for assistance;
 - Use only approved containers; and
 - Use and dispense only in well-ventilated areas.
- Combustible Materials (solids):
 - Solid combustible materials include: wood, paper, and cloth. Proper housekeeping reduces concerns for combustion of these materials. Use proper receptacles for disposal and dispose of routinely.

- **Oxidizers:**
 - An oxidizer is a substance that increases the flammability of materials, allowing them to burn easier. Examples include: pure oxygen, chlorine, ammonium nitrate. Store oxidizers in a remote location from flammable and combustible materials.
- **Electric Appliances:**
 - Do not use electric appliances near flammable or combustible materials. Never place an appliance on an unstable surface. Use only UL- or FM-approved appliances. Follow the manufacturer's recommendations or requirements for use and maintenance. Obtain approval from H&S staff prior to purchase and use of portable heater units in office settings. Do not leave portable heaters on and unattended.
- **Smoking:**
 - Smoking is prohibited indoors. Smoking is allowed only in outdoor, designated areas, and not within the MRS. Smokers are to maintain smoking areas in a clean and safe condition. Ensure that receptacles for disposal of cigarettes and other smoking materials are appropriately constructed, free of combustible debris and when necessary, are cool before emptying into waste receptacles.
- **Housekeeping:**
 - Personnel are responsible for keeping work areas free of combustible materials and debris; and
 - Weeds and grass must be properly maintained to limit potential fire hazard.

15.8 Spills

The following procedures comprise the spill containment program in place for activities at the site. Spill procedures will be reviewed by the UXOSO with team members.

15.8.1 Measures for Preventing Fuel Spills

- Care shall be taken when transferring fuels;
- A containment dike around fuel storage tanks shall be constructed;
- Inspect all fuel storage tanks and containment structures for leaks daily;
- Where spills, leaks, or ruptures may occur, adequate quantities of spill containment equipment (*e.g.*, absorbent, pillow, shovels) will be stationed in the immediate area. The spill containment equipment must be sufficient to contain and isolate the entire volume of fuel being transferred; and
- Fire-extinguishing equipment meeting 29 CFR Part 1926, Subpart F, shall be on hand and ready for use to control fires.

15.8.2 Fuel Spills Greater than Five Gallons

The following response procedures shall be followed for spills of flammable fuels greater than five gallons in volume:

- Shut down operation in area immediately;
- Limit ignition sources;
- Suppress vapors as required;
- Survey area with combustible gas indicator (CGI) if available; don protective equipment as necessary;
- Pump liquids into drums;
- Recover contaminated solids and place in containers; and
- Clean up all residues.

15.8.3 Notification

In the event of a spill or release, project team personnel will immediately dial 911, and will then notify the UXOSO or designee. The project team PM and H&S Manager will be informed of any injuries, minor or serious. The project team UXOSO will file an incident report within 24 hours of the accident.

Accidents resulting in a fatality, lost-time injury or illness, hospitalization of three or more personnel, due to the same incident, or property damage to government or project team property (which occurred during performance of the task order) equal to or exceeding \$1,000 must be reported to the project team H&S Officer and the Contracting Officer's Representative (COR), or designee as soon as possible, but not later than two hours after occurrence, and reported in writing within five days of occurrence. Accidents resulting in fatalities must be reported to the regional OSHA Office no later than eight hours after occurrence. All work-related inpatient hospitalizations of one or more employees, all work-related amputations and all work-related losses of an eye must be reported within 24 hours of being notified of the incident.

Chapter 16 Logs, Reports, Audits, Inspections, and Recordkeeping

16.1 Safety Log

The UXOSO will maintain a safety log of all safety-related activities. The UXOSO is responsible for ensuring that H&S activities for the day, as well as safety meeting minutes, are documented in the safety log or filed appropriately. In addition, the UXOSO will maintain a site OSHA 300 log (Attachment E of the project APP).

16.2 Training Log

The UXOSO is responsible for ensuring that all training conducted relative to job site activities is documented appropriately.

16.3 Site Control Log

A log of all personnel visiting, entering, or working on the site will be maintained. The log will include the following: date, name, agency or company, and the time entering and exiting the site. This information, including dates, will be recorded in the site control log.

16.4 Inspection Forms

Daily safety and health inspections will be conducted by the UXOSO with the results recorded in the daily safety log. The UXOSO will conduct periodic safety and health audits to ensure site personnel are performing the tasks in accordance with the project UFP-QAPP and this SSHP.

This Page Intentionally Left Blank

Attachment C
Certifications

Note: This appendix has undergone editorial revisions in order to incorporate errata comments on the Final version of the document.

This Page Intentionally Left Blank

List of personnel whose certifications included in this appendix:

Personnel:

- Michael Coyle (Corporate Health and Safety Manager);
- David Gerow (Certified Industrial Hygienist)
- Robert Cook (Health and Safety Manager/Unexploded Ordnance [UXO] Safety Officer);
- Marco Beltran (Senior UXO Supervisor); and
- John Coberley (UXO Quality Control Specialist/Alternative UXO Safety Officer).

Note: Current certifications will be verified before mobilization of field teams

This Page Intentionally Left Blank

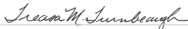
To verify current status, visit bcsp.org/certification_directory.

Having met the applicable requirements defined by its bylaws,
BCSP hereby authorizes the use of

**Certified Safety Professional (CSP)
to
Michael D Coyle**

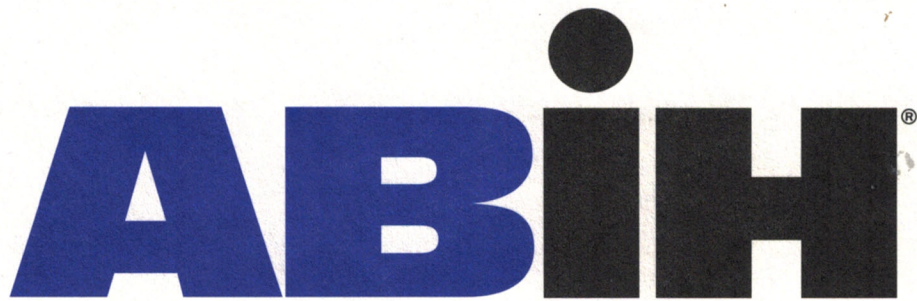
**Certificate #
CSP-17321**

**Expires on
12/31/2017**



SECRETARY

This Page Intentionally Left Blank



american board of industrial hygiene®

**organized to improve the practice of industrial hygiene
proclaims that**

David D. Gerow

**having met all requirements of
education, experience and examination, and
ongoing maintenance,
is hereby certified in the**

**CHEMICAL PRACTICE
of
INDUSTRIAL HYGIENE**

and has the right to use the designations

CERTIFIED INDUSTRIAL HYGIENIST

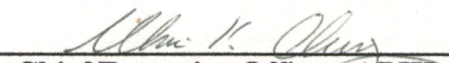
CIH

Certificate Number	4229 C
Awarded:	July 7, 1989
Expiration Date:	June 1, 2022





Chair, ABIH



Chief Executive Officer, ABIH

This Page Intentionally Left Blank

Comprehensive Safety Services Training Academy

Certification

This Certificate Acknowledges That

ROBERT W. COOK

HAS BEEN TRAINED IN THE FOLLOWING:

HAZARDOUS WASTE OPERATIONS AND EMERGENCY RESPONSE
OSHA 1910.120
40 HOUR TRAINING

Dated this 17th of Day of May, 2002



Lt. Carl R. Patfield Cleveland FD Ret. Certified by NV. State Fire Marshal
World Safety Organization/CSSD-CSI
702-254-1659 Las Vegas, NV Web Site @ WSS.CSS.PRODIGYBIZ.COM





Waikoloa Maneuver Area Project, Hawaii

Certificate of Completion

Awarded to

Robert Cook

for successfully completing

on

September 20, 2016

8 Hour HAZWOPER Refresher

This training was conducted in accordance with 29 CFR 1910.120 relevant to Hazardous Waste Operations and Response; all applicable United States Army Corps of Engineers publications; GSI Pacific Inc. Site Safety Health Plan, Accident Prevention Plan and applicable company policies. The above person is hereby qualified to participate in activities pertinent to the specified training.

A handwritten signature in black ink, appearing to read 'Chris Matute', written over a horizontal line.

Chris Matute, CHST

UXO Safety Officer, MEC Division

Certificate No.9202016 -018



certifies that

ROBERT COOK

has successfully completed ClickSafety's web-based training course:

C4 Hazwoper Supervisor

In accordance with the requirements of 29 CFR 1910.120(e).

This course was developed and presented by ClickSafety.com, Inc.

This online training course was designed and presented to provide generic classroom skills training to meet the requirements of 29 CFR, 1910.120(e)(4)



I confirm that I personally took the course listed above.

18628495
SERIAL NUMBER

8/22/2016
COMPLETION DATE

8 HOURS
COURSE DURATION


STUDENT SIGNATURE

Certificate of Completion

Presented to:
ROBERT COOK

On 3/20/2013, ROBERT COOK successfully completed the OSHA 30 Hour Outreach Training for the Construction Industry.

Taylor Alan Sisk

OSHA TRAINING
INSTITUTE
EDUCATION CENTER

USF UNIVERSITY OF
SOUTH FLORIDA

**American
Safety Council**
.COM

OSHA Authorized Trainer

As an OSHA authorized trainer, I verify that I have conducted this OSHA outreach training class in accordance with OSHA Outreach Training Program requirements. I will document this class to my authorizing OSHA training organization. Upon successful review of my documentation, I will provide each student their completion card within 90 days of the end of the class.



Naval School Explosive Ordnance Disposal

This is to certify that

A1C Robert W. Cook, USAF

has successfully completed the

Basic EOD Course

Class 01010S

Graduated – 10 May 2001

*In witness thereof, this certificate has been signed and
given under my hand at*

Naval School Explosive Ordnance Disposal, Eglin AFB, Florida

This 14th day of August in the Year of Our Lord, Two Thousand Nine



Commanding Officer



**American
Red Cross**

Robert Cook

has successfully completed requirements for
First Aid/CPR/AED Instructor Update: valid 2 Years

Date Completed: 07/30/2016
conducted by: American Red Cross



ID: 0XVW2Y
Scan code or visit:
redcross.org/confirm

BCSP | BOARD OF CERTIFIED SAFETY PROFESSIONALS

2301 W Bradley Avenue, Champaign, IL 61821 | P: +1 217-359-9263
To verify current status visit bcsp.org/certification_directory
Having met the applicable requirements defined by its bylaws,
BCSP hereby authorizes the use of

Certified Safety Professional (CSP)
to
Robert W Cook

Certificate #
CSP-30036

Expires on
12/31/2016


SECRETARY

BCSP | BOARD OF CERTIFIED SAFETY PROFESSIONALS

2301 W Bradley Avenue, Champaign, IL 61821 | P: +1 217-359-9263
To verify current status visit bcsp.org/certification_directory
Having met the applicable requirements defined by its bylaws,
BCSP hereby authorizes the use of

Associate Safety Professional (ASP)
to
Robert W Cook

Certificate #
ASP-23612

Expires on
12/31/2016


SECRETARY

BCSP | BOARD OF CERTIFIED SAFETY PROFESSIONALS

2301 W Bradley Avenue, Champaign, IL 61821 | P: +1 217-359-9263
To verify current status visit bcsp.org/certification_directory
Having met the applicable requirements defined by its bylaws,
BCSP hereby authorizes the use of

Construction Health and Safety Technician (CHST)
to
Robert W Cook

Certificate #
CHST-C3698

Expires on
12/31/2016


SECRETARY

This Page Intentionally Left Blank

P.1

Division for Safety



COMPREHENSIVE SAFETY SERVICES

This certificate acknowledges that

MARCO A. BELTRAN JR.

HAS COMPLETED THE

OSHA 1910.120 HAZWOPER 40 HOUR COURSE

This 16th Day of December 2003

Carl R. Petfield Certificate # 2002091201

Lt Carl R. Petfield Cleveland Fire Department

1-702-254-1659 E-mail carlpat@aol.com Web site www.css.prodigybl.com

Dec 16 03 02:15p

452 CES/CFD LEUW1

15091 600-3021

P.1



Waikoloa Maneuver Area Project, Hawaii

Certificate of Completion

Awarded to

Marco Beltran

for successfully completing

on

September 20, 2016

8 Hour HAZWOPER and Supervisor Refresher

This training was conducted in accordance with 29 CFR 1910.120 relevant to Hazardous Waste Operations and Response; all applicable United States Army Corps of Engineers publications; GSI Pacific Inc. Site Safety Health Plan, Accident Prevention Plan and applicable company policies. The above person is hereby qualified to participate in activities pertinent to the specified training.

A handwritten signature in black ink, appearing to read 'Chris Matute', positioned above a horizontal line.

Chris Matute, CHST
UXO Safety Officer, MEC Division

A handwritten signature in black ink, appearing to read 'Robert Cook', positioned above a horizontal line.

Robert Cook, CSP, ASP, CHST
Safety Manager, MEC Division

Certificate No.9202016 -011

Certificate of Completion

Presented to:
MARCO BELTRAN

On 8/9/2011, MARCO BELTRAN successfully completed the OSHA 30 Hour Outreach Training for the Construction Industry.

Taylor Alan Sika

OSHA Authorized Trainer

As an OSHA authorized trainer, I verify that I have conducted this OSHA outreach training class in accordance with OSHA Outreach Training Program requirements. I will document this class to my authorizing OSHA training organization. Upon successful review of my documentation, I will provide each student their completion card within 90 days of the end of the class.

OSHA TRAINING INSTITUTE
EDUCATION CENTER

USE UNIVERSITY OF SOUTH FLORIDA

American Safety Council
.com



Naval School
Explosive Ordnance Disposal

This is to certify that

AIC Marco A. Beltran, Jr., USAF

completed the

Basic EOD Course

Surface (CIN A-431-0012)

Class 02100S

*In witness thereof, this certificate has been signed and
 given under my hand at*

Naval School Explosive Ordnance Disposal, Eglin AFB, Florida

This 18th day of October in the Year of Our Lord, Two Thousand Two


 Commanding Officer
 Acting



**American
Red Cross**

Marco Beltran

has successfully completed requirements for

Adult First Aid/CPR/AED: valid 2 Years

Date Completed: 08/23/2016

conducted by: American Red Cross

Instructor: Robert Cook



ID: GTMFW7

Scan code or visit:
redcross.org/confirm

This Page Intentionally Left Blank

Certificate of Completion



This certifies that

John Coberley

has successfully completed the requirements for
40 Hour OSHA Training for Hazardous Waste Operations –
29 CFR 1910.120 (e)

Awarded on this 7th Day of June, 2011



Certificate No: T-6-7-2011

James Walden, UXO Safety and Health Manager

USA Environmental, Inc., 720 Brooker Creek Blvd. Suite 204, Oldsmar, FL. 34677 (813) 343-6336

CERTIFICATE OF COMPLETION

This certificate awarded to

John (JD) Coberley

for satisfactory participation in

OSHA 8 Hour Hazwoper Refresher

29 CFR Part 1910.120 - 8 Contact Hour(s)

Certificate 73011 awarded on May 22, 2016.



Eduwhere
Your compliance connection.

Joni White

Eduwhere

Eduwhere - PO Box 4704 - Chapel Hill, NC 27515 - www.eduwhere.com - (919) 246-4847

UCSD-7000714

International Safety Education Institute (ISEI)



JOHN (JD) COBERLEY

Has diligently and with merit completed a
30-Hour OSHA Hazard Recognition Training for the Construction Industry Course
on **7/7/2012**
from the University of California San Diego International Safety Education Institute (ISEI).

CEUs Awarded: 3.0


Director: **Scott MacKay**



**American
Red Cross**

JD Coberley

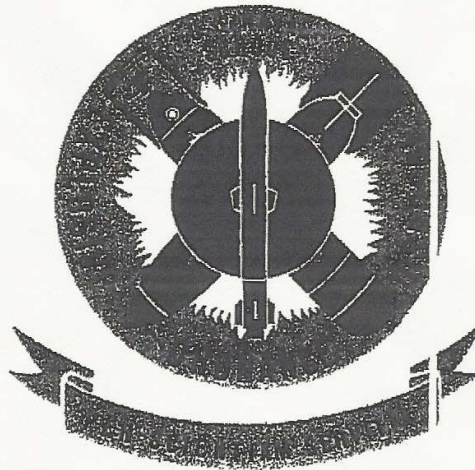
has successfully completed requirements for
Adult and Pediatric First Aid/CPR/AED: valid 2 Years

Date Completed: 07/29/2016
conducted by: American Red Cross
Instructor: Michele Block



ID: 0YTNJT
Scan code or visit:
redcross.org/confirm

Naval School Explosive Ordnance Disposal



This certifies that

SERGEANT JOHN D. COBERLEY, ██████████ USAF

having successfully completed
the prescribed course of study for

MUNITIONS DISPOSAL SPECIALIST - 5ABN46430 - PDS: CID 19wk/3da

is awarded this
Certificate

this 14TH day of DECEMBER A.D. 1976

D. L. Schauble
D. L. SCHAUBLE, CDR, USN

COMMANDING OFFICER

This Page Intentionally Left Blank

Attachment D
Activity Hazard Analyses

This Page Intentionally Left Blank

Activity/Work Task 1: Mobilization		Overall Risk Assessment Code (RAC) (Use highest code)				M	
Project Location: Former Waikane Training Area, Kaneohe, Oahu, Hawaii		Risk Assessment Code (RAC) Matrix					
Contract Number: W9128A-15-C-0006		Severity	Probability				
Date Prepared: 11/4/2015			Frequent	Likely	Occasional	Seldom	Unlikely
Prepared by (Name/Title): Robert Cook, MEC Division Safety Manager, CSP, ASP, CHST		Catastrophic	E	E	H	H	M
		Critical	E	H	H	M	L
Reviewed by (Name/Title): Michael Van Woerkom, Corporate Health and Safety Manager, ASP, CHST		Marginal	H	M	M	L	L
		Negligible	M	L	L	L	L
Notes: (Field Notes, Review Comments, etc.)		Step 1: Review each “Hazard” with identified safety “Controls” and determine RAC (See above)					
		“Probability” is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.				RAC Chart	
		“Severity” is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible				E = Extremely High Risk	
		Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each “Hazard” on AHA. Annotate the overall highest RAC at the top of AHA.				H = High Risk	
			M = Moderate Risk		L = Low Risk		
Job Steps	Hazards	Controls				RAC	
Mobilize equipment and personnel.	Biological Hazards: <ul style="list-style-type: none"> ▪ Possibility of stinging and biting insects. <ul style="list-style-type: none"> ○ Spiders ○ Wasps ○ Bees ○ Mosquitoes ○ Centipedes ○ Scorpions 	<ul style="list-style-type: none"> ▪ Use appropriate insect repellants. ▪ Wear gloves when moving objects on the ground. ▪ Wear long-sleeved shirts. ▪ Shake-out boots (footwear) when changing shoes. ▪ Recognize hazards and avoid them. 				L	
	Radiation Hazards: <ul style="list-style-type: none"> ▪ Sun 	<ul style="list-style-type: none"> ▪ Use sun block as appropriate. Avoid direct exposure to sun for long periods of time. ▪ Hydrate ▪ Wear lightweight, loose-fitting clothing appropriate for weather conditions 				M	

	<p>Physical Hazards:</p> <ul style="list-style-type: none"> ▪ Injury due to moving equipment ▪ Slips, trips, falls, tools, terrain, or vegetation; uneven walking surfaces; weather hazards; and poor visibility. ▪ Manual lifting ▪ Hands or fingers caught between objects; abrasions and lacerations. ▪ Inclement weather, heat/cold stress <ul style="list-style-type: none"> ○ Lightning ○ Flooding 	<p>Controls to avoid injury due to moving equipment</p> <ul style="list-style-type: none"> ▪ Only trained & authorized, experienced operators ▪ Equipment inspected daily ▪ Personnel restricted in area of operation ▪ Back up alarms functional ▪ Use of hand signals, radios, and equipment horns for communications. <p>Controls to avoid injury due to Slips, Trips and Falls:</p> <ul style="list-style-type: none"> ▪ Slip, trip, and fall hazards shall be either removed or marked and barricaded. Materials will be stored to prevent intrusion into the work areas. Work will be completed in adequate natural light. The “buddy system” will be implemented. <p>Controls to avoid injury due to manual lifting:</p> <ul style="list-style-type: none"> ▪ Use proper lifting techniques such as keeping straight back, lifting with legs; avoid twisting back; use mechanical equipment or get help from others whenever possible. Heavy loads will be split into smaller loads and/or assistance sought. The path of travel will be verified clear prior to the lift. <p>Controls for hands and fingers caught between objects:</p> <ul style="list-style-type: none"> ▪ Personnel shall be made aware of the hazard and asked to coordinate carefully the handling and placement of heavy objects. Materials and objects being handled will be inspected for rough or sharp edges, and appropriate precautions shall be taken to avoid contact. Personnel shall wear work gloves and avoid placing hands between objects. <p>Controls for inclement weather:</p> <ul style="list-style-type: none"> ▪ Personnel shall be dressed according to weather conditions. Workers shall be briefed and cognizant of heat and cold stress symptoms. ▪ Shut down operations during lightning storms, heavy rain, high wind, and evacuate site/take cover. ▪ Monitor weather system. ▪ If signs or warnings of flooding are evident, evacuate work area or seek shelter on higher ground immediately. ▪ Personnel shall be trained on Emergency Response. ▪ Outdoor activities will be suspended when the potential for lightning occurs ▪ Personnel shall be evacuated to safe areas (e.g., inside fully enclosed metal-topped vehicles with windows up or substantial/permanent buildings). ▪ Outdoor activities may resume 30 minutes after the last bolt of lightning was observed and the last clap of thunder was heard. ▪ Avoid trees, water, open fields, and using hard-wired telephones and headsets when lightning is in the area. 	L
--	---	---	---

	<ul style="list-style-type: none"> ▪ Noise exposure ▪ Fire 	<ul style="list-style-type: none"> ▪ If hopelessly isolated from shelter during close-in lightning, adopt a low crouching position, with feet together (up on toes, if possible) and hands on ears. ▪ Remember, “If you can see it (lightning), flee it, if you can hear it (thunder), clear it.” <p><i>Controls for noise exposure:</i></p> <ul style="list-style-type: none"> ▪ High noise activities will be identified. Hearing protection will be provided as appropriate. The latest ACGIH threshold limit values (TLVs) will be used. Hearing control program, which consists of audiometric examination; training; use of hearing protection; and sound level pressure monitoring when and where necessary. <p><i>Controls to avoid fire:</i></p> <ul style="list-style-type: none"> ▪ Smoking will not be permitted within the MRS. 	
--	--	--	--

Equipment to be Used	PPE	Training Requirements/Competent or Qualified Personnel name(s)	Inspection Requirements
<ul style="list-style-type: none"> ▪ Vehicles 	<ul style="list-style-type: none"> ▪ Gloves for loading/unloading ▪ Safety boots. 	<p><i>Site-Specific:</i></p> <ul style="list-style-type: none"> ▪ Initial site-specific <p><i>Motor Vehicle</i></p> <ul style="list-style-type: none"> ▪ Operators will hold a valid license for the type and class of vehicle they are operating. 	<p><i>Site Inspection:</i></p> <ul style="list-style-type: none"> ▪ Before initial use vehicles will be inspected and found to be in a safe operating condition

Activity/Work Task 2: Site Preparation		Overall Risk Assessment Code (RAC) (Use highest code)					M
Project Location: Former Waikane Training Area, Kaneohe, Oahu, Hawaii		Risk Assessment Code (RAC) Matrix					
Contract Number: W9128A-15-C-0006		Severity	Probability				
Date Prepared: 11/4/2015			Frequent	Likely	Occasional	Seldom	Unlikely
Prepared by (Name/Title): Robert Cook, MEC Division Safety Manager, CSP, ASP, CHST		Catastrophic	E	E	H	H	M
		Critical	E	H	H	M	L
Reviewed by (Name/Title): Michael Van Woerkom, Corporate Health and Safety Manager, ASP, CHST		Marginal	H	M	M	L	L
		Negligible	M	L	L	L	L
Notes:		Step 1: Review each “ Hazard ” with identified safety “ Controls ” and determine RAC (See above)					
		“ Probability ” is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.				RAC Chart	
		“ Severity ” is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible				E = Extremely High Risk	
		Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each “Hazard” on AHA. Annotate the overall highest RAC at the top of AHA.				H = High Risk	
						M = Moderate Risk	
				L = Low Risk			
Job Steps	Hazards	Controls				RAC	
Visual survey of work area to determine boundaries and control points.	Biological Hazards: <ul style="list-style-type: none"> ▪ Possibility of stinging and biting insects. <ul style="list-style-type: none"> ○ Spiders ○ Mosquitos ○ Bees ○ Wasps ○ Centipedes ○ Scorpions 	<ul style="list-style-type: none"> ▪ Use appropriate insect repellants. ▪ Wear gloves when moving objects on the ground. ▪ Wear long-sleeved shirts. ▪ Shake-out boots (footwear) when changing shoes. ▪ Recognize hazards and avoid them. 				M	
Locate underground utilities.	Explosives Hazards: <ul style="list-style-type: none"> ▪ Unintentional detonation of unknown/unanticipated UXO/MEC items. 	<ul style="list-style-type: none"> ▪ MEC/UXO/Anomaly Avoidance will be maintained during this activity. ▪ Any suspected MEC/UXO shall not be moved or disturbed and reported to the SUXOS immediately. 					

Establish grid layout.	<p>Radiation Hazards:</p> <ul style="list-style-type: none"> ▪ Sun 	<ul style="list-style-type: none"> ▪ Use sun block as appropriate. Avoid direct exposure to sun for long periods of time. ▪ Hydrate. ▪ Wear lightweight, loose-fitting clothing appropriate for weather conditions. ▪ Electrolyte/fluids replacement will be available to workers. Work rest periods will be established according to ACGIH, NIOSH guidelines. Personnel will be monitored. 	M
	<p>Physical Hazards:</p> <ul style="list-style-type: none"> ▪ Slips, trips, falls, terrain, or vegetation ▪ Muddy terrain ▪ Uneven walking surfaces ▪ Vegetation contact ▪ Underground utilities <p>Environmental Hazards:</p> <ul style="list-style-type: none"> ▪ Weather hazards ▪ Inclement weather, heat/cold stress ▪ Lightning ▪ Flooding 	<p>Controls to avoid injury due to Slips, Trips and Falls:</p> <ul style="list-style-type: none"> ▪ Slip, trip, and fall hazards shall be either removed or marked and barricaded. Avoid walking in areas where positive footing is unlikely or unknown. Use a walking stick to assist in balance if necessary. Work will be completed in adequate natural light. The “buddy system” will be implemented. ▪ Avoid when possible or observe extreme caution when walking in muddy environments. ▪ Use care when working or walking in or near areas with kiawe. ▪ Locate and avoid underground utilities. <p>Controls for inclement weather:</p> <ul style="list-style-type: none"> ▪ Personnel shall be dressed according to weather conditions. Workers shall be briefed and cognizant of heat and cold stress symptoms. As determined by the SSHO, operations are to cease during severe weather conditions. ▪ Electrolyte/fluids replacement will be available to workers. Work rest periods will be established according to ACGIH, NIOSH guidelines. Personnel will be monitored. ▪ Shut down operations during lightning storms, heavy rain, high wind, and evacuate site/take cover. ▪ Monitor weather system. ▪ If signs or warnings of flooding are evident, evacuate work area or seek shelter on higher ground immediately. ▪ Personnel shall be trained on Emergency Response. ▪ Outdoor activities will be suspended when the potential for lightning occurs. ▪ Personnel shall be evacuated to safe areas (e.g., inside fully enclosed metal-topped vehicles with windows up or substantial/permanent buildings). ▪ Outdoor activities may resume 30 minutes after the last bolt of lightning was observed and the last clap of thunder was heard. ▪ Avoid trees, water, open fields, and using hard-wired telephones and headsets when lightning is in the area. ▪ If hopelessly isolated from shelter during close-in lightning, adopt a low crouching position, with feet together (up on toes, if possible) and hands on ears. Remember, “If you can see it (lightning), flee it, if you can hear it (thunder), clear it.” 	L

Equipment to be Used	PPE	Training Requirements/Competent or Qualified Personnel name(s)	Inspection Requirements
<ul style="list-style-type: none"> ▪ Cell phones ▪ Radios ▪ Binoculars ▪ First aid kit 	<ul style="list-style-type: none"> ▪ <i>Level D</i> 	<p><i>Site-Specific:</i></p> <ul style="list-style-type: none"> ▪ UXO/EOD certification, qualified in accordance with DDESB TP18, 40 hr-OSHA, HAZWOPER, 8-hr refresher, First Aid/CPR (at least 2 personnel). 	<ul style="list-style-type: none"> ▪ Ensure all emergency equipment is in serviceable order. ▪ Ensure communication devices are in serviceable order. ▪ All PPE should be in good condition.

This Page Intentionally Left Blank

Activity/Work Task 3: Biological and Archaeological Surveys and Monitoring		Overall Risk Assessment Code (RAC) (Use highest code)					M
Project Location: Former Waikane Training Area, Kaneohe, Oahu, Hawaii		Risk Assessment Code (RAC) Matrix					
Contract Number: W9128A-15-C-0006		Severity	Probability				
Date Prepared: 11/4/2015			Frequent	Likely	Occasional	Seldom	Unlikely
Prepared by (Name/Title): Robert Cook, MEC Division Safety Manager, CSP, ASP, CHST		Catastrophic	E	E	H	H	M
		Critical	E	H	H	M	L
Reviewed by (Name/Title): Michael Van Woerkom, Corporate Health and Safety Manager, ASP, CHST		Marginal	H	M	M	L	L
		Negligible	M	L	L	L	L
Notes:		Step 1: Review each “ Hazard ” with identified safety “ Controls ” and determine RAC (See above)					
		“ Probability ” is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.				RAC Chart	
		“ Severity ” is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible				E = Extremely High Risk	
		Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each “Hazard” on AHA. Annotate the overall highest RAC at the top of AHA.				H = High Risk	
				M = Moderate Risk			
				L = Low Risk			
Job Steps	Hazards	Controls				RAC	
Visual survey of work site for sensitive species identification.	Biological Hazards: <ul style="list-style-type: none"> ▪ Possibility of stinging and biting insects. <ul style="list-style-type: none"> ○ Spiders ○ Mosquitos ○ Bees ○ Wasps ○ Centipedes ○ Scorpions 	<ul style="list-style-type: none"> ▪ Use appropriate insect repellants. ▪ Wear gloves when moving objects on the ground. ▪ Wear long-sleeved shirts. ▪ Shake-out boots (footwear) when changing shoes. ▪ Recognize hazards and avoid them. 				M	
	Explosives Hazards: <ul style="list-style-type: none"> ▪ Unintentional detonation of unknown/unanticipated UXO/MEC items. 	<ul style="list-style-type: none"> ▪ MEC/UXO/Anomaly Avoidance will be maintained during this activity. ▪ Any suspected MEC/UXO shall not be moved or disturbed and reported to the SUXOS immediately. 					

	<p>Radiation Hazards:</p> <ul style="list-style-type: none"> ▪ Sun 	<ul style="list-style-type: none"> ▪ Use sun block as appropriate. Avoid direct exposure to sun for long periods of time. ▪ Hydrate. ▪ Wear lightweight, loose-fitting clothing appropriate for weather conditions. ▪ Electrolyte/fluids replacement will be available to workers. Work rest periods will be established according to ACGIH, NIOSH guidelines. Personnel will be monitored. 	M
	<p>Physical Hazards:</p> <ul style="list-style-type: none"> ▪ Slips, trips, falls, terrain, or vegetation ▪ Muddy terrain ▪ Uneven walking surfaces ▪ Vegetation contact <p>Environmental Hazards:</p> <ul style="list-style-type: none"> ▪ Weather hazards ▪ Inclement weather, heat/cold stress <ul style="list-style-type: none"> ○ Lightning ○ Flooding 	<p>Controls to avoid injury due to Slips, Trips and Falls:</p> <ul style="list-style-type: none"> ▪ Slip, trip, and fall hazards shall be either removed or marked and barricaded. Avoid walking in areas where positive footing is unlikely or unknown. Use a walking stick to assist in balance if necessary. Work will be completed in adequate natural light. The “buddy system” will be implemented. ▪ Avoid when possible or observe extreme caution when walking in muddy environments. ▪ Use care when working or walking in or near areas with kiawe. <p>Controls for inclement weather:</p> <ul style="list-style-type: none"> ▪ Personnel shall be dressed according to weather conditions. Workers shall be briefed and cognizant of heat and cold stress symptoms. As determined by the SSHO, operations are to cease during severe weather conditions. ▪ Electrolyte/fluids replacement will be available to workers. Work rest periods will be established according to ACGIH, NIOSH guidelines. Personnel will be monitored. ▪ Shut down operations during lightning storms, heavy rain, high wind, and evacuate site/take cover. ▪ Monitor weather system. ▪ If signs or warnings of flooding are evident, evacuate work area or seek shelter on higher ground immediately. ▪ Personnel shall be trained on Emergency Response. ▪ Outdoor activities will be suspended when the potential for lightning occurs. ▪ Personnel shall be evacuated to safe areas (e.g., inside fully enclosed metal-topped vehicles with windows up or substantial/permanent buildings). ▪ Outdoor activities may resume 30 minutes after the last bolt of lightning was observed and the last clap of thunder was heard. ▪ Avoid trees, water, open fields, and using hard-wired telephones and headsets when lightning is in the area. ▪ If hopelessly isolated from shelter during close-in lightning, adopt a low crouching position, with feet together (up on toes, if possible) and hands on ears. Remember, “If you can see it (lightning), flee it, if you can hear it (thunder), clear it.” 	L

Equipment to be Used	PPE	Training Requirements/Competent or Qualified Personnel name(s)	Inspection Requirements
<ul style="list-style-type: none"> ▪ Cell phones ▪ Radios ▪ Binoculars ▪ First aid kit 	<ul style="list-style-type: none"> ▪ <i>Level D</i> 	<p><i>Site-Specific:</i></p> <ul style="list-style-type: none"> ▪ UXO/EOD certification, qualified in accordance with DDESB TP18, 40 hr-OSHA, HAZWOPER, 8-hr refresher, First Aid/CPR (at least 2 personnel). 	<ul style="list-style-type: none"> ▪ Ensure all emergency equipment is in serviceable order. ▪ Ensure communication devices are in serviceable order. ▪ All PPE should be in good condition.

This Page Intentionally Left Blank

Activity/Work Task 4: Vegetation Clearance		Overall Risk Assessment Code (RAC) (Use highest code)				M	
Project Location: Former Waikane Training Area, Kaneohe, Oahu, Hawaii		Risk Assessment Code (RAC) Matrix					
Contract Number: W9128A-15-C-0006		Severity	Probability				
Date Prepared: 11/4/2015			Frequent	Likely	Occasional	Seldom	Unlikely
Prepared by (Name/Title): Robert Cook, MEC Division Safety Manager, CSP, ASP, CHST		Catastrophic	E	E	H	H	M
		Critical	E	H	H	M	L
Reviewed by (Name/Title): Michael Van Woerkom, Corporate Health and Safety Manager, ASP, CHST		Marginal	H	M	M	L	L
		Negligible	M	L	L	L	L
Notes:		Step 1: Review each “Hazard” with identified safety “Controls” and determine RAC (See above)					
		“Probability” is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.				RAC Chart	
		“Severity” is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible				E = Extremely High Risk	
		Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each “Hazard” on AHA. Annotate the overall highest RAC at the top of AHA.				H = High Risk	
			M = Moderate Risk		L = Low Risk		
Job Steps	Hazards	Controls				RAC	
Locating and preparing to cut vegetation on the work site.	Biological Hazards: <ul style="list-style-type: none"> ▪ Possibility of stinging and biting insects. <ul style="list-style-type: none"> ○ Spiders ○ Mosquitos ○ Bees ○ Wasps ○ Centipedes ○ Scorpions 	<ul style="list-style-type: none"> ▪ Use appropriate insect repellants. ▪ Wear gloves when moving objects on the ground. ▪ Wear long-sleeved shirts. ▪ Shake-out boots (footwear) when changing shoes. ▪ Recognize hazards and avoid them. 				L	
	Radiation Hazards: <ul style="list-style-type: none"> ▪ Sun 	<ul style="list-style-type: none"> ▪ Use sun block as appropriate. Avoid direct exposure to sun for long periods of time. ▪ Hydrate ▪ Wear lightweight, loose-fitting clothing appropriate for weather conditions 				M	

	<p>Physical Hazards:</p> <ul style="list-style-type: none"> ▪ Injury due to clearing equipment ▪ Slips, trips, falls, tools, terrain, or vegetation; uneven walking surface, muddy terrain; weather hazards; and poor visibility. ▪ Manual lifting ▪ Hands or fingers caught between objects; abrasions and lacerations. ▪ Inclement weather, heat/cold stress ▪ Lightning 	<p>Controls to avoid injury due to moving equipment</p> <ul style="list-style-type: none"> ▪ Only trained & authorized, experienced operators ▪ Equipment inspected daily ▪ Personnel restricted in area of operation ▪ Unserviceable tools or equipment shall not be used ▪ Walk with sharp edges pointed away from yourself and others ▪ Use of hand signals, radios, and equipment horns for communications. <p>Controls to avoid injury due to Slips, Trips and Falls:</p> <ul style="list-style-type: none"> ▪ Slip, trip, and fall hazards shall be either removed or marked and barricaded. Materials will be stored to prevent intrusion into the work areas. Work will be completed in adequate natural light. The “buddy system” will be implemented. <p>Controls to avoid injury due to manual lifting:</p> <ul style="list-style-type: none"> ▪ Use proper lifting techniques such as keeping straight back, lifting with legs; avoid twisting back; use mechanical equipment or get help from others whenever possible. Heavy loads will be split into smaller loads and/or assistance sought. The path of travel will be verified clear prior to the lift. <p>Controls for hands and fingers caught between objects:</p> <ul style="list-style-type: none"> ▪ Personnel shall be made aware of the hazard and asked to coordinate carefully the handling and placement of heavy objects. Materials and objects being handled will be inspected for rough or sharp edges, and appropriate precautions shall be taken to avoid contact. Personnel shall wear work gloves and avoid placing hands between objects. <p>Controls for inclement weather:</p> <ul style="list-style-type: none"> ▪ Personnel shall be dressed according to weather conditions. Workers shall be briefed and cognizant of heat and cold stress symptoms. ▪ Shut down operations during lightning storms, heavy rain, high wind, and evacuate site/take cover. ▪ Monitor weather system ▪ Personnel shall be trained on Emergency Response. ▪ Outdoor activities will be suspended when the potential for lightning occurs ▪ Personnel shall be evacuated to safe areas (e.g., inside fully enclosed metal-topped vehicles with windows up or substantial/permanent buildings). ▪ Outdoor activities may resume 30 minutes after the last bolt of lightning was observed and the last clap of thunder was heard. ▪ Avoid trees, water, open fields, and using hard-wired telephones and headsets when lightning is in the area. ▪ If hopelessly isolated from shelter during close-in lightning, adopt a low 	L
--	---	--	---

<p>Cutting vegetation</p>	<ul style="list-style-type: none"> ▪ Noise exposure ▪ Fire <p>Explosives Hazards:</p> <ul style="list-style-type: none"> ▪ Unintentional detonation of unknown/unanticipated UXO/MEC items. <p>Physical hazards:</p> <ul style="list-style-type: none"> ▪ Improper chainsaw maintenance. ▪ Chainsaw kickback. 	<p>crouching position, with feet together (up on toes, if possible) and hands on ears.</p> <ul style="list-style-type: none"> ▪ Remember, “If you can see it (lightning), flee it, if you can hear it (thunder), clear it.” <p>Controls for noise exposure:</p> <ul style="list-style-type: none"> ▪ High noise activities will be identified. Hearing protection will be provided as appropriate. The latest ACGIH threshold limit values (TLVs) will be used. Hearing control program, which consists of audiometric examination; training; use of hearing protection; and sound level pressure monitoring when and where necessary. <p>Controls to avoid fire:</p> <ul style="list-style-type: none"> ▪ Smoking will not be permitted within the MRS. ▪ Do not place hot equipment on dry vegetation. ▪ Wait for equipment to cool before refueling. ▪ Fire extinguishers must be present during operations. <p>Controls for explosives hazards:</p> <ul style="list-style-type: none"> ▪ MEC/UXO/Anomaly Avoidance will be maintained during this activity. ▪ Any suspected MEC/UXO shall not be moved or disturbed and reported to the SUXOS immediately. ▪ Inspect and clear area using a metal detector prior to beginning operations. ▪ Qualified UXO personnel as escort for non-qualified workers. <p>Controls for improper chainsaw maintenance:</p> <ul style="list-style-type: none"> ▪ All equipment will be inspected before use and during operations per manufacturer specifications. <p>Controls for chainsaw kickback:</p> <ul style="list-style-type: none"> ▪ Remain alert to kickback hazards and keep a firm, proper grip on chain saw at all times. ▪ All chainsaws shall be equipped with automatic chain brake and other anti-kickback devices. ▪ Personnel shall not operate chainsaws above shoulder height. 	
---------------------------	--	---	--

	<ul style="list-style-type: none"> ▪ Tree climbing. ▪ Utilities. ▪ Impact hazards. <p>Biological hazards:</p> <ul style="list-style-type: none"> ▪ Poisonous plants. <ul style="list-style-type: none"> ▪ Noise 	<p>Controls for tree climbing:</p> <ul style="list-style-type: none"> ▪ Personnel are prohibited from climbing trees unless all necessary safety precautions are in place. <p>Controls for utilities:</p> <ul style="list-style-type: none"> ▪ Physically verify the location and depth of existing utilities, prior to starting site work, through site preparation survey. ▪ Maintain minimum required clearance from the power lines. <p>Controls for impact hazards:</p> <ul style="list-style-type: none"> ▪ Never stand underneath the material to be cut. ▪ Make eye contact with operators before approaching equipment. ▪ Understand and review all hand signals. <p>Controls for poisonous plants:</p> <ul style="list-style-type: none"> ▪ Identify and avoid cutting poisonous plants if possible. ▪ Additional protective clothing (coveralls) may be necessary. ▪ Avoid skin contact with plants and sap during cutting operations. ▪ Handle clothing and equipment used during and after operations with caution as they may be contaminated with biological irritants. ▪ Contaminated clothing should be sealed in a labelled plastic bag or container for cleaning. ▪ Contaminated equipment should be thoroughly cleaned before next use. <p>Controls for noise:</p> <ul style="list-style-type: none"> ▪ Required hearing protection will be worn when equipment is operating. 	
--	--	---	--

Equipment to be Used	PPE	Training Requirements/Competent or Qualified Personnel name(s)	Inspection Requirements
<ul style="list-style-type: none"> ▪ Vehicles ▪ Chainsaws ▪ Trimmers ▪ Saws 	<ul style="list-style-type: none"> ▪ Level D ▪ Hearing protection ▪ Faceshields ▪ Chaps ▪ Safety boots 	<p>Site-Specific:</p> <ul style="list-style-type: none"> ▪ Initial site-specific. ▪ Equipment training. ▪ UXO/EOD certification, qualified in accordance with DDESB TP18(for escort only) ▪ 40 hr-OSHA, HAZWOPER, 8-hr refresher, First Aid/CPR (at least 2 personnel). <p>Motor Vehicle</p> <ul style="list-style-type: none"> ▪ Operators will hold a valid license for the type and class of vehicle they are operating. 	<p>Site Inspection:</p> <ul style="list-style-type: none"> ▪ Before initial use vehicles will be inspected and found to be in a safe operating condition ▪ Daily equipment inspection.
Equipment to be Used	PPE	Training Requirements/Competent or Qualified Personnel name(s)	Inspection Requirements
<ul style="list-style-type: none"> ▪ Vehicles ▪ Chainsaws ▪ Trimmers ▪ Saws 	<ul style="list-style-type: none"> ▪ Level D ▪ Hearing protection ▪ Faceshields ▪ Chaps ▪ Safety boots 	<p>Site-Specific:</p> <ul style="list-style-type: none"> ▪ Initial site-specific. ▪ Equipment training. ▪ UXO/EOD certification, qualified in accordance with DDESB TP18(for escort only) ▪ 40 hr-OSHA, HAZWOPER, 8-hr refresher, First Aid/CPR (at least 2 personnel). <p>Motor Vehicle</p> <ul style="list-style-type: none"> ▪ Operators will hold a valid license for the type and class of vehicle they are operating. 	<p>Site Inspection:</p> <ul style="list-style-type: none"> ▪ Before initial use vehicles will be inspected and found to be in a safe operating condition ▪ Daily equipment inspection.

This Page Intentionally Left Blank

Activity/Work Task 5: Geophysical Surveys		Overall Risk Assessment Code (RAC) (Use highest code)					M
Project Location: Former Waikane Training Area, Kaneohe, Oahu, Hawaii		Risk Assessment Code (RAC) Matrix					
Contract Number: W9128A-15-C-0006		Severity	Probability				
Date Prepared: 11/4/2015			Frequent	Likely	Occasional	Seldom	Unlikely
Prepared by (Name/Title): Robert Cook, MEC Division Safety Manager, CSP, ASP, CHST		Catastrophic	E	E	H	H	M
		Critical	E	H	H	M	L
Reviewed by (Name/Title): Michael Van Woerkom, Corporate Health and Safety Manager, ASP, CHST		Marginal	H	M	M	L	L
		Negligible	M	L	L	L	L
Notes:		Step 1: Review each “ Hazard ” with identified safety “ Controls ” and determine RAC (See above)					
		“ Probability ” is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.				RAC Chart	
		“ Severity ” is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible				E = Extremely High Risk	
		Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each “Hazard” on AHA. Annotate the overall highest RAC at the top of AHA.				H = High Risk	
						M = Moderate Risk	
						L = Low Risk	
Job Steps	Hazards	Controls				RAC	
Equipment set up and acquisition of data.	Biological Hazards: <ul style="list-style-type: none"> ▪ Possibility of stinging and biting insects. <ul style="list-style-type: none"> ○ Spiders ○ Mosquitos ○ Bees ○ Wasps ○ Centipedes ○ Scorpions 	<ul style="list-style-type: none"> ▪ Use appropriate insect repellants. ▪ Wear gloves when moving objects on the ground. ▪ Wear long-sleeved shirts. ▪ Shake-out boots (footwear) when changing shoes. ▪ Recognize hazards and avoid them. 				M	
	Explosives Hazards: <ul style="list-style-type: none"> ▪ Unintentional detonation of unknown/unanticipated UXO/MEC items. 	<ul style="list-style-type: none"> ▪ Any suspected MEC/UXO shall not be moved or disturbed and reported to the SUXOS immediately. 					

	<p>Radiation Hazards:</p> <ul style="list-style-type: none"> ▪ Sun 	<ul style="list-style-type: none"> ▪ Use sun block as appropriate. Avoid direct exposure to sun for long periods of time. ▪ Hydrate. ▪ Wear lightweight, loose-fitting clothing appropriate for weather conditions. ▪ Electrolyte/fluids replacement will be available to workers. Work rest periods will be established according to ACGIH, NIOSH guidelines. Personnel will be monitored. 	M
	<p>Physical Hazards:</p> <ul style="list-style-type: none"> ▪ Slips, trips, falls, terrain, or vegetation ▪ Muddy terrain ▪ Uneven walking surfaces ▪ Vegetation contact <p>Environmental Hazards:</p> <ul style="list-style-type: none"> ▪ Weather hazards ▪ Inclement weather, heat/cold stress <ul style="list-style-type: none"> ○ Lightning ○ Flooding 	<p>Controls to avoid injury due to Slips, Trips and Falls:</p> <ul style="list-style-type: none"> ▪ Slip, trip, and fall hazards shall be either removed or marked and barricaded. Avoid walking in areas where positive footing is unlikely or unknown. Use a walking stick to assist in balance if necessary. Work will be completed in adequate natural light. The “buddy system” will be implemented. ▪ Avoid when possible or observe extreme caution when walking in muddy environments. ▪ Use care when working or walking in or near areas with kiawe. <p>Controls for inclement weather; heat/cold stress:</p> <ul style="list-style-type: none"> ▪ Personnel shall be dressed according to weather conditions. Workers shall be briefed and cognizant of heat and cold stress symptoms. As determined by the SSHO, operations are to cease during severe weather conditions. ▪ Electrolyte/fluids replacement will be available to workers. Work rest periods will be established according to ACGIH, NIOSH guidelines. Personnel will be monitored. ▪ Shut down operations during lightning storms, heavy rain, high wind, and evacuate site/take cover. ▪ Monitor weather system. ▪ If signs or warnings of flooding are evident, evacuate work area or seek shelter on higher ground immediately. ▪ Personnel shall be trained on Emergency Response. ▪ Outdoor activities will be suspended when the potential for lightning occurs. ▪ Personnel shall be evacuated to safe areas (e.g., inside fully enclosed metal-topped vehicles with windows up or substantial/permanent buildings). ▪ Outdoor activities may resume 30 minutes after the last bolt of lightning was observed and the last clap of thunder was heard. ▪ Avoid trees, water, open fields, and using hard-wired telephones and headsets when lightning is in the area. ▪ If hopelessly isolated from shelter during close-in lightning, adopt a low crouching position, with feet together (up on toes, if possible) and hands on ears. Remember, “If you can see it (lightning), flee it, if you can hear it (thunder), clear it.” 	L

Equipment to be Used	PPE	Training Requirements/Competent or Qualified Personnel name(s)	Inspection Requirements
<ul style="list-style-type: none"> ▪ Cell phones ▪ Radios ▪ First aid kit ▪ Walking stick 	<ul style="list-style-type: none"> ▪ <i>Level D</i> 	<p><i>Site-Specific:</i></p> <ul style="list-style-type: none"> ▪ UXO/EOD certification, qualified in accordance with DDESB TP18 (as necessary). ▪ 40 hr-OSHA, HAZWOPER, 8-hr refresher, First Aid/CPR (at least 2 personnel). ▪ Initial site specific training. 	<ul style="list-style-type: none"> ▪ Ensure all emergency equipment is in serviceable order. ▪ Ensure communication devices are in serviceable order. ▪ All PPE should be in good condition.

This Page Intentionally Left Blank

Activity/Work Task 6: Surface and Subsurface Clearance		Overall Risk Assessment Code (RAC) (Use highest code)				M	
Project Location: Former Waikane Training Area, Kaneohe, Oahu, Hawaii		Risk Assessment Code (RAC) Matrix					
Contract Number: W9128A-15-C-0006		Severity	Probability				
Date Prepared: 11/4/2015			Frequent	Likely	Occasional	Seldom	Unlikely
Prepared by (Name/Title): Robert Cook, MEC Division Safety Manager, CSP, ASP, CHST		Catastrophic	E	E	H	H	M
		Critical	E	H	H	M	L
Reviewed by (Name/Title): Michael Van Woerkom, Corporate Health and Safety Manager, ASP, CHST		Marginal	H	M	M	L	L
		Negligible	M	L	L	L	L
Notes: (Field Notes, Review Comments, etc.)		Step 1: Review each “ Hazard ” with identified safety “ Controls ” and determine RAC (See above)					
		“ Probability ” is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.			RAC Chart		
		“ Severity ” is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible			E = Extremely High Risk		
		Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each “Hazard” on AHA. Annotate the overall highest RAC at the top of AHA.			H = High Risk		
			M = Moderate Risk				
			L = Low Risk				
Job Steps	Hazards	Controls				RAC	
Perform surface removal activities. Hand excavate target anomalies.	Biological Hazards: <ul style="list-style-type: none"> ▪ Possibility of stinging and biting insects. <ul style="list-style-type: none"> ○ Spiders ○ Mosquitos ○ Bees ○ Wasps ○ Centipedes ○ Scorpions 	<ul style="list-style-type: none"> ▪ Use appropriate insect repellants. ▪ Wear gloves when moving objects on the ground. ▪ Wear long-sleeved shirts. ▪ Shake-out boots (footwear) when changing shoes. ▪ Recognize hazards and avoid them. 				L	

<p>Locate surface MEC items utilizing visual means or metal detector</p> <p>Identify MEC items.</p>	<p>Explosives Hazards:</p> <ul style="list-style-type: none"> ▪ Unintentional detonation of unknown/unanticipated UXO/MEC items. 	<ul style="list-style-type: none"> ▪ All live, suspected live, or undetermined MEC items will be clearly marked with pin flags and reported to the SUXOS. ▪ Any live MEC/UXO shall not be moved or disturbed until it is determined safe to do so by the SUXOS and UXOSO. ▪ Observe the minimum separation distance (MSD) between UXO and non-UXO operations. ▪ Excavations will be performed by carefully digging from the side of the anomaly inward toward its location. ▪ Do not smoke except in designated areas outside the MRS. ▪ Do not carry fire or spark producing devices into the site. ▪ Operations will be conducted during daylight hours. ▪ Anyone can stop operations for an unsafe act or situation. 	<p>M</p>
	<p>Radiation Hazards:</p> <ul style="list-style-type: none"> ▪ Sun 	<ul style="list-style-type: none"> ▪ Use sunblock as appropriate. Avoid direct exposure to sun for long periods of time. ▪ Hydrate ▪ Utilize work/rest cycles as needed ▪ Wear lightweight, loose-fitting clothing appropriate for weather conditions ▪ UXOSO monitors heat conditions and WBGT data 	<p>M</p>
	<p>Physical Hazards:</p> <ul style="list-style-type: none"> ▪ Slips, trips, falls, tools, terrain, or vegetation; uneven walking surfaces; weather hazards, muddy terrain; and poor visibility. ▪ Manual lifting ▪ Hands or fingers caught between objects; abrasions and lacerations. 	<p>Controls to avoid injury due to Slips, Trips and Falls:</p> <ul style="list-style-type: none"> ▪ Slip, trip, and fall hazards shall be either removed or marked and barricaded. Materials will be stored to prevent intrusion into the work areas. The “buddy system” will be implemented. <p>Controls to avoid injury due to manual lifting:</p> <ul style="list-style-type: none"> ▪ Use proper lifting techniques such as keeping straight back, lifting with legs; avoid twisting back; use mechanical equipment or get help from others whenever possible. Heavy loads will be split into smaller loads and/or assistance sought. The path of travel will be verified clear prior to the lift. <p>Controls for hands and fingers caught between objects:</p> <ul style="list-style-type: none"> ▪ Personnel shall be made aware of the hazard and asked to coordinate carefully the handling and placement of heavy objects. Materials and objects being handled will be inspected for rough or sharp edges, and appropriate precautions shall be taken to avoid contact. Personnel shall wear work gloves and avoid placing hands between objects. 	<p>M</p>

	<ul style="list-style-type: none"> ▪ Hand tools. <p>Environmental hazards:</p> <ul style="list-style-type: none"> ▪ Inclement weather, heat/cold stress <ul style="list-style-type: none"> ○ Lightning ○ Flooding 	<p>Controls for hand tools, manual and power: Tools shall be inspected prior to use. Damaged tools will be tagged out of service until repair can be performed by a qualified person. Tools will be used properly and for their intended purpose.</p> <p>Controls for inclement weather: Controls for inclement weather; heat/cold stress:</p> <ul style="list-style-type: none"> ▪ Personnel shall be dressed according to weather conditions. Workers shall be briefed and cognizant of heat and cold stress symptoms. As determined by the SSHO, operations are to cease during severe weather conditions. ▪ Electrolyte/fluids replacement will be available to workers. Work rest periods will be established according to ACGIH, NIOSH guidelines. Personnel will be monitored. ▪ Shut down operations during lightning storms, heavy rain, high wind, and evacuate site/take cover. ▪ Change into dry clothing/boots as soon as is practical. ▪ Monitor for signs of foot fungus. ▪ Monitor weather system. ▪ If signs or warnings of flooding are evident, evacuate work area or seek shelter on higher ground immediately. ▪ Personnel shall be trained on Emergency Response. ▪ Outdoor activities will be suspended when the potential for lightning occurs. ▪ Personnel shall be evacuated to safe areas (e.g., inside fully enclosed metal-topped vehicles with windows up or substantial/permanent buildings). ▪ Outdoor activities may resume 30 minutes after the last bolt of lightning was observed and the last clap of thunder was heard. ▪ Avoid trees, water, open fields, and using hard-wired telephones and headsets when lightning is in the area. ▪ If hopelessly isolated from shelter during close-in lightning, adopt a low crouching position, with feet together (up on toes, if possible) and hands on ears. ▪ Remember, “If you can see it (lightning), flee it, if you can hear it (thunder), clear it.” 	
--	---	--	--

Equipment to be Used	PPE	Training Requirements/Competent or Qualified Personnel name(s)	Inspection Requirements
<ul style="list-style-type: none"> ▪ Hand tools ▪ Magnetometer 	<ul style="list-style-type: none"> ▪ Level D ▪ Safety boots with non-metallic toes 	<p><i>Site-Specific:</i></p> <ul style="list-style-type: none"> ▪ UXO/EOD certification, qualified in accordance with DDESB TP18. ▪ 40 hr-OSHA, Hazwoper, 8-hr refresher, First Aid/CPR (at least 2 personnel) 	<p><i>Site Inspection:</i></p> <ul style="list-style-type: none"> ▪ All equipment will be properly stored, inspected, and/or maintained on a daily basis, or according to manufacturer's requirements. Records of inspections will be maintained onsite. Fire extinguishers and first aid kits will be inspected by the UXOSO.

Activity/Work Task 7: Explosive Disposal Operations		Overall Risk Assessment Code (RAC) (Use highest code)					M
Project Location: Former Waikane Training Area, Kaneohe, Oahu, Hawaii		Risk Assessment Code (RAC) Matrix					
Contract Number: W9128A-15-C-0006		Severity	Probability				
Date Prepared: 11/4/2015			Frequent	Likely	Occasional	Seldom	Unlikely
Prepared by (Name/Title): Robert Cook, MEC Division Safety Manager, CSP, ASP, CHST		Catastrophic	E	E	H	H	M
		Critical	E	H	H	M	L
Reviewed by (Name/Title): Michael Van Woerkom, Corporate Health and Safety Manager, ASP, CHST		Marginal	H	M	M	L	L
		Negligible	M	L	L	L	L
Notes:		Step 1: Review each “ Hazard ” with identified safety “ Controls ” and determine RAC (See above)					
		“ Probability ” is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.				RAC Chart	
		“ Severity ” is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible				E = Extremely High Risk	
		Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each “Hazard” on AHA. Annotate the overall highest RAC at the top of AHA.				H = High Risk	
				M = Moderate Risk			
				L = Low Risk			
Job Steps	Hazards	Controls				RAC	
Ensure required notifications of disposal/venting operations have been made. Set up disposal charges in accordance with the disposal procedures. Detonation	Biological Hazards: <ul style="list-style-type: none"> ▪ Possibility of stinging and biting insects. <ul style="list-style-type: none"> ○ Spiders ○ Mosquitos ○ Bees ○ Wasps ○ Centipedes ○ Scorpions 	<ul style="list-style-type: none"> ▪ Use appropriate insect repellants. ▪ Wear gloves when moving objects on the ground. ▪ Wear long-sleeved shirts. ▪ Shake-out boots (footwear) when changing shoes. ▪ Recognize hazards and avoid them. 				M	
	Explosives Hazards: <ul style="list-style-type: none"> ▪ Unintentional detonation of unknown/unanticipated UXO/MEC items. 	Controls for unintentional detonations: <ul style="list-style-type: none"> ▪ Site Specific training will be provided for all individuals to include daily MEC training ▪ All MEC items will be positively identified prior to disposition ▪ MEC and MPPEH may only be moved after determination and agreement between both the SUXOS and UXOSO that the item is acceptable to move ▪ All workers handling explosives will be required to wear non-static producing clothing 					

	<ul style="list-style-type: none"> ▪ Intentional detonation of MEC items 	<p>(under- and outerwear) to reduce the generation of static electricity.</p> <ul style="list-style-type: none"> ▪ Electronic communication will not be used within a 50ft radius of electrical caps or lead wires connected to caps. ▪ Hard hats will not be worn when handling MEC or performing demolition operations ▪ Do not smoke except in designated areas outside the MRS. ▪ Do not carry fire or spark producing devices into the site. ▪ Operations will be conducted during daylight hours. ▪ Anyone can stop operations for an unsafe act or situation. <p>Controls for intentional detonations:</p> <ul style="list-style-type: none"> ▪ A Demolition Supervisor (DS) will be designated during all demolition operations ▪ Demolition briefing will be conducted by the DS prior to operational commencement ▪ Exclusion zones (EZ) will be established around disposal area for nonessential personnel based on maximum blast and fragmentation distances of item(s) being disposed of. ▪ UXOSO will maintain applicable exclusion zones during all disposal activities. ▪ Disposal operations will be conducted during daylight hours only. ▪ Post detonation location will be checked with magnetometer and investigated to ensure no hazards remain. 	
	<p>Radiation Hazards:</p> <ul style="list-style-type: none"> ▪ Sun 	<ul style="list-style-type: none"> ▪ Use sun block as appropriate. Avoid direct exposure to sun for long periods of time. ▪ Hydrate. ▪ Wear lightweight, loose-fitting clothing appropriate for weather conditions. ▪ Electrolyte/fluids replacement will be available to workers. Work rest periods will be established according to ACGIH, NIOSH guidelines. Personnel will be monitored. 	M
	<p>Physical Hazards:</p> <ul style="list-style-type: none"> ▪ Slips, trips, falls, tools, terrain, or vegetation; uneven walking surfaces; weather hazards, muddy terrain. ▪ Uneven walking surfaces <ul style="list-style-type: none"> ▪ Manual lifting 	<p>Controls to avoid injury due to Slips, Trips and Falls:</p> <ul style="list-style-type: none"> ▪ Slip, trip, and fall hazards shall be either removed or marked and barricaded. Avoid walking in areas where positive footing is unlikely or unknown. Use a walking stick to assist in balance if necessary. Work will be completed in adequate natural light. The “buddy system” will be implemented. <p>Controls to avoid injury due to manual lifting:</p> <ul style="list-style-type: none"> ▪ Use proper lifting techniques such as keeping straight back, lifting with legs; avoid twisting back; use mechanical equipment or get help from others whenever possible. Heavy loads will be split into smaller loads and/or assistance sought. The path of travel will be verified clear prior to the lift. 	L

	<ul style="list-style-type: none"> ▪ Hands or fingers caught between objects; abrasions and lacerations. ▪ Hand tools <p>Environmental Hazards:</p> <ul style="list-style-type: none"> ▪ Weather hazards ▪ Inclement weather, heat/cold stress <ul style="list-style-type: none"> ○ Lightning ○ Flooding 	<p>Controls for hands and fingers caught between objects:</p> <ul style="list-style-type: none"> ▪ Personnel shall be made aware of the hazard and asked to coordinate carefully the handling and placement of heavy objects. Materials and objects being handled will be inspected for rough or sharp edges, and appropriate precautions shall be taken to avoid contact. Personnel shall wear work gloves and avoid placing hands between objects. <p>Controls for hand tools, manual and power:</p> <ul style="list-style-type: none"> • Tools shall be inspected prior to use. Damaged tools will be tagged out of service until repair can be performed by a qualified person. Tools will be used properly and for their intended purpose. <p>Controls for inclement weather:</p> <ul style="list-style-type: none"> ▪ Personnel shall be dressed according to weather conditions. Workers shall be briefed and cognizant of heat and cold stress symptoms. As determined by the SSHO, operations are to cease during severe weather conditions. ▪ Electrolyte/fluids replacement will be available to workers. Work rest periods will be established according to ACGIH, NIOSH guidelines. Personnel will be monitored. ▪ Shut down operations during lightning storms, heavy rain, high wind, and evacuate site/take cover. ▪ Monitor weather system. ▪ If signs or warnings of flooding are evident, evacuate work area or seek shelter on higher ground immediately. ▪ Personnel shall be trained on Emergency Response. ▪ Outdoor activities will be suspended when the potential for lightning occurs. ▪ Personnel shall be evacuated to safe areas (e.g., inside fully enclosed metal-topped vehicles with windows up or substantial/permanent buildings). ▪ Outdoor activities may resume 30 minutes after the last bolt of lightning was observed and the last clap of thunder was heard. ▪ Avoid trees, water, open fields, and using hard-wired telephones and headsets when lightning is in the area. ▪ If hopelessly isolated from shelter during close-in lightning, adopt a low crouching position, with feet together (up on toes, if possible) and hands on ears. Remember, “If you can see it (lightning), flee it, if you can hear it (thunder), clear it.” 	
--	--	---	--

Equipment to be Used	PPE	Training Requirements/Competent or Qualified Personnel name(s)	Inspection Requirements
<ul style="list-style-type: none"> ▪ Cell phones ▪ Radios ▪ First aid kit ▪ Hand tools 	<ul style="list-style-type: none"> ▪ <i>Level D</i> 	<p><i>Site-Specific:</i></p> <ul style="list-style-type: none"> ▪ UXO/EOD certification, qualified in accordance with DDESB TP18 (as necessary). ▪ Certificate of Competency (minimum 1 license on site). ▪ 40 hr-OSHA, HAZWOPER, 8-hr refresher, First Aid/CPR (at least 2 personnel). ▪ Initial site specific training. 	<ul style="list-style-type: none"> ▪ Ensure all emergency equipment is in serviceable order. ▪ Ensure communication devices are in serviceable order. ▪ All PPE should be in good condition.

Activity/Work Task 8: MPPEH Management		Overall Risk Assessment Code (RAC) (Use highest code)				M	
Project Location: Former Waikane Training Area, Kaneohe, Oahu, Hawaii		Risk Assessment Code (RAC) Matrix					
Contract Number: W9128A-15-C-0006		Severity	Probability				
Date Prepared: 11/24/2015			Frequent	Likely	Occasional	Seldom	Unlikely
Prepared by (Name/Title): Robert Cook, MEC Division Safety Manager, CSP, ASP, CHST		Catastrophic	E	E	H	H	M
		Critical	E	H	H	M	L
Reviewed by (Name/Title): Michael Van Woerkom, Corporate Health and Safety Manager, ASP, CHST		Marginal	H	M	M	L	L
		Negligible	M	L	L	L	L
Notes: (Field Notes, Review Comments, etc.)		Step 1: Review each "Hazard" with identified safety "Controls" and determine RAC (See above)					
		"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.				RAC Chart	
		"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible				E = Extremely High Risk	
		Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.				H = High Risk	
			M = Moderate Risk		L = Low Risk		
Job Steps	Hazards	Controls				RAC	
Thoroughly inspect MPPEH to determine if an explosive hazard remains	Biological Hazards: <ul style="list-style-type: none"> ▪ Possibility of stinging and biting insects. <ul style="list-style-type: none"> ○ Spiders ○ Mosquitos ○ Bees ○ Wasps ○ Centipedes ○ Scorpions 	<ul style="list-style-type: none"> ▪ Use appropriate insect repellants. ▪ Wear gloves when moving objects on the ground. ▪ Wear long-sleeved shirts. ▪ Shake-out boots (footwear) when changing shoes. ▪ Recognize hazards and avoid them. 				L	
Inspected munitions debris will be segregated from Range Related Debris (RRD) and trash.	Explosives Hazards: <ul style="list-style-type: none"> ▪ Unintentional detonation of MPPEH 	<ul style="list-style-type: none"> ▪ MPPEH will be inspected by two UXO qualified personnel (one of which will be a Tech III) prior to leaving the grid. ▪ Approved ESS, EM 385-1-97, and MPPEH Management SOP will be adhered to at all times. ▪ UXO techs will receive daily training on MEC hazards and associated identifying features ▪ Debris classified as MDAS will be prevented from commingling with hazardous items or items not inspected ▪ 100% certification regarding the safety of the munitions debris will be conducted by the SUXOS 				M	
Suspect or confirmed hazardous items will be handled accordingly (refer to demolition operations AHA)							
MPPEH, once							

<p>inspected will be classified as MDAS, if appropriate, and secured in sealed containers.</p>	<p>Radiation Hazards:</p> <ul style="list-style-type: none"> ▪ Sun 	<ul style="list-style-type: none"> ▪ Use sun block as appropriate. Avoid direct exposure to sun for long periods of time. ▪ Hydrate ▪ Wear lightweight, loose-fitting clothing appropriate for weather conditions 	<p>M</p>
<p>Sealed containers will be transfer to a qualified receiver after SUXOS certification and OESS verification</p>	<p>Physical Hazards:</p> <ul style="list-style-type: none"> ▪ Slips, trips, falls, tools, terrain, or vegetation; uneven walking surfaces; weather hazards, muddy terrain. ▪ Manual lifting ▪ Hands or fingers caught between objects; abrasions and lacerations. ▪ Hand tools ▪ Inclement weather, heat/cold stress <ul style="list-style-type: none"> ○ Lightning ○ Flooding 	<p>Controls to avoid injury due to Slips, Trips and Falls:</p> <ul style="list-style-type: none"> ▪ Slip, trip, and fall hazards shall be either removed or marked and barricaded. Materials will be stored to prevent intrusion into the work areas. The “buddy system” will be implemented. <p>Controls to avoid injury due to manual lifting:</p> <p>Use proper lifting techniques such as keeping straight back, lifting with legs; avoid twisting back; use mechanical equipment or get help from others whenever possible. Heavy loads will be split into smaller loads and/or assistance sought. The path of travel will be verified clear prior to the lift.</p> <p>Controls for hands and fingers caught between objects:</p> <ul style="list-style-type: none"> ▪ Personnel shall be made aware of the hazard and asked to coordinate carefully the handling and placement of heavy objects. Materials and objects being handled will be inspected for rough or sharp edges, and appropriate precautions shall be taken to avoid contact. Personnel shall wear work gloves and avoid placing hands between objects. <p>Controls for hand tools, manual and power:</p> <ul style="list-style-type: none"> ▪ Tools shall be inspected prior to use. Damaged tools will be tagged out of service until repair can be performed by a qualified person. Tools will be used properly and for their intended purpose. <p>Controls for inclement weather:</p> <ul style="list-style-type: none"> ▪ Personnel shall be dressed according to weather conditions. Workers shall be briefed and cognizant of heat and cold stress symptoms. Electrolyte/fluids replacement will be available to workers. Work rest periods will be established according to ACGIH, NIOSH guidelines. Personnel will be monitored. As determined by the UXOSO, operations are to cease during severe weather conditions. ▪ Shut down operations during lightning storms, heavy rain, high wind, and evacuate site/take cover. ▪ Monitor weather system. ▪ If signs or warnings of flooding are evident, evacuate work area or seek shelter on higher ground immediately. ▪ Personnel shall be trained on Emergency Response. ▪ Outdoor activities will be suspended when the potential for lightning occurs ▪ Personnel shall be evacuated to safe areas (e.g., inside fully enclosed metal-topped vehicles with windows up or substantial/permanent buildings). 	<p>M</p>

		<ul style="list-style-type: none"> ▪ Outdoor activities may resume 30 minutes after the last bolt of lightning was observed and the last clap of thunder was heard. ▪ Avoid trees, water, open fields, and using hard-wired telephones and headsets when lightning is in the area. ▪ If hopelessly isolated from shelter during close-in lightning, adopt a low crouching position, with feet together (up on toes, if possible) and hands on ears. ▪ Remember, “If you can see it (lightning), flee it, if you can hear it (thunder), clear it.” 	M
Equipment to be Used	Training Requirements/Competent or Qualified Personnel name(s)	Inspection Requirements	
<ul style="list-style-type: none"> ▪ Buckets 	<p><i>Site-Specific:</i></p> <ul style="list-style-type: none"> ▪ UXO/EOD certification, qualified in accordance with DDESB TP18. ▪ 40 hr-OSHA, Hazwoper, 8-hr refresher, First Aid/CPR (at least 2 personnel). 	<p><i>Site Inspection:</i></p> <ul style="list-style-type: none"> ▪ All equipment will be properly stored, inspected, and/or maintained on a daily basis, or according to manufacturer’s requirements. Records of inspections will be maintained onsite. Fire extinguishers and first aid kits will be inspected by the UXOSO. Manufacturers’ operating manuals will be followed for equipment used. 	

This Page Intentionally Left Blank

Activity/Work Task 10: Site Restoration		Overall Risk Assessment Code (RAC) (Use highest code)					M
Project Location: Former Waikane Training Area, Kaneohe, Oahu, Hawaii		Risk Assessment Code (RAC) Matrix					
Contract Number: W9128A-15-C-0006		Severity	Probability				
Date Prepared: 11/4/2015			Frequent	Likely	Occasional	Seldom	Unlikely
Prepared by (Name/Title): Robert Cook, MEC Division Safety Manager, CSP, ASP, CHST		Catastrophic	E	E	H	H	M
		Critical	E	H	H	M	L
Reviewed by (Name/Title): Michael Van Woerkom, Corporate Health and Safety Manager, ASP, CHST		Marginal	H	M	M	L	L
		Negligible	M	L	L	L	L
Notes:		Step 1: Review each “ Hazard ” with identified safety “ Controls ” and determine RAC (See above)					
		“ Probability ” is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.				RAC Chart	
		“ Severity ” is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible				E = Extremely High Risk	
		Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each “Hazard” on AHA. Annotate the overall highest RAC at the top of AHA.				H = High Risk	
						M = Moderate Risk	
				L = Low Risk			
Job Steps	Hazards	Controls				RAC	
Backfill anomaly excavations. Remove temporary stakes.	Biological Hazards: <ul style="list-style-type: none"> ▪ Possibility of stinging and biting insects. <ul style="list-style-type: none"> ○ Spiders ○ Mosquitos ○ Bees ○ Wasps ○ Centipedes ○ Scorpions 	<ul style="list-style-type: none"> ▪ Use appropriate insect repellants. ▪ Wear gloves when moving objects on the ground. ▪ Wear long-sleeved shirts. ▪ Shake-out boots (footwear) when changing shoes. ▪ Recognize hazards and avoid them. 				M	
Site cleanup.	Explosives Hazards: <ul style="list-style-type: none"> ▪ Unintentional detonation of unknown/unanticipated UXO/MEC items. 	<ul style="list-style-type: none"> ▪ All live, suspected live, or undetermined MEC items will be clearly marked with pin flags and reported to the SUXOS. ▪ Any live MEC/UXO shall not be moved or disturbed until it is determined safe to do so by the SUXOS and UXOSO. ▪ Observe the minimum separation distance (MSD) between UXO and non-UXO operations. 					

	<ul style="list-style-type: none"> ▪ Excavations will be performed by carefully digging from the side of the anomaly inward toward its location. ▪ Do not smoke except in designated areas outside the MRS. ▪ Do not carry fire or spark producing devices into the site. ▪ Operations will be conducted during daylight hours. ▪ Anyone can stop operations for an unsafe act or situation. 	
<p>Radiation Hazards:</p> <ul style="list-style-type: none"> ▪ Sun 	<ul style="list-style-type: none"> ▪ Use sun block as appropriate. Avoid direct exposure to sun for long periods of time. ▪ Hydrate. ▪ Wear lightweight, loose-fitting clothing appropriate for weather conditions. ▪ Electrolyte/fluids replacement will be available to workers. Work rest periods will be established according to ACGIH, NIOSH guidelines. Personnel will be monitored. 	M
<p>Physical Hazards:</p> <ul style="list-style-type: none"> ▪ Slips, trips, falls, terrain, or vegetation ▪ Uneven walking surfaces ▪ Manual lifting ▪ Hands or fingers caught between objects; abrasions and lacerations ▪ Hand tools <p>Environmental Hazards:</p> <ul style="list-style-type: none"> ▪ Weather hazards 	<p>Controls to avoid injury due to Slips, Trips and Falls:</p> <ul style="list-style-type: none"> ▪ Slip, trip, and fall hazards shall be either removed or marked and barricaded. Avoid walking in areas where positive footing is unlikely or unknown. Use a walking stick to assist in balance if necessary. Work will be completed in adequate natural light. The “buddy system” will be implemented. <p>Controls to avoid injury due to manual lifting:</p> <ul style="list-style-type: none"> ▪ Use proper lifting techniques such as keeping straight back, lifting with legs; avoid twisting back; use mechanical equipment or get help from others whenever possible. Heavy loads will be split into smaller loads and/or assistance sought. The path of travel will be verified clear prior to the lift. <p>Controls for hands and fingers caught between objects:</p> <ul style="list-style-type: none"> ▪ Personnel shall be made aware of the hazard and asked to coordinate carefully the handling and placement of heavy objects. Materials and objects being handled will be inspected for rough or sharp edges, and appropriate precautions shall be taken to avoid contact. Personnel shall wear work gloves and avoid placing hands between objects. <p>Controls for hand tools, manual and power:</p> <ul style="list-style-type: none"> ▪ Tools shall be inspected prior to use. Damaged tools will be tagged out of service until repair can be performed by a qualified person. Tools will be used properly and for their intended purpose. <p>Controls for inclement weather; heat/cold stress:</p> <ul style="list-style-type: none"> ▪ Personnel shall be dressed according to weather conditions. Workers shall be briefed 	L

	<ul style="list-style-type: none"> ▪ Inclement weather, heat/cold stress <ul style="list-style-type: none"> ○ Lightning ○ Flooding 	<p>and cognizant of heat and cold stress symptoms. As determined by the SSHO, operations are to cease during severe weather conditions.</p> <ul style="list-style-type: none"> ▪ Electrolyte/fluids replacement will be available to workers. Work rest periods will be established according to ACGIH, NIOSH guidelines. Personnel will be monitored. ▪ Shut down operations during lightning storms, heavy rain, high wind, and evacuate site/take cover. ▪ Change into dry clothing/boots as soon as is practical. ▪ Monitor for signs of foot fungus. ▪ Monitor weather system. ▪ If signs or warnings of flooding are evident, evacuate work area or seek shelter on higher ground immediately. ▪ Personnel shall be trained on Emergency Response. ▪ Outdoor activities will be suspended when the potential for lightning occurs. ▪ Personnel shall be evacuated to safe areas (e.g., inside fully enclosed metal-topped vehicles with windows up or substantial/permanent buildings). ▪ Outdoor activities may resume 30 minutes after the last bolt of lightning was observed and the last clap of thunder was heard. ▪ Avoid trees, water, open fields, and using hard-wired telephones and headsets when lightning is in the area. ▪ If hopelessly isolated from shelter during close-in lightning, adopt a low crouching position, with feet together (up on toes, if possible) and hands on ears. Remember, “If you can see it (lightning), flee it, if you can hear it (thunder), clear it.” 	
Equipment to be Used	PPE	Training Requirements/Competent or Qualified Personnel name(s)	Inspection Requirements
<ul style="list-style-type: none"> ▪ Cell phones ▪ Radios ▪ First aid kit ▪ Walking stick ▪ Hand digging tools 	<ul style="list-style-type: none"> ▪ <i>Level D</i> 	<p><i>Site-Specific:</i></p> <ul style="list-style-type: none"> ▪ UXO/EOD certification, qualified in accordance with DDESB TP18 (as necessary). ▪ 40 hr-OSHA, HAZWOPER, 8-hr refresher, First Aid/CPR (at least 2 personnel). ▪ Initial site specific training. 	<ul style="list-style-type: none"> ▪ Ensure all emergency equipment is in serviceable order. ▪ Ensure communication devices are in serviceable order. ▪ All PPE should be in good condition.

This Page Intentionally Left Blank

Activity/Work Task 11: Demobilization		Overall Risk Assessment Code (RAC) (Use highest code)				M	
Project Location: Former Waikane Training Area, Kaneohe, Oahu, Hawaii		Risk Assessment Code (RAC) Matrix					
Contract Number: W9128A-15-C-0006	Severity	Probability					
Date Prepared: 11/4/2015		Frequent	Likely	Occasional	Seldom	Unlikely	
Prepared by (Name/Title): Robert Cook, MEC Division Safety Manager, CSP, ASP, CHST	Catastrophic	E	E	H	H	M	
	Critical	E	H	H	M	L	
Reviewed by (Name/Title): Michael Van Woerkom, Corporate Health and Safety Manager, ASP, CHST	Marginal	H	M	M	L	L	
	Negligible	M	L	L	L	L	
Notes: (Field Notes, Review Comments, etc.)		Step 1: Review each “ Hazard ” with identified safety “ Controls ” and determine RAC (See above)					
		“ Probability ” is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.			RAC Chart		
		“ Severity ” is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible			E = Extremely High Risk		
		Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each “Hazard” on AHA. Annotate the overall highest RAC at the top of AHA.			H = High Risk		
		M = Moderate Risk			L = Low Risk		
Job Steps	Hazards	Controls				RAC	
Demobilize equipment and personnel.	Biological Hazards: <ul style="list-style-type: none"> ▪ Possibility of stinging and biting insects. <ul style="list-style-type: none"> ○ Spiders ○ Mosquitos ○ Bees ○ Wasps ○ Centipedes ○ Scorpions 	<ul style="list-style-type: none"> ▪ Use appropriate insect repellants. ▪ Wear gloves when moving objects on the ground. ▪ Wear long-sleeved shirts. ▪ Shake-out boots (footwear) when changing shoes. ▪ Recognize hazards and avoid them. 				L	
	Radiation Hazards: <ul style="list-style-type: none"> ▪ Sun 	<ul style="list-style-type: none"> ▪ Use sun block as appropriate. Avoid direct exposure to sun for long periods of time. ▪ Hydrate ▪ Wear lightweight, loose-fitting clothing appropriate for weather conditions 				M	

	<p>Physical Hazards:</p> <ul style="list-style-type: none"> ▪ Injury due to moving equipment ▪ Slips, trips, falls, tools, terrain, or vegetation; uneven walking surfaces; weather hazards; and poor visibility. ▪ Manual lifting ▪ Hands or fingers caught between objects; abrasions and lacerations. ▪ Inclement weather, heat/cold stress <ul style="list-style-type: none"> ○ Lightning ○ Flooding 	<p>Controls to avoid injury due to moving equipment</p> <ul style="list-style-type: none"> ▪ Only trained & authorized, experienced operators ▪ Equipment inspected daily ▪ Personnel restricted in area of operation ▪ Back up alarms functional ▪ Use of hand signals, radios, and equipment horns for communications. <p>Controls to avoid injury due to Slips, Trips and Falls:</p> <ul style="list-style-type: none"> ▪ Slip, trip, and fall hazards shall be either removed or marked and barricaded. Materials will be stored to prevent intrusion into the work areas. Work will be completed in adequate natural light. The “buddy system” will be implemented. <p>Controls to avoid injury due to manual lifting:</p> <ul style="list-style-type: none"> ▪ Use proper lifting techniques such as keeping straight back, lifting with legs; avoid twisting back; use mechanical equipment or get help from others whenever possible. Heavy loads will be split into smaller loads and/or assistance sought. The path of travel will be verified clear prior to the lift. <p>Controls for hands and fingers caught between objects:</p> <ul style="list-style-type: none"> ▪ Personnel shall be made aware of the hazard and asked to coordinate carefully the handling and placement of heavy objects. Materials and objects being handled will be inspected for rough or sharp edges, and appropriate precautions shall be taken to avoid contact. Personnel shall wear work gloves and avoid placing hands between objects. <p>Controls for inclement weather:</p> <ul style="list-style-type: none"> ▪ Personnel shall be dressed according to weather conditions. Workers shall be briefed and cognizant of heat and cold stress symptoms. ▪ Shut down operations during lightning storms, heavy rain, high wind, and evacuate site/take cover. ▪ Monitor weather system. ▪ If signs or warnings of flooding are evident, evacuate work area or seek shelter on higher ground immediately. ▪ Personnel shall be trained on Emergency Response. ▪ Outdoor activities will be suspended when the potential for lightning occurs ▪ Personnel shall be evacuated to safe areas (e.g., inside fully enclosed metal-topped vehicles with windows up or substantial/permanent buildings). ▪ Outdoor activities may resume 30 minutes after the last bolt of lightning was observed and the last clap of thunder was heard. ▪ Avoid trees, water, open fields, and using hard-wired telephones and headsets when lightning is in the area. 	L
--	---	---	---

	<ul style="list-style-type: none"> ▪ Noise exposure ▪ Fire 	<ul style="list-style-type: none"> ▪ If hopelessly isolated from shelter during close-in lightning, adopt a low crouching position, with feet together (up on toes, if possible) and hands on ears. ▪ Remember, “If you can see it (lightning), flee it, if you can hear it (thunder), clear it.” <p><i>Controls for noise exposure:</i></p> <ul style="list-style-type: none"> ▪ High noise activities will be identified. Hearing protection will be provided as appropriate. The latest ACGIH threshold limit values (TLVs) will be used. Hearing control program, which consists of audiometric examination; training; use of hearing protection; and sound level pressure monitoring when and where necessary. <p><i>Controls to avoid fire:</i></p> <ul style="list-style-type: none"> ▪ Smoking will not be permitted within the MRS. 	
--	--	--	--

Equipment to be Used	PPE	Training Requirements/Competent or Qualified Personnel name(s)	Inspection Requirements
<ul style="list-style-type: none"> ▪ Vehicles 	<ul style="list-style-type: none"> ▪ Gloves for loading/unloading ▪ Safety boots. 	<p><i>Site-Specific:</i></p> <ul style="list-style-type: none"> ▪ Initial site-specific <p><i>Motor Vehicle</i></p> <ul style="list-style-type: none"> ▪ Operators will hold a valid license for the type and class of vehicle they are operating. 	<p><i>Site Inspection:</i></p> <ul style="list-style-type: none"> ▪ Before initial use vehicles will be inspected and found to be in a safe operating condition

Activity/Work Task 1: Cutting and Mutilation of Munitions Debris		Overall Risk Assessment Code (RAC) (Use highest code)				M	
Project Location: Former Waikane Training Area, Kaneohe, Oahu, Hawaii		Risk Assessment Code (RAC) Matrix					
Contract Number: W9128A-15-C-0006		Severity	Probability				
Date Prepared: 11/4/2015			Frequent	Likely	Occasional	Seldom	Unlikely
Prepared by (Name/Title): Robert Cook, MEC Division Safety Manager, CSP, ASP, CHST		Catastrophic	E	E	H	H	M
		Critical	E	H	H	M	L
Reviewed by (Name/Title): Michael Van Woerkom, Corporate Health and Safety Manager, ASP, CHST		Marginal	H	M	M	L	L
		Negligible	M	L	L	L	L
Notes: (Field Notes, Review Comments, etc.)		Step 1: Review each “ Hazard ” with identified safety “ Controls ” and determine RAC (See above)					
		“ Probability ” is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.			RAC Chart		
		“ Severity ” is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible			E = Extremely High Risk		
		Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each “Hazard” on AHA. Annotate the overall highest RAC at the top of AHA.			H = High Risk		
			M = Moderate Risk				
			L = Low Risk				
Job Steps	Hazards	Controls				RAC	
Inspection of equipment Perform Cutting Operations	Biological Hazards: <ul style="list-style-type: none"> ▪ Possibility of stinging and biting insects. <ul style="list-style-type: none"> ○ Spiders ○ Wasps ○ Bees ○ Mosquitoes ○ Centipedes ○ Scorpions 	<ul style="list-style-type: none"> ▪ Use appropriate insect repellants. ▪ Wear gloves when moving objects on the ground. ▪ Wear long-sleeved shirts. ▪ Shake-out boots (footwear) when changing shoes. ▪ Recognize hazards and avoid them. 				L	
	Radiation Hazards: <ul style="list-style-type: none"> ▪ Sun 	<ul style="list-style-type: none"> ▪ Use sun block as appropriate. Avoid direct exposure to sun for long periods of time. ▪ Hydrate. ▪ Wear lightweight, loose-fitting clothing appropriate for weather conditions. 				M	

	<p>Physical Hazards:</p> <ul style="list-style-type: none"> ▪ Slips, trips, falls, tools, terrain, or vegetation; uneven walking surfaces; weather hazards; and poor visibility. ▪ Cuts, abrasions, eye hazards, and sharp objects ▪ Hands or fingers caught between objects; abrasions and lacerations. ▪ Burns ▪ Inclement weather, heat/cold stress <ul style="list-style-type: none"> ○ Lightning ○ Flooding 	<p>Controls to avoid injury due to Slips, Trips and Falls:</p> <ul style="list-style-type: none"> ▪ Slip, trip, and fall hazards shall be either removed or marked and barricaded. Materials will be stored to prevent intrusion into the work areas. Work will be completed in adequate natural light. The “buddy system” will be implemented. <p>Controls to avoid injury due to cuts, abrasions, eye hazards, and sharp objects:</p> <ul style="list-style-type: none"> ▪ Ensure all operators are trained, competent and qualified to operate the cutting equipment to be used. ▪ Ensure that all equipment is in good condition and all adjustments are made before starting cutting operations. ▪ Remove rings, watches, other jewelry, and secure loose clothing and hair. ▪ Always keep hands away from the blade when machine is in operation ▪ Operators will receive hazard training which will instruct them on the hazards and protective measures concerning band saw operations. ▪ Keep the floor around the machine clean and free of scrap material, oil and grease. ▪ Do not over reach. Maintain a balanced stance at all times so that you do not fall or lean against blades or other moving parts. ▪ Keep machine guards in place at all time when the machine is in use. If removed for maintenance purposes, use LOTO and replace the guards immediately after work is complete <p>Controls for hands and fingers caught between objects:</p> <ul style="list-style-type: none"> ▪ Personnel shall be made aware of the hazard and asked to coordinate carefully the handling and placement of heavy objects. Materials and objects being handled will be inspected for rough or sharp edges, and appropriate precautions shall be taken to avoid contact. Personnel shall wear work gloves and avoid placing hands between objects. <p>Controls for burns:</p> <ul style="list-style-type: none"> ▪ Personnel will use glove to avoid making contact with potentially hot surfaces. <p>Controls for inclement weather:</p> <ul style="list-style-type: none"> ▪ Personnel shall be dressed according to weather conditions. Workers shall be briefed and cognizant of heat and cold stress symptoms. ▪ Shut down operations during lightning storms, heavy rain, high wind, and evacuate site/take cover. ▪ Monitor weather system. ▪ If signs or warnings of flooding are evident, evacuate work area or seek shelter on higher ground immediately. 	L
--	---	---	---

	<ul style="list-style-type: none"> ▪ Noise exposure ▪ Fire 	<ul style="list-style-type: none"> ▪ Personnel shall be trained on Emergency Response. ▪ Outdoor activities will be suspended when the potential for lightning occurs ▪ Personnel shall be evacuated to safe areas (e.g., inside fully enclosed metal-topped vehicles with windows up or substantial/permanent buildings). ▪ Outdoor activities may resume 30 minutes after the last bolt of lightning was observed and the last clap of thunder was heard. ▪ Avoid trees, water, open fields, and using hard-wired telephones and headsets when lightning is in the area. ▪ If hopelessly isolated from shelter during close-in lightning, adopt a low crouching position, with feet together (up on toes, if possible) and hands on ears. ▪ Remember, “If you can see it (lightning), flee it, if you can hear it (thunder), clear it.” <p><i>Controls for noise exposure:</i></p> <ul style="list-style-type: none"> ▪ High noise activities will be identified. Hearing protection will be provided as appropriate. The latest ACGIH threshold limit values (TLVs) will be used. Hearing control program, which consists of audiometric examination; training; use of hearing protection; and sound level pressure monitoring when and where necessary. <p><i>Controls to avoid fire:</i></p> <ul style="list-style-type: none"> ▪ Smoking will not be permitted within the area. ▪ Remove all ignitable and combustible materials from the vicinity of cutting operations. ▪ Ensure an approved fire extinguisher is readily available during operations. 	
--	--	---	--

Equipment to be Used	PPE	Training Requirements/Competent or Qualified Personnel name(s)	Inspection Requirements
<ul style="list-style-type: none"> ▪ Cutting band saw 	<ul style="list-style-type: none"> ▪ Gloves for preparation and processing film ▪ Face shield ▪ Safety boots. 	<p><i>Site-Specific:</i></p> <ul style="list-style-type: none"> ▪ Initial site-specific <p><i>Cutting saw</i></p> <ul style="list-style-type: none"> ▪ Operators will be trained in the hazards and proper operation of the band saw. ▪ Individuals operating the band saw must read and understand the SOP. 	<p><i>Band Saw Inspection:</i></p> <ul style="list-style-type: none"> ▪ Before initial use of the band saw it will be inspected and found to be in a safe operating condition

Activity/Work Task 1: Batch Burner Furnace Operations		Overall Risk Assessment Code (RAC) (Use highest code)				M	
Project Location: Former Waikane Training Area, Kaneohe, Oahu, Hawaii		Risk Assessment Code (RAC) Matrix					
Contract Number: W9128A-15-C-0006		Severity	Probability				
Date Prepared: 11/4/2015			Frequent	Likely	Occasional	Seldom	Unlikely
Prepared by (Name/Title): Robert Cook, MEC Division Safety Manager, CSP, ASP, CHST		Catastrophic	E	E	H	H	M
		Critical	E	H	H	M	L
Reviewed by (Name/Title): Michael Van Woerkom, Corporate Health and Safety Manager, ASP, CHST		Marginal	H	M	M	L	L
		Negligible	M	L	L	L	L
Notes: (Field Notes, Review Comments, etc.)		Step 1: Review each “ Hazard ” with identified safety “ Controls ” and determine RAC (See above)					
		“ Probability ” is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.			RAC Chart		
		“ Severity ” is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible			E = Extremely High Risk		
		Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each “Hazard” on AHA. Annotate the overall highest RAC at the top of AHA.			H = High Risk		
			M = Moderate Risk				
			L = Low Risk				
Job Steps	Hazards	Controls				RAC	
Pre-operational preparation	Biological Hazards: <ul style="list-style-type: none"> ▪ Possibility of stinging and biting insects. <ul style="list-style-type: none"> ○ Spiders ○ Wasps ○ Bees ○ Mosquitoes ○ Centipedes ○ Scorpions 	<ul style="list-style-type: none"> ▪ Use appropriate insect repellants. ▪ Wear gloves when moving objects on the ground. ▪ Wear long-sleeved shirts. ▪ Shake-out boots (footwear) when changing shoes. ▪ Recognize hazards and avoid them. 				L	
Batch burner furnace operations						<ul style="list-style-type: none"> ▪ Use sun block as appropriate. Avoid direct exposure to sun for long periods of time. ▪ Hydrate ▪ Wear lightweight, loose-fitting clothing appropriate for weather conditions 	
	Radiation Hazards: <ul style="list-style-type: none"> ▪ Sun 						

	<p>Physical Hazards:</p> <ul style="list-style-type: none"> ▪ Injury due to moving equipment ▪ Slips, trips, falls, tools, terrain, or vegetation; uneven walking surfaces; weather hazards; and poor visibility. ▪ Manual lifting ▪ Hands or fingers caught between objects; abrasions and lacerations. ▪ Burns ▪ Inclement weather, heat/cold stress <ul style="list-style-type: none"> ○ Lightning ○ Flooding 	<p>Controls to avoid injury due to moving equipment</p> <ul style="list-style-type: none"> ▪ Only trained & authorized, experienced operators ▪ Equipment inspected daily ▪ Personnel restricted in area of operation <p>Controls to avoid injury due to Slips, Trips and Falls:</p> <ul style="list-style-type: none"> ▪ Slip, trip, and fall hazards shall be either removed or marked and barricaded. Materials will be stored to prevent intrusion into the work areas. Work will be completed in adequate natural light. The “buddy system” will be implemented. <p>Controls to avoid injury due to manual lifting:</p> <ul style="list-style-type: none"> ▪ Use proper lifting techniques such as keeping straight back, lifting with legs; avoid twisting back; use mechanical equipment or get help from others whenever possible. Heavy loads will be split into smaller loads and/or assistance sought. The path of travel will be verified clear prior to the lift. <p>Controls for hands and fingers caught between objects:</p> <ul style="list-style-type: none"> ▪ Personnel shall be made aware of the hazard and asked to coordinate carefully the handling and placement of heavy objects. Materials and objects being handled will be inspected for rough or sharp edges, and appropriate precautions shall be taken to avoid contact. Personnel shall wear work gloves and avoid placing hands between objects. <p>Controls for burns:</p> <ul style="list-style-type: none"> ▪ Individuals should wear all required PPE when operating the batch burner ▪ Proper face shields and heat shield gloves will be worn. ▪ All individuals shall be trained on the SOP and operation of the batch burner <p>Controls for inclement weather:</p> <ul style="list-style-type: none"> ▪ Personnel shall be dressed according to weather conditions. Workers shall be briefed and cognizant of heat and cold stress symptoms. ▪ Shut down operations during lightning storms, heavy rain, high wind, and evacuate site/take cover. ▪ Monitor weather system. ▪ If signs or warnings of flooding are evident, evacuate work area or seek shelter on higher ground immediately. ▪ Personnel shall be trained on Emergency Response. ▪ Outdoor activities will be suspended when the potential for lightning occurs ▪ Personnel shall be evacuated to safe areas (e.g., inside fully enclosed metal-topped vehicles with windows up or substantial/permanent buildings). ▪ Outdoor activities may resume 30 minutes after the last bolt of lightning was observed and the last clap of thunder was heard. 	L
--	--	--	---

	<ul style="list-style-type: none"> ▪ Noise exposure ▪ Fire 	<ul style="list-style-type: none"> ▪ Avoid trees, water, open fields, and using hard-wired telephones and headsets when lightning is in the area. ▪ If hopelessly isolated from shelter during close-in lightning, adopt a low crouching position, with feet together (up on toes, if possible) and hands on ears. ▪ Remember, “If you can see it (lightning), flee it, if you can hear it (thunder), clear it.” <p><i>Controls for noise exposure:</i></p> <ul style="list-style-type: none"> ▪ High noise activities will be identified. Hearing protection will be provided as appropriate. The latest ACGIH threshold limit values (TLVs) will be used. Hearing control program, which consists of audiometric examination; training; use of hearing protection; and sound level pressure monitoring when and where necessary. <p><i>Controls to avoid fire:</i></p> <ul style="list-style-type: none"> ▪ Smoking will not be permitted within the area around the batch burner. ▪ A fire extinguisher will be at hand when operating the batch burner. ▪ Operations shall not be conducted when wind speed is 15mph or greater. ▪ Ensure MEC debris is certified MDAS prior to placement in furnace. 	
--	--	---	--

Equipment to be Used	PPE	Training Requirements/Competent or Qualified Personnel name(s)	Inspection Requirements
<ul style="list-style-type: none"> ▪ Batch burner machine 	<ul style="list-style-type: none"> ▪ Gloves for operating the batch burner ▪ Face shield ▪ Safety boots. 	<p>Site-Specific:</p> <ul style="list-style-type: none"> ▪ Initial site-specific <p>Batch Burner</p> <ul style="list-style-type: none"> ▪ Operators will be trained in the hazards and proper operation of the batch burner. ▪ Individuals operating the batch burner must read and understand the SOP. 	<p>Site Inspection:</p> <ul style="list-style-type: none"> ▪ Before initial use batch burner will be inspected and found to be in a safe operating condition

Activity/Work Task 1: X-Ray MEC Investigation		Overall Risk Assessment Code (RAC) (Use highest code)				M	
Project Location: Former Waikane Training Area, Kaneohe, Oahu, Hawaii		Risk Assessment Code (RAC) Matrix					
Contract Number: W9128A-15-C-0006		Severity	Probability				
Date Prepared: 11/4/2015			Frequent	Likely	Occasional	Seldom	Unlikely
Prepared by (Name/Title): Robert Cook, MEC Division Safety Manager, CSP, ASP, CHST		Catastrophic	E	E	H	H	M
		Critical	E	H	H	M	L
Reviewed by (Name/Title): Michael Van Woerkom, Corporate Health and Safety Manager, ASP, CHST		Marginal	H	M	M	L	L
		Negligible	M	L	L	L	L
Notes: (Field Notes, Review Comments, etc.)		Step 1: Review each “ Hazard ” with identified safety “ Controls ” and determine RAC (See above)					
		“ Probability ” is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.				RAC Chart	
		“ Severity ” is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible				E = Extremely High Risk	
		Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each “Hazard” on AHA. Annotate the overall highest RAC at the top of AHA.				H = High Risk	
			M = Moderate Risk		L = Low Risk		
Job Steps	Hazards	Controls				RAC	
Preparation for field operation X-Ray film preparation and processing	Biological Hazards: <ul style="list-style-type: none"> ▪ Possibility of stinging and biting insects. <ul style="list-style-type: none"> ○ Spiders ○ Wasps ○ Bees ○ Mosquitoes ○ Centipedes ○ Scorpions 	<ul style="list-style-type: none"> ▪ Use appropriate insect repellants. ▪ Wear gloves when moving objects on the ground. ▪ Wear long-sleeved shirts. ▪ Shake-out boots (footwear) when changing shoes. ▪ Recognize hazards and avoid them. 				L	
Conducting X-Ray field operations X-Ray unit maintenance and storage	Radiation Hazards: <ul style="list-style-type: none"> ▪ Sun ▪ X-Rays 	<ul style="list-style-type: none"> ▪ Use sun block as appropriate. Avoid direct exposure to sun for long periods of time. ▪ Hydrate ▪ Wear lightweight, loose-fitting clothing appropriate for weather conditions ▪ All licenses, registrations, calibrations, and personnel training shall be current before operations begin. ▪ Only trained and authorized personnel will perform x-ray operations. ▪ All personnel authorized to perform x-ray operations shall follow required dosimeter/film badge program procedures. ▪ X-Ray unit shall be used in accordance with manufacturer’s recommended operation procedures, state and federal regulations and company established operating procedures. ▪ Never place your hand or other body part in path of the x-ray. 				M	

	<p>Physical Hazards:</p> <ul style="list-style-type: none"> ▪ Slips, trips, falls, tools, terrain, or vegetation; uneven walking surfaces; weather hazards; and poor visibility. ▪ Manual lifting ▪ Hands or fingers caught between objects; abrasions and lacerations. ▪ Burns ▪ Inclement weather, heat/cold stress <ul style="list-style-type: none"> ○ Lightning ○ Flooding 	<p>Controls to avoid injury due to Slips, Trips and Falls:</p> <ul style="list-style-type: none"> ▪ Slip, trip, and fall hazards shall be either removed or marked and barricaded. Materials will be stored to prevent intrusion into the work areas. Work will be completed in adequate natural light. The “buddy system” will be implemented. <p>Controls to avoid injury due to manual lifting:</p> <ul style="list-style-type: none"> ▪ Use proper lifting techniques such as keeping straight back, lifting with legs; avoid twisting back; use mechanical equipment or get help from others whenever possible. Heavy loads will be split into smaller loads and/or assistance sought. The path of travel will be verified clear prior to the lift. <p>Controls for hands and fingers caught between objects:</p> <ul style="list-style-type: none"> ▪ Personnel shall be made aware of the hazard and asked to coordinate carefully the handling and placement of heavy objects. Materials and objects being handled will be inspected for rough or sharp edges, and appropriate precautions shall be taken to avoid contact. Personnel shall wear work gloves and avoid placing hands between objects. <p>Controls for burns:</p> <ul style="list-style-type: none"> ▪ Personnel will use nitrile gloves when handling film pods to prevent caustic burns <p>Controls for inclement weather:</p> <ul style="list-style-type: none"> ▪ Personnel shall be dressed according to weather conditions. Workers shall be briefed and cognizant of heat and cold stress symptoms. ▪ Shut down operations during lightning storms, heavy rain, high wind, and evacuate site/take cover. ▪ Monitor weather system. ▪ If signs or warnings of flooding are evident, evacuate work area or seek shelter on higher ground immediately. ▪ Personnel shall be trained on Emergency Response. ▪ Outdoor activities will be suspended when the potential for lightning occurs ▪ Personnel shall be evacuated to safe areas (e.g., inside fully enclosed metal-topped vehicles with windows up or substantial/permanent buildings). ▪ Outdoor activities may resume 30 minutes after the last bolt of lightning was observed and the last clap of thunder was heard. ▪ Avoid trees, water, open fields, and using hard-wired telephones and headsets when lightning is in the area. ▪ If hopelessly isolated from shelter during close-in lightning, adopt a low crouching position, with feet together (up on toes, if possible) and hands on ears. 	L
--	--	---	---

	<ul style="list-style-type: none"> ▪ Noise exposure ▪ Fire 	<ul style="list-style-type: none"> ▪ Remember, “If you can see it (lightning), flee it, if you can hear it (thunder), clear it.” <p><i>Controls for noise exposure:</i></p> <ul style="list-style-type: none"> ▪ High noise activities will be identified. Hearing protection will be provided as appropriate. The latest ACGIH threshold limit values (TLVs) will be used. Hearing control program, which consists of audiometric examination; training; use of hearing protection; and sound level pressure monitoring when and where necessary. <p><i>Controls to avoid fire:</i></p> <ul style="list-style-type: none"> ▪ Smoking will not be permitted within the area. 	
--	--	---	--

Equipment to be Used	PPE	Training Requirements/Competent or Qualified Personnel name(s)	Inspection Requirements
<ul style="list-style-type: none"> ▪ X-Ray Machine 	<ul style="list-style-type: none"> ▪ Gloves for preparation and processing film ▪ Face shield ▪ Safety boots. ▪ Dosimeter 	<p><i>Site-Specific:</i></p> <ul style="list-style-type: none"> ▪ Initial site-specific <p><i>X-Ray Investigations</i></p> <ul style="list-style-type: none"> ▪ Operators will be trained in the hazards and proper operation of the x-ray machine. ▪ Individuals operating the x-ray machine must read and understand the SOP. 	<p><i>X-Ray Inspection:</i></p> <ul style="list-style-type: none"> ▪ Before initial use of the x-ray machine it will be inspected and found to be in a safe operating condition

Attachment E
OSHA 300 Form

This Page Intentionally Left Blank

OSHA's Form 300A (Rev. 01/2004)

Summary of Work-Related Injuries and Illnesses

Year 2015



U.S. Department of Labor
Occupational Safety and Health Administration

Form approved OMB no. 1218-0176

All establishments covered by Part 1904 must complete this Summary page, even if no injuries or illnesses occurred during the year. Remember to review the Log to verify that the entries are complete

Using the Log, count the individual entries you made for each category. Then write the totals below, making sure you've added the entries from every page of the log. If you had no cases write "0."

Employees former employees, and their representatives have the right to review the OSHA Form 300 in its entirety. They also have limited access to the OSHA Form 301 or its equivalent. See 29 CFR 1904.35, in OSHA's Recordkeeping rule, for further details on the access provisions for these forms.

Number of Cases

Total number of deaths	Total number of cases with days away from work	Total number of cases with job transfer or restriction	Total number of other recordable cases
<u>0</u>	<u>2</u>	<u>1</u>	<u>1</u>
(G)	(H)	(I)	(J)

Number of Days

Total number of days away from work	Total number of days of job transfer or restriction
<u>273</u>	<u>26</u>
(K)	(L)

Injury and Illness Types

Total number of... (M)			
(1) Injury	<u>4</u>	(4) Poisoning	<u>0</u>
(2) Skin Disorder	<u>0</u>	(5) Hearing Loss	<u>0</u>
(3) Respiratory Condition	<u>0</u>	(6) All Other Illnesses	<u>0</u>

Post this Summary page from February 1 to April 30 of the year following the year covered by the form

Public reporting burden for this collection of information is estimated to average 58 minutes per response, including time to review the instruction, search and gather the data needed, and complete and review the collection of information. Persons are not required to respond to the collection of information unless it displays a currently valid OMB control number. If you have any comments about these estimates or any aspects of this data collection, contact: US Department of Labor, OSHA Office of Statistics, Room N-3644, 200 Constitution Ave. NW, Washington, DC 20210. Do not send the completed forms to this office.

Establishment information

Your establishment name GSI Pacific

Street 181 South Kukui Street

City Honolulu State Hawaii Zip 96813

Industry description (e.g., Manufacture of motor truck trailers)
Construction

Standard Industrial Classification (SIC), if known (e.g., SIC 3715)

OR North American Industrial Classification (NAICS), if known (e.g., 336212)
2 3 6 2 2 0

Employment information

Annual average number of employees 95

Total hours worked by all employees last year 154,892

Sign here

Knowingly falsifying this document may result in a fine.

I certify that I have examined this document and that to the best of my knowledge the entries are true, accurate, and complete.



Company executive

Health and Safety Manager
Title

808-833-2225

Phone

1/11/2016

Date

This Page Intentionally Left Blank

Attachment F
Incident Reporting Procedures

This Page Intentionally Left Blank



Incident Reporting, Investigation, and Review

Table of Contents

Section 1: Purpose and Summary 3

Section 2: Policy Statement 3

Section 3: Responsibility Matrix 3

 3.1 Procedure Responsibility 3

 3.2 Corporate Management 4

 3.3 Project Managers 4

 3.4 Employees 4

 3.5 Health and Safety Personnel 4

 3.6 Human Resources and Workers Compensation Personnel 4

Section 4: Definitions 4

Section 5: Reporting, Investigation, and Review 7

 3.7 Incident Reporting Process 7

 5.1.1 Supervisor’s Employee Injury/Illness Report (Attachment 2) 9

 5.1.2 Vehicle Accident Report (Attachment 3) 9

 5.1.3 Equipment, Property Damage, General Liability, and Loss Report (Attachment 4) 9

 5.1.4 Incident Investigation Report (Attachment 5) 9

 5.1.5 Injured Employee Statement and Witness Statement Forms (Attachment 6a and 6b) 10

 5.1.6 Accident Review Board (ARB) Report (Attachment 7) 10

 5.1.7 Monthly Loss Report 11

 3.8 Incident Recordkeeping 11

 5.1.8 OSHA Recordkeeping 11

 5.1.9 Record Retention 11

 3.9 Employee Involvement 11

 5.1.10 Program evaluation 12

 3.10 Exception Provisions 12

 3.11 Attachments 12



Procedure No.	HS 3-001
Revision No.	1
Date of Revision	June 2011
Last Review Date	June 2011

This Page Intentionally Left Blank



Procedure No.	HS 3-001
Revision No.	1
Date of Revision	June 2011
Last Review Date	June 2011

Section 1: Purpose and Summary

The purpose of this procedure is to establish the requirements for incident reporting, investigation, and review. This procedure is an integral part of the company's overall Accident Prevention Program and aids in the identification of potential causal factors and corrective actions. This program satisfies, in part, the recording, reporting and employee participation requirements specified in Title 29 of the Code of Federal Regulations (CFR), Part 1904. Key elements of this procedure include:

- All occupational injuries/illnesses, vehicle accidents, and near miss incidents must be promptly reported and investigated.
- All Occupational Safety and Health Administration (OSHA) recordable injuries/illnesses and chargeable vehicle accidents must be reviewed by an Accident Review Board. The Accident Review Board report is submitted to the Corporate Safety Department, for production and retention.
- All incidents involving a fatality, major injury/illness, or resulting in significant property damage will be immediately reported to: The Health and Safety Manager and the Operations Vice President.
- All investigations and associated materials obtained and/or produced, in association with OSHA recordable injuries/illnesses, chargeable vehicle accidents, fatalities, major injury/illness, or incidents resulting in significant property damage, are to be performed for and on behalf of the Health and Safety Department and can be made confidential.
- All Health and Safety Managers are required to prepare a Monthly Loss Report summarizing all current month and year to-date chargeable vehicle accidents, injury/illness cases (requiring outside medical care), lost work day totals, and restricted work day totals. This report shall then be forwarded by the 10th day of the following month to the Corporate Safety Department.

Section 2: Policy Statement

All Incidents including near-miss incidents involving GSI Pacific personnel or GSI Pacific subcontractors under GSI Pacific's immediate direction shall be reported and investigated. Investigations shall be conducted in a timely manner and provide an accurate and substantiated account of how and why the incident occurred and what corrective actions have been identified to address the investigation findings. Information gathered from the investigations shall be used by management to improve conditions to prevent future occurrence of the incident or similar incidents.

Section 3: Responsibility Matrix

3.1 Procedure Responsibility

The Corporate Health and Safety Department is responsible for the issuance, revision, and maintenance of this procedure.



Procedure No.	HS 3-001
Revision No.	1
Date of Revision	June 2011
Last Review Date	June 2011

3.2 Corporate Management

GSI Pacific Management has the overall responsibility for the effective implementation and maintenance of this program. This includes assuring the necessary resources are provided and that Project Managers and employees are held accountable for their responsibilities under this program. Corporate Management will also participate in executive reviews of all major incidents as well as monitor enterprise incident metrics.

3.3 Project Managers

Project Managers shall ensure that program requirements have been addressed for all areas and employees they manage, including communicating program requirements to their employees, ensuring that complete and thorough incident investigations are conducted and that corrective actions identified as the result of an incident investigation are documented, corrected, and verified as complete.

3.4 Employees

Employees are responsible for performing their job duties in a manner that is compliant with the requirements of this program. Employees are responsible to report all unsafe conditions or acts and immediately report any work related incident to supervisory personnel.

3.5 Health and Safety Personnel

Health and Safety Personnel are responsible for providing overall direction for the program and ensuring that all program elements are implemented at the individual operating units. They will serve as a contact for incident reporting for the operating unit and act as a resource in conducting incident investigations. Health and Safety personnel are responsible for completing the classification and documentation of all incident investigation data, reviewing investigation effectiveness, communicating lessons learned from completed incident investigations and other related issues to assure program effectiveness.

3.6 Human Resources and Workers Compensation Personnel

Human Resources and Workers Compensation Personnel shall support the recordkeeping and reporting requirements as established by this program. Human Resources will assist in coordination of post-accident drug and alcohol screening should incident circumstances or client requirements warrant testing.

Section 4: Definitions

Chargeable Vehicle Accident – An at-fault vehicle accident meeting any one of the following criteria:

- An individual other than an employee of the company is a party in the accident.
- Property owned by a person or entity other than the company is damaged.
- When company owned, leased, or rented vehicles are involved in damages exceeding \$2,500.00.



Procedure No.	HS 3-001
Revision No.	1
Date of Revision	June 2011
Last Review Date	June 2011

Company – All affiliates, indirect and wholly owned subsidiaries of GSI Pacific, Inc.

Days Away From Work – Days away from work are the number of calendar days following the injury or illness, excluding the date of the injury.

First Aid – Specific treatment that can be rendered by a first aid responder at the location where the injury occurred or by a physician or health care professional. Examples of first aid treatment include, but are not limited to:

- cleaning, flushing or soaking wounds on the skin surface;
- using wound coverings such as bandages, gauze pads, steri-strips or butterfly bandages;
- administering tetanus immunizations;
- using temporary immobilization devices such as a sling or splint while transporting; or
- using hot or cold therapy.

A complete list of first aid treatments as defined by OSHA is found in 29 CFR 1904.7(b)(5)(ii)

Hazardous Substance – Any substance that results or may result in adverse effects on the health or safety of an exposed employee.

Incident – An incident is defined as “an undesired event which results or could have resulted in harm to people, or loss/damage to property, production, or the environment.” Some examples of incidents are as follows:

- work-related injury or illness;
- suspected hazardous substance exposure over the allowable exposure limit;
- automobile or vehicle-related incidents;
- significant property or equipment damage;
- an unplanned fire or explosion;
- an unplanned spill or release (including air releases) to the environment;
- a permit or permit equivalent exceedance; or
- unexpected contact with damage to aboveground or belowground utilities.

A near miss incident is described as “an undesired event or workplace condition which under slightly different circumstances had a reasonable probability of resulting in one of the outcomes described above. Some examples of near miss incidents are as follows:

- tools falling from overhead work near workers below;
- unexpected contact without damage to aboveground or belowground utilities;
- discovery of an unknown and potentially hazardous material, or anomaly; or
- discovery of confirmed or potential Munitions and Explosives of Concern (MEC) or Recovered Chemical Warfare Material (RCWM) that may present a hazard.



Procedure No.	HS 3-001
Revision No.	1
Date of Revision	June 2011
Last Review Date	June 2011

Injury or Illness – An injury or illness is an abnormal condition or disorder. Injuries include such cases as, but not limited to, a cut, fracture, sprain, amputation or insect bite. Illnesses include both acute and chronic illnesses, such as, but not limited to, skin disease or disorder, respiratory conditions, poisoning or hearing loss.

Job Safety Analysis (JSA) – The JSA is an effective management technique for identifying hazardous conditions and unsafe acts in the workplace. A JSA is intended to analyze the individual steps or activities, which together create a job or specific work duty, and to detect any actual or potential hazards that may be present.

Major Incident – A major incident is defined as the following:

- results in a fatality;
- results in the hospitalization of one or more employees;
- specific treatment for the injury or condition is rendered by a health care professional and results in permanent total, permanent partial disability or temporary total disability; or
- significant property or equipment damage has occurred.

Minor Incident – A minor incident is defined as the following:

- specific treatment for the injury is rendered by a first aid provider or health care professional either at the location of injury or at a local medical provider and the employee is treated and released;
- lost time, restricted duty or job transfer incident without permanent total or partial disability or temporary total disability; or
- minimal property or equipment damage.

Medical Treatment – Medical treatment includes managing and caring for a patient by a physician or health care professional for the purpose of combating disease or disorder. The following are some examples of medical treatment:

- prescription medication;
- sutures;
- application of a rigid means of support;
- hospitalization for medical treatment.

Overexposure – Exposure to a hazardous substance that results in signs or symptoms indicative of an adverse effect or reaction.

Restricted Work – Occurs when, as the result of a work-related injury or illness:

- A physician or other licensed health care professional recommends that the employee not perform one or more of the routine functions of his or her job, or not work the full workday that he or she would otherwise have been scheduled to work.



Procedure No. HS 3-001
Revision No. 1
Date of Revision June 2011
Last Review Date June 2011

Root Cause Analysis – An investigative approach designed to identify the most basic causative factors of why and how an incident occurred.

Vehicle – Any passenger vehicle, including trucks, used upon the highway or in private facilities for transporting passengers and/or property. For the purpose of this procedure, off-road vehicles such as earthmoving equipment, forklifts, non-highway use trucks, etc., are not considered vehicles.

Section 5: Reporting, Investigation, and Review

The following sections describe the various program elements that comprise the GSI Pacific Incident Reporting, Investigation, and Review Program. Elements include incident notification and reporting procedures, incident response and investigation, incident recording, employee participation and program evaluation.

5. Incident Reporting Process

Employees are required to immediately report to their direct supervisor all occupational injuries, illnesses, accidents, and near miss incidents having the potential for injury. Site Managers or Supervisors (supervisors directly responsible for the employee involved in the incident) with first-hand knowledge of an incident are required to:

- Immediately arrange for appropriate medical attention and notify the responsible health and safety representative.
- As soon as practical, but not longer than one hour after gaining knowledge of the occurrence, notify the Corporate Health and Safety Manager of any injury requiring off-site medical treatment, any chargeable vehicle accident, or equipment incident involving property damage exceeding \$2,500.00 in value.
- Complete the *Authorization for Treatment of Occupational Injury/Illness, Authorization for Release of Medical Information, and Return to Work Examination Form* (Attachment 8A, 8B, 8C) and the *Supervisor's Employee Injury/Illness Report* (Attachment 2) for all cases requiring off-site medical attention. The Site Safety and Health Representative or responsible supervisor shall ensure that the forms are completed and submitted to the Corporate Health and Safety Department prior to leaving the medical facility or as soon as reasonably possible.
- Post-Accident drug and alcohol testing shall occur in accordance with HS101 Drug and Alcohol testing, immediately following an incident.

NOTE: Prior to performing non-Department of Transportation (USDOT) post-accident testing, it is the responsibility of the employee's supervisor to ensure that the Corporate Health and Safety Department has verified that this testing is not prohibited or restricted by state or local regulations.

- Prior to an injured employee returning to his/her job duties, a follow-up call by the Corporate Health and Safety Department will be made to the Project Manager. The purpose of this call is to ensure work restrictions are clarified and planned work activities are consistent with medical recommendations.



Procedure No. HS 3-001
Revision No. 1
Date of Revision June 2011
Last Review Date June 2011

- The Supervisor shall initiate/complete the appropriate company documentation in accordance with the following incident classifications: (note: if a Site Safety and Health Representative is on site, he/she should work in concert with the supervisor).
 - OSHA Recordable Cases
 - Supervisor's Employee Injury/Illness Report (Attachment 2)
 - Incident Investigation Report (Attachment 5)
 - Injured Employee Statement (Attachment 6a)
 - Witness Statement Form (Attachment 6b)
 - Accident Review Board (Attachment 7)
 - First Aid Cases
 - Supervisor's Employee Injury/Illness Report (Attachment 2)
 - Incident Investigation Report (Attachment 5)
 - Injured Employee Statement (Attachment 6a)
 - Witness Statement Form (Attachment 6b)
 - Chargeable Vehicle Accidents
 - Vehicle Accident Report (Attachment 3)
 - Incident Investigation Report (Attachment 5)
 - Injured Employee Statement (Attachment 6a)
 - Witness Statement Form (Attachment 6b)
 - Accident Review (Attachment 7)
 - Driving Record Certification
 - Non-Chargeable Vehicle Accidents
 - Vehicle Accident Report (Attachment 3)
 - Incident Investigation Report (Attachment 5)
 - Injured Employee Statement (Attachment 6a)
 - Witness Statement Form (Attachment 6b)
 - Equipment, Property Damage, and General Liability Incidents
 - Incident Investigation Report (Attachment 5)
 - Injured Employee Statement (Attachment 6a)
 - Witness Statement Form (Attachment 6b)
 - Equipment, Property Damage and General Liability Loss Report (Attachment 4)
 - Near Miss
 - Incident Investigation Report (Attachment 5)



Procedure No.	HS 3-001
Revision No.	1
Date of Revision	June 2011
Last Review Date	June 2011

5.1.1 Supervisor's Employee Injury/Illness Report (Attachment 2)

The Supervisor's Employee Injury/Illness Report is to be completed for all incidents that result in an employee occupational injury or illness requiring off-site medical attention. It is to be initiated by the supervisor of the injured employee and forwarded to the respective Safety Manager for review/comments. Upon completion of review and comments, the report should be forwarded within 24 hours to the GSI Pacific Human Resources Department.

5.1.2 Vehicle Accident Report (Attachment 3)

The Vehicle Accident Report must be completed for any vehicle accident in which a company vehicle is involved. This includes company-owned or leased vehicles, rental vehicles, and personal vehicles being used for company business. This report is to be initiated by both the employee involved in the accident and his/her direct supervisor and forwarded to the respective Safety Manager for review/comments. Upon completion of review and comments, the report should be forwarded to the GSI Pacific Human Resources Department.

5.1.3 Equipment, Property Damage, General Liability, and Loss Report (Attachment 4)

The General Liability, Property Damage, and Loss Report is to be used for all losses or damage to company property in excess of \$2,500.00. This form must be completed for all third party property, regardless of value, damaged as a result of company activities. The employee most familiar with the events that contributed to the loss or damage will complete the form, and then forward it to the project manager. The respective Safety Manager must receive a copy of the report within one business day of the incident.

5.1.4 Incident Investigation Report (Attachment 5)

All injuries, illnesses, accidents, and near miss incidents will be investigated. Once arrangements for immediate medical care have been made, the employee's direct supervisor, with assistance from the health and safety representative, will:

- collect the facts;
- describe and document (including sketch, photos, etc.) how the incident occurred;
- collect support documentation (JSAs, Activity Hazard Analysis (AHAs), Tailgate Safety Meetings, Work Orders, etc.);
- list witnesses and collect written statements;
If applicable, contact the employee's manager in an effort to gain relevant information.
- identify the causative factors;
- identify potentially unsafe acts or unsafe conditions that may have contributed to the incident;
- identify potential curative action; and
- list the corrective actions which are to be executed, appropriate curative action, the person(s) responsible for the corrective action, and the date by which action is to be completed.



Procedure No.	HS 3-001
Revision No.	1
Date of Revision	June 2011
Last Review Date	June 2011

The investigation will be started as soon as possible following the incident and the relevant reports and support documentation (JSAs, AHAs, Tailgate Safety Meetings, Work Orders, etc.) shall be submitted to the appropriate Health and Safety Manager within 72 hours. In addition to the previous information, reports from external sources (police, insurance carriers, testing laboratories, etc.) are to be obtained as soon as they become available and forwarded by the Safety Manager to the Health and Safety Department.

5.1.5 Injured Employee Statement and Witness Statement Forms (Attachment 6a and 6b)

The Injured Employee and Witness Statement Form allows for consistency in the development of the investigation process. The Injured Employee Statement must be completed in all cases where an employee injury results in off-site medical treatment. If there are witnesses to the accident/incident, the Witness Statement form should be completed and signed by the subject witness. Both of these forms should be attached to the incident investigation report. It is essential that these statements are executed immediately following the incident to ensure an accurate account of the events.

5.1.6 Accident Review Board (ARB) Report (Attachment 7)

The purpose of the Accident Review Board is to collect and review the information gathered for each incident, report that information to the Health and Safety Department, and take appropriate corrective action. In all cases, the purpose of the entire investigative process, inclusive of conducting an ARB, is to identify corrective actions as it relates to the incident/injury. Accordingly, a diligent and concerted effort to accomplish these tasks must be established at the onset of all of the subject incidents.

In order to assist the Health and Safety Department in evaluating the risk to, or liability of, the company associated with OSHA recordable injuries, chargeable vehicle accidents, fatalities or incidents resulting in significant property damage, the responsible Project Manager is required to coordinate with all parties and set up the ARB such that it occurs within 10 days of the accident. The respective Health and Safety Manager is then required to conduct the subject ARB.

The ARB shall be composed of the Project Manager, the employee's direct supervisor (at the time of the incident), a health and safety representative, and the employee(s) involved in the incident.

Additionally, there may be cases that involve an employee that has been assigned to a project and the Functional Manager of that employee may not have direct knowledge of an incident. In cases such as these, the Functional Manager shall be notified of the incident and requested to participate in the ARB. Also, as determined by the Health and Safety Manager, a representative of other internal sources of expertise should be involved where applicable.

All investigations and associated materials obtained and/or produced in association with injuries/illnesses resulting in OSHA recordable classification, chargeable vehicle accidents, fatalities, or incidents resulting in significant property damage are to be performed for and on behalf of the Health and Safety Department. The ARB Report and associated documents are submitted to the Health and Safety Department for production and retention.

The ARB Report, and all associated documents, shall be completed as soon as practicable, but not more than five business days following the ARB meeting, and forwarded by the Safety Manager to the



Procedure No.	HS 3-001
Revision No.	1
Date of Revision	June 2011
Last Review Date	June 2011

Corporate Safety Department. These documents shall then be filed separate from files not meeting the subject criteria by the Health and Safety Department for production and retention. In the event that copies of these files are maintained by safety managers and/or the respective location in which the injury occurred, the same filing criteria shall be followed.

It is generally not acceptable to discipline an employee for having an accident. However, if in the opinion of the ARB, it is determined that the accident resulted from an intentional unsafe act or intentional violation of company procedure on the employee's part, the employee may be subject to disciplinary action in accordance with the company's progressive disciplinary action system.

5.1.7 Monthly Loss Report

Each Project Manager is responsible to submit a Monthly Loss Report summarizing incidents that took place during the previous month. The Health and Safety Manager is responsible for submitting a consolidated package to the Health and Safety Department for receipt no later than the 10th working day of the following month.

5.2 Incident Recordkeeping

5.2.1 OSHA Recordkeeping

Injuries and illnesses defined as recordable by OSHA (for example, incidents involving days away, job restrictions or medical treatment beyond basic first aid) must be recorded on OSHA Form 300, "Log of Work-Related injuries and illnesses". Details on OSHA recordkeeping criteria are presented in HS-2-004 "Recordkeeping and Reporting Requirements." The operating health and safety representative shall determine whether the injury or illness is recordable according to OSHA recordkeeping requirements.

In accordance with 29 CFR 1904.39, GSI Pacific must report to OSHA any incident involving a fatality or resulting in the in-patient hospitalization of three or more employees within 8 hours after the occurrence. This report must be made to the nearest area office of OSHA either by phone or in person. The operating unit health and safety representative should be immediately notified of the event and will coordinate responses and contact with the agencies involved.

5.2.2 Record Retention

All incident reports and OSHA injury and illness records must be maintained at the operating unit level for at least five years after the end of the calendar year in which the incident occurred.

5.3 Employee Involvement

All GSI Pacific employees are expected to immediately report all incidents including near miss incidents to their supervisor. Reporting of incidents is critical in providing proper medical attention, correcting unsafe conditions, and maintaining an effective incident prevention program.

Employees are also expected to cooperate in incident investigations in order to conduct a thorough investigation. Employees are instructed in proper reporting procedures through safety training, site specific health and safety plans, company publications and guidance available on the company intranet site.



Procedure No.	HS 3-001
Revision No.	1
Date of Revision	June 2011
Last Review Date	June 2011

Employees have the right to access company injury and illness records in accordance with the provisions outlined in 29 CFR 1904.35.

5.3.1 Program evaluation

Evaluation of program compliance and recordkeeping will be completed during audits as described in HS 2-003 “Health and Safety Audit Program”

5.4 Exception Provisions

Variances and exceptions may be requested pursuant to the provisions of procedure Health and Safety Procedure Variances.

5.4.1 Attachments

1. Reporting, Investigation, and Review Responsibility Matrix
2. Supervisor’s Employee Injury/Illness Report Form
3. Vehicle Accident Report
4. Equipment, Property Damage and General Liability Loss Report
5. Incident Investigation Report
6. Injured Employee Forms:
 - a. Injured Employee Statement
 - b. Employee Witness Statement
7. Accident Review Board Report
8. Injury/Illness Classification Guidelines
9. Medical Forms
 - a. Authorization for Treatment of Occupational Injury/Illness
 - b. Authorization for Release of Protected Medical Information
 - c. Return-to-Work Examination Form



Procedure No. HS 3-001
 Revision No. 1
 Date of Revision June 2011
 Last Review Date June 2011

ATTACHMENT 1

**ACCIDENT PREVENTION PROGRAM:
 REPORTING, INVESTIGATION, AND REVIEW RESPONSIBILITY MATRIX**

Action	Procedure Section	RESPONSIBLE PARTY					
		Employee	Supervisor	Project/ Location Manager	Site Health and Safety Rep./Officer	Business Line Health and Safety Manager	Corporate Health & Safety Manager
Issue, Revise, and Maintain Procedure	3.1						X
Report All Incidents to Supervisor	5.1	X					
Notify Health and Safety Representative	5.1		X				
Arrange Medical Care	5.1		X		X		
Notify Health Resources	5.1		X		X		
Initiate/Complete Company Forms	5.1		X		X		
Complete Investigation of incident	5.5		X	X	X	X	
Complete Equipment, Property Damage and General Liability Loss Report Incident	5.4	X					
Coordinate and Set up Accident Review Board	5.7			X			
Conduct Accident Review Board	5.7					X	
Participate in Accident Review Board	5.7	X	X	X	X	X	
Complete Monthly Loss Report	5.8					X	



Procedure No.	HS 3-001
Revision No.	1
Date of Revision	June 2011
Last Review Date	June 2011

This Page Intentionally Left Blank



ATTACHMENT 2

Page 1 of 2

REPORT ALL WORKER'S COMPENSATION INJURIES TO GSI PACIFIC'S HUMAN RESOURCES DEPARTMENT

Supervisor's Employee Injury/Illness Report Form

EMPLOYEE INFORMATION			
Employee's Social Security Number:		Claim Number:	
Home Address:		Business Line Code:	
Male:	Female:	Date of Birth:	Hire Date:
Dependents:		Dependents Under 18:	Marital Status:
Occupation:		Department Name:	
State Hired:		Current Weekly Wage:	Hourly Wage:
Hours/Days Worked Per Week:		Days Per Week:	Hourly Wage:
Employment Status:		Employee Report No.:	Employee ID No.:
Salaried Continued:		Paid For Date of Injury:	Education No. of Years:
Ever Injured on the Job:		Supervisor Name & Phone:	
EMPLOYER INFORMATION			
Employer Name:			
Work Location:			
Contact Name:		Telephone Number:	
Employer SIC:		Employer Location Code:	
Employer FED ID:		Employer Code:	
Nature of Business:			
Policy Number:			
ACCIDENT INFORMATION			
Date and Time of Injury:			
Did the Accident Occur at the Work Location:		If no, where did the accident occur?	
Accident Address:			
Nature of Accident:			
Give a Full Description of the Accident: (Be as Factually Complete as Possible)			
Are Other WC Claims Involved?		Date and Time Reported to Employer:	
Person Reported To:			
WITNESS INFORMATION			
Were There Any Witnesses?			
If Yes, List Names and How to Contact Them:			



Procedure No. HS 3-001
 Revision No. 1
 Date of Revision June 2011
 Last Review Date June 2011

ATTACHMENT 2

Page 2 of 2

INJURY INFORMATION	
Which Part of the Body Was Injured? (e.g. Head, Neck, Arm, Leg)	
What Was the Nature of the Injury? (e.g. Fracture, Sprain, Laceration)	
Part of Body Location: (e.g. Left, Right, Upper, Lower)	
Injury Description	
Source of Injury:	Is Employee Hospitalized?
Lost Time:	If Yes, What was First Full Day Out?
Date Last Day Worked:	Date Disability Began:
Date Returned to Work:	Estimated Return Date:
MEDICAL INFORMATION	
ER Treated & Released:	Hospitalized:
Phy./Clinic:	
Was Employee Transported via Ambulance?	
Hospital – Name, Address, Phone Number:	
Clinic – Name, Address, Phone Number:	
ADDITIONAL COMMENTS & INFORMATION	
REPORT PREPARED BY	
Name:	Title:
Signature:	Phone:

**ATTACHMENT 3
Vehicle Accident Report
Page 1 of 2**

This report is to be initiated by the employee involved in the accident or his/her direct supervisor. Please answer all questions completely. This report must be forwarded to the appropriate health and safety representative within 24 HOURS of the accident. Attach police report.

ACCIDENT DESCRIPTION

ACCIDENT DATE: _____ TIME: _____ A.M. or P.M.
LOCATION OF ACCIDENT (CITY, STATE): _____
ACCIDENT DESCRIPTION: _____

WITNESS: _____ PHONE NUMBER: _____
ADDRESS: _____ CITY: _____ STATE & ZIP: _____
POLICE OFFICER'S NAME AND BADGE #: _____ DEPARTMENT: _____

COMPANY VEHICLE

DRIVER: _____ D.L. # _____ STATE: _____
ADDRESS: _____ CITY: _____ STATE & ZIP: _____
WORK PHONE NO.: _____ S.S. # _____ PROJECT # _____
VEHICLE NO.: _____ YR: _____ MAKE: _____ MODEL: _____ LIC. PLATE # _____
STATE: _____ VEHICLE OWNER: COMPANY LEASE/RENTED PRIVATE VEHICLE
VEHICLE TYPE: COMMERCIAL MOTOR VEHICLE NON-COMMERCIAL
IF NOT COMPANY-OWNED: OWNER _____ PHONE NO.: _____
ADDRESS: _____ CITY: _____ STATE & ZIP: _____
VEHICLE DAMAGE: _____
NO. OF VEHICLES TOWED FROM SCENE: _____ NUMBER OF INJURIES: _____ NUMBER OF FATALITIES: _____
WERE HAZARDOUS MATERIALS RELEASED? YES NO IF YES, DESCRIBE MATERIALS _____

OTHER VEHICLE

DRIVER: _____ D.L. # _____ STATE: _____
ADDRESS: _____ CITY: _____ STATE & ZIP: _____
WORK PHONE NO.: _____ S.S. # _____
OWNERS NAME (CHECK IF SAME AS DRIVER) _____
ADDRESS: _____ CITY: _____ STATE & ZIP: _____
INSURANCE COMPANY: _____ POLICY # _____
AGENT'S NAME: _____ PHONE NO.: _____
ADDRESS: _____ CITY: _____ STATE & ZIP: _____
VEHICLE YR: _____ MAKE: _____ MODEL: _____ LIC. PLATE # _____ STATE: _____
VEHICLE I.D. NO.: _____
VEHICLE DAMAGE: _____
PASSENGERS: YES NO INJURIES: YES NO (If Yes, list names and telephone numbers below)

**ATTACHMENT 3
VEHICLE ACCIDENT REPORT
Page 2 of 2**

WEATHER: Clear Cloudy Fog Rain Sleet Snow OTHER: _____

PAVEMENT: Asphalt Steel Concrete Wood Gravel/Dirt Brick/Stone
OTHER: _____

CONDITION: Dry Wet Icy Pot Holes OTHER: _____


TRAFFIC CONTROL: Traffic Light Stop Sign Railroad No Intersection No Control



ROADWAY: Number of Lanes Each Direction: _____ Residential Divided Highway Undivided Highway


Draw and name roadways showing each vehicle, direction of travel, and point of impact. Indicate travel before the accident with a solid line, and post-accident movement with a broken line.





SYMBOLS:


Your Vehicle: 

Other Vehicle(s):  

Pedestrian: 

Stop Sign: 

Yield: 

Railroad: 

ADDITIONAL INFORMATION: _____

Employee: _____ (Print) _____ (Signature) _____ (Date)

Supervisor: _____ (Print) _____ (Signature) _____ (Date)

Safety Rep.: _____ (Print) _____ (Signature) _____ (Date)

ATTACH POLICE REPORT TO VEHICLE ACCIDENT REPORT
**REPORT MUST BE FAXED TO: GSI
PACIFIC, INC. (FAX: 808-356-0900)**
WITHIN 24 HOURS, OR NOT LATER THAN NEXT BUSINESS DAY

ATTACHMENT 4 EQUIPMENT, PROPERTY DAMAGE AND GENERAL LIABILITY LOSS REPORT

This report is to be completed for all losses or damage to company property in excess of 1,000.00 and all third party damage, regardless of value, resulting from company activities.

PROJECT/LOCATION: _____ PROJECT # _____ DATE: _____

ADDRESS: _____

HOW DID DAMAGE OR LOSS OCCUR: _____

DESCRIPTION AND VALUE (\$) OF DAMAGED/LOST/STOLEN PROPERTY: _____

LOCATION OF DAMAGED/LOST/STOLEN PROPERTY (Before Loss): _____

DATE AND TIME OF DAMAGE, LOSS, OR THEFT: DATE: _____ TIME: _____ AM PM

OWNER OF DAMAGED/LOST/STOLEN PROPERTY:

Name: _____ Phone # _____

Address: _____ City/State: _____

Employer and Address: _____

INJURED PARTIES (Also Complete a Supervisor's Employee Injury Report if a Company Employee):

Name: _____ Phone # _____

Address: _____ City/State: _____

Employer and Address: _____ Address: _____

Description of Injury: _____

Witnesses:

1. Name: _____ Home Phone # _____

Home Address: _____ City/State: _____

Employer and Address: _____

2. Name: _____ Home Phone # _____

Home Address: _____ City/State: _____

Employer and Address: _____

WERE PICTURES TAKEN? YES NO

WERE POLICE NOTIFIED? YES NO DEPT. _____ REPORT NO. _____

COMPLETED BY: _____ (Print) _____ (Signature) _____ (Date)

SUPERVISOR: _____ (Print) _____ (Signature) _____ (Date)

REPORT MUST BE FAXED TO: GSI
PACIFIC, INC. (FAX: 808-356-0900)
WITHIN 24 HOURS, OR NOT LATER THAN NEXT BUSINESS DAY
F-F-21

**ATTACHMENT 5
INCIDENT INVESTIGATION REPORT**

***Must Be Completed Within 72 Hours & Relevant Support Documentation
Must Be Attached/Submitted***

Investigation Date: _____ Date of Incident: _____

Employee Name: _____

Supervisor Name: _____

Project No./Name: _____

Location of Incident: _____

Incident Classification:

- | | | | | | |
|----------------|---|------------------|---|--------------------------|---|
| <u>Injury:</u> | <input type="checkbox"/> First Aid | <u>Vehicle:</u> | <input type="checkbox"/> Chargeable | <u>DOT:</u> | <input type="checkbox"/> DOT Vehicle |
| | <input type="checkbox"/> OSHA Recordable | | <input type="checkbox"/> Non-Chargeable | | <input type="checkbox"/> DOT Reportable |
| | <input type="checkbox"/> Lost Workday | | | | |
| | <input type="checkbox"/> Restricted Workday | <u>Near Miss</u> | <input type="checkbox"/> | <u>General Liability</u> | <input type="checkbox"/> |

Description (Provide facts, describe how incident occurred, provide diagram [on back] or photos)

Analysis (What unsafe acts or conditions contributed to the incident?)

Corrective Action(s) (List corrective action items, responsible person, scheduled completion date)

Witness Names (Complete Attachment 6b - Employee Witness Statement)

Investigated By: _____
Print Name Signature Date

Supervisor: _____
Print Name Signature Date

ATTACHMENT 6a
Injured Employee Statement
MUST BE COMPLETED WITHIN 24 HOURS OF THE INCIDENT

This form should be completed by the injured employee involved in the incident. Describe only the facts for which you have personal knowledge. If you have no knowledge of a particular question, write "no knowledge".

Company: _____

Exact Location of Incident/Accident: _____

Name of Injured Employee: _____

Date of Incident/Accident: _____ Time: _____ A.M. P.M.

Date of This Statement: _____ Time: _____ A.M. P.M.

Time Your Shift Begins: _____ A.M. P.M. Time Your Shift Ends: _____ A.M. P.M.

Name(s) of Known Witnesses: _____

Name: _____ Name: _____

Name: _____ Name: _____

Your Immediate Supervisor's Name: _____

If Not Employed by GSI Pacific, Inc., Enter the Name of Your Company and Phone Number: _____

Have You Had a Prior Injury Similar to This Injury? _____

Was It While You Were at Work? _____

What Date Did the Prior Injury Occur? _____

Stating Only Factual Information, Describe in Detail What Happened and Include Any Applicable Events Leading to the Incident/Accident.

I certify that, to the best of my knowledge, all of the above information is complete, accurate and factual. I acknowledge that the intentional falsification or altering of facts or making misleading statements may be grounds for disciplinary action.

(Signature/Date)

(Print Name)

**ATTACHMENT 6b
Employee Witness Statement
*MUST BE COMPLETED WITHIN 24 HOURS OF THE INCIDENT***

This form should be completed by every employee working in the crew of the injured employee and by every other employee with knowledge of events or circumstances involved in the incident. This information is being solicited from you so that the company can accurately assess the reported incident to avoid similar occurrences in the future. Describe only the facts for which you have personal knowledge. If you have no knowledge of the incident, write "no knowledge".

Company: _____

Exact Location of Incident/Accident: _____

Name of Injured Employee: _____

Date of Incident/Accident: _____

Date of This Statement: _____

Time Your Shift Begins: _____

Witness Information:

Name: _____

Home Phone No.: _____

Home Address: _____ City: _____

State/Zip: _____ Witness Supervisor's Name: _____

If not employed by GSI Pacific, Inc., enter the name of your company: _____

Company Phone Number: _____

Did you see the Incident/Accident? _____

How far from you (approx., in feet) did the Incident/Accident occur? _____

Stating only factual information, describe in detail what happened and include any applicable events leading to the Incident/Accident.

I certify that, to the best of my knowledge, all of the above information is complete, accurate and factual. I acknowledge that the intentional falsification or altering of facts or making misleading statements may be grounds for disciplinary action.

(Witness Signature/Date)

(Print Name)



Procedure No. HS 3-001
 Revision No. 1
 Date of Revision February 2011
 Last Review Date February 2011

**ATTACHMENT 7
 ACCIDENT REVIEW BOARD REPORT**

DATE: _____	LOCATION: _____
BOARD MEMBERS: _____	
ACCIDENT DATE: _____	EMPLOYEE(S) INVOLVED IN INCIDENT: _____
INVESTIGATION COMPLETE: _____	ACCIDENT CLASSIFICATION: _____
THE FOLLOWING INFORMATION MUST BE PROVIDED BY THE REVIEW BOARD FOR THIS INCIDENT (PRINT): SUPERVISOR: _____ PROJECT/LOCATION MGR: _____	
POTENTIAL CAUSE OF ACCIDENT: _____ _____ _____ _____ _____ _____ _____	
ACTION BY BOARD*: _____ _____ _____ _____ _____ _____ _____	
*All actions by the Accident Review Board are subject to final review by the Human Resources and Legal Departments.	
ACCEPTED:	
_____ (Employee Signature)	_____ (Supervisor Signature)
APPROVED: _____ (Project/Location Manager)	REJECTED FOR: _____ _____ _____
APPROVED: _____ (Business Line Health and Safety Manager or Designee)	REJECTED FOR: _____ _____ _____
APPROVED: _____ (Business Line Vice President)	REJECTED FOR: _____ _____ _____



Procedure No.	HS 3-001
Revision No.	1
Date of Revision	June 2011
Last Review Date	June 2011

ATTACHMENT 8

Page 1 of 2

INJURY/ILLNESS CLASSIFICATION GUIDELINES

First Aid Treatment - if the incident requires only the following types of treatment, consider it first aid.

Do Not record the case if it involves only:

- Using non-prescription medications at non-prescription strengths.
- Administering tetanus immunizations.
- Cleaning, flushing, or soaking wounds on the skin surface.
- Using wound coverings such as bandages, Band-Aids™, gauze pads, etc., or using SteriStrips™ or butterfly bandages.
- Using hot or cold therapy.
- Using any totally non-rigid means of support, such as elastic bandages, non-rigid back belts, etc.
- Using temporary immobilization devices while transporting an accident victim (slings, neck collars, or back boards).
- Drilling a fingernail or toenail to relieve pressure, or draining fluids from blisters.
- Using eye patches.
- Using simple irrigation or a cotton swab to remove foreign bodies not embedded in or adhered to the eye.
- Using finger guards.
- Using massage.
- Drinking fluids to relieve heat stress.

Medical Treatment – Includes managing and caring for a patient for the purpose of combating disease or disorder. The following are not considered medical treatments and are not recordable:

- Visits to a doctor or Licensed Health Care Professional (LHCP) solely for the purpose of observation or counseling.
- Diagnostic procedures, including administering prescription medications that are used solely for diagnostic purposes.
- Any procedure that can be labeled first aid (see descriptions above).



Procedure No.	HS 3-001
Revision No.	1
Date of Revision	June 2011
Last Review Date	June 2011

ATTACHMENT 8

Page 2 of 2

OSHA Recordable Injuries and Illnesses

Work related injuries and illnesses that result in the following should be recorded on the OSHA 300 Log:

- Death.
- Loss of Consciousness.
- Days away from work.
- Restricted work activity or job transfer.
- Medical treatment beyond first aid.

You must also record any **work related** injury or illness that involves cancer, chronic irreversible disease, a fractured or cracked bone, or a punctured eardrum.

Additional Recordable Criteria

You must also records the following conditions when they are work related:

- Any needle stick injury or cut from a sharp object that is contaminated with another person's blood or other potentially infectious material.
- Any case requiring an employee to be medically removed from a site under the requirements of an OSHA health standard.
- Any Standard Threshold Shift (STS) in hearing (i.e., cases involving an average hearing loss of 10 dB or more in either ear).
- Tuberculosis infection as evidenced by a positive skin test or diagnosis by a physician or other licensed health care professional after exposure to a known case of active tuberculosis.

ATTACHMENT 9A
MEDICAL FORMS

Last Review Date February 2011

AUTHORIZATION FOR TREATMENT OF OCCUPATIONAL INJURY/ILLNESS

Employee Name: _____
Social Security #: _____ Injury: Illness:
Job Title: _____ Incident Date: _____
Project/Location: _____ Location of Accident/Exposure: _____
Telephone #: _____
H&S Representative: _____
Body Part(s) Injured: _____
Describe in detail how incident occurred: _____

TO TREATING PHYSICIAN:

In the case of occupational injury/illness, please examine the employee and render necessary conservative treatment directly related to the occupational injury/illness.

Light Duty Work:

It is the policy of our company to provide work assignments, whenever possible, for employees with physical activity restrictions resulting from an occupational injury/illness. If the employee will be subject to a restriction, please contact **GSI Pacific** before releasing the employee, so that a light duty assignment may be arranged.

Medically Unfit to Return to Work:

It is the policy of our company to assist employees unable to return to work, due to an injury/illness, in obtaining needed medical care and other available benefits. Medical findings are also used to help evaluate unsafe conditions that may have led to the incident. Please help us assist our employees by contacting **GSI Pacific** with your findings as soon as possible, preferably before the employee leaves your office, but not later than the close of business on the day of initial treatment.

GSI Pacific: Telephone: (808) 834-4631 Fax: (808) 356-0900

Please Send Reports To: **GSI Pacific, Inc.**
181 South Kukui Street
Honolulu, Hawaii 96813

Please Send Bills To: **GSI Pacific, Inc.**
181 South Kukui Street
Honolulu, Hawaii 96813

DOCTOR, Please provide:

Medical Diagnosis: _____
Treatment Provided: _____

Recommended Work Limitation/Restriction: _____
Return Visit Needed: No Yes Date if Yes: _____ First Aid Only
Physician Name: _____ Physician Telephone: _____
Physician Signature: _____ Date: _____

YOU MUST CALL HUMAN RESOURCES FOR ALL OCCUPATIONAL INJURIES/ILLNESSES
REQUIRING OUTSIDE MEDICAL TREATMENT: (808) 834-4631.

FAX COMPLETED FORM TO HUMAN RESOURCES: (808) 356-0900

Send Bills to GSI Pacific, Inc.

**ATTACHMENT 9B
MEDICAL FORMS**

AUTHORIZATION FOR RELEASE OF PROTECTED MEDICAL INFORMATION

Printed Name: _____ Date of Birth: _____

Address: _____

Social Security #: _____ Home Telephone: _____

Authority to Release Protected Health Information

I hereby authorize the release of medical information, identified in this authorization form, and provide such information to:

GSI Pacific, Inc.
181 South Kukui Street
Honolulu, Hawaii 96813

The Information To Be Released includes the following:

Complete health record	Discharge summary	Progress notes
History and physical exam	Consultation reports	X-ray films / images
Laboratory test results	X-ray & Image reports	Itemized bill
Diagnosis & treatment codes	Complete billing record	

Other, (specify) _____

Purpose of the Requested Disclosure of Protected Health Information

I am authorizing the release of my Protected Health Information.

Drug and/or Alcohol Abuse, and/or Psychiatric, and/or HIV/AIDS Records Release

I understand if my medical or billing record contains information in reference to, psychiatric care, sexually transmitted disease, hepatitis B or C testing, previous drug and/or alcohol abuse and/or other sensitive information, I agree to its release. **Check One:** Yes No

I understand if my medical or billing record contains information in reference to HIV/AIDS (Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome) testing and/or treatment I agree to its release. **Check One:** Yes No

Right to Revoke Authorization

Except to the extent that action has already been taken in reliance on this authorization, the authorization may be revoked at any time by submitting a written notice to **Human Resources at GSI Pacific, Inc., 650 Iwilei Road Suite 204, Honolulu, Hawaii 96817.** Unless revoked, this authorization will expire at which time completion of treatment for the injury or illness has been accomplished.

Re-disclosure

I understand the information disclosed by this authorization may be subject to re-disclosure by the recipient and no longer be protected by the Health Insurance Portability and Accountability Act of 1996.

Signature of Patient or Personal Representative Who May Request Disclosure

I understand that I do not have to sign this authorization. However, if health care services are being provided to me for the purpose of providing information to a third-party (e.g. fitness-for-work test), I understand that services may be denied if I do not authorize the release of information related to such health care services to the third-party. I can inspect or copy the protected health information to be used or disclosed.

I hereby release and discharge GSI Pacific, Inc. of any liability and the undersigned will hold GSI Pacific, Inc. harmless for complying with this Authorization.

Signature: _____ Date: _____

Description of relationship if not patient: _____

ATTACHMENT 9C
MEDICAL FORMS

RETURN-TO-WORK EXAMINATION FORM

Exam Date: ____/____/____ Employee Name: _____
Birth Date: ____/____/____ Social Security #: _____-_____-_____
Job Title: _____ Sex: Male Female

Examining Provider: Please complete this form and fax to GSI Pacific, Inc. at (808) 356-0900. Please contact GSI Pacific, Inc. at (808) 834-4631 to report status of employee post-treatment.

DIAGNOSIS: _____
TREATMENT PLAN: _____
MEDICATIONS: _____
PHYSICAL THERAPY: _____
OTHER: _____

- May return to full duty work effective ____/____/____
- May return to limited duty from ____/____/____ to ____/____/____
- Unable to return to work from ____//____ to ____//____

WORK LIMITATIONS:

- Restricted lifting/pushing/pulling: maximum weight in lbs: _____ (company limits all lifting to ≤ 60 lbs).
- Work only with right/left hand. Restricted repetitive motion right/left hand.
- Sitting job only. Restricted operation of moving equipment.
- Other: _____

FOLLOW-UP PLAN:

- Release from care.
- Schedule for follow-up appointment on ____/____/____
Time: _____ AM PM
- Referral to _____
Appointment date: ____/____/____ Time: _____ AM PM

Comments: _____

Examiner's Name (print) Examiner's Signature Date

Attachment G
Forms

Note: This appendix has undergone editorial revisions in order to incorporate errata comments on the Final version of the document.

This Page Intentionally Left Blank

List of forms included in this attachment:

Safety Forms:

- Daily Safety Meeting Attendance Log;
- Tailgate Safety Brief;
- Daily Safety Report;
- Safety and Health Deficiency Tracking Log;
- ENG Form 3394 (USACE Accident Investigation Report);
- Monthly Exposure Report;
- Documentation of Training;
- Weekly Safety Inspection Log;
- Site Visitor's Log;
- Operator's Equipment Inspection Report;
- Excavation/Trench Inspection Form;
- Supervisor's Employee Injury/Illness Report Form;
- Vehicle Accident Report;
- Equipment, Property Damage, and General Liability Loss Report;
- Incident Investigation;
- Injured Employee Statement;
- Employee Witness Statement;
- Accident Review Board Report;
- Medical Forms; and
- POD Form 265 (Immediate Report of Mishap).

Note, the forms provided in the Attachment are the formats planned for use, but these forms may need to be altered to accommodate project specific elements during project execution.

This Page Intentionally Left Blank

This Page Intentionally Left Blank



**GSI PACIFIC, INC.
DAILY BRIEFING SIGN-IN SHEET
TAILGATE SAFETY BRIEF**

Date: _____ Project Name/Location: _____

Team: _____ Person Conducting Briefing: _____

1. AWARENESS (e.g., special EHS concerns, pollution prevention, recent incidents, lessons learned, etc.):

Team Assignments

2. OTHER ISSUES (EHS Plan changes, attendee comments, etc.):

MEC Training, Smoking Policy, Accident/Incident Reporting, Fire Safety, Slips/Trips/Falls, Heat Stress, Hydration, PPE, Vehicle safety, Proper Lifting, Wildlife, General Safety, OE/UXO Safety, Safety Around MHE, Drink H2O, Pick-up trash, etc...

Specific Topics:

EM 385-1-97:
AHA:
ORDNANCE TRAINING:
SAFETY OBSERVER COMMENT:

3. ATTENDEES (Sign Name):

This Page Intentionally Left Blank

Daily Safety Report



PROJECT NAME: _____		REPORT NO.: _____
PROJECT NO.: _____	LOCATION: _____	DATE: _____
I. Site Safety Brief Topics		
II. Safety Inspections		
III. Problems Encountered / Corrective Actions Taken		
IV. Additional Health and Safety Comments		
VII. Visitors		
VIII. Approval		
Name/Role: _____		Date: _____
Signature: _____		

This Page Intentionally Left Blank

This Page Intentionally Left Blank

<i>(For Safety Staff only)</i>	REPORT NO.	EROC CODE	UNITED STATES ARMY CORPS OF ENGINEERS ACCIDENT INVESTIGATION REPORT <i>(For Use of this Form See Help Menu and USACE Suppl to AR 385-40)</i>			REQUIREMENT CONTROL SYMBOL: CEEC-S-8(R2)	
1. ACCIDENT CLASSIFICATION							
PERSONNEL CLASSIFICATION		INJURY/ILLNESS/FATAL		PROPERTY DAMAGE	MOTOR VEHICLE INVOLVED	DIVING	
GOVERNMENT <input type="checkbox"/> CIVILIAN <input type="checkbox"/> MILITARY		<input type="checkbox"/>		<input type="checkbox"/> FIRE INVOLVED <input type="checkbox"/> OTHER	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/> CONTRACTOR		<input type="checkbox"/>		<input type="checkbox"/> FIRE INVOLVED <input type="checkbox"/> OTHER	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/> PUBLIC		<input type="checkbox"/> FATAL <input type="checkbox"/> OTHER		X	X	X	
2. PERSONAL DATA							
a. Name (Last, First, MI)		b. AGE	c. SEX <input type="checkbox"/> MALE <input type="checkbox"/> FEMALE		d. SOCIAL SECURITY NUMBER	e. GRADE	
f. JOB SERIES/TITLE		g. DUTY STATUS AT TIME OF ACCIDENT <input type="checkbox"/> ON DUTY <input type="checkbox"/> TDY <input type="checkbox"/> OFF DUTY		h. EMPLOYMENT STATUS AT TIME OF ACCIDENT <input type="checkbox"/> ARMY ACTIVE <input type="checkbox"/> ARMY RESERVE <input type="checkbox"/> VOLUNTEER <input type="checkbox"/> PERMANENT <input type="checkbox"/> FOREIGN NATIONAL <input type="checkbox"/> SEASONAL <input type="checkbox"/> TEMPORARY <input type="checkbox"/> STUDENT <input type="checkbox"/> OTHER (Specify) _____			
3. GENERAL INFORMATION							
a. DATE OF ACCIDENT (month/day/year)	b. TIME OF ACCIDENT (Military time) hrs	c. EXACT LOCATION OF ACCIDENT			d. CONTRACTOR'S NAME		
e. CONTRACT NUMBER _____ <input type="checkbox"/> CIVIL WORKS <input type="checkbox"/> MILITARY <input type="checkbox"/> OTHER (Specify) _____	f. TYPE OF CONTRACT <input type="checkbox"/> CONSTRUCTION <input type="checkbox"/> SERVICE <input type="checkbox"/> A/E <input type="checkbox"/> DREDGE <input type="checkbox"/> OTHER (Specify) _____		g. HAZARDOUS/TOXIC WASTE ACTIVITY <input type="checkbox"/> SUPERFUND <input type="checkbox"/> DERP <input type="checkbox"/> IRP <input type="checkbox"/> OTHER (Specify) _____		(1) PRIME: (2) SUBCONTRACTOR:		
4. CONSTRUCTION ACTIVITIES ONLY (Fill in line and corresponding code number in box from list - see help menu)							
a. CONSTRUCTION ACTIVITY _____ (CODE) # <input type="text"/>			b. TYPE OF CONSTRUCTION EQUIPMENT _____ (CODE) # <input type="text"/>				
5. INJURY/ILLNESS INFORMATION (Include name on line and corresponding code number in box for items e, f & g - see help menu)							
a. SEVERITY OF ILLNESS/INJURY _____ (CODE) # <input type="text"/>		b. ESTIMATED DAYS LOST # <input type="text"/>	c. ESTIMATED DAYS HOSPITALIZED # <input type="text"/>	d. ESTIMATED DAYS RESTRICTED DUTY # <input type="text"/>			
e. BODY PART AFFECTED PRIMARY _____ (CODE) # <input type="text"/> SECONDARY _____ (CODE) # <input type="text"/>		g. TYPE AND SOURCE OF INJURY/ILLNESS TYPE _____ (CODE) # <input type="text"/> SOURCE _____ (CODE) # <input type="text"/>					
f. NATURE OF ILLNESS/INJURY _____ (CODE) # <input type="text"/>							
6. PUBLIC FATALITY (Fill in line and correspondence code number in box - see help menu)							
a. ACTIVITY AT TIME OF ACCIDENT _____ (CODE) # <input type="text"/>			b. PERSONAL FLOATATION DEVICE USED? <input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> N/A				
7. MOTOR VEHICLE ACCIDENT							
a. TYPE OF VEHICLE <input type="checkbox"/> PICKUP/VAN <input type="checkbox"/> AUTOMOBILE <input type="checkbox"/> TRUCK <input type="checkbox"/> OTHER (Specify) _____		b. TYPE OF COLLISION <input type="checkbox"/> SIDE SWIPE <input type="checkbox"/> HEAD ON <input type="checkbox"/> REAR END <input type="checkbox"/> BROADSIDE <input type="checkbox"/> ROLL OVER <input type="checkbox"/> BACKING <input type="checkbox"/> OTHER (Specify) _____		c. SEAT BELTS	USED	NOT USED	NOT AVAILABLE
				(1) FRONT SEAT			
				(2) REAR SEAT			
8. PROPERTY/MATERIAL INVOLVED							
a. NAME OF ITEM		b. OWNERSHIP		c. \$ AMOUNT OF DAMAGE			
(1) _____		_____		_____			
(2) _____		_____		_____			
(3) _____		_____		_____			
9. VESSEL/FLOATING PLANT ACCIDENT (Fill in line and correspondence code number in box from list - see help menu)							
a. TYPE OF VESSEL/FLOATING PLANT _____ (CODE) # <input type="text"/>			b. TYPE OF COLLISION/MISHAP _____ (CODE) # <input type="text"/>				
10. ACCIDENT DESCRIPTION (Use additional paper, if necessary)							

11. CAUSAL FACTOR(S) <i>(Read Instruction Before Completing)</i>					
a. (Explain YES answers in item 13)	YES	NO	a. <i>(CONTINUED)</i> CHEMICAL AND PHYSICAL AGENT FACTORS: Did exposure to chemical agents, such as dust, fumes, mists, vapors or physical agents, such as, noise, radiation, etc., contribute to accident?	YES	NO
DESIGN: Was design of facility, workplace or equipment a factor?	<input type="checkbox"/>	<input type="checkbox"/>	OFFICE FACTORS: Did office setting such as, lifting office furniture, carrying, stooping, etc., contribute to the accident?	<input type="checkbox"/>	<input type="checkbox"/>
INSPECTION/MAINTENANCE: Were inspection & maintenance procedures a factor?	<input type="checkbox"/>	<input type="checkbox"/>	SUPPORT FACTORS: Were inappropriate tools/resources provided to properly perform the activity/task?	<input type="checkbox"/>	<input type="checkbox"/>
PERSON'S PHYSICAL CONDITION: In your opinion, was the physical condition of the person a factor?	<input type="checkbox"/>	<input type="checkbox"/>	PERSONAL PROTECTIVE EQUIPMENT: Did the improper selection, use or maintenance of personal protective equipment contribute to the accident?	<input type="checkbox"/>	<input type="checkbox"/>
OPERATING PROCEDURES: Were operating procedures a factor?	<input type="checkbox"/>	<input type="checkbox"/>	DRUGS/ALCOHOL: In your opinion, was drugs or alcohol a factor to the accident?	<input type="checkbox"/>	<input type="checkbox"/>
JOB PRACTICES: Were any job safety/health practices not followed when the accident occurred?	<input type="checkbox"/>	<input type="checkbox"/>	b. WAS A WRITTEN JOB/ACTIVITY HAZARD ANALYSIS COMPLETED FOR TASK BEING PERFORMED AT TIME OF ACCIDENT? <input type="checkbox"/> YES <i>(If yes, attach a copy.)</i> <input type="checkbox"/> NO		
HUMAN FACTORS: Did any human factors such as, size or strength of person, etc., contribute to accident?	<input type="checkbox"/>	<input type="checkbox"/>			
ENVIRONMENTAL FACTORS: Did heat, cold, dust, sun, glare, etc., contribute to the accident?	<input type="checkbox"/>	<input type="checkbox"/>			
12. TRAINING					
a. WAS PERSON TRAINED TO PERFORM ACTIVITY/TASK? <input type="checkbox"/> YES <input type="checkbox"/> NO		b. TYPE OF TRAINING. <input type="checkbox"/> CLASSROOM <input type="checkbox"/> ON JOB		c. DATE OF MOST RECENT FORMAL TRAINING. (Month) (Day) (Year)	
13. FULLY EXPLAIN WHAT ALLOWED OR CAUSED THE ACCIDENT; INCLUDE DIRECT AND INDIRECT CAUSES <i>(See instruction for definition of direct and indirect causes.) (Use additional paper, if necessary)</i>					
a. DIRECT CAUSE					
b. INDIRECT CAUSE(S)					
14. ACTION(S) TAKEN, ANTICIPATED OR RECOMMENDED TO ELIMINATE CAUSE(S).					
DESCRIBE FULLY:					
15. DATES FOR ACTIONS IDENTIFIED IN BLOCK 14.					
a. BEGINNING (Month/Day/Year)			b. ANTICIPATED COMPLETION (Month/Day/Year)		
c. SIGNATURE AND TITLE OF SUPERVISOR COMPLETING REPORT CORPS _____ CONTRACTOR _____		d. DATE (Mo/Da/Yr)	e. ORGANIZATION IDENTIFIER (Div, Br, Sect)	f. OFFICE SYMBOL	
16. MANAGEMENT REVIEW <i>(1st)</i>					
a. <input type="checkbox"/> CONCUR b. <input type="checkbox"/> NON CONCUR c. COMMENTS					
SIGNATURE		TITLE		DATE	
17. MANAGEMENT REVIEW <i>(2nd - Chief Operations, Construction, Engineering, etc.)</i>					
a. <input type="checkbox"/> CONCUR b. <input type="checkbox"/> NON CONCUR c. COMMENTS					
SIGNATURE		TITLE		DATE	
18. SAFETY AND OCCUPATIONAL HEALTH OFFICE REVIEW					
a. <input type="checkbox"/> CONCUR b. <input type="checkbox"/> NON CONCUR c. ADDITIONAL ACTIONS/COMMENTS					
SIGNATURE		TITLE		DATE	
19. COMMAND APPROVAL					
COMMENTS					
COMMANDER SIGNATURE				DATE	

10.

ACCIDENT DESCRIPTION *(Continuation)*

13a.

DIRECT CAUSE *(Continuation)*

13b.

INDIRECT CAUSES *(Continuation)*

14. **ACTION(S) TAKEN, ANTICIPATED, OR RECOMMENDED TO ELIMINATE CAUSE(S)** *(Continuation)*

MONTHLY EXPOSURE REPORT (see AR 385-40 as supplemented)						<u>RCS DAEN-SO-1 (R1)</u> Report for Month of	
TO:				FROM: GSI Pacific Inc.			
CONTRACTOR EXPOSURE HOURS							
CONTRACT NUMBER		MONTHLY HRS		CONTRACT NUMBER		MONTHLY HRSG	
MILITARY PERSONNEL MAN-DAYS EXPOSURE				ARMY AIRCRAFT FLYING HOURS			
	CE	ARMY RESERVE		FIXED WING		ROTARY WING	
CIVIL	0	0		TRNG	OTHER	TRNG	OTHER
MILITARY	0	0	CIVIL	0	0	0	0
OTHER	0	0	MILITARY	0	0	0	0
TOTAL	0	0	OTHER	0	0	0	0
ACCIDENT PROPERTY DAMAGE LOSS:				MOTOR VEHICLE ACCIDENTS:			
GOVERNMENT:		CONTRACTOR:		GOVERNMENT:		CONTRACTOR:	
NUMBER OF NON-LOST TIME INJURIES: GOVERNMENT:				CONTRACTOR:			
MILITARY CONSTRUCTION				CIVIL WORKS			
CE PAX VEHICLES N/A		MILEAGE N/A	CE PAX VEHICLES N/A		MILEAGE N/A		
CE TRUCKS N/A		MILEAGE N/A	CE TRUCKS N/A		MILEAGE N/A		
REMARKS:							
TYPED NAME, TITLE & PHONE				SIGNATURE		DATE	

This Page Intentionally Left Blank



Documentation of Training

Training Course Name: _____
(General, UXO Equipment, Visitor, Special)

Presented By: _____ **Date:** _____

Topics Discussed

Work Plan/SSHP/APP: _____

UXO/OE Hazards: _____

Chemical Hazards: _____

Physical Hazards: _____

Emergency Procedures: _____

Other: _____

Attendees

Printed Name

Signature

Date

_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Trainer: _____ **Date:** _____

This Page Intentionally Left Blank



Weekly Safety Inspection Log

DATE:	TIME:	LOG NO.:	
CONTRACT NO.:	TASK ORDER NO.:		
SITE NAME AND LOCATION:			
WEATHER CONDITIONS: _____			

I. AREAS INSPECTED: (List by grid number, Team or task) _____			

II. INSPECTION RESULTS			
Item Description	Pass	Item Description	Pass
1. Personal Protection (PPE) per SSHP	Y / N	9. UXO/OE Detection Equipment	Y / N
2. Work Practices Follow SSHP/WP	Y / N	10. UXO/OE Detection Equipment Calibration	Y / N
3. Site Control/Decon per SSHP	Y / N	11. MSDSs and Container Labeling per SSHP	Y / N
4. First Aid Kit(s)/Eyewash Station(s)	Y / N	12. On- and Off-Site Communications	Y / N
5. Fire Extinguisher(s)	Y / N	13. Site House Keeping	Y / N
6. Flammable Storage Areas	Y / N	14. Explosives / Ordnance Storage Areas	Y / N
7. Safety and Health Monitoring Equipment Use	Y / N	15. Other: (list)	Y / N
8. Monitoring Equipment Calibration	Y / N	16. Other: (list)	Y / N
III. SUMMARY OF DEFICIENCIES NOTED: (If Required) _____			

IV. REINSPECTION RESULTS: (If required) _____			

VI. SIGNATURES:		I acknowledge that I have been briefed on the results of this inspection and will take corrective actions (if necessary)	
_____		_____	
UXOSO/Site Safety and Health Officer		Sr. UXO Supervisor / Project Manager	

Note: Safety Inspections are to be conducted each day and documented on this form. This form will also be used to document the Weekly Safety Audit conducted at the end of each workweek. The weekly audit will not only indicate the present status of the site/site operations, but will also be used to note the current status of deficiencies noted during daily inspections.

This Page Intentionally Left Blank



Site Visitor's Log

PRINT NAME	SIGNATURE	AGENCY	PURPOSE OF VISIT	PHONE #	DATE/TIME ARRIVED	DATE/TIME DEPARTED

This Page Intentionally Left Blank

Operator's Equipment Inspection Report (turn in at the completion of each day of Equipment Op)

Date: _____

Location: _____

Vehicle: _____

Hourmeter Beginning of Shift: _____ Hourmeter End of Shift: _____ Next Maintenance: _____

G = Good NA = Not Applicable NM = Needs Maintenance

ITEMS OF INSPECTION:	G	NA	NM	ITEMS OF INSPECTION:	G	NA	NM				
ENGINE				SAFETY CHECKS							
Oil Level				Warning Devices, Back-up Alarm							
Coolant				Operating Brakes							
Coolant Hoses				Parking Brake							
Fuel Water Separator				Steering							
Dust Unloader Valve				Lights							
Air Filter Indicator				Fire Extinguisher							
Air Filter Check				Seat Belt							
Batteries				Mirrors							
Belts				Quick Coupler/Locking Mechanism							
Fuel Level				Steps and Platforms							
TRANSMISSION, CONVERTER				Safety Decals							
Oil Level				Air Horn							
HYDRAULICS				Radiator							
Oil Level				Boom/Articulation Joint Lock							
Hoses											
Leaks											
GEAR BOXES, FINAL DRIVE, DIFFERENTIAL											
Pedal Operation											
Leaks											
MISCELLANEOUS											
Daily Greasing Complete											
Bucket, Blade, Linkage											
Tires (pressure), Wheels											
Operators Compartment Clean											
AHA											
Operators Manual											
Bolts / Pins											
Fire Extinguisher											
Spill Kit											
				<u>REPORT "NM" CHECKED SAFETY ITEMS IMMEDIATELY!!</u>							
				<p>*Perform a post operational inspection for damage and/or leaks</p> <p>*Wipe free oil, grease, and dirt deposits after use</p> <p>*Report any deficiencies found during or after operation</p>							
				Comments: (overall condition, details on checked boxes, etc.)							
				OPERATOR		DATE		SUPERVISOR		DATE	
				I made inspection as required on listed items.				I certify that repairs checked or listed were completed.			

This Page Intentionally Left Blank

Excavation/Trench Inspection Form

Date	Job No	Location	Competent Person	Gas Monitor Ser No
------	--------	----------	------------------	--------------------

Inspect excavations throughout the work period. If conditions change, complete a new inspection form.

Time:	<input type="checkbox"/> a.m.	<input type="checkbox"/> p.m.	Weather:
Time:	<input type="checkbox"/> a.m.	<input type="checkbox"/> p.m.	Weather:
Time:	<input type="checkbox"/> a.m.	<input type="checkbox"/> p.m.	Weather:
Time:	<input type="checkbox"/> a.m.	<input type="checkbox"/> p.m.	Weather:

Locates Date: _____ Confirmation No: _____ Locates Visible Y N

Jobsite Hazards

Work Practices

<input type="checkbox"/> Vehicle Traffic	<input type="checkbox"/> Mobile Equipment	Traffic Control:	<input type="checkbox"/> Signs	<input type="checkbox"/> Cones	<input type="checkbox"/> Barricades
<input type="checkbox"/> Overhead Obstructions	<input type="checkbox"/> Underground Installations	Ladders:	<input type="checkbox"/> Within 25'	<input type="checkbox"/> Extends 3'	<input type="checkbox"/> Accumulation
<input type="checkbox"/> Falling Loads	<input type="checkbox"/> Hazardous Atmosphere	Dewatering:	<input type="checkbox"/> CP monitors	<input type="checkbox"/> Proper Operations	<input type="checkbox"/> Supplied Air
<input type="checkbox"/> Adjacent Structures	<input type="checkbox"/> Surface Encumbrances	Atmosphere:	<input type="checkbox"/> Ventilation	<input type="checkbox"/> Monitoring	<input type="checkbox"/> Other
		Equipment:	<input type="checkbox"/> > 2' from edge	<input type="checkbox"/> Warning device	

Soil Stability

<input type="checkbox"/> Previously distributed by underground structures or utilities	<input type="checkbox"/> Soil subject to thawing conditions?
<input type="checkbox"/> Soil subject to vibration from adjacent area or from equipment used in the excavation?	<input type="checkbox"/> Soil subject to surcharge from spoils, materials, or equipment?

Visual Test

<input type="checkbox"/> Y <input type="checkbox"/> N Soil spill from excavator bucket in cohesive clumps or granular stream?	<input type="checkbox"/> Y <input type="checkbox"/> N Particle sizes of predominate soils are fine grained, coarse grained, or gravel?
<input type="checkbox"/> Y <input type="checkbox"/> N Soil exist in layered system Layers slope: _____ % Slope	<input type="checkbox"/> Y <input type="checkbox"/> N Soil is fissured?
<input type="checkbox"/> Y <input type="checkbox"/> N Presence of rock?	<input type="checkbox"/> Y <input type="checkbox"/> N Rock is stable?
<input type="checkbox"/> Y <input type="checkbox"/> N Accumulating runoff?	<input type="checkbox"/> Y <input type="checkbox"/> N High groundwater table?
<input type="checkbox"/> Y <input type="checkbox"/> N Seeping from sides?	<input type="checkbox"/> Y <input type="checkbox"/> N Submerged in surface water (creeks, etc.) ?

Manual Test

Penetrometer Readings (Minimum of five test must be completed)									
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
Average tsf:		<input type="checkbox"/> <0.5 tsf = Type C			<input type="checkbox"/> 0.5 - 1.5 tsf = Type B			<input type="checkbox"/> >1.5 tsf = Type A	

Plasticity Test

Length of 1/8" thread that can be held horizontally _____ inches < 2" = Granular < 2" = Cohesive

Thumb Penetration Test All tests should be run on: • Large clump of soil material • As soon as excavated • Later after wetting • Reclassified	TYPE C <input type="checkbox"/> Easy <input type="checkbox"/> Molded by light finger pressure	TYPE B <input type="checkbox"/> Effort	TYPE A <input type="checkbox"/> Great effort/not at all <input type="checkbox"/> Can only indent
---	--	--	---

Soil Test Classification

Personnel Protective System Chosen

Results of Testing: Soil Type <input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C	Protection Chosen: <input type="checkbox"/> Sloping <input type="checkbox"/> Shielding <input type="checkbox"/> Shoring
--	---

Trench Box Information

<input type="checkbox"/> Y <input type="checkbox"/> N Trench box drawings available	<input type="checkbox"/> Y <input type="checkbox"/> N PE stamped drawings available for special shoring
<input type="checkbox"/> Y <input type="checkbox"/> N Stack locking Pins available and used	<input type="checkbox"/> Y <input type="checkbox"/> N Spreader bar pin installed and safety pinned

Comments: _____

Note: All unsafe conditions must be corrected before trench entry. If any hazardous conditions are observed, the trench must be immediately evacuated and no one allowed to re-enter until corrective action has been taken.

Excavation Entry Authorized By: Competent Person _____

This Page Intentionally Left Blank



ATTACHMENT 2

Page 1 of 2

REPORT ALL WORKER'S COMPENSATION INJURIES TO GSI PACIFIC'S HUMAN RESOURCES DEPARTMENT

Supervisor's Employee Injury/Illness Report Form

EMPLOYEE INFORMATION			
Employee's Social Security Number:		Claim Number:	
Home Address:		Business Line Code:	
Male:	Female:	Date of Birth:	Hire Date:
Dependents:		Dependents Under 18:	Marital Status:
Occupation:		Department Name:	
State Hired:		Current Weekly Wage:	Hourly Wage:
Hours/Days Worked Per Week:		Days Per Week:	Hourly Wage:
Employment Status:		Employee Report No.:	Employee ID No.:
Salaried Continued:		Paid For Date of Injury:	Education No. of Years:
Ever Injured on the Job:		Supervisor Name & Phone:	
EMPLOYER INFORMATION			
Employer Name:			
Work Location:			
Contact Name:		Telephone Number:	
Employer SIC:		Employer Location Code:	
Employer FED ID:		Employer Code:	
Nature of Business:			
Policy Number:			
ACCIDENT INFORMATION			
Date and Time of Injury:			
Did the Accident Occur at the Work Location:		If no, where did the accident occur?	
Accident Address:			
Nature of Accident:			
Give a Full Description of the Accident: (Be as Factually Complete as Possible)			
Are Other WC Claims Involved?		Date and Time Reported to Employer:	
Person Reported To:			
WITNESS INFORMATION			
Were There Any Witnesses?			
If Yes, List Names and How to Contact Them:			



ATTACHMENT 2

INJURY INFORMATION		
Which Part of the Body Was Injured? (e.g. Head, Neck, Arm, Leg)		
What Was the Nature of the Injury? (e.g. Fracture, Sprain, Laceration)		
Part of Body Location: (e.g. Left, Right, Upper, Lower)		
Injury Description		
Source of Injury:	Is Employee Hospitalized?	
Lost Time:	If Yes, What was First Full Day Out?	
Date Last Day Worked:	Date Disability Began:	
Date Returned to Work:	Estimated Return Date:	
MEDICAL INFORMATION		
ER Treated & Released:	Hospitalized:	Phy./Clinic:
Was Employee Transported via Ambulance?		
Hospital – Name, Address, Phone Number:		
Clinic – Name, Address, Phone Number:		
ADDITIONAL COMMENTS & INFORMATION		
REPORT PREPARED BY		
Name:	Title:	
Signature:	Phone:	

ATTACHMENT 3
Vehicle Accident Report
Page 1 of 2

This report is to be initiated by the employee involved in the accident or his/her direct supervisor. Please answer all questions completely. This report must be forwarded to the appropriate health and safety representative within 24 HOURS of the accident. Attach police report.

ACCIDENT DESCRIPTION

ACCIDENT DATE: _____ TIME: _____ A.M. or P.M.
LOCATION OF ACCIDENT (CITY, STATE): _____
ACCIDENT DESCRIPTION: _____

WITNESS: _____ PHONE NUMBER: _____
ADDRESS: _____ CITY: _____ STATE & ZIP: _____
POLICE OFFICER'S NAME AND BADGE #: _____ DEPARTMENT: _____

COMPANY VEHICLE

DRIVER: _____ D.L. # _____ STATE: _____
ADDRESS: _____ CITY: _____ STATE & ZIP: _____
WORK PHONE NO.: _____ S.S. # _____ PROJECT # _____
VEHICLE NO.: _____ YR: _____ MAKE: _____ MODEL: _____ LIC. PLATE # _____
STATE: _____ VEHICLE OWNER: COMPANY LEASE/RENTED PRIVATE VEHICLE
VEHICLE TYPE: COMMERCIAL MOTOR VEHICLE NON-COMMERCIAL
IF NOT COMPANY-OWNED: OWNER _____ PHONE NO.: _____
ADDRESS: _____ CITY: _____ STATE & ZIP: _____
VEHICLE DAMAGE: _____
NO. OF VEHICLES TOWED FROM SCENE: _____ NUMBER OF INJURIES: _____ NUMBER OF FATALITIES: _____
WERE HAZARDOUS MATERIALS RELEASED? YES NO IF YES, DESCRIBE MATERIALS _____

OTHER VEHICLE

DRIVER: _____ D.L. # _____ STATE: _____
ADDRESS: _____ CITY: _____ STATE & ZIP: _____
WORK PHONE NO.: _____ S.S. # _____
OWNERS NAME (CHECK IF SAME AS DRIVER) _____
ADDRESS: _____ CITY: _____ STATE & ZIP: _____
INSURANCE COMPANY: _____ POLICY # _____
AGENT'S NAME: _____ PHONE NO.: _____
ADDRESS: _____ CITY: _____ STATE & ZIP: _____
VEHICLE YR: _____ MAKE: _____ MODEL: _____ LIC. PLATE # _____ STATE: _____
VEHICLE I.D. NO.: _____
VEHICLE DAMAGE: _____
PASSENGERS: YES NO INJURIES: YES NO (If Yes, list names and telephone numbers below)

**ATTACHMENT 3
VEHICLE ACCIDENT REPORT
Page 2 of 2**

WEATHER: Clear Cloudy Fog Rain Sleet Snow OTHER: _____

PAVEMENT: Asphalt Steel Concrete Wood Gravel/Dirt Brick/Stone

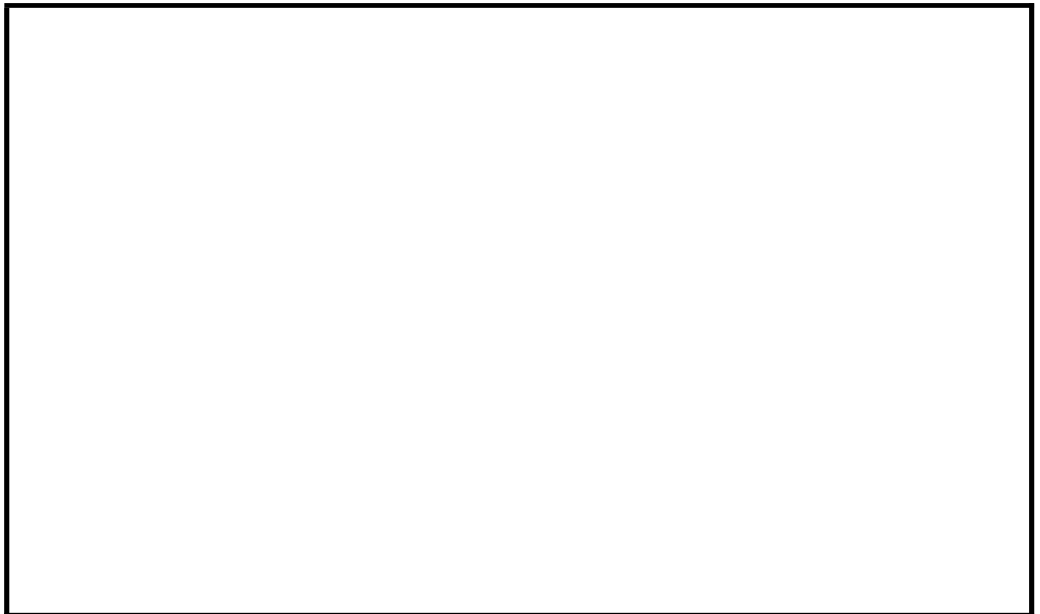
OTHER: _____

CONDITION: Dry Wet Icy Pot Holes OTHER: _____








TRAFFIC CONTROL: Traffic Light Stop Sign Railroad No Intersection No Control

ROADWAY: Number of Lanes Each Direction: _____ Residential Divided Highway Undivided Highway

Draw and name roadways showing each vehicle, direction of travel, and point of impact. Indicate travel before the accident with a solid line, and post-accident movement with a broken line.



SYMBOLS:

- Your Vehicle: 
- Other Vehicle(s):  
- Pedestrian: 
- Stop Sign: 
- Yield: 
- Railroad: 

ADDITIONAL INFORMATION: _____

Employee: _____ (Print) _____ (Signature) _____ (Date)

Supervisor: _____ (Print) _____ (Signature) _____ (Date)

Safety Rep.: _____ (Print) _____ (Signature) _____ (Date)

ATTACH POLICE REPORT TO VEHICLE ACCIDENT REPORT

**REPORT MUST BE FAXED TO: GSI
PACIFIC, INC. (FAX: 808-356-0900)
WITHIN 24 HOURS, OR NOT LATER THAN NEXT BUSINESS DAY**

ATTACHMENT 4 EQUIPMENT, PROPERTY DAMAGE AND GENERAL LIABILITY LOSS REPORT

This report is to be completed for all losses or damage to company property in excess of 1,000.00 and all third party damage, regardless of value, resulting from company activities.

PROJECT/LOCATION: _____ PROJECT # _____ DATE: _____

ADDRESS: _____

HOW DID DAMAGE OR LOSS OCCUR: _____

DESCRIPTION AND VALUE (\$) OF DAMAGED/LOST/STOLEN PROPERTY: _____

LOCATION OF DAMAGED/LOST/STOLEN PROPERTY (Before Loss): _____

DATE AND TIME OF DAMAGE, LOSS, OR THEFT: DATE: _____ TIME: _____ AM PM

OWNER OF DAMAGED/LOST/STOLEN PROPERTY:

Name: _____ Phone # _____

Address: _____ City/State: _____

Employer and Address: _____

INJURED PARTIES (Also Complete a Supervisor's Employee Injury Report if a Company Employee):

Name: _____ Phone # _____

Address: _____ City/State: _____

Employer and Address: _____ Address: _____

Description of Injury: _____

Witnesses:

1. Name: _____ Home Phone # _____

Home Address: _____ City/State: _____

Employer and Address: _____

2. Name: _____ Home Phone # _____

Home Address: _____ City/State: _____

Employer and Address: _____

WERE PICTURES TAKEN? YES NO

WERE POLICE NOTIFIED? YES NO DEPT. _____ REPORT NO. _____

COMPLETED BY: _____ (Print) _____ (Signature) _____ (Date)

SUPERVISOR: _____ (Print) _____ (Signature) _____ (Date)

REPORT MUST BE FAXED TO: GSI
PACIFIC, INC. (FAX: 808-356-0900)
WITHIN 24 HOURS, OR NOT LATER THAN NEXT BUSINESS DAY
F-G-33

This Page Intentionally Left Blank

**ATTACHMENT 5
INCIDENT INVESTIGATION REPORT**

***Must Be Completed Within 72 Hours & Relevant Support Documentation
Must Be Attached/Submitted***

Investigation Date: _____ Date of Incident: _____

Employee Name: _____

Supervisor Name: _____

Project No./Name: _____

Location of Incident: _____

Incident Classification:

- | | | | | | |
|----------------|---|------------------|---|--------------------------|---|
| <u>Injury:</u> | <input type="checkbox"/> First Aid | <u>Vehicle:</u> | <input type="checkbox"/> Chargeable | <u>DOT:</u> | <input type="checkbox"/> DOT Vehicle |
| | <input type="checkbox"/> OSHA Recordable | | <input type="checkbox"/> Non-Chargeable | | <input type="checkbox"/> DOT Reportable |
| | <input type="checkbox"/> Lost Workday | | | | |
| | <input type="checkbox"/> Restricted Workday | <u>Near Miss</u> | <input type="checkbox"/> | <u>General Liability</u> | <input type="checkbox"/> |

Description (Provide facts, describe how incident occurred, provide diagram [on back] or photos)

Analysis (What unsafe acts or conditions contributed to the incident?)

Corrective Action(s) (List corrective action items, responsible person, scheduled completion date)

Witness Names (Complete Attachment 6b - Employee Witness Statement)

Investigated By:	_____	_____	_____
	Print Name	Signature	Date
Supervisor:	_____	_____	_____
	Print Name	Signature	Date

This Page Intentionally Left Blank

ATTACHMENT 6a
Injured Employee Statement
MUST BE COMPLETED WITHIN 24 HOURS OF THE INCIDENT

This form should be completed by the injured employee involved in the incident. Describe only the facts for which you have personal knowledge. If you have no knowledge of a particular question, write "no knowledge".

Company: _____

Exact Location of Incident/Accident: _____

Name of Injured Employee: _____

Date of Incident/Accident: _____ Time: _____ A.M. P.M.

Date of This Statement: _____ Time: _____ A.M. P.M.

Time Your Shift Begins: _____ A.M. P.M. Time Your Shift Ends: _____ A.M. P.M.

Name(s) of Known Witnesses: _____

Name: _____ Name: _____

Name: _____ Name: _____

Your Immediate Supervisor's Name: _____

If Not Employed by GSI Pacific, Inc., Enter the Name of Your Company and Phone Number: _____

Have You Had a Prior Injury Similar to This Injury? _____

Was It While You Were at Work? _____

What Date Did the Prior Injury Occur? _____

Stating Only Factual Information, Describe in Detail What Happened and Include Any Applicable Events Leading to the Incident/Accident.

I certify that, to the best of my knowledge, all of the above information is complete, accurate and factual. I acknowledge that the intentional falsification or altering of facts or making misleading statements may be grounds for disciplinary action.

(Signature/Date)

(Print Name)

This Page Intentionally Left Blank

**ATTACHMENT 6b
Employee Witness Statement
*MUST BE COMPLETED WITHIN 24 HOURS OF THE INCIDENT***

This form should be completed by every employee working in the crew of the injured employee and by every other employee with knowledge of events or circumstances involved in the incident. This information is being solicited from you so that the company can accurately assess the reported incident to avoid similar occurrences in the future. Describe only the facts for which you have personal knowledge. If you have no knowledge of the incident, write "no knowledge".

Company: _____

Exact Location of Incident/Accident: _____

Name of Injured Employee: _____

Date of Incident/Accident: _____

Date of This Statement: _____

Time Your Shift Begins: _____

Witness Information:

Name: _____

Home Phone No.: _____

Home Address: _____ City: _____

State/Zip: _____ Witness Supervisor's Name: _____

If not employed by GSI Pacific, Inc., enter the name of your company: _____

Company Phone Number: _____

Did you see the Incident/Accident? _____

How far from you (approx., in feet) did the Incident/Accident occur? _____

Stating only factual information, describe in detail what happened and include any applicable events leading to the Incident/Accident.

I certify that, to the best of my knowledge, all of the above information is complete, accurate and factual. I acknowledge that the intentional falsification or altering of facts or making misleading statements may be grounds for disciplinary action.

(Witness Signature/Date)

(Print Name)

This Page Intentionally Left Blank

**ATTACHMENT 7
ACCIDENT REVIEW BOARD REPORT**

DATE: _____	LOCATION: _____
BOARD MEMBERS: _____	
ACCIDENT DATE: _____	EMPLOYEE(S) INVOLVED IN INCIDENT: _____
INVESTIGATION COMPLETE: _____	ACCIDENT CLASSIFICATION: _____
THE FOLLOWING INFORMATION MUST BE PROVIDED BY THE REVIEW BOARD FOR THIS INCIDENT (PRINT): SUPERVISOR: _____ PROJECT/LOCATION MGR: _____	
POTENTIAL CAUSE OF ACCIDENT: _____ _____ _____ _____ _____ _____ _____	
ACTION BY BOARD*: _____ _____ _____ _____ _____ _____ _____	
*All actions by the Accident Review Board are subject to final review by the Human Resources and Legal Departments.	
ACCEPTED:	
_____ (Employee Signature)	_____ (Supervisor Signature)
APPROVED: _____ (Project/Location Manager)	REJECTED FOR: _____ _____
APPROVED: _____ (Business Line Health and Safety Manager or Designee)	REJECTED FOR: _____ _____
APPROVED: _____ (Business Line Vice President)	REJECTED FOR: _____ _____

This Page Intentionally Left Blank

**ATTACHMENT 9A
MEDICAL FORMS**

Last Review Date

February 2011

AUTHORIZATION FOR TREATMENT OF OCCUPATIONAL INJURY/ILLNESS

Employee Name: _____
Social Security #: _____
Job Title: _____
Project/Location: _____
Telephone #: _____
H&S Representative: _____
Body Part(s) Injured: _____
Describe in detail how incident occurred: _____

Injury: Illness:
Incident Date: _____
Location of Accident/Exposure: _____

TO TREATING PHYSICIAN:

In the case of occupational injury/illness, please examine the employee and render necessary conservative treatment directly related to the occupational injury/illness.

Light Duty Work:

It is the policy of our company to provide work assignments, whenever possible, for employees with physical activity restrictions resulting from an occupational injury/illness. If the employee will be subject to a restriction, please contact **GSI Pacific** before releasing the employee, so that a light duty assignment may be arranged.

Medically Unfit to Return to Work:

It is the policy of our company to assist employees unable to return to work, due to an injury/illness, in obtaining needed medical care and other available benefits. Medical findings are also used to help evaluate unsafe conditions that may have led to the incident. Please help us assist our employees by contacting **GSI Pacific** with your findings as soon as possible, preferably before the employee leaves your office, but not later than the close of business on the day of initial treatment.

GSI Pacific: Telephone: (808) 834-4631 Fax: (808) 356-0900

Please Send Reports To: **GSI Pacific, Inc.**
181 South Kukui Street
Honolulu, Hawaii 96813

Please Send Bills To: **GSI Pacific, Inc.**
181 South Kukui Street
Honolulu, Hawaii 96813

DOCTOR, Please provide:

Medical Diagnosis: _____
Treatment Provided: _____

Recommended Work Limitation/Restriction: _____
Return Visit Needed: No Yes Date if Yes: _____ First Aid Only
Physician Name: _____ Physician Telephone: _____
Physician Signature: _____ Date: _____

**YOU MUST CALL HUMAN RESOURCES FOR ALL OCCUPATIONAL INJURIES/ILLNESSES
REQUIRING OUTSIDE MEDICAL TREATMENT: (808) 834-4631.**

FAX COMPLETED FORM TO HUMAN RESOURCES: (808) 356-0900

Send Bills to GSI Pacific, Inc.

ATTACHMENT 9B
MEDICAL FORMS

Last Review Date

February 2011

AUTHORIZATION FOR RELEASE OF PROTECTED MEDICAL INFORMATION

Printed Name: _____ Date of Birth: _____

Address: _____

Social Security #: _____ Home Telephone: _____

Authority to Release Protected Health Information

I hereby authorize the release of medical information, identified in this authorization form, and provide such information to:

GSI Pacific, Inc.
181 South Kukui Street
Honolulu, Hawaii 96813

The Information To Be Released includes the following:

Complete health record	Discharge summary	Progress notes
History and physical exam	Consultation reports	X-ray films / images
Laboratory test results	X-ray & Image reports	Itemized bill
Diagnosis & treatment codes	Complete billing record	

Other, (specify) _____

Purpose of the Requested Disclosure of Protected Health Information

I am authorizing the release of my Protected Health Information.

Drug and/or Alcohol Abuse, and/or Psychiatric, and/or HIV/AIDS Records Release

I understand if my medical or billing record contains information in reference to, psychiatric care, sexually transmitted disease, hepatitis B or C testing, previous drug and/or alcohol abuse and/or other sensitive information, I agree to its release. **Check One:** Yes No

I understand if my medical or billing record contains information in reference to HIV/AIDS (Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome) testing and/or treatment I agree to its release. **Check One:** Yes No

Right to Revoke Authorization

Except to the extent that action has already been taken in reliance on this authorization, the authorization may be revoked at any time by submitting a written notice to **Human Resources at GSI Pacific, Inc., 650 Iwilei Road Suite 204, Honolulu, Hawaii 96817.** Unless revoked, this authorization will expire at which time completion of treatment for the injury or illness has been accomplished.

Re-disclosure

I understand the information disclosed by this authorization may be subject to re-disclosure by the recipient and no longer be protected by the Health Insurance Portability and Accountability Act of 1996.

Signature of Patient or Personal Representative Who May Request Disclosure

I understand that I do not have to sign this authorization. However, if health care services are being provided to me for the purpose of providing information to a third-party (e.g. fitness-for-work test), I understand that services may be denied if I do not authorize the release of information related to such health care services to the third-party. I can inspect or copy the protected health information to be used or disclosed.

I hereby release and discharge GSI Pacific, Inc. of any liability and the undersigned will hold GSI Pacific, Inc. harmless for complying with this Authorization.

Signature: _____ Date: _____

Description of relationship if not patient: _____

ATTACHMENT 9C
MEDICAL FORMS

Last Review Date

February 2011

RETURN-TO-WORK EXAMINATION FORM

Exam Date: ____/____/____ Employee Name: _____
Birth Date: ____/____/____ Social Security #: _____-_____-_____
Job Title: _____ Sex: Male Female

Examining Provider: Please complete this form and fax to GSI Pacific, Inc. at (808) 356-0900. Please contact GSI Pacific, Inc. at (808) 834-4631 to report status of employee post-treatment.

DIAGNOSIS: _____
TREATMENT PLAN: _____
MEDICATIONS: _____
PHYSICAL THERAPY: _____
OTHER: _____

- May return to full duty work effective ____/____/____
- May return to limited duty from ____/____/____ to ____/____/____
- Unable to return to work from ____/____/____ to ____/____/____

WORK LIMITATIONS:

- Restricted lifting/pushing/pulling: maximum weight in lbs: _____ (company limits all lifting to \leq 60 lbs).
- Work only with right/left hand. Restricted repetitive motion right/left hand.
- Sitting job only. Restricted operation of moving equipment.
- Other: _____

FOLLOW-UP PLAN:

- Release from care.
- Schedule for follow-up appointment on ____/____/____
Time: _____ AM PM
- Referral to _____
Appointment date: ____/____/____ Time: _____ AM PM

Comments: _____

Examiner's Name (*print*)

Examiner's Signature

Date

This Page Intentionally Left Blank

U.S. ARMY CORPS OF ENGINEERS, PACIFIC OCEAN DIVISION IMMEDIATE REPORT OF MISHAP For use of this form, see EM 385-1-1; the proponent agency is CEPOD-SO.		1. SAFETY AND OCCUPATIONAL HEALTH OFFICE (SOHO) USE ONLY a. DATE RECORDED (YYYYMMDD) _____ b. TIME RECORDED (0001-2400 hours) _____	
2. TO CORPS OF ENGINEERS (COE) OFFICE:		3. FROM:	
4. NAME OF PERSON REPORTING MISHAP (Last, First MI)		5. TELEPHONE NUMBER	
6. MISHAP INFORMATION (Select (X) all that apply) <input type="checkbox"/> a. INJURY. <input type="checkbox"/> b. ILLNESS. <input type="checkbox"/> c. FATALITY. <input type="checkbox"/> d. INITIAL REPORT. <input type="checkbox"/> e. FOLLOW UP REPORT. <input type="checkbox"/> f. FINAL REPORT. <input type="checkbox"/> g. CONTRACTOR. <input type="checkbox"/> h. GOVERNMENT. <input type="checkbox"/> i. PUBLIC. <input type="checkbox"/> j. PROPERTY DAMAGE. <input type="checkbox"/> k. NEAR MISS. <input type="checkbox"/> l. OTHER (explain)			
*A FOLLOW UP REPORT IS DUE WITHIN 24 HOURS OF ANY CHANGES OR ADDITIONAL INFORMATION RELATED TO THE ACCIDENT (e.g., workers duty status).			
7. CONTRACTOR / SUBCONTRACTOR		8. CONTRACT NUMBER	
9. LOCATION OF MISHAP (be specific, include project name and number).		10. MISHAP DATE (YYYYMMDD)	11. MISHAP TIME (0001-2400 hours)
12a. NAME OF PERSON INVOLVED OR INJURED (Last, First MI)	b. AGE	c. OCCUPATION	
13. WHAT WAS THE ACTIVITY BEFORE THE MISHAP OCCURRED? DESCRIBE THE ACTIVITY, AS WELL AS THE TOOLS, EQUIPMENT, OR MATERIALS THE EMPLOYEE WERE USING (e.g., excavating with a backhoe, electrical equipment installation, demolition of facility, erecting structural steel).			
14. WHAT HAPPENED? TELL HOW THE MISHAP, ILLNESS OR PROPERTY DAMAGE OCCURRED (e.g., struck by, contacted by, cut by, strained by, fell from same or different level, stung by).			
15. WHAT WAS THE INJURY, ILLNESS OR PROPERTY DAMAGE (e.g., contusion, bruise, muscle strain, fracture, respiratory, allergic reaction, skin disease, poisoning, collapsed crane boom, engine fire, damaged utilities)?			
16. IS THE INJURY, ILLNESS, OR PROPERTY DAMAGE RECORDABLE AS DEFINED IN OSHA 29 CFR PART 1904 OR ER 385-1-99? IF YES, AN ENG FORM 3394 MUST BE SUBMITTED WITHIN 10 DAYS. NOTE: AN INJURY OR ILLNESS IS RECORDABLE IF IT RESULTS IN DEATH, DAYS AWAY FROM WORK, TRANSFER TO ANOTHER JOB, RESTRICTED WORK, MEDICAL TREATMENT BEYOND FIRST AID, LOSS OF CONSCIOUSNESS OR OTHER SIGNIFICANT ILLNESS. PROPERTY DAMAGE OF \$5,000.00 OR MORE IS RECORDABLE. <input type="checkbox"/> YES <input type="checkbox"/> NO			
17. WHAT MEDICAL TREATMENT WAS REQUIRED FOR THE INJURY OR ILLNESS (e.g., first aid, sutures, prescription medication, x-rays, cast)?			
18. IF MEDICAL TREATMENT WAS GIVEN AWAY FROM THE WORK SITE, WHERE WAS IT GIVEN?			
19. WAS EMPLOYEE HOSPITALIZED OVERNIGHT AS AN IN-PATIENT? <input type="checkbox"/> YES <input type="checkbox"/> NO	20. ESTIMATED DAYS AWAY FROM WORK	21. ESTIMATED JOB TRANSFER OR RESTRICTED DAYS	22. ESTIMATED DAYS HOSPITALIZED
23. DID MISHAP RESULT IN PROPERTY DAMAGE <input type="checkbox"/> YES <input type="checkbox"/> NO	24. IF YES, ESTIMATED PROPERTY DAMAGE (if property damage is \$5,000 or greater ENG Form 3394 must be completed and submitted).		
25. **MISHAP BOARD OF INVESTIGATION REQUIRED? <input type="checkbox"/> YES <input type="checkbox"/> NO	26. IF YES, WAS IMMEDIATE NOTIFICATION TO THE DESIGNATED AUTHORITIES MADE? DISTRICT SAFETY OFFICER AND COMMANDER MUST BE NOTIFIED OF ALL SERIOUS CASES. <input type="checkbox"/> YES <input type="checkbox"/> NO		
**A BOARD OF INVESTIGATION IS REQUIRED IF THE MISHAP RESULTS IN: 1. A FATALITY 2. THREE OR MORE PEOPLE ADMITTED TO THE HOSPITAL 3. PERMANENT TOTAL OR PARTIAL DISABILITY OR 4. PROPERTY DAMAGE OF \$500,000 AND GREATER.		27. NAME (Last, First MI) AND TITLE OF INDIVIDUAL WHO WILL INVESTIGATE THE MISHAP	
29a. NAME (Last, First MI) AND TITLE OF PERSON REPORTING	b. TELEPHONE NUMBER	c. DATE (YYYYMMDD)	d. PERSON REPORTING SIGNATURE

This Page Intentionally Left Blank

Appendix G
Standard Operating Procedures

This Page Intentionally Left Blank

List of Standard Operating Procedures (SOPs) included in this appendix:

Field SOPs:

- SOP G-1, *Field Documentation*;
- SOP G-2, *Anomaly Avoidance*;
- SOP G-3, *Surveying and Mapping*;
- SOP G-4, *Vegetation Clearance*;
- SOP G-5, *Project Quality Control*;
- SOP UXO-01, *Surface and Subsurface Clearance*;
- SOP UXO-02, *Explosive Disposal Operations*;
- SOP UXO-03, *Material Potentially Presenting an Explosive Hazard Management*;
- SOP UXO-04, *Heavy Equipment and Earth Moving Machinery Operations*;
- SOP UXO-05, *Demilitarization Operations*;
- SOP UXO-06, *Batch Burner Thermal Treatment*;
- SOP UXO-07, *X-Ray Operations*; and
- SOP UXO-08, *Instrument Verification Strip and Geophysical Survey Equipment*.

This Page Intentionally Left Blank

FINAL
FIELD DOCUMENTATION
STANDARD OPERATING PROCEDURE G-1

Munitions and Explosives of Concern Remedial Action
Former Waikane Training Area
Southeastern Region Munitions Response Site
Kāneʻohe, Oʻahu, Hawaiʻi

RMIS ID: H09HI035401

Prepared by:

GSI Pacific Inc.
181 South Kukui Street, First Floor
Honolulu, HI 96813

December 2016

This Page Intentionally Left Blank

Section 1 Standard Operating Procedure Approvals

This page provides a record of the signatures and dates of personnel who have developed, reviewed, validated, and approved this Standard Operating Procedure (SOP).

Table 1-1: Contractor Approvals

Name and Signature	Role	Date
 Daniel C. Haines Quality Control Manager	Review/Approval	11/29/16
 Dan Wolf Project Manager/Subject Matter Expert	Review/Approval	11/22/16
 Brian Stepp Senior Project Manager	Review/Approval	11/28/16

Section 2 Scope and Application

This SOP describes procedures for proper field documentation, which focuses on the completion of field logbooks and field forms for documenting field activities conducted by the project team. The field logbook and field forms provide a permanent and traceable record of all field activities related to a project and will become a part of the project file.

This SOP is to be used in conjunction with Worksheet #29 (Data Management Plan) of the project Uniform Federal Policy Quality Assurance Project Plan (UFP-QAPP) and SOPs identified in Section 4.

Section 3 Materials Required

The following materials and equipment are considered minimal for the assigned tasks and additional materials or equipment may be required:

- Field logbooks;
- Field forms;
- Global Positioning System (GPS) unit;
- Camera; and
- Pens.

Section 4 Related Procedures

Related SOPs include the following:

- *Anomaly Avoidance*, SOP G-2;
- *Surveying and Mapping*, SOP G-3;
- *Vegetation Clearance*, SOP G-4;
- *Project Quality Control*, SOP G-5;
- *Surface and Subsurface Clearance*, SOP UXO-01;
- *Explosive Disposal Operations*, SOP UXO-02;
- *Material Potentially Presenting an Explosive Hazard Management*, SOP UXO-03;
- *Heavy Equipment and Earth Moving Machinery Operations*, SOP UXO-04;
- *Demilitarization Operations*, SOP UXO-05;
- *Batch Burner Thermal Treatment*, SOP UXO-06;
- *X-Ray Operations*, SOP UXO-07; and
- *Instrument Verification Strip and Geophysical Survey Equipment*, SOP UXO-08.

Section 5 Procedures

5.1 Field Logbook

The field logbook is the primary means of documenting field activities. It must be completed daily concurrent with field activities and present a thorough but concise summary of the activities conducted. The field logbook should enable the field activities to be reconstructed without relying on the field member's memory.

All data collection will be documented in a bound field logbook. Field logbooks will be assigned to individual field personnel for daily entries. Logbooks should be kept in the field member's possession or in a secure place during field work. Notes in the bound field logbooks will be made legibly, written in black or blue ink, and be as detailed and descriptive as possible so that a particular situation may be recalled without reliance on the collector's memory. No blank pages or sections of pages will be allowed. If a page is not completely filled in, a line will be drawn through the blank portion and initialed by the person keeping the log. There should be no erases or deletions from the field notes. At the end of each day, the logbook will be signed and dated.

General provisions for field logbooks include:

- Project name/location and sequential logbook number should appear on the cover;
- Contact information should be recorded inside the front cover in case the logbook is misplaced;
- Write legibly and use a black or blue ink pen for all logbook entries;
- Corrections should be made by crossing out the data with a single strike mark, which will be initialed and dated by the person making the correction. Ensure that the original entry being struck out is still readable;
- Each page of the logbook should be sequentially numbered, dated, and each day's entry signed by the field team member;
- The name and location of site should be stated at the beginning of each entry;
- The Field Team Leader or Manager should be identified;
- Names and responsibilities of all field team members using the logbook (or involved with activities for which entries are being made) should be listed;
- Weather conditions should be stated;
- Objective narratives and field observations should be written;
- Names of any site visitors, including entities that they represent;
- Any significant activity (*e.g.*, accident/incident, near-miss, site condition change);
- Times should be recorded in military time (24-hour clock);

- Note “End of Entry” after the last entry of each day and sign; and note “End of Logbook” on the last page of the logbook once completed; and
- Note late entries appropriately.

For oversight activities of consultants and subcontractors, entries should include, but not be limited to:

- Name of author, date, and time of entry;
- Name, company/agency affiliation, and responsibility of field team members;
- Oversight location and task;
- Names, titles, and arrival/departure times of any site visitors;
- Weather (*e.g.*, temperature, cloud cover, humidity, wind);
- Arrival and departure times of oversight staff;
- Progress and activities performed by contractors including operating times;
- Deviations of contractor activities with respect to project governing documents (*i.e.*, specifications);
- Contractor sampling results and disposition of contingent soil materials/stockpiles, if applicable;
- Details of any split samples collected, including location, matrix, field sample identification numbers, if applicable;
- Description of photographs taken;
- General site housekeeping and safety issues by site contractors;
- Equipment on site and duration of equipment use versus standby;
- Inventory of shipments received (or verification of items on packing slip); and
- Document inspection of disposal trucks arriving at the site (*e.g.*, visual observation of clean tankers or truck trailers).

General safety information entries should include, but not limited to:

- All safety, accidents, and/or incidents reports;
- Real-time personnel air monitoring results, if applicable, or if not documented in the Accident Prevention Plan (APP)/Site Safety and Health Plan (SSHP);
- Heat/cold stress monitoring data, if applicable;
- Level of protection for tasks;
- Reasons for upgrades or downgrades in personal protective equipment (PPE);
- Health and safety inspections, checklists (drilling safety guide), meetings/briefings;

- Equipment make, model, and serial number for monitoring instruments;
- Calibration records for monitoring instruments;
- Site safety meeting (time/topics);
- Site objectives/plan of activities;
- Chemical/physical hazards;
- Personnel attending; and
- Special personnel information (allergies, *etc.*).

If equipment are used, general entries should include, but not limited to:

- Equipment type (make and model);
- Serial number(s);
- Calibration records;
- Background readings and locations;
- Monitoring readings and locations; and
- Sampler(s) initials.

5.2 *Field Forms*

Various field data collection forms may be used to streamline the documentation of field data. Field forms may also be customized for large data collection efforts. If field data are recorded on a field form, this data entry should be documented in the daily field logbook entry. Field form data entry should be executed with the same quality standards as field logbook data entry. Entries should be neatly written in black or blue ink and corrections made with single line strike-out and initials. Original field forms should be submitted daily to the Senior UXO Supervisor (SUXOS), or designee, and be incorporated into the project file. The anticipated Remedial Action project field forms are provided as attachments to relevant SOPs and the APP/SSHP. Copies of the Training Log and General Photographic Log forms are provided in Attachment 1 of this SOP. *Note, the forms provided are the formats planned for use, but these forms may need to be altered to accommodate project specific elements during project execution.*

5.3 *GPS Documentation*

In addition to hard copy field logbooks and field forms, information will be documented electronically in handheld and survey grade Real-Time Kinematic (RTK) GPS units. The GPS accuracy and type of equipment utilized will depend on the features being collected. GPS coordinates and pertinent items photographed will as described in the Data Management Plan (Worksheet #29 of the project UFP-QAPP). Detailed GPS documentation procedures are also identified in the *Surveying and Mapping* SOP G-3.

Section 6 References

Federal Geodetic Control Committee, 1984. *Standards and Specifications for Geodetic Control Networks*.

United States Army Corps of Engineers (USACE), 2002. EM 1110-1-1004. *Geodetic and Control Surveying*.

_____, 2009. Data Item Description (DID) MMRP-09-007. *Geospatial Information and Electronic Submittals*. 19 August.

Attachment 1
General Forms

This Page Intentionally Left Blank

List of forms included in this attachment:

General Forms:

- Training Log; and
- General Photographic Log.

Note, the forms provided in the Attachment are the formats planned for use, but these forms may need to be altered to accommodate project specific elements during project execution.

This Page Intentionally Left Blank



TRAINING LOG

Project Name:		Project Number:		Location:	
Entry Number	Date Performed	Training (Brief description of training performed)	Personnel or Sign-In Roster Reference		Performed by:

This Page Intentionally Left Blank

This Page Intentionally Left Blank

FINAL
ANOMALY AVOIDANCE
STANDARD OPERATING PROCEDURE G-2

Munitions and Explosives of Concern Remedial Action
Former Waikane Training Area
Southeastern Region Munitions Response Site
Kāneʻohe, Oʻahu, Hawaiʻi

RMIS ID: H09HI035401

Prepared by:

GSI Pacific Inc.
181 South Kukui Street, First Floor
Honolulu, HI 96813

December 2016

This Page Intentionally Left Blank

Section 1 Standard Operating Procedure Approvals

This page provides a record of the signatures and dates of personnel who developed, reviewed, validated, and approved this Standard Operating Procedure (SOP).

Table 1-1: Contractor Approvals

Name and Signature	Role	Date
  Mike Coyle Corporate Health and Safety Manager	Review/Approval	11/23/16
 Daniel C. Haines Quality Control Manager	Review/Approval	11/29/16
 Brian Stepp Senior Project Manager	Review/Approval	11/28/16

Section 2 Scope and Application

The objective of this SOP is to provide guidance and general reference information for the avoidance of potential Material Potentially Presenting an Explosive Hazard (MPPEH), including munitions and explosives of concern (MEC) and discarded military munitions (DMM). “Anomaly avoidance” is the avoidance of surface MPPEH/MEC and any subsurface metallic anomalies that may be MPPEH/MEC. Anomaly avoidance techniques are used to support intrusive activities where the specific point of excavation can be moved to another anomaly free location. Anomaly avoidance techniques are implemented for activities that include, but are not limited to, site preparation, surveying, archaeological and natural resources surveys, vegetation clearance, and where the placement of stakes or fencing posts are required.

Section 3 Materials Required

The following materials and equipment are considered minimal for the assigned tasks, but additional materials or equipment may be required:

- Metal detector;
- Field logbook;
- Flagging;
- Global Positioning System (GPS) unit; and
- Camera.

Personnel Protective Clothing:

GSI Pacific Inc. (GSIP) and all personnel on site will have all necessary modified Level D personal protective equipment (PPE) as per 29 Code of Federal Regulations (CFR) Part 1910.120. The equipment listed below comprises modified Level D PPE for this project:

- Normal work clothes (long pants and shirt);
- Safety glasses;
- Leather gloves; and
- Boots (leather, ankle stability).

Section 4 Related Procedures

Related SOPs include the following:

- *Field Documentation*, SOP G-1;
- *Surveying and Mapping*, SOP G-3;
- *Vegetation Clearance*, SOP G-4;
- *Project Quality Control*, SOP G-5; and
- *Instrument Verification Strip and Geophysical Survey Equipment*, SOP UXO-08.

Section 5 Procedures

The project team shall provide all labor, materials, and equipment necessary to perform anomaly avoidance support for performance of the required site activities in accordance with (IAW) Engineer Manual (EM) 385-1-97 (United States Army Corps of Engineers [USACE], 2013). Unexploded ordnance (UXO) escort support is required and must be provided by UXO-qualified personnel under the supervision of a UXO Technician II or higher-qualified personnel per Department of Defense Explosive Safety Board (DDESB) Technical Paper (TP) 18 (DDESB, 2015).

Project personnel selected for UXO escort will be confirmed to meet these requirements prior to assignment to MEC support activities.

The UXO escort (UXO-qualified personnel) has the following responsibilities:

- Conduct explosives safety briefings for all site personnel and visitors;
- Provide MEC recognition, location, and explosives safety functions; and
- Initiate MEC reporting procedures IAW the approved work plan (*i.e.*, Uniform Federal Policy Quality Assurance Project Plan [UFP-QAPP]).

Since the purpose is anomaly avoidance, the UXO escort is not tasked, authorized, or equipped to perform anomaly investigations or MEC disposal operations. The UXO escort will not handle or move any MPPEH/MEC encountered. In the event that MEC is encountered, the UXO escort will notify the Senior UXO Supervisor (SUXOS) who will, in turn, notify the UXO Safety Officer (UXOSO), and Demolition Team.

An access survey must precede any type of activity to determine ingress/egress within an area with known or suspected MEC. The UXO escort shall locate an access route and investigation area that is free of munitions related hazards and anomalies using an appropriate geophysical detection instrument. The sweeps of investigation areas will be performed utilizing an analog “all-metals” detector (*e.g.*, Minelab Explorer), which identifies both ferrous and non-ferrous metals.

The UXO escort should be out in front of the escorted personnel at all times utilizing visual and hand held metal detector sweeps in order to avoid surface hazards and subsurface anomalies. If more than one group requires escort, then one escort for each group is required. Also, depending on the number in each group and the level of contamination expected in the area, the lead UXO escort and/or UXOSO may require more escorts and/or limit the size and quantity of groups.

The UXO-qualified personnel shall communicate visual observations to escorted personnel and avoid contact with any discovered MEC or MPPEH-related items by leading the group around them. If surface MEC are encountered, they will be marked with flagging ribbon, the GPS position will be recorded, each will be photographed with a ruler or other size reference, and the planned work will be relocated to another hazard free area. If anomalies are detected at a

proposed excavation location or too many anomalies are detected in a general area of interest, the excavation area will be moved to another anomaly free location.

If intrusive activities are required during anomaly avoidance, then a surface and additional hand held detector sweeps for anomalies will be required. During anomaly avoidance procedures, stakes/posts or digging equipment cannot penetrate deeper than the detection limits of the metal detector being utilized. The default depth selected for anomaly avoidance metal detector checks is 12 inches below the surface. When the smallest munitions item expected in the area is known, then a depth 80 percent of the tested and confirmed depth of detection may be utilized if documented and approved by the Project Geophysicist. If a new item is discovered that changes this determination, then it must be immediately adjusted to ensure safe anomaly avoidance procedures.

If excavations or holes are required to be deeper than 12 inches, then the auger, shovel, or other excavation equipment utilized will have to restrict its cut to 12 inches or less at a time, withdrawing from the excavation just long enough for the UXO escort to resweep the hole. If the hole is clear, then another 12 inches lift may be excavated and then rechecked. The process must be repeated in this manner until reaching the desired depth or bedrock, whichever is reached first. If a metallic anomaly is detected at any time during the process, then the hole must be backfilled and another anomaly free location must be selected.

AT NO TIME ARE UXO ESCORTS PERMITTED TO HANDLE OR MOVE DISCOVERED MPPEH/MEC OR INVESTIGATE OR CLEAR DETECTED SUBSURFACE ANOMALIES.

Section 6 *Quality Control*

6.1 *Operator Proficiency*

Prior to field operations, an instrument operator proficiency test will be conducted by the SUXOS, UXO Quality Control Specialist (UXOQCS), Project Geophysicist, or a designated representative to ensure and document operator proficiency. The analog instrument operator will conduct a sweep of the Instrument Verification Strip (IVS) utilizing the project specific handheld geophysical instruments and mark the locations with pin flags of the items encountered during the sweep. The UXOQCS will compare the results with the baseline record. To demonstrate proficiency, an instrument operator must demonstrate the ability of detecting all seed items in the IVS. Details on the IVS are provided in SOP UXO-08 *Instrument Verification Strip and Geophysical Survey Equipment*. When an IVS is not established, Industry Standard Objects (ISOs) or another comparable metal object will be utilized to determine equipment functionality and the ability to detect the smallest munition expected in the area.

6.2 *Daily Instrument Functionality Tests*

To verify normal instrument function, the analog instrument will be checked at the beginning of each workday following these quality control (QC) criteria: personnel test, correct project sensitivity/operation settings, noise cancelation, and IVS/detector response test. As the operator deems necessary, additional simple function checks with a metallic item may be performed throughout the day.

After checking the instrument settings to ensure the project parameters are programmed correctly (*e.g.*, sensitivity, gain, and tone), the operators will do a personnel test by checking each other for audible tone interference sources on a daily basis.

Due to a lack of numeric output, equivalent digital geophysical mapping (DGM) static/response tests are not possible with the analog instrument. Instead, the analog detector has an internal noise cancelation feature and frequency channel adjustment, which will be adjusted daily; the noise cancelation will eliminate ambient noise or interference from other detectors in the area.

The cable shake test will be modified to a coil and instrument shake test for the instrument due to the internal cable location in a fixed protected tube.

For instrument response and sensitivity, the operators will note audible instrument response over all seed items while performing the IVS test or when using a ISOs pipe nipple or comparable metal object. The results of the daily instrument check will be recorded in the Daily Operator Test Report form and the checkout of all equipment noted in the field log book.

If analog instrument function measurement performance criteria (MPCs) are not met, a root cause analysis will be performed. Identified non-conformances will result in a correction action and the results will be documented.

Additional QC metrics are described in the project UFP-QAPP Worksheets #12 and #22, 24, & 25, SOP UXO-08, and SOP G-5.

Section 7 Documentation

Anomaly avoidance activities and QC efforts will be documented. All field logbooks, field forms and electronic data will be incorporated in the project database and report. The Data Management Plan (Worksheet #29 of the project UFP-QAPP) lists the types of hard copy and electronic data generated for the project, and provides detailed procedures for electronic data (e.g., geographic information system [GIS]) documentation.

7.1 List of Forms

For anomaly avoidance operations, the following will be completed:

- Logbook; and
- Daily Operator Test Report (Attachment 1).

7.2 Logbook

Daily field activities will be documented in a Logbook. Refer to SOP G-1 *Field Documentation* for field logbook procedures.

7.3 Daily Operator Test Report

To ensure operator proficiency and that quality data is collected, an operator instrument proficiency test will be conducted on the hand-held geophysical instruments that will be used for project operations. This test will be documented using the Daily Operator Test Report form (Attachment 1). Guidance for filling out each field on the form is provided below:

- **Project Name** - Project name;
- **Location** - Project location;
- **Team** - UXO team;
- **Day of the week (select the day that the test occurred);**
- **I. Test Plot Information:**
 - **Location of Test Plot** - State the location of the Test Plot; and
 - **Total Targets Emplaced** - List the total number of target items emplaced or if an ISO pipe nipple or comparable metal object was utilized for the detector response test.
- **II. Instrument/Operator Information:**
 - **Operator** - List the full name of the operator being tested;
 - **Instrument Type/Manufacturer** - List the instrument type and manufacturer;
 - **Instrument Serial Number** - List the instrument serial number;

- **Test Plot** - Select either “Pass” or “Failed”;
- **Daily Team Leader Seed Results** - Select either “Pass”, “Failed” or “N/A”; and
- **Comments** - Add any comments as needed.
- **III. Problems Encountered/Corrective Actions Taken:**
 - Provide an explanation in space provided. Report any corrective actions required to the SUXOS and UXOQCS daily.
- **IV. Supervisor:**
 - **Name** - List the full name of the supervisor;
 - **Date** - Date test completed; and
 - **Signature** - Supervisor’s signature.

Section 8 References

DDESB, 2015. TP-18. *Minimum Qualifications for Personnel Conducting Munitions and Explosives of Concern-Related Activities*. 1 September.

USACE, 2013. EM 385-1-97. *Explosives - Safety and Health Requirements Manual*. 17 May.

_____, 2014. EM 385-1-1. *Safety and Health Requirements Manual*. 30 November.

Attachment 1
Daily Operator Test Report

This Page Intentionally Left Blank



DAILY OPERATOR TEST REPORT

Project Name: _____ **Location:** _____ **Team:** _____
 Sunday Monday Tuesday Wednesday Thursday Friday Saturday

I. Test Plot Information

Location of Test Plot: _____ Total Targets Emplaced: _____

II. Instrument/Operator Information

Operator	Instrument Type/ Manu facture	Instrument Serial Number	Test Plot	Daily Team Leader Seed Results	Comments
Team Leader			<input type="checkbox"/> Passed <input type="checkbox"/> Failed	N/A	
			<input type="checkbox"/> Passed <input type="checkbox"/> Failed	<input type="checkbox"/> Passed <input type="checkbox"/> Failed	
			<input type="checkbox"/> Passed <input type="checkbox"/> Failed	<input type="checkbox"/> Passed <input type="checkbox"/> Failed	
			<input type="checkbox"/> Passed <input type="checkbox"/> Failed	<input type="checkbox"/> Passed <input type="checkbox"/> Failed	
			<input type="checkbox"/> Passed <input type="checkbox"/> Failed	<input type="checkbox"/> Passed <input type="checkbox"/> Failed	
			<input type="checkbox"/> Passed <input type="checkbox"/> Failed	<input type="checkbox"/> Passed <input type="checkbox"/> Failed	
			<input type="checkbox"/> Passed <input type="checkbox"/> Failed	<input type="checkbox"/> Passed <input type="checkbox"/> Failed	
			<input type="checkbox"/> Passed <input type="checkbox"/> Failed	<input type="checkbox"/> Passed <input type="checkbox"/> Failed	
			<input type="checkbox"/> Passed <input type="checkbox"/> Failed	<input type="checkbox"/> Passed <input type="checkbox"/> Failed	
			<input type="checkbox"/> Passed <input type="checkbox"/> Failed	<input type="checkbox"/> Passed <input type="checkbox"/> Failed	
			<input type="checkbox"/> Passed <input type="checkbox"/> Failed	<input type="checkbox"/> Passed <input type="checkbox"/> Failed	

III. Problems Encountered / Corrective Actions Taken.

explain in space below:

IV. Supervisor

Name: _____ **Date:** _____

Signature: _____

This Page Intentionally Left Blank

FINAL
SURVEYING AND MAPPING
STANDARD OPERATING PROCEDURE G-3

Munitions and Explosives of Concern Remedial Action
Former Waikane Training Area
Southeastern Region Munitions Response Site
Kāneʻohe, Oʻahu, Hawaiʻi

RMIS ID: H09HI035401

Prepared by:

GSI Pacific Inc.
181 South Kukui Street, First Floor
Honolulu, HI 96813

December 2016

This Page Intentionally Left Blank

Section 1 *Standard Operating Procedure Approvals*

This page provides a record of the signatures and dates of personnel who developed, reviewed, validated, and approved this Standard Operating Procedure (SOP).

Table 1-1: Contractor Approvals

Name and Signature	Role	Date
 Daniel C. Haines Quality Control Manager	Review/Approval	11/29/16
 Dan Wolf Project Manager/Subject Matter Expert	Review/Approval	11/22/16
 Brian Stepp Senior Project Manager	Review/Approval	11/28/16

Section 2 Scope and Application

The purpose of this SOP is to provide technical guidance for Global Positioning System (GPS) surveying and mapping activities.

This SOP provides general guidance for data collection and reporting requirements for measuring coordinates using a GPS unit and the incorporation of surveyed data into the geographic information system (GIS) database. This SOP does not cover other methods of acquiring survey data using a total station or differential leveling. This information will be presented as a separate SOP if required.

Section 3 Materials Required

The types and amount of field equipment will vary based on project specific factors (*e.g.*, topography and vegetation limitations) and the required precision and accuracy of the data. Below are examples of typical equipment that may be utilized during GPS surveys:

- Real-Time Kinematic (RTK) GPS including:
 - Hand-carried receiver (rover);
 - Data collector;
 - Base station with antenna;
 - Radio to transmit differential correction information; and
 - Laser Robotic Total Station (RTS) for under dense canopy.
- Mapping grade GPS unit (*e.g.*, Trimble Geo-7x);
- Recreational grade GPS unit (*e.g.*, Garmin GPSMAP 64);
- Camera;
- Measuring tape;
- All-metals detector;
- Consumables including stakes, flagging, paint, *etc.*;
- Calculator; and
- Hand held radios for voice communication.

Section 4 Related Procedures

Related SOPs include the following:

- *Field Documentation*, SOP G-1;
- *Anomaly Avoidance*, SOP G-2;
- *Vegetation Clearance*, SOP G-4;
- *Project Quality Control*, SOP G-5;
- *Surface and Subsurface Clearance*, SOP UXO-01;
- *Explosive Disposal Operations*, SOP UXO-02;
- *Material Potentially Presenting an Explosive Hazard Management*, SOP UXO-03; and
- *Instrument Verification Strip and Geophysical Survey Equipment*, SOP UXO-08.

Section 5 Procedures

5.1 Geodetic Survey Control

The purpose of a geodetic survey is to provide accurate and well-documented positional information that is referenced to an appropriate survey datum. It is equally important that the calculated coordinate information be reported in a pre-established format to facilitate the timely uploading of this information into the project database for GIS mapping purposes.

An Unexploded Ordnance (UXO) Technician II or higher will escort the State of Hawaiʻi Professional Land Surveyor (PLS) during all field surveying activities. Anomaly avoidance procedures will be utilized for placement of all stakes and control points.

Primary survey control will be established utilizing GPS techniques in accordance with Engineer Manual (EM) 1110-1-1002. Survey control points will have the horizontal accuracy necessary to meet the requirements of the project at a minimum of Third Order Class I, 1:10,000 closure standard or +/- 3 centimeters at 1.96 sigma (95 percent [%] confidence level) whichever is greater. Horizontal accuracy will be verified utilizing least squares techniques or as reported by a positioning service such as the National Geodetic Survey (NGS) Online Positioning User System (OPUS). Coordinates will be provided as grid and not modified to ground coordinates. Survey control monuments shall be set using at least a No. 5 rebar at least 24 inches long. Survey control will remain in place after the completion of the survey. A minimum of three survey control points shall be established.

5.2 Survey Datum and Units

The project survey datum and units will be defined prior to the commencement of any surveying related activities. At a minimum the following information should be defined:

- Linear units;
- Angular units;
- Horizontal project datum;
- Horizontal datum realization;
- Combined scale factor (if utilizing a ground coordinate system or comingling total station measurements with GPS measurements);
- Projection;
- Vertical datum; and
- Geoid model (if utilizing GPS to establish elevations).

Survey control will be referenced to the following datum and coordinate system:

- Horizontal Datum: North American Datum of 1983 (NAD83);

- Realization: PA11 realization;
- Projection: Universal Transverse Mercator (UTM) Zone 4N;
- Vertical Datum: mean sea level (msl); and
- Geoid Model: GEOID12B.

The preferred linear units are metric. If feet are utilized the project surveyor will clearly state whether the United States (U.S.) Survey Foot or the International Foot is utilized. When reporting coordinates and measurements in feet, the U.S. Survey Foot will be utilized unless otherwise stated. Angular units should be reported in degrees minutes seconds.

5.3 RTK GPS Survey and Mapping Procedures

The RTK GPS is a dual frequency system that utilizes carrier-phase based measurements. The system is equipped with on-the-fly ambiguity resolution, which allows receivers to collect high-quality data quickly, and without complicated initialization procedures. Standard field procedures for GPS surveys vary depending on the survey objectives and the X, Y, Z positional accuracy required.

The positional quality of the GPS may be affected by any overhead obstructions (*e.g.*, overhead vegetation cover), multi-path interference sources (*e.g.*, reflection of GPS signals off of objects), or poor satellite geometry. If an area cannot be surveyed with GPS due to tree canopy, building infrastructure, or any other interference source, a laser range finder or RTS or measuring tapes may be used. If items of interest are found, the items will be spatially positioned from known locations established using a GPS unit and measured offsets. The offsets will be measured using tape measures that will be collected from two known GPS locations; preferably at 90-degree angles to the item of interest. Taped measurements will be accurate to at least 10 centimeters and will be measured horizontally in steep and sloped terrain. The spatial location of the item of interest will then be calculated using Coordinate Geometry (COGO) and uploaded to the GIS. A position dilution of precision (PDOP) of 6 or less indicates favorable satellite geometry. It should be noted that PDOP is not an indicator of positional accuracy but rather an indicator of the quality of the satellite geometry. The GPS receiver will be configured to utilize a PDOP value of 6 or less which increases the probability of quality GPS data.

5.3.1 RTK GPS Equipment

The RTK system consists of a base station with antenna and hand-carried receiver (also known as the rover), which combine to provide centimeter-level accuracy. Prior to conducting a RTK GPS survey, the GPS base station will be setup at a survey control point with known X, Y, Z coordinates. The location of the base station should ideally be higher than the surrounding terrain and free of obstructions (*e.g.*, trees, hillsides, buildings, power poles) to permit clear line-of-sight radio transmission of differential corrections between the GPS base station and rover. The GPS base station will continually transmit differential corrections during the time the GPS rover unit is acquiring field survey data, typically at a 1 Hertz (Hz) interval.

5.3.2 RTK GPS Procedures

RTK GPS units may be used to document field activities such as boundary surveys, establishing grid corners, performing geophysical surveys, and recording the locations of items recovered during the Remedial Action (RA) (*e.g.*, MEC items).

The field procedures used to collect RTK GPS data will include those outlined below:

- A RTK GPS base station shall be established at the site. The locations of the base station will be clearly marked in the field and recorded on the field logbook;
- Instrument operation shall be in accordance with manufacturer's operating instructions and operator training;
- GPS rover data will be collected based on site-specific objectives as stated in the project Uniform Federal Policy Quality Assurance Project Plan (UFP-QAPP);
- The GPS data, including the date and time of acquisition, positional, and attribute information will be digitally stored in the internal memory of the unit;
- All GPS data will be downloaded to a laptop computer on a daily basis. Field team comments and file names assigned to the data files during downloading shall be recorded in the field logbook; and
- All GPS data will be verified for accuracy and completeness and uploaded to the project database.

5.3.2.1 Stake and Flag Procedure

Grid corners will be marked with a wooden stake and flag. The wooden stake will be a minimum of 24 inches in length and will be driven into the ground with a sledgehammer at the grid corner. The site name will be written on the wooden stake. A bright orange or some other highly visible colored flag strip will be tied to the top of stake. The grid corner identification number will be written on the stake with a permanent-marking pen. Grid corners located on paved areas will be identified using marking paint. The grid number will be painted on the surface next to the concrete/asphalt pavement patch.

All ground penetrating activities will utilize anomaly avoidance procedures to ensure a safe location to drive stakes. If an anomaly precludes accurate placement, then an offset shall be used. The final boundary and grid locations will be downloaded to the field GPS units and uploaded to the project database for tracking and managing data generated during the RA activities.

5.4 Mapping/Recreational Grade GPS Survey and Mapping Procedures

A mapping grade GPS can be used for a variety of data collection activities including navigation to grids and logging features of interest (*e.g.*, munitions related items). This type of GPS survey generally requires attribute fields that are programmed in the GPS unit prior to the survey. The

attributes are designated as area features (*e.g.*, firing point boundaries and target structures), line features (*e.g.*, metal fences and roads), and point features (*e.g.*, surface metal and monitoring wells).

A recreational grade GPS can be used for a variety of site navigation needs including location of grids, roads, and features of interest. Secondary software (*e.g.*, DNR Garmin) may be used for uploading coordinates and polygon shapes for navigation purposes.

5.5 Accuracy and Precision

The specific accuracy and precision requirements will be defined within the project UFP-QAPP. The following table presents typical accuracy and precision requirements based on technology type:

Table 5-1: Typical Accuracy and Precision Requirements

Technology	Representative Mapping Purpose	Accuracy ^{1,2}
Static GPS	Geodetic survey control	0.03
RTK GPS	MEC locations, MRS and grid boundaries	0.30
Mapping Grade GPS	Munitions related features	1.0-2.0
Recreational GPS	Site navigation	4.0

Notes:

¹ Reported in meters.

² Minimum network accuracy will meet or exceed the requirements set forth in EM 1110-1-1004, typically third order, class I or 1:10,000 at 1.96 sigma (95% confidence level).

Section 6 *Quality Control*

Once survey control is established, the positional accuracy of the GPS units will be tested daily to verify the proper setup and functioning. Prior to daily field activities, the GPS will be measured at a known control point to record any positional offset. Acceptance criteria will be +/-30 centimeters from the established control point coordinates for RTK and +/-1 to 2 meters for mapping grade GPS. If the GPS unit does not accurately acquire the control point and troubleshooting methods cannot resolve the problem, the piece of equipment will be replaced by a properly functioning GPS unit. This equipment functionality tests will be documented in the Daily Operators Test Report (DOTR). Any equipment failure and resulting corrective action will also be documented in the Daily Quality Control Report (DQCR).

The results of any quality control (QC) procedures will be recorded and reviewed by the PLS, UXO Quality Control Specialist (UXOQCS) or GIS Manager. QC procedures should, at a minimum, include the following:

- Instrument batteries will be checked for sufficient charge;
- Verify that the GPS receiver is providing proper differential corrections by “checking in to” a control point each work day; and
- Periodic inspection of the field survey team and GPS data adherence to project settings and protocols (*e.g.*, local projections, datums, and accuracy requirements).

The results of above QC procedures will be recorded daily in the field logbook and appropriate field forms. Additional QC procedures are provided in the project UFP-QAPP Worksheets and SOP G-5.

Section 7 Documentation

All geodetic surveying, RTK, mapping grade, and recreational grade GPS data collection and QC efforts will be documented. All field logbooks, field forms, and electronic data will be incorporated in the project database and RA Report. The Data Management Plan located in Worksheet #29 of the project UFP-QAPP details the types of hard copy and electronic GPS data generated for the project, and details the procedures for electronic data (*e.g.*, GIS) documentation.

Section 8 References

Federal Geodetic Control Committee, 1984. *Standards and Specifications for Geodetic Control Networks*.

U.S. Army Corps of Engineers (USACE), 2002. EM 1110-1-1004. *Geodetic and Control Surveying*. 1 June.

_____, 2009. Data Item Description MMRP-09-007. *Geospatial Information and Electronic Submittals*. 19 August.

_____, 2012. EM 1110-1-1002. *Survey markers and Monumentation*. 1 March.

This Page Intentionally Left Blank

FINAL
VEGETATION CLEARANCE
STANDARD OPERATING PROCEDURE G-4

Munitions and Explosives of Concern Remedial Action
Former Waikane Training Area
Southeastern Region Munitions Response Site
Kāneʻohe, Oʻahu, Hawaiʻi

RMIS ID: H09HI035401

Prepared by:

GSI Pacific Inc.
181 South Kukui Street, First Floor
Honolulu, HI 96813

December 2016

This Page Intentionally Left Blank

Section 1 *Standard Operating Procedure Approvals*

This page provides a record of the signatures and dates of personnel who developed, reviewed, validated, and approved this Standard Operating Procedure (SOP).

Table 1-1: Contractor Approvals

Name and Signature	Role	Date
  Mike Coyle Corporate Health and Safety Manager	Review/Approval	11/23/16
 Daniel C. Haines Quality Control Manager	Review/Approval	11/29/16
 Brian Stepp Senior Project Manager	Review/Approval	11/28/16

Section 2 Scope and Application

The purpose of this SOP is to provide the minimum procedures, safety, and health requirements applicable to the vegetation clearance activities, including use of the Slashbuster brush/small tree cutting equipment. Due to the potential munitions and explosives of concern (MEC) hazards, all vegetation removal operations will utilize anomaly avoidance procedures (refer to SOP G-2) with Unexploded Ordnance (UXO) Technician II or above qualified escorts aided by the use of handheld metal detectors.

UXO Teams will remove only enough vegetation to efficiently and safely perform the MEC removal action using hand tools and/or powered machinery. Qualified botanists will survey the vegetation for presence of threatened or endangered species prior to vegetation removal. The removal of endangered species will be prohibited until alternatives and a biological consultation can be discussed with the United States Army Corps of Engineers (USACE) Ordnance and Explosives Safety Specialist (OESS) and/or USACE Project Manager.

Additional guidance will include safety regulations, manuals, relevant operational publications, and preventative/scheduled maintenance of equipment that may be leased, purchased, or otherwise employed on this site. It is required for all supervisors and designated operators to read and implement this SOP and all applicable operator's manuals in an effort to remain safe and current with all vegetation removal equipment and operations on site.

Section 3 Materials Required

3.1 Required Safety Equipment

The following lists identify special and critical tools, and equipment and supplies used during the vegetation clearance operations:

Special and Critical Tools:

- Minelab Explorer SE (or similar all metal detectors); and
- Handheld Global Positioning System (GPS).

Safety Supplies:

- Modified level D personal protective equipment (PPE) with any additional specific operating gear;
- Fire extinguisher (4-A:80-B:C);
- Spill kit;
- First aid kit;
- Bloodborne pathogen kit;
- Trauma kit;
- Emergency alert device (*e.g.*, air horn, whistle);
- Eye wash station (for immediate field use);
- Insect repellants containing 33 percent (%) N,N-diethyl-meta-toluamide (DEET) (if required);
- Sun protection;
- Two-way radio;
- Cellular phone;
- Water and/or hydrating drinks; and
- Electrolyte packets.

Tools/Equipment:

- Excavator or smaller heavy equipment with approved attachments;
- Slashbuster attachment;
- Gas powered machinery (*e.g.*, chainsaw, STIHL Brushcutter or equivalent);
- Hand tools;
- Flagging tape;

- Tool box;
- Safety cones; and
- Gas can.

Personnel Protective Clothing:

GSI Pacific Inc. (GSIP) and all personnel on site will have all necessary modified Level D PPE as per 29 Code of Federal Regulations (CFR) Part 1910.120. The equipment listed below comprises modified Level D PPE and additional safety equipment required for specific vegetation removal operations for this project:

- PPE: Modified level D (work clothes; leather work gloves; over the ankle, lace up leather work boots, American National Standards Institute [ANSI] Z87.1-1989 safety glasses);
- Hard hat with mesh face shield and attached over the ear hearing protection;
- High visibility shirt (short/long sleeve) or Class II high visibility vest (when utilizing the slash buster and/or other heavy equipment); Class III or higher vest/clothing when working around traffic hazards;
- Safety toe shoes (steel toe or composite) as required; and
- Safety chaps (required for chainsaw operators and when utilizing metal blades on handheld brush cutting equipment; also whenever a hazard of flying debris exists).

Refer to and utilize the approved Activity Hazard Analysis (AHA) in the Accident Prevention Plan (APP) for specific safety equipment and personnel requirements. When in conflict, the AHA will prevail; report all discrepancies to your supervisor and the UXO Safety Officer (UXOSO).

Section 4 Related Procedures

Related SOPs include the following:

- *Field Documentation*, SOP G-1;
- *Anomaly Avoidance*, SOP G-2;
- *Project Quality Control*, SOP G-5; and
- *Instrument Verification Strip and Geophysical Survey Equipment*, SOP UXO-08.

Section 5 *Procedures*

5.1 *Personnel and Training Requirements*

The minimum team make-up will be:

- Brush Removal Team:
 - Foreman/Supervisor;
 - Field Technician; and
 - UXO Technician II or Higher Escort/Safety Observer.
- Slashbuster Mechanized Equipment Team:
 - Foreman/Lead Operator;
 - Field Technician; and
 - UXO Technician II or Higher Escort/Safety Observer.

5.1.1 *UXO Personnel*

The required qualification for escorting the vegetation clearance operation will be at least a minimum of a UXO Technician II or higher. UXO personnel will meet the qualifications defined per Technical Paper (TP)-18. The qualified UXO Technician(s) will conduct visual surveys for surface MEC or other hazards. The UXO Technician(s) will check the area using a handheld metal detector (*e.g.*, Minelab Explorer or similar) to detect and avoid potential MEC and/or subsurface anomalies as described in SOP G-2 *Anomaly Avoidance*.

5.1.2 *Equipment Operators*

The brush removal team will consist, at a minimum, of two personnel. A machine operator and a UXO Technician II/Safety Observer. All site personnel operating equipment will be qualified through documented formal training or equivalent previous employment experience approved by the Project Manager and the UXOSO. Documentation of this training will be kept on file at the site. The operator will perform daily inspection and maintenance functions as directed by the operator's manual for each piece of equipment.

5.2 *General Safety Procedures*

The following describes the general safety procedures used during vegetation clearance operations:

- Personnel performing the activity shall receive site-specific training involving recognition of all types of MEC expected to be found on site, other anticipated site hazards, and PPE requirements for this activity;

- All personnel shall have current Occupational Safety and Health Association (OSHA) Hazardous Waste Operations and Emergency Response (HAZWOPER) training;
- All personnel shall have a current medical clearance to perform work on site;
- Personnel will observe all precautions for biological hazards;
- Personnel will observe all precautions for heat/cold stress;
- Personnel will observe all basic safety rules for MEC;
- Required PPE shall be worn at all times;
- Personnel shall refer to the manufacturer's operating/maintenance manual for specific equipment information;
- Personnel will observe all site safety precautions around flammable liquids;
- Gasoline powered equipment will NOT be fueled while running, hot, or near open flames;
- Gasoline powered equipment will be taken to a designated fueling point for refueling;
- Equipment will NOT be started within 3 meters (10 feet) of an open fuel container;
- Spill kits will be utilized for all fuel/oil operations;
- All sources of ignition shall be prohibited within 15 meters (50 feet) of operations with a potential fire hazard;
- Personnel will use caution when performing maintenance or replacing sharp objects (chains, cutting blades);
- All personnel will operate equipment within guidelines provided by the manufacturer's operating manual;
- Operator shall conduct a pre-operational safety inspection of equipment and ensure all safety guards will be in place and working properly prior. If deficiencies are noted, the Senior UXO Supervisor (SUXOS) will be informed and operations will not continue until the deficiency is resolved; and
- The UXOSO will ensure that all required safety equipment is in its proper place and in serviceable condition prior to starting grubbing operations.

5.3 *Vegetation Removal Procedures*

The vegetation clearance will be conducted by UXO Technicians to enable the MEC surface and subsurface clearance. Non-UXO-qualified field crew personnel may be utilized to supplement the minimum required UXO personnel as needed. These field crew personnel will still need to meet the requirements for training and working on site.

Only vegetation that will hamper a safe and efficient MEC removal action will be cut. The removal or disturbance of endangered species will be prohibited. If endangered vegetation is

suspected, the immediate area will not be disturbed until the biologist/ecologist subcontractor can do a field visit and consultation.

Brush crew personnel will remove the vegetation using hand tools and/or powered machinery (*e.g.*, STIHL Brushcutter or equivalent, chainsaw, Slashbuster) while practicing anomaly avoidance techniques. If MPPEH or MEC is found during vegetation clearance activities, it will be properly inspected and managed in accordance with SOP G-2 *Anomaly Avoidance*. Grasses, small scrubby brush, and trees less than 3 inches in diameter will be cut and left in place. The following describes the general procedures used during vegetation clearance operations:

- Tailgate safety brief;
- Identify location of vegetation that needs to be cut;
- The terrain will be assessed by the UXO Technician II for MEC or other hazards prior to commencement of grubbing operations;
- Use a metal detector to identify anomalies and mark clear boundaries to work in;
- Set up and mark brush removal operation refueling point, spill kit, fire extinguishers, safety and rest areas, and first aid kits;
- Establish safety zones and responsibilities and brief frequent hydration and work/rest cycles for the operation;
- Check and document required equipment checks and maintenance before use;
- Use metal detector to locate an anomaly free area to stock pile green waste as necessary;
- Use STIHL Brushcutter or equivalent to cut grasses and light brush;
- Use chain saws to cut tree limbs and heavy brush up to 3 inches in diameter and not more than 4 feet above ground;
- Chain saw operators will have an assistant pull limbs away to a cleared area;
- Operation of any equipment utilizing blades (chain saw, brush cutter) requires chaps and safety toed footwear;
- Personnel performing grubbing operations will exercise caution to avoid vegetation that has the potential to cause adverse or allergic reactions if contact is made; and alert supervisor immediately if contact is made or a reaction is occurring;
- Personnel performing operations will notify the UXOSO of any allergic reactions they may have that require immediate medical attention or prescribed medication; and
- Personnel should be aware of the possibility of dead falls and exercise extreme caution when grubbing.

5.3.1 Slashbuster Procedures

The UXO Technician II (or above) will use the handheld metal detector to designate an area that is free and clear of MEC and anomalies before commencing with heavy equipment operations.

Refer to the *Slashbuster Operator Instruction Manual* (Attachment 1) for safety and operation guidance.

The following are general operating procedures using the Slashbuster:

- After confirmation that a designated work area is free and clear of MEC and anomalies, heavy equipment operations may proceed;
- The UXO Technician will remove him/herself behind and away from the heavy equipment, making sure that no one else is within or in front of the machine;
- A safety arc will be established by the operator, with the Slashbuster in the off position. The arc will be marked with orange cones or flagging ribbon to define the hazardous area for personnel to avoid the reach of the equipment during operation;
- The UXO Technician will be staged at a minimum of 200 feet away but within operators view and be in constant radio communications;
- No one will approach the cutter wheel when the engine is running!;
- The operator/UXO Technician/Safety Observer should never be able to see the bottom of the cutting wheel while in operation, because of the possibility of throwing debris towards the operation/observation station;
- The operator will cut a little high to expose hidden fences, rocks, utilities, *etc.* then mow to the designated finish height avoiding trees greater than 3 inches in diameter. Debris is discharged from the front and right of the cutting head;
- Engaging Cutter: Select forward cutting head direction, using three position toggle switch, (forward, neutral, reverse), start cutter by pressing foot switch, (once for ON, once again for OFF);
- Always let the cutter head do the work. NEVER force the cutting action;
- Wheel Speed: The speed of the cutter wheel is adjustable on some installations via flow controls. A desirable feature when working in tight areas;
- Before approaching heavy equipment operations, the UXO Technician will radio the operator, and the operator will turn off and ground the Slashbuster;
- When the boom is grounded and machine is off, the operator will communicate and confirm the machine is off, then the UXO Technician may proceed within the operation area;
- As areas are being exposed and cleared, a UXO Technician may consider sweeping to identify any MEC and or anomalies; and
- Process shall be repeated until the area is suitable for sweep operations.

Section 6 Documentation

6.1 List of Forms

For vegetation clearance operations, the equipment operator will complete the following:

- Daily Operator Test Report;
- Team Logbook; and
- Slashbuster Inspection Checklist (Attachment 2).

6.2 Daily Operator Test Report

To ensure operator proficiency and that quality data is collected, an operator instrument proficiency test will be conducted on the handheld geophysical instruments that will be used for project operations. This test will be documented using the Daily Operator Test Report (Attachment in SOP G-2). Guidance for filling out the form is provided in Section 7 of SOP G-2 *Anomaly Avoidance*.

6.3 Team Logbook

Daily field activities will be documented in a Team Logbook. Refer to SOP G-1 *Field Documentation* for field logbook procedures.

6.4 Slashbuster Inspection Checklist

A Slashbuster Inspection Checklist (Attachment 2) will be completed and turned in daily at the end of equipment operations. Please refer to the Slashbuster operating manual for complete instructions and service details. Guidelines for filling out each field on the form are provided below:

- **Date** - Date the inspection is conducted (mm/dd/yy);
- **Location** - Location of where the Slashbuster is located for that day;
- **Model#** - Model number found on Slashbuster attachment;
- **Start Time** - Enter the start time of clearance operations;
- **Stop Time** - Enter the end time of clearance operations;
- **Next Maintenance** - Date next maintenance is scheduled per the manufacturer operating manual. Please see operator's manual;
- **Items of Inspection:**
 - For each item of inspection insert a check mark in the box to indicate:
 - “Y” for Yes;
 - “N” for No;

- “G” for Good;
- “NA” for Not Applicable; or
- “NM” for Needs Maintenance.

NOTE, PLEASE REPORT “NM” CHECKED SAFETY ITEMS IMMEDIATELY!

- Slashbuster Daily Checklist:
 - **Damages** - Check for structural, casing, tooth, hoses, *etc.*;
 - **Cracks** - Check for cracks in housing, spindle, *etc.*;
 - **Loose Parts** - Manually shake parts to see if it is loose;
 - **Worn Parts** - Inspect for damage and or sevicability;
 - **Hydraulic Lines** - Look for cuts, damages or abrasions;
 - **Nuts** - Should be installed and secured;
 - **Bolts** - Should be installed and secured;
 - **Spindle/ Shaft** - Inspect for damages and or looseness; and
 - **Bearings** - Inspect for wear and tear and looseness.
- Lubrication/Grease:
 - **Pins (Daily)** - Verify all are secured and accounted for;
 - **Bushings (Daily)** - Inspect for wear and tear and looseness; and
 - **Head Bushings (Every 8 hours)** - Inspect for wear and tear and looseness.
- Angle Grinder:
 - **Sharpen Tooth** - Sharpen teeth to original angles with an angle grinder.
- **Safety Tips** - Safety reminders;
- **Comments** - Add comments on overall condition, details on checked boxes, *etc.*;
- **Operator/Date** - The operator will print, sign, and date the line to indicate that he/she has made the inspection as required on the listed items; and
- **Supervisor/Date** - The supervisor will print, sign, and date the line to indicate that he/she has certified that repairs checked or listed were completed.

Section 7 References

29 CFR Part 1910.120. *Hazardous Waste Operations and Emergency Response*.

Army Regulation (AR), 2007. AR 200-1. *Environmental Protection and Enhancement*.

Department of the Army (DA), 2014. DA Pamphlet (PAM) 385-30. *Mishap Risk Management*.
2 December 2014.

DDESB, 2015. TP-18. *Minimum Qualifications for Personnel Conducting Munitions and
Explosives of Concern-Related Activities*. 1 September.

Slashbuster Operator's Manual(s) and Manufacture's Publications.

USACE, 2013. EM 385-1-97. *Explosives - Safety and Health Requirements Manual*. 17 May.

_____, 2014. EM 385-1-1. *Safety and Health Requirements Manual*. 30 November.

Attachment 1
Slashbuster Operator Instruction Manual

This Page Intentionally Left Blank

“SLASHBUSTER”®

Operator Instructions

**D&M Machine Division, Inc.
12 Monte Brady RD
Montesano, WA 98563
360-249-3366-Phone
360-249-1171-Fax**

Operator Instructions

Safety

- I. **Never** approach cutter wheel when the engine is running!!!!
- II. **Wheel position**: The operator should never be able to see the bottom of the cutting wheel while in operation, because of the possibility of throwing debris towards the operator station. Whenever possible, keep the cutter head parallel to the surface.
- III. **Cutting safety**: Always cut a little high to expose hidden fences, rocks, utilities, etc., then mow to finish height. Remember debris is discharged to the front and right of the cutting head. Use this to your advantage when working in congested areas. Always work away from building, fences, highways, etc. When cutting down trees, always undercut first, then use the head to place the tree where desired. Never cut trees at full extension of the boom. **Use common sense!!!**

Basic operating procedure

- I. **Engaging cutter**: Select forward cutting head direction, using three position toggle switch, (forward, neutral, reverse), start cutter by pressing foot switch, (once for one, once again for off).
- II. **The D&M Machine Division, Inc. “SLASHBUSTER”®** is a finesse machine. Always let the cutter head do the work - never force the cutting action. For best results, use the outer edge of the cutter wheel to do the cutting. The bottom teeth are for mulching debris already on the ground. Angle the head slightly and use the outer teeth to mulch standing trees. Run the cutter head unit to the contour of the ground. The head tilts to allow this action. Keep the third boom up and not in contact with the ground. Do not force the head sideways or down...let the cutter do the work.

- III. **Wheel speed**: The speed of the cutter wheel is adjustable on some installations via flow control valves. This is a desirable feature when working in tight areas.
- IV. **Material handler**: The uses of the material handler are many. You can handle what you cut to build a working mat to lower ground pressure. You can build road with it; clean ditches with it; rake with it; load and unload with it; and remove stumps with it, (always dig around and loosen first).

To prevent damage, always pick logs and materials from center and use extreme caution when swinging. Keep side torsion to a minimum. This unit is not designed to dig in rock.

If you maintain the “SLASHBUSTER”® and work it within its limits, it will give you years of reliable service.

“SLASHBUSTER”®

Maintenance

**D&M Machine Division, Inc.
12 Monte-Brady RD
Montesano, WA 98563
360-249-3366-Phone
360-249-1171-Fax**

Note:

Keep spindle bearings adjusted to zero endplay...check daily.

Note:

Keep teeth sharp as per enclosed instructions.

Note:

Grease bearing housing daily.

Daily Maintenance Program

- I. Check the “SLASHBUSTER” daily for damage, cracks, loose or worn parts, nuts and bolts. Repair, replace or tighten as necessary.
- II. Check the shaft and bearings by pushing on the cutting wheel while watching for bearing play. Adjust out all movement using the adjusting nuts and lock in place.

Lubrication

- I. Grease pins and bushings daily.
- II. Grease the head bushing every eight hours of operation. For a manual grease gun, use approximately 20 pumps, then tip the head to the inverted position and let the head turn for five minutes, thus lubricating the top bearings.

Teeth, Backings, Debris Seal

- I. To maintain full warranty, use only genuine D&M Machine Division, Inc. replacement teeth.
- II. Keep teeth sharp. We recommend sharpening every two hours, using an electric angle grinder. Dress teeth to original angles.
- III. See “S-7” tooth sharpening information provided in this manual.

Notice

Daily Maintenance

“SLASHBUSTER”®

1. Lower “SLASHBUSTER”® to the ground and turn off engine
2. Check for damage, cracks, loose or worn parts, nuts and bolts. Tighten or replace as needed. Refer to operator’s manual and warranty.
3. Check the spindle and bearings by pushing on the wheel and watching for bearing end play. Adjust out all movement using the bearing adjusting nuts.
4. Grease all pins daily using hand grease gun only.
5. Grease the “SLASHBUSTER”® bearing assembly with **Power Punch MPG15** grease. Lubricate enough to purge grease from the relief valve. Tip the “SLASHBUSTER”® to the inverted position and run for 5 minutes to lubricate the top of bearing.
6. It is the responsibility of the owner or operator to perform these maintenance functions and to operate the “SLASHBUSTER”® within its limitations. See operator’s manual.

“SLASHBUSTER”®

Safety Instructions

**D&M Machine Division, Inc.
12 Monte Brady RD
Montesano, WA 98563
360-249-3366-Phone
360-249-1171-Fax**

Safe Operation

Before Operation

1. Read the entire operator's manual before attempting to start and operate the unit.
2. Locate and read all caution labels on the excavator.

Prepare to Operate

1. Review the work area:
 - » Check for underground lines and cables.
 - » Check for hidden holes, obstacles or drop-offs.
 - » Check for steep slopes.
2. Dress safely. Wear a safety helmet; non-skid shoes; and tight fitting clothing.
3. Before starting the engine, fasten the seat belt and place all levers in the neutral position.
4. Know your equipment and its limitations.

Operate Safely

1. Never allow passengers on the "SLASHBUSTER"®. Keep bystanders away from the "SLASHBUSTER"® during operation.
2. Never operate the "SLASHBUSTER"® or any equipment while under the influence of alcohol or drugs, or while fatigued.
3. Never start the engine while standing on the ground.
4. For your safety, the excavator may be equipped with a seat belt and ROPS (roll over protective structure). Never modify structural member of the ROPS by welding, drilling, bending, grinding, or cutting; as this may weaken the structure. Replace, DO NOT REPAIR damaged components. Periodically check ROPS mounting bolts for proper torque. (See ROPS installation Instructions.)

5. To prevent tip over:

- » Keep “SLASHBUSTER”[®] low while traveling uphill.
- » Turn gradually, not quickly, while on slopes.
- » Do not drive excavator close to the edges of ditches or banks as they may collapse under the weight.

High Pressure Fluids

Escaping hydraulic fluid under pressure can have sufficient force to penetrate skin, causing serious personal injury. Before disconnecting lines, be sure to relieve all pressure. Before applying pressure to the system, be sure that all connections are tight and that lines, pipes and hoses are not damaged. Fluid escaping from a very small hole can be almost invisible. Don't use hands to search for suspected leaks; use a piece of cardboard or wood.

If injured by escaping fluid, see a doctor at once. Serious infection or reaction may result if proper medical treatment is not administered immediately.

Safe Servicing

1. Before servicing the “SLASHBUSTER”[®] locate the “SLASHBUSTER”[®] on a firm level surface; lower the head to the ground; apply the swing lock; stop the engine and remove the key.
2. Never get under the machine while it is jacked up by the blade or the boom and arm to avoid possible injury or death from machine falling. Always use safety blocks, safety supports, etc.
3. Lower hydraulic pressure by moving the control levers to all positions after stopping the engine; to avoid personal injury from escaping high pressure oil.
4. Service or check the excavator and “SLASHBUSTER”[®] after it has completely cooled off. Avoid touching the muffler and radiator until they have cooled off.

5. When you drive connecting pins in or out; guard against injury from flying pieces of metal. Use eye and/or face protection.
6. Never attempt to get on or off the machine while it is operating.
7. Keep all safety covers, shields and guards in place at all times.

Using The Excavator As A Crane

The “SLASHBUSTER”® is specifically designed. It has no safety devices for crane operation. If you use a “SLASHBUSTER”® for lifting, you must not exceed safe lifting capacity. Refer to the lift capacity charts in the specifications chapter of the excavator. Allow for the weight of the “SLASHBUSTER”®.

Explosions

- » A battery, especially when charging, will give off hydrogen and oxygen gases, which are very explosive. Keep away from sparks and open flames at all times.
- » To avoid sparks from an accidental short circuit, always disconnect the battery ground cable (-) first and always reconnect the ground cable (-) last.

“SLASHBUSTER”®



Safety Alert Symbols

**D&M Machine Division, Inc.
12 Monte Brady RD
Montesano, WA 98563
360-249-3366 Phone
360-249-1171 Fax**

Safety Alert Symbol

This is the industry “safety alert symbol”. This symbol is used to call your attention to items or operations that could be dangerous to you or other persons using this equipment. Please read these messages and follow these instructions carefully. It is essential that you read the instructions and safety regulations before you attempt to assemble or use this unit.

WARNING

To avoid possible injury or death from a machine runaway:

1. Do not start engine by shorting across starter terminals. Machine may start in gear and move if normal starting circuitry is bypassed.
2. Start engine only from operator’s seat - **NEVER** start engine while standing on ground.

WARNING

To avoid personal injury:

1. Stay clear of operating area of the “SLASHBUSTER”®.
2. Stay clear of boom pinch points.

Inspect “SLASHBUSTER”®

- Inspect your “SLASHBUSTER”® carefully each day before you start it.
- Do not start or operate the “SLASHBUSTER”® unless you are in the operator’s seat.
- When you operate the “SLASHBUSTER”®, do not let another person on the machine.
- When you get on or off the excavator, use handrails and steps.
- Start the engine only in well-ventilated areas.
- Before you move the “SLASHBUSTER”®, be sure all persons are away from the excavator.

Protect Eyes

- When you drive pins in or out, or sharpen teeth, guard against injury from flying pieces of metal or debris.
- Always wear goggles or safety glasses.

Stability

- Refer to the excavator manufacturer’s manual to determine the gradability and loading limits.

Parts

- Use only genuine “SLASHBUSTER”[®] replacement parts to maintain a safe “SLASHBUSTER”[®] and to insure the warranty is valid.
- *D&M Machine Division, Inc. is only responsible for genuine “SLASHBUSTER”[®] parts.*

Operation

- Operate “SLASHBUSTER”[®] with the excavator windows and doors closed.

Caution

Care of safety signs:

1. Keep safety signs clean and free from debris.
2. Clean safety signs with soap and water, dry with a soft cloth.
3. Replace damaged or missing safety signs with new safety signs.
4. If a new component with safety sign(s) affixed is replaced with a new part, make sure new safety sign(s) is (are) attached in the same location as the replaced component.
5. Mount new safety signs by applying on a clean, dry surface and pressing any bubbles to the outside edge.



Caution

To avoid personal injury:

1. Read and understand the operator's manual before attempting to start or operate the "SLASHBUSTER"[®].
2. Before starting engine, fasten seat belt, make sure all control levers are in neutral, and the operating area is clear of all bystanders.
3. Never allow passengers on any part of the excavator while operating.
4. Know your work area before starting operation:
 - Check underground lines and cables.
 - Check overhead clearance of power lines.
 - Check for hidden holes, obstacles or drop drop-offs.
 - Stay off slopes that are too steep for safe operation.
5. Make sure all shields are in place and securely fastened.
6. Before dismounting from excavator, lower the "SLASHBUSTER"[®]; stop the engine; remove the key; and relieve the hydraulic pressure by moving each control lever in all directions.
7. Before storing or transporting the excavator, install the swing lock pin.

WARRANTY

D&M Machine Division, Inc.
12 Monte-Brady Rd.
Montesano, WA 98563
360-249-3366-Phone
360-249-1171-Fax

D&M Machine Division, Inc. warrants to the original purchaser that each "SLASHBUSTER"® product is free from defects in material and workmanship. D&M Machine Division agrees to repair or replace under this warranty any defective product for a period of 6 months from the original date of purchase.

This warranty is not transferable and does not cover damage or liability caused by improper operation, improper maintenance or the use of accessories and/or attachments not specifically recommended by D&M Machine Division, Inc. for this product.

1. Warranty Coverage:

Within the warranty period, D&M Machine Division, Inc. will repair or replace at its option, free of charge, any part or parts of the new machine which are found by D&M Machine Division, Inc. to be defective in material and/or workmanship. (Any replaced parts must be returned to D&M Machine Division, Inc. with its transportation charge prepaid, all warranty parts will be invoiced. A credit will be issued with return of all warrantable parts.)

2. Limitation of Liability:

D&M Machine Division, Inc. shall not be liable for:

- 2.1 Any cost for repairs, alterations or replacements or expenses connected therewith made or incurred by other than D&M Machine Division, Inc.
- 2.2 Any special and consequential damages caused by defective materials, parts, or equipment except for repairing or replacement of parts as described under warranty coverage.
- 2.3 Any damages caused by the use of other than genuine D&M Machine Division, Inc. replacement parts.
- 2.4 Any loss or damage sustained or caused by the use of the machine while any of the parts were loose, broken or out of order.
- 2.5 Any damage caused if the machine is improperly operated or its successful operation is impaired by natural elements after its delivery to the customer.

3. Items Not Covered by Warranty:

- 3.1 Cutting wheel, teeth, hoses, grease fittings, packings, other normal wearing and aging parts.
- 3.2 Transportation charges or work performed in field.

The foregoing warranty is exclusive and in lieu of all other warranties whether written, oral or implied. (Including any warranty or merchantability or fitness for purpose.)

Operation of the equipment beyond its rated capacity will void all warranty terms.

This Page Intentionally Left Blank

Attachment 2
Slashbuster Inspection Checklist

This Page Intentionally Left Blank

Slashbuster Inspection Checklist (turn in at the completion of each day of Equipment Op)

Date: _____

Location: _____

Model#: _____

Start Time: _____ Stop Time: _____ Next Maintenance: _____

Y = Yes N = No G = Good NA = Not Applicable NM = Needs Maintenance

ITEMS OF INSPECTION:	Y	N	G	NA	NM	ITEMS OF INSPECTION:	Y	N	G	NA	NM
Slashbuster Daily Checklist						Lubrication / Grease					
Damages						Pins (Daily)					
Cracks						Bushings (Daily)					
Loose Parts						Head Bushings (Every 8 hours)					
						Angle Grinder					
Worn Parts						Sharpen Tooth					
Nuts						<u>REPORT "NM" CHECKED SAFETY ITEMS IMMEDIATELY!!</u>					
Bolts						*Perform a post operational inspection for damage and/or leaks					
Spindle/Shaft						*Wipe free oil, grease, and dirt deposits after use					
Bearings						*Report any deficiencies found during or after operation					
Safety Tips						Comments: (overall condition, details on checked boxes, etc.)					
<ul style="list-style-type: none"> * Keep bystanders away from the SLASHBUSTER during operations. * NEVER start the engine while standing on the ground. * Keep SLASHBUSTER low while traveling uphill. * Turn gradually, not quickly, while on slopes. * Before servicing, locate machine on a firm level surface area, lower the head to the ground, apply the swing lock, stop the engine and remove the key. * NEVER get under the machine while it is jacked up by the blade or the boom. * Always use safety blocks, safety supports, etc. * Lower hydraulic pressure by moving controllers in all positions after the engine has stopped. * Service SLASHBUSTER after it has completely cooled. * SLASHBUSTER will not be operated as a crane 											
						OPERATOR	DATE			SUPERVISOR	DATE

This Page Intentionally Left Blank

FINAL
PROJECT QUALITY CONTROL
STANDARD OPERATING PROCEDURE G-5

Munitions and Explosives of Concern Remedial Action
Former Waikane Training Area
Southeastern Region Munitions Response Site
Kāneʻohe, Oʻahu, Hawaiʻi

RMIS ID: H09HI035401

Prepared by:

GSI Pacific Inc.
181 South Kukui Street, First Floor
Honolulu, HI 96813

December 2016

This Page Intentionally Left Blank

Section 1 Standard Operating Procedure Approvals

This page provides a record of the signatures and dates of personnel who have developed, reviewed, validated, and approved this Standard Operating Procedure (SOP).

Table 1-1: Contractor Approvals

Name and Signature	Role	Date
 Daniel C. Haines Quality Control Manager	Review/Approval	11/29/16
 Dan Wolf Project Manager/Subject Matter Expert	Review/Approval	11/22/16
 Brian Stepp Senior Project Manager	Review/Approval	11/28/16

Section 2 Scope and Application

This SOP was developed for the munitions and explosives of concern (MEC) Remedial Action (RA) at the 36-acre area within the Southeastern Region Munitions Response Site (MRS), former Waikane Training Area (WTA), Kāneʻohe, Oʻahu Hawaiʻi. This SOP addresses the quality control (QC) procedures that are to be followed during the completion of the RA. This SOP summarizes the project QC program, including personnel responsibilities, field changes, field activity control, equipment standardization and maintenance, report submittals, deficiencies and noncompliance, corrective actions (CAs), audits, and associated documentation and recordkeeping.

This SOP applies to all work performed by the project team and its subcontractors and adheres to the requirements specified in industry standard guidance documents published by the Department of Defense (DoD), Department of the Army (DA), Department of Defense Explosives Safety Board (DDESB), and the United States (U.S.) Army Corps of Engineers (USACE). Specific guidance documents used to prepare this *Project Quality Control* SOP include:

- Engineer Manual (EM) 200-1-15 *Environmental Quality, Technical Guidance for Military Munitions Response Action* (USACE, 2015); and
- *Quality Considerations for Munitions Response Projects* (Interstate Technology and Regulatory Council [ITRC], 2008).

The objectives of this SOP are to describe the project specific operating requirements and to establish procedures to ensure that the quality of the work performed meets the RA objectives and conforms to the contract requirements and approved MEC Uniform Federal Policy Quality Assurance Project Plan (UFP-QAPP) which also contains specific project quality measurement performance criteria (MPC).

Specifically, this SOP:

- Identifies the project QC personnel and defines each individual's respective authority, responsibilities, and qualifications;
- Identifies the QC program approach and three phase inspection process for the definable features of work (DFWs);
- Establishes the project QC procedures, including the necessary supervision and inspections to ensure that work meets applicable specifications;
- Specifies equipment QC and maintenance procedures;
- Describes procedures for the management deficiencies, non-conformances, and CAs; and
- Defines the project QC communication, documentation, and recordkeeping procedures.

Data Quality Objectives (DQOs) are identified in Worksheet #11 of the project UFP-QAPP. Worksheet #12 provides the MPC for each DFW to ensure that the data collected satisfy the DQOs documented on Worksheet #11. Worksheet #31, 32, & 33 presents the assessments, QC member performing the inspections and acceptability criteria, as well as addresses Non-Conformance Report (NCR) and CA procedures.

Section 3 Materials Required

The following materials and equipment are considered minimal for the assigned tasks and additional materials or equipment may be required:

- Field logbooks;
- Field forms;
- Handheld analog geophysical sensor;
- EM61-MK2;
- Global Positioning System (GPS) unit;
- Laptop;
- Camera; and
- Pens.

Section 4 Related Procedures

Related SOPs include the following:

- *Field Documentation*, SOP G-1;
- *Anomaly Avoidance*, SOP G-2;
- *Surveying and Mapping*, SOP G-3;
- *Vegetation Clearance*, SOP G-4;
- *Surface and Subsurface Clearance*, SOP UXO-01;
- *Explosive Disposal Operations*, SOP UXO-02;
- *Material Potentially Presenting an Explosive Hazard Management*, SOP UXO-03;
- *Heavy Equipment and Earth Moving Machinery Operations*, SOP UXO-04;
- *Demilitarization Operations*, SOP UXO-05;
- *Batch Burner Thermal Treatment*, SOP UXO-06;
- *X-Ray Operations*, SOP UXO-07; and
- *Instrument Verification Strip and Geophysical Survey Equipment*, SOP UXO-08.

Section 5 Procedures

5.1 Safety Procedures

All MEC clearance operations will be performed under the supervision of a Senior Unexploded Ordnance (UXO) Supervisor (SUXOS) per DDESB Technical Paper (TP)-18 (DDESB, 2015). Each MEC Investigation Team will be supervised by a minimum of a UXO Technician III level Team Leader (TL). The project will be monitored by a UXO Safety Officer (UXOSO) and UXO Quality Specialist (UXOQCS) in accordance with (IAW) TP-18 (DDESB, 2015) and EM 385-1-97 (USACE, 2013) as well.

During MEC operations, GSI Pacific Inc. (GSIP) personnel will strictly adhere to the Accident Prevention Plan (APP)/Site Safety and Health Plan (SSHP) and the following general safety practices:

- SAFETY IS PARAMOUNT;
- Do not move or disturb unidentified items;
- Do not collect souvenirs;
- Do not smoke except in designated areas outside the RA site;
- Do not carry fire or spark producing devices into the site;
- All operations will utilize the “Buddy” system;
- Prohibit non-essential personnel from visiting the site without approval from the UXOSO and an UXO-qualified escort in uncleared areas;
- Operations will be conducted during daylight hours;
- Access to operating areas will be limited to only those personnel necessary to accomplish the specific operation;
- All personnel will attend the daily safety briefing (tailgate safety briefing) prior to entering the operating area;
- Anyone can stop operations for an unsafe act or situation; and
- Safety violations and/or unsafe acts will be immediately reported to the UXOSO.

5.2 Quality Control Project Personnel

5.2.1 Project Manager

The Project Manager (PM) is responsible for bringing many different functions and activities together to successfully complete the project. QC is the function that provides independent review and assessment for the PM and senior management. QC personnel openly communicate with the project management team and contribute to the overall success of the project. QC personnel work with the PM and other project personnel to ensure that this SOP is implemented,

to identify areas where the project could benefit from improvement, and to assist with the implementation of improvements.

5.2.2 Quality Control Manager

The Quality Control Manager (QCM) provides the quality management oversight and has the responsibility to ensure that this SOP is developed and implemented IAW the Performance Work Statement (PWS). The QCM is a part of the project team, but is authorized to elevate any quality problems that cannot be resolved by the project team to senior management. The QCM interacts with the Senior PM, PM, SUXOS, UXOQCS, UXOSO, and USACE Ordnance and Explosives Safety Specialist (OESS) personnel to prevent and/or correct problem situations, as necessary.

5.2.3 Unexploded Ordnance Quality Control Specialist

The UXOQCS will have documented certification or be in training to obtain certification by the American Society for Quality as a Certified Quality Auditor (CQA), Certified Manager of Quality/Organizational Excellence (CMQ/OE), or equivalent. The UXOQCS reports directly to the QCM. Although the UXOQCS is separate and independent from the PM, he/she contributes to problem identification and resolution process and must maintain close and open communication with the PM. The UXOQCS is responsible for:

- Assisting in this SOP development;
- Implementing this SOP during field activities;
- Conducting QC related training for project personnel and site visitors;
- Implementing and verifying the operator proficiency tests prior to operations;
- Implementing the three-phase control process (*i.e.*, preparatory, initial, and follow-up inspections);
- Conducting surveillance and inspections IAW this SOP and QC Program policies and procedures;
- Identifying field change requests (FCRs);
- Identifying, evaluating, and initiating NCRs and CAs;
- Issuing stop work requests when conditions warrant;
- Directly communicating with client quality assurance (QA) (*i.e.*, USACE OESS) project oversight;
- Maintaining a daily log of activities;
- Providing QC updates to the PM; and
- Verifying project related documentation generated during field operations.

All personnel will be qualified IAW DDESB TP-18 and the APP. All personnel will receive site-specific and/or refresher training in the proper use of detection and location equipment, as appropriate, and proper data collection/documentation and site-specific safety.

5.3 *Quality Control Approach*

A three-phase QC approach will be utilized for this project to ensure that the MEC RA fieldwork is conducted IAW the project UFP-QAPP and contract requirements. The first phase incorporates the initial project team training and preparatory phase inspections for each DFW. The second is the initial phase inspections completed at the start of the project and first day of each DFW. The third, follow-up phase, involves inspections performed periodically during the performance of work for each DFW. A DFW is a representative portion of work that is separate and distinct from any other stage of work and has a separate set of control requirements. The DFWs for this project include:

- Mobilization;
- Site Preparation;
- Biological and Archaeological Surveys and Monitoring;
- Vegetation Clearance;
- Instrument Verification Strip (IVS);
- Surface and Subsurface Clearance;
- Explosive Disposal Operations;
- Material Potentially Presenting an Explosive Hazard (MPPEH) Management;
- Data Management;
- Site Restoration; and
- Demobilization.

The approach utilizes the three phases of control inspections, which include preparatory, initial, and follow-up phase inspections performed by the UXOQCS and other QC field personnel. Vendors and subcontractors will be monitored to assure that they supply items and services that meet the contractor's QA/QC requirements.

5.3.1 Phase 1

Phase 1 initiates the three-phase control process by conducting the necessary training and preparatory inspections to ensure that processes are followed and opportunities for improving processes are captured and implemented.

The UXOQCS will work closely with the QCM and PM to verify all personnel are properly trained and understand the requirements stated in the PWS and project UFP-QAPP. Table 5-1 presents the project's DFWs with associated QC actions for the RA activities including the frequency of the inspection activities.

5.3.1.1 Training

All personnel will be properly trained for the activities performed during the RA. The UXOQCS will verify site personnel have the following training requirements:

- Qualification per TP-18 for the position assigned;
- 40-Hour Hazardous Waste Operations and Emergency Response (HAZWOPER) Course;
- 8-Hour HAZWOPER Annual Refresher Course;
- Occupational Safety and Health Administration (OSHA) medical clearance; and
- Site-specific training.

During site-specific training, personnel will be briefed by the UXOQCS on the importance of quality work. The training is aimed at ensuring that all site personnel understand the project team's commitment to quality. Project team members are responsible for and will be held accountable for the quality of their work. All project team members are encouraged to identify potential quality problems and to suggest solutions or CAs to ensure all work conforms to the approved project UFP-QAPP requirements. The UXOQCS will also conduct periodic quality related briefings during the morning safety meeting. These briefings will cover quality related topics such as results from surveillance, three-phase inspections, deficiencies, process improvement, and field changes (if required).

5.3.1.1.1 Operator Instrument Proficiency Test

Each operator will be trained on the selected instruments and data collection requirements for each field activity. The training will include all performance requirements for the task and the required equipment maintenance and calibrations as recommended by the manufacturer. To ensure operator proficiency and collection of quality data, an operator instrument proficiency test will be conducted on the GPS and geophysical instruments used during field operations. The tests will be documented as part of the preparatory phase inspection and included in the Daily Operator Test Report (DOTR). The MPCs include the following:

- GPS positional checks to verify equipment meets the accuracy requirements;
- Analog tests (*e.g.*, personnel noise test, noise cancelation, and instrument settings checks); and
- Detection of all seed items in IVS, or when an IVS is not established, Industry Standard Objects (ISOs) or something comparable will be utilized to determine equipment functionality.

The operator will receive either a Go/No Go assessment. If a No Go results, additional operator training may be required or equipment replaced depending on the failure root-cause analysis (RCA). The performance requirements are outlined in Worksheets #12 and #17 & 18 of the project UFP-QAPP and standard operating procedures (SOPs) (Appendix G of the project UFP-QAPP).

Table 5-1: Inspection Frequency Requirements for DFWs and Surveillance Tasks

DFW Inspections ^{1, 2}	100% ³	Daily	Weekly	Monthly
Mobilization	X			
Site Preparation			X _{4,5}	
Biological and Archaeological Surveys and Monitoring		X ₆		
Vegetation Clearance			X	
IVS			X _{4,5}	
Surface and Subsurface Clearance			X _{4,5}	
Explosive Disposal Operations	X ₅		X ₅	
MPPEH Management		X ₇	X _{1,5}	
Data Management			X _{4,5}	
Site Restoration			X ₄	
Demobilization	X			
Surveillances	100% ²	Daily	Weekly	Monthly
Project Documentation	X			
Personnel Qualifications	X ₈			
Site Specific Training	X ₈			
IVS (installation and verification)	X			
Safety and Health Plan Compliance		X ₁		
Daily Operator/Instrument Tests & Seeding			X ₉	
Heavy Equipment			X	
Management of Project Equipment/Maintenance			X	
Explosives Accountability, Storage, & Transportation				X
Communications Equipment & Effectiveness				X
Physical Security				X
Accident/Incident Reporting	X			
QC Acceptance Sampling	X			
Final Area Close-out (stakes, restoration)	X			

Notes:

¹ Will be documented on the Daily Quality Control Report (DQCR) and a QC Inspection/Surveillance Log

² Follow-up inspections without deficiencies or non-conformances may be recorded on the same QCIR for each day

³ 100 percent (%) corresponds to whenever the activity or event is performed

⁴ Inspections will only be required if the activity is performed during that week

⁵ Three-Phase inspections require Preparatory, Initial, and Follow-up Inspections

⁶ Daily QC inspections of Biological and Archaeological Surveys will be documented in the DQCR

⁷ Daily QC inspections of MPPEH procedures will be documented in the DQCR

⁸ DQCR and inspected weekly by QC in a Quality Conformance Inspection Record (QCIR)

⁹ Daily IVS and TL seed results will be recorded on the Daily Operator/Instrument Test Report form

5.3.1.2 Preparatory Phase Inspections

A preparatory phase inspection will be performed prior to beginning each DFW. The purpose of this inspection is to review applicable specifications and verify that the necessary resources, conditions, and controls are in place before starting work activities. The preparatory phase

inspections will be conducted by the UXOQCS and attended by the SUXOS, UXOSO, and appropriate team members depending on the activity. The following QC actions are performed by the UXOQCS for each preparatory phase inspection:

- Verify appropriate plans and procedures are developed, approved, and available;
- Verify the UFP-QAPP has been reviewed and understood by the project personnel;
- Verify personnel identified are available, trained, and meet the requirements and qualifications for the position;
- Verify the project equipment is available, functional, and appropriate for the job;
- Verify the preliminary work and coordination have been accomplished;
- Verify the level of quality expected is understood by project personnel; and
- Identify a process improvement program.

The specific QC activities performed during the preparatory phase inspection and results of those activities will be documented on the Preparatory Phase Inspection Report, which will be referenced in the DQCR and QC Inspection/Surveillance Log (Attachment 1). Any additional forms used during the inspections will be attached to the Preparatory Phase Inspection Report. The list of forms is provided in Worksheet #29 of the project UFP-QAPP.

5.3.2 Phase 2

Phase 2 continues the three-phase control process by conducting spot checks and initial inspections. The initial inspections are performed to verify that personnel and equipment are ready and that all the processes are followed and deficiencies are caught and corrected before work under the DFW continues. Use of proactive process QC is a preventative approach to quality issues. The UXOQCS will work closely with the field QC personnel to verify all personnel follow the MPCs for each process and to identify process improvements. Table 5-1 presents the project's DFWs with associated QC actions for the RA field activities including the frequency of the inspection activities.

5.3.2.1 Initial Phase Inspection

An initial phase inspection will be performed by the UXOQCS the first time a DFW is performed. The purpose of the inspection will be to check the preliminary work for compliance with procedures and contract specifications. Another aim is to establish the acceptable level of workmanship, check safety compliance, review the preparatory phase inspection, and check for omissions and resolve differences of plan interpretation.

The following actions will be performed during the initial phase inspection for each DFW:

- Verify that deficiencies identified during the preparatory phase have been corrected;
- Verify requirements of quality of workmanship will be established; and
- Resolve differences of interpretation in execution of the project plans.

The specific QC activities performed during the initial phase inspection and results of those activities will be documented on the Initial Phase Inspection Report, which will be referenced in the DQCR and QC Inspection/Surveillance Log (Attachment 1). Any additional forms used during the inspections will be attached to the Initial Phase Inspection Report. The list of forms is provided in Worksheet #29 of the project UFP-QAPP.

5.3.3 Phase 3

Phase 3 completes the three-phase control process by conducting follow-up inspections and continuous process improvement, utilizing the feedback mechanisms in the QC system. The follow-up inspections are performed to verify that processes are followed and opportunities for improving processes are captured and implemented through RCA and lessons learned. The UXOQCS will work closely with the field QC personnel to verify all personnel follow the MPCs for each process and to identify process improvements. Table 5-1 presents the project's DFWs with associated QC actions for the RA field activities including the frequency of the inspection activities.

5.3.3.1 Follow-up Phase Inspection

The purpose of the follow-up inspection is to verify the continuous quality of workmanship. The UXOQCS will conduct the follow-up phase inspection on a scheduled and unscheduled basis. The following inspections will be performed for each DFW:

- Inspections to ensure the required level of workmanship is maintained; and
- Inspections to ensure each project documentation is properly filled out and maintained.

The specific QC activities performed during the follow-up phase inspection and results of those activities will be documented on the Follow-up Phase Inspection Report, which will be referenced in the DQCR and QC Inspection/Surveillance Log (Attachment 1). Any additional forms used during the inspections will be attached to the Follow-up Phase Inspection Report. The list of forms is provided in Worksheet #29 of the project UFP-QAPP.

5.3.4 Surveillance

Surveillance is the process of monitoring and verifying the status of procedures, methods, conditions, products, processes, and the analysis of records in relation to requirements to confirm that the requirements for quality are met. Surveillance of fieldwork activities and processes will be performed to evaluate completion of required activities and their effectiveness. The UXOQCS will conduct surveillance activities to collect objective evidence to document and report processes observed. The UXOQCS has the latitude to modify this schedule based on the quality of work being performed and the frequency of noted activities. Table 5-1 presents the QC actions for the RA activities including the frequency of the surveillance activities. Surveillance of the task areas will be conducted using the appropriate guidance, this SOP, and the project UFP-QAPP. Surveillance activities will be documented on the DQCR and QC Inspection/Surveillance Log, and will be part of the project record.

5.3.5 Seeding

The UXOQCS will execute and monitor the QC blind seeding plan. The seed plan includes the placement, recording, and monitoring of seed items that consist of ISOs, steel pipe nipples. At a minimum, all work grids (100%) will contain a QC emplaced blind seed item buried at depths up to 24 inches. Also, 5% or more of the grids will contain additional duplicate seeds randomly placed throughout the work area. In some areas, seed items may need to be emplaced on the surface due to the rocky substrate.

QC blind seed items will be distributed throughout the entire project site at a variety of orientations, depths, and azimuths. The seed items will be designated by a unique seed item number. The seeds may be a mixture of small (1 inch by 4 inches), medium (2 inches by 8 inches), and large (4 inches by 12 inches) ISO pipe nipples with threaded ends, as encouraged by the latest Geophysical System Verification (GSV) guidance for standardization of response.

The UXOQCS will record and safe guard the GPS location and data features of all seed items on the Seeding Checklist/Log. As items are discovered by the field teams, the seed number will be reported on the grid sheets and verified by QC before QC acceptance sampling/inspection and the log will be updated accordingly. If seed items are not discovered and/or recorded on the grid sheet, then the grid and/or documentation will be failed, turned back over to the SUXOS and a RCA will be performed. In almost every circumstance, the RCA will result in CAs that include the rework of the grid. The Seeding Checklist/Log will be reconciled as soon as data is available and at least weekly. Where multiple QC blind seeds are missed by the same team, the RCA may warrant CAs that include the re-sweep of all grids from that team for that day.

TLs will also perform self-seeding on their own UXO team members with the goal of testing each operator at least once per day and one seed emplaced per grid. This program is managed at the team level and allows real time observation of the reasons why seeds are missed and promotes team development and confidence in sweep detection and coverage. At least one self-seed will be emplaced for every grid swept. This method ensures that the sweep team's coverage is tested every grid and each operator is tested once per day in addition to the QC blind seeding program.

Should a team member miss a seed, the TL will stop the team, conduct on-the-spot training and CA, and have the whole team re-sweep the entire grid. The results of the TL self-seeding will be recorded in the Daily Operator/Instrument Report. Any lessons learned and/or problems encountered will be reported to the SUXOS and the UXOQCS and shared with the other teams in the morning meeting along with any CAs.

5.3.6 Quality Control Acceptance Sampling

QC acceptance sampling will be performed by the UXOQCS on approximately 10% of all field activities. For example, after completion of all surface and subsurface investigations, the UXOQCS will check approximately 10% of the area within each grid or flagged anomalies that are surveyed utilizing the EM61-MK2. The UXOQCS will check the grids by using the same methodology utilized by the field team and will verify anomalies have been resolved to depth

and all targets above the millivolt (mV) threshold have been investigated. The results of the acceptance sampling will be compared with the following criteria:

- **Accept:** Zero metal items are found equivalent to or greater than, the size and mass of the smallest munitions of concern (SMC) (*e.g.*, 37mm Projectile M63) within the depth of detection. All targets above the mV threshold have been investigated if the EM61-MK2 is utilized; and
- **Reject:** One or more metal items equivalent to, or greater than, the size and mass of the SMC is detected within the depth of detection or targets above the mV threshold remain if EM61-MK2 was utilized.

If rejected, the grid will then be reworked and resubmitted for QC acceptance inspection. Upon a grid failure, a RCA will be performed and documented on a NCR. The team that produced the failed grid will meet with the UXOQCS to discuss the failure. Upon RCA, the team may receive refresher training and/or process through the IVS in addition to any other required CAs, as per findings of the analysis. Upon concurrence of the CAs by the UXOQCS, the entire grid will be re-swept. The UXOQCS may place additional seed(s) in the grid before re-sweep.

5.4 Equipment Calibration, Testing, and Maintenance Requirements

All tools, instruments, and equipment deployed to the project site will be properly maintained and calibrated (as necessary) IAW the instrument manufacturer specifications, standard industry practice, or SOPs. This applies to equipment used in the field for activities affecting quality, including communications equipment, vehicles/machinery, environmental monitoring equipment, and personal protective equipment (PPE). Rulers, tape measures, levels, and other such devices will not be standardized if normal commercial equipment provides adequate accuracy, but will be maintained in good working condition.

Equipment will be visually checked for damage prior to use. Preventive maintenance on equipment will be performed on a regular basis according to the manufacturer's operating instructions or recommendations. Critical spare parts will be kept on hand to minimize downtime, particularly batteries for GPS units and radios. All maintenance will be recorded in the maintenance field logbook. To ensure that equipment is fully capable and will perform IAW the manufacturer's specifications, pre-operational and post-operational checks will be performed. Following these checks, any equipment that is found unsuitable will be immediately removed from service. These checks will provide QC data indicating the proper functionality of the equipment. The UXOQCS will verify these actions and document findings on the DQCR and QC Inspection/Surveillance Log.

Every instrument operator will check the instruments daily for proper function. The operator will test the instruments on known control points or seeds in the test area. If the instrument does not function properly IAW manufacturer's criteria, the instrument operator will deliver it to the UXOQCS and request repair as well as a replacement instrument. Daily instrument checks will be documented in the team logbook and the DOTR. The UXOQCS will verify daily instrument checks during QC surveillance activity.

Worksheets #12 and #22, 24, & 25 of the project UFP-QAPP detail the MPC and field equipment calibration, maintenance, testing and inspection procedures, respectively, for the equipment used during this project. For additional geophysical instrument functionality checks, refer to SOP UXO-08 *Instrument Verification Strip and Geophysical Survey Equipment* (Appendix G of the project UFP-QAPP). For additional GPS functionality tests, refer to the SOP G-3 *Surveying and Mapping* (Appendix G of the project UFP-QAPP).

5.5 Quality Control Verification

QC verification is built into each DFW to monitor potential problems before the process goes to the next step. However, situations can arise in which requirements are not or cannot be met. Discrepancies between existing conditions and approved plans may be resolved using FCRs. In addition, CAs will be implemented for unsatisfactory and nonconforming conditions. In such cases, the person responsible for the process, instrument, or product exhibiting the non-conformance (QA/QC failure) must have the authority to stop the process and implement CAs. The UXOQCS will document the situation on a QC Inspection/Surveillance Log and communicate the issue to the PM and QCM.

5.5.1 Field Change Requests

A FCR form will be completed for initiating changes to a documented process in the approved UFP-QAPP. Any field team member assigned to perform or supervise a task that recognizes the necessity for a change is responsible for initiating the FCR process and the UXOQCS is responsible for completing and submitting the FCR for review and approval of appropriate field changes. The PM will submit all proposed FCRs to the Explosives Safety Submission (ESS) or UFP-QAPP to the USACE PM, who will request concurrence from the Project Delivery Team prior to forwarding to the Contracting Officer for approval. The USACE may ask that the FCR be reviewed by appropriate regulatory personnel if it is deemed to be a significant change to a process or overall scope of work. In addition, the UXOQCS will conduct training and briefings to all field personnel on the approved changes to these documents at the earliest opportunity. This training on changes to existing documents could occur at the daily safety meetings or in a more formal presentation.

5.5.2 Deficiencies, Non-Conformance, and Root-Cause Analysis

Deficiencies and nonconforming conditions will be managed IAW this SOP and the Quality Management Program for control of nonconforming conditions and CAs. It is the responsibility of all personnel on the project to identify deficiencies and nonconforming conditions to their supervisor or manager as soon as they are identified. Any process that does not meet project standards will be documented on a NCR that will include the results of the RCA and appropriate CAs taken. Spot inspections (not process related) will be documented on a Deficiency Notice (DN) that will include the results of the RCA and appropriate CAs taken. The DQCR will also include a report on each deficiency or nonconforming condition and the CA that was completed and closed out for the day. All deficiencies will be resolved prior to completion of the project and in the timeliest manner possible.

Deficiencies and nonconforming conditions will be considered opportunities to improve processes. The determination of the root cause of a deficiency or non-conformance is an integral part of the QC process. The depth and extent of the RCA depends on the situation. It may be as simple as an overlooked step or procedure or be a complicated process. Input will be obtained as necessary from field personnel and technical advisors in order to identify the factors, which led to the problem. RCA is the responsibility of the PM and QCM with the assistance of UXOQCS. Criteria considered in the RCA will include:

- Staff qualifications and training;
- Adequacy of procedures;
- Adequacy of equipment;
- Adequacy of QC measures; and
- Root cause.

The root cause is always “upstream” from where the problem was detected. Two strategies that should be employed for determining the root cause of a deficiency for this project are: 1) tracing the problem back to the source, and 2) evaluation of the cause using basic questions such as who, what, when, where, why, and how. Why is probably the most beneficial question when attempting to arrive at a root cause. This question may need to be asked multiple times before the cause is identified. For example “Why did A happen?” Answer: “Because of B.” “Why did B happen?” Answer: “Because of C.” This process is carried on until the real cause is identified.

5.5.3 Corrective Action

Following the RCA, the UXOQCS will perform analysis of potential solutions (*i.e.*, CAs) to determine which remedy is most effective in correcting the problem. The process will include all appropriate personnel and will be documented via meeting notes provided in the QC Inspection/Surveillance Log, NCR, Corrective Action Request (CAR) form as well as the CAR/DN/NCR Status log. Potential remedies considered may include:

- Supplemental personnel training;
- Changes of equipment or modification of equipment currently in use;
- Acquisition of supplemental equipment;
- Implementation of new procedures or modification of existing procedures;
- Rework the deficient process or a portion of the process; and
- Changes in QC procedures.

The decision for identifying and implementing appropriate CA is the responsibility of the UXOQCS, QCM, and PM. However, all parties involved prior to implementation should agree upon this decision. The UXOQCS will verify through follow-up phase surveillance that the CA implemented has corrected the deficiency or nonconforming condition and is sufficient to prevent recurrence.

If the re-inspection indicates that the non-conformance has been corrected, then the NCR will annotate verification and be closed out on the CAR/DN/NCR Status log. If the re-inspection indicates the non-conformance has *not* been corrected, the NCRs will remain open until the CA is completed as required. The NCR and CAR will be filed and a copy of the re-inspection will be forwarded to the SUXOS, PM, and the QCM. In addition, the Senior PM will monitor the effectiveness of the CA.

5.5.4 Customer Complaints

Customer complaints will be addressed immediately. The complaint may come in the form of a verbal comment, written correspondence, a CAR from the Contracting Officer, or a USACE Engineer (ENG) Quality Assurance Report (QAR) Form from the USACE OESS. The UXOQCS, QCM, and PM will be informed of the complaint and involved in the investigation to analyze the complaint and assure CA has been initiated. The CA will address not only the root cause but also the application of CAs to ensure the control's effectiveness.

The UXOQCS will utilize a NCR for documenting and investigating non-conformances issued by the USACE OESS on the ENG QAR Form. A CAR or ENG QAR Form will require a response back to the government describing the RCA and the CA taken; therefore, the UXOQCS or QCM will record and report the RCA and CAs approved by the PM. Lessons learned will be documented and communicated to project personnel and the QCM.

The action on the CAR or ENG QAR Form is not complete until the verification inspection has been performed and the CA has passed. The corrective and preventative actions have to be adequate to prevent recurrence and the customer must be satisfied with these actions. The PM, UXOQCS or QCM, and the USACE OESS will sign the CAR or NCR when both parties confirm that all CAs have been implemented and all deficiencies and non-conformances have been resolved.

5.5.5 Lessons Learned

Lessons learned will be captured, documented, and submitted in the Lessons Learned Report. The UXOQCS will attach the completed Lessons Learned Report to daily and weekly DQCRs when documented.

Section 6 Documentation

All project plans and procedures will be issued only to the required project staff identified by the PM. These plans and procedures will be tracked as project controlled documents.

Project documentation will be developed with the following requirements:

- All documents and associated revisions prescribing technical, management, and quality requirements will reference the project number and unique control number to verify implementation;
- Each technical, management, and quality document will indicate the preparer, reviewer, approver, purpose of issue, and revision status; and
- All changes to the previously issued document will be identified either within the document or in an appropriate attachment.

Documents and associated revisions will be reviewed by personnel who are:

- Responsible for implementation;
- Qualified by experience, education, or training to provide a critical review;
- Responsible for ensuring that the document does not contain information or direction that conflicts with documents of superior authority or other documents that relate to the same work or subject; and
- Participants in the original review and approval, unless designated otherwise.

6.1 Document Distribution and Retrieval

The most current revisions of documents will be internally and externally distributed to personnel identified in the procedures. These personnel are responsible for the document's implementation and its verification for implementation.

The QCM will track all changes and ensure that official notification has been received from the appropriate personnel. Additionally, the UXOQCS will conduct random surveillance of documents in the field and for field office use to validate that the most current documents are in place and being implemented.

6.2 List of Forms

For project QC, the following will be completed:

- Field Logbook;
- DQCR;
- Preparatory Phase Inspection Report;
- Initial Phase Inspection Report;

- Follow-up Inspection/Surveillance Report;
- QC Inspection/Surveillance Log;
- Seeding Checklist/Log;
- NCR;
- DN;
- CAR;
- CAR/DN/NCR Status Log;
- Lessons Learned Report;
- FCR;
- FCR Status Log;
- DOTR;
- USACE Munitions Response QA Report Form (ENG Form 6048); and
- QA Submittal.

Refer to Attachment 1 for copies of the QC forms.

6.3 *Field Logbook*

Daily field activities will be documented in a Team Logbook. Refer to SOP G-1 *Field Documentation* for field logbook procedures.

Section 7 References

DDESB, 2015. TP-18. *Minimum Qualifications for Personnel Conducting Munitions and Explosives of Concern-Related Activities*. 1 September.

ITRC, 2008. *Quality Considerations for Munitions Response Projects*. October.

USACE, 2015. EM 200-1-15. *Environmental Quality Technical Guidance for Military Munitions Response Actions*. 30 October.

Attachment 1
QC Forms

This Page Intentionally Left Blank

List of forms included in this attachment:

Quality Control Forms:

- Daily Quality Control Report;
- Preparatory Phase Inspection Report;
- Initial Phase Inspection Report;
- Follow-up Inspection/Surveillance Report;
- Quality Control Inspection/Surveillance Log;
- Seeding Checklist/Log;
- Non-Conformance Report (NCR);
- Deficiency Notice (DN);
- Corrective Action Request (CAR);
- CAR/DN/NCR Status Log;
- Lessons Learned Report;
- Field Change Request (FCR) Form;
- FCR Status Log;
- Daily Operator Test Report;
- USACE Munitions Response Quality Assurance Report Form (ENG Form 6048); and
- Quality Assurance Submittal.

Note, the forms provided in the Attachment are the formats planned for use, but these forms may need to be altered to accommodate project specific elements during project execution.

This Page Intentionally Left Blank



DAILY QUALITY CONTROL REPORT

Project Name: _____ Report No: _____
 Project No: _____ Location: _____ Date: _____

I. Personnel Present (Reference/attach SUXOS' daily report if applicable)

See Daily Activity Report

II. Work Performed

Blank area for reporting work performed.

III. Quality Control Activities (Reference/attach inspection/surveillance reports):

QCIR #	Date	Scope (Brief description of scope)	Performed By	Pass/Fail	NCR#

IV. Problems Encountered / Corrective Actions Taken

Blank area for reporting problems and corrective actions.

V. Directions Given / Received

Blank area for reporting directions given or received.

VI. Special Notes / Lessons Learned

Blank area for special notes or lessons learned.

I. Visitor

Blank area for visitor information.

VIII. Approval

Name and Signature:	Title/Company:	Date:
	UXOQCS	

This Page Intentionally Left Blank



PREPARATORY PHASE INSPECTION REPORT

Project Name: _____ Project No: _____ Report No: _____
UXO Team: _____ Location: _____ Date: _____

IV. Submittals Reviewed (Work Plan, EHSP, Permits, etc.)

Submittals Reviewed.	Item No. (Rev No.)	Date	Approval Authority

Have all submittals been approved? Yes No

If No, what items have not been submitted/ approved?

Are all submittals on hand? Yes No

If No, what items are missing?

Check approved submittals against delivered material. (This should be done as material arrives.)

Comments:

V. Resources (Personnel & Equipment)

Are adequate resources on hand to effectively conduct work? Yes No

If No, what action will be taken?

VI. Procedures (Project Manger should be involved in this stage of the inspection)

Review contract specifications. (List special requirements such as location accuracy, format for deliverables, etc.)

Discuss procedure for accomplishing the work (Reference WP Section or SOP).

Clarify any differences (revisions needed).

VII. Resolve Differences (What did you do to resolve outstanding issues/problems)

Comments:

VIII. Testing/ Surveillance

Identify Tests/ Surveillance to be performed, frequency, and by whom.

Where will the testing to take place (in the test bed, at a selected monument, etc.)?



PREPARATORY PHASE INSPECTION REPORT

Project Name: _____ Project No: _____ Report No: _____
UXO Team: _____ Location: _____ Date: _____

Is the Testing/ Surveillance Plan Adequate?

Yes

IX. Safety

Review applicable portion of the Health and Safety Plan.

Has the Activity Hazard Analysis been approved? Yes No

X. Results of Inspection

Acceptable Unacceptable NCR #: _____

Name: _____ Signature: _____ Date: _____

QCM Comments

QCM Review

Concur Non-Concur Signature: _____ Date: _____

XI. Distribution

PM UXOSO QCM SUXOS CLIENT REP

This Page Intentionally Left Blank



INITIAL PHASE INSPECTION REPORT

Project Name: _____ Report No: _____

Project No: _____ Location: _____ Date: _____

I. Definable Feature of Work

- | | | | |
|--|---|--|---|
| <input type="checkbox"/> Project Management | <input type="checkbox"/> Vegetation Clearance | <input type="checkbox"/> Acceptance Sampling | <input type="checkbox"/> Site Restoration |
| <input type="checkbox"/> Mobilization | <input type="checkbox"/> Analog Geophysical Survey | <input type="checkbox"/> Scrap Processing | <input type="checkbox"/> Demobilization |
| <input type="checkbox"/> Site Survey | <input type="checkbox"/> Surface/Subsurface Clearance | <input type="checkbox"/> UXO Avoidance | <input type="checkbox"/> Other: |
| <input type="checkbox"/> Archaeological & Biological Surveys | <input type="checkbox"/> Demolition | <input type="checkbox"/> Data Management | |
| | <input type="checkbox"/> MPPEH Management | <input type="checkbox"/> GIS Management | |

II. References (USACE DIDs, Corporate references, SOPs, etc.):

III. Personnel Present (employees performing the work) Attach supplemental sheet if necessary

Name	Position	Company

IV. Preparatory Work (equipment set up & testing, EZ set up, logbook entries, etc.)

Is preliminary work complete and correct? Yes No

If No, what action(s) will be taken?

V. Task Execution

Is work being completed in accordance with plans and specifications? Yes No

If No, what corrective action(s) will be taken?

Is workmanship acceptable? Yes No

If No, what action(s) will be taken?

V. Resolve Differences

Comments None:



INITIAL PHASE INSPECTION REPORT

Project Name: _____ Report No: _____

Project No: _____ Location: _____ Date: _____

VI. Safety (Review work conditions using EHSP and AHAs)

Comments: All procedures and precautions are being followed and taken.

VII. Results of Inspection

Acceptable Unacceptable NCR #:

Name: _____ Signature: _____ Date: _____

QC Manager Comments

QC Manager Review

Concur Non-Concur Signature: _____ Date: _____

VIII. Distribution

PM UXOSO QCM SUXOS CLIENT REP



FOLLOW-UP INSPECTION / SURVEILLANCE REPORT

Project Name: _____ Report No: _____

Project No: _____ Location: _____ Date: _____

I. Definable Feature of Work

- | | | | |
|--|---|---|---|
| <input type="checkbox"/> Project Management | <input type="checkbox"/> Analog Geophysical Survey | <input type="checkbox"/> Scrap Processing | <input type="checkbox"/> Site |
| <input type="checkbox"/> Mobilization | <input type="checkbox"/> Surface/Subsurface Clearance | <input type="checkbox"/> UXO Avoidance | <input type="checkbox"/> Restoration |
| <input type="checkbox"/> Site Survey | <input type="checkbox"/> Demolition | <input type="checkbox"/> Data Management | <input type="checkbox"/> Demobilization |
| <input type="checkbox"/> Archaeological & Biological Surveys | <input type="checkbox"/> MPPEH Management | <input type="checkbox"/> GIS Management | <input type="checkbox"/> Other: |
| <input type="checkbox"/> Vegetation Clearance | <input type="checkbox"/> Acceptance Sampling | | |

II. Type of Inspection

- 3-Phase Follow-up Surveillance QC Sampling

II. References (USACE DIDs, Corporate references, SOPs, etc.):

III. Activities/Conditions Observed

Conducted By: _____

Signature: _____

Date: _____

X. UXOQC Review

- Acceptable Unacceptable

NCR #: _____

Comments: _____

Name: _____

Signature: _____

Date: _____

XI. Distribution

- PM UXOSO QCM SUXOS CLIENT REP

This Page Intentionally Left Blank



QC Inspection/Surveillance Log

Project Name:

Project Number:

Location:

QCIR Number	Date Performed	Scope (Brief description of scope)	Performed By	Ref. Docs. (DN, NCRs, CARs, etc.)	Comments	Date Closed

This Page Intentionally Left Blank

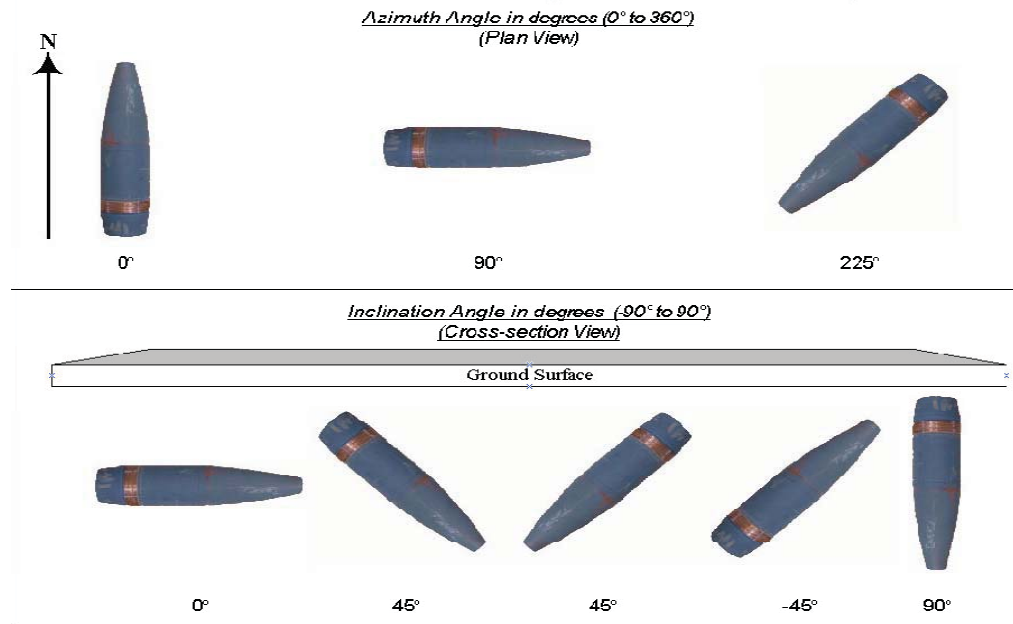
SEEDING CHECKLIST/ LOG

Area	Teams Designated	No. of Transects for Seeding	Type of Seed (simulated caliber)	Max Depth	Comments

NOTES:

- 1.
2. Randomly select Transects from Transects to be investigated
3. Bury inert ordnance items at locations in the randomly selected transects where geophysical surveys or mag and dig operations will be performed.
4. The seeded items should be painted blue and tagged with a non-biodegradable label identifying the items as inert and providing a point of contact address, phone number, and a unique target identifier.
5. The items will be placed at depths and orientations that, when surveyed effectively, will cause instrument responses that indicate the presence of a buried metallic item.
6. A log will be maintained documenting the exact location, depth Azimuth and Inclination of every seeded item.
7. If the seeded item is not detected, a Nonconformance report will be issued and a causal analysis/corrective action will be developed.

Azimuth and Inclination Angle Definition Examples



SEEDING CHECKLIST/ LOG

Item Number	Item Description	Transect ID	Coordinates Easting	Coordinates Northing	Depth (in.)	Azimuth Angle (degrees)	Inclination Angle (degrees)	Item Recovered	Comments <small>(Anomaly Number, Date Recovered, NCR Issued)</small>
01								<input type="checkbox"/> Yes <input type="checkbox"/> No	
02								<input type="checkbox"/> Yes <input type="checkbox"/> No	
03								<input type="checkbox"/> Yes <input type="checkbox"/> No	
04								<input type="checkbox"/> Yes <input type="checkbox"/> No	
05								<input type="checkbox"/> Yes <input type="checkbox"/> No	
06								<input type="checkbox"/> Yes <input type="checkbox"/> No	
07								<input type="checkbox"/> Yes <input type="checkbox"/> No	
08								<input type="checkbox"/> Yes <input type="checkbox"/> No	
09								<input type="checkbox"/> Yes <input type="checkbox"/> No	
10								<input type="checkbox"/> Yes <input type="checkbox"/> No	
11								<input type="checkbox"/> Yes <input type="checkbox"/> No	
12								<input type="checkbox"/> Yes <input type="checkbox"/> No	
13								<input type="checkbox"/> Yes <input type="checkbox"/> No	
14								<input type="checkbox"/> Yes <input type="checkbox"/> No	
15								<input type="checkbox"/> Yes <input type="checkbox"/> No	
16								<input type="checkbox"/> Yes <input type="checkbox"/> No	
17								<input type="checkbox"/> Yes <input type="checkbox"/> No	
18								<input type="checkbox"/> Yes <input type="checkbox"/> No	
19								<input type="checkbox"/> Yes <input type="checkbox"/> No	
20								<input type="checkbox"/> Yes <input type="checkbox"/> No	
21								<input type="checkbox"/> Yes <input type="checkbox"/> No	
22								<input type="checkbox"/> Yes <input type="checkbox"/> No	
23								<input type="checkbox"/> Yes <input type="checkbox"/> No	
24								<input type="checkbox"/> Yes <input type="checkbox"/> No	
25								<input type="checkbox"/> Yes <input type="checkbox"/> No	
26								<input type="checkbox"/> Yes <input type="checkbox"/> No	
27								<input type="checkbox"/> Yes <input type="checkbox"/> No	
28								<input type="checkbox"/> Yes <input type="checkbox"/> No	
29								<input type="checkbox"/> Yes <input type="checkbox"/> No	
30								<input type="checkbox"/> Yes <input type="checkbox"/> No	
31								<input type="checkbox"/> Yes <input type="checkbox"/> No	
32								<input type="checkbox"/> Yes <input type="checkbox"/> No	



NON-CONFORMANCE REPORT

Project Name: _____	Report No: _____
Project No: _____ Location: _____	Date: _____
Description of Process : _____	

I. Description of Non-conformance (Items involved; specification, code or standard to which the items do not conform) (Provide sketch if applicable)

Name & Signature of Person Reporting Non-conformance: _____	Title/Company: _____	Date: _____
---	----------------------	-------------

II. Root Cause Analysis**Immediate Causes:** What actions and conditions contributed to this event? Check all that apply:**Substandard Acts**

<input type="checkbox"/> Operating equipment without authority	<input type="checkbox"/> Inadequate inspection/peer review
<input type="checkbox"/> Failure to follow/improper execution of procedure	<input type="checkbox"/> Poor judgment
<input type="checkbox"/> Using equipment improperly	<input type="checkbox"/> Failure to communicate—written and/or verbal
<input type="checkbox"/> Improper servicing/maintenance of equipment	<input type="checkbox"/> Acceptance of defective equipment/material
<input type="checkbox"/> Under influence of alcohol/drugs	<input type="checkbox"/> Other substandard acts
<input type="checkbox"/> Horseplay	

Substandard Conditions

<input type="checkbox"/> Personnel not properly qualified or trained	<input type="checkbox"/> Inadequate oversight
<input type="checkbox"/> Defective equipment/material	<input type="checkbox"/> Inadequate procedure/instruction

Enter brief explanation of each **immediate cause** below:

--

Basic Causes: What specific personal or job management system factors contributed to this event? Check all that apply:

Personal Factors	Job Factors
<input type="checkbox"/> Inadequate physical/physiological capability	<input type="checkbox"/> Inadequate leadership and/or supervision
<input type="checkbox"/> Inadequate mental/psychological capability	<input type="checkbox"/> Inadequate engineering
<input type="checkbox"/> Physical or physiological stress	<input type="checkbox"/> Inadequate purchasing
<input type="checkbox"/> Lack of knowledge	<input type="checkbox"/> Inadequate maintenance
<input type="checkbox"/> Lack of skill	<input type="checkbox"/> Inadequate tools and equipment
<input type="checkbox"/> Improper motivation	<input type="checkbox"/> Inadequate work standards
<input type="checkbox"/> Other personal factors	<input type="checkbox"/> Excessive wear and tear
	<input type="checkbox"/> Abuse and misuse
	<input type="checkbox"/> Change
	<input type="checkbox"/> Other job factors

Enter brief explanation of each **basic cause** below:

--

Name & Signature of Person Conducting RCA: _____	Title/Company: _____	Date: _____
--	----------------------	-------------



NON-CONFORMANCE REPORT

Project Name: _____	Report No: _____
Project No: _____	Location: _____
Date: _____	
Description of Process : _____	

III. Recommended Disposition *(Provide sketch if applicable)*

Name & Signature of Person Recommending Disposition:	Title/Company:	Date:
--	----------------	-------

IV. Corrective Action Required Not Required

V. Verification of Disposition/Corrective Action Required Not Required

Name & Signature of Person Verifying Disposition/CA:	Title/Company:	Date:
--	----------------	-------

VI. Approvals

<input type="checkbox"/> SUXOS	<input type="checkbox"/> PM	<input type="checkbox"/> Client	<input type="checkbox"/> Quality Manager
Name(Signature):	Name(Signature):	Name(Signature):	Name(Signature):
Date:	Date:	Date:	Date:
<input type="checkbox"/> Accepted <input type="checkbox"/> Rejected <input type="checkbox"/> Accepted with Comments	<input type="checkbox"/> Accepted <input type="checkbox"/> Rejected <input type="checkbox"/> Accepted with Comments	<input type="checkbox"/> Accepted <input type="checkbox"/> Rejected <input type="checkbox"/> Accepted with Comments	<input type="checkbox"/> Accepted <input type="checkbox"/> Rejected <input type="checkbox"/> Accepted with Comments

Distribution

<input type="checkbox"/> PM	<input type="checkbox"/> UXOSO	<input type="checkbox"/> SUXOS	<input type="checkbox"/> CLIENT	<input type="checkbox"/> Quality Manager
-----------------------------	--------------------------------	--------------------------------	---------------------------------	--



DEFICIENCY NOTICE (ROUTE CAUSE ANALYSIS)

		Deficiency Notice No.
Client:	Project Number:	
Project:	Specific Process:	
Description of Process		
I. Description of Deficiency (<i>Items involved, specification, code or standard to which items do not comply, submit sketch if applicable</i>)		
Name and Signature of Person Reporting Deficiency	Title/Company	Date
II. Root Cause Analysis		
Immediate Causes: What actions and conditions contributed to this event? Check all that apply:		
Substandard Acts		
<input type="checkbox"/> Operating equipment without authority	<input type="checkbox"/> Inadequate inspection/peer review	
<input type="checkbox"/> Failure to follow/improper execution of procedure	<input type="checkbox"/> Poor judgment	
<input type="checkbox"/> Using equipment improperly	<input type="checkbox"/> Failure to communicate—written and/or verbal	
<input type="checkbox"/> Improper servicing/maintenance of equipment	<input type="checkbox"/> Acceptance of defective equipment/material	
<input type="checkbox"/> Under influence of alcohol/drugs	<input type="checkbox"/> Other substandard acts	
<input type="checkbox"/> Horseplay		
Substandard Conditions		
<input type="checkbox"/> Personnel not properly qualified or trained	<input type="checkbox"/> Inadequate oversight	
<input type="checkbox"/> Defective equipment/material	<input type="checkbox"/> Inadequate procedure/instruction	
Enter brief explanation of each immediate cause below:		
Basic Causes: What specific personal or job management system factors contributed to this event? Check all that apply:		
Personal Factors	Job Factors	
<input type="checkbox"/> Inadequate physical/physiological capability	<input type="checkbox"/> Inadequate leadership and/or supervision	
<input type="checkbox"/> Inadequate mental/psychological capability	<input type="checkbox"/> Inadequate engineering	
<input type="checkbox"/> Physical or physiological stress	<input type="checkbox"/> Inadequate purchasing	
<input type="checkbox"/> Lack of knowledge	<input type="checkbox"/> Inadequate maintenance	
<input type="checkbox"/> Lack of skill	<input type="checkbox"/> Inadequate tools and equipment	
<input type="checkbox"/> Improper motivation	<input type="checkbox"/> Inadequate work standards	
<input type="checkbox"/> Other personal factors	<input type="checkbox"/> Excessive wear and tear	
	<input type="checkbox"/> Abuse and misuse	
	<input type="checkbox"/> Change	
	<input type="checkbox"/> Other job factors	
Enter brief explanation of each basic cause below:		
Name and Signature of Person Conducting RCA	Title/Company	Date
III. Corrective Action		



DEFICIENCY NOTICE (ROUTE CAUSE ANALYSIS)

Name and Signature of Person Recommending CA		Title/Company	Date
Re-Inspection Results			
IV. Re-Inspection <input type="checkbox"/> Accepted <input type="checkbox"/> Rejected		Reissued Under: Deficiency Notice Number: Non-Conformance Report Number:	
Name and Signature of Person Re-Inspection		Title/Company	Date
V. <input type="checkbox"/> Responsible Organization	<input type="checkbox"/> QA/QC	<input type="checkbox"/> Site Manager	<input type="checkbox"/> Project Manager
Name (<i>Signature</i>)	Name (<i>Signature</i>)	Name (<i>Signature</i>)	Name (<i>Signature</i>)
Date	Date	Date	Date
<input type="checkbox"/> Accepted <input type="checkbox"/> Rejected <input type="checkbox"/> Accepted with Comments	<input type="checkbox"/> Accepted <input type="checkbox"/> Rejected <input type="checkbox"/> Accepted with Comments	<input type="checkbox"/> Accepted <input type="checkbox"/> Rejected <input type="checkbox"/> Accepted with Comments	<input type="checkbox"/> Accepted <input type="checkbox"/> Rejected <input type="checkbox"/> Accepted with Comments



CORRECTIVE ACTION REQUEST

Project/Location		CAR No.:		CAR Issue Date	
Responsible Organization		Discussed With			
Response Assigned to		Response Due Date			
I. Requirement Violated/Finding					
II. Recommended Corrective Action					
Initiated by		Date	Approved By		Date
III. Remedial Action to Correct Condition (Include Cause):					
Scheduled Completion Date:					
IV. Corrective Action to Prevent Recurrence					
Response Submitted By:				Date:	
V. Evaluation Comments:		<input type="checkbox"/> Accept		<input type="checkbox"/> Reject	
VI. Verification Comments:		<input type="checkbox"/> Accept		<input type="checkbox"/> Reject	
Evaluated By		Date	Verified By		Date
VI. <input type="checkbox"/> QA/QC		<input type="checkbox"/> Project Manager	<input type="checkbox"/> Client		<input type="checkbox"/> Other
Name (Signature)		Name (Signature)	Name (Signature)		Name (Signature)
Date		Date	Date		Date
<input type="checkbox"/> Accepted <input type="checkbox"/> Rejected <input type="checkbox"/> Accepted with Comments		<input type="checkbox"/> Accepted <input type="checkbox"/> Rejected <input type="checkbox"/> Accepted with Comments	<input type="checkbox"/> Accepted <input type="checkbox"/> Rejected <input type="checkbox"/> Accepted with Comments		<input type="checkbox"/> Accepted <input type="checkbox"/> Rejected <input type="checkbox"/> Accepted with Comments

This Page Intentionally Left Blank

This Page Intentionally Left Blank

LESSONS LEARNED REPORT FORM

Client:	Project Number:	
Project:	Location:	
Type Of Project:		
I. TOPIC		
II. DESCRIPTION (Narrative of relevant events, problem, impact)		
III. LESSON(S) LEARNED (e.g. Project Specific, Location Specific, Company-wide):		
IV. RECOMMENDED FUTURE ACTION (e.g., Revise Project Procedures, Company Procedures, Additional Training):.		
V. EVALUATION BY DEPARTMENT HEAD (e.g., Support Recommendation, Alternate Recommendation):		
VI. List supporting data/ references (if applicable)		
Reference/ Supporting Data:	Location:	
VII. <input type="checkbox"/> PM	<input type="checkbox"/> QCM	<input type="checkbox"/> VP of UXO Operations
Name (<i>Signature</i>)	Name (<i>Signature</i>)	Name (<i>Signature</i>)
Date	Date	Date
<input type="checkbox"/> Accepted <input type="checkbox"/> Rejected <input type="checkbox"/> Accepted with Comments Comments:	<input type="checkbox"/> Accepted <input type="checkbox"/> Rejected <input type="checkbox"/> Accepted with Comments Comments:	<input type="checkbox"/> Accepted <input type="checkbox"/> Rejected <input type="checkbox"/> Accepted with Comments Comments:
VIII. Forward Approved Lessons Learned Report to VP of Support Services		
Name (<i>Signature</i>)	Date	<input type="checkbox"/> Accepted <input type="checkbox"/> Rejected <input type="checkbox"/> Accepted with Comments Comments:

This Page Intentionally Left Blank



Field Change Request (FCR) Form

Project Name:		Project Number:		
Client:		Request Number: FCR-		
Field Change Request Title:				
I. Description				
II. Reason for Change				
III. Recommended Disposition				
Field Operations Lead (or designee)		Signature	Date	
IV. Disposition				
V.				
<input type="checkbox"/> QC Manager(FCR <small>Concerns Quality issues</small>)	<input type="checkbox"/> Operations Manager	<input type="checkbox"/> Project Manager	<input type="checkbox"/> Senior Project Manager	<input type="checkbox"/> Client Project Manager
Name (<i>Signature</i>)	Name (<i>Signature</i>)	Name (<i>Signature</i>)	Name (<i>Signature</i>)	Name (<i>Signature</i>)
Date	Date	Date	Date	Date
<input type="checkbox"/> Accepted <input type="checkbox"/> Rejected <input type="checkbox"/> Accepted with Comments	<input type="checkbox"/> Accepted <input type="checkbox"/> Rejected <input type="checkbox"/> Accepted with Comments	<input type="checkbox"/> Accepted <input type="checkbox"/> Rejected <input type="checkbox"/> Accepted with Comments	<input type="checkbox"/> Accepted <input type="checkbox"/> Rejected <input type="checkbox"/> Accepted with Comments	<input type="checkbox"/> Accepted <input type="checkbox"/> Rejected <input type="checkbox"/> Accepted with Comments
Comments:	Comments:	Comments:	Comments:	Comments:
VI. Distribution				
Client Project Manager Senior Project Manager Project Manager QC Manager Operations Manager Project File			Other:	

This Page Intentionally Left Blank

This Page Intentionally Left Blank



DAILY OPERATOR TEST REPORT

Project Name: _____ **Location:** _____ **Team:** _____
 Sunday Monday Tuesday Wednesday Thursday Friday Saturday

I. Test Plot Information

Location of Test Plot: _____ Total Targets Emplaced: _____

II. Instrument/Operator Information

Operator	Instrument Type/ Manu facture	Instrument Serial Number	Test Plot	Daily Team Leader Seed Results	Comments
Team Leader			<input type="checkbox"/> Passed <input type="checkbox"/> Failed	N/A	
			<input type="checkbox"/> Passed <input type="checkbox"/> Failed	<input type="checkbox"/> Passed <input type="checkbox"/> Failed	
			<input type="checkbox"/> Passed <input type="checkbox"/> Failed	<input type="checkbox"/> Passed <input type="checkbox"/> Failed	
			<input type="checkbox"/> Passed <input type="checkbox"/> Failed	<input type="checkbox"/> Passed <input type="checkbox"/> Failed	
			<input type="checkbox"/> Passed <input type="checkbox"/> Failed	<input type="checkbox"/> Passed <input type="checkbox"/> Failed	
			<input type="checkbox"/> Passed <input type="checkbox"/> Failed	<input type="checkbox"/> Passed <input type="checkbox"/> Failed	
			<input type="checkbox"/> Passed <input type="checkbox"/> Failed	<input type="checkbox"/> Passed <input type="checkbox"/> Failed	
			<input type="checkbox"/> Passed <input type="checkbox"/> Failed	<input type="checkbox"/> Passed <input type="checkbox"/> Failed	
			<input type="checkbox"/> Passed <input type="checkbox"/> Failed	<input type="checkbox"/> Passed <input type="checkbox"/> Failed	
			<input type="checkbox"/> Passed <input type="checkbox"/> Failed	<input type="checkbox"/> Passed <input type="checkbox"/> Failed	
			<input type="checkbox"/> Passed <input type="checkbox"/> Failed	<input type="checkbox"/> Passed <input type="checkbox"/> Failed	

III. Problems Encountered / Corrective Actions Taken.

explain in space below:

IV. Supervisor

Name: _____ **Date:** _____

Signature: _____

This Page Intentionally Left Blank

US ARMY CORPS OF ENGINEERS (USACE) MUNITIONS RESPONSE QUALITY ASSURANCE REPORT (QAR) FORM <small>The proponent agency is CESO. See instructions on page 2.</small>		1. REPORT NO. (1,2,3, etc., for the Task Order (T.O.))		
2. USACE REPRESENTATIVE'S NAME		3. DATE ACTIVITY COMPLETED		
4. PROJECT NAME	5. PROJECT LOCATION		6. WEATHER CONDITIONS	
7. CONTRACTOR		8. CONTRACT NUMBER		
		9. T.O. NUMBER		
10. DISTRIBUTED TO (check boxes and insert individual's name)				
<input type="checkbox"/>	a. District Program/Project Manager		<input type="checkbox"/>	b. Design Center
<input type="checkbox"/>	c. Remedial Action District TM		<input type="checkbox"/>	d. Contractor
11. RESPONSE DUE DATE (Based on type of nonconformance, IF REQUIRED)				
12. TYPE OF ACTIVITY CONDUCTED (Include types of inspections/audits conducted, operations observed, etc.)				
13. RESULTS AND OBSERVATIONS				
14. DEFICIENCY TYPE (select one) <input type="checkbox"/> a. Not Applicable <input type="checkbox"/> b. Critical <input type="checkbox"/> c. Major <input type="checkbox"/> d. Minor				
<input type="checkbox"/> e. Other, Specify				
15. DATE		16. USACE REPRESENTATIVE'S SIGNATURE		
17. CONTRACTOR REPRESENTATIVE'S NAME			18. DATE	
19. CONTRACTOR REPRESENTATIVE'S SIGNATURE (indicating receipt of the QAR)				
20. The Contractor will provide the following information to the Contract Specialist by the "Response Due" date above. Please contact the Contracting Officer's Representative (COR) or Project Manager if you have any questions.				
a. Contractor Response as to Cause and Actions Taken to Correct Current Condition and to Prevent Recurrence (cite applicable quality control procedures or changes in plans, procedures, or practices).				
b. Contractor Representative's Authentication (form must be signed before returning)				
(1) Printed Name	(2) Title	(3) Date Signed	(4) Signature	
c. Government Evaluation (acceptance, partial acceptance, etc.)				
d. Government Actions (reduced payment, cure notice, show cause, other)				
e. Close Out	Name	Title	Date (YYYY-MM-DD)	Signature
(1) Contractor Notified				
(2) USACE PDT Representative				
(3) Contracting Officer or COR				

INSTRUCTIONS FOR ENG FORM 6048

Block 1. Report number.

Block 2. Name of USACE representative conducting the quality assurance (QA) activity.

Block 3. Date QA Activity completed.

Block 4. Project Name, i.e., "Camp Swampy (MRS-02).

Block 5. Project Location, i.e., "Smithville, Alaska".

Block 6. Weather conditions, if applicable.

Block 7. Contractor and/or subcontractor executing the work.

Block 8. Contract number.

Block 9. Task Order number.

Block 10. List by name all official recipients of the QAR. At a minimum, the District Program/Project Manager must be selected.

Block 11. Enter the date that the contractor is to respond, if applicable.

Block 12. List all QA-related activities, inspections, audits conducted, operations observed, etc. Include specific references to applicable government quality requirements, i.e., Quality Assurance Surveillance Plans, Department of Defense, Army, and/or USACE requirements, policy, guidance, etc., requiring the inspection/audit being conducted. For example: "Spot-checked inventory of demolition explosives as required by the project QASP and approved Explosives Safety Submission (ESS)."

Block 13. Describe results and observations of each QA activity conducted. Attach discipline-specific checklists/documentation used. All deficiencies noted must include reference to the specific regulation or requirement that was violated. For example: "Demolition explosives stored on site were not inventoried weekly in accordance with ESS paragraph 4.2 and Work Plan paragraph 5.4. Last inventory was conducted 3 weeks ago on xx Feb 2013."

Block 14. Select the type of deficiency, if any, observed. Use contract-specific definitions if available, or use the following general definitions:

- a. Check the appropriate box.
- b. Critical: A deficiency that is likely to result in hazardous or unsafe conditions for individuals using, maintaining, or depending upon the supplies or services; or is likely to prevent performance of a vital agency mission.
- c. Major: A deficiency, other than critical, that is likely to result in failure of the supplies or services, or to materially reduce the usability of the supplies or services for their intended purpose.
- d. Minor: A deficiency that is not likely to materially reduce the usability of the supplies or services for their intended purpose or is a departure from established standards having little bearing on the effective use or operation of the supplies or services.

Block 15. Date the USACE Representative signs.

Block 16. QA representative's signature.

Block 17. Contractor Representative's printed name.

Block 18. Date Contractor Representative signs.

Block 19. Contractor representative signature. Signature does not indicate concurrence with stated findings, only that contractor has received the report.

Block 20a. Contractor indicates action(s) taken to determine cause of the deficiency, action taken to correct immediate deficiency, and action taken to prevent a recurrence of the deficiency. Include dates of actions taken and a schedule for completion of planned actions.

Block 20b. Contractor representative's printed name, title, date signed, and signature.

Block 20c. Indicate government acceptance of contractor's actions to correct identified deficiencies.

Block 20d. Indicate negative government actions taken as a result of the deficiency.

Block 20e. Signature of contractor, PDT representative and contracting officer or COR indicating close out for all deficiencies indicated.

QUALITY ASSURANCE SUBMITTAL

Report #:	Date:	Site:	Location:	Grid Coordinate: SEE BELOW
		Senior UXO Supervisor:		
All features of work have passed QC acceptance sampling.				
Final Acceptance Inspected By / Date:				

This Page Intentionally Left Blank

FINAL
SURFACE AND SUBSURFACE CLEARANCE
STANDARD OPERATING PROCEDURE UXO-01

Munitions and Explosives of Concern Remedial Action
Former Waikane Training Area
Southeastern Region Munitions Response Site
Kāneʻohe, Oʻahu, Hawaiʻi

RMIS ID: H09HI035401

Prepared by:

GSI Pacific Inc.
181 South Kukui Street, First Floor
Honolulu, HI 96813

December 2016

This Page Intentionally Left Blank

Section 1 Standard Operating Procedure Approvals

This page provides a record of the signatures and dates of personnel who developed, reviewed, validated, and approved this Standard Operating Procedure (SOP).

Table 1-1: Contractor Approvals

Name and Signature	Role	Date
  Mike Coyle Corporate Health and Safety Manager	Review/Approval	11/23/16
 Daniel C. Haines Quality Control Manager	Review/Approval	11/29/16
 Brian Stepp Senior Project Manager	Review/Approval	11/28/16

Section 2 Scope and Application

This SOP applies to all site personnel involved in the munitions and explosives of concern (MEC) surface and subsurface clearance operations. The following procedures are not all inclusive nor are they applicable in all situations. This SOP is not a stand-alone document and is to be used together with the Uniform Federal Policy Quality Assurance Project Plan (UFP-QAPP), other SOPs, the Accident Prevention Plan (APP)/Site Safety and Health Plan (SSHP), applicable Federal, state, and local regulations, and contract restrictions and guidance.

As agreed upon during the project kick-off meeting, GSI Pacific Inc. (GSIP) will not be removing any illegal public dumping related non-munitions related debris (NMRD) such as cars, washers, and rubbish. If encountered, these items will be moved to the side and the area beneath will be checked for MEC/munitions debris (MD)/Material Potentially Presenting an Explosive Hazard (MPPEH) to a depth of 2 feet below ground surface.

Section 3 *Materials Required*

The following lists identify special and critical tools, and equipment and supplies used during the grid network establishment and MEC surface and subsurface clearance operations:

Special and Critical Tools:

- Primary Detector- Minelab Explorer SE (or similar all metals detectors);
- Secondary Detector- EM61-MK2 in analog mode (for limited use in areas with high background noise [*e.g.*, rust flakes, nails, and/or small metallic clutter]);
- Handheld Global Positioning System (GPS); and
- Digital camera.

Safety Supplies:

- First aid kit;
- Bloodborne pathogen kit;
- Eye wash (for immediate field use);
- Insect repellants containing 33 percent (%) N,N-diethyl-meta-toluamide (DEET) (if required);
- Sunscreen;
- Two-way radio;
- Cellular phone;
- Water and/or hydrating drinks; and
- Electrolyte packets.

Tools/Equipment:

- Field logbooks,
- Field forms;
- Flagging tape;
- Tool pouches;
- Pin flags;
- Grid stakes;
- Buckets;
- Water jugs;
- Batteries;
- Hand tools (*e.g.*, shovel, pick, handpick); and

- Heavy equipment (earth moving machinery [EMM]). *Note: Heavy equipment operations will be performed in accordance with (IAW) Engineer Manual (EM) 385-1-97 where the operator can only dig in anomaly free soil to within 12 inches of the anomaly).*

Personnel Protective Clothing:

GSIP and all personnel on site will have all necessary modified Level D personal protective equipment (PPE) as per 29 Code of Federal Regulations (CFR) Part 1910.120. The equipment listed below comprises modified Level D PPE for this project:

- Normal work clothes (long pants and shirt);
- Safety glasses;
- Leather gloves;
- Boots (leather, ankle stability);
- Reflective short or long sleeve shirts or Class II reflective vest; and
- Also, heavy equipment operation-specific PPE (*e.g.*, safety toe boots, hard hat, hearing protection, and Class II high visibility vest).

Section 4 Related Procedures

Related SOPs include the following:

- *Field Documentation*, SOP G-1;
- *Anomaly Avoidance*, SOP G-2;
- *Surveying and Mapping*, SOP G-3;
- *Project Quality Control*, SOP G-5;
- *Explosive Disposal Operations*, SOP UXO-02;
- *Material Potentially Presenting an Explosive Hazard Management*, SOP UXO-03;
- *Heavy Equipment and Earth Moving Machinery Operations*, SOP UXO-04;
- *Demilitarization Operations*, SOP UXO-05;
- *Batch Burner Thermal Treatment*, SOP UXO-06;
- *X-Ray Operations*, SOP UXO-07; and
- *Instrument Verification Strip and Geophysical Survey Equipment*, SOP UXO-08.

Section 5 Procedures

5.1 Safety Procedures

All surface and subsurface clearance operations for MEC will be performed under the supervision of a Senior Unexploded Ordnance (UXO) Supervisor (SUXOS) per Department of Defense Explosive Safety Board (DDESB) Technical Paper (TP)-18 (DDESB, 2015). Each MEC Investigation Team will be supervised by a minimum of a UXO Technician III level Team Leader (TL). The project will be monitored by a UXO Safety Officer (UXOSO) and UXO Quality Specialist (UXOQCS) IAW TP-18 (DDESB, 2015) and EM 385-1-97 (USACE, 2013) as well.

During MEC removal operations, GSIP personnel will strictly adhere to the APP/SSHP and the following general safety practices:

- SAFETY IS PARAMOUNT;
- Do not move or disturb unidentified items;
- Do not collect souvenirs;
- Do not smoke except in designated areas outside the Remedial Action (RA) site;
- Do not carry fire or spark producing devices into the site;
- All MEC team operations will utilize the “Buddy” system;
- Prohibit non-essential personnel from visiting the site without approval from the UXOSO and an escort in uncleared areas;
- Operations will be conducted during daylight hours;
- Access to operating areas will be limited to only those personnel necessary to accomplish the specific operation;
- Minimum separation distances (MSDs) will be enforced by all project personnel IAW the approved Explosives Safety Submission (ESS) and this SOP;
- All personnel will attend the daily safety briefing (tailgate safety briefing) prior to entering the operating area;
- Anyone can stop operations for an unsafe act or situation; and
- Safety violations and/or unsafe acts will be immediately reported to the UXOSO.

5.2 Minimum Separation Distances and Exclusion Zones

The 36-acre RA project site is located within the Southeastern Region Munitions Response Site (MRS) at the former Waikane Training Area (WTA). The former WTA was used as a training and artillery impact area from 1942 to 1976. For safety purposes, Exclusion Zones (EZs) will be established at the project site while subsurface MEC-related clearance or disposal operations are being conducted. An EZ is a controlled area where only essential and authorized project

personnel are allowed to be while MEC-related operations are taking place. The EZ for different types of operations and personnel are based on MSDs developed for each project based on the expected munitions with the greatest fragmentation distance (MGFD).

During MEC subsurface investigations, the MSD between MEC teams and non-essential project personnel (public/land owners/tenants) is the hazardous fragmentation distance (HFD) of the MGFD, as stated in the approved ESS.

During MEC subsurface investigations, the MSD between MEC teams and other essential project personnel is the Team Separation Distance (TSD) of the MGFD, as stated in the approved ESS.

Essential personnel are personnel whose duties require them to remain within the EZ to ensure that munitions operations are conducted in a safe and efficient manner. Authorized personnel conduct project-related functions that require them to be present in the EZ for a specific purpose and for a limited time. All personnel limits and visitor access is controlled by the UXOSO.

During intentional detonations during explosive disposal of MEC, the MSD will be based on the maximum fragmentation distance (MFD) of the item(s) being destroyed. The most current Fragmentation Data Review Forms for all of the discovered MEC will provide the appropriate distance for the appropriate disposal and/or engineering controls utilized. All forms of engineering controls and disposal methods will be approved in the ESS.

The HFD and the appropriate MFD will be the basis for the MSD in circumstances where protection of personnel and property is required. If access to an EZ is required by non-UXO-qualified personnel during subsurface investigation or disposal operations, then all MEC related operations will stop while they are in the EZ.

5.3 Surface and Subsurface Clearance MEC Team

IAW EM 385-1-97 (USACE, 2013), at least two UXO-qualified technicians, one of whom must be a qualified UXO Technician III, are required in order for an MEC team to conduct surface and/or subsurface clearance activities. The UXO Technician III will be the assigned TL and will be responsible for coordinating team activities efficiently to accomplish the daily work assignments in a safe, effective manner.

The UXOSO will ensure that the EZ remains clear; a vehicle equipped with first aid supplies is available; and will maintain communications with the UXO team and the SUXOS. All non-essential personnel will remain outside the EZ unless approved by the UXOSO and work stoppage are IAW the ESS and this SOP.

Anticipated team composition for surface and subsurface clearance activities will consist of a TL (UXO Technician III), one UXO Technician II, and two to four UXO Technician Is or IIs. All personnel will be qualified IAW DDESB TP-18 and the APP. All personnel will receive site-specific and/or refresher training in the proper use of detection and location equipment, as appropriate, and proper data collection/documentation and site-specific safety.

5.4 *Surface and Subsurface Clearance Approach*

A vegetation clearance will be conducted prior to surface and subsurface clearance efforts as described in SOP G-4 and Worksheet #17 & 18 of the project UFP-QAPP to facilitate the surface and subsurface clearance efforts. Biological and archaeological surveys will also be conducted prior to any field activities to identify any threatened or endangered species and significant cultural or archaeological sites. The field teams will be provided training on how to identify relevant plants and animals and potentially significant cultural or archaeological sites. If any significant findings by the field teams occur during the clearance operations, the botanist/biologists or archaeologist will be contacted to provide further investigation.

The surface and subsurface clearance will be performed to remove MEC to a depth of 2 feet below ground surface within limitations in detection technology. Coverage and detection seeding will be performed by the UXOQCS before MEC clearances. SOP G-5 *Project Quality Control* and SOP UXO-08 *Instrument Verification Strip and Geophysical Survey Equipment* presents the quality control (QC) seeding requirements. GSIP also encourages the MEC TL to place seeds during daily clearance activities to assist with monitoring and improving the MEC team's effectiveness and work processes in the field.

The purpose of a surface and subsurface sweep with a metal detector is first to locate, mark, and flag the location of surface and subsurface MEC contamination contained in each grid; and second, to investigate and inspect all metallic anomalies and remove all MEC and munitions debris (MD) within each grid.

Handheld metal detectors will be utilized to complete the surface and subsurface clearance activities. The UXO team members will use pin flags, paint, ropes, and/or cones, as required, to mark 5 foot sweep lanes parallel to the grid boundary. The TL will dictate sweep lane set up and direction based on the terrain of each grid in order to achieve the safest and most efficient execution.

Operators will ensure that their detector heads extend beyond the sweep lane boundaries on both sides in order to ensure overlapping sweep coverage. At the beginning of each day and whenever the detectors have been turned off, operators will conduct a noise cancellation procedure in sequence together IAW with the manufacturer's instructions to reduce background and detector interference. A minimum 5-foot operator separation distance or following interval will also be utilized to further reduce interference between detectors.

In areas cluttered with small metallic contamination (*e.g.*, nails, staples, rusty flakes of metallic debris), the EM61-MK2 geophysical sensor will be used in analog mode of operation to reduce the background noise. Since the handheld analog metal detectors detect very small metallic pieces, the EM61-MK2, which is designed for larger metallic items, will be utilized in these cluttered areas to identify the targets of interest. The EM61-MK2 will be utilized as a secondary application after the Minelab Explorer sweep teams have flagged anomalies and cluttered anomalous areas. If utilized for anomaly reductions, the EM61-MK2 will use the minimum millivolt (mV) value threshold as determined by the Instrument Verification Strip (IVS) results

and directed by the Project Geophysicist and project delivery team. For EM61-MK2, analog operations, the audio response in conjunction with the display on the instrument panel will be used to reduce anomalies below the threshold. In areas where the EM61-MK2 is utilized to reduce anomalies, digital geophysical mapping will be utilized after the initial removal efforts to verify that detector responses are below threshold. Any remaining anomalies will be reacquired, investigated and resolved. Grids where the EM61-MK2 is utilized for cluttered areas will be identified and reported in the project Remedial Action Report (RAR).

Each anomaly will be treated as a suspect MEC until it has been determined otherwise. Every excavation hole will be checked thoroughly during the removal process. Per the Decision Document, surface and subsurface criteria anomalies will be excavated up to a depth of 2 feet below ground surface within limitations in detection technologies.

The team will utilize proper techniques for maximum detection, including proper detector height, orientation, and operation. The detector head (coil) will be kept as close to the ground surface as possible in a parallel orientation during sweep operation. The operators will avoid sweeping the detector up at the end of each swing.

The TL will follow behind the sweep line ensuring that proper spacing and coverage is maintained. The TL will also inspect and verify the identification of all flagged items, and will record data on the type, nomenclature, and location of the flagged targets. Upon completion of the grid sweep, the Subsurface Clearance Team will investigate, classify, recover and segregate all qualifying metallic debris under the direct supervision of the UXO Technician III. MPPEH will be inspected IAW SOP UXO-03.

All live, suspected live, or undetermined MEC items will be clearly marked with red pin flags and reported to the SUXOS. The SUXOS and UXOSO will make final disposition and/or safe to move determination IAW EM 385-1-97 (USACE, 2013).

Grid location, GPS coordinates, and other item features will be recorded and reported to the SUXOS for explosive disposal planning and annotated or recorded in the MEC Accountability Log (refer to SOP UXO-02 *Explosive Disposal Operations*).

5.4.1 Procedures for Unknown Liquid-Filled Munitions

Unknown liquid-filled munitions have not been identified and are not suspected at the project site. If, during project activities, personnel identify or suspect unknown liquid-filled munitions, then all personnel will immediately withdraw upwind from the work area, and the SUXOS will contact the United States Army Corps of Engineers (USACE) Ordnance and Explosives Safety Specialist (OESS). The SUXOS will secure the site by positioning two personnel as far upwind as possible of the suspected unknown liquid-filled munitions while maintaining visual security of the area until they are relieved by Explosive Ordnance Disposal (EOD) personnel or designated authorities.

5.5 MEC Identification

MEC determined to be live or containing hazardous components will be marked for final disposal procedures by the Demolition Team or as otherwise appropriate. If the condition of an item cannot be determined, it will be considered live and marked for blow-in-place disposal. The SUXOS and UXOSO will be notified of all MEC discoveries.

The SUXOS and Demolition Supervisor will make the determination if a MEC item is suspected to be live, but only the SUXOS and UXOSO have the authority to determine if an item is acceptable to move IAW EM 385-1-97. Site office publications will be researched, as required. If publications are not available on site, the SUXOS will request pertinent publications/information through the onsite USACE OESS.

Refer to the project UFP-QAPP Worksheet #17 & 18 and SOP UXO-02 *Explosive Disposal Operations* for further details regarding accountability and disposal activities of MEC and MPPEH.

5.6 MPPEH

Refer to the project UFP-QAPP Worksheet #17 & 18 and SOP UXO-03 *Material Potentially Presenting an Explosive Hazard Management* for further details regarding MPPEH management.

5.7 Equipment Quality Control Procedures

An IVS will be utilized to check each analog handheld or EM61-MK2 detector on a daily basis prior to usage to ensure proper working conditions. Refer to SOP G-5 and SOP UXO-08 for details on the IVS installation.

For the all GPS equipment utilized, the operator will check for functionality each morning and horizontal accuracy IAW SOP G-3 and project UFP-QAPP Worksheet #17 & 18.

In addition, the results of the daily functionality tests for both the geophysical and GPS equipment will be documented in the Daily Operators Test Report. Any equipment that does not meet the project requirements will be repaired or replaced prior to conducting fieldwork and reported.

Section 6 Documentation

Field documentation generated during surface and subsurface clearance activities include but are not limited to the logbook, Daily Operator Test Report, Grid Report Form, and Daily Activity Report. Refer to Worksheet #29 of the project UFP-QAPP for a list of the type of data generated during clearance activities.

All MEC or MPPEH items will be reported to the SUXOS and UXOSO. Grid location and GPS coordinates will be recorded and reported to the SUXOS for explosive disposal planning purposes (refer to SOP UXO-02 *Explosive Disposal Operations*). The following data will be collected, at minimum, by the UXO TL per grid on a daily basis:

- MEC identification (standard official military nomenclature will be used whenever possible);
- MEC GPS location coordinates and date/time;
- MEC Condition (fuzed/fired/low ordered, *etc.*);
- MD/RRD estimated total weight and quantity (count of items);
- NMRD estimated total weight and quantity (count of items);
- Digital photographs; and
- Any exception area information.

The surface and subsurface clearance activities will also be documented by taking representative photos of the munitions-related items that are discovered. All MEC items will be photographed with unique identification numbers and type/nomenclature information. All GPS data will be uploaded to the geographic information system (GIS) database and all field forms will be scanned into the project file.

6.1 List of Forms

For surface and subsurface clearance operations, the following will be completed:

- Team Logbook;
- Daily Operator Test Report;
- Grid Report Form (Attachment 1); and
- Daily Activity Report (Attachment 1).

6.2 Team Logbook

Daily field activities will be documented in a Team Logbook. Refer to SOP G-1 *Field Documentation* for field logbook procedures.

6.3 *Daily Operator Test Report*

To ensure operator proficiency and that quality data is collected, an operator instrument proficiency test will be conducted on the handheld geophysical instruments that will be used for project operations. This test will be documented using the Daily Operator Test Report (Attachment in SOP G-2). Guidance for filling out each field on the form is provided in Section 7 of SOP G-2 *Anomaly Avoidance*.

6.4 *Grid Report Form*

The Grid Report Form (Attachment 1) is used to document surface and subsurface clearance field activities. Example guidance for filling out each field on the form is provided below:

- **Team #** - Team number who conducted the activities (*e.g.*, Team 1, Team 2);
- **Date** - Date of the clearance activity (mm/dd/yy);
- **Grid #** - Numeric of the grid stake;
- **MEC Quantity** - Number of munitions/explosives item(s) in grid;
- **MEC ID & Condition** - Identification and attributes of munitions/explosives;
- **MD/RRD Weight** - Pounds (lbs) in grid;
- **MD/RRD Quantity** - Number (count) in grid;
- **NMRD Weight** - lbs in grid;
- **NMRD Quantity** - Number (count) in grid;
- **Field Eliminated Anomalies** - Number (count) in grid;
- **Live Small Arms** - Number count of small arms found;
- **Seed(s) Found** - Number of seeds (unique seed identifier[s] in Field Notes);
- **Exception Areas** - (*e.g.*, homes, buildings);
 - **Exception(s) Surveyed?** - Filled out by Survey;
 - **Survey Pics** - Filled out by Survey;
 - **File Name** - Filled out by Survey;
- **Anomalies Remain?** - Total number of anomalies investigated that are left in the grid;
 - **# Anomalies** - Filled out by Survey;
 - **File Name** - Filled out by Survey;
- **EM-61 utilized?** - Yes or No; list number of anomalies checked and discriminated;
- **Camera/GPS Unit & Files** - Electronics unit and file information;
- **Field Notes** - Pertinent information of importance about grid, *e.g.*, seed identifier(s); and
- **Grid Sketch** is used to illustrate the storyline of the grid (*e.g.*, fences, density areas). Please include MEC and seed approximate locations using the grid blocks for scale.

6.5 *Daily Activity Report*

The Daily Activity Report (Attachment 1) is completed by the SUXOS and is used to document field activities. Example guidance for filling out each field on the form is provided below:

- **Project** - Provide the project name;
- **Date** - Provide the date the form was completed;
- **Contract Number** - Provide the project contract number;
- **Task Order** - Provide the task order number, if applicable;
- **Site Personnel** (provide the following information):
 - **Name** - Provide person's full name;
 - **Position** - Provide the person's position (*e.g.*, UXO Technician I);
 - **Team Assignment** - Provide the team number; and
 - **Onsite/Offsite** - Indicate if the person is onsite or offsite.
- **Verbal Instructions:**
 - **Verbal Instructions given by the Client** - Provide any instructions that were given by the client; and
 - **Has anything developed which might lead to a change order or claim?** - Select **Yes** or **No**.
- **Live Ordnance Found** (provide the following information):
 - **Item** - Provide the MEC nomenclature;
 - **Grid Location** - Provide the grid location where the item was found; and
 - **Status** - Provide the item status.
- **General Comments** - Provide any comments;
- **Name** - Provide the SUXOS name who completed the report; and
- **Date** - Provide the date the report was completed.

Section 7 *References*

29 CFR Part 1910.120. *Hazardous Waste Operations and Emergency Response*.

Army Regulation (AR), 2007. AR 200-1. *Environmental Protection and Enhancement*.

DDESB, 2015. TP-18. *Minimum Qualifications for Personnel Conducting Munitions and Explosives of Concern-Related Activities*. 1 September.

Department of the Army (DA), 2014. DA Pamphlet (PAM) 385-30. *Risk Management*. 2 December.

Department of Defense (DoD), 1995. 4160.21-M 1: *Defense Demilitarization Manual*. 21 October 1991. Revised 14 February 1995.

_____, 2011. 6055.09-M Volume 5. *Ammunition and Explosive Safety Standards. Quantity-Distance Criteria for Intentional Burns or Detonations, Energetic Liquids and Underground Storage*. September.

Department of Transportation (DOT), 2015. Title 49 CFR 177.835 (g). *Class I Materials*. 1 October.

Operator's Manual(s) and Manufacturer's Publications.

USACE, 2014. EM 385-1-1. *Safety and Health Requirements Manual*. 30 November.

_____, 2013. EM 385-1-97. *Explosives - Safety and Health Requirements Manual*. 17 May.

***Attachment 1
Forms***

This Page Intentionally Left Blank

List of forms included in this attachment:

Forms:

- Grid Report; and
- Daily Activity Report.

Note, the forms provided in the Attachment are the formats planned for use, but these forms may need to be altered to accommodate project specific elements during project execution.

This Page Intentionally Left Blank

GRID REPORT Grid# _____ Team # _____ Date _____

MD Weight	Lbs			
Types of MD found (circle with specifics in the notes)	Grenade	Projectile	Bomb	Rocket
	Fuzes	Mines	WP	Other
Non-Munitions Related Debris (NMRD)	Lbs			
Field Investigated Anomalies	(count)			
MD Depth Range	Inches			
Frag Pit Depth Range	Inches			
Live Small Arms	(count)			
*MEC Found * (page 2)	(count)			
Seeds Found	(count)	QC?	QA?	
Seed ID(s)				
Exception Areas	Yes	No		
Exceptions(s) Surveyed?	Yes	No		
-Survey Pics	Yes	No		
-File Name:	Surveyor:			
Anomalies Remain?	Yes	No		
-# anomalies	(count)			
-File Name:	Surveyor:			
EM-61 utilized?	Yes	No		

Notes:

GRID REPORT Grid# _____ Team # _____ Date _____

MEC Item # _____ Fuzed/Unfuzed Armed/Unarmed

Item Description: _____

Location: E: _____ N: _____

Depth ("): _____ Azimuth: _____ Inclination: _____

Notes:

MEC Item # _____ Fuzed/Unfuzed Armed/Unarmed

Item Description: _____

Location: E: _____ N: _____

Depth ("): _____ Azimuth: _____ Inclination: _____

Notes:

MEC Item # _____

Location: E: _____ N: _____

Depth ("): _____ Azimuth: _____ Inclination: _____

Notes:

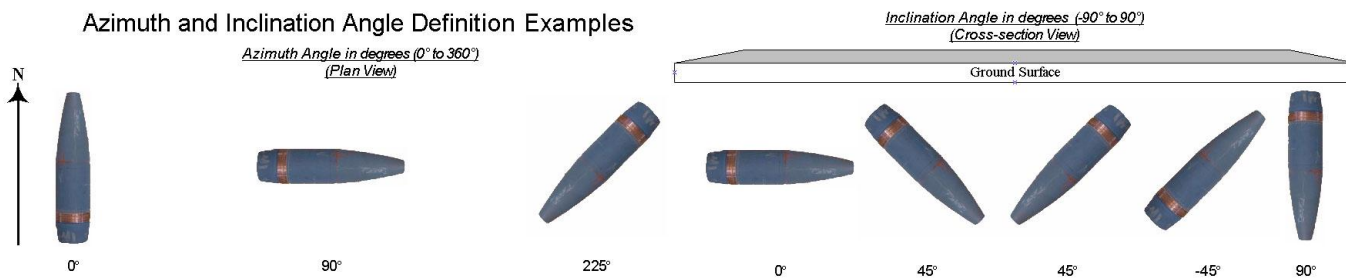
MEC Item # _____

Location: E: _____ N: _____

Depth ("): _____ Azimuth: _____ Inclination: _____

Notes:

Azimuth and Inclination Angle Definition Examples





Daily Activity Report (DAR)

Project: _____

Date: _____

Contract Number: _____

Task Order: _____

SITE PERSONNEL:

Name	Position	Team Assignment

Onsite	Offsite

VERBAL INSTRUCTIONS:

Verbal instructions given by the Client: N/A

Has anything developed which might lead to a change order or claim? YES NO

LIVE ORDNANCE FOUND:

Item	Grid Location

Status

GENERAL COMMENTS:

Name

Date

This Page Intentionally Left Blank

FINAL
EXPLOSIVE DISPOSAL OPERATIONS
STANDARD OPERATING PROCEDURE UXO-02

Munitions and Explosives of Concern Remedial Action
Former Waikane Training Area
Southeastern Region Munitions Response Site
Kāneʻohe, Oʻahu, Hawaiʻi

RMIS ID: H09HI035401

Prepared by:

GSI Pacific Inc.
181 South Kukui Street, First Floor
Honolulu, HI 96813

December 2016

This Page Intentionally Left Blank

Section 1 Standard Operating Procedure Approvals

This page provides a record of the signatures and dates of personnel who developed, reviewed, validated, and approved this Standard Operating Procedure (SOP).

Table 1-1: Contractor Approvals

Name and Signature	Role	Date
  Mike Coyle Corporate Health and Safety Manager	Review/Approval	11/23/16
 Daniel C. Haines Quality Control Manager	Review/Approval	11/29/16
 Brian Stepp Senior Project Manager	Review/Approval	11/28/16

Section 2 Scope and Application

The purpose of this SOP is to establish basic procedures for conducting munitions and explosives of concern (MEC) disposal operations. Information contained in this SOP should be used in conjunction with appropriate sections of the approved Uniform Federal Policy Quality Assurance Project Plan (UFP-QAPP), Accident Prevention Plan (APP)/Site Safety and Health Plan (SSHP), and Explosives Safety Submission (ESS). Adjustments to these procedures must be approved by the Project Manager (PM) and Quality Control Manager and may require review and approval by the client. The procedures in this document are applicable to all unexploded ordnance (UXO) and support personnel of GSI Pacific Inc. (GSIP) and their subcontractors.

Section 3 Materials Required

The Demolition Supervisor (DS) will be responsible for ensuring that all required equipment and materials are on site and serviceable. The Demo (Demolition) Equipment Inventory and Demo Operations Checklist (Attachments 1 and 2) will be used to document this activity. The items listed in the Demo Equipment Inventory will be checked daily prior to commencing disposal operations.

Section 4 Related Procedures

Related SOPs include the following:

- *Field Documentation*, SOP G-1;
- *Survey and Mapping*, SOP G-3;
- *Project Quality Control*, SOP G-5;
- *Surface and Subsurface Clearance*, SOP UXO-01;
- *Material Potentially Presenting an Explosive Hazard Management*, SOP UXO-03;
- *Heavy Equipment and Earth Moving Machinery Operations*, SOP UXO-04; and
- *Instrument Verification Strip and Geophysical Survey Equipment*, SOP UXO-08.

Section 5 *Procedures*

5.1 *Personnel Responsibilities*

All personnel have the responsibility to identify and report any unsafe acts or activities that do not conform to prescribed technical, safety, and quality requirements during all phases of the operation.

5.1.1 *Project Manager*

The PM has overall responsibility for ensuring the availability of the resources needed to implement this SOP and will ensure that this SOP is incorporated into plans, procedures, and training for sites where applicable. The PM, or designated representative, will be responsible for ordering the required explosives. Refer to the Explosives Management Plan (EMP) for details (Appendix I of the project UFP-QAPP).

5.1.2 *UXO Personnel*

All personnel conducting explosive disposal operations will meet the requirements specified in Department of Defense Explosives Safety Board (DDESB) Technical Paper (TP)-18 (2015). If applicable, at least one person supervising the explosive disposal operation will be properly licensed in the country and/or state where the operations are being conducted. Disposal operations will not be conducted without the client's notification, notification of Federal Aviation Administration (FAA), if applicable, and local authorities (*e.g.*, civil service, police, fire department), approved plans/SOPs, qualified and trained UXO personnel, and proper explosive disposal and safety equipment.

5.1.2.1 *Senior UXO Supervisor*

The Senior UXO Supervisor (SUXOS) will be responsible for assuring that adequate safety measures and housekeeping are performed during all phases of site operations including explosive disposal activities. The SUXOS will visit site explosive disposal locations, as deemed necessary, to ensure that explosive disposal operations are carried out in a safe, clean, efficient, and economical manner. The SUXOS will be responsible for training all onsite UXO personnel regarding the nature of materials handled, the hazards involved, and the necessary precautions. The SUXOS will be present for making disposal determinations with the DS and UXO Safety Officer (UXOSO) for all MEC items. The SUXOS has overall responsibility for all explosive disposal activities and their safe execution. The SUXOS will designate a competent, qualified DS to lead explosive disposal operations full time for the project.

5.1.2.2 *UXO Safety Officer*

The UXOSO will be responsible for ensuring that all explosive disposal operations are being conducted in a safe and healthful manner, maintaining exclusion zone (EZ) control, and is required to be present during all explosive disposal operations. The UXOSO will ensure the

compliance of the Demolition Team with the referenced documents that are applicable to the particular task being performed.

5.1.2.3 UXO Quality Control Specialist

The UXO Quality Control Specialist (UXOQCS) will be responsible for ensuring this SOP is effectively implemented. The UXOQCS ensures that all operations are conducted in accordance with (IAW) approved plans and procedures. This is done by implementing a three-phase control process during all definable features of work; including explosive disposal operations. A comprehensive inspection on explosive disposal operations, including all personnel involved in the activity, will be performed before any work at a preparatory inspection and the first time performed at an initial inspection. Thereafter, a follow-up inspection will be performed at least weekly or as frequent as deemed necessary by the UXOQCS, even when no explosive disposal operation take place. This will ensure that the Demolition Team is always ready and that all equipment and safety gear is present and serviceable. Additionally, the UXOQCS is also responsible for checking that the MEC Accountability Log and explosives documentation are correct.

5.1.2.4 Demolition Supervisor

The DS is responsible for setting up the disposal shots as well as the safety and quality of the work performed by the Demolition Team. The DS (UXO Technician III or above) is responsible for accuracy and completion of all explosive and MEC accountability records. The DS will consult with the SUXOS and UXOSO on the explosives status and final disposal determination before execution. The DS is responsible for ensuring that this SOP and all applicable plans, laws, regulations, and policies are followed in the performance of all explosive disposal operations. Any discrepancy or concern should be immediately brought to the attention of the SUXOS, PM, and UXOSO. If a work stoppage should occur, then the MEC item will be properly guarded until the operation can be safely performed.

5.2 Safety

The following procedures were developed for conducting safe and efficient disposal operations at project sites where MEC/Material Potentially Presenting an Explosive Hazard (MPPEH) and related materials must be disposed of by detonation. Emergency contact numbers and hospital routes will be detailed in the approved APP/SSHP. Before using the procedures outlined in this SOP, responsible individuals will review and comply with the provisions of the project UFP-QAPP, APP/SSHP, and the approved ESS.

5.2.1 Safety Warnings

The following steps will be taken to ensure that explosive disposal operations are conducted in a safe and prudent manner:

- Ensure all required notifications have been made (see Section 5.3.1);
- Set up the EZ and post cordon guards/man barricades (if utilized);

- Visually inspect the EZ and surrounding area for unauthorized personnel, aircraft, and livestock;
- The DS will give a five-minute warning on the radio by executing a series of long blasts on the horn/siren prior to detonation of MEC and donor explosives;
- The DS will give a one-minute warning on the radio by executing a series of short blasts on the horn/siren one-minute prior to the shot;
- Prior to initiating the shot, the DS will give three loud “Fire in the Hole” warnings then give the fire command on the radio; and
- After disposal is complete, the disposal area will be inspected and a prolonged blast on the horn/siren will be sounded to indicate that the area is safe. The SUXOS and/or the UXOSO/UXOQCS will verify through a second inspection that the disposal area is safe before giving the “All Clear.”

5.2.2 Safety Briefing

The following safety brief topics will be covered prior to commencement of disposal operations:

- Tailgate/Emergency procedures;
- Demo Operations Checklist;
- General Explosive Disposal Activity Hazard Analysis (AHA) (provided in the APP located in Appendix F of the project UFP-QAPP);
- Roles and responsibilities for all personnel involved;
- Heavy Equipment (if utilized) AHA (provided in the APP located in Appendix F of the project UFP-QAPP);
- Remote Firing Device (RFD) or SureFire procedures (Manufacturers’ Operation Manual);
- UXO-specific hazards; and
- Engineering controls and minimum safe distances (*e.g.*, maximum fragmentation distance).

5.2.3 Communications

Two methods of communication will be utilized during disposal operations. The preferred methods are cellular phones and radios. Radio and cellular phone transmissions will be secured whenever electric blasting caps are exposed. Observer(s) will be assigned as necessary to a location(s) where there is a good view of the air and surface approaches to the disposal site. It will be the responsibility of the observer(s) to notify the DS to suspend firing if any aircraft, vehicle, or personnel are sighted approaching the EZ.

5.2.4 Personal Protective Equipment

Unless otherwise directed, disposal operations will be conducted in modified Level D. Personal protective equipment (PPE) will consist of non-static producing clothing, gloves, safety glasses, and leather work boots.

5.2.5 Vehicle Safety

The following requirements apply to project vehicles:

- There will be a sufficient number of vehicles to transport all personnel involved in the disposal operation;
- Each vehicle must have a seat, with a seat belt, for each person;
- Vehicles will be parked in a protected area, free of vegetation, facing away from the detonation site. The keys will be placed on top of the driver's dash board when not in use;
- Before loading donor explosives, a DD Form 626 Motor Vehicle Inspection (Transporting Hazardous Materials) will be used to check out the vehicle;
- Drivers transporting class 1.4 explosives must have completed hazardous drivers training IAW 49 Code of Federal Regulations (CFR) S177.816 or have a current commercial driver's license (CDL) with a hazardous materials endorsement;
- Drivers transporting any amount of class 1.1 explosives must have a current CDL with a hazardous materials endorsement;
- Detonators in a vehicle hauling 55 pounds or more of class 1.1 explosives cannot be transported. If 55 pounds or more of class 1.1 explosives must be transported, a Hazardous Materials Permit IAW 49 CFR 385.400 will be obtained;
- A maximum of two people can ride in vehicles transporting explosives;
- Explosive vehicles must comply with the provisions of 49 CFR 177.835(a) (b) (e) (f) and (g), the APP/SSHP, and AHA;
- No explosives will be carried in the passenger cab;
- Personnel will not ride in the bed with explosive cargo;
- Plastic bed liners will not be utilized;
- Exposed metal in the bed will be covered;
- Vehicles will be serviced before being loaded with explosives;
- Smoking or flame-producing devices are not permitted within 50 feet of explosive vehicles; and
- Vehicles will not be driven or parked in areas with dry vegetation that could be ignited by the heat generated from catalytic converters.

5.2.6 General Explosive Disposal Safety

The following sections present the safety measures that will be followed during explosive disposal activities.

General:

- Explosive disposal of any kind is prohibited without the express permission from the PM and/or SUXOS;
- Know and observe Federal, state, and local laws/regulations, which apply to the transportation, storage, and use of explosives;
- Restrict and control access to the disposal site to the minimum number of authorized personnel necessary for safe conduct of operations;
- Disposal operations will not be initiated until at least one-half hour after sunrise and will be concluded by at-least one-half hour prior to sunset;
- Do not conduct blasting or explosive disposal operations during dust, sand, or thunder storms that are severe enough to produce atmospheric static electrical charges;
- If thunder storms or local conditions warrant, a lightning detector will be used to monitor the area. If lightning is detected within 10 miles of the Munitions Response Site (MRS), all operations will be suspended or terminated, cap and leads wires shunted, and all personnel evacuated to a safe area;
- In the event of a misfire when disposing of explosives by detonation, do not approach the disposal site for at least 60 minutes after the expected detonation time;
- Do not strike or dig into a buried misfired charge. Uncover only enough to position a fresh charge;
- Do not use explosives or pieces of accessory equipment that are obviously deteriorated or damaged. They may cause premature detonation or fail completely;
- Do not carry fire or spark-producing devices into a disposal site except as specifically authorized;
- Smoking is not allowed during handling, transportation, storage, or use of explosives and nowhere within the MRS;
- Avoid skin contact with explosives, inhalation of the smoke, fumes, vapors of explosives, and related hazardous materials;
- Do not strike, tamper with, or attempt to remove or investigate, the contents of a blasting cap (electric or non-electric), detonator, or other explosive initiating device. Detonation may occur;
- Do not use improvised methods for initiating blasting caps;
- Do not bury blasting caps. Use a detonating cord to transmit the explosive wave from the blasting caps, on the surface, to a buried/tamped explosive charge. Buried blasting caps

are subject to unobserved pressures and movement, which could lead to premature firing or misfires;

- Carry blasting caps in approved containers and keep them out of the direct rays of the sun;
- Keep caps located at least 25 feet from other explosives until they are needed for priming;
- Always point the explosive end of blasting caps, detonators, and explosive devices away from the body during handling;
- Protective measures IAW approved DDESB mitigating methods will be considered in order to protect personnel and property;
- Do not carry explosives or explosive components in pockets or on the body;
- Items with lugs, strong backs, tail-booms, base plates, shape charge jets, *etc.*, should be oriented away from personnel locations; and
- Inert ordnance will not be disposed of, or sold for scrap, until the internal fillers have been exposed and unconfined. Heat generated during a reclamation operation can cause the inert filler, moisture, or air to expand and burst the sealed casings. Venting or exposure may be accomplished in any way necessary to preclude rupture due to pressure from being confined. All MPPEH will be managed IAW SOP UXO-3 and Engineer Manual (EM) 385-1-97.

Electric Priming:

- An Electromagnetic Radiation (EMR) survey of the explosive disposal site will be conducted prior to any electrical explosive disposal operations being performed. If EMR hazards are found, shots will be initiated using a non-electrical system;
- Maintain minimum safe distances between electromagnetic-radiating sources and electro-explosive devices IAW EM 385-1-97;
- Electrical power lines also pose a hazard with respect to electric initiating systems. Disposal operations closer than 517 feet (155 meters) to electric lines shall be performed with a non-electrical system;
- Cell phones and radios will not be used within 50 feet of electric caps or wires leading to them;
- Personnel working with electric blasting caps or other electro-explosive devices will not wear static-producing clothing such as nylon, silk, or synthetic hair;
- Use only standard blasting caps of at least the equivalent of a commercial No. 8 blasting cap;
- Use electric blasting caps of the same manufacturer for each explosive disposal shot involving more than one cap;

- Do not hold blasting caps directly in the hand when uncoiling the leads, secure the caps under a sand bag or behind a barricade. Unroll the lead wires to their full extent and with your back to the caps, ground yourself before breaking the shunt to test caps with a galvanometer;
- The leads wires should be straightened by hand and not thrown, waved;
- Test electric-blasting caps for continuity at least 50 feet downwind from any other explosives prior to connecting them to the firing circuit. Upon completion of testing, the lead wires will be shunted by twisting the bare ends of the wires together. The wires will remain shunted until ready to be connected to the firing circuit;
- Do not pull on the electrical lead wires of electric blasting caps, detonators, or their electro-explosive devices. A detonation may occur; and
- Dragging a firing cable over sand or other insulated surfaces can generate a static charge that will electrically fire blasting caps.

Non-electric Priming:

- Do not insert anything but time fuse or detonating cord into the open end of a blasting cap;
- Do not force safety fuse or detonating cord into the open end of a blasting cap;
- Do not attempt to remove an unfired or misfired primer or blasting cap from a base coupling. There is a high risk of an explosion;
- Always point the explosive end of blasting caps, detonators, and other explosive devices away from the body;
- Safety Fuse/Time Fuse test burning must be conducted at least 50 feet downwind from any explosives;
- Do not allow the safety fuse to coil up and contact itself after being ignited, premature detonation could occur; and
- Do not confuse detonating cord with safety fuse of the same color.

Detonator Assemblies/Shock Tube:

- Do not subject Detonator assemblies to heat shock or friction, a detonation may occur;
- The connector block is not designed to initiate detonation cord;
- Never pull so hard as to stretch or break the shock tubing. A pre-mature detonation may result;
- The firing device must not be connected to and part of the shock tube until the shot is safe to fire; and
- Do not connect more than six shock tube lines to a starter block.

Binary Explosives:

- Follow the manufacturer's instructions for transportation, storage, mixing, and use;
- Always wear appropriate rubber gloves and eye protection when mixing; and
- Make sure you read and follow guidance on individual product Safety Data Sheet (SDS) before use.

Transportation/Storage of Explosives:

- The storage of explosives will be IAW all United States Army Corps of Engineers (USACE) and Bureau of Alcohol, Tobacco, Firearms, and Explosives (ATF) regulations;
- Explosive transportation will be IAW ATF regulations where the stricter rules will apply;
- Do not fight fires involving explosive material. Evacuate all personnel to a safe location and secure the area;
- Do not permit metal, except approved metal truck bodies, to contact explosive containers;
- Do not transport metal, flammable, or corrosive substances with explosives;
- Carefully load and unload explosives from vehicles. Never throw or drop explosives from the vehicle;
- Assure the load is blocked and braced to prevent it from movement and displacement;
- Do not drive vehicles containing explosives over public highways until all permits and certifications have been obtained from the state enforcement agencies;
- All routes must be approved in writing prior to transporting explosive materials over public highways;
- Licensed commercial carriers will conduct the shipment of explosive materials over public highways unless GSIP UXO personnel have been specifically licensed and certified to make the shipment;
- Never leave vehicle loaded with explosives unattended;
- Do not store blasting caps, detonators, or other items containing initiating explosives in the same box, container, or magazine with other explosives;
- Store explosive materials in military or ATF-approved magazines only. Ensure the magazines used for the storage comply with quantity distance requirements for the class of explosive material they contain. Reference documents include: TM 9-1325-200, ATF-Explosives Law and Regulation, ATF P 5400.7, and 49 CFR;
- Do not store spark-producing metal/tools in an explosive magazine;
- Do not permit smoking, matches, or any source of fire or flame within 50 feet of an explosive magazine;
- Do not allow leaves, grass, brush, or debris to accumulate within 50 feet of an explosive magazine; and

- Do not permit the discharge of firearms within 300 feet of an explosive magazine.

5.3 Explosive Disposal Procedures

This Explosive Disposal Operations SOP, with emergency procedures, points of contact, safety precautions and communications protocol, will be provided to all personnel and will be available at the project site. The following sections detail activities that will be performed and procedures that will be accomplished prior to conducting disposal operations in the designated MEC disposal locations.

5.3.1 Notification Procedures

The following agencies, as a minimum, must be notified by the USACE Representative or SUXOS prior to conducting a disposal by detonation operation. Agencies will be notified that detonation operations are planned and at what time they will commence. The agencies to be notified include:

- Local City (Civil Defense Agency/Police Department);
- Client Representative (if on site);
- Fire Department ([808] 723-7139);
 - Fire is a hazard during explosive disposal operations. Explosive disposal fire suppression practices, such as vegetation removal in sandbag barricade footprint, covering detonation priming cord with sand, shielding caps, and post disposal inspection for possible ignition points, shall be utilized. In instances of higher fire hazard, such as disposal of white phosphorus (WP) items, windy conditions or thick dry vegetation, additional precautions, such as MEC relocation to a safer area (if possible); vegetation removal and adding sand or dirt to the immediate area; water soaking of barricade/fire suppression protective works and immediate area, will be utilized. The Buried Explosion Module (BEM), which greatly reduces explosive disposal fire hazards, will be utilized whenever appropriate. Note, that the BEM is not authorized for WP munitions. Additional fire prevention and protection information can be found in the Fire Prevention Plan located in APP/SSHP (Appendix F of the project UFP-QAPP); and
 - Fire extinguishers, portable water containers and shovels will be on site to fight small fires. Evacuate the area if the fire approaches ordnance or explosives. Do not fight grass fires in areas where there may be ordnance or kick-outs.
- Police Department ([808] 723-8640);
- Fire Department ([808] 723-7139);
- FAA ([808] 840-6201) (if applicable);
- Hotels/Home/Property Owners (if applicable); and
- Emergency Medical Support.

- A dedicated UXO person conducting disposal operations will be trained in first aid and cardiopulmonary resuscitation (CPR); and
- A first aid kit, portable eyewash, and bloodborne pathogen kit will be on site at all times. Ensure the first aid kit contains dressings capable of treating the traumatic injuries that could result from an explosion. A list of current telephone contacts will be in the possession of the SUXOS.

5.3.2 Exclusion Zone

Prior to beginning disposal operation, an EZ will be established IAW the approved UFP-QAPP and ESS for the project. Reduction of approved EZ distances will require approval by the client and Department of Defense (DoD) component explosive safety personnel. During MEC operations, only essential project personnel are allowed in the EZ. If required, the SUXOS and UXOSO will coordinate with local authorities on road closures and facility evacuations in order to clear the EZ.

5.3.3 Explosive Disposal Operations

The following actions are to be accomplished during MEC disposal to assure a safe and efficient operation is conducted:

- All explosive disposal operations will be conducted IAW EM 385-1-97;
- Prior to commencing disposal operations the SUXOS/UXOSO will obtain a local weather report;
- Disposal operations will not be conducted if electrical storms are within 10 miles or during any severe weather conditions that would impact safety;
- The SUXOS or DS will ensure the appropriate calls have been completed before commencing the operation;
- Communication up the chain of command is paramount at all times;
- All non-essential personnel must evacuate to a safe area;
- A designated vehicle will be positioned near the shot location, with the keys on top of the driver's dash board and direction toward the emergency escape route;
- All shots will be dual primed when possible;
- The DS will direct placement of the initiating explosives. Charges will be placed in such a manner as to take full advantage of the effect of the initiating explosive and contribution from the explosive content of the MEC being detonated;
- Blasting caps/detonators will not be inserted into explosives materials that do not have a cap well without first making a hole with a non-sparking punch of proper size, or the pointed handle of a blasting crimper;

- The DS and one other fully qualified UXO person will remain at the shot location to affix the firing system to the initiating explosive material. All other personnel will move to the safe area at the firing point;
- The DS must maintain control of the means of initiation at all times until clearance is given to fire the shots; and
- If anything unusual or unplanned happens: **STOP!!** Regroup, come up with a plan, and make sure all team members understand their duties. Brief the SUXOS and the Safety Team on the plan and make sure they agree with it.

5.3.4 Site Preparation

The following actions are to be accomplished during explosive disposal site preparation:

- Build appropriate Engineering Control(s) if needed, either before operation begins or in conjunction with operation as appropriate;
- If tamping a shot with soil, use the current version of the DDESB BEM and appropriate Fragmentation Data Review Form(s) to calculate required burial depth;
- If no data is available in the Fragmentation Data Review Forms than the current version of the DDESB Primary Fragment Range Generic Equation Calculator (refer to TP-16) will be used calculating the net explosive weight (NEW) or the using the diameter of the munitions;
- If heavy equipment is required, ensure the operator has received proper training and certification on the type of heavy equipment;
- Review AHAs for the equipment and ensure all PPE and spill kit requirements are met;
- The spotter needs to be certified on the metal detector to clear the hole area at the surface and then every foot down during excavations;
- If sandbags are utilized, build the first layer of sandbag barricade IAW Amendment 2 to HNC-ED-CS-S-98-7 *Use of Sandbags for Mitigation of Fragmentation and Blast Effects Due to Intentional Detonation of Munitions* (USACE, 1998); and
- Build the rest of barricade IAW referenced publications after MEC item(s), donor explosive charge, and Nonel are in position.

5.3.5 Donor Explosives

The primary donor explosives used for MEC disposal may be boosters, plastic explosives, jet perforators, binary explosives, *etc.*

5.3.5.1 Boosters

The following procedures will be used with boosters:

- Insert the detonating cord into the detonator well;

- Insert the cord all the way through and back through to create a double strand ensuring the fit in the hole is tight. When using more than one booster, insert the detonating cord through each of the boosters' detonator wells and secure to keep them from sliding along the detonating cord; and
- Position the booster(s) on or next to the MEC as appropriate.

5.3.5.2 Plastic Explosives

Set up with blasting cap(s) or detonating cord lead(s) as per EM 385-1-97. Position the plastic explosives on or next to the MEC as applicable.

5.3.5.3 Jet Perforator

The following procedures will be used with jet perforators:

- Use the detonating cord clip provided to secure the detonating cord to the jet perforator;
- Place the jet perforator on the MEC item using tape or other suitable methods to prevent it from moving. Jet perforators for 60 millimeter MEC items and below will have at least a one inch air gap (edge to edge) between jet perforators placed on items, to prevent possible kick off; and
- For tamped shots, use a box or other suitable material to prevent soil from getting between the perforator and MEC item.

Jet perforators are the only initiating devices that are authorized to be used with sandbag and water mitigation.

5.3.5.4 Binary Explosives

Binary explosives are two part explosives that are not classified as an explosive until mixed. These can be procured in various configurations to include plastic tube containers and pliable packs in varying sizes depending on the required application. The binary should not be mixed until ready for use. After mixing, it can be primed as a cap sensitive explosive using Nonel, detonating cord or electric/non-electric blasting caps. It can be used as any high explosive with a velocity of detonation around 20,000 feet per second (fps). Once mixed is must be handled, transported, and stored as 1.1D explosives.

5.3.6 Initiation Systems

The following requirements and criteria apply to the four potential initiation systems used for MEC disposal:

- The primary firing system will be the RFD with electric caps;
- The secondary firing system will be the Shock Tube/Nonel (*e.g.*, in areas of increased electromagnetic radiation, or a high fire index, a Nonel system will be used when possible);

- The tertiary system will be a hard wire with an Electric Blasting Machine; and
- The quaternary system will be Non-Electric.

Regardless of the firing system used, permission to begin cap check out, priming, arming, and firing of the shot must be requested by the DS and be granted by the UXOSO.

5.3.6.1 Remote Firing Device System

An RFD firing system is one in which an encrypted radio signal is sent from a control unit to activate the firing mechanism on a receiver unit downrange. The downrange receiver uses electricity to fire the primary initiating element. An electric impulse supplied from the receiver power source travels through the lead wires to fire an electric blasting cap. When using shock tube/Nonel, the receiver sends an electric impulse to initiate the explosive train contained with the shock tube to fire the detonators. The chief components of the system are the control unit, receiver unit, and electric blasting caps or shock tube/Nonel. The preparation of the explosive charge for detonation by electrical means is called electric priming. Static electricity is an increased hazard when operating in an extremely cold climate, high wind, or area of low humidity. Care must be taken to reduce the possibility of premature activation of RFD and subsequent detonation of electric blasting caps and other electro-explosive devices. Refer to the Manufacturer's Operation Manual/RFD Condensed Instructions for the steps to take to prepare the RFD for disposal operations.

5.3.6.2 RFD Electric Caps

Refer to the Manufacturer's Operation Manual/RFD Condensed Instructions for steps to take to activate the RFD for disposal operations.

- Check the galvanometer or blaster's multimeter;
- If using electric caps, cut off a length of firing wire that will reach between the remote, the caps, and the charges;
- Conduct a continuity check of the firing wire with a galvanometer. Shunt the free ends of the wire to prevent an electric charge from building up in the firing wire;
- Fully extend the leg wires and have your backs to the caps. Ground yourself before breaking a shunt;
- Test for continuity of the caps one at a time using a galvanometer, touch one cap lead wire to one post and the other cap lead wire to the other post. If the galvanometer's needle deflects slightly less than it did when the instrument was tested, the blasting cap is satisfactory; if not the cap is defective and should be disposed of on the detonation. Note, if the battery is fresh, the galvanometer should read at least half scale when the instrument is tested and when a good blasting cap is tested. Test the second cap in the same manner;
- Next, hook the caps in parallel by twisting the same color wire from one cap to the same color wire from the other cap. Retest the connection for continuity. After the test, insert

one set of the same colored wires into one on the electrical terminals on the side of the remote, then repeat the procedure for the other set wires. This action shunted the caps to each other and hooked them up to the power source;

- Request permission to prime from the UXOSO; and
- After permission is granted, retrieve the electric caps from the barricade, prime the shot by taping the caps to the detonation cord, report the shot is primed and return to a safe area.

5.3.6.3 RFD Shock Tube with Caps (i.e, Nonel)

Refer to the Manufacturer's Operation Manual/RFD Condensed Instructions for steps to take to activate the RFD or SureFire for disposal operations.

The high reliability of shock tube blasting is due to the fact that all of the components are sealed and unlike standard non-electric priming components, cannot be easily degraded by moisture.

Cutting the shock tube makes the open end vulnerable to moisture. Care should be taken to keep moisture from the cut end of the shock tube. If a pre-capped shock tube is not utilized, use the following procedures to cut and splice the shock tube:

- Use a shock tube cutter or a sharp knife to squarely cut (90 degree angle) approximately 12 inches from a new roll or the cut off end of a partial roll;
- Loosely tie the two shock tube ends to be spliced together in a SQUARE KNOT. Leave at least two inches free at the end of each shock tube beyond the knot;
- Pull the shock tube lightly to tighten the knot, but not so tight as to significantly deform the shock tube in the knot;
- Use only the splicing tubes provided to make splices. Taping the two cut ends of the shock tube together does not make a reliable splice;
- Push one of the free shock tubes, to be spliced, firmly into one of the pre-cut splicing tubes at least 1/4 inch;
- Push the other shock tube end firmly into the other end of the splicing tube at least 1/4 inch. Attempt to push the two ends up against each other or get as close as possible;
- Secure the splice with electrician's tape;
- Each additional splice in the shock tube reduces the reliability of the priming system. Minimize the number of splices in a shock tube line to as few as possible;
- Spool out the desired length of shock tube and cut off squarely with a sharp knife or razor blade;
- Secure the shock tube remaining on the spool by tying a tight overhand knot in the loose end;

- Protect the open end of the shock tube by sealing it with the end caps provided or with electrician's tape;
- Attach an initiator to the free end of the shock tube that is spliced into the blasting cap. If a separate blasting cap or detonating cord is used to actuate the shock tube, tie a tight overhand knot in this end.
- Lay out required length of shock tube (trunk line) from the explosive disposal area back to the firing point;
- Attach an EZTL 30 bunch block (or equivalent) using the supplied splicing tube to the lead line at the explosive disposal site. Secure the bunch block or immobilize with sandbags. Run additional lead line(s) from the bunch block to the MEC; and
- Only attach a maximum of six additional leads per bunch block. Use additional bunch blocks, if necessary.

5.3.6.4 *Electric Blasting Machine System*

An electric firing system is one in which electricity is used to fire the primary initiating element. An electric impulse supplied from a power source, usually an electric blasting machine, travels through the firing wire and cap lead wires to fire an electric blasting cap. The chief components of the system are the electric blasting cap/electric squibs, firing wire, and the blasting machine. The preparation of the explosive charge for detonation by electrical means is called electric priming. Static electricity is an increased hazard when operating in an extremely cold climate, high wind, or area of low humidity. Care must be taken to reduce the possibility of premature detonation of electric blasting caps and other electro-explosive devices.

The following steps will be taken to prepare the Electronic Blasting Machine for disposal operations:

- Perform pre-operational checks as per instructions on the blasting machine;
- Lay out firing wire;
- Conduct a continuity check of the firing wire with a galvanometer. Shunt the free ends of the wire to prevent an electric charge from building up in the firing wire;
- Test each blasting cap with a galvanometer 50 feet downward of other explosives;
- Place blasting caps in a hole, behind a barricade or under a sandbag before removing the shunt and testing for continuity;
- Fully extend the leg wires and ensure the cap is pointing away from the person conducting the continuity test;
- Secure the leg wires to prevent the cap from moving during the test;
- Use only a special silver-chloride dry cell battery in testing the galvanometer. Other types of batteries may provide sufficient voltage to fire the blasting cap;

- Upon completion of testing, re-shunt the leg wires. The wires will remain shunted until ready to connect to the firing circuit;
- For dual priming connect blasting caps in a parallel circuit to the firing wire; and
- Retrieve caps from the barricade, prime the shot, and return to a safe area.

5.3.6.5 Firing the Electric Blasting Machine

The following steps will be taken to fire the Electric Blasting Machine:

- The DS and UXOSO will verify that the EZ is clear and barricades are in place;
- The DS and UXOSO will give a “five-minute warning” on the horn siren and radio;
- The DS and UXOSO will give a “one-minute warning” on the horn siren and radio;
- If firing electric, check firing wire with a galvanometer;
- Connect the firing leads to the terminal posts of the blasting machine;
- The DS will give three loud “Fire-in-the-Hole” warnings;
- The UXOSO will give permission to fire the shot; and
- Depress and twist “blast handle” (keep depressed throughout sequence).

5.3.6.6 Non-electric System

Non-electric or time safety fuse firing procedures will be employed as a method of last resort for MEC disposal due to the lack of positive control of the operation. A non-electric system is one in which an explosive charge is prepared for detonation by means of a non-electric-blasting cap. The basic priming materials consist of a non-electric blasting cap, safety/time fuse, and an igniter. When activated, the igniter uses a primer to produce a flame. This flame is transferred to the safety/time fuse. The safety/time fuse transmits the flame from the igniter to the blasting cap. The blasting cap provides a shock adequate enough to detonate the explosives. If more than one charge must be detonated simultaneously, the non-electric system must be combined with the detonating cord to ensure simultaneous firing.

The following procedures are required when using a time/safety fuse:

- Note: Conduct this test at least 50 feet downwind from any explosives;
- Prior to each daily use, the burn rate for the time/safety fuse must be tested to ensure the accurate determination of the length of time/safety fuse needed to achieve the minimum burn time of five minutes needed to conduct explosive disposal operations;
- To ensure both ends of the time/safety fuse are moisture free, use detonation cord cutters to cut 6 inches off the end of the time/safety fuse roll, and place the 6 inch piece in the time/safety fuse container;
- If quantity allows, accurately measure and cut off a 6-foot long piece of the time/safety fuse from the roll;

- Attach a fuse igniter to the 6-foot section;
- In a safe location, free from combustibles and removed from explosive disposal materials and UXO/MEC, ignite the time/safety fuse, measure the burn time from the point of initiation to the “spit” at the end, and record the burn time in the explosive disposal log book;
- To measure the burn time, use a watch with a second hand or chronograph;
- To calculate the burn rate in seconds per foot, divide the total burn time (in seconds) by the length (in feet) of the test fuse; and
- When using a time/safety fuse for explosive disposal operations, the minimum amount of fuse to be used for each shot will be the amount needed to permit a minimum burn time of five minutes.

5.3.6.7 Preparation and Priming, Non-electric and Electric Caps, and Shot

Follow procedures listed in EM 385-1-97:

- When possible, attach a dual firing system to fire the charge;
- Do not use blasting caps underground, use detonating cords;
- Insert cap into the booster cap well and secure if necessary; and
- If caps are to be inserted into the explosive without a cap hole, use the punch end of the approved non-sparking crimpers to make the appropriate hole, if it can be done safely. Insert the cap into hole.

Detonating Cord can be used to run through boosters, C-4 blocks can be hasty whipped or double over hand knots can be molded inside of C-4 all IAW EM 385-1-97. Non-electric caps setups are then attached to the detonation cord to fire the charge.

5.3.7 Misfire Procedures

5.3.7.1 Misfire Procedures for the Remote Firing Device:

- If the RFD fails to fire, check the status of the remote by pushing the status button on the controller unit. If the ready status light comes on, rearm the unit and fire again (exceed two minute automatic disarm time);
- If the red arm indicator light is on, push the check battery voltage. If the voltage is below 12 volts, the unit will not send a fire signal;
- If the voltage is above 12 volts, move the controller 25 feet in a safe direction and rearm and the fire unit. Make two more attempts to fire. If the unit does not fire, push the disarm switch and turn the key to the off position and remove the key;
- The DS will declare misfire and start a one-hour wait time;

- Make the preparations to use a second remote or blasting machine, firing wire, and new electric caps;
- The DS must maintain control of the means of initiation at all times until clearance is given to fire the shots;
- Following expiration of the wait time and approval by the SUXOS and UXOSO to check the misfire, the DS and a safety observer will approach the shot and investigate the misfire cause. The SUXOS and UXOSO will be advised of the onsite appraisal;
- If no apparent reason can be found, the remote will be turned off and the key removed. Electric caps from the misfire will not be disturbed; and
- A new RFD or hard wire firing system will be set up and connected to the existing detonation cord leads using new electric caps. Work will be accomplished and the shot will be fired IAW this SOP.

5.3.7.2 *Misfire Procedures for the Surefire Shock Tube Starter:*

- Immediately disconnect the Surefire from the shock tube;
- Look at the Surefire Igniter Tip to make sure it is not clogged or broken;
- Function test the Surefire, look for a bright blue spark and listen for a crisp loud spark;
- If the starter is clogged, cut 3 feet of the shock tube and attach a different Shock Tube Igniter or fire using the RFD in shock tube mode. Try again cutting 3 feet of Shock Tube and fire again with different system;
- If unsuccessful, disconnect the firing system, the DS will declare a misfire and start a one-hour wait time;
- Wait 60 minutes from the last initiation attempt;
- Following expiration of the wait time and approval from the SUXOS/UXOSO to check the misfire, the DS and a safety observer will approach the shot and investigate the misfire cause. The SUXOS/UXOSO will be advised of onsite appraisal;
- If no apparent reason can be found, non-electric caps from the misfire will not be disturbed; and
- A new shock tube system will be set up and connected to existing detonation cord leads using new non-electric caps. Work will be accomplished and the shot will be fired IAW this SOP.

5.3.7.3 *Misfire Procedures for the Electric Blasting Machine:*

- If still unsuccessful, check the connections of the firing wires to the terminals and make three more attempts to fire;
- If unsuccessful, disconnect and shunt the firing leads;
- Wait 60 minutes from the last initiation attempt;

- After the wait time has elapsed, the DS and a safety observer will proceed down range to inspect the firing system;
- Disconnect the extension wires or cap “legs” from the receiver. Shunt the cap leg wires; and
- Set up new firing system.

5.3.7.4 *Misfire Procedures for Non-electric Shot:*

- Allow a minimum of 60 minutes to elapse after maximum delay predicted for any part of disposal shot has passed, before starting the investigation;
- When practical, insert a new fused blasting cap into the charge if this can be done without disturbing the old blasting cap. Or prime and place a new charge close enough to the original charge to ensure detonation of both; and
- If the shot is tamped, without disturbing the old blasting cap, attach a new fused blasting cap to the detonation cord coming out of the buried shot.

5.3.8 White Phosphorous

When WP or suspected WP MEC items are located the following procedural/safety requirements apply to disposal operations:

- The wind speed must be below 15 miles per hour (mph) to conduct WP disposal operations, if applicable;
- Ensure medical support personnel know they are supporting WP disposal operations and have WP first aid treatment materials on hand;
- See the SSHP AHA for MEC Disposal Activities for WP PPE and equipment requirements;
- In the field, irrigate WP wounds with water, pick out visible pieces of WP (with tweezers) and apply saline soaked dressing. Keep dressing wet until arrival of medical personnel;
- Water and sand will be readily available when disposing of suspected WP ordnance;
- WP filled ordnance will be Counter-Charged Bottom Centerline (CCBC) to disperse the WP in the air for complete combustion at a ratio of five pounds of explosive for every pound of WP using one pound boosters or equitant;
- Do not conduct WP disposal operations when the ambient temperature is above 95 degrees Fahrenheit;
- There can be no population, building, historic or environmental concerns at the shot site and the area must be able to withstand an unmitigated high order detonation;

- If necessary, implement fire control methods such as vegetation reduction using heavy equipment, brush cutters, chain saws, shovels, and picks; building berms, fire breaks, wetting down the area and local fire department involvement;
- Wait 30 minutes after all smoke has cleared before requesting permission to check the shot; and
- Care must be taken when returning to the disposal site after detonation to ensure that all WP was consumed.

In areas where the fire hazard is low, blow-in-place (BIP) operations may be conducted if the above concerns have been addressed. If the item cannot be BIP where found, but is deemed safe to move by the SUXOS and UXOSO, it will be transported to a more suitable disposal area. During transportation it will be submerged in water or covered in wet sand. If operations are delayed and the USACE Ordnance and Explosives Safety Specialist (OESS) deems it necessary, the MEC will be guarded until BIP operations can resume.

5.3.9 Post Explosive Disposal Procedures

After each disposal event, the following wait times will be observed:

- A minimum of five minutes after single shots or after a series of shots that can be counted; and
- Wait a minimum of 60 minutes after multiple shots that could not be counted.

The DS and one other UXO technician will then return to the detonation site and check the results of the shot. If the procedure was successful, the DS will notify the SUXOS, UXOSO, or UXOQCS to verify the shot hole has been cleared then call in additional personnel to clean up the site. UXO personnel will conduct a visual sweep of the detonation site and the immediate area to gather fragments and explosive residue, if present:

- Explosive residue will be collected and detonated;
- Metal fragments will be examined to ensure complete consumption of explosive material;
- Intact MEC items that failed to detonate will be disposed of on the next shot;
- After the area is determined to be clear by the DS, he/she will notify the SUXOS, UXOSO, or UXOQCS to verify the shot hole has been cleared and after the second inspection has been completed the “All Clear” will be given;
- The SUXOS or UXOSO will notify all activities that the disposal operation is complete per the SOP; and
- Munitions debris will be managed IAW EM 385-1-97 and SOP UXO-03.

Section 6 Documentation

6.1 List of Forms

For explosive disposal operations, the SUXOS or the DS will, at a minimum, complete the following:

- Initial Receipt of Explosives Memo for Record;
- Magazine Data Cards (*not applicable for this project since explosives will be stored/maintained by an explosive vendor*);
- Demo Operations Checklist;
- Explosive Disposal Team Logbook;
- MEC Photos (photographs will be taken of each MEC item disposed);
- Disposal Team Daily Journal;
- MEC Accountability Log;
- Explosives Manifests;
- Motor Vehicle Inspection (Transporting Hazardous Materials) DD Form 626; and
- Report of Theft or Loss – Explosive Materials (ATF Form 5400).

6.2 Initial Receipt of Explosives Memo for Record

Upon receipt of donor materials, an inventory will be conducted to ascertain the correct type and serviceable condition.

A copy of the invoice(s) for the incoming donor materials will be kept in the onsite donor materials accountability file. Upon receipt, a separate memorandum will be prepared and retained on site with the following information:

- Date of acquisition;
- Name of manufacturer or brand name;
- Manufacturer marks of identification;
- Quantity;
- Description; and
- Name, address, and license number of the persons from whom the explosive materials are received.

If during the initial receipt inventory a discrepancy is found between the quantity listed on the invoice and the quantity being delivered, the quantity received will be annotated on the invoice. The DS will notify the supplier of any discrepancy as soon as possible. The PM will be notified and provided a copy of the memorandum and a copy of the invoice.

6.3 Magazine Data Cards

Magazine Data Cards are not applicable for this project since explosives will be stored/maintained by an explosive vendor. The text in this section is applicable for projects where a magazine is sited for a project.

Upon receipt of donor materials, two Magazine Data Cards (MDCs) will be completed. One copy will be kept in the magazine with the materials and one copy will be kept in the onsite project office in the donor accountability file. Guidelines for filling out each field on the form are provided below:

- **Nomenclature** - Nomenclature of the item;
- **Manufacturer/Brand Name** - Manufacturer or Brand Name;
- **Manufacturer's ID No.** - Manufacturer's identification Number;
- **Date** - Enter the date the action is being completed;
- **Action Taken:**
 - **INT REC** - Initial receipt from shipper;
 - **ISSUE** - Issued for use;
 - **RTS** - Returned to Stock;
 - **WMI/INV** - Weekly magazine inspection & explosive inventory;
 - **ATF A Inv** - ATF annual required inventory (last Inv of Sept);
 - **BCF** - Balance carried forward; and
 - **BBF** - Balance brought forward.
- **QTY Rec** - Enter the number of items received from shipper or returned to stock;
- **QTY Issued** - Enter number of items issued for use;
- **BAL** - To be completed for each transaction;
- **Print Name** - Print name of the individuals completing the transaction; and
- **Signature** - Signature of the individuals completing the transaction.

*Note, the last row on the form should contain the entry **BALANCE CARRIED FORWARD** and the balance. The first row on a new form should contain the entry **BALANCE BROUGHT FORWARD** and the balance.*

6.4 Demo Operations Checklist

A Demo Operations Checklist (Attachment 2) will be completed for each explosive disposal operation. The checklist consists of a series of questions, for which either “Yes,” “No,” or “N/A” will be selected. The checklist will be signed by the UXOSO and the DS to indicate that he/she has made the inspection/performed the tasks as listed.

6.5 Explosive Disposal Team Logbook

An Explosive Disposal Team Logbook will be maintained by the Demolition Team to document daily events. Refer to SOP G-1 *Field Documentation* for field logbook procedures.

6.6 MEC Photos

Every confirmed or suspected MEC item encountered at the project site will be identified using a unique numerical identifier, such as 0001. Photographs of confirmed or suspected MEC items will be taken for documentation purposes. A white board with an item for scale positioned beside the UXO, with the date, UXO Team number, UXO description, grid number, and Global Positioning System (GPS) location written with a white board erasable felt tip pen, will be placed adjacent to the item. The photographer will know that these photographs will be utilized in the final report; thus, a focused, well-thought out photograph is necessary.

6.7 Disposal Team Daily Journal

An entry in the Disposal Team Daily Journal (Attachment 3) will be completed for each explosive disposal operation. Guidelines for filling out each field on the form are provided below:

- **Date** - Date the disposal occurred;
- **Location** - Project location;
- **Contract** - Project contract number;
- **Supervisor** - Name of the DS;
- **Explosives Drawn** - Provide the quantities that were drawn from the magazine of each of the following items:
 - Detonators Assemblies Non-electric (each);
 - Shock Tube (feet);
 - Electric Caps (each);
 - Boosters (each);
 - Jet Perforators (each); and
 - Detonating Cord (feet).

- **Explosives Expended** - Provide the quantities that were expended of each of the items listed under Explosives Drawn;
- **Explosives Returned** - Provide the quantities that were returned to the magazine of each of the items listed under Explosives Drawn;
- **Signature** - Signature the of person who “certify that these explosives were expended for demilitarizing ordnance”;
- **Item Location** - Provide the grid number that the item was found;
- **Item #** - Provide the MEC Item number (*e.g.*, 0001);
- **Nomenclature** - Provide the MEC type;
- **Qty** - Provide the quantity found;
- **Comments/** - Provide comments on the item (*e.g.*, For Disposal);
- **Comments** - Provide any additional comments;
- **Item North/East Coordinates** - Provide the coordinates the item was found; and
- **Signature** -Demolition Supervisor.

6.8 *MEC Accountability Log*

A detailed accounting of all confirmed or suspected UXO or MEC items encountered during the MEC removal action will be accomplished. The MEC Accountability Log (Attachment 3) will be completed on each confirmed or suspected MEC item encountered. This accounting will include:

- Identification number of the MEC item (a unique item number [*e.g.*, 0001]);
- Type, condition, and grid location (GPS coordinates);
- Nomenclature;
- Fuze description;
- Fuze condition;
- Alignment (the longitudinal axis orientation of the item);
- Placement (the location with respect to ground surface);
- Additional comments, if required; and
- Date and recorder of log.

6.9 *Explosives Manifests*

An Explosives Manifest (Attachment 3) will be filled out every time explosives are being transported. Guidelines in filling out the form are provided below:

- **No. of Unit & Container Type:** BoxHM: Hazard Material – leave blank;
- **Basic Description** - Add United Nation (UN) number, Proper Shipping Name, Hazard Class (*i.e.*, 1.1, or 1.4) and Package Group (PGII);
- **Net Explosive Mass (NEM)** - Add the amount in pounds (lbs);
- **Total Quantity Issue** - Amount removed from the magazine;
- **The second set of boxes is the same as above only this is for returning explosives back to storage;**
- **Special Instructions** - Add any comments or special instructions;
- **24 Hr. Notification Contacts** - Add the SUXOS and DS and include the Emergency Response Guide – Guide 112 and Guide 114;
- **Comments** - Add any comments including route to the magazine;
- **Print Name** - Name of the Blaster in Charge;
- **Signature** - Signature of the Blaster in Charge;
- **COF #** - Add Blaster License; and
- **Expiration Date** - Expiration date of Blaster’s License.

6.10 *Motor Vehicle Inspection (Transporting Hazardous Materials) DD Form 626*

Motor Vehicle Inspection DD Form 626 dated October 2011 (Attachment 3) will be filled out any time explosives are being transported. Guidelines for filling out each field on the form are provided below:

1. **Bill of Lading/Transportation Control Number** - Company generated number for tracking;
2. **Carrier/Government Organization** - Companies name;
3. **Date/Time of Inspection** - Current date and time;
4. **Location of Inspection** - Location of where the inspection took place;
5. **Operator(s) Name(s)** - Name(s) of the vehicle operator;
6. **Operator(s) License Number(s)** - Driver’s license number;
7. **Medical Examiner’s Certificate** - Expiration date of certificate;
8. For the following items check all that apply:
 - a. **HAZMAT Endorsement;**

- b. **Valid Lease;**
 - c. **Route Plan;**
 - d. **ERG or Equivalent Commercial (Yes or No);**
 - e. **Driver's Vehicle Inspection Report; and**
 - f. **Copy of 49 CFR Part 397.**
9. **CSVA Decal Displayed on Commercial Equipment**, check all that apply:
- a. **Truck/Tractor; and**
 - b. **Trailer.**
10. **Type of Vehicle(s)** - List vehicle that will carry explosives;
11. **Vehicle Number(s)** - Add the VN number;
12. **Part Inspected** - Check all that apply on whether the vehicle is Satisfactory (SAT) or Unsatisfactory (UNSAT):
- a. **Spare Electrical Fuses;**
 - b. **Horn Operative;**
 - c. **Steering System;**
 - d. **Windshield/Wipers;**
 - e. **Mirrors;**
 - f. **Warning Equipment;**
 - g. **Fire Extinguisher;**
 - h. **Electrical Wiring;**
 - i. **Lights and Reflectors;**
 - j. **Fuel System;**
 - k. **Exhaust System;**
 - l. **Brake System;**
 - m. **Suspension;**
 - n. **Coupling Devices;**
 - o. **Cargo Space;**
 - p. **Landing Gear;**
 - q. **Tires, Wheels, Rims;**
 - r. **Tailgate/Doors;**
 - s. **Tarpaulin; and**
 - t. **Other (specify).**

- 13. **Inspection Results** - Check Accepted or Rejected;
- 14. **Satellite Motor Surveillance System** - Our vehicles will always be checked **rejected**;
- 15. **Remarks** - Add any remarks;
- 16. **Inspector Signature (Origin)** - Signature of the inspector;
- 17. **Inspector Signature (Destination)** - Signature of the inspector;
- 18. **Loaded IAW Applicable Segregation Table of 49 CFR** - Check SAT or UNSAT;
- 19. **Load Properly Secured to Prevent Movement** - Check SAT or UNSAT;
- 20. **Seals Applied** - Check N/A;
- 21. **Proper Placards Applied** - Check SAT or UNSAT;
- 22. **Shipping Papers/DD Form 2890 for Government Vehicle Shipments** - Check SAT or UNSAT;
- 23. **Copy of DD Form 626 for Driver** - Check SAT or UNSAT;
- 24. **Shipped Under DOT Special Permit 868** - Check N/A;
- 25. **Inspector Signature (Origin)** - Signature of the inspector;
- 26. **Driver(s) Signature (Origin)** - Signature of the driver;
- 27. **Inspector Signature (Destination)** - Signature of the inspector; and
- 28. **Driver(s) Signature (Destination)** - Signature of the Driver.

6.11 Report of Theft or Loss – Explosive Materials (ATF Form 5400)

A Report of Theft or Loss-Explosive Materials form (Attachment 3) will be completed and submitted to ATF in the case of theft or loss of explosive materials. Questions regarding the completion of the form should be referred to the U.S. Bomb Data Center toll free at 1-800-461-8841.

Section 7 References

27 CFR, Part 555. *Commerce in Explosives*.

49 CFR. *Transportation*.

ATF, 2012. ATF Publication 5400.7, *Explosives Laws and Regulations*.

DDESB, 2012. TP-16. *Methodologies for Calculating Primary Fragment Characteristics*. 2 August.

DDESB, 2015. TP-18. *Minimum Qualifications for Personnel Conducting Munitions and Explosives of Concern-Related Activities*. 1 September.

Department of the Army, 1966. *Bombs and Bomb Components*. April.

_____, 2011. 6055.09-M, *Ammunition and Explosive Safety Standards: Quantity-Distance Criteria for Intentional Burns or Detonations, Energetic Liquids and Underground Storage*. Volume 5. September.

Service Directives

State and Local Directives

USACE, 1998. HNC-ED-CS-S-98-7. *Use of Sandbags for Mitigation of Fragmentation and Blast Effects Due to Intentional Detonation of Munitions*; Safety Advisory, 12 July 2010; Clarification Memorandum, 29 November 2010; Amendment 1 February 2011, Clarification Memorandum May 22, 2014.

_____, updated 2010. *Procedures for Demolition of Multiple Rounds (Consolidated Shots) on Ordnance and Explosives (OE) Sites*.

_____, 2013. EM 385-1-97. *Explosives - Safety and Health Requirements Manual*. 17 May.

Attachment 1
Demo Equipment Inventory

This Page Intentionally Left Blank

DEMO EQUIPMENT INVENTORY

Truck Bed			
Wooden Chocks	1 set		
Water Jugs Drinking 5 gal	1 ea		
Bucket 5 gal	2 ea		
Shovel long handle	2 ea		
Ice Chest	1 ea		
UXO Box w/3 sand bags	1 ea		
Water Jugs 5 gal (WP)	2 ea		
Fire Extinguisher Model 2 A 10 B C (min) w/truck mounting bracket	2 ea		
Explorer SE	1 ea		Brain: Small Head:
ATF Explosive Day Box	1 ea		
IME Day Box	1 ea		
Backpack (set-up to haul 155mm Projos)	1 ea		
Rake long handle	2 ea		
Pick	1 ea		
Dig Tools	2 ea		
Diamond Plated Fuze Box w/bungee cords	1 ea		
Heavy Equip Spill Kit	1 ea		If required

Truck Cab			
Tire Changing Equipment	1 ea		Jack Lug Wrench extensions
First Aid Kit	1 ea		
Trauma Kit	1 ea		
Blood Pathogen Kit	1 ea		
Stretcher folding	1 ea		
Emergency Response Book	1 ea		
Radio Motorola Hand Held	2 ea		
1.1D & 1.4 Explosive Flip Placards	4 ea		
Explosive Transportation Log Book	1 ea		
Safety Triangle	1 st		
“EXPLOSIVES” Signage for Truck (4mag+1metal)	4 ea 1 ea		
“CONTAINS EXPLOSIVES HANDLE CAREFULLY” mag signs for day boxes	3 ea		
Fire Resistant Tarp Heavy Duty 84” x 75”	1 ea		Cover exp in bed of truck
Remote Firing Device	1 ea		
Magnetic Mount Antenna for RFD	1 ea		
Tire Pressure Gauge	1 ea		
Tire Depth Gauge	1 ea		
Spare Fuses Large & Small (assorted)	1 ea		
.50 cal ammo can	1 ea		
7.62 cal ammo can	1 ea		
Hand Dig Tools	2 ea		

DEMO EQUIPMENT INVENTORY

Admin / Tech Data Action Packer	1 ea		
Work Plan w/ applicable attachments	1 ea		
EOD General Demolition Procedures	1 ea		On memory stick
EOD General Safety Precautions	1 ea		On memory stick
Demo Book (Forms, OFB, Sandbag Corp Regs)	1 ea		Update MOFB ect Stick
Entire site Work plan	1 ea		On memory stick
Team Chief Guide	1 ea		Make after u get work plan
Notebook sm	1 ea		
Expanding File Folder	1 ea		
Expanding Wallet Folder	1 ea		
Pens	3 ea		In ammo can
Sharpie Black Marker	2 ea		In ammo can
Sharpie Silver Marker	2 ea		
Yellow Highlighter	1 ea		In ammo can
Clip Board	1 ea		
AA batteries	1 bx		
AAA batteries	6 ea		
C Cell batteries	8 ea		
9 Volt batteries	4 ea		
Ordnance ID Guide Book	1 ea		On memory Stick make cy
Frag Mitigation Guide Book DDESB Current	1 ea		On memory Stick make cy

PPE Action Packer			
Backpack Fire Extinguisher (Water Bladder)	2 ea		
Safety Glasses	2 pr		
Leather Work Gloves	2 pr		
Safety Cotton Vest Orange	2 ea		
Safety Hard Hat	2 ea		
Face Shield	2 ea		
Welder's Apron	2 ea		
Welder's Jacket	2 ea		
Welder's Gloves	2 ea		
Dust Masks	1 bx		
Quart Ziploc bags	10ea		
Gallon Ziploc bags	10ea		
Heavy Duty Garbage Bags (shot clean-up)	8 ea		
Ear Protection (foam)	12ea		
Walkie Talkie (Motorola) w/charger	4 ea		

DEMO EQUIPMENT INVENTORY

Demo Action Packer	1 ea		
Laser Distance Finder Bushnell	1 ea		
Bull horn/siren w/batteries (8ea "C" cells)	1 ea		
Thunder Bolt Storm Detector w/case	1 ea		
Jumper Cables	1 ea		
Tow Rope	1 ea		
Duct Tape	2 ro		
Electrical Tape	3 ro		
Plastic Bags (1 qt & 1 gal)	6 ea		
18 awg Firing Wire on Reel	1 ro		(500 feet)
18 awg Firing Wire	1 ro		(500 feet)
Power Inverter Large 410 Watt	1 ea		
Power Inverter Small 140 Watt	1 ea		
Tarp Fire Resistant Heavy Duty 84" X 75"	1 ea		cover explosive in truck bed
Tape Measure 300 Foot	1 ea		
Tape Measure 30 Foot	1 ea		
Tie Down Straps	8 ea		
Rags (cushion material for explosives) & Pack	6 ea		
Bungee Cords	1 bx		
Recon Bag	1 ea		*Contents listed separately
Demo Bag	1 ea		*Contents listed separately

DEMO EQUIPMENT INVENTORY

Recon Cloth Briefcase	1 ea		
Digital Camera w/ case	1 ea		
Etrex GPS	1 ea		
White Board	1 ea		
Dry Eraser Marker Black	3 ea		
Sizing Stick 12 inch	1 ea		
Flash light Small	1 ea		
Flexible tape measure	1 ea		
Outside calipers 6 inch	1 ea		
Electrical Tape	1 ro		
Wire Brush	1 ea		
Common Screw Driver	1 ea		
Phillips Screw Driver	1 ea		
Magnify Lens	1 ea		
Protractor	1 ea		
Hand Held Anemometer	1 ea		
Small Note Book	1 ea		
Ink Pens	3 ea		
Mirror	1 ea		
Non Magnetic Tool	1 ea		

DEMO Bag	1 ea		
Electric Blasting Machine 10 Cap (Crank)	1 ea		
Blaster's Ohm meter	1 ea		
Surefire Shock Tubing Starter	1 ea		
Tape Measure (30 Feet)	1 ea		
Det Cord Cutters Large	2 ea		
Det Cord Cutters Mini	1 ea		
Crimpers	1 pr		
Wire Strippers	1 ea		
Phillips # 1 Screw Driver 6 inch	1 ea		
Common Screw Driver 6 inch	1 ea		
Side cutters	1 pr		
Needle nose pliers 4 in	1 pr		
Duct Tape	1 ro		
Electrical Tape	3 ro		
"Y" Connectors	6 ea		
Shock Tube Connectors	1 bg		
Det Cord Connectors for 80 grain	100ea		
Zip Ties Small & Large	1 bg		
Letterman Knife	1 ea		

Attachment 2
Demo Operations Checklist

This Page Intentionally Left Blank

DEMO OPERATIONS CHECKLIST

Date: _____

(Circle appropriate answer)

- | | | | |
|--|-----|----|-----|
| 1. Are weather conditions appropriate for demo operations: | | | |
| a. Was the weather forecast checked in the morning for possible adverse conditions? | Yes | No | |
| b. If possible adverse conditions, was lightning detector turned on? | Yes | No | N/A |
| c. If lightning was approaching near/within ten miles of site, were operations halted, explosives secured and personnel evacuated? | Yes | No | N/A |
| d. Was there at least a 3000 foot visible ceiling for aircraft? | Yes | No | |
| 2. Were the following safety briefings conducted: | | | |
| a. Tail Gate | Yes | No | |
| b. General Demo | Yes | No | |
| c. Remote Control Device or Surefire | Yes | No | |
| d. UXO-specific | Yes | No | |
| 3. Was the Remote Firing Device Bench tested? | Yes | No | N/A |
| 4. Were protective works constructed correctly? | | | |
| a. Six inches air gap between edge of ordnance and sandbags/plywood? | Yes | No | N/A |
| b. Correct sandbag height/width for the UXO being disposed of? | Yes | No | N/A |
| c. BEM calculations checked? | Yes | No | N/A |
| 5. Has USACE OE Safety Specialist made all the following required demo notifications? | | | |
| a. Civil Defense | Yes | No | |
| b. Police | Yes | No | |
| c. Fire Department | Yes | No | |
| 6. Has SUXOS or Demo made the required CFA notification? | Yes | No | N/A |
| 7. Has a cordon been established and are all guards posted? | Yes | No | |
| 8. Was a five minute wait time observed before checking each shot? | Yes | No | N/A |
| 10. Was the shot cleared by a Tech III using a safety back-up? | Yes | No | |
| 11. In the event of a post-shot WP hazard: | | | N/A |
| a. After all smoke has cleared, was a 30 minute wait time observed before checking the shot? | Yes | No | |
| b. Were face shields, protective apron with long sleeves and gloves worn by personnel checking shot? | Yes | No | |
| c. Did personnel approach site from an upwind direction? | Yes | No | |

UXOSO

Demo Supervisor

This Page Intentionally Left Blank

Attachment 3
Forms

This Page Intentionally Left Blank

List of forms included in this attachment:

Explosive Disposal Forms:

- Disposal Team Daily Journal;
- MEC Accountability Log;
- Motor Vehicle Inspection (Transporting Hazardous Material) (DD Form 626);
- Explosive Manifest; and
- Report of Theft or Loss – Explosive Materials (ATF Form 5400).

Note, the forms provided in the Attachment are the formats planned for use, but these forms may need to be altered to accommodate project specific elements during project execution.

This Page Intentionally Left Blank



Disposal Team Daily Journal

DATE:	LOCATION:	CONTRACT:
SUPERVISOR:		

	DETONATORS ASSEMBLIES NONELECTRIC	SHOCK TUBE	ELECTRIC CAPS	BOOSTERS	JET PERFORATORS	DETONATING CORD
EXPLOSIVES DRAWN	EA	FT	EA	EA	EA	FT
EXPLOSIVES EXPENDED	EA	FT	EA	EA	EA	FT
EXPLOSIVES RETURNED	EA	FT	EA	EA	EA	FT

I certify that these explosives were expended for demilitarizing ordnance. Signature: _____

ITEM LOCATION	ITEM#	NOMENCLATURE	QTY	COMMENTS/TASK ORDER
			EA	FOR DISPOSAL
			EA	FOR DISPOSAL
			EA	FOR DISPOSAL
			EA	FOR DISPOSAL
			EA	FOR DISPOSAL
			EA	FOR DISPOSAL
			EA	FOR DISPOSAL
			EA	FOR DISPOSAL
			EA	FOR DISPOSAL
			EA	FOR DISPOSAL
			EA	FOR DISPOSAL
			EA	FOR DISPOSAL
			EA	FOR DISPOSAL
			EA	FOR DISPOSAL
			EA	FOR DISPOSAL
			EA	FOR DISPOSAL

COMMENTS: _____

**ITEM NORTH/EAST
 COORDINATES:** _____

Signature: _____

This Page Intentionally Left Blank



MEC ACCOUNTABILITY LOG

Location:	Date Started:	Scrap Lbs:
UXO Team:		
Supervisor's Name:	Date Finished:	Page _____ of _____ Pages

ID #	TRANSECT#	EASTING NORTHERN	NOMENCLATURE	FUZE DESCRIPTION	FUZE CONDITION	ALIGN MENT	PLACE MENT	DATE	COMMENTS

This Page Intentionally Left Blank

MOTOR VEHICLE INSPECTION (TRANSPORTING HAZARDOUS MATERIALS)

(Read Instructions before completing this form.)

This form applies to all vehicles which must be marked or placarded in accordance with Title 49 CFR.

1. BILL OF LADING/TRANSPORTATION CONTROL NUMBER

SECTION I - DOCUMENTATION

ORIGIN
a.

DESTINATION
b.

2. CARRIER/GOVERNMENT ORGANIZATION

3. DATE/TIME OF INSPECTION

4. LOCATION OF INSPECTION

5. OPERATOR(S) NAME(S)

6. OPERATOR(S) LICENSE NUMBER(S)

7. MEDICAL EXAMINER'S CERTIFICATE*

8. *(X if satisfactory at origin)*

9. CVSA DECAL DISPLAYED ON COMMERCIAL EQUIPMENT*

a. HAZMAT ENDORSEMENT

d. ERG OR EQUIVALENT COMMERCIAL:

YES NO

YES NO

b. VALID LEASE*

e. DRIVER'S VEHICLE INSPECTION REPORT*

a. TRUCK/TRACTOR

c. ROUTE PLAN

f. COPY OF 49 CFR PART 397

b. TRAILER

SECTION II - MECHANICAL INSPECTION

All items shall be checked on empty equipment prior to loading. Items with an asterisk shall be checked on all incoming loaded equipment.

10. TYPE OF VEHICLE(S)

11. VEHICLE NUMBER(S)

12. PART INSPECTED
(X as applicable)

ORIGIN
(1)

DESTINATION
(2)

ORIGIN
(1)

DESTINATION
(2)

COMMENTS
(3)

SAT UNSAT

SAT UNSAT

SAT UNSAT

SAT UNSAT

a. SPARE ELECTRICAL FUSES

k. EXHAUST SYSTEM

b. HORN OPERATIVE

l. BRAKE SYSTEM*

c. STEERING SYSTEM

m. SUSPENSION

d. WINDSHIELD/WIPERS

n. COUPLING DEVICES

Item (N) N/A

e. MIRRORS

o. CARGO SPACE

f. WARNING EQUIPMENT

p. LANDING GEAR*

Item (P) N/A

g. FIRE EXTINGUISHER*

q. TIRES, WHEELS, RIMS

h. ELECTRICAL WIRING

r. TAILGATE/DOORS*

i. LIGHTS AND REFLECTORS

s. TARPULIN*

Item (S) N/A

j. FUEL SYSTEM*

t. OTHER *(Specify)*

13. INSPECTION RESULTS *(X one)* ACCEPTED

REJECTED

(If rejected give reason under "Remarks". Equipment will be approved if deficiencies are corrected prior to loading.)

14. SATELLITE MOTOR SURVEILLANCE SYSTEM: *(X one)* ACCEPTED

REJECTED

15. REMARKS

16. INSPECTOR SIGNATURE *(Origin)*

17. INSPECTOR SIGNATURE *(Destination)*

SECTION III - POST LOADING INSPECTION

This section applies to Commercial and Government/Military vehicles. All items will be checked prior to release of loaded equipment and shall be checked on all incoming loaded equipment.

ORIGIN
(1)

DESTINATION
(2)

COMMENTS
(3)

SAT UNSAT

SAT UNSAT

18. LOADED IAW APPLICABLE SEGREGATION/COMPATIBILITY TABLE OF 49 CFR

19. LOAD PROPERLY SECURED TO PREVENT MOVEMENT

20. SEALS APPLIED TO CLOSED VEHICLE; TARPULIN APPLIED ON OPEN EQUIPMENT

21. PROPER PLACARDS APPLIED

I

22. SHIPPING PAPERS/DD FORM 2890 FOR GOVERNMENT VEHICLE SHIPMENTS

23. COPY OF DD FORM 626 FOR DRIVER

24. SHIPPED UNDER DOT SPECIAL PERMIT 868

25. INSPECTOR SIGNATURE *(Origin)*

26. DRIVER(S) SIGNATURE *(Origin)*

27. INSPECTOR SIGNATURE *(Destination)*

28. DRIVER(S) SIGNATURE *(Destination)*

INSTRUCTIONS

SECTION I - DOCUMENTATION

General Instructions.

All items (2 through 9) will be checked at origin prior to loading. Items with an asterisk (*) apply to commercial operators or equipment only. Only Items 2 through 7 are required to be checked at destination.

Items 1 through 5. Self explanatory.

Item 6. Enter operator's Commercial Driver's License (CDL) number or Military OF-346 License Number. CDL and OF-346 must have the HAZMAT and other appropriate endorsements IAW 49 CFR 383.

Item 7. *Enter the expiration date listed on the Medical Examiner's Certificate.

Item 8.a. Hazardous Materials Certification. In accordance with applicable service regulations, ensure operator has been certified to transport hazardous materials. Check the expiration date on driver's HAZMAT Certification.

b. *Valid Lease. Shipper will ensure a copy of the appropriate contract or lease is carried in all leased vehicles and is available for inspection. (49 CFR 376.12 and 376.11(c)(2)).

c. Route Plan. Prior to loading any Hazard Class/Division 1.1, 1.2, or 1.3 (Explosives) for shipment, ensure that the operator possesses a written route plan in accordance with 49 CFR Part 397. Route Plan requirements for Hazard Class 7 (Radioactive) materials are found in 49 CFR 397.101.

d. Emergency Response Guidebook (ERG) or Equivalent. Commercial operators must be in possession of an ERG or equivalent document. Shipper will provide applicable ERG page(s) to military operators.

e. *Driver's Vehicle Inspection Report. Review the operator's Vehicle Inspection Report. Ensure that there are no defects listed on the report that would affect the safe operation of the vehicle.

f. Copy of 49 CFR Part 397. Operators are required by regulation to have in their possession a copy of 49 CFR Part 397 (Transportation of Hazardous Materials Driving and Parking Rules). If military operators do not possess this document, shipper will provide a copy to operator.

Item 9. *Commercial Vehicle Safety Alliance (CVSA) Decal. Check to see if equipment has a current CVSA decal and mark applicable box. Vehicles without CVSA, check documentation of the last vehicle periodic inspection and perform DD Form 626 inspection.

SECTION II - MECHANICAL INSPECTION

General Instructions.

All items (12.a. through 12.t.) will be checked on all incoming empty equipment prior to loading. All UNSATISFACTORY conditions must be corrected prior to loading. Items with an asterisk (*) shall be checked on all incoming loaded equipment. Unsatisfactory conditions that would affect the safe off-loading of the equipment must be corrected prior to unloading.

SECTION II (Continued)

Item 12.a. Spare Electrical Fuses. Check to ensure that at least one spare fuse for each type of installed fuse is carried on the vehicle as a spare or vehicle is equipped with an overload protection device (circuit breaker). (49 CFR 393.95)

b. Horn Operative. Ensure that horn is securely mounted and of sufficient volume to serve purpose. (49 CFR 393.81)

c. Steering System. The steering wheel shall be secure and must not have any spokes cracked through or missing. The steering column must be securely fastened. Universal joints shall not be worn, faulty or repaired by welding. The steering gear box shall not have loose or missing mounting bolts or cracks in the gear box mounting brackets. The pitman arm on the steering gear output shaft shall not be loose. Steering wheel shall turn freely through the limit of travel in both directions. All components of a power steering system must be in operating condition. No parts shall be loose or broken. Belts shall not be frayed, cracked or slipping. The power steering system shall not be leaking. (49 CFR 396 Appendix G)

d. Windshield/Wipers. Inspect to ensure that windshield is free from breaks, cracks or defects that would make operation of the vehicle unsafe; that the view of the driver is not obscured and that the windshield wipers are operational and wiper blades are in serviceable condition. Defroster must be operative when conditions require. (49 CFR 393.60, 393.78 and 393.79)

e. Mirrors. Every vehicle must be equipped with two rear vision mirrors located so as to reflect to the driver a view of the highway to the rear along both sides of the vehicle. Mirrors shall not be cracked or dirty. (49 CFR 393.80)

f. Warning Equipment. Equipment must include three bidirectional emergency reflective triangles that conform to the requirements of FMVSS No. 125. FLAME PRODUCING DEVICES ARE PROHIBITED. (49 CFR 393.95)

g. Fire Extinguisher. Military vehicles must be equipped with one serviceable fire extinguisher with an Underwriters Laboratories rating of 10 BC or more. (Commercial motor vehicles must be equipped with one serviceable 10 BC Fire Extinguisher). Fire extinguisher must be located so that it is readily accessible for use and securely mounted on the vehicle. The fire extinguisher must be designed, constructed and maintained to permit visual determination of whether it is fully charged. (49 CFR 393.95)

h. Electrical Wiring: Electrical wiring must be clean and properly secured. Insulation must not be frayed, cracked or otherwise in poor condition. There shall be no uninsulated wires, improper splices or connections. Wires and electrical fixtures inside the cargo area must be protected from the lading. (49 CFR 393.28)

INSTRUCTIONS

SECTION II (Continued)

i. Lights/Reflectors. (Head, tail, turn signal, brake, clearance, marker and identification lights, Emergency Flashers). Inspect to see that all lighting devices and reflectors required are operable, of proper color and properly mounted. Ensure that lights and reflectors are not obscured by dirt or grease or have broken lenses. High/Low beam switch must be operative. Emergency Flashers must be operative on both the front and rear of vehicle. (49 CFR 393.24, 25, and 26)

j. Fuel System. Inspect fuel tank and lines to ensure that they are in serviceable condition, free from leaks, or evidence of leakage and securely mounted. Ensure that fuel tank filler cap is not missing. Examine cap for defective gasket or plugged vent. Inspect filler necks to see that they are in completely serviceable condition and not leaking at joints. (49 CFR 393.83)

k. Exhaust System. Exhaust system shall discharge to the atmosphere at a location to the rear of the cab or if the exhaust projects above the cab, at a location near the rear of the cab. Exhaust system shall not be leaking at a point forward of or directly below the driver compartment. No part of the exhaust system shall be located where it will burn, char or damage electrical wiring, fuel system or any other part of the vehicle. No part of the exhaust system shall be temporarily repaired with wrap or patches. (49 CFR 393.83)

l. Brake System (to include hand brakes, parking brakes and Low Air Warning devices). Check to ensure that brakes are operational and properly adjusted. Check for audible air leaks around air brake components and air lines. Check for fluid leaks, cracked or damaged lines in hydraulic brake systems. Ensure that parking brake is operational and properly adjusted. Low Air Warning devices must be operative. (49 CFR 393.40, 41, 42, 43, 44, 45, 47, 48, 49, 50, 51, 52, 53, and 55)

m. Suspension. Inspect for indications of misaligned, shifted or cracked springs, loosened shackles, missing bolts, spring hangers unsecured at frame and cracked or loose U-bolts. Inspect for any unsecured axle positioning parts, and sign of axle misalignment, broken torsion bar springs (if so equipped). (49 CFR 393.207)

n. Coupling Devices (Inspect without uncoupling). Fifth Wheels: Inspect for unsecured mounting to frame or any missing or damaged parts. Inspect for any visible space between upper and lower fifth wheel plates. Ensure that the locking jaws are around the shank and not the head of the kingpin. Ensure that the release lever is seated properly and safety latch is engaged. Pintle Hook, Drawbar, Towbar Eye and Tongue and Safety Devices: Inspect for unsecured mounting, cracks, missing or ineffective fasteners (welded repairs to pintle hook is prohibited). Ensure safety devices (chains, hooks, cables) are in serviceable condition and properly attached. (49 CFR 393.70 and 71)

o. Cargo Space. Inspect to ensure that cargo space is clean and free from exposed bolts, nuts, screws, nails or inwardly projecting parts that could damage the lading. Check floor to ensure it is tight and free from holes. Floor shall not be permeated with oil or other substances. (49 CFR 393.84)

p. Landing Gear. Inspect to ensure that landing gear and assembly are in serviceable condition, correctly assembled, adequately lubricated and properly mounted.

SECTION II (Continued)

q. Tires, Wheels and Rims: Inspect to ensure that tires are properly inflated. Flat or leaking tires are unacceptable. Inspect tires for cuts, bruises, breaks and blisters. Tires with cuts that extend into the cord body are unacceptable. Thread depth shall not be less than: 4/32 inches for tires on a steering axle of a power unit, and 2/32 inches for all other tires. Mixing bias and radial on the steering axle is prohibited. Inspect wheels and rims for cracks, unseated locking rings, broken, loose, damaged or missing lug nuts or elongated stud holes. (49 CFR 393.75)

r. Tailgate/Doors. Inspect to see that all hinges are tight in body. Check for broken latches and safety chains. Doors must close securely. (49 CFR 177.835(h))

s. Tarpaulin. If shipment is made on open equipment, ensure that lading is properly covered with fire and water resistant tarpaulin. (49 CFR 177.835(h))

t. Other Unsatisfactory Condition. Note any other condition which would prohibit the vehicle from being loaded with hazardous materials.

Item 14. For AA&E and other shipments requiring satellite surveillance, ensure that the Satellite Motor Surveillance System is operable. The DTTS Message Display Unit, when operative, will display the signal "DTTS ON". The munitions carrier driver, when practical, will position the DTTS message display unit in a manner that allows the shipping inspector or other designated shipping personnel to observe the "DTTS ON" message without climbing aboard the cab of the motor vehicle.

SECTION III - POST LOADING INSPECTION

General Instructions.

All placarded quantities items will be checked prior to the release of loaded equipment. Shipment will not be released until deficiencies are corrected. All items will be checked on incoming loaded equipment. Deficiencies will be reported in accordance with applicable service regulations.

Item 18. Check to ensure shipment is loaded in accordance with 49 CFR Part 177.848 and the applicable Segregation or Compatibility Table of 49 CFR 177.848.

Item 19. Check to ensure the load is secured from movement in accordance with applicable service outload drawings.

Item 20. Check to ensure seal(s) have been applied to closed equipment; fire and water resistant tarpaulin applied on open equipment.

Item 21. Check to ensure each transport vehicle has been properly placarded in accordance with 49 CFR 172.504.

Item 22. Check to ensure operator has been provided shipping papers that comply with 49 CFR 172.201 and 202. For shipments transported by Government vehicle, shipping paper will be DD Form 2890.

Item 23. Ensure operator(s) sign DD Form 626, are given a copy and understand the hazards associated with the shipment.

Item 24. Applies to Commercial Shipments Only. If shipment is made under DOT Special Permit 868, ensure that shipping papers are properly annotated and copy of Special Permit 868 is with shipping papers.

Item 26. Ensure driver/operator signs DD Form 626 at origin.

Item 28. Ensure driver/operator signs DD Form 626 at destination.

This Page Intentionally Left Blank

EXAMPLE

64-1002 Mamalahoa Hwy
Kamuela, HI 96743
808-887-1131
9-HI-001-20-8G-00109



Explosives Manifest

NO. Of Units & Container Type	HM	Basic Description United Nation (UN) Number, Proper Shipping Name Hazard Class, Pack Group	Net Explosive Mass (NEM) in LBS	Total Quantity Issue
Box		UN0042; Boosters; 1.1D; PGII	LBS	EA
Box		UN0289; Cord, Detonating; 1.4D; PGII	LBS	FT
Box		UN0440; Charges, Shaped; 1.4D; PGII	LBS	EA
Box		UN0349; Articles Explosive N.O.S.; 1.4S; PGII; (Shock Tube)	LBS	FT
Box		UN0255; Detonator, Electric; 1.4B; PGII	LBS	EA
Box		UN0361; Detonator, Assemblies, Non-Electric; 1.4B; PGII	LBS	EA
Total NEM			LBS	

NO. Of Units & Container Type	HM	Basic Description United Nation (UN) Number, Proper Shipping Name Hazard Class, Pack Group	Net Explosive Mass (NEM) in LBS	Total Quantity Returned to Stock
Box		UN0042; Boosters; 1.1D; PGII	LBS	EA
Box		UN0289; Cord, Detonating; 1.4D; PGII	LBS	FT
Box		UN0440; Charges, Shaped; 1.4D; PGII	LBS	EA
Box		UN0349; Articles Explosive N.O.S.; 1.4S; PGII; (Shock Tube)	LBS	FT
Box		UN0255; Detonator, Electric; 1.4B; PGII	LBS	EA
Box		UN0361; Detonator, Assemblies, Non-Electric; 1.4B; PGII	LBS	EA
Total NEM			LBS	

<p>Special Instructions: Electric Detonators (UN 0255) and/or Non-Electric Detonators (UN 0361) are located in the RED IME day box. Boosters (UN0042), Detonating Cord (UN 0289), Shaped Charges (UN 0440), and/or Shock Tube (UN 0349) are located in the White day box.</p>	<p>Comments:</p>
<p style="color: red;">24 Hr. Emergency Contacts, Robert Reed (808)223-7618 or Dan Wolf (808)895-7815. ERG – Guide 112 and Guide 114</p>	<p>Route:</p>
<p>NEM Calculations: 1 ea Booster = 1 lb, 1ft 80grain det cord = .0114 lbs 1ea 19.5 gram shaped charge = .043 lbs 1ft shock tube = .000011 lbs 2ea elec caps = .0042 lbs 2ea non-elec caps = .0054 lbs</p>	<p>See appropriate Task Order _____ Route Map</p>
<p>This is to certify that the above named materials are properly classified, described, packaged, marked and labeled, and are in proper condition for transportation according to the applicable regulations of the Department of Transportation.</p>	
<p>Print Name: _____ Date: _____</p>	<p>COF# _____</p>
<p>Signature: _____</p>	<p>Expiration Date: _____</p>

This Page Intentionally Left Blank

Report of Theft or Loss-Explosive Materials**For ATF Use Only**

Date Received	Date E-Mailed to JSOC & Field Division	BATS ID
		Case Number

To Be Completed By Person Making Report

Upon discovery of any theft or loss of any of your explosive materials:

- First, contact ATF toll free at 1-800-461-8841 between 8:00 a.m. - 5:00 p.m. EST or after hours and weekends contact ATF at 1-800-800-3855 to report the theft or loss;
- Second, contact your local law enforcement office to report the theft or loss to obtain a police report; and
- Third, complete this form and attach any additional reports, sheets or invoices necessary to provide the required information, and fax the form with additional material(s) to the ATF U.S. Bomb Data Center (USBDC) at 866-927-4570 or email to USBDC@atf.gov.

1. Date	2. Type of Report (<i>Check one</i>): <input type="checkbox"/> Theft <input type="checkbox"/> Loss <input type="checkbox"/> Attempted Theft/Suspicious <input type="checkbox"/> Supplement Activity		
3. Full Name of Person Making the Report (<i>Last, First, Middle</i>)		4a. Licensee or Permittee Name	
4b. Federal Explosives License or Permit Number			
5a. Office Address (<i>Street Address, City, State, and Zip Code</i>)		5b. Telephone Number	
		5c. E-mail Address	
6. Actual Location of Theft or Loss (<i>If different from item 5a</i>)			

7. Theft or Loss	Date	Time	8. Name of Local Law Enforcement Officer to Whom Reported
a. Discovered			9. Name and Address of Local Authority to Whom Reported
b. When Was the Magazine Last Checked			
c. Occurred (<i>Show approximate if exact not known</i>)			
d. Reported to ATF by Telephone			10. Telephone Number
e. Reported to Local Authorities			11. Police Report Number

12. Explosive Materials Lost or Stolen (*Attach invoices or additional sheets, if necessary*)

a. Manufacturer and/or Importer	b. Brand Name	c. Date Shift Code	d. Size (Length & Diameter)	e. Quantity (Pounds of Explosives, Number of Dets)	f. Type and Description (Dynamite, Blasting Agents, Detonators, etc. Include for each type, size, MS delay or length of legwire, as applicable)

13. Theft or Loss Occurred from *(Check applicable box on each row)*

a. Magazine Type:

<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 2 Det. Box	<input type="checkbox"/> 3 Day Box	<input type="checkbox"/> 4	<input type="checkbox"/> 5
<input type="checkbox"/> Outdoor	<input type="checkbox"/> Indoor				
<input type="checkbox"/> Permanent	<input type="checkbox"/> Portable	<input type="checkbox"/> Mobile Truck	<input type="checkbox"/> Mobile Trailer		
<input type="checkbox"/> Overnight Storage	<input type="checkbox"/> Day Storage				

b. Types of Locks *(Check all that apply)*:

<input type="checkbox"/> Padlock	<input type="checkbox"/> Mortise	<input type="checkbox"/> 3-Point	<input type="checkbox"/> Puck Lock	<input type="checkbox"/> Other <i>(Explain)</i> _____
----------------------------------	----------------------------------	----------------------------------	------------------------------------	---

c. Location Description/Type:

<input type="checkbox"/> Licensed/Permitted Premises	<input type="checkbox"/> Remote Storage	<input type="checkbox"/> Work Site	<input type="checkbox"/> In Transit	<input type="checkbox"/> During Operations
--	---	------------------------------------	-------------------------------------	--

14. Method of Entry:

<input type="checkbox"/> Door	Was a Key Used?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	Suspected Employee-Involved Theft?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
<input type="checkbox"/> Wall(s)	<input type="checkbox"/> Roof	<input type="checkbox"/> Floor/Bottom				

Lock(s) Defeated? *(If yes, check additional appropriate boxes)* Yes No

<input type="checkbox"/> Lock Shackle Cut <i>(How?)</i> _____	<input type="checkbox"/> Lock Pried, Twisted or Levered
<input type="checkbox"/> Lock Left Unlocked	<input type="checkbox"/> Lock Picked or Shimmed
<input type="checkbox"/> Keyway Drilled Out	<input type="checkbox"/> Lock Body Drilled Out or Cut
<input type="checkbox"/> Other <i>(Explain)</i> _____	

Manufacturer and Model of Lock:	Location of Magazine Keys: <input type="checkbox"/> Office <input type="checkbox"/> Employee	Are All Keys Accounted For?
	<input type="checkbox"/> Other <i>(Address)</i> _____	<input type="checkbox"/> Yes
		<input type="checkbox"/> No

15. Hood Defeated? *(If yes, check all applicable)* Yes No

<input type="checkbox"/> Hood Cut	<input type="checkbox"/> Hood Removed
<input type="checkbox"/> Other <i>(Explain)</i> _____	<input type="checkbox"/> Hood Broken

Hood Width *(Inches)* _____ Hood Length *(Inches)* _____

Hood Depth *(Inches)* _____ Hood Thickness *(Inches)* _____

16. Circumstances Pertaining to the Theft, Loss or Suspicious Activity *(Any details you can provide)*

16a. Was Theft or Loss Disclosed During an ATF Inspection or Being Reported as a Result of Inspection? Yes No

16b. Additional Security Measures in Place?

<input type="checkbox"/> Alarm	<input type="checkbox"/> Security System/Service	<input type="checkbox"/> Fencing	<input type="checkbox"/> Lighting	<input type="checkbox"/> Other <i>(Explain)</i> _____
--------------------------------	--	----------------------------------	-----------------------------------	---

17. Signature and Title of Person Making Report

18. Date

Reporting Instructions

Email or fax this completed form to the ATF address listed below or call if no fax is available:

Bureau of Alcohol, Tobacco, Firearms and Explosives
U.S. Bomb Data Center
99 New York Ave., N.E. 8.S-295
Washington, DC 20226
Toll Free Fax: 1-866-927-4570
Email Address: USBDC@atf.gov

Questions regarding the completion of this form should be referred to the U.S. Bomb Data Center toll free at 1-800-461-8841.

Privacy Act Information

The following information is provided pursuant to section 3 of the Privacy Act of 1974 (5 U.S.C. § 522a(e)(3)).

1. **Authority.** Solicitation of this information is made pursuant to Title XI of the Organized Crime Control Act of 1970 (18 U.S.C. Chapter 40). Disclosure of a theft or loss of explosive materials is mandatory pursuant to 18 U.S.C. § 842(k) for any person who has knowledge of such theft or loss from his stock.
2. **Purpose.** The purpose for the collection of this information is to give ATF notice of the theft or loss of explosive materials, and to furnish ATF with the pertinent facts surrounding such theft or loss. In addition, the information is used to confirm and verify prior notification of this theft or loss of explosive materials.
3. **Routine Uses.** The information will be used by ATF to aid in the administration of laws within its jurisdiction concerning the regulation of explosive materials and other related areas. In addition, the information may be disclosed to other Federal, State, foreign, and local law enforcement of laws within their jurisdiction. System of records notice Justice/ATF-008 Regulatory Enforcement Record System FR Vol.68 No.16 Page 3558 dated January 24, 2003.
4. **Effects of not supplying information requested.** 18 U.S.C. § 842(k) makes it unlawful for any person, who has knowledge of the theft or loss of explosive materials from his stock, to fail to report such theft or loss within twenty-four hours of discovery thereof, to the Secretary and to appropriate local authorities. The penalty for violation of this section is a fine of not more than \$1,000 or imprisonment for not more than one year, or both. 18 U.S.C. § 844(b).

Paperwork Reduction Act Notice

This request in accordance with the Paperwork Reduction Act of 1995. The purpose of this information collection is to report the theft or loss of explosive materials. The information is used for investigative purposes by ATF officials. This information is mandatory by statute. (18 U.S.C. § 842)

The estimated average burden associated with this collection of information is 1 hour and 48 minutes per respondent or recordkeeper, depending on individual circumstances. Comments concerning the accuracy of this burden estimate and suggestions for reducing this burden should be addressed to Reports Management Officer, Document Services, Bureau of Alcohol, Tobacco, Firearms and Explosives, Washington, DC 20226.

An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number.

This Page Intentionally Left Blank

FINAL
***MATERIAL POTENTIALLY PRESENTING AN EXPLOSIVE
HAZARD MANAGEMENT
STANDARD OPERATING PROCEDURE UXO-03***

**Munitions and Explosives of Concern Remedial Action
Former Waikane Training Area
Southeastern Region Munitions Response Site
Kāneʻohe, Oʻahu, Hawaiʻi**

RMIS ID: H09HI035401

Prepared by:

GSI Pacific Inc.
181 South Kukui Street, First Floor
Honolulu, HI 96813

December 2016

This Page Intentionally Left Blank

Section 1 Standard Operating Procedure Approvals

This page provides a record of the signatures and dates of personnel who developed, reviewed, validated, and approved this Standard Operating Procedure (SOP).

Table 1-1: Contractor Approvals

Name and Signature	Role	Date
  Mike Coyle Corporate Health and Safety Manager	Review/Approval	11/23/16
 Daniel C. Haines Quality Control Manager	Review/Approval	11/29/16
 Brian Stepp Senior Project Manager	Review/Approval	11/28/16

Section 2 Scope and Application

This SOP applies to all site personnel involved in managing Material Potentially Presenting an Explosive Hazard (MPPEH). The intent of this guidance is to require compliance with MPPEH management procedures by all non-Department of Defense (DoD) entities that possess, manage, process, or provide disposition of MPPEH as material documented as an explosive hazard (MDEH) or Material Documented as Safe (MDAS) for the DoD.

Management and disposition of MPPEH, MDEH, and MDAS includes the identification; recovery; collection; inspection; determination of the material's explosives safety status; marking; storage, including segregating by the explosives safety status; security; demilitarization; the accountability, when appropriate; and the transfer or release, including sale.

MPPEH is material owned or controlled by the DoD that, before determination of its explosives safety status, potentially contains explosives or munitions (*e.g.*, munitions containers and packaging material; munitions debris (MD) remaining after munitions use, demilitarization, or disposal; and range-related debris [RRD]) or potentially contains a high enough concentration of explosives that the material presents an explosive hazard (*e.g.*, equipment, drainage systems, holding tanks, piping, or ventilation ducts that were associated with munitions production, demilitarization, or disposal operations).

MDAS is MPPEH that has been assessed and documented as not presenting an explosive hazard and for which the chain-of-custody has been established and maintained. This material is no longer considered to be MPPEH.

MDEH is MPPEH that cannot be documented as MDAS, that has been assessed and documented as to the maximum explosive hazards the material is known or suspected to present, and for which the chain-of-custody has been established and maintained. This material is no longer considered to be MPPEH.

This SOP is to be used in conjunction with the Uniform Federal Policy Quality Assurance Project Plan (UFP-QAPP), Explosives Safety Submission (ESS), other project related SOPs, the Accident Prevention Plan (APP)/Site Safety and Health Plan (SSHP), applicable Federal, state, and local regulations, and contract restrictions and guidance.

Section 3 Materials Required

The following lists identify special and critical tools, equipment, and supplies used for MPPEH processing and inspection during munitions and explosives of concern (MEC) projects.

Special and Critical Tools:

- Securable storage container(s); and
- Chain-of-custody seals.

Supplies:

- Logbooks;
- DD Form 1348-1A;
- Tool pouches; and
- Buckets.

Personnel Protective Equipment:

GSI Pacific Inc. (GSIP) and all personnel on site will have all necessary modified Level D personal protective equipment (PPE) as per 29 Code of Federal Regulations (CFR) Part 1910.120. The equipment listed below comprises modified Level D PPE for this project:

- Normal work clothes (long pants and shirt);
- Safety glasses;
- Leather gloves; and
- Boots (leather, ankle stability).

Section 4 Related Procedures

Related SOPs include the following:

- *Field Documentation*, SOP G-1;
- *Project Quality Control*, SOP G-5;
- *Surface and Subsurface Clearance*, SOP UXO-01;
- *Explosive Disposal Operations*, SOP UXO-02;
- *Heavy Equipment and Earth Moving Machinery Operations*, SOP UXO-04;
- *Demilitarization Operations*, SOP UXO-05;
- *Batch Burner Thermal Treatment*, SOP UXO-06; and
- *X-Ray Operations*, SOP UXO-07.

Section 5 Procedures

5.1 Safety

The project site is located at the 36-acre area within the Southeastern Region Munitions Response Site (MRS), former Waikane Valley Training Area. For safety purposes, exclusion zones (EZs) will be established at the project sites while MPPEH inspections are being conducted. An EZ is a controlled area where only essential and authorized personnel are allowed while MEC-related operations are taking place. Essential personnel are personnel whose duties require them to remain within the EZ to ensure that munitions operations are conducted in a safe and efficient manner. Authorized personnel conduct project-related functions that require them to be present in the EZ for a specific purpose for a limited time. Hazardous fragmentation distances (HFDs) will be the basis for the non-essential personnel EZs during MPPEH inspections. HFDs and team separation distance (TSD) will be based on the munitions with the greatest fragmentation distance (MGFD) in the approved ESS and will be the basis for the EZ in circumstances where protection of personnel and property is required.

During MPPEH inspection and handling activities, GSIP personnel will strictly adhere to the APP/SSHP and the following general safety practices:

- SAFETY IS PARAMOUNT;
- Do not move or disturb unidentified items;
- Do not smoke except in designated areas;
- Do not carry fire or spark producing devices into the site;
- All MEC operations will use the “Buddy” system;
- Prohibit non-essential personnel from visiting the site without approval and escort;
- Operations will be conducted during daylight hours or approved night time hours only;
- Access to operating areas will be limited to only those personnel necessary to accomplish the specific operation;
- During MEC operations, the minimum separation distance (MSD) between MEC teams and other non-MEC essential personnel is the TSD of the MGFD, as stated in the approved ESS;
- During MEC operations, the MSD between MEC teams and the non-essential personnel or the public is the HFD of the MGFD, as stated in the approved ESS;
- All personnel will attend the daily safety briefing and tailgate safety briefing prior to entering the operating area;
- Anyone can stop operations for an unsafe act or situation;
- Safety violations and/or unsafe acts will be immediately reported to the Unexploded Ordnance (UXO) Safety Officer (UXOSO); and
- Failure to comply with safety rules/procedures may result in termination of employment.

WARNING

MPPEH WILL ONLY BE HANDLED BY QUALIFIED UXO TECHNICIANS.

5.2 *UXO Qualified Personnel*

All MPPEH management inspections will be performed by UXO-qualified personnel per Department of Defense Explosive Safety Board (DDESB) Technical Paper (TP)-18.

5.2.1 Inspection Responsibilities

UXO Technician II will:

- Perform a 100 percent (%) inspection of each item as it is recovered to determine if the item's explosive safety status is classified as MDEH or MDAS. Further classification will be made to determine if the material is MEC, discarded military munitions (DMM), MD, RRD, or non-munitions related debris (NMRD). Inspections will serve to determine if items contain explosives, inert material, engine fluids, or if illuminating dials and/or other visible liquid hazardous, toxic, and radioactive waste (HTRW) materials are present;
- It will be ascertained if demilitarization or remote explosive access is required for further inspection and/or processing;
- Segregate items requiring demilitarization or venting procedures from those items ready for certification; and
- Items found to contain explosives hazards or other dangerous fillers will be processed for disposition in accordance with (IAW) applicable procedures.

UXO Technician III will:

- Perform a 100% re-inspection of all recovered items to determine if free of explosives hazards or other dangerous fillers and engine fluids, illuminating dials and other visible liquid HTRW materials;
- Segregate MDEH from MDAS;
- Supervise detonation or transfer to the Demolition Team of MDEH; items found to contain explosive hazards or other dangerous fillers;
- Segregate MD and RRD from NMRD; and
- Supervise the consolidation of MDAS for containerization and sealing.

Unexploded Ordnance Quality Control Specialist (UXOQCS) will:

- Conduct daily audits of the procedures used by MEC teams for processing MPPEH; and

- Perform and document random sampling (by pieces, volume or area) of all MPPEH collected from the various teams to ensure no items with explosive hazards, engine fluids, illuminating dials and other visible liquid HTRW materials are identified as MD or RRD as required for completion of the Requisition and Turn-in Document, DD Form 1348-1A.

UXO Safety Officer (UXOSO) will:

- Ensure the specific procedures and responsibilities for processing MPPEH for certification as MDAS specified in the project UFP-QAPP are being followed; and
- Ensure all procedures for processing MPPEH are being performed safely and consistent with applicable regulations.

Senior UXO Supervisor (SUXOS) will:

- Be responsible for ensuring the operational safety and quality of the procedures and responsibilities for processing MPPEH for final disposition;
- Ensure a Requisition and Turn-in Document, DD Form 1348-1A is completed for all MDAS to be transferred for final disposition;
- Perform random checks to satisfy that the MD and RRD is free from explosive hazards necessary to complete the DD Form 1348-1A. Certify all MDAS as free of explosive hazards, engine fluids, illuminating dials, and other visible liquid HTRW materials; and
- Be responsible for ensuring that inspected debris is secured in a closed, labeled, and sealed container and documented as follows:
 - The container will be closed and clearly labeled on the outside. The first container will be labeled with a unique identifier (ID) that will start with United States Army Corps of Engineers (USACE)/Installation Name/Contractor's Name/0001/Seal's unique ID and continue sequentially;
 - The container will be closed in such a manner that a seal must be broken in order to open the container. The seal will bear the same unique ID number as the container or the container will be clearly marked with the seal's ID, if different from the container; and
 - A documented description of the container will be provided by the contractor. The description will include the contents, weight of container, location where the MDAS was obtained, name of contractor, names of certifying and verifying individuals, unique container ID, and seal ID, if required. The contractor in a separate section of the final report will also provide these documents.

5.3 Material Potentially Presenting an Explosive Hazard Management

The purpose of MPPEH management is three-fold. First is to locate and inspect the MPPEH. The second is to dispose of identified or suspected MDEH. The third is to consolidate/remove, certify, and transfer MDAS to a qualified receiver.

Procedures outlined in Engineer Manual (EM) 385-1-97 (USACE, 2013), DOD 6055.09-M, *Ammunition and Explosive Safety Standards*, 6055.09-M, Volume 7 (2008), and DoD Instruction (DODI) 4140.62 (DoD, 2014) will be utilized for guidance on the certification, treatment, and final disposition of MPPEH. All site personnel will be made aware of and will be trained in the procedures to inspect and document MPPEH as MDAS or MDEH.

The following MPPEH inspection protocol will be followed:

- 100% visual examination of the exterior and interior surfaces by UXO Technician II and UXO Technician III;
- All MPPEH (including inert ordnance) that cannot be 100% visually inspected will be perforated explosively and/or detonated with countercharges to allow for filler exposure and/or access for inspection and disposal of any potential explosives and explosives components; and
- All material classified as HTRW that is non-explosive will be reported, locally treated and/or properly segregated, packaged, and labeled for shipment to a qualified receiver for disposal.

5.3.1 MDAS Collection Point

All MPPEH classified as MDAS will be collected, segregated by metal composition and loaded in the team pick-up truck for transportation to the field MDAS collection point at the end of the day. It will be the UXO Technician III's responsibility to assure only MDAS will be transported to the collection point. MDAS will not be co-mingled with other types of material or HTRW and will be held in secured containers with proper labeling.

Any MPPEH that is found to have an explosive hazard will be classified as MDEH. All MDEH will be disposed of via explosive disposal. The only exception to this rule is small arms ammunition (SAA) classified as MDEH.

5.3.2 Certification and Verification (DD Form 1348-1A)

The SUXOS will certify and the USACE Ordnance and Explosives Safety Specialist (OESS), or UXOQCS, if the USACE OESS is not on site, will verify that the collected MD is free of explosive hazards and appropriate for certification as MDAS.

DD Form 1348-1A will be used as certification/verification documentation. Refer to Section 6 for details on the DD Form 1348-1A.

All SAA (.50 cal and below) discovered in the field will be inspected, segregated, and secured in a field container marked "Small Arms Ammunition" located next to the field MDAS collection point. Even though SAA present a lesser explosive hazard, they do contain small amounts of low explosives that can cause injury if mishandled and must be classified as MDEH for the purposes of segregating and classifying MPPEH on the MRS. The SAA barrel will also display the acronym "MDEH" and a red band will be painted near the top of the barrel/container. The

barrel will be placed on a pallet and positioned at least 15 feet from the other MDAS barrels/containers at the field collection point.

At the end of the project, the SUXOS and USACE OESS or UXOQCS, if the USACE OESS is not on site, will verify that only SAA .50 cal and below are in the “Small Arms Ammunition” container. The safe transportation documentation and a DD Form 1348-1A will be completed and accompany the material for shipment to a qualified receiver for disposition.

The SAA will be shipped and labeled according to all applicable laws and regulations to a qualified receiver for disposal.

5.3.3 Maintaining the Chain-of-Custody and Final Disposition

In coordination with the USACE, the chain-of-custody and final disposition of the certified and verified materials will be maintained. The contractor will maintain custody of all MDAS at the field collection point until certification and verification (as stated above) has been conducted. MDAS will be transferred to a qualified receiver IAW EM 385-1-97.

5.3.4 Quality Control Inspections and Sampling

MPPEH will receive quality control inspections throughout the MPPEH inspection, collection, and MDAS certification and transfer. The UXOQCS will monitor the SUXOS certification and documentation of MDAS in concert with the USACE OESS verification. In addition, the UXOQCS will perform regular inspections on the maintenance of custody and final disposition of all materials. Quality control inspections and their frequencies are detailed in SOP G-5 *Project Quality Control*.

Section 6 Documentation

6.1 List of Forms

For MPPEH inspection and management activities, the SUXOS will, at a minimum, complete the following:

- Field logbook entries recording periodic inspections of MDAS collected during the project; and
- DD Form 1348-1A Issue Release/Receipt for final verification and transfer of MDAS (Attachment 1).

6.2 Field Logbook

Daily field activities will be documented in a Field Logbook. Refer to SOP G-1 *Field Documentation* for field logbook procedures.

6.3 DD Form 1348-1A Issue Release/Receipt

DD Form 1348-1A will be used as certification/verification documentation. All forms will clearly show the following information:

- The typed or printed names of the SUXOS and the USACE OESS or UXOQCS, if the USACE OESS is not available, organization, signature, and contractor's home office and field office phone number(s) of the persons certifying and verifying the debris as free of explosive hazards.

In addition to the data elements required, the DD Form 1348-1A will clearly indicate the following information:

- Basic material content (type of metal; *e.g.*, steel or mixed);
- Estimated weight;
- Unique ID of each of the containers and seals;
- Location where MDAS was obtained; and
- Seal ID, if different from the unique ID of the sealed container.

The following certification/verification statement will be entered on each DD Form 1348-1A and will be signed by the SUXOS and the USACE OESS (or UXOQCS if an USACE OESS is not on site):

“This certifies and verifies that the material listed has been 100% inspected and to the best of our knowledge and belief, are inert and/or free of explosives or related materials.”

All SAA (.50 cal and below) discovered in the field will be inspected, segregated, and secured in a field container marked “Small Arms Ammunition” located next to the field MDAS collection point. At the end of the project, the SUXOS and USACE OESS or UXOQCS if the USACE OESS is not on site will verify that only SAA .50 cal and below are in the “Small Arms Ammunition” container. The safe transportation documentation and a DD Form 1348-1A will be completed and accompany the material for shipment to a qualified receiver for disposition.

The DD Form 1348-1A will contain the same statement as for MDAS with the exception that the material will be classified as “MDEH-Small Arms Ammunition (.50 cal and below).” The explosive free statement will be modified to read:

“This certifies and verifies that the material listed has been 100% inspected and, to the best of our knowledge and belief, contains only small arms ammunition (.50 cal and below) and are free from explosives hazards except those generally with small arms ammunition.”

All certified MDAS will be demilitarized (*e.g.*, remove rotating bands, make unusable as a munitions), disfigured to resemble its basic material content (*e.g.*, scrap steel and aluminum), and thermally treated or transferred to another qualified receiver for the proper treatment and documentation IAW EM 385-1-97 (USACE, 2013) and DoD 6055.09 M, Vol. 7 (DoD, 2008) before public release.

In-house demilitarization, disfigurement, and thermal treatment will be performed IAW SOP UXO-05 *Demilitarization Operations*, SOP UXO-06 *Batch Burner Thermal Treatment*, and the approved project plans.

Section 7 References

29 CFR Part 1910.120. *Hazardous Waste Operations and Emergency Response*.

DDESB, 2015. TP-18. *Minimum Qualifications for Personnel Conducting Munitions and Explosives of Concern-Related Activities*. 1 September.

Department of the Army, 2013. DA Pamphlet 385-64. *Ammunition and Explosives Safety Standards*. 24 May 2011; Rapid Action Revision issued on 10 October 2013.

DoD, 1995. 4160.21-M 1: *Defense Demilitarization Manual*. 21 October 1991. Revised 14 February 1995.

_____, 2011. 6055.09-M, *Ammunition and Explosive Safety Standards: Quantity-Distance Criteria for Intentional Burns or Detonations, Energetic Liquids and Underground Storage*. Volume 5. September.

_____, 2014. DODI 4140.62. *Material Potentially Presenting an Explosive Hazard*. 25 November 2008; Change 1, 19 February 2014.

USACE, 2013. EM 385-1-97. *Explosives - Safety and Health Requirements Manual*. 17 May.

Attachment 1
DD Form 1348-1A Issue Release/Receipt

This Page Intentionally Left Blank

DD Form 1348-1a Issue Release/Receipt Document

DD FORM 1348-1A, JUL 91 (EG) ISSUE RELEASE/RECEIPT DOCUMENT

27. ADDITIONAL DATA	28. RIC (4-6) UI (23-24) QTY (25-29) CON CODE (71) DIST (55-58) UP (74-80)	25. NATIONAL STOCK NO. & ADD (8-22)	24. DOCUMENT NUMBER & SUFFIX (30-44)
---------------------	---	-------------------------------------	--------------------------------------

1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	--

This Page Intentionally Left Blank

FINAL
***HEAVY EQUIPMENT AND EARTH MOVING MACHINERY
OPERATIONS
STANDARD OPERATING PROCEDURE UXO-04***

**Munitions and Explosives of Concern Remedial Action
Former Waikane Training Area
Southeastern Region Munitions Response Site
Kāneʻohe, Oʻahu, Hawaiʻi**

RMIS ID: H09HI035401

Prepared by:

GSI Pacific Inc.
181 South Kukui Street, First Floor
Honolulu, HI 96813

December 2016

This Page Intentionally Left Blank

Section 1 *Standard Operating Procedure Approvals*

This page provides a record of the signatures and dates of personnel who developed, reviewed, validated, and approved this Standard Operating Procedure (SOP).

Table 1-1: Contractor Approvals

Name and Signature	Role	Date
  Mike Coyle Corporate Health and Safety Manager	Review/Approval	11/23/16
 Daniel C. Haines Quality Control Manager	Review/Approval	11/29/16
 Brian Stepp Senior Project Manager	Review/Approval	11/28/16

Section 2 Scope and Application

The purpose of this SOP is to provide the minimum procedures, safety, and health requirements applicable to the operation of heavy equipment and earth moving machinery (EMM).

This SOP contains information specific to the operation of heavy equipment and EMM. Additional guidance will include safety regulations, manuals, relevant operational publications, and preventative/scheduled maintenance of equipment that may be leased, purchased, or otherwise employed on this site. It is incumbent upon all designated operators to familiarize themselves with this SOP and to periodically review it in an effort to remain current with safe heavy equipment and EMM operations.

Section 3 Materials Required

3.1 Required Safety Equipment

All heavy equipment/EMM operators under guidance of their supervisors will conduct inspections prior to all operations to ensure the following safety equipment is present:

- Back-up warning system;
- Seat belts;
- Roll over protection system (ROPS);
- Warning labels;
- Machine guards;
- Fire extinguisher (1-A:10-B:C);
- Communication devices (*e.g.*, radio and cell phone);
- Field first-aid kit;
- Emergency alert device (*e.g.*, air horn, whistle);
- Operator's Manual; and
- Activity Hazard Analyses (AHAs).

3.2 Personal Protective Equipment

Modified Level D personal protective equipment (PPE) will be required for personnel engaged in heavy equipment/EMM operations. Clothing items will include:

- Work clothing as prescribed by the Accident Prevention Plan (APP)/Site Safety and Health Plan (SSHP);
- Work gloves, leather, as prescribed by the APP/SSHP;
- Safety glasses - Safety goggles as wind conditions and airborne particulates dictate;
- Hard hats;
- Highly visibility Class II or higher vest;
- Work boots, safety toe - sturdy and of sufficient height to aid in ankle support;
- Hearing protection - will be determined through a Noise Survey (Sound Level Meter) for any heavy equipment/EMM brought on site. Until the survey is completed, personnel on the heavy equipment/EMM team will wear appropriate hearing protection;
- The operator and safety spotter will keep visual contact and utilize hand and arm signals. Handheld radio communications will be required during all munitions and explosives of concern (MEC) operations. The operator will utilize an earphone under ear muffs to allow for hearing commands from the spotter and/or Team Leader (TL); and
- Comfort mask - as wind conditions and airborne particulate matter dictates.

Section 4 Related Procedures

Related SOPs include the following:

- *Field Documentation*, SOP G-1;
- *Anomaly Avoidance*, SOP G-2;
- *Vegetation Clearance*, SOP G-4;
- *Project Quality Control*, SOP G-5;
- *Surface and Subsurface Clearance*, SOP UXO-01; and
- *Explosive Disposal Operations*, SOP UXO-02.

Section 5 Procedures

WARNING: EMM will only be utilized for general earth movement and removal of overburden during subsurface anomaly investigations in accordance with Engineer Manual (EM) 385-1-97.

5.1 Personnel and Training Requirements

The minimum team make-up will be:

- One qualified operator;
- One ground guide (the Safety Observer can fill this role as well if conditions permit); and
- One heavy equipment/EMM Safety Observer/Supervisor (unexploded ordnance [UXO] Technician III if MEC related excavation).

5.1.1 Team Leader/Safety Observer

For excavations in areas where a MEC hazard exists, a UXO Technician III (TL) will serve as the Supervisor and overall Safety Observer for directing the site personnel and equipment during the operation. Depending on the complexity of the operation, he/she may also serve as the ground guide.

5.1.2 Equipment Operators

All site personnel who operate heavy equipment/EMM will be qualified through documented formal training or equivalent previous employment experience approved by the Project Manager (PM) and the UXO Safety Officer (UXOSO). Documentation of this training will be kept on file at the site. The operator will perform daily inspection and maintenance functions as directed by the operator's manual for each piece of equipment.

5.1.3 Use of Non-UXO Personnel

During MEC operations, and in accordance with EM 385-1-97, the use of non-UXO personnel as operators on UXO sites is authorized when they are supervised by a UXO Technician III or higher.

5.2 Heavy Equipment/EMM Procedures

During MEC operations, there is no requirement for additional safety barriers or shielding during the operation as long as excavation activities are limited to the removal of overburden to within 12 inches of a suspected MEC item (EM 385-1-97). Personnel will dig off to the side of the anomaly for subsequent lateral hand dig.

The hazards associated with heavy equipment/EMM involve moving parts and exposure to possible pinch points, struck by, or caught in-between. Safe operating procedures for each type

of equipment or activity must be reviewed and followed. Safety protection, including equipment guards (which must not be removed), spotters (safety observers) and equipment training shall be provided to mitigate this problem. Site personnel operating or working within close proximity to heavy equipment/EMM will wear hard hats, eye protection, safety toe boots, and hearing protection when necessary.

Heavy equipment/EMM used on the site must meet the requirements of the Occupational Safety and Health Administration (OSHA), Department of Transportation (DOT), and general industry standards. The Senior UXO Supervisor (SUXOS) and UXOSO will ensure that all heavy equipment/EMM brought on site have a documented mechanic checkout sheet from a certified mechanic provided to be kept on file and with the equipment. A new mechanic checkout sheet should be created whenever the equipment is repaired, not in use for a long period of time, or moved to another project location. Rental equipment companies should provide the equipment checkout sheet signed by their certified mechanic on or before delivery.

Upon delivery, the SUXOS and operator should take pictures of the condition of the equipment and email to the PM and equipment rental company, if applicable. Pictures of the condition of the equipment should be taken periodically or when changing operators to document any damage and pinpoint the cause.

The operator will be responsible for completing daily written inspections of all heavy equipment/EMM with the supervisor's signature and provide the original inspection to the SUXOS. A general form, the Operator's Equipment Inspection Report is located in Attachment 1. All personnel who operate equipment must use all safety devices, such as seat belts, that the equipment is equipped with during operation. All operators will adhere to the following heavy equipment/EMM operating rules at a minimum:

- Only personnel trained in the operation of heavy equipment/EMM are permitted to operate such equipment;
- Personnel may only operate equipment for which they have received training and have been authorized. Trainees may operate heavy equipment/EMM, but only under competent supervision of a trainer, and after the instructional phase of the training;
- Before operating any heavy equipment/EMM, the operator must conduct a pre-operational check of the piece of equipment. Brakes, parking system, hydraulic lines, light signals, fire extinguishers, fluid levels, steering, tires, horn, coupling devices, seat belts, operating controls and other safety devices will be checked daily and maintained in good working order throughout the duration of its use. If the equipment is found to be unsafe, the operator must report the condition immediately to the appropriate supervisor. The piece of equipment will then be placed in an unserviceable status until it has been repaired or replaced;
- The heavy equipment/EMM will not be backed up unless the vehicle has a reverse signal alarm audible above the surrounding noise level, backup warning lights;

- Heavy equipment/EMM will be provided with necessary safety equipment including seat belts, ROP, emergency shut-off capabilities during roll-over, backup warning lights, and audible alarms as applicable;
- Blades, buckets, and forks will be lowered to the ground and parking brakes will be set before shutting off any heavy equipment/EMM;
- Special consideration must be given to the proper functioning of tires, horns, lights, batteries, controllers, lift systems (including forks, chains, cables, and limit switches), brakes and steering mechanisms;
- All heavy equipment/EMM must be operated at an authorized safe speed, consistent with conditions, and at a safe distance from other vehicles. Heavy equipment/EMM must be under positive control at all times;
- No riders other than the driver are permitted on heavy equipment/EMM when the equipment is operational;
- When heavy equipment/EMM is left unattended, loads must be lowered to the surface, controls neutralized, power shut off, and brakes set. Wheels (if applicable) should be chocked if the equipment is parked on an incline;
- Prior to anyone entering the hazard area of a piece of heavy equipment/EMM, all blades, buckets, and forks will be lowered to the ground and de-energized and the equipment will be shut off;
- Prior to starting the heavy equipment/EMM, the spotter and operator must establish and understand operational hand and arm signals;
- No one will, at any time, start the heavy equipment/EMM from any place other than the operational seat with their seatbelt fastened;
- Never dismount a running piece of heavy equipment/EMM;
- Three points of contact must be utilized when climbing on or off heavy equipment/EMM and the individual must face the machinery; and
- Areas around the work site must be surveyed for overhead obstructions (trees, power lines [a minimum of 10 feet], *etc.*) to prevent contact by the equipment.

5.3 Safety Procedure for Heavy Equipment/EMM

When working near heavy equipment/EMM, field personnel will maintain visual contact with the operator. Heavy equipment/EMM will not be operated without a ground guide. This includes moving, repositioning, and using the front and rear attachments.

Field personnel shall not work within the swing radius of the equipment with articulation capabilities while the equipment is operating. Prior to starting an excavation, a swing safety arc, 360 degrees if able, will be etched in the ground with the front or rear boom, fully extended. If operating on a hard surface, the safety arc will be marked on the ground, with spray paint or traffic cones.

Prior to anyone entering the safety arc, the operator will:

- Swing the boom fully to the side;
- Lower the bucket to the ground;
- Place the engine in idle or off;
- De-energize the boom; and
- Hold his/her hands clear of the controls in the “Hands Up” position.

When operating a power take-off (PTO) installed equipment:

- Turn off the engine and wait until the PTO stops before dismounting, disconnecting, or servicing the PTO unit;
- Wear snug fitting clothing when operating the PTO, or near other rotating equipment;
- When operating stationary PTO equipment, always apply the parking brake and chock the rear wheels to prevent any unnecessary movement; and
- PTO shields are mandatory on all PTO-driven equipment.

Section 6 *General Safety Hazard Precautions*

6.1 *Underground Utilities*

Prior to heavy equipment/EMM operations beginning, the UXOSO or SUXOS will obtain a dig permit (if applicable) prior to excavation activities. Excavation activities will occur at least 3 feet away from all marked utilities until revealed using caution and a spotter. All excavations within 3 feet of expected utility markings and 12 inches of anomalies must be dug by hand. The UXOSO or SUXOS will provide the work location for all heavy equipment/EMM excavation activities and maintain notification confirmation for review.

6.2 *Exposure to Vehicle Traffic*

Heavy equipment/EMM team members exposed to vehicular traffic shall be provided and wear appropriate high visibility safety vest as required by American National Standards Institute (ANSI) 107 (*e.g.*, Class II, III). Traffic direction paddles or portable traffic caution signs may also be required to halt or redirect vehicular traffic around the excavation site.

6.3 *Exposure to Falling Loads*

No worker shall be permitted underneath loads handled by lifting or digging equipment. Workers are required to stand away from any vehicle being loaded or unloaded to avoid being struck by any spillage or falling material.

6.4 *Equipment Warning Device*

All heavy equipment/EMM will be equipped with an audible warning system that sounds when the equipment is backing up. Heavy equipment/EMM needing to be moved adjacent to an excavation or approach the edge, and the operator does not have a clear and direct view of the edge, will institute a warning system, such as an air horn or arm and hand signals from the Safety Observer.

Mechanized equipment will be shut down before and during refueling operations. Closed systems, with an automatic shutoff that will prevent spillage if connections are broken, may be used to fuel diesel powered equipment left running.

6.5 *Loose Rock or Soil*

Workers will be protected from excavated or other materials or equipment that could pose a hazard by falling or rolling into excavations. All equipment or materials will be placed at a minimum of 2 feet from the edge of excavations to prevent the equipment or materials from falling or rolling into the excavation.

6.6 *Cave-In*

Excavations will be protected from cave-ins by adequate protective systems (sloping and benching or shielding and support). Refer to EM 385-1-1 25.C (USACE, 2014) for benching and

sloping requirements. An excavation competent person (CP) will inspect all excavations at least daily and whenever conditions change. The CP will also determine proper sloping, benching, shoring, shielding, or other protective systems based on conditions of the soil and excavation type and depth.

The CP will ensure that all excavations over 4 feet provide a ramp, stairs, or ladder for ingress and egress. No more than 25 feet of travel will be required for these exits and ladders will extend 3 feet past the top of the excavation.

All excavations over 5 feet will provide proper shielding/shoring for excavation personnel and/or will require 1.5/1 sloping/benching unless the CP can substantiate a steeper ratio based on approved soil classification methods and excavation conditions. Without approved soil classification methods, assume Class C soil type and conditions and utilize 1.5/1 sloping for excavation safety.

No excavations deeper than 4 feet are expected for this project.

Section 7 Documentation

7.1 List of Forms

For heavy equipment and EMM operations, the equipment operator will, at a minimum, complete the following:

- Operator’s Equipment Inspection Report (Attachment 1).

The excavation CP will complete an Excavation/Trench Inspection Form (Attachment 1) to inspect all excavations.

7.2 Operator’s Equipment Inspection Report

An Operator’s Equipment Inspection Report (Attachment 1) will be used to document that the heavy equipment/EMM used on the site meet the requirements of the OSHA, DOT, and general industry standards. The operator will be responsible for completing the daily report and will provide the original inspection to the SUXOS. Guidance for filling out each field on the form is provided below:

- **Date** - Date the inspection is conducted;
- **Location** - Location of where the operation will take place;
- **Vehicle** - Excavator, Dozer, Backhoe, Rough Terrain Forklift, *etc.*;
- **Hourmeter Beginning of Shift** - Hourmeter reading at the beginning of the shift;
- **Hourmeter End of Shift** - Hourmeter reading at the end of the shift;
- **Next Maintenance** - Date next maintenance is scheduled per the manufacturer operator’s manual located behind the operator’s seat or project specific schedule;
- **Items of Inspection:**
 - For each item of inspection (*e.g.*, oil level, coolant, coolant hoses, belts), insert a check mark in the box to indicate:
 - “G” for Good;
 - “NA” for Not Applicable; or
 - “NM” for Needs Maintenance.
 - NOTE, PLEASE REPORT “NM” CHECKED SAFETY ITEMS IMMEDIATELY!
- **Comments** - Add comments on overall condition, details on checked boxes, *etc.*;
- **Operator/Date** - The operator will print, sign, and date the line to indicate that he/she has made the inspection as required on the listed items; and
- **Supervisor/Date** - The supervisor will print, sign, and date the line to indicate that he/she has certified that repairs checked or listed were completed.

7.3 *Excavation/Trench Inspection Form*

The Excavation/Trench Inspection Form (Attachment 1) will be used by the excavation CP when inspecting all excavations at least daily and whenever conditions change. Guidance for filling out each field on the form is provided below:

- **Date** - Provide the date of the inspection;
- **Job No.** - Provide the job number (if applicable);
- **Location** - Provide the site location;
- **Competent Person** - Provide the name of the CP;
- **Gas Monitor Ser. No.** - Provide the gas monitor serial number;
- **Inspect excavations throughout the work period. If conditions change, complete a new inspection form.**
 - Provide the **Times** and **Weather** conditions during the inspections.
- **Locates:**
 - **Date** - Provide the date of the locates;
 - **Confirmation No.** - Provide the confirmation number of the locates;
 - **Locates Visible** (select one):
 - **Y** - Yes; or
 - **N** - No.
- **Jobsite Hazards** (select all that apply):
 - **Vehicle Traffic;**
 - **Overhead Obstructions;**
 - **Falling Loads;**
 - **Adjacent Structures;**
 - **Mobile Equipment;**
 - **Underground Installation;**
 - **Hazardous Atmosphere;** and
 - **Surface Encumbrances.**
- **Work Practices:**
 - **Traffic Control** (select if applicable):
 - **Signs;**
 - **Cones;** and

- **Barricades.**
- **Ladders** (select if applicable):
 - **Within 25’;**
 - **Extends 3’;** and
 - **Accumulation.**
- **Dewatering** (select if applicable):
 - **CP monitors;**
 - **Proper Operations;** and
 - **Supplied Air.**
- **Atmosphere** (select if applicable):
 - **Ventilation;**
 - **Monitoring;** and
 - **Other.**
- **Equipment** (select if applicable):
 - **>2’ from edge;** and
 - **Warming device.**
- **Soil Stability** (select if applicable):
 - **Previously distributed by underground structures or utilities;**
 - **Soil subject to vibration from adjacent area or from equipment used in the excavation?;**
 - **Soil subject to thawing conditions?;** and
 - **Soil subject to surcharge from spoils, materials, or equipment?**
- **Visual Test** (select Y or N for the following):
 - **Soil spill from excavator bucket in cohesive clumps or granular stream?;**
 - **Soil exist in layered system** (also provide **Layers slope** and **% Slope**);
 - **Presence of rock?;**
 - **Accumulating runoff?;**
 - **Seeping from sides?;**
 - **Particle sizes of predominate soils are fine grained, course grained, or gravel?;**
 - **Soil is fissured?;**

- **Rock is stable?;**
- **High groundwater table?;** and
- **Submerged in surface water (creeks, *etc.*)?**
- **Manual Test:**
 - **Penetrometer Readings (Minimum of five test must be completed);**
 - **Average tsf** - Provide the average tons per square foot; and
 - Select one of the the following:
 - **<0.5 tsf = Type C;**
 - **0.5 - 1.5 tsf = Type B;** and
 - **>1.5 tsf = Type A.**
- **Plasticity Test** (Length of 1/8” thread that can be held horizontally) (select one):
 - **< 2” = Granular;** or
 - **< 2” = Cohesive.**
- **Thumb Penetration Test** (*all tests should be run on: Large clump of soil material, as soon as excavated, later after wetting, and reclassified*):
 - **Type C:**
 - **Easy;** and
 - **Molded by light finger pressure.**
 - **Type B:**
 - **Effort.**
 - **Type A:**
 - **Great effort/not at all;** and
 - **Can only indent.**
- **Soil Test Classification:**
 - Results of Testing: **Soil Type** (select one):
 - **A;**
 - **B;** or
 - **C.**

- **Personnel Protective System Chosen:**
 - **Protection Chosen** (select one):
 - **Sloping;**
 - **Shielding;** or
 - **Shoring.**

- **Trench Box Information** (select **Y** or **N**) for the following:
 - **Trench box drawings available;**
 - **Stack locking Pins available and used;**
 - **PE stamped drawings available for special shoring;** and
 - **Spreader bar pin installed and safety pined.**

- **Comments** - Provide any comments; and

- **Excavation Entry Authorized By: Competent Person** - Provide the signature of the CP.

Section 8 References

29 CFR 1926, Subpart P, Appendix A, *Soil Classification*.

29 CFR 1926.652, Subpart P, Appendix F, *Safety and Health Requirements for Construction*.

Army Regulation (AR), 1993. 385-55, *Prevention of Motor Vehicle Accidents*.

USACE, 2013. EM 385-1-97. *Explosives - Safety and Health Requirements Manual*. 17 May.

_____, 2014. EM 385-1-1. *Safety and Health Requirements Manual*. 30 November.

***Attachment 1
Forms***

This Page Intentionally Left Blank

List of forms included in this attachment:

Forms:

- Operator's Equipment Inspection Report; and
- Excavation/Trench Inspection Form.

Note, the forms provided in the Attachment are the formats planned for use, but these forms may need to be altered to accommodate project specific elements during project execution.

This Page Intentionally Left Blank

Operator's Equipment Inspection Report (turn in at the completion of each day of Equipment Op)

Date: _____

Location: _____

Vehicle: _____

Hourmeter Beginning of Shift: _____ Hourmeter End of Shift: _____ Next Maintenance: _____

G = Good NA = Not Applicable NM = Needs Maintenance

ITEMS OF INSPECTION:	G	NA	NM	ITEMS OF INSPECTION:	G	NA	NM
ENGINE				SAFETY CHECKS			
Oil Level				Warning Devices, Back-up Alarm			
Coolant				Operating Brakes			
Coolant Hoses				Parking Brake			
Fuel Water Separator				Steering			
Dust Unloader Valve				Lights			
Air Filter Indicator				Fire Extinguisher			
Air Filter Check				Seat Belt			
Batteries				Mirrors			
Belts				Quick Coupler/Locking Mechanism			
Fuel Level				Steps and Platforms			
TRANSMISSION, CONVERTER				Safety Decals			
Oil Level				Air Horn			
HYDRAULICS				Radiator			
Oil Level				Boom/Articulation Joint Lock			
Hoses							
Leaks							
GEAR BOXES, FINAL DRIVE, DIFFERENTIAL							
Pedal Operation							
Leaks							
MISCELLANEOUS							
Daily Greasing Complete							
Bucket, Blade, Linkage							
Tires (pressure), Wheels							
Operators Compartment Clean							
AHA							
Operators Manual							
Bolts / Pins							
Fire Extinguisher							
Spill Kit							
				<u>REPORT "NM" CHECKED SAFETY ITEMS IMMEDIATELY!!</u>			
				<p>*Perform a post operational inspection for damage and/or leaks</p> <p>*Wipe free oil, grease, and dirt deposits after use</p> <p>*Report any deficiencies found during or after operation</p>			
				Comments: (overall condition, details on checked boxes, etc.)			
				OPERATOR		DATE	
				I made inspection as required on listed items.		I certify that repairs checked or listed were completed.	
				SUPERVISOR		DATE	

This Page Intentionally Left Blank

Excavation/Trench Inspection Form

Date	Job No	Location	Competent Person	Gas Monitor Ser No
------	--------	----------	------------------	--------------------

Inspect excavations throughout the work period. If conditions change, complete a new inspection form.

Time:	<input type="checkbox"/> a.m.	<input type="checkbox"/> p.m.	Weather:	
Time:	<input type="checkbox"/> a.m.	<input type="checkbox"/> p.m.	Weather:	
Time:	<input type="checkbox"/> a.m.	<input type="checkbox"/> p.m.	Weather:	
Time:	<input type="checkbox"/> a.m.	<input type="checkbox"/> p.m.	Weather:	

Locates Date: _____ Confirmation No: _____ Locates Visible Y N

Jobsite Hazards

Work Practices

<input type="checkbox"/> Vehicle Traffic	<input type="checkbox"/> Mobile Equipment	Traffic Control:	<input type="checkbox"/> Signs	<input type="checkbox"/> Cones	<input type="checkbox"/> Barricades
<input type="checkbox"/> Overhead Obstructions	<input type="checkbox"/> Underground Installations	Ladders:	<input type="checkbox"/> Within 25'	<input type="checkbox"/> Extends 3'	<input type="checkbox"/> Accumulation
<input type="checkbox"/> Falling Loads	<input type="checkbox"/> Hazardous Atmosphere	Dewatering:	<input type="checkbox"/> CP monitors	<input type="checkbox"/> Proper Operations	<input type="checkbox"/> Supplied Air
<input type="checkbox"/> Adjacent Structures	<input type="checkbox"/> Surface Encumbrances	Atmosphere:	<input type="checkbox"/> Ventilation	<input type="checkbox"/> Monitoring	<input type="checkbox"/> Other
		Equipment:	<input type="checkbox"/> > 2' from edge	<input type="checkbox"/> Warning device	

Soil Stability

<input type="checkbox"/> Previously distributed by underground structures or utilities	<input type="checkbox"/> Soil subject to thawing conditions?
<input type="checkbox"/> Soil subject to vibration from adjacent area or from equipment used in the excavation?	<input type="checkbox"/> Soil subject to surcharge from spoils, materials, or equipment?

Visual Test

<input type="checkbox"/> Y <input type="checkbox"/> N Soil spill from excavator bucket in cohesive clumps or granular stream?	<input type="checkbox"/> Y <input type="checkbox"/> N Particle sizes of predominate soils are fine grained, course grained, or gravel?
<input type="checkbox"/> Y <input type="checkbox"/> N Soil exist in layered system Layers slope: _____ % Slope	<input type="checkbox"/> Y <input type="checkbox"/> N Soil is fissured?
<input type="checkbox"/> Y <input type="checkbox"/> N Presence of rock?	<input type="checkbox"/> Y <input type="checkbox"/> N Rock is stable?
<input type="checkbox"/> Y <input type="checkbox"/> N Accumulating runoff?	<input type="checkbox"/> Y <input type="checkbox"/> N High groundwater table?
<input type="checkbox"/> Y <input type="checkbox"/> N Seeping from sides?	<input type="checkbox"/> Y <input type="checkbox"/> N Submerged in surface water (creeks, etc.) ?

Manual Test

Penetrometer Readings (Minimum of five test must be completed)									
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
Average tsf: <input type="checkbox"/> <0.5 tsf = Type C			<input type="checkbox"/> 0.5 - 1.5 tsf = Type B				<input type="checkbox"/> >1.5 tsf = Type A		

Plasticity Test

Length of 1/8" thread that can be held horizontally _____ inches < 2" = Granular < 2" = Cohesive

Thumb Penetration Test All tests should be run on: <ul style="list-style-type: none"> Large clump of soil material As soon as excavated Later after wetting Reclassified 	TYPE C <input type="checkbox"/> Easy <input type="checkbox"/> Molded by light finger pressure	TYPE B <input type="checkbox"/> Effort	TYPE A <input type="checkbox"/> Great effort/not at all <input type="checkbox"/> Can only indent
---	--	--	---

Soil Test Classification

Personnel Protective System Chosen

Results of Testing: Soil Type <input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C	Protection Chosen: <input type="checkbox"/> Sloping <input type="checkbox"/> Shielding <input type="checkbox"/> Shoring
--	---

Trench Box Information

<input type="checkbox"/> Y <input type="checkbox"/> N Trench box drawings available	<input type="checkbox"/> Y <input type="checkbox"/> N PE stamped drawings available for special shoring
<input type="checkbox"/> Y <input type="checkbox"/> N Stack locking Pins available and used	<input type="checkbox"/> Y <input type="checkbox"/> N Spreader bar pin installed and safety pinned

Comments: _____

Note: All unsafe conditions must be corrected before trench entry. If any hazardous conditions are observed, the trench must be immediately evacuated and no one allowed to re-enter until corrective action has been taken.

Excavation Entry Authorized By: Competent Person _____

This Page Intentionally Left Blank

FINAL
DEMILITARIZATION OPERATIONS
STANDARD OPERATING PROCEDURE UXO-05

Munitions and Explosives of Concern Remedial Action
Former Waikane Training Area
Southeastern Region Munitions Response Site
Kāneʻohe, Oʻahu, Hawaiʻi

RMIS ID: H09HI035401

Prepared by:

GSI Pacific Inc.
181 South Kukui Street, First Floor
Honolulu, HI 96813

December 2016

This Page Intentionally Left Blank

Section 1 Standard Operating Procedure Approvals

This page provides a record of the signatures and dates of personnel who developed, reviewed, validated, and approved this Standard Operating Procedure (SOP).

Table 1-1: Contractor Approvals

Name and Signature	Role	Date
  Mike Coyle Corporate Health and Safety Manager	Review/Approval	11/23/16
 Daniel C. Haines Quality Control Manager	Review/Approval	11/29/16
 Brian Stepp Senior Project Manager	Review/Approval	11/28/16

Section 2 Scope and Application

The purpose of this SOP is to provide procedures for demilitarization (DEMIL) of Material Documented as Safe (MDAS) before final certification and transfer of custody.

This SOP applies to unexploded ordnance (UXO) personnel conducting DEMIL operations. It provides detailed information required to DEMIL MDAS. The internal cavities of all items must be visible in order to verify the absence of explosive constituents and classify the material as MDAS.

Section 3 Materials Required

The following lists identify special and critical tools, equipment, and supplies used for Material Potentially Presenting an Explosive Hazard (MPPEH) processing and inspection during munitions and explosives of concern (MEC) projects.

Special and Critical Tools:

- Chop Saw;
- Horizontal Miter Saw;
- Generator;
- Table vise; and
- Securable storage container(s).

Supplies:

- Logbooks;
- Emery cloth; and
- Oil.

Personnel Protective Equipment:

GSI Pacific Inc. (GSIP) and all personnel on site will have all necessary modified Level D personal protective equipment (PPE) as per 29 Code of Federal Regulations (CFR) Part 1910.120. The equipment listed below comprises modified Level D PPE for this project:

- Normal work clothes (long pants and shirt);
- Safety glasses;
- Face shield;
- Hearing protection;
- Leather gloves; and
- Boots (leather, ankle stability).

Section 4 Related Procedures

Related SOPs include the following:

- *Field Documentation*, SOP G-1;
- *Project Quality Control*, SOP G-5;
- *Material Potentially Presenting an Explosive Hazard*, SOP UXO-03; and
- *Batch Burner Thermal Treatment*, SOP UXO-06.

Section 5 *Procedures*

5.1 *Safety*

5.1.1 **Potential Health and Safety Hazards**

The utilization of PPE with temperature levels in excess of 70 degrees Fahrenheit (°F) or more may lead to heatstroke or heat fatigue if the break schedule presented in the Site Safety and Health Plan (SSHP) is not followed. Strict adherence to and timely monitoring of the break schedule, in conjunction with annual medical monitoring will ensure that conditions contributing to heatstroke and/or heat fatigue do not adversely affect individuals utilizing PPE during the DEMIL operations.

5.1.2 **Activity Hazard Analysis**

An Activity Hazard Analysis (AHA) for cutting and mutilation of munitions debris is provided in the Accident Prevention Plan (APP)/SSHP. The AHA identifies the activity steps, hazards, controls, and PPE related to DEMIL operations utilizing the Chop Saw, Horizontal Miter Saw, and generator.

5.1.3 **Site Security**

Daily inspections will be performed to ensure the security of all MDAS containers. All material will be re-sealed and locked in secure containers with a unique identification number assigned for each container at the end of each day.

5.1.4 **Personnel Access to Work Zones**

Onsite management and general site workers will have access to work zones provided that they meet the requirements set forth in Section 5.2 of this SOP and maintain appropriate PPE levels. Visitors and emergency personnel may be granted access to work zones after the health and safety of those individuals has been evaluated by the UXO Safety Officer (UXOSO) and the PPE of said individuals have been determined to offer sufficient levels of protection. The UXOSO will brief all visitors and observers of potential hazards, alarm signals, and evacuation plans prior to granting access to any work zone.

5.1.4.1 *Preliminary Survey*

The survey that deals with the hazards presented by the materials slated for DEMIL will be reviewed each time there is a change in materials or the manner in which the materials are being cut or disfigured.

Exposure duration versus ambient heat for the site worker wearing PPE is specified in this document. Potable water will be available in marked containers as conditions require. A break is defined as helmet off, hood off, and vest open as a minimum.

Prior to initiating site activities each day, and periodically throughout the day, the UXOSO will inspect the site personnel for evidence of heat related illnesses. Evidence of extreme dehydration or illness may require the UXOSO to restrict the worker's activities until such time as the worker is fit for duty. Personnel identified as being at high risk for heat stress, who are allowed to participate in site operations, will be monitored frequently by the UXOSO. Refer to the APP/SSHP for heat/cold stress monitoring information.

5.2 *UXO Qualified Personnel*

All DEMIL operations will be performed by UXO-qualified personnel per Department of Defense Explosive Safety Board (DDESB) Technical Paper (TP)-18. A minimum of a UXO Technician III and UXO Technician II are required to perform this operation.

5.2.1 Responsibilities

UXO Technician II will:

- Assist with 100 percent (%) visual inspection of all material before cutting operations begin;
- Assist with 100% visual inspection of all material after cutting operations have concluded;
- Be fully trained and competent with the cutting equipment;
- Follow all safety requirements during cutting operations; and
- Assist the UXO Technician III during cutting operations.

UXO Technician III will:

- Be in charge of the DEMIL operations and will work with the Senior UXO Supervisor (SUXOS) to ensure that all tasks are performed in accordance with (IAW) this SOP;
- Perform 100% visual inspection of all material before cutting operations begin;
- Perform 100% visual inspection of all material after cutting operations have concluded;
- Be fully trained and competent with the cutting equipment;
- Follow all of the safety requirements during cutting operations; and
- Perform all cutting operations.

UXO Quality Control Specialist (UXOQCS) will:

- Conduct inspections of the DEMIL operations to ensure procedures are being performed IAW this SOP.

UXO Safety Officer (UXOSO) will:

- Ensure the specific procedures and responsibilities for processing DEMIL operations specified in this SOP are being followed; and
- Ensure all procedures for DEMIL operations are being performed safely and consistent with applicable regulations.

Senior UXO Supervisor (SUXOS) will:

- Be responsible for ensuring the operational safety and quality of the procedures and responsibilities for DEMIL operations;
- Ensure a reacquisition and turn-in document, DD Form 1348-1A, is completed for all MDAS to be transferred for final disposition; and
- Responsible for ensuring that inspected MDAS is secured in a closed, labeled, and sealed container.

5.2.2 Training

All personnel assigned to the DEMIL operations will receive training on the equipment used, its AHA, and this SOP. The training will be conducted by the SUXOS, UXOSO, or a UXO Technician III experienced with operation of the DEMIL operations. Training will be documented with attendance sheets and in the project training log.

5.3 DEMIL Operations

5.3.1 Pre-Operations

5.3.1.1 Pre-operational Precautions

The SUXOS will hold a pre-operational meeting with all personnel involved in DEMIL operations. This meeting will assess and define potential hazards, ensure compliance with the APP/SSHP, ensure clarity of communication, and confirm the chain of command.

5.3.2 Demilitarization Operations

A combination of Chop Saw and Horizontal Miter Saw cutting will be used for DEMIL of MDAS. The operations will be conducted in locations where a generator will be required to provide equipment power. The objective of the DEMIL is to meet Department of Defense (DoD) and United States Army Corps of Engineers (USACE) DEMIL requirements and disfigure all MDAS so that the MDAS no longer resembles munitions or munitions-related debris. MDAS will be segregated according to metal type and cut type required to meet the objectives. Recyclers may require specific cutting specifications for each type of MDAS. Quality control criteria for each type of item will be developed for each project in writing before DEMIL operations and will be approved by the SUXOS and UXOQCS.

5.3.2.1 *Chop Saw Operation*

Chop Saw operators will familiarize themselves with the Manufacturer's Operators Manual (Attachment 1). General operating procedures are as follows:

- Applicable safety equipment/proper PPE will be worn at all times when operating machinery. Use of safety glasses, face shield and hearing protection will be required while using machinery. Loose hair and clothing, dangling jewelry (to include wrist watches), gloves, or anything else which could potentially cause the equipment operator to be pulled into, or slip into moving equipment is prohibited;
- Although gloves are prohibited during actual machine operation, gloves will be worn to bring work pieces to and from the relevant machine;
- Ensure work area is clear of clutter and/or trip hazards;
- Ensure saw power switch is OFF when not in use;
- Inspect the generator prior to start-up by:
 - Checking fuel and oil levels; and
 - Ensuring exhaust is clear of obstructions.
- Start the generator and turn the power switch ON;
- Ensure work table is clear, and the abrasive disc is not damaged;
- With power off, slowly rotate the abrasive disc by hand to inspect;

WARNING!
**NEVER OPERATE CHOP SAW WITH A DAMAGED ABRASIVE
WHEEL; INJURY OR DEATH COULD OCCUR!**
**Immediately replace the abrasive disc or tag the unit "OUT OF SERVICE" if
any damage is discovered.**

- Because the abrasive disc throws sparks when cutting, ensure there is no combustible material in the path of the spark arc. Additionally, open trays of water will be placed below spark fall;
- Secure the workpiece in saw table vise prior to cutting. While sawing, never attempt to hold workpieces by hand!;
- Lower the abrasive disc to the workpiece;
- When cutting, allow the abrasive disc to do the work. Never ask the saw to cut faster than its capability; the abrasive disc may be damaged;

- Once cutting is complete, turn the saw off. Allow the abrasive disc to come to a complete stop before removing the workpiece. Never remove the workpiece while the saw is running!;
- At the end of saw use, secure the power to saw and clean the work area of chips and slag. Wipe the work surfaces with a light coat of oil;
- Daily maintenance should include a thorough inspection of the abrasive disc and saw components for any damage. Use an emery cloth to remove any surface rust and wipe surfaces with a light coat of oil; and
- Replacement of the abrasive disks or blades will be done with the unit turned off and unplugged from the power source.

5.3.2.2 *Horizontal Miter Saw Operation*

Horizontal Miter Saw operators will familiarize themselves with the Manufacturer's Operators Manual (Attachment 2). General operating procedures are as follows:

- Applicable safety equipment/proper PPE will be worn at all times when operating machinery. Use of safety glasses, face shield and hearing protection will be required while using machinery. Loose hair and clothing, dangling jewelry (to include wrist watches), gloves, or anything else which could potentially cause the equipment operator to be pulled into, or slip into moving equipment is prohibited;
- Although gloves are prohibited during actual machine operation, gloves will be worn to bring work pieces to and from the relevant machine;
- Prior to use, inspect machinery to ensure it is in safe operating condition as identified in the relevant Manufacturer's Instructions and Recommendations. Any damage or discrepancy will be immediately reported and the machinery will be tagged out and secured from service until the damage or discrepancy has been rectified;
- Maintaining machinery will keep it in good working order. When using saws, be sure the blade is sharp and the proper blade for the material being cut is used;
- Ensure the blade is properly tensioned;
- Where applicable, ensure adequate cooling fluid is available in the relevant sump;
- Ensure work area is clear of clutter and trip hazards;
- Ensure saw power switch is OFF;
- Inspect generator prior to start-up by:
 - Checking fuel and oil levels;
 - Ensuring exhaust is clear of obstructions; and
 - Ensuring potential electrical loads connected with primary power switch is OFF.

- Ensure work table is clear, blade speed is appropriate for the material being cut, blade is square to workpiece and adequate cooling liquid is in the sump;
- Prior to cutting work piece, secure workpiece in saw table vise;

CAUTION

WHILE SAWING NEVER ATTEMPT TO HOLD WORKPIECES BY HAND!

- When cutting, allow the blade to do the work;

CAUTION

NEVER ASK THE SAW TO CUT FASTER THAN THE CAPABILITY OF THE SAW!

- Head Control Panel has a three-position lever:
 - “DOWN” position allows rapid descent of the blade to the work piece;
 - “HOLD” position stops head in any position; and
 - “FEED” position is used in conjunction with the control knob to control the descent of the blade through the work piece.
- Ensure cooling fluid is circulating;
- When cutting is complete, turn saw OFF;

WARNING

NEVER REACH THROUGH SAW OR REMOVE WORKPIECE WHILE SAW IS RUNNING!

- At the end of the saw use, secure power to saw, and clean work area of chips and shavings;
- Wipe work surfaces with a light coat of oil; and
- Weekly maintenance should include using emery cloth on any surface rust, topping off cooling fluid, and a thorough inspection for saw security.

5.3.3 Post-Operations

- MDAS will be placed in a locked container and secured at the end of the day’s operation;
- The work and storage area will be policed of all MDAS every evening. The certifying UXO Technician III will maintain locks/seals and all unprocessed MDAS will be placed back in a barrel for recertification;

- Each day before the container/barrel is opened, the work and storage area will be inspected to make sure no seal tampering or security breaches are discovered; and
- Process will be repeated daily.

Section 6 Documentation

6.1 List of Forms

For DEMIL operations, the UXO Technician III will, at a minimum, complete the following:

- Field Logbook entries recording DEMIL operations; and
- Process and Treatment Record for MDAS (Attachment 3).

The SUXOS will complete the DD Form 1348-1A Issue Release/Receipt for final verification and transfer of MDAS (Attachment in SOP UXO-03).

6.2 Field Logbook

Daily field activities will be documented in a Field Logbook. Refer to SOP G-1 *Field Documentation* for field logbook procedures.

6.3 Process and Treatment Record for MDAS

A Process and Treatment Record For MDAS (Attachment 3) will be completed for each barrel of MDAS. Guidelines for filling out each field on the form are provided below:

- **Contract** - Provide the project contract number;
- **Task Order** – Provide the task order number (if applicable);
- **Barrel** - Provide the barrel number;
- **Seal** - Provide the barrel seal number;
- **Type of MDAS** - Provide the type of MDAS that is in the barrel (*e.g.*, frag, expended fuzes, brass);
- **Weight** - Provide the barrel weight;
- **100% Inspected** - Identify the individual that conducted the 100% inspection (Print Name, Signature, and Date inspection performed);
- **Barrel Content** (circle one):
 - **DEMIL**;
 - **FRAG**; or
 - **MIX**.
- **Initial Explosive Residue Tested:**
 - **Date** - Provide the date the initial explosive residue was tested; and
 - **Pass or Fail** - Circle one.

- **Thermal Treated** (circle one):
 - Yes; or
 - N/A.

- **Final Explosive Residue Tested:**
 - **Date** - Provide the date the final explosive residue was tested; and
 - **Pass or Fail** - Circle one.

- **DEMIL/Disfigurement**
 - **Date** - Provide the date of DEMIL/Disfigurement; and
 - **Pass or Fail** - Circle one.

- **Temp Seal** - Provide the temp seal number;
- **Date** - Provide date of the temp seal;
- **Print Name** - Print the name of the person who applied the temp seal;
- **Signature** - Provide signature of the person who applied the temp seal;
- **100% Re-Inspected** - Identify the individual that conducted the 100% re-inspection (Print Name, Signature, and Date inspection performed);
- **Weight** - Provide the weight of the barrel after 100% re-inspection;
- **Barrel** - Provide the number of the re-inspected barrel;
- **Seal** - Provide the seal number of the re-inspected barrel;
- **1348-1A Completed** (circle one):
 - Yes; or
 - No.

- **Certification Letter Completed** (circle one):
 - Yes; or
 - No.

- **Comments** - Provide any comments.

6.4 DD Form 1348-1A Issue Release/Receipt

The SUXOS and the UXOQCS will utilize the DD Form 1348-1A for the final certification/verification and transfer documentation. The DD Form 1348-1A allows for tracking MDAS through shipping and final transfer of custody. The form will include an inventory by weight and contain the following statement to be signed by the certifying individual and a DoD representative as required by DoD 4160.21-M and DoD 6055.9-M1. Refer to SOP UXO-03 *Material Potentially Presenting an Explosive Hazard Management* for DD Form 1348-1A form and procedures.

Section 7 References

29 CFR 1910. *Occupational Safety and Health Standards.*

29 CFR 1926. *Safety and Health Regulations for Construction.*

American Conference of Governmental Industrial Hygienist, 2008. *Threshold Limit Values and Biological Expose Indices, Cincinnati, Ohio.*

DDESB, 2015. TP-18. *Minimum Qualifications for Personnel Conducting Munitions and Explosives of Concern-Related Activities.* 1 September.

Department of Defense (DoD), 1995. 4160.21-M: *Defense Demilitarization Manual.* 21 October 1991. Revised 14 February 1995.

_____, 2008. 6055.09-M, *DOD Ammunition and Explosive Safety Standards.* 28 February.

_____, 2011. 4160.28 Volume 3. *Defense Demilitarization: Procedural Guidance.* 7 June.

USACE, 2013. EM 385-1-97. *Explosives - Safety and Health Requirements Manual.* 17 May.

_____, 2014. EM 385-1-1. *Safety and Health Requirements Manual.* 30 November

_____, 2015. EM 200-1-15. *Environmental Quality Technical Guidance for Military Munitions Response Actions.* 30 October.

Attachment 1
Chop Saw Operator Manual

This Page Intentionally Left Blank

CHOP SAW OPERATION

Safety Instructions

- Keep guards in place and in working order
- Remove adjusting keys and wrenches
- Keep work area clean
- Don't use in dangerous environment
- Don't force tools
- Use proper extension cord

Volts	Total Length of Cord in Feet (Gauge)
120v	0-25 26-50 51-100 101-150
240v	0-50 51-100 101-200 201-300

Ampere Rating (more-not more)	American Wire Gauge
10-12	16 16 14 12
12-16	14 12 Not Recommended

- Wear proper PPE: Modified Level D (Safety glasses, leather gloves, hearing protection, and safety toe boots.)
- Secure work
- Don't overreach
- Maintain tools with care
- Disconnect tools
- Reduce the risk of unintentional starting
- Use recommended accessories
- Never stand on tools
- Check damaged parts
- Never leave tool running unattended

POWER SUPPLY

Be sure your power supply agrees with the nameplate marking. 120 volts, 60 Hz means alternating current (normal 120 volts, 60 Hz house current). A voltage decrease of more than 10% will cause a loss of power and over heating.

Cutting Capacity

The wide vise opening and high pivot point provides cutting capacity for many large pieces. Use the cutting chart to determine total maximum size cuts that can be made with a new wheel.

CAUTION:

CERTAIN LARGE, CIRCULAR OR IRREGULARLY SHAPED OBJECTS MAY REQUIRE ADDITIONAL HOLDING MEANS IF THEY CANNOT BE HELD SECURELY IN VISE

CAUTION:

DO NOT CUT MAGNESIUM WITH THIS TOOL

CUTTING CHART

Cutting Angle	Circle	Square	Rectangle	L-shape
90 Degrees	5" 127mm	4.7" 119.4mm	4.5" x 6.5" 114 x 165mm 3" x 9" 76 x 228.6mm	5.6" 142.2mm

TO CARRY

Fold down unit to position where you can carry saw. Push in lock pin to lock arm down.

UNLOCKING

To unlock tool and raise head, depress motor arm slightly and pull lock pin out. Motor arm will then pivot upward.

MATERIAL CLAMPING AND SUPPORTING

- Angles are best clamped and cut with both legs resting against base.
- A spacer block slightly narrower than the work piece can be used to increase wheel utilization.
- Long work pieces must be supported by a block so they will be level with top of base. The cut-off end should be free to fall downward to avoid wheel binding.

SPARK DEFLECTOR ADJUSTMENT

To best deflect sparks away from the surrounding persons and material, loosen the screw, adjust the spark deflector and then retighten screw.

WISE OPERATION

The vise has a quick travel feature. To release the vise when it is clamped tightly, turn the crank counterclockwise one or two times to remove clamping pressure. Lift the vise level up. Pull crank assembly out as far as desired. The vise may be shoved into work without cranking. Lower vise lever then tighten vise on work by using crank.

USAGE

To start the tool, depress the trigger switch. To turn the tool off, release the trigger switch. Keep hands and material from wheel until it has coasted to a stop. To prevent unauthorized use of tool, install a standard padlock into the padlock hole located in the trigger.

REMOVAL AND INSTALLATION OF WHEELS

WARNING

To reduce the risk of injury, turn unit off and disconnect machine from power source before installing and removing accessories, before adjusting or changing set-ups or when making repairs. Be sure the trigger switch is in the OFF position. An accidental start-up can cause injury.

The quick-change blade clamp requires no tools to change the blade.

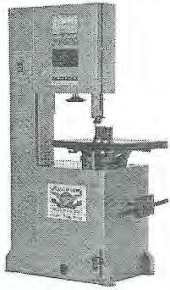
- Push in wheel lock lever and rotate wheel by hand until wheel lock lever engages slot in inside flange to lock wheel. Loosen the quick-change blade clamp counterclockwise. Clamp has right-handed thread.
- Remove the quick-change blade clamp, blade clamp washer and old wheel by hand.
- Make sure flange surfaces are clean and flat. Install the new abrasive wheel by reversing the above steps.
- Tighten the quick-change blade clamp clockwise until the knob clicks at least three times to ensure the knob is tight. The quick-change blade clamp cannot be over-tightened.

This Page Intentionally Left Blank

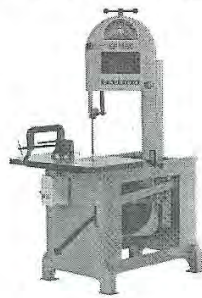
Attachment 2
Horizontal Miter Operator Manual

This Page Intentionally Left Blank

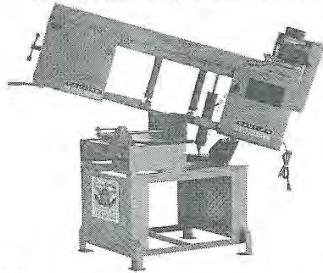
**Model JM1220 Journeyman
20" Vertical Tool & Die Bandsaw**



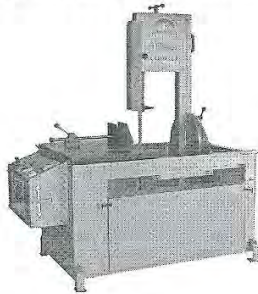
**Model EF1459
Vertical All-Purpose Bandsaw**



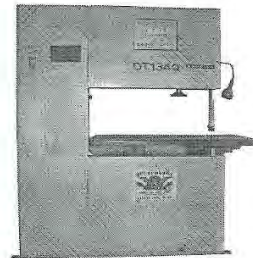
**Model HM1212
Horizontal Mitre Bandsaw**



**Model TF 1420
Vertical Tilt-Frame Bandsaw**



**Model DT 1340 Deep Throat
Vertical Journeyman Bandsaw**



ROLLIN SAW

HORIZONTAL / MITER

MODEL'S HS1418

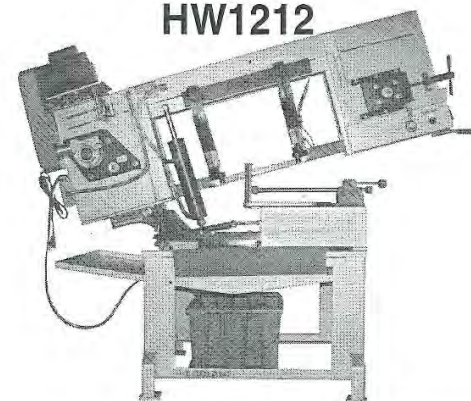
HW1212 & HM1212

OPERATORS MANUAL

HS1418



HW1212



ROLLIN SAW

1311 Brookpark Road • Cleveland, Ohio 44109
800-966-1925 • 216-459-9001 • Fax 216-459-9220
www.rollinsaw.com



Made In U.S.A.



Made In U.S.A.

Congratulations on your purchase of a new Roll-In Saw. This machine was built with pride in the United States of America in Cleveland, Ohio by people that have cared about quality since 1940.

Your Roll-In Saw is a simple but robust band saw that will give you years of service. To get you started using this machine we would like you to follow these easy steps.

First, give your saw a thorough first inspection as they can be damaged in shipment. It is best to do this inspection before you accept delivery of the machine. Any problems with appearance or function should be noted right away so this situation can be remedied immediately.

Then remove the lag bolts from the wooden skid. There are certain marked shipping bolts on the tracks of some models and metal banding on others. These can be removed. Secure the saw to its working area.

Roll-In Saw models with 110 volt motors can be plugged in to any approved electrical outlet. Models with 220 or 440 volt will need a qualified electrician to wire them into appropriate outlets.

Install the band saw blade if not installed by the factory. Check for any other condition that may cause concern. Once this is done, you are ready to begin cutting material. Follow the basic instructions appropriate for the model you have.

If there are any questions regarding the operation or maintenance of this machine, call our Technical Assistance Department for support not covered in this manual at 800-966-1925.

ATTENTION

Before operation of saw, please read manual completely.

Upon delivery of HW1212, HM1212, or HS1418, a thorough inspection should be made to check for damage that may have occurred in shipping. If any damage is noted, contact carrier immediately.

Roll-In Saw Models HW1212, HM1212, and HS1418 operate in similar fashion. Instructions given here will apply to all models unless specifically noted.

Machine Set-Up

Locate HM1212, HW1212 or HS1418 in an area with sufficient room to load and unload material safely.

When removing saw from pallet, only lift at points marked "*Lift Here.*"

DO NOT LIFT ON ANY PORTION OF THE HEAD

On/Off Switch

Note: Machine should be wired by a qualified electrician only. Be sure blade is running in the proper direction.

Depressing the green start button will start the saw blade.

Note: The saw will not start with the head in the down position.

Head Control Panel

1. The **3-position** lever:
 - A. **Down** position allows rapid descent of the blade to the workpiece.
 - B. **Hold** position stops head in any position.
 - C. **Feed** position is used in conjunction with the feed control knob to control the descent of the blade through the workpiece.
2. **Sensor Switch** is located at the bottom of the head.
 - A. This switch interrupts power to the motor when the head is lowered to its adjusted position.
 - B. Switch is adjusted at factory to allow for full cut-off of workpiece.

The HM1212, HW1212 or HS1418 head will swivel 60° left and right of center to allow for miter cuts. Simply loosen lock down handle and move head in the desire direction. An angle chart is attached to the base swivel plate on both sides. **Note:** Be sure to always re-lock hold down handle before cutting.

Electrical System

Roll-In Saw models HW1212 and HM1212 are one horsepower 110 volt single phase or 220 volt single phase only. Model HS1418 is two horsepower 220/440 volt three phase only.

This system consists of an ON/OFF button located on the operator side of the blade head. Push the green button for ON and the red button for OFF. There is a sensor to shut the saw motor off and prevent it from starting when in the down position.

Hydraulic System

All Roll-In Saw Horizontal Miter Saws have a closed Hydraulic System. It consists of a hydraulic cylinder, an actuator valve with three position lever and the necessary tubing.

This system should not require any special maintenance or service. However if hydraulic fluid is lost from the system it can be replaced as follows:

1. Lower the blade head to the full down position.
2. Make sure all tubing is in its proper place and secure.
3. Near the top of the hydraulic cylinder there is a port closed by a set screw. Remove this screw and fill with a light hydraulic fluid IS032 then reset the screw tightly.
4. Lift the head to the top and allow it to drop several times using the control lever. A pumping action will also allow the trapped air to leave the system allowing for smooth blade operation.

Blade Speed Chart

The Blade Speed Chart is located on the drive wheel saw door. Proper speed and feeds rates are critical to blade life and squareness of cuts. Check with your blade supplier for proper blade and coolant specs for the material you are cutting. Different blade speeds are obtained by lowering the toggle clamp at the motor pedestal and moving the belt to the desired pulley. Speeds are from outside to in 70-140-270 feet per minute.

Blade Guide System

Roll-In Saw Model HW1212 and HM1212 will have Blade Guide Rollers. These may be adjusted by loosening the set screws on the blade guide housing of the saw then adjusted to the square position with the table and tightened. Further instructions are in "Checking and Adjusting Blade Squareness" found below.

Model HS1418 has carbide inserts in the blade guide arms. They will not require any further settings and should last for a considerable time. When completely worn they can be replaced.

Blade Installation / Removal

Open the saw wheel doors and flip up the center guard. Remove the front and rear blade guards. Loosen the blade tensioning handle (located at the front of the saw head) until the blade is loose. Loosen carbide blade inserts located at the base of each guide (For Model HS1418 only). Push the blade down and out of the guide arms. Pull blade off idler and drive wheels. Remove blade from saw. Reverse sequence for installation of new blade.

Blade Tension Adjustment

CAUTION: Before adjusting your saw disconnect from, or lockout, the power source.

T-Handle on head of saw is to control tension of your saw blade. Tighten firmly before using, or you cannot get straight cuts. Hand tighten with one hand, then one full turn with both hands. Leave slack in saw blade when not in use for extended periods of time.

Blade Tracking Adjustment

Remove blade from each guide arm so that blade is running on the drive and idler wheels only. Start saw on low speed and let run a few revolutions. Shut off and check. Back of blade should be approximately .002 to .003 away from flange on both wheels.

Drive wheel is adjusted by loosening the 3 - 3/8 hold down bolts on the gear box. Next to the hold down bolts are 3 - 3/8 set screws. Turn the set screws in or out to change blade position on the wheel until proper tracking is accomplished. Re-tighten bolts and run, shut off and re-check. Idler wheel adjustment is done at the upper wheel slide plate. Loosen the 4 - 3/8 bolts. Between the two (2) lower bolts is a 3/8 set screw. Turn in or out to change the tilt of the wheel moving blade to the desired position. Re-tighten and run saw. Shut off and re-check.

Note: Re-tighten the bolts both at the gear box and wheel slide plate will effect the adjustment. Always re-check adjustments.

Checking and Adjusting Blade Squareness

Set square to the side of the blade on the table. Raise and lower the head of the saw to check. If adjustment is needed, loosen 2 knobs then adjust from side to side with 2 - 3/8" bolts and 2 - 3/8" set screws. Caution should be used as balance spring will try to lift the saw head frame up as bolts are loosened. Re-tighten all bolts and re-check squareness.

Coolant System

Roll-In Saw Model HW1212 and HS1418 are equipped with a Blade Coolant feature. This system consists of an 8 gallon reservoir, 3.5 GPM Little Giant pump, tubing, needle valve flow control and check valve.

Any water soluble coolant may be used at the operator's discretion.

Operation of the system is performed by turning the Coolant Control Switch located on the Blade Head near the control feed lever. A simple ON/OFF switch turns the fluid flow on or off. The coolant flow will only operate when the motor is running. Fluid flow is adjusted by turning the needle control valve located at the upper part of the top blade arm.

IMPORTANT SAFETY INSTRUCTIONS

WARNING

Failure to follow the following safety precautions may result in serious injury!

DISCONNECT POWER SOURCE. Always disconnect the power source before performing maintenance or changing the blade of this machine.

USE SAFETY EQUIPMENT. Eye protection is required at all times when operating this machine. In some cases face mask and ear protection may be needed. Wear proper apparel to avoid accidents such as slipping, clothing or hair caught in the moving parts of the band saw.

NEVER LEAVE MACHINE RUNNING ATTENDED. Before leaving this machine, make sure the power is off and the blade has come to a complete stop.

KEEP A CLEAN WORK AREA. A clean work area will help prevent accidents. Keep clutter to a minimum and clean oil spills immediately to avoid slipping. Good housekeeping is always a good practice.

ALWAYS BE ALERT. Keep alert to potential work hazards. Do not overcrowd a work area. Watch what others are doing in your work area. Avoid the moving parts of this machine.

SECURE ALL WORK. Use proper clamps, vices or jigs to hold your work secure. Do not push machinery beyond its normal capability. Do not overreach while working on this saw.

MAINTAIN THIS MACHINE. Always keep this machine well maintained by keeping the working parts of this saw in good working order. Be sure the blade is sharp and it is the proper one for the material being cut. Always make sure the blade has proper tension and is cutting straight.

ALWAYS KEEP ALL SAFETY GUARDS IN PLACE.

DO NOT PERFORM MODIFICATIONS TO THIS MACHINE AS THEY MAY CREATE AN UNSAFE CONDITION AND WILL VOID ANY WARRANTIES.

DO NOT ATTEMPT TO USE THIS MACHINE FOR ANYTHING OTHER THAN WHAT IT WAS INTENDED.

DO NOT OPERATE WHEN TIRED OR UNDER THE INFLUENCE OF DRUGS OR ALCOHOL.

This Page Intentionally Left Blank

Attachment 3
Process and Treatment Record for MDAS

This Page Intentionally Left Blank

Process and Treatment Record for MDAS

CONTRACT: _____	TASK ORDER: _____
BARREL: _____	SEAL: _____
TYPE OF MDAS _____	WEIGHT _____

100% INSPECTED: _____		
Print Name	Signature	Date

BARREL CONTENTS:	DEMIL	FRAG	MIX	(CIRCLE ONE)
INITIAL EXPLOSIVE RESIDUE TESTED: _____	PASS	FAIL	(CIRCLE ONE)	
DATE				
THERMAL TREATED:	YES	N/A	(CIRCLE ONE)	
FINAL EXPLOSIVE RESIDUE TESTED: _____	PASS	FAIL	(CIRCLE ONE)	
DATE				
DEMIL/DISFIGUREMENT: _____	PASS	FAIL	(CIRCLE ONE)	
DATE				

TEMP SEAL	DATE	PRINT NAME	SIGNATURE

100% RE-INSPECTED: _____		
Print Name	Signature	Date
WEIGHT: _____	BARREL: _____	SEAL: _____

1348-1A COMPLETED: YES NO	CERTIFICATION LETTER COMPLETED: YES NO
----------------------------------	---

COMMENTS: _____

This Page Intentionally Left Blank

FINAL
BATCH BURNER THERMAL TREATMENT
STANDARD OPERATING PROCEDURE UXO-06

Munitions and Explosives of Concern Remedial Action
Former Waikane Training Area
Southeastern Region Munitions Response Site
Kāneʻohe, Oʻahu, Hawaiʻi

RMIS ID: H09HI035401

Prepared by:

GSI Pacific Inc.
181 South Kukui Street, First Floor
Honolulu, HI 96813

December 2016

This Page Intentionally Left Blank

Section 1 Standard Operating Procedure Approvals

This page provides a record of the signatures and dates of personnel who developed, reviewed, validated, and approved this Standard Operating Procedure (SOP).

Table 1-1: Contractor Approvals

Name and Signature	Role	Date
  Mike Coyle Corporate Health and Safety Manager	Review/Approval	11/23/16
 Daniel C. Haines Quality Control Manager	Review/Approval	11/29/16
 Brian Stepp Senior Project Manager	Review/Approval	11/28/16

Section 2 Scope and Application

The purpose of this SOP is to provide procedures for thermal treatment of Material Documented as Safe (MDAS) utilizing a Batch Burner Thermal Treatment Unit (BBTT) prior to final certification and transfer of custody.

This SOP applies to unexploded ordnance (UXO) personnel conducting thermal treatment operations with the BBTT. It provides detailed information required to thermally treat MDAS. The internal cavities of all items must be visible in order to verify the absence of explosive constituents and classify the material as MDAS and also to prevent an explosive or mechanical event in the BBTT.

Section 3 Materials Required

The following lists identify special and critical tools, equipment, and supplies used for BBTT operations during munitions and explosives of concern (MEC) projects.

Special and Critical Tools:

- BBTT;
- Propane tank;
- Wind screen;
- Torch;
- EXPRAY kit; and
- Securable storage container(s).

Supplies:

- Logbooks; and
- Shovel.

Personnel Protective Equipment:

GSI Pacific Inc. (GSIP) and all personnel on site will have all necessary modified Level D personal protective equipment (PPE) as per 29 Code of Federal Regulations (CFR) Part 1910.120. The equipment listed below comprises modified Level D PPE for this project:

- Normal work clothes (long pants and shirt);
- Safety glasses;
- Leather gloves; and
- Boots (leather, ankle stability).

During flashing activities, additional PPE will be required:

- Welder's gloves;
- Aprons;
- Steel toe boots;
- Safety glasses; and
- Hard hat with a full-face shield.

Section 4 Related Procedures

Related SOPs include the following:

- *Field Documentation*, SOP G-1;
- *Project Quality Control*, SOP G-5;
- *Material Potentially Presenting an Explosive Hazard*, SOP UXO-03; and
- *Demilitarization Operations*, SOP UXO-05.

Section 5 *Procedures*

5.1 *Safety*

5.1.1 *Potential Health and Safety Hazards*

The main door of the BBTT is designed to open in the event of overpressure and standing in front of the door may expose the operator to the possibility of explosively ejected material. The operator must wear the correct PPE and will not stand in line with the mouth of the door at any time during thermal treatment.

The materials that will be introduced into the BBTT are classified as reactive material components and therefore, present the expected hazards of burns. The correct employment of PPE, work procedures, and the use of common best practices will limit hazards.

The material being treated may also present varied levels of toxicity when burnt. Standing in the downwind exhaust plume of the BBTT may expose the operator to hazardous levels of fumes that may be hazardous to the operator's health and/or safety. Therefore, no personnel shall stand downwind of or in the exhaust plume of the BBTT during thermal treatment procedures.

The utilization of PPE with temperature levels in excess of 70 degrees Fahrenheit (°F) or more may lead to heatstroke or heat fatigue if the break schedule presented in the Accident Prevention Plan (APP)/Site Safety and Health Plan (SSHP) is not followed. Strict adherence to and timely monitoring of the break schedule, in conjunction with annual medical monitoring will ensure that conditions contributing to heatstroke and/or heat fatigue do not adversely affect individuals utilizing PPE during the operation of the BBTT.

5.1.2 *Site Security*

Daily inspections will be performed to ensure the security of all MDAS and thermally treated material containers. All material will be re-sealed and locked in secure containers with a unique identification number assigned for each container at the end of each day. Areas for thermally treated MDAS, MDAS waiting demilitarization (DEMIL) or disfigurement, and unprocessed MDAS will be separated, and plainly marked. All material will be tracked through every step of the process on the MDAS Processing Barrel Tracker, Process and Treatment Record for MDAS (refer to SOP UXO-05), and then with a final DD Form 1348-1A Certification/Verification (refer to SOP UXO-03) and transfer of custody document (*i.e.*, Final Certification/Transfer Letter [Attachment 2]).

5.1.3 *Personnel Access to Work Zones*

Onsite management and general site workers will have access to work zones provided that they meet the requirements set forth in Section 5.2 of this SOP and maintain appropriate PPE levels. Visitors and Emergency Personnel may be granted access to work zones after the health and safety of those individuals has been evaluated by the UXO Safety Officer (UXOSO) and the PPE of said individuals has been determined to offer sufficient levels of protection. The UXOSO will

brief all visitors and observers of potential hazards, alarm signals, and evacuation plans prior to granting access to any work zone.

5.2 UXO Qualified Personnel

All BBTT operations will be performed by UXO-qualified personnel per Department of Defense Explosive Safety Board (DDESB) Technical Paper (TP)-18. A minimum of a UXO Technician III, UXO Technician II, and UXO Technician I are required to perform this operation.

5.2.1 Responsibilities

UXO Technician I/II will:

- Be fully trained and competent with the thermal equipment;
- Follow all safety requirements during thermal operations; and
- Assist the UXO Technician III during thermal operations.

UXO Technician III will:

- Be in charge of the BBTT operations and will work with the Senior UXO Supervisor (SUXOS) to ensure that all tasks are performed in accordance with (IAW) this SOP;
- Be fully trained and competent with the thermal equipment;
- Ensure all equipment being used is inspected for serviceability prior to use;
- Test MDAS for explosive residue with EXPRAY; and
- Follow all of the safety requirements during thermal operations.

UXO Quality Control Specialist (UXOQCS) will:

- Conduct inspection on BBTT operations to ensure procedures are being performed IAW this SOP.

UXO Safety Officer (UXOSO) will:

- Ensure the specific procedures and responsibilities for BBTT operations specified in this SOP are being followed; and
- Ensure all procedures for BBTT are being performed safely and consistent with applicable regulations.

Senior UXO Supervisor (SUXOS) will:

- Be responsible for ensuring the operational safety and quality of the procedures and responsibilities for BBTT operations;
- Ensure a reacquisition and turn-in document, DD Form 1348-1A, is completed for all MDAS to be transferred for final disposition; and

- Responsible for ensuring that inspected MDAS is secured in a closed, labeled and sealed container.

5.2.2 Training

All personnel assigned to the BBTT will receive training on operational theory of the BBTT, its activity hazard analysis (AHA), and this SOP. The specific batch burner model being utilized for this thermal treatment procedure is the Mobile Thermal Destruction Unit (MTDU) and the manual for this equipment is included in this SOP as Attachment 7. The training will be conducted by the SUXOS, UXOSO, or a UXO Technician III experienced with operation of the BBTT. Training will be documented with attendance sheets and in the project training log.

5.2.3 Preliminary Survey

The survey that deals with the hazards presented by the materials to be treated will be reviewed each time there is a change in materials or the manner in which the materials are being processed.

Exposure duration versus ambient heat for the site worker wearing PPE is specified in this document. Portable water will be available in marked containers as conditions require. A break is defined as helmet off, hood off, and vest open as a minimum.

Prior to initiating site activities each day, and periodically throughout the day, the UXOSO will inspect the site personnel for evidence of heat related illnesses. Evidence of dehydration or illness may require the UXOSO to restrict the worker's activities until such time as the worker is fit for duty. Personnel identified as being at high risk for heat stress, who are allowed to participate in site operations, will be monitored frequently by the UXOSO. Refer the APP/SSHP for heat/cold stress monitoring information.

5.3 BBTT Operations

5.3.1 Pre-Operations

5.3.1.1 Pre-operational Precautions

The SUXOS will hold a pre-operational meeting with all personnel involved in BBTT operations. This meeting will assess and define potential hazards, ensure compliance with the APP/SSHP, ensure clarity of communication, and confirm the chain of command.

5.3.1.2 Equipment Inspection

The BBTT and all related equipment must be inspected for damage or unusual wear prior to operation. The UXO Team Leader will inspect health and safety equipment prior to commencing daily operations. Most tasks will be performed in modified Level D PPE. During flashing activities, additional PPE (welder's gloves, aprons, steel toe boots, safety glasses, and a hard hat with a full-face shield) will be required. Below is a list of inspections to be conducted:

- Check the propane tank fill level, valve thread condition, and hydro test date;
- Check all gas hoses and valves for leaks, splits, or malfunctions;
- Check the Flint Lighter;
- Check BBTT insert boxes for cracks at welds and unusual warping;
- Check all BBTT required safety equipment to ensure date is current and it is readily accessible;
- Check BBTT required PPE. Replace any damaged PPE;
- Check the forklift and/or barrel handler operator's manuals for barrel handling equipment guidance (Attachment 3);
- Check Infrared Thermometer per manufacturer guidance (Attachment 4), and
- Check the wind screen.

5.3.1.3 Inspection Discrepancies

Report any discovered inspection discrepancies to the SUXOS and UXOSO. Once a piece of equipment has been identified as not meeting manufacturer safe operating procedure requirements, the UXOSO will remove the equipment from operational use and lockout/tagout defective equipment IAW United States Army Corps of Engineers (USACE) *Safety and Health Requirements Manual*, EM 385-1-1 (USACE, 2014). The UXOSO will then make an entry in lockout/tagout log and inform personnel authorized to use equipment, of non-operable status and update them as necessary. There will be no operational activities conducted on a system where the unexpected energizing, start up, or release of kinetic or stored energy could occur and cause injury or damage to workers. Routine maintenance, manufacturer service or repair may be conducted with approval by the UXOSO, where there is no potential risk for injury to occur.

5.3.1.4 Safety Manual for use of Propane

Refer to the company's policy letter (Attachment 5).

5.3.1.5 Safety Manual for Utility Torches

Refer to Attachment 6 for inspections and installation instructions.

5.3.1.6 Site Operational Requirements

The following are site operational requirements:

- The site of BBTT operation will be divided into various separate Work Zones which each serve a specific purpose;
- The Exclusion Zone will include the foot print of the BBTT and the area immediately surrounding it;
- The Hotline will be a line running at a 10-foot radius around the BBTT; and

- The Support Zone will extend from the edge of the hotline out to a 200-foot radius from the BBTT.

5.3.1.7 Alarm System

The SUXOS will determine a system to alert all personnel of the operational status of the BBTT using both audio and visual signals. This alarm system will be used to indicate emergencies, commencement and continuation of operations, test operations, and area clear status.

5.3.1.8 Pre-Burn Set-Up (Cool or Cold)

The pre-burn set-up procedures are as follows:

- Operations will not proceed unless a wind screen is in place to minimize the wind around the torches. The BBTT will not function properly if the wind is greater than 15 miles per hour (mph). Operating the BBTT in these conditions may present a safety hazard;
- The BBTT must be grounded if burning static sensitive material;
- Check that the BBTT is empty of unwanted materials;
- Screw torch lines to propane tanks (*note, propane tank threads are left-handed*);
- Install torch header to the BBTT at torch portals; clamp torches pointed into the BBTT leaving a one-to-two inch air gap between mouth of header and torch port to allow for adequate air flow to the torch flame; and
- Swing out outer door of batch burner, then carefully lower door of inner box.

WARNING!

INNER BOX DOOR IS MODERATELY HEAVY! KEEP BODY PARTS CLEAR WHEN OPENING!

5.3.1.9 Loading BBTT

Using a forklift, load the pre-filled insert box into the inner BBTT box. There is a channel on the bottom of the insert box specifically designed to accommodate a single forklift tine for transport.

WARNING!

EMPTY INSERT BOX WEIGHS APPROXIMATELY 140 POUNDS. ALWAYS USE AT LEAST TWO PEOPLE TO MOVE AN EMPTY INSERT BOX!

When no forklift is available, load the empty insert box into the inner batch burner box and manually shovel the unprocessed MDAS into the inner box with a square head shovel.

5.3.1.10 *Thermal Sensor setup*

The thermal set-up procedures are as follows:

- Install the temperature sensing probe to the thermal sensor probe mounting point;
- Plug the thermocouple lead into the infrared thermometer;
- Ensure that the thermal sensor readout reflects the correct ambient air temperature;
- Insert the temperature sensing probe fully into the compression fitting on the side of BBTT; and
- Ensure the thermocouple is clear of the material contained within the insert box, then close and secure the inner and outer doors of the BBTT.

5.3.2 **Operations**

5.3.2.1 *MDAS Testing Procedure*

IAW this SOP, a BBTT will be utilized to conduct thermal treatment on MDAS prior to final certification and transfer of custody. The barrel containing the MDAS will be weighed using a scale and its contents will be removed and inspected visually. All MDAS will receive 100 percent (%) inspection before and after thermal treatment by the UXO Technician II and UXO Technician III. During the inspection process, the MDAS will be tested with EXPRAY explosive residue test kit (Attachment 1) by sampling material from the top, middle and bottom of the barrel.

WARNING!

THE INTERNAL CAVITIES OF ALL ITEMS MUST BE VISIBLE PRIOR TO THERMAL TREATMENT IN ORDER TO VERIFY THE ABSENCE OF EXPLOSIVE CONSTITUENTS AND CLASSIFY THE MATERIAL AS MDAS AND ALSO TO PREVENT AN EXPLOSIVE OR MECHANICAL EVENT IN THE BBTT.

5.3.2.1.1 *Negative EXPRAY Result*

If a negative EXPRAY result is found, and no DEMIL or disfigurement is required (*i.e.*, all contents of the barrel are frag only), then the contents will be returned to the barrel which will be resealed, and recertified as MDAS with negative explosive residue test verification and documentation.

5.3.2.1.2 *Positive EXPRAY Result*

If a positive result is found, then the UXO Technician III will immediately notify the SUXOS and segregate the barrel and all of its contents from the processed material and mark it as Material Documented as an Explosive Hazard (MDEH). Additional reporting, labeling, and

disposal methods will be required and determined by the Project Manager and project delivery team (PDT).

5.3.2.2 *Demilitarization and Disfigurement*

MDAS requiring DEMIL will be segregated and thermally treated in the BBTT **before** any cutting operations are performed. DEMIL operations, quality control criteria, and safety procedures are covered in the DEMIL SOP (SOP UXO-05) and AHA, and are not covered in this SOP. Should an item be too large to fit in the BBTT, then the item will be tested with the EXPRAY kit by sampling at each planned cutting point and in several places on the item before any cutting is performed. Any positive results will be treated as discussed in Section 5.3.2.1.2.

5.3.2.3 *BBTT Operation*

CAUTION

ANY OPERATION DURING BURN OPERATIONS THAT REQUIRES DIRECT CONTACT WITH, OR CLOSE PROXIMITY TO THE BBTT OR ASSOCIATED HEATED COMPONENTS AND MDAS REQUIRES FACE SHIELD, STEEL TOE BOOTS, SAFETY GLASSES, HEAVY LEATHER GLOVES, LEATHER APRON AND CAPE IN ADDITION TO LEVEL D PPE.

The BBTT operation procedures are as follows:

- Ensure the area adjacent to the torch header is clear of combustible material;
- Ensure the manual valves at the torches (Attachment 6) are closed;
- Fully open propane tank valves;
- On the torch header furthest away, open the torch valve just enough to hear gas flow through the torch header, and then ignite the propane with the Flint Lighter. Perform same torch ignition procedure on nearest torch header;
- Once ignited, adjust the torch valves to allow the gas to flow at a smooth consistent rate. The “Fully Open” valve position should not be necessary. If a torch valve requires being in the fully open position in order to produce adequate flame:
 - Ensure there are no kinks or external restrictions in the torch line;
 - Close both valves at the torches;
 - Re-check relevant propane tank to ensure the tank valve is open and adequate propane is available;
 - If adequate propane is available, close the propane tank valve, remove the torch line from the propane tank, and inspect both propane tank valve and torch hose line fitting for obstructions; and
 - Clear any obstructions, re-connect torch line, and attempt to re-ignite the torch.

- Once both torches are operating normally, install the wind screen by placing the notches in the wind screen over the torch lines;
- After the torches are ignited, all personnel will move to designated safe areas within the prescribed work zones for the period of time required to complete treatment of the MDAS;
- The BBTT operator must be in a position where the temperature readout on the Thermal Sensor can be read;
- As the temperature closes on, and achieves, the required 650 °F minimum temperature, prepare to reduce torch output with a slow, incremental closure of the propane tank valves until the required temperature is obtained and has stabilized;
- **Do not exceed 900 °F as this will damage the thermocouple;**
- BBTT temperature between 650 °F and 700 °F must be maintained for 30 minutes minimum, following the last sign of reaction (audible or visual) to ensure complete thermal treatment of MDAS;
- There is an undeniable audio difference when torches become extinguished, so pay attention to the sound of the torches. Where a lit torch has a mild rumble, unlit torches make very little noise. If one torch becomes extinguished, the still-ignited torch will re-ignite the extinguished torch. If both torches are suspected of having been extinguished, a brief inspection of torch flames is recommended as confirmation;

DANGER!

SHOULD BOTH TORCHES BE EXTINGUISHED, NEVER ATTEMPT TO REIGNITE TORCHES WITHOUT CLOSING BOTH PROPANE TANK AND TORCH VALVES. OPEN THE BATCH BURNER DOOR AND ALLOW THE BURNER TO VENT FOR AT LEAST FIVE (5) MINUTES BEFORE CLOSING THE BATCH BURNER DOOR AND RE-IGNITING. ACCUMULATED PROPANE GAS WITHIN THE BATCH BURNER MAY IGNITE IN A VIOLENT MANNER!

5.3.3 Post-Operations

5.3.3.1 Post-Burn Procedures

The post-burn procedures are as follows:

- The operator must be in proper PPE for exposure to heat or hot components;
- Secure valves at propane tanks;
- Remove wind screen and ensure the torch valves are secured;
- Withdraw Temperature Sensor Probe (if needed) from BBTT;
- Open inner BBTT door;

- Remove insert box with forklift from inner box, and move insert box to designated cooling area;
- When no forklift is available, using a square head shovel, manually shovel the processed MDAS out of the inner box into a wheel barrel and taken to a designated cooling area;
- Final inspection is required at the end of every operational cycle of the BBTT; and
- All spent material and ashes must be removed in order to ensure that no hot coals remain that could ignite new material being loaded.

5.3.3.2 End of Day Operations

The end of day procedures are as follows:

- Treated and untreated MDAS will be placed in a locked container and secured at the end of the day's operation and all MDAS secured IAW Section 5.1.2;
- The work and storage area will be inspected and cleared of all loose MDAS and tools every evening. The certifying UXO Technician III will maintain Locks and Seals for all materials. Any unprocessed MDAS will be placed and secured in a container until the inspection and/or processing operations can be started again;
- Each day before container/barrel is opened, the work and storage area will be inspected to ensure no seal tampering or security breaches have occurred; and
- Process will be repeated daily.

Section 6 Documentation

6.1 List of Forms

For BBTT operations, the UXO Technician III will, at a minimum, complete the following:

- Field Logbook entries recording BBTT operations;
- Process and Treatment Record for MDAS; and
- Final Certification/Transfer Letter.

The SUXOS will complete the DD Form 1348-1A Issue Release/Receipt for final verification and transfer of MDAS (Attachment in SOP UXO-03).

6.2 Field Logbook

Daily field activities will be documented in a Field Logbook. Refer to SOP G-1 *Field Documentation* for field logbook procedures.

6.3 Process and Treatment Record for MDAS

A Process and Treatment Record For MDAS (Attachment in SOP UXO-05) will be completed for each barrel of MDAS. Guidelines for filling out each field on the form are provided in Section 6.3 of SOP UXO-05 *Demilitarization Operations*.

6.4 DD Form 1348-1A Issue Release/Receipt

The SUXOS and the UXOQCS will provide certification that the MDAS has been 100% visually inspected and tested with EXPRAY to be “explosive free” and that all required demilitarization and thermal treatment have been performed. The SUXOS and the UXOQCS will utilize the DD Form 1348-1A for the final certification/verification and transfer documentation. The DD Form 1348-1A allows for tracking MDAS through shipping and final transfer of custody. The form will include an inventory by weight and contain the following statement to be signed by the certifying individual and a DoD representative as required by DoD 4160.21-M and DoD 6055.9-M1. Refer to SOP UXO-03 *Material Potentially presenting an Explosive Hazard Management* for DD Form 1348-1A procedures.

6.5 Final Certification/Transfer Letter

A Final Certification/Transfer Letter (Attachment 2) will be completed to document transfer of custody of MDAS.

Section 7 References

29 CFR 1910. *Occupational Safety and Health Standards.*

29 CFR 1926. *Safety and Health Regulations for Construction.*

American Conference of Governmental Industrial Hygienist, 2008. *Threshold Limit Values and Biological Exposure Indices, Cincinnati, Ohio.*

DDESB, 2015. TP-18. *Minimum Qualifications for Personnel Conducting Munitions and Explosives of Concern-Related Activities.* 1 September.

Department of Defense (DoD), 1995. 4160.21-M: *Defense Demilitarization Manual.* 21 October 1991. Revised 14 February 1995.

USACE, 2013. EM 385-1-97. *Explosives - Safety and Health Requirements Manual.* 17 May.

_____, 2014. EM 385-1-1. *Safety and Health Requirements Manual.* 30 November

This Page Intentionally Left Blank

Attachment 1
Manufacturer's Notes for EXPRAY

This Page Intentionally Left Blank

MANUFACTURER'S NOTES FOR EXPRAY

Expray is a field test kit for the immediate detection and identification of explosive. Detection is accurate, quick and distinct. The kit will provide visual evidence of traces of the following: GROUP A: Nitroaromatics such as T.N.T., Tetril, T.N.B. GROUP B: Nitroesters and Nitroamines (RDX, Semtex, Dynamite, Smokeless powder). Inorganic Nitrate based explosives: Such as ANFO, Black powder.

The operating temperature range for the kit is 32 to 110°F.

The spraying order must not be altered and all three sprays should be used when testing to perform a complete test. If EXPRAY-2 is sprayed after a positive result was obtained with EXPRAY-1, a change to pink color is an indication of a double base or a triple-base explosive (such as Composition B and triple-base gunpowder). Even when group B explosives only are tested, one should start with EXPRAY-1 and only then spray with EXPRAY-2. If nitrate-based explosives are suspected, one should still start with EXPRAY-1, then move to EXPRAY-2, and only then apply EXPRAY-3.

False Positives

If nitrite compounds (such as sodium nitrite) are tested, a color reaction will be obtained even after applying EXPRAY-1 and EXPRAY-2. No other false positives are known, but one should note that only the colors listed should be observed.

Different colors may appear during use of EXPRAY at any time and should be compared with those listed in the detection chart (i.e., picric acid causes a yellow color). If a color appears in any stage that is not listed on the chart, it should be disregarded. Furthermore, an un-reacted test paper left in the open air will gradually change in color to light pink. Note that there are some varnishes and lacquers made of nitrocellulose (which is a group B explosive), and if the kit is applied directly to a surface treated with such coatings, a positive (pink) reaction will appear; however the varnishes do not disperse residue so testing an object that has come into contact with a varnished surface will not cause a false positive.

Kit Operation Step 1 (Detection of Nitroaromatics)

1. Slide one collection paper from the dispenser.
2. Peel the protective silicon layer, exposing the sticky collection surface.
3. Wipe the suspected area or touch the collection to the suspected substance
4. Spray the paper briefly with Expray #1 can from a distance of 15 CM (6").
5. Observe for an immediate appearance of Group A explosive. Use color chart to interpret results. If no color reaction appears, continue to Step 2.

Kit Operation Step 2 (detection of Nitroesters)

1. Spray with Expray #2 can on the same paper used for Step 1 until slightly wet

2. Observe for an immediate appearance of pink stain indicating the presence of Group B explosive. Use color chart to interpret results. If no color reaction appears, continue to Step 3.

Kit Operation Step 3 (Detection of Nitrates)

1. Shake well Expray #3 can
2. Spray with Expray #3 can on the same spot made by Expray #1 and #2.
3. Observe for an appearance of pink stains indicating the presence of Inorganic Nitrate based explosive. Use color chart to interpret results.

Kit Verification

Tear one verification paper from the verification pad in the left side of the case. (Do not wipe anything). Spray the paper briefly (on the non glossy side) with Expray #1 can from a distance of 15 cm (6"), then Spray with Expray #2 can onto the spot made by Expray #1 until slightly wet. Observe for an immediate appearance of the letters **EX** indicating the validity of the reagents.

Notes: Only an immediate color reaction should be considered as positive (a sprayed paper left in open polluted air, may change its color to pink gradually. This late color reaction should be disregarded). Some Lacquers may contain Nitrocellulose, and may react after spraying Expray #2.

Safety Precautions

Use in well ventilated area. Spray away from the body. Do not inhale. Avoid contact with eyes or skin. In case of accidental contact – flush with water. Do not use near fire. Do not puncture.

Detection Chart

Expray is sold in a kit configuration, which provides all three aerosol sprays, collection papers, and an RDX-impregnated verification pad (verification pad is useful for ensuring that the spray can still contains active reagents and for demonstrating how a positive reaction will appear) in a convenient plastic carry case. Expray kits are available in both regular size (100 tests) and mini-size (50 tests).

Mistral is proud to say that Expray provides a low "per test" cost and poses no risk to you or the environment

"E": Expray-1 for Group A Expray-1 is used to search for GROUP A type explosives which include TNT, Tetryl, TNB, DNT, picric acid and its salts. To use, wipe suspected surface with special collector test paper. Spray with Expray-1. If a dark brown-violet color appears, this indicates the presence of TNT; An orange color indicates the presence of Tetryl and other GROUP A explosives.

"X": Expray-2 for Group B Expray-2 is used to search for GROUP B type explosives which include Dynamite, Nitroglycerine, RDX, PETN, SEMTEX, Nitrocellulose and smokeless powder. If after spraying Expray-1 there is no color change, spray Expray-2. The almost immediate appearance of a pink color change indicates the presence of GROUP B explosives. Most plastic types of explosives belong to this group, including C-4 and Semtex.

"I": Expray-3 for Nitrates Expray-3 is used to search for nitrate-based explosives which includes ANFO (ammonium nitrate-fuel oil), commercial and improvised explosives based on inorganic nitrates, black powder, flash powder, gun powder, potassium chlorate and nitrate, sulfur (powder), and ammonium nitrate (both fertilizer and aluminum). If there is still no reaction after using the Expray cans 1 and 2, but presence of explosives is still suspected, spray the same paper with Expray-3. A pink reaction indicates the presence of nitrates, which could be part of an improvised explosive.

Detection Chart

Product :	EXPRAY - 1 / Drop-Ex 1		EXPRAY - 2 / Drop-Ex 2		EXPRAY - 3 / Drop-Ex 3		Drop-Ex 4 (used alone)	
Detects:	Polynitro Aromatics		Nitrate-esters Nitramines		Inorganic Nitrate Compounds		Chlorates	
	Group A		Group B		Group C		Group D	
#	Substance	Color	Substance	Color	Substance	Color	Substance	Color
1	TNT	Dark Brown	Semtex	Pink	Ammonium Nitrate	Pink	Potassium Chlorate	Dark Blue
2	TNB	Dark Brown	RDX	Pink	Potassium Nitrate	Pink	Sodium Chlorate	Dark Blue
3	DNT	Blue Green	HMX	Pink	Sodium Nitrate	Pink	Bromides	Dark Blue
4	Picric Acid	Yellow	PETN	Pink	Barium Nitrate	Pink		
5	Tri Nitro Naphthalene	Violet	EGDN	Pink	BlackPowder	Pink		
6	Lead Styphnate	Yellow	Nitro Glycerin	Pink				
7			Nitro Cellulose	Pink				
8			Tetryl	Pink				
9			Smokeless Powder	Pink				

This Page Intentionally Left Blank

Attachment 2
Final Certification/Transfer Letter

This Page Intentionally Left Blank

FINAL CERTIFICATION/TRANSFER LETTER

TO WHOM IT MAY CONCERN

By accepting this letter, _____, (Receiver) agrees upon receiving an unopened, labeled container/barrel (Listed Below) with all the provided supporting documents that the sealed container contained no explosive hazards. The contents of the sealed container will not be sold, traded or otherwise given to another party until the contents have been smelted/shredded and/or only identifiable by their basic content.

_____ (Receiver) agrees to send notification and supporting documentation to GSI Pacific Inc. (Issuer) that the seal containers have been smelted/shredded and are now identifiable only by their basic content.

BARREL: _____	SEAL # _____	WEIGHT: _____
BARREL: _____	SEAL # _____	WEIGHT: _____
BARREL: _____	SEAL # _____	WEIGHT: _____
BARREL: _____	SEAL # _____	WEIGHT: _____

(Issuer)

Receiver

Print Name: _____

Print Name: _____

Signature: _____

Signature: _____

Date: _____

Date: _____

This Page Intentionally Left Blank

Attachment 3
Forklift Operating Manual and Heavy Duty Drum Handler Manual

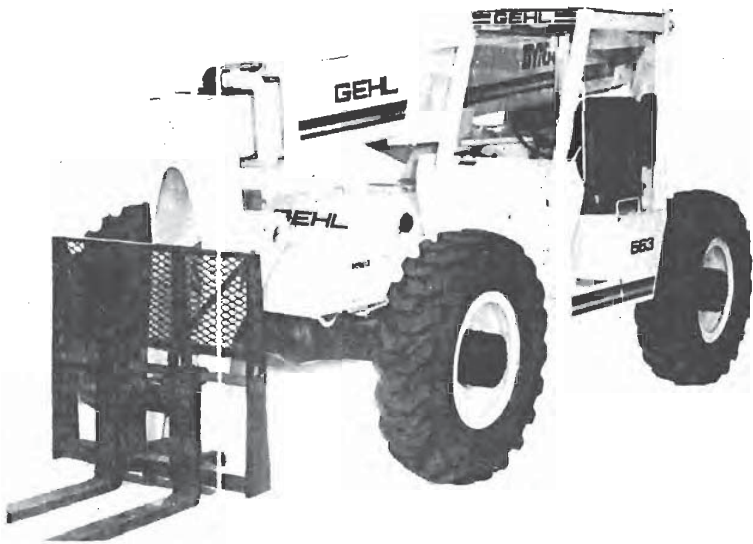
This Page Intentionally Left Blank

GEHL®

FORM
NO.
904281
1P289

Telescoping Boom Forklift DYNALIFT SERIES

Model 663



OPERATOR'S MANUAL

Warranty

GEHL COMPANY Industrial/Construction Equipment

GEHL Company (Incorporated), hereinafter referred to as **GEHL**, as manufacturer of quality machinery since 1859, warrants new **GEHL** machinery and/or attachments at the time of delivery to the original purchaser to be free from defects in material and workmanship if properly set up and operated in accordance with the recommendations set forth in **GEHL**'s Operator Manual.

GEHL's liability for any defect with respect to accepted goods shall be limited to repairing the goods at an authorized **GEHL** dealer or other **GEHL** designated location, or replacing them, as **GEHL** shall elect. The above shall be in accordance with **GEHL** warranty adjustment policies. **GEHL**'s obligation shall terminate twelve (12) months after the delivery of the goods to the original user or when the equipment is first put into use.

This warranty shall not apply to any machine or attachment which shall have been repaired or altered outside the **GEHL** factory or authorized **GEHL** dealership or in any way so as in **GEHL**'s judgment, to affect its stability or reliability, nor which has been subject to misuse, negligence or accident, nor to any machine or attachment which shall not have been operated in accordance with **GEHL**'s printed instructions or beyond the Company recommended machine rated capacity.

This warranty shall not be limited to items which are subject to the warranties of their respective manufacturers. Such items would include but would not be limited to engines, clutches, universal joints, knives, hydraulic components, bearings, tires, belts and other trade accessories.

EXCLUSION OF WARRANTIES

Except as otherwise expressly stated herein, **GEHL** makes no representation or warranty of any kind, express or implied, AND MAKES NO WARRANTY OF MERCHANTABILITY IN RESPECT TO ITS MACHINERY AND/OR ATTACHMENTS AND MAKES NO WARRANTY THAT ITS MACHINERY AND/OR ATTACHMENTS ARE FIT FOR ANY PARTICULAR PURPOSE. **GEHL** shall not be liable for incidental or consequential damages for any breach of warranty, including but not limited to inconvenience, rental or replacement equipment, loss of profits or other commercial loss. **GEHL** shall not be liable for, and the buyer assumes all liability for, all personal injury and property damage resulting from the handling, possession or use of the goods by the buyer.

No agent, employee or representative of **GEHL** has any authority to bind **GEHL** to any affirmation, representation or warranty concerning its machinery and/or attachments except as specifically set forth herein.

TABLE OF CONTENTS

Chapter	Description	Page
	Warranty	Inside Front Cover
1	Introduction	2
2	Check Lists	3
3	Specifications	6
4	SAFETY	7
5	Controls & Accessories	17
6	Operation	26
7	Fuels & Lubrication	35
8	Transporting & Theft Deterrents	40
9	Troubleshooting	42
10	Service	51
11	Storage	64
12	Decal Locations	65
13	Maintenance Log	68
	Index	72
	Standard Hardware Torque Data	Inside Back Cover

CHAPTER 1

INTRODUCTION

Your decision to purchase this piece of **GEHL** equipment was a good one. We are sure that your decision was strongly considered and that you are looking forward to many years of work from this machine.

We, as a Company, have invested a great deal of time and effort in developing our lines of agricultural and industrial equipment. The equipment you have purchased is built with a great deal of pride and designed to give you long life, efficient operation, durability and dependability.

This manual was developed specifically for the machine you have purchased. The information, contained within, is for your assistance in preparing, adjusting, maintaining and servicing your machine. More importantly, this manual provides an operating plan for safe and proper use of your machine. Major points of safe operation are detailed in the **SAFETY** chapter of this manual. Refer to the Table of Contents for an outline (by chapters) of this manual. Use the Index, located at back of this manual, for specific chapter and topic page number references.

A Manual Compartment is provided on this unit for storing the Operator's Manual. After using the Manual, please return it to the Compartment and keep it with the unit at all times! Furthermore, **GEHL** Company recommends that this Manual (and separate Engine manual) be given to the new owner if this machine is resold.

Modern machinery has become more sophisticated and, with that in mind, GEHL Company asks that you read and understand the contents of this manual COMPLETELY and become familiar with your new machine, BEFORE attempting to operate it.

Our extensive Dealership network stands by to provide you with any assistance you may require, including genuine **GEHL** service parts. All parts should be obtained from or ordered through you **GEHL** Dealer. Give complete information about the part as well as the model number and the serial number of your machine. Record numbers, in the spaces provided, as a handy record for quick reference.

Numbers for this unit are on a plate located on the lower dash. "Right" and "left" are determined from a position standing behind the unit and facing the direction of travel. From this position, the Operator's Station is on the left side.

Model No. (Fill In)	
Serial No. (Fill In)	
GEHL COMPANY WEST BEND, WIS. 53095 U.S.A.	

Typical Model & Serial Number Plate

GEHL Company reserves the right to make changes or improvements in the design or construction of any part without incurring the obligation to install such changes on any unit previously delivered.

Standard hardware torques appear in a chart at the end of the manual.

Throughout this manual, information is provided which is set in **bold type** and introduced by the word **NOTE**. **BE SURE** to read carefully and comply with the message or directive given. Following this information will improve your operating or maintenance efficiency, help to avoid costly breakdown or unnecessary damage and, extend your machine's life.

The **GEHL** Company, in cooperation with the American Society of Agricultural Engineers, has adopted this **SAFETY ALERT SYMBOL**



to pinpoint characteristics which, if not properly followed, can create a safety hazard. When you see this symbol in this manual or on the unit itself, you are reminded to BE ALERT! Your personal SAFETY is involved.

CHAPTER 2

CHECKLISTS

PRE-DELIVERY

The following Checklist is an important reminder of valuable information and inspections which **MUST** be made before delivering the Telescoping Boom Forklift Truck to the Customer. Check off each item after prescribed action is taken. Check that:

- NO parts of unit have been damaged in shipment. Check for such things as dents and loose or missing parts; correct or replace components as required.
- Battery is securely mounted and **NOT** cracked. Cable connections are tight and Electrolyte is at proper level and strength. (Batteries for domestic sales are filled at the factory.)
- Wheel lugs are tight and tires properly inflated. Cylinders, hoses and fittings are **NOT** damaged, leaking or loosely secured.
- Oil, fuel and air filters are **NOT** damaged, leaking or loosely secured.
- All grease fittings have been properly lubricated and **NO** fittings are missing; see Fuels and Lubrication Chapter of this manual.
- Hydraulic system reservoir, reserve brake reservoir, engine crankcase, engine coolant, axle carrier and planetaries are filled to the proper operating levels.
- All adjustments have been made to comply with the settings given in this manual and in the separate Engine manual.
- All Guards, Shields and Decals are in place and securely attached.
- Serial Number for this unit is recorded in space provided on this page and page 7.

Start the Forklift Truck Engine and test-run the unit while checking that proper operation is exhibited by all controls.

Check that:

- All Engine monitors (lamps, meters, etc.) function properly.
- All accessories (operating lights, etc.) function properly.
- Listen for any abnormal noises or vibrations; if any are detected, determine their cause and repair as necessary.
- Boom, DYNATTACH™ with attachment and frame leveling control all function properly.
- Foot Service Brake and Park Brake function properly.
- Cylinders, hoses and fittings do **NOT** leak when under pressure.

I acknowledge that pre-delivery procedures were performed on this unit as outlined above.

Dealership Name

Dealer Representative's Name

Date Checklist Filled-out

Model #	Forklift Serial #	Engine Serial #

DELIVERY

The following Checklist is an important reminder of valuable information that **MUST** be passed on to the Customer at the time the unit is delivered. Check off each item as you explain it to the Customer.

- Give the Operator's Manual which is stored in the compartment attached to the lower dash, to the Customer and instruct the Customer to be sure to read and completely understand its contents **BEFORE** operating the unit.
- Direct the Customer on how to use the Index of this manual as a quick page number locating guide.
- explain and review with the Customer the **SAFETY** chapter of this manual.
- Explain and review with the Customer the **Controls & Accessories** chapter of this manual.
- Explain that regular lubrication is required for continued proper operation and long life. Review with the Customer the **Fuels and Lubrication** chapter of this manual.
- Explain and review with the Customer the **Service** chapter of this manual.
- Explain to the Customer the importance of his thorough understanding of and familiarity with the Forklift Truck Controls, Load Capacities/Reach relationships. Refer to the appropriate information in the **Operation** chapter.
- Explain that the Customer **MUST** consult the Engine Manual (provided) for related specifications, operating adjustments and maintenance instructions.
- Completely fill out the Owner's Registration, including Customer's signature and return to the company.

Customer's Signature

Date Delivered

(Dealer's File Copy)

(Remove Dealer's File Copy at Perforation)

CHAPTER 2

CHECKLISTS

PRE-DELIVERY

The following Checklist is an important reminder of valuable information and inspections which **MUST** be made before delivering the Telescoping Boom Forklift Truck to the Customer. Check off each item after prescribed action is taken. Check that::

- NO parts of unit have been damaged in shipment. Check for such things as dents and loose or missing parts; correct or replace components as required.
- Battery is securely mounted and **NOT** cracked. Cable connections are tight and Electrolyte is at proper level and strength. (Batteries for domestic sales are filled at the factory.)
- Wheel lugs are tight and tires properly inflated.
- Cylinders, hoses and fittings are **NOT** damaged, leaking or loosely secured.
- Oil, fuel and air filters are **NOT** damaged, leaking or loosely secured.
- All grease fittings have been properly lubricated and **NO** fittings are missing; see Fuels and Lubrication Chapter of this manual.
- Hydraulic system reservoir, reserve brake reservoir, engine crankcase, engine coolant, axle carrier and planetaries are filled to the proper operating levels.
- All adjustments have been made to comply with the settings given in this manual and in the separate Engine manual.
- All Guards, Shields and Decals are in place and securely attached.
- Serial Number for this unit is recorded in space provided on this page and page 2.

Start the Forklift Truck Engine and test-run the unit while checking that proper operation is exhibited by all controls.

Check that:

- All Engine monitors (lamps, meters, etc.) function properly
- All accessories (operating lights, etc.) function properly.
- Listen for any abnormal noises or vibrations; if any are detected, determine their cause and repair as necessary.
- Boom, DYNATTACH™ with attachment and frame leveling control all function properly.
- Foot Service Brake and Park Brake function properly.
- Cylinders, hoses and fittings do **NOT** leak when under pressure.

I acknowledge that pre-delivery procedures were performed on this unit as outlined above.

Dealership Name

Dealer Representative's Name

Date Checklist Filled-out

Model #	Forklift Serial #	Engine Serial #
---------	-------------------	-----------------

DELIVERY

The following Checklist is an important reminder of valuable information that **MUST** be passed on to the Customer at the time the unit is delivered. Check off each item as you explain it to the Customer.

- Give the Operator's Manual which is stored in the compartment attached to the lower dash, to the Customer and instruct the Customer to be sure to read and completely understand its contents **BEFORE** operating the unit.
- Direct the Customer on how to use the Index of this manual as a quick page number locating guide.
- explain and review with the Customer the SAFETY chapter of this manual.
- Explain and review with the Customer the Controls & Accessories chapter of this manual.
- Explain that regular lubrication is required for continued proper operation and long life. Review with the Customer the Fuels and Lubrication chapter of this manual.
- Explain and review with the Customer the Service chapter of this manual.
- Explain to the Customer the importance of his thorough understanding of and familiarity with the Forklift Truck Controls, Load Capacities/Reach relationships. Refer to the appropriate information in the Operation chapter.
- Explain that the Customer **MUST** consult the Engine Manual (provided) for related specifications, operating adjustments and maintenance instructions.
- Completely fill out the Owner's Registration, including Customer's signature and return to the company.

Customer's Signature

Date Delivered

(Note: Pages 3 & 4 Have Been Removed at Perforation)

CHAPTER 3

SPECIFICATIONS

All Dimensions are in Inches Unless Otherwise Noted

<p>Model & Description 663 (Diesel) Telescoping Boom Forklift Truck</p> <p>Operating Capacities:</p> <p>Lift 6000 lb Max. Lift Height 37'-6" Top of Forks Capacity at Max. Lift Ht. 6000 lb Max. Fwd. Reach 23'-4" to Load Center Capacity at Max. Fwd. Reach 1750 lb Max. Below Grade Reach24"</p> <p>Dimensions:</p> <p>Machine Wt. (less Hydrofill) 20,300 lb Overall Length (less Forks) 208" Overall Machine Height 92" Overall Machine Width 96" Wheel Base 118" Ground Clearance 16" Outside Turning Radius 164"(13'-8")</p> <p>Frame Leveling 10°</p> <p>Engine 80 HP (Diesel) at 2500 RPM</p> <p>Transmission Power Shift with 3 Speeds Travel Speeds 1st, 3.6 MPH 2nd, 7.0 MPH 3rd, 18.6 MPH</p> <p>Axles Heavy Duty Planetary Double Reduction, Full Time 4-Wheel Drive</p> <p>Service Brakes Hydraulic Disc Type (4) Hyd. Booster Master Cyl. w/Electric Reserve in event of Engine failure</p> <p>Parking Brakes Drum type on Transmission</p> <p>Electrical System 12 volt dc Negative ground Circuit Breaker protected 745 Amp cold cranking power Battery 65 Amp Alternator</p> <p>Steering Hydraulic power Selected dash mounted control 4-wheel, 2-wheel, 4-wheel crab</p> <p>Hyd. Pump Single Section Gear Driven 31.5 GPM to Main Hydraulics 3.5 GPM to Steering & Brakes</p> <p>Volumetric Capacities:</p> <p>Transmission Cooler 19 GPM Flow Hydraulic Oil Cooler up to 32 GPM Flow Engine Cooling Sys. 4.3 Gallons Hydraulic Tank (w/Sys.) 47 Gallons Transmission (w/Cooler) 6.0 Gallons</p>	<p>Differential (2) ea. 6.8 Pints Planetary Axle Hubs (4) ea. 2.5 Pints</p> <p>Valves:</p> <p>Joystick Valve for Boom Extend & Raise. Self-Centering Hyd. Valve for Attachment Tilt Fine Metering & Self-Centering Valve for Frame Level</p> <p>Cylinders:</p> <p>Double Cyls. for Boom Lift & Self-Leveling Attachment Function (Slave Cylinders) Single Cyls. for Attachment Tilt, Frame Leveling and Boom Extend Bushings at all Cylinder pin points Safety Cartridge Type Valves are standard to prevent cylinder motion in the event of hydraulic failure</p> <p>Filtration:</p> <p>Eng. Lube Oil Spin-on type with Safety Bypass, 25 micron Fuel Dual stage, single Element; Water Separator standard on some models Transmission Spin-on cartridge type w/Safety Bypass, 55 micron</p> <p>Main Hydraulics:</p> <p>Full flow 100 micron Suction Strainer Full flow 10 micron Filter Element w/Safety Bypass</p> <p>Air Cleaner Dry, replaceable Element type</p> <p>Other Standard Equipment</p> <p>Full Instrumentation including: Fuel Gauge, Water Temperature Gauge, Tach/Hourmeter, Alternator, Transmission Temperature, Oil and Brake Warning Lights, Parking Brake Light.</p> <p>Full Safety Equipment including: Operator's Overhead Guard, Brake Lights, Reverse Warning Horn, Neutral Start Switch, Seat Belt, Horn, Mirror with Lockable Vandalism Cover, Padded Bucket Seat, Anti-Freeze Protection (-30 F), Machine Level Indicator, Full Vandalism Protection</p> <p>Optional Equipment/Accessories</p> <p>Two Rotating Carriages Winch Truss Boom Tire Options Fork Options All Weather Car Lights Material Handling Bucket</p>
--	--



CHAPTER 4

SAFETY



The above Safety Alert Symbol means **ATTENTION! BECOME ALERT! YOUR SAFETY IS INVOLVED!** It stresses an attitude of "Heads Up for Safety" and can be found throughout this Operator's Manual and on the machine itself.

BEFORE YOU ATTEMPT TO OPERATE THIS EQUIPMENT, READ AND STUDY THE FOLLOWING SAFETY INFORMATION. IN ADDITION, MAKE SURE THAT EVERY INDIVIDUAL WHO OPERATES OR WORKS WITH THIS EQUIPMENT, WHETHER FAMILY MEMBER OR EMPLOYEE, IS FAMILIAR WITH THESE SAFETY PRECAUTIONS.

Our Company **ALWAYS** takes the operator and his/her safety into consideration when designing its machinery and guards exposed moving parts for his/her protection. However, some areas can **NOT** be guarded or shielded in order to assure proper operation. In addition, this Operator's Manual and Decals, on the machine, warn of further danger and should be read and observed closely.



DANGER

"DANGER" indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.



WARNING

"WARNING" indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.



CAUTION

"CAUTION" indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. May also alert against unsafe practices.

REMEMBER! It is the owner's responsibility for communicating information on the safe use and proper maintenance of this machine! This includes providing understandable interpretation of these instructions for operators who are not fluent in reading English.

MANDATORY SAFETY SHUTDOWN PROCEDURE

BEFORE cleaning, adjusting, lubricating or servicing the unit:

1. **Bring machine to full parking stop on level surface (never park on a slope or hill side.)**
2. **Fully retract the boom and lower the attachment to the ground.**
3. **Place controls in Neutral and set Park Brake.**
4. **Idle engine for gradual cooling.**
5. **Turn the Ignition Keyswitch to OFF position and remove key (take key with you for security reasons.)**

NOTE: When Engine is stopped, be sure the key switch is in the OFF position. Loss of Battery power will result if left in ON position.

ONLY when you have taken these precautions can you be sure it is safe to proceed. Failure to follow the above procedure, could lead to death or serious bodily injury.

ADDITIONAL SAFETY REMINDERS

USER/OPERATOR SAFETY PRACTICES as established by ANSI SPEC.B56.6-1987 are included in this Operator's Manual and intended to promote **SAFE OPERATION** of the Forklift Truck. These guidelines do not preclude the use of good judgment, care and common sense as may be indicated by the particular jobsite work conditions.



SAFETY

(Continued)



It is essential that operators be physically and mentally free of mind altering drugs and chemicals and thoroughly trained in the safe operation of the Forklift Truck. Such training should be presented completely to all new operators and not condensed for those claiming previous experience. Information on operator training is available from several sources including the manufacturer.

Some photographs, used in this manual, may show Doors, Guards and Shields open or removed for illustration purposes **ONLY**. **BE SURE** that all Doors, Guards and Shields are in their proper operating positions **BEFORE** starting the Forklift Truck Engine to operate the unit.

Any or all of the following elements: the terrain, the Engine speed, the type of load being carried and placed, the abrupt movement of any Control Lever, affect the stability of the Telescoping Boom Forklift Truck. **IF YOU ARE NOT CAREFUL WHILE OPERATING THE FORKLIFT TRUCK, ANY OF THE ABOVE FACTORS COULD CAUSE THE MACHINE TO TIP AND THROW YOU OUT OF THE OPERATOR'S STATION, WHICH MAY CAUSE SERIOUS BODILY INJURY OR DEATH!** As an added precaution, to prevent you from being tossed from the machine, **ALWAYS** wear the Seat Belt provided!

ALWAYS keep hands, feet, and arms inside of the Operator's Station when operating the machine!

ALWAYS wear appropriate personal safety gear as called for by the job or working conditions!

ALWAYS be aware of pinch point areas on the Forklift Truck such as Wheels to Frame, Cylinders to Frame, Boom and Attachment to Frame, etc.)

ALWAYS maintain a safe clearance from electric power lines and avoid contact with any electrically charged conductor! Contact can result in electrocution. Contact proper local authorities for utility line locations **BEFORE** starting a job.

ALWAYS check the job site for terrain hazards, obstructions and people!

NEVER attempt to by-pass the keyswitch to start the forklift truck engine. Use the jump-starting procedure detailed in the Operation chapter, **ONLY!**

NEVER use your hands to search for hydraulic fluid leaks; escaping fluid under pressure can be invisible and can penetrate the skin and cause a serious injury! If any fluid is injected into your skin, see a doctor at once! Injected fluid **MUST BE** surgically removed by a doctor familiar with this type of injury or gangrene may result.

DO NOT exceed the Forklift Truck's rated operating capacity for the type of attachment being used!

DO NOT allow minors or any unqualified personnel to operate or be near the Forklift Truck unless properly supervised; this is strictly a single Seat, **NO** passenger machine!

DO NOT attempt to start the Engine or operate any Controls unless properly seated in the Operator's Seat!

DO NOT operate the Forklift Truck in an enclosed area without adequate ventilation! Internal combustion engines deplete the oxygen supply within enclosed spaces and may create a serious hazard unless the oxygen is replaced. This includes the atmosphere within the cab when provided.

DO NOT leave the Operator's station with the Boom and Attachment raised! **ALWAYS** lower the Boom Attachment to the ground, shut off the Engine and engage the Parking Brake **BEFORE** leaving the Operator's Station!

DO NOT attempt to refill the fuel tank when the Engine is hot. Allow Engine to cool down **BEFORE** refilling to prevent hot Engine from igniting the fuel if it should spill or splash.

DO NOT smoke while filling Fuel Tank or working on the fuel or hydraulic systems!

DO NOT drive too close to an excavation or ditch; **BE SURE** that the surrounding ground has adequate strength to support the combined weight of the Forklift Truck, the load and yourself!

DO NOT turn quickly while traveling on a slope or operate the Forklift Truck beyond the grade and slope limits noted in the Operation chapter of this manual.

DO NOT attempt to remove the Radiator Cap when the Engine is running **HOT**, or overheated because the Engine Coolant will be extremely **HOT** and under pressure. **ALWAYS** wait for the Engine to cool down



SAFETY

(Continued)



BEFORE attempting to relieve pressure and remove the Radiator Cap!

DO NOT attempt to loosen or disconnect **ANY** Hydraulic Lines, Hoses or Fittings without first relieving hydraulic circuit pressure. Also, be careful **NOT** to touch any hydraulic components that have been in recent operation because they can be extremely **HOT** and can burn you!

DO NOT wear loose or baggy clothing while operating or servicing the machine!

Modifications, Nameplates, Markings And Capacities

Modifications and additions which affect capacity or safe operation shall not be performed without the manufacturer's prior written approval. Where such authorization is granted, tags or decals shall be changed accordingly.

All Attachments **MUST** be marked to identify the Attachment(s), show the approximate weight of the Forklift Truck and Attachment combination, and the total capacity with Attachment(s) at maximum elevation with load laterally centered.

ALWAYS make sure all nameplates, caution and instruction markings are in place and legible.

Steering knobs may be used if they meet the requirements of **ANSI B56.6, Paragraph 5.2.5.**

Study the Load Chart carefully. It shows maximum capacity to be lifted and placed at specific outward and upward distances. **ALWAYS** be aware of load weights prior to attempting lift and placement with the Forklift Truck.

Safety Guards And Warning Devices

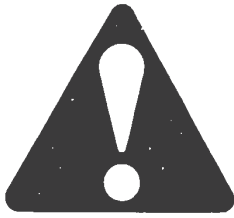
The Forklift Truck is fitted with an Overhead Guard in accordance with **ANSI B56.6-1987**. It is intended to offer protection to the operator from falling objects, but cannot protect against every possible impact. Therefore, it should not be considered a substitute for good judgment and care in operating the Forklift Truck.

Under certain unusual operating conditions, a stronger Guard or one having opening of smaller size may be specified by the user working with the manufacturer.

The Forklift Truck is equipped with a Horn, Backup Alarm and a Side Mirror. The operator/user shall determine if operating conditions require the Forklift Truck be equipped with additional sound-producing or visual devices (extra mirrors, blinking lights, etc.) and be responsible for providing and maintaining such devices.

SAFETY

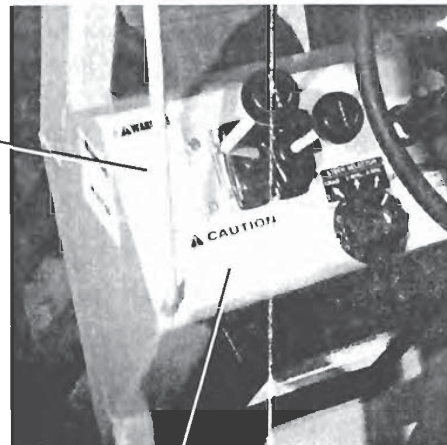
(Continued)



! WARNING

1. Before operating read and fully understand the operator's manual and load chart.
2. Always start and operate this machine seated on the seat.
3. Be sure attachment is in locked position before operating machine.
4. No riders allowed.
5. Never leave operator's seat with boom in elevated position.

L65228



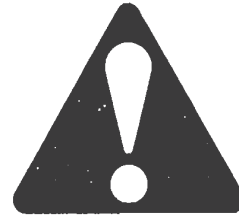
L64806 **! CAUTION**

1. Set park brake and put transmission in neutral before raising or extending boom.
2. Use only front wheel steer for high speed travel.
3. Always travel with load lowered to "Carry" position.
4. Do not use machine as a manlift.



SAFETY

(Continued)



L64803 **PARKING BRAKE**

WARNING

Unattended machine hazard.
 Set parking brake, lower carriage or attachment to ground before leaving machine.
 An unattended machine can move or roll and cause death or serious injury to operator or bystanders.

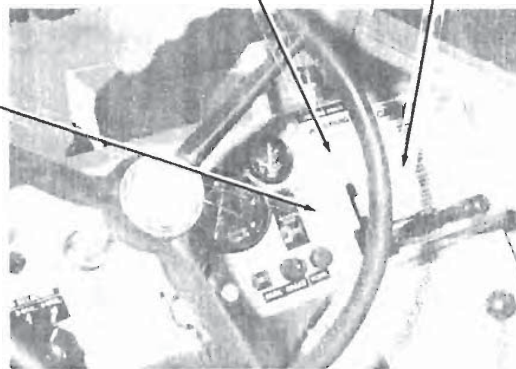
L64804 **CAUTION**

1. Do not operate machine in need of repairs, or without mirrors or safety guards in place, and operating warning devices.
2. Be alert for jobsite hazards, uneven or unstable terrain. Use guide or signalman if forward view is obstructed.
3. Do not exceed lifting capacities of machine. See load chart.
4. Work controls smoothly, abrupt control handle movement, engine speed and stopping can affect stability.
5. Use of attachments and alterations, modifications not authorized by Gehl Co. could cause injury to operator or bystanders and can void warranty.
6. Do not use outriggers to lift or level machine. Use only to stabilize the machine.

CAUTION

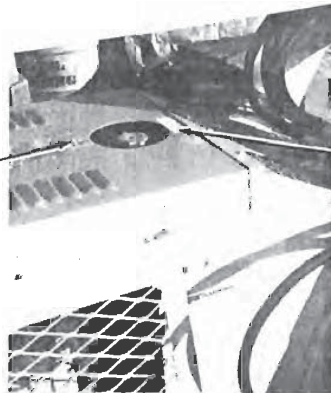
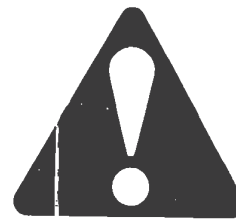
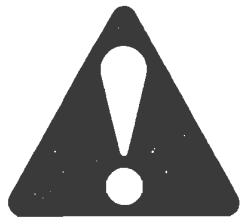
If light is "ON" with engine running a primary brake system malfunction has occurred.
 Follow mandatory safety shut down procedure and see Operator's Manual for corrective action.
 Circuit breaker must be in for reserve brake to operate with Ignition off.

L 64801



SAFETY

(Continued)



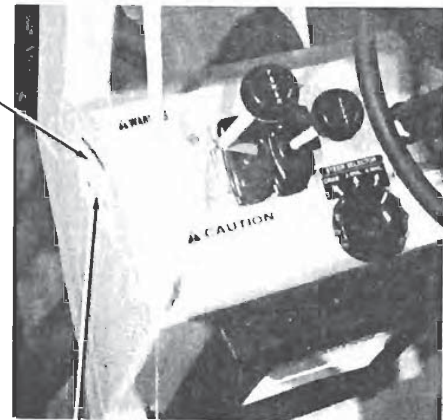
COOLING SYSTEM IS FILLED WITH A 50-50 MIXTURE OF PERMANENT ETHYLENE GLYCOL ANTI-FREEZE.

056859

L64822

! WARNING

Rider injury hazard. No riders allowed. Failure to observe warning could result in death or serious injury.



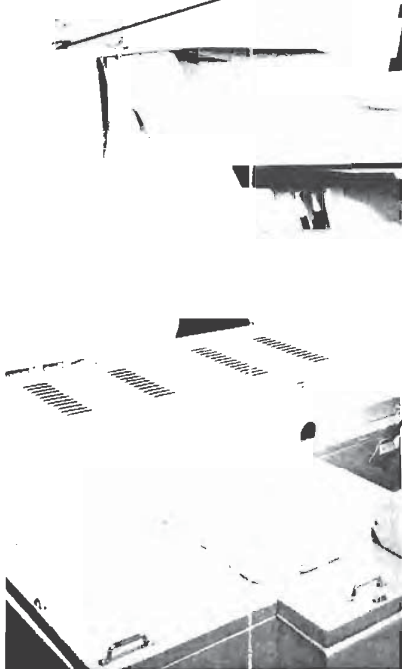
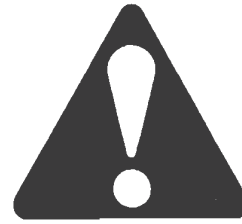
! CAUTION

Check and tighten wheel lug nuts each time unit is serviced.

L60943

SAFETY

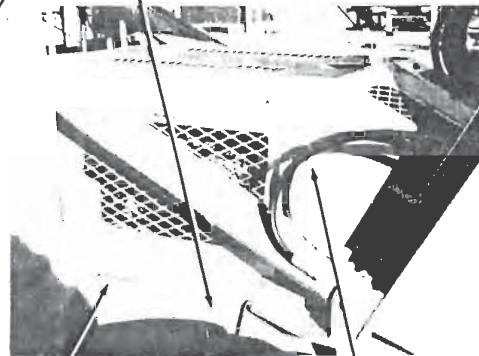
(Continued)



L64805

! WARNING

Pinch-point hazard. Keep clear anytime machine is running. Follow mandatory safety shut down procedure before working on or near machine. Failure to do so could result in death or serious injury.



! WARNING

Do not bypass ignition key by connecting across the starter terminals to jump start. Follow recommended procedure in the Operator's Manual for jump starting using the ignition key. Starting in gear could occur if the neutral start switch is by-passed. Failure to observe warning could result in death or serious injury.

L65108

L64802

! WARNING

Rotating fan and belts could catch hands or clothing. Keep hands and clothing out. Failure to do so could result in death or serious injury.



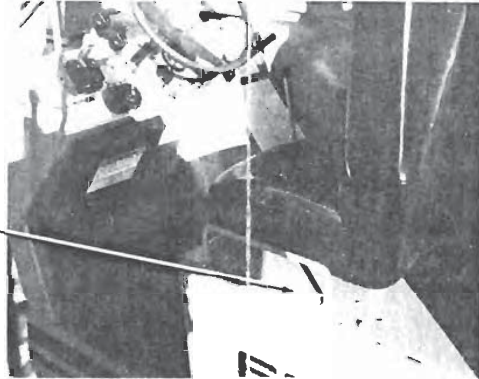
SAFETY

(Continued)



IMPORTANT

Check brake reservoir level weekly. Brake reservoir is located under hinged seat section. Fill only with DOT 3 brake fluid. See maintenance guide for further instruction. L65109

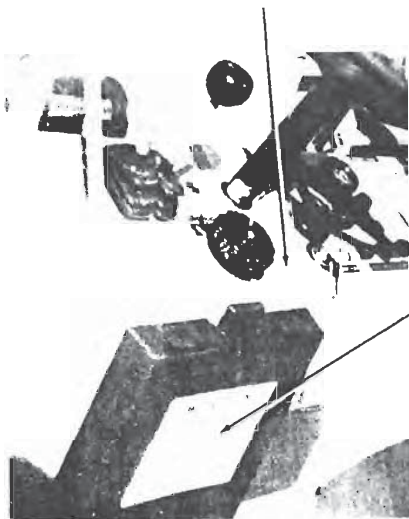


WARNING

BEFORE STARTING ENGINE
FASTEN SEAT BELT

UNSTABLE TERRAIN OR MISUSE OF THE MACHINE CAN CAUSE A ROLLOVER. DO NOT JUMP, HOLD TIGHT AND LEAN AWAY FROM FALL, KEEP SEAT BELT FASTENED AT ALL TIMES.

FAILURE TO HEED WARNING COULD RESULT IN DEATH OR SERIOUS INJURY. L65440



CAUTION

L64800

OPERATOR'S MANUAL SHOULD BE KEPT HERE

Do not start, operate or work on this machine until you have carefully read and thoroughly understand the contents of the Operator's Manual.

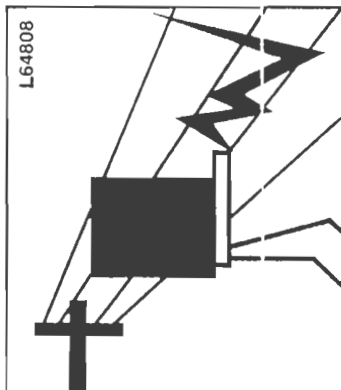
Failure to follow safety, operating, and maintenance instructions could result in death or serious injury to the operator or bystanders, poor operation and/or costly breakdown.

IF THE OPERATOR'S MANUAL IS NOT HERE, CONTACT THE OWNER, THE EQUIPMENT DEALER, OR THE GEHL COMPANY AT THE FOLLOWING LOCATION FOR A COPY

GEHL COMPANY
SERVICE DEPARTMENT
P.O. BOX 179
WEST BEND, WISCONSIN 53095
(414) 334-9461

SAFETY

(Continued)

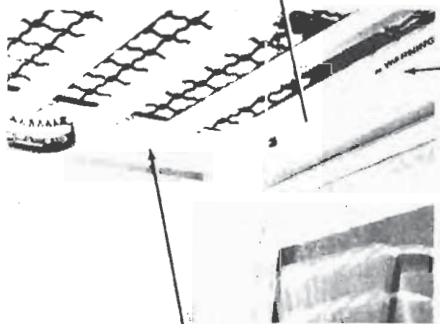


DANGER

High voltage power line hazard. Keep boom and machine a minimum of 50 ft. from high voltage power lines.

Check local electric power company codes for requirements in your area.

Direct or near contact with high voltage power lines can cause death or serious injury.

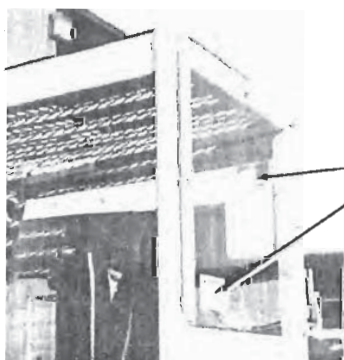


WARNING

Machine rollover hazard. Always level machine before elevating boom. Never level frame to position an elevated load. Failure to keep frame level could result in death or serious injury to operator or bystanders.

CAUTION

FOR MAXIMUM STABILITY ALWAYS
CARRY LOAD AS LOW
AS POSSIBLE



WARNING

Operating machine without protective panel in place will expose operator to moving machine parts. Do not remove this panel except for replacement. Failure to observe warning could result in death or serious injury.

L60945



SAFETY

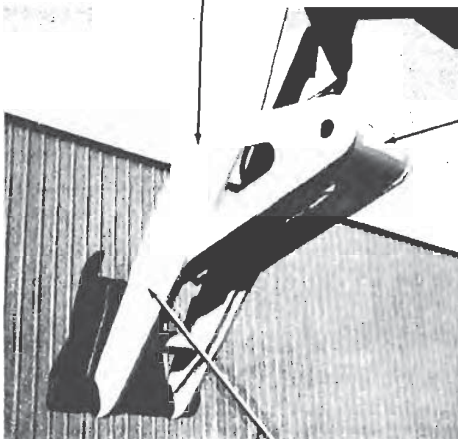
(Continued)



LG4805

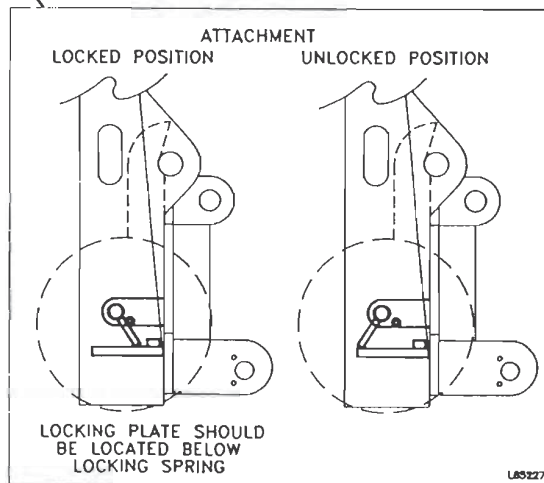
! WARNING

Pinch-point hazard. Keep clear anytime machine is running. Follow mandatory safety shut down procedure before working on or near machine. Failure to do so could result in death or serious injury.



! CAUTION

FOR MAXIMUM STABILITY ALWAYS
CARRY LOAD AS LOW
AS POSSIBLE



CHAPTER 5

CONTROLS AND ACCESSORIES



CAUTION

The operator must be familiar with all controls and instruments before operating the Telescoping Boom Forklift Truck. All controls are within easy reach of the operator.

INDICATORS, LAMPS, SWITCHES

Ignition Keyswitch and Start Button (Fig. 5-1)

When the key is straight up and down in the Keyswitch, it is in the OFF position and all electrical functions are disconnected from the electrical circuit. Also, this is the only position in which the Keyswitch key can be inserted or removed.

Turn the key clockwise to the ON position and electrical power is supplied to all functions.

NOTE: The Alternator, Brake Reserve, Engine and Transmission oil temperature Lamps should come ON when the key is turned to the ON position. Use this Keyswitch position as a "bulb check".

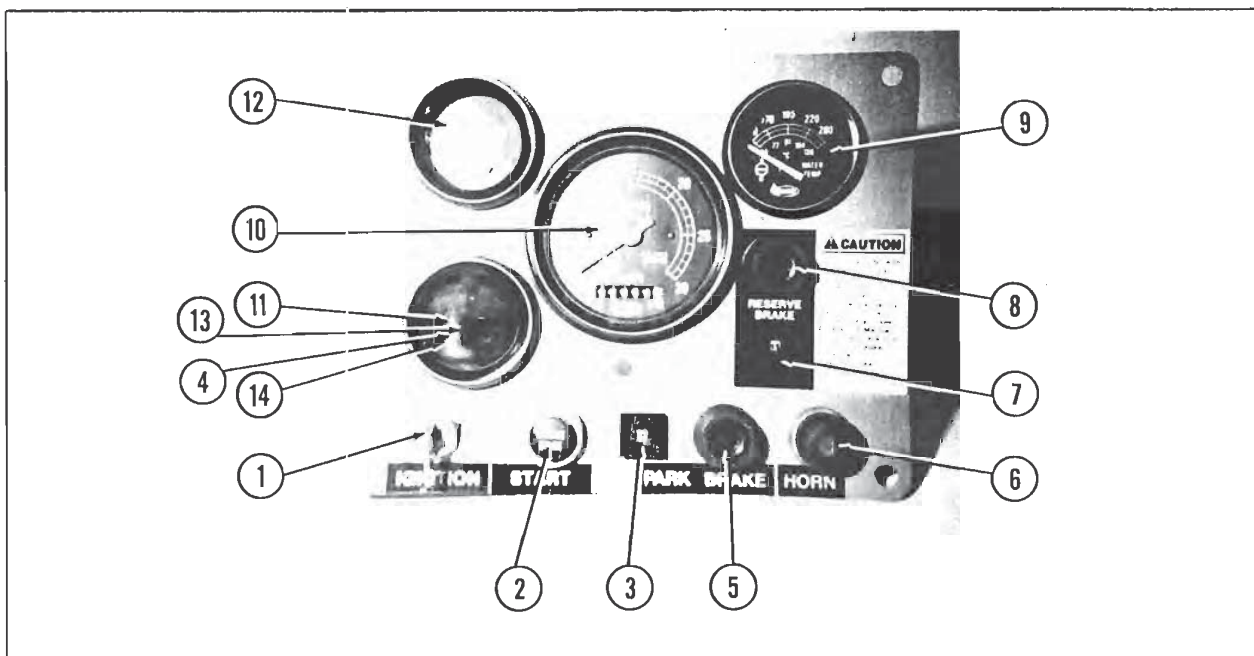
Alternator Lamp (Fig. 5-1)

This Lamp indicates output performance of the Alternator. During normal operation, with the Engine running above idle speed, this lamp should be OFF. During starting and when the Engine is NOT running, this Lamp will be ON.

NOTE: If this Lamp comes ON during normal operation, a problem may exist in the charging system. Refer to the Troubleshooting chapter in this manual.

Engine Oil Pressure Lamp (Fig. 5-1)

This Lamp indicates whether sufficient engine lubricating oil pressure is present or not. During nor-



- | | |
|--|---|
| <ul style="list-style-type: none"> 1 - Ignition Keyswitch 2 - Start Button 3 - Main Circuit Breaker 4 - Transm. Temp. Light 5 - Park Brake ON Light 6 - Horn Button 7 - Brake Reserve Circuit Breaker | <ul style="list-style-type: none"> 8 - Brake Reserve Light 9 - Water Temp. Gauge 10 - Tachometer/Hourmeter 11 - Engine Oil Press. Light 12 - Fuel Gauge 13 - Alternator Light 14 - Brake Line Press. Light |
|--|---|

Fig. 5-1: Dash Gauge, Indicators, Switches Panel

mal operation, with the Engine running, this Lamp should be **OFF**. During starting and when the Engine is **NOT** running, this Lamp will be **ON**.

NOTE: *If this Lamp and Buzzer comes ON during normal operation with the Engine running, STOP the Engine immediately and after allowing the oil to drain down for a few minutes, check the Engine oil level. Maintain oil level at the FULL mark on the dipstick.*

Water Temperature Gauge (Fig. 5-1)

This Gauge indicates whether the Engine coolant is at the proper temperature or not. During normal operation, a reading of 180°F indicates that the Engine coolant is at the proper temperature.

NOTE: *If the Gauge indication moves toward the HIGH number range during normal operation, it indicates a problem in the cooling system. STOP the Engine immediately and investigate the cause of the problem!*

Refer to the Service chapter. Common causes are (1) low coolant level, (2) dirty radiator fins, (3) improper fan belt tension, or (4) radiator core plugged.



WARNING

DO NOT remove the Radiator Cap when the Engine is running **HOT**, or **overheated**. Coolant is **extremely HOT** and under pressure and will **severely burn** the skin. Wait for the engine to cool **BEFORE** relieving the pressure and removing the Radiator Cap.

Transmission Oil Temperature Lamp (Fig. 5-1)

This Lamp indicates whether the Transmission oil is at the proper temperature or not. During normal operation this Lamp should be **OFF** indicating that the Transmission oil system is at the proper temperature. It is normal for the bulb check Relay to keep the Lamp on a few seconds after the Engine has started.

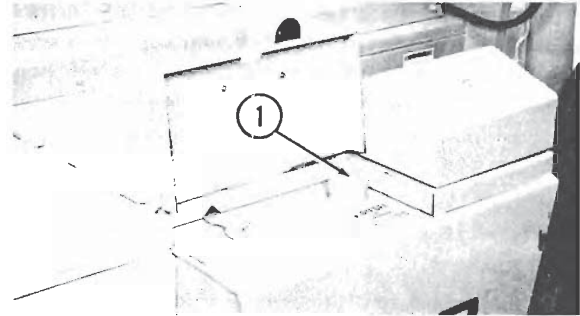
NOTE: *If this Lamp comes on during normal operation, a problem may exist in the Transmission oil system. Stop the machine immediately and then investigate the cause of the problem!*

Tachometer and Hourmeter (Fig. 5-1)

Tachometer relates to Engine speed during operation. The Hourmeter indicates the operating time of the machine and should be used for keeping up the Maintenance Log chapter of this manual.

Fuel Level Gauge (Fig. 5-1 and 5-2)

The Fuel Gauge has three circle representations with a division mark between each to represent the amount of fuel remaining in the Fuel Tank, as shown by the position of the indicator needle.



1 - Fuel Fill Cap

Fig. 5-2

Fuel Tank Fill Cap is accessible by lifting up the Cover on the Fuel Tank/Battery Box Compartment. Working capacity of the Fuel Tank is approximately 47.0 Gallons.

Horn Pushbutton (Fig. 5-1)

Push this pushbutton Switch in to activate the horn. The Keyswitch **MUST** be **ON** for this Switch to be effective.

Brake Reserve Lamp and Buzzer (Fig. 5-1)

This Lamp indicates the output performance of the Service Brake system. During normal operation, with the Engine running above idle speed, this Lamp should be **OFF**.

NOTE: *If Lamp is ON with Engine running, a primary brake system malfunction has occurred. Follow MANDATORY SAFETY SHUTDOWN PROCEDURE.*

Conditions that will activate the Brake Reserve System:

1. Should hydraulic pressure be lost with Keyswitch **ON** and the Engine running, the Lamp comes **ON**, a Buzzer sounds and the Electric Motor Driven Pump provides backup Service Brake power.
2. With the Keyswitch **ON** and starting the Engine, if the Reserve Lamp does not come **ON** and Buzzer sound, a Service Brake system problem is indicated.

3. While operating machine and a malfunction of the electric circuit to the Brake Reserve Motor occurs, the Reserve Lamp comes ON and Buzzer sounds but hydraulic brake pressure is still available to the Service Brakes.
4. If the Ignition Keyswitch is OFF, Engine is not running and Service Brake Pedal is actuated, a Buzzer sounds and the Electric Driven Motor Pump provides backup Service Brake function as long as power is available from the Battery.

Unequal Brake Line Pressure Lamp (Fig. 5-1)

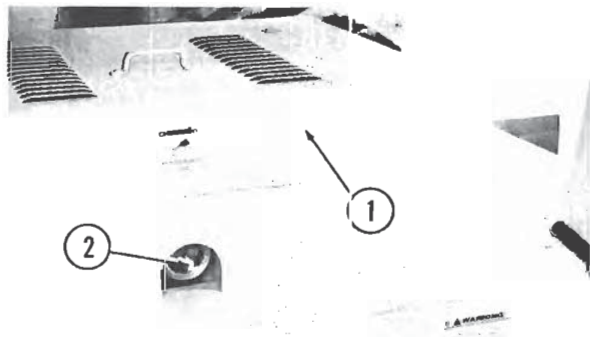
Front and rear wheel brakes are on independent brake line systems. If loss of pressure occurs in either system, the Unequal Brake Line Pressure Lamp comes ON. Failure in one line system does not affect the operation of the other system. However, the **MANDATORY SAFETY SHUTDOWN PROCEDURE** should be followed and required repairs made immediately.

Park Brake ON Lamp (Fig. 5-1 & 5-7)

This Lamp remains ON as long as the Park Brake Lever is engaged.

Hydraulic Reservoir Oil Level Gauge (Fig. 5-3)

The Sight Gauge on the side of the Reservoir indicates the level of the hydraulic oil in the Reservoir. The Fill Cap is accessible by removing the Front Cover of the Front Hood Section. Capacity of the Reservoir is 35 Gallons.



- 1 - Fill Cap Inside Cover
- 2 - Oil Level Sight Gauge

Fig. 5-3

Brake Fluid Reservoir (Fig. 5-4)

The Brake Fluid Reservoir is located under the hinged seat mounting section. With rear bolts removed, this section may be tilted forward for accessibility.

CAUTION

This is a two fluid brake system. Use only DOT 3 fluid in this Reserve Brake Reservoir. Use of hydraulic oil type fluid will damage components.

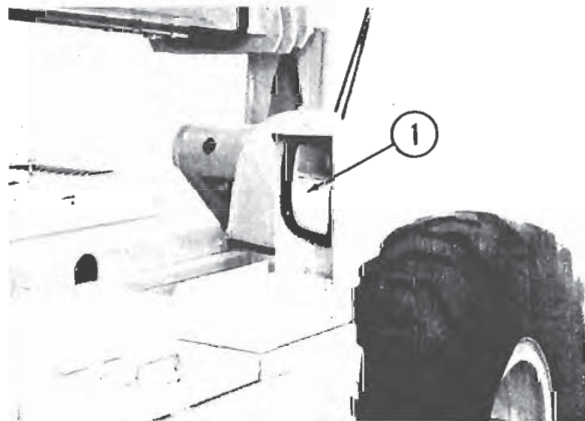


- 1 - Tilt Back Seat Section
- 2 - Brake Fluid Reservoir

Fig. 5-4

Side Mirror Box (Fig. 5-5)

Located on the front outside corner of the Fuel Tank/Battery Box compartment, the Side Mirror provides the operator with a rear view on the right hand side and rear area behind the Forklift Truck.

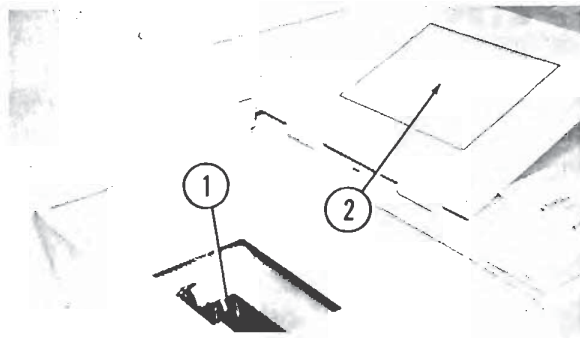


- 1 - Side Mirror

Fig. 5-5

Battery Compartment and Tool Box (Fig. 5-6)

The Battery compartment is just below the toolbox section at the rear of the Fuel Tank. Electrolyte level can be checked by removing the Bottom Panel of the tool box.



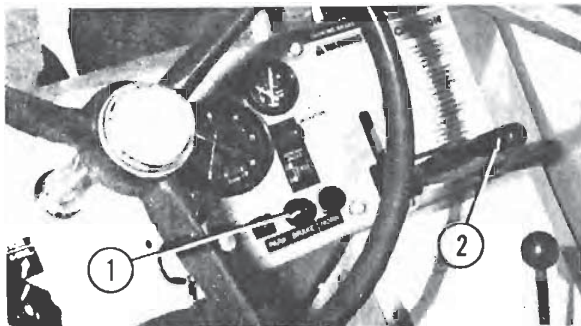
- 1 - Battery
- 2 - Lube Chart Decal

Fig. 5-6

FUNCTION CONTROLS AND ACCESSORIES

Parking Brake Lever (Fig. 5-7)

The Parking Brake is a mechanical drum-type on the Transmission output shaft. Adjust the tension by turning the Knob on the top of the Brake Lever until a pull effort on the hand lever of 100 to 120 lbs. is achieved.



- 1 - Park Brake ON Lamp
- 2 - Park Brake Lever

Fig. 5-7

WARNING

Unattended machine hazard. Set Brake, lower Attachment to ground before leaving the machine. An unattended machine can move or roll and cause death or serious injury to operator or bystanders.

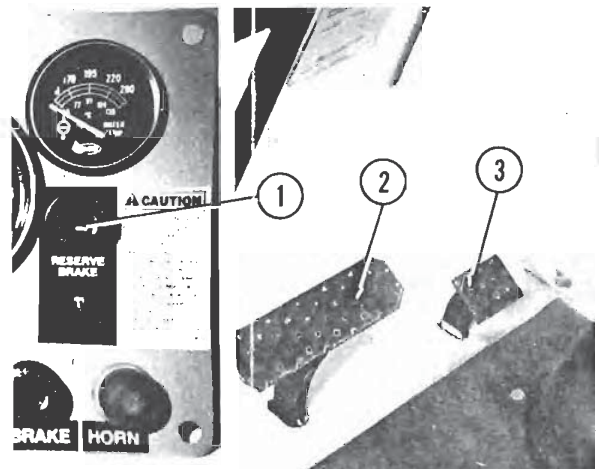
CAUTION

Periodically check the Park Brake Tension and adjust if required to maintain adequate holding power. Always make sure the Park Brake Lever is off when resuming Forklift Truck operation.

The Parking Brake may be used as an emergency stopping system on relatively level terrain should the Service Brakes fail. When properly adjusted and maintained it meets test requirements of ANSI B56.6-1987 providing 35% of Service Brake performance at 100 to 120 lbs. hand lever effort.

Service Brake Pedal (Fig. 5-8)

Service Brakes are outboard hydraulic disc-type on all four wheels. If the Brake Booster hydraulic oil should cease to flow or Engine stop running, a Reserve Electric Motor Driven Pump provides backup Service Brake power to bring the Forklift Truck to a safe stop.



- 1 - Reserve Brake Lamp (Dash)
- 2 - Service Brake Foot Pedal
- 3 - Accelerator Foot Pedal

Fig. 5-8

NOTE: Should the Engine stall or Brake Booster hydraulic oil cease to flow, depress the Service Brake Pedal. If the Reserve Brake System FAILS to operate, increase maximum foot pressure on the Service Brake Pedal. Set the Park Brake and place the Transmission in neutral.

Speed Range Selector (Fig. 5-9)

Changes the Transmission speed between low and high.

- 3 (High) - Forward or Up
- 2 (Medium) - Center position
- 1 (Low) - Back or Down

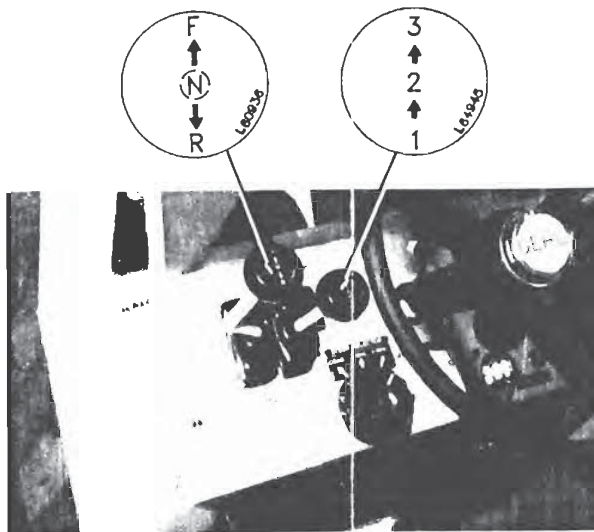


Fig. 5-9

Travel Direction Selector (Fig. 5-9)

Changes the direction of travel between forward or reverse. The Selector **MUST** be in N (Neutral) position before the Engine will start.

- F (Forward) - Forward or Up
- N (Neutral) - Center position
- R (Reverse) - Back or Down

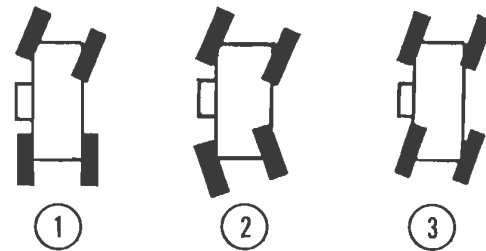
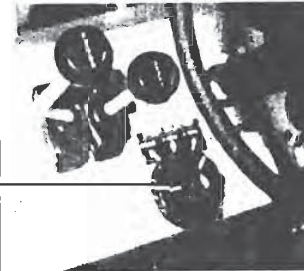
NOTE: Backup Alarm automatically sounds with Travel Selector in reverse. Care should be taken when down shifting or reversing as damage to the Transmission can occur if shifting is forced or attempted at too high a speed. Allow Engine RPM to slow before any shift down or directional change is attempted.

Steering Selector (Fig. 5-10)

All four wheels of the Forklift Truck are steerable. A Steer Selector on the dash allows the operator to use "4 Wheel, 2 Wheel or 4 Wheel crab" steering modes.

Two Wheel Steering **MUST** be used while traveling in higher speeds such as on roads from one location to another. Four Wheel Steering is used for making tighter turns, usually on the jobsite.

Crab Steering provides angular movement to the right or left. This mode is used when a small amount of side shift is needed for picking or placing loads.



- 1 - Two Wheel Steer Position
- 2 - Four Wheel Steer Position
- 3 - Crab Steer Position

Fig. 5-10

Any of the steering position modes can be used in forward or reverse travel. The operator should learn to anticipate changes in Forklift Truck movement if the Steering Selector mode must be change.



CAUTION

Rear wheels are not self centering. Make sure all wheels are in a straight ahead position before changing the Selector mode.

Frame Leveling (Fig. 5-11)

The Forklift Truck frame may be tilted slowly 10° to the left or right to level the Frame and Boom in relation to the ground. Move the Lever to the left to tilt to the left. Move the Lever to the right to tilt to the right. The Leveling Bubble Indicator shows when the frame is at level condition.



WARNING

Do not attempt to correct the Frame level condition with the Boom raised or extended. Only level the Forklift Truck while at complete stop with the boom fully retracted and the Attachment raised just enough to clear the ground.

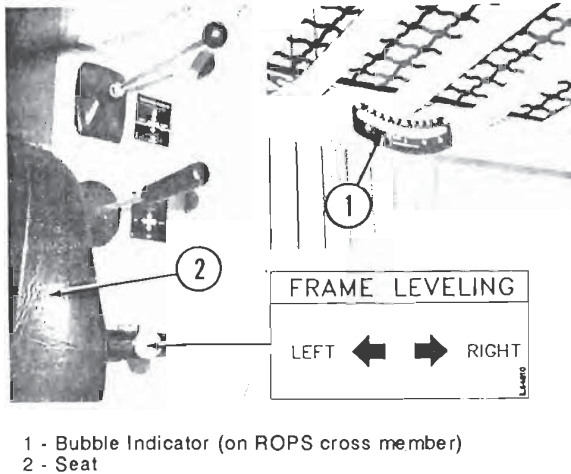


Fig. 5-11

Boom Controls

The Forklift Truck has a hydraulic type Boom (with three telescopic sections). The sections extend by means of a hydraulic cylinder and triple chain system inside the Boom, sequenced for uniform extension of each section.



CAUTION

Use extreme caution when raising or extending the Boom. The Forklift Truck must be level. Loaded or empty, this machine can tip if it is not level.

Always place the Transmission in neutral, set the Park Brake, and keep the Service Brake Pedal fully depressed before raising or extending the Boom.

Never exceed the specified lifting and/or extending capacities of this Forklift Truck. Serious machine damage or personal injury may result. Refer to the Load Chart(s) in the Operator's Station or this manual.

If a Boom circuit hose should break with the Boom up, with or without a load, shut the Forklift Truck down following the MANDATORY SAFETY SHUTDOWN PROCEDURE. Do not attempt repairs. Call your GEHL dealer immediately for assistance.

Boom Lift And Extend (Fig. 5-12)

Pull the 4-position Joystick Lever back to **RAISE** the Boom, push it forward to **LOWER** the Boom. Pull the

Lever to the right to **EXTEND** the Boom, pull the Lever to the left to **RETRACT** the Boom.

When the Boom is raised, extended or retracted speed of operation is a function of Engine speed. The higher the Engine RPM, the faster the boom will operate.

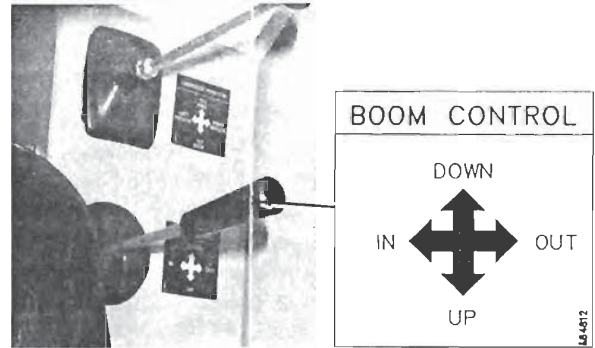


Fig. 5-12

DYNATTACH™ Nose (Fig. 5-13)

The Boom inner section nose is equipped with an Attachment carrying device feature called DYNATTACH™. This provides the operator with a convenient means of utilizing optional Attachment tools for this model of Forklift Truck.

To pickup the Attachment:

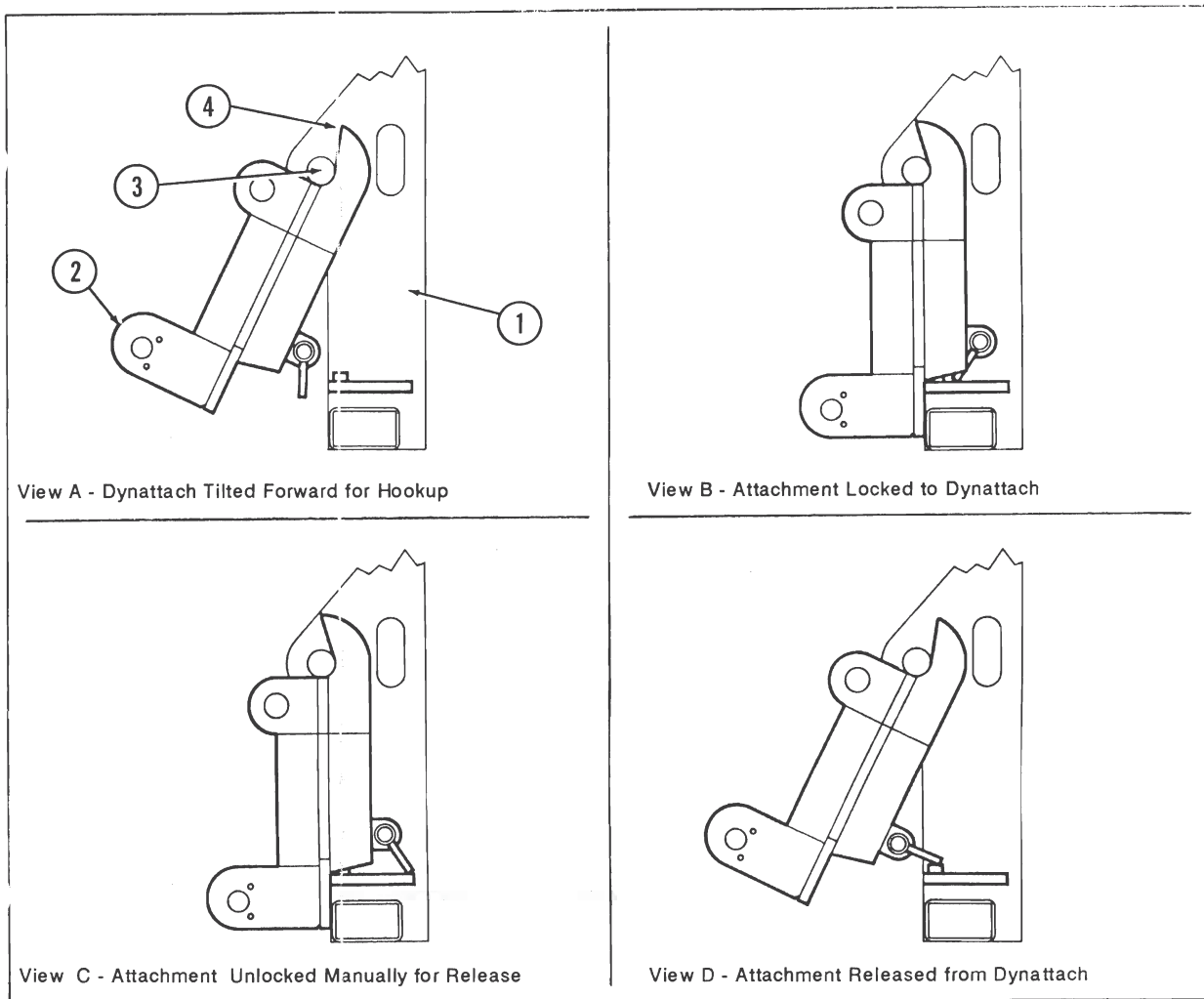
1. Raise the Boom slightly and extend it 2 to 3 feet for better visibility. Tilt the Dynattach forward and approach the Attachment. Extend the Dynattach and lower the Hooks under the Attachment Hookup Bar.
2. Tilt the Dynattach back so that the Lock Plate engages the Attachment. This secures the Attachment to the Dynattach. Connect any hoses onto Attachments requiring hydraulics.

To remove the Attachment:

1. Raise the Boom slightly and extend it 2 to 3 feet for better visibility. Lower the Boom until the attachment is approximately 12" off the ground. Manually raise the Lock Spring and flip the Lock Plate up and outward at least 180° so it is in position to re-lock on the next Attachment.

NOTE: One side of the Lock Plate is painted bright orange to indicate the unlocked position.

2. Tilt the Dynattach forward to allow the Attachment to rollout, then lower the Boom so the



- 1 - Attachment
- 2 - Dynattach
- 3 - Hookup Bar
- 4 - Hook

Fig. 5-13

Hooks clear the Hookup Bar. Disconnect hoses on Attachments requiring hydraulics.

Standard Carriage Attachment (Fig. 5-14)

The Forks on the Carriage Attachment are self leveling. Once the operator tilts the Forks to a desired angle that angle will be maintained as the Boom is raised or lowered, extended or retracted, until a new angle is desired.

A 4-position Controller sets the Dynattach/Carriage tilt. Pull the Lever **BACK** to raise the Fork tips. Push the lever **FORWARD** to lower the fork tips.



CAUTION

Always have the Carriage tilted back when moving.

Rotating Carriage Attachment (Fig. 5-14)

This attachment is controlled by the 4-position Controller and the Dynattach™. Moving the Controller Lever to the left rotates the carriage UP to 12-1/2° to the **LEFT**. Moving the Controller Lever to the right rotates the carriage up to 12-1/2° to the **RIGHT**. The function of this Attachment is to place loads onto or pickup from sloped surfaces.



CAUTION

Do NOT attempt to use the Rotating Carriage as a load leveling function. Always level the Frame prior to handling a load.

Winch Attachment (Fig. 5-14)

This Attachment is controlled by the 4-position Controller and the Dynattach. Moving the Controller Lever to the left **LOWERS** the Winch cable. Moving the Controller Lever to the right **RAISES** the Winch cable.



CAUTION

Do NOT use Winch for lifting or moving of personnel. Such use is at the sole risk of the user. NEVER exceed the maximum rated capacity of the Winch (3000 lbs.) or exceed the load chart rating for Winch applications.

Truss Boom (Fig. 5-14)

This Attachment is controlled by the 4-position Controller and the Dyna-tach. Moving the Controller Lever **FORWARD** tilts the Truss Boom down. Moving the Controller Lever **BACK** tilts the Truss Boom up.



CAUTION

DO NOT tilt the Truss Boom back more than 45° from horizontal (see Load Chart in Operation chapter).

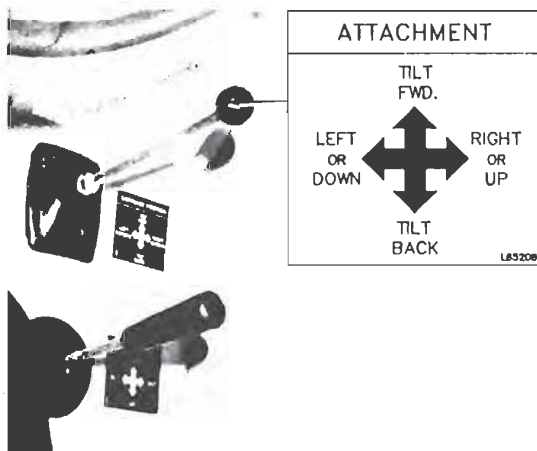


Fig. 5-14

Transmission Clutch Dump Option (Fig. 5-15)

When activated, it allows greater Engine acceleration and power to the hydraulics system without power to the drive Axles while the Service Brake Pedal is held down.

In the **OFF** position, the clutch mechanism of the Transmission remains engaged when applying Brake Pedal force to stop the Engine. In **ON** position, the clutch mechanism is disengaged but the Transmission remains in gear while applying Brake Pedal force.

Normal Brake force will hold the machine in position while accelerating the Engine to power hydraulic control functions during load placement.

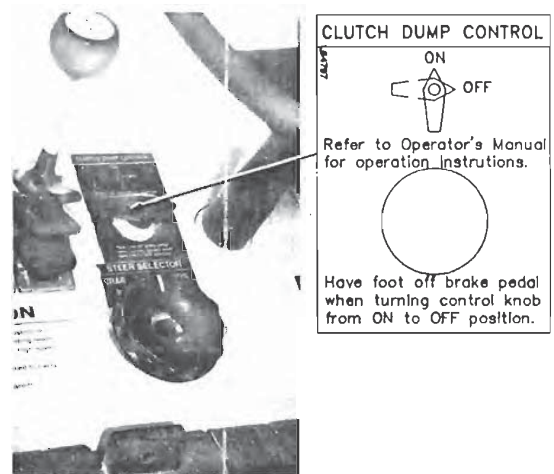


Fig 5-15

Guards, Shields, Covers (Fig. 5-16)

The following listing below refers to the corresponding reference number locations on the Forklift Truck illustrations.

- 1 - Dash Front Access
- 2 - Tip Forward Seat Panel
- 3 - Rear Access Operator Station
- 4 - Brake Valve & Master Cyl. Access
- 5 - Side Mount Controls Access
- 6 - Foot Controls Access
- 7 - Tool Box, Battery Check
- 8 - Hydraulic Pump, Transmission Access
- 9 - Hydraulic Oil Reservoir & Fill Cap
- 10 - Fuel Tank Fill Cap
- 11 - Battery Access
- 12 - Top Panel Radiator Check
- 13 - RH Side Engine Access Panel
- 15 - LH Side Engine Access Panel
- 16 - Rear Access (Tail Lights, Backup Alarm, Auxiliary Hydraulics)

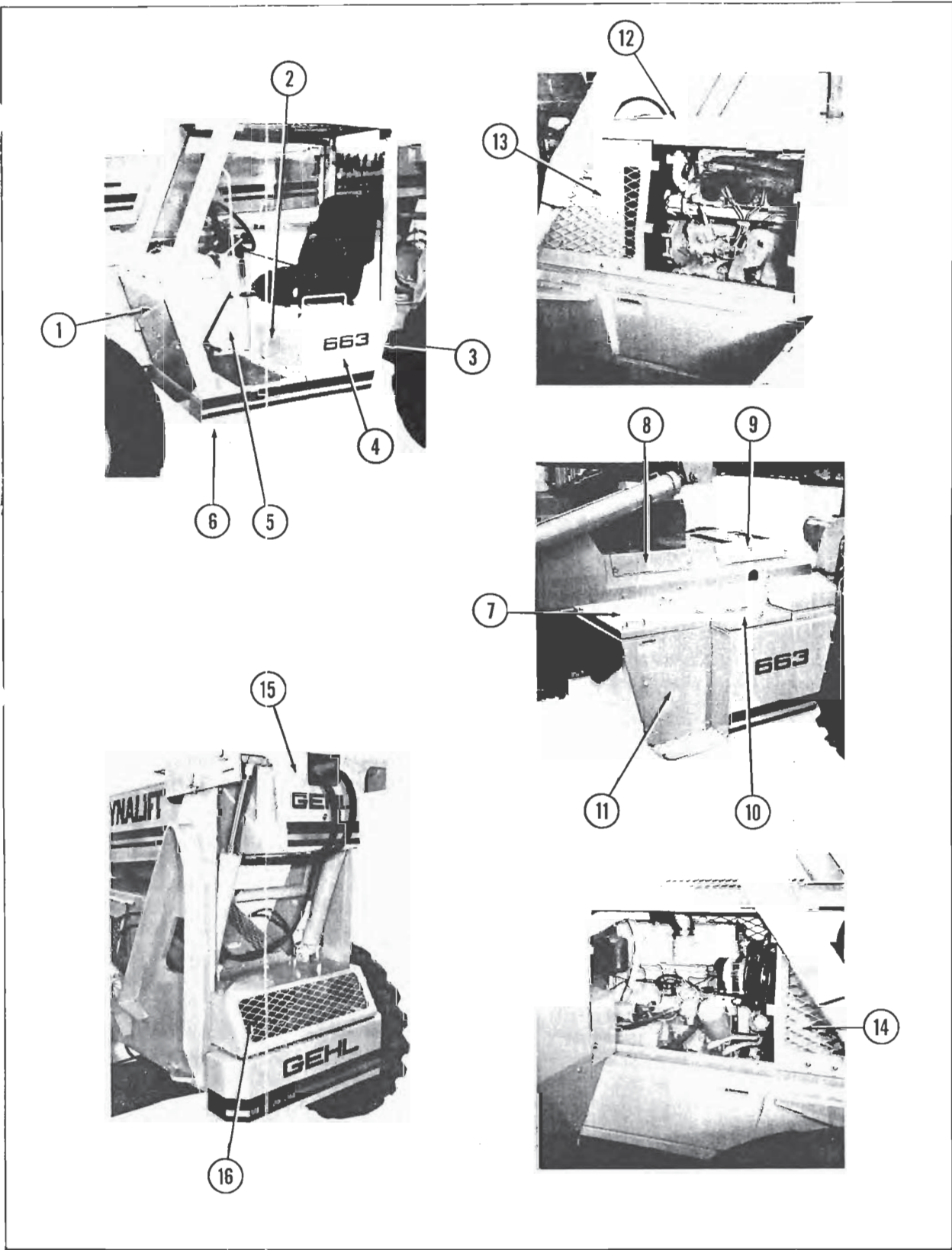


Fig. 5-16

CHAPTER 6

OPERATION

PRE-START

Take time to check the Forklift Truck to make sure all systems are in good operating condition. Perform the following before starting the machine the first time each day.

1. Check the Engine oil and coolant, Transmission oil, hydraulic oil levels.
2. Make sure daily lubrication has been done.
3. Check the Service and Park Brakes. Turn the Keyswitch to ON position but do not start engine. Brake Reserve Lamp should come ON and Buzzer sound. The Park Brake Lamp should also be ON with the Lever engaged (pulled up).
4. Visually inspect for leaks, broken or malfunctioning parts. Make sure all caps, covers and safety shields are in place.
5. Check tires for cuts, bulges, nails, correct pressure, loose wheel nuts, etc.
6. Inspect the work area. Make sure you know where you will make load pickups, lifts, and turns. Look over the terrain of the jobsite for holes, obstacles, slippery surfaces, soft or deep mud.
7. Check clearances of ramps, doorways and passage ways. Check overhead clearances and if you will travel and place loads near power or telephone lines.

If the Forklift Truck is found to be in need of repair or in any way unsafe, or contributes to an unsafe condition, the matter shall be reported immediately to the user's designated authority. The machine shall not be operated until it has been restored to a safe operating condition.



CAUTION

Follow manufacturer recommendations regarding use of proper lubricants, oil or coolant.



CAUTION

To prevent a fire or explosion, allow engine to cool down **BEFORE** attempting to refill the Fuel Tank. A hot engine could ignite the fuel and burn you. Also, **DO NOT** smoke while refilling the Fuel Tank.

Overinflated tires can explode and cause injury or death. Tire repairs must be made only by authorized personnel using proper tools and equipment.

NEVER operate the machine with safety guards or covers removed.



DANGER

Always contact the electric power company when placing loads near power lines. Power should be disconnected or lines moved, or insulated before machine operation begins.

Death or injury can result from contacting electrical power lines. It is not necessary to make direct contact with a power line for power to ground through the structure of the machine. Keep the boom at least 50 ft. from such power lines.

Before operating the Forklift Truck on roads or highways, check local laws on use of lights, flags, licensing, slow moving vehicle emblem (SMV), etc.

Engine Break-In

Your new Engine does not require extensive "break-in". However, for the first 100 hours of operation, keep the following in mind:

1. Allow the Engine to idle for a few minutes after every cold start.
2. **DO NOT** idle Engine for long periods of time.
3. **DO NOT** operate the Engine at maximum power for long periods of time.
4. Check the oil level frequently and replenish as necessary.

A special "break-in" oil is not used. The oil in the Engine crankcase is the same specified for regular oil changes. Change the oil and replace the oil filter at the intervals specified in the Service chapter. **DO NOT** add special additives or special "break-in" components to the crankcase.

STARTUP

Before mounting the operator's station walk completely around the Forklift Truck to make sure no one is under, on, or close to it. Let others near the area know you are going to start up and wait until everyone is clear of the machine. Then proceed as follows:

1. Make sure the floor of the operator's station and the foot controls are free of debris and mud. Adjust the seat and fasten the seat belt securely.



CAUTION

Before starting the Engine and operating the Forklift Truck, review and comply with **ALL** recommendations set forth in the Safety chapter of this manual. Know how to **STOP** the machine before starting it!

2. Place all controls in neutral. Make sure the Park Brake is **ON**. Depress the Service Brake Pedal. Turn the Keyswitch to **ON** and make sure that Oil, Alternator and Brake Reserve Lamps are **ON**.
3. Push the Start Button. If the Button is released before the Engine starts, allow the Starting Motor to stop before attempting to depress the Button again.

NOTE: Do not crank the starter for more than 30 seconds at a time or Starter Motor damage could result. If prevailing temperature is 40°F or below, it may be necessary to use a cold weather starting aid to start the diesel Engine. For proper use of starting aids, check instructions in the OEM engine manual.



CAUTION

Exhaust fumes can kill. Insure proper ventilation when starting indoors or in enclosed areas.



CAUTION

Use proper grab handles, not the Steering Wheel or Levers, as a hand hold when mounting or dismounting. Start and operate the Forklift Truck only from the Operator Seat, and only with the Seat Belt securely fastened.

NOTE: If the engine fails to start on the first try or it dies out after only running a short time, turn the Keyswitch to **OFF**, wait at least two minutes and repeat above steps.

Jump-Starting

If the Battery becomes discharged and fails to have sufficient power to start the Engine, jumper cables can be used to obtain starting assistance. Use the following procedure to jump-start the Forklift Truck.



CAUTION

The **ONLY** safe method for jump-starting a discharged Battery is for **TWO PEOPLE** to carry-out the following process. The second person is needed for removing the jumper cables so that the operator does **NOT** have to leave the Operator's Seat while the Engine is running.



WARNING

Do **NOT** attempt to jump-start the Battery if it is frozen as this can cause it to rupture or explode. Closely follow these procedures, in the order listed, to avoid personal injury.

BATTERIES PRODUCE EXPLOSIVE GASES! ALWAYS keep sparks, flames and cigarettes away from Batteries. Also, wear safety glasses to protect your eyes and avoid leaning over batteries while jump starting.

NOTE: BE SURE that the jumper battery is also a 12 volt D.C. Battery.

1. Turn the Keyswitches on both vehicles to **OFF**. Make sure that both vehicles are in "Neutral" and **NOT** touching.
2. Remove the Battery Filler Caps and make sure that electrolyte solution is up to the proper level. In addition, place a clean cloth over the uncapped filler holes to prevent the electrolyte solution from boiling-over.



CAUTION

If acid comes in contact with your skin, eyes or clothing, flush the area IMMEDIATELY with running water.



WARNING

NEVER attempt to make the jumper cable connections directly to the Starter Solenoid of the Engine. Do NOT start Engine from any position other than the Operator's Seat and then ONLY after making sure all Controls are in "neutral".

3. Connect one end of the positive (+) Jumper Cable to the positive (+) Battery Terminal on the disabled vehicle first. DO NOT allow the jumper's positive (+) cable clamps to touch any metal other than the positive (+) Battery terminals. Connect the other end of the positive Jumper Cable to the jumper Battery positive (+) terminal.
4. Connect one end of the negative (-) Jumper Cable to the jumper Battery negative (-) terminal.



CAUTION

When jump starting, NEVER connect the negative (-) Jumper Cable to the frame or boom. Doing so could present a high resistance current path resulting in poor jumper performance.

5. Make final Jumper Cable connection (the other end of the negative (-) jumper cable) to the disabled vehicle's Engine Block -- NOT to the Battery Negative Post. If making the connection to the Engine, keep the clamp away from the Battery, Fuel Lines, Tubing or Moving Parts.

NOTE: Twist the Jumper Cable clamps a couple of time on the Battery terminals to insure a good electrical path for conducting current.

6. Proceed to start the Forklift Truck. If it does NOT start immediately, start the jumper vehicle Engine to avoid excessive drain on the jumper Battery.
7. After the Forklift Truck is started and running smoothly, have the second person shut the jumper

vehicle OFF first. Next, he should remove the Jumper Cables from the jumper vehicle Battery, and then from the Forklift Truck while making sure NOT to short the two cables together.

Allow sufficient time for the Alternator to build-up a charge in the Battery before attempting to operate the Forklift Truck or shut the Engine off. BE SURE to discard the cloths and re-install the Vent Caps.

NOTE: If the Battery frequently becomes discharged, have the Battery checked for a possible dead cell(s) or troubleshoot the entire electrical system for possible short circuits or damaged wire insulation.

After Start Checks

After the Forklift Truck starts and BEFORE beginning operation, perform the following:

1. Run the Engine at "idle" speed for about five minutes to allow it to warm up.
2. Check that the Indicator Lamps are OFF.
3. Check that the color of the exhaust gas is normal (it should be light grey).
4. Check that there are NO fuel, oil or Engine coolant leaks.
5. Check that there are NO abnormal noises or vibrations.

Gear Ratio and Travel Selection

With the Engine warmed up, proceed as follows:

1. Place the Speed Selector in the desired gear ratio and the Travel Selector in forward or reverse direction of travel. Release the Park Brake, and move slowly testing the steering and brakes. Stop and operate all boom controls and machine leveling to check for smooth response.
2. Apply the Brakes, stop the machine and move the Travel Selector to the opposite direction (forward or reverse).
3. Shifting to next higher gear may be done at any Engine RPM while the machine is in motion. DO NOT over speed the Engine when down shifting. Allow the machine to slow down before shifting to the next lower gear.



CAUTION

Twice daily increase the Engine speed (fast idle), extend and retract the Frame Leveling Cylinder to the stroke limit. This removes any trapped air in the circuit. Trapped air can cause the Forklift Truck to lean to one side or the other.

Be certain you can control both speed and direction before moving. Always place the machine in neutral and set the Park Brake before raising or extending the boom.

If any function, operation or control of the Forklift Truck does not respond correctly, shutdown the machine and do not use until it has been made operational.

NOTE: Avoid unnecessary idling. Prolonged idle can cause crankcase oil dilution and incomplete fuel combustion. This can lead to premature Engine failure from gum deposits on internal Engine parts.

Stopping Engine

When ready to stop operating the Forklift Truck use the following procedure:

1. Bring the Forklift Truck to full parking stop on a level surface (**NEVER** park on a slope or hill side).
2. Fully retract the boom and lower the attachment to the ground.
3. Place controls in neutral and set the Park Brake.
4. Idle the Engine for gradual cooling.
5. Turn the Keyswitch to **OFF** and remove the key (take key with you for security reasons).

NOTE: When the Engine is stopped, be sure the Keyswitch is in the **OFF** position. Loss of Battery power will result if left in **ON** position.

GRADE AND SLOPE PRECAUTIONS

The Forklift Truck complies with all stability requirements of ANSI B56.6 - 1987 and is stable when properly operated. However, improper operation, faulty maintenance, or poor housekeeping may contribute to a condition of instability and defeat the purpose of the Standard.

The amount of forward and rearward tilt to be used is governed by the application. Although use of maxi-

mum rearward tilt is allowable under certain conditions such as traveling with the load fully lowered, the stability of the Forklift Truck as determined by the tests outlined in ANSI B56.6-1987 does not encompass consideration for excessive tilt at high elevations, or the handling of off-center loads.

Handle only loads within the capacity limits of the Forklift Truck, and that are stable or safely arranged. When Attachments are used, extra care shall be taken in securing, manipulating, positioning and transporting the load.

Grade Limits (Fig. 6-1)

1. **DO NOT** travel on a grade or slope that exceeds 22% or 12.41° grade.
2. **DO NOT** place or retrieve loads on a slope or grade that exceeds 6% or 3.44° grade.
3. **DO NOT** travel on a side hill that exceeds 40% or 21.8° grade. Regardless of the terrain or position of the wheels, the **FRAME MUST BE LEVEL** as indicated by the Level Indicator on the ROPS cross member. The load must be maintained at the "carry" position with the boom fully retracted, and attachment at minimum ground clearance.
4. **DO NOT** place or retrieve loads on a side hill with a slope or grade that exceeds 10% or 5.71° grade. Regardless of terrain or position of wheels, the **FRAME MUST BE LEVEL** as indicated by the Level Indicator.



WARNING

Do NOT attempt to correct the frame level condition with the boom raised or extended. Only level the Forklift Truck while at complete stop with the boom fully retracted and the attachment raised just enough to clear the ground

When ascending or descending grades in excess of 5% or 2.8°, the Forklift Truck shall be driven with the load upgrade. Unloaded the Forklift Truck should be operated on all grades with the load handling attachment downgrade, tilted back if applicable, and raised only as far as necessary to clear the road surface.

Avoid turning if possible and use extreme caution on grades, ramps or inclines. Normally travel straight up and down.

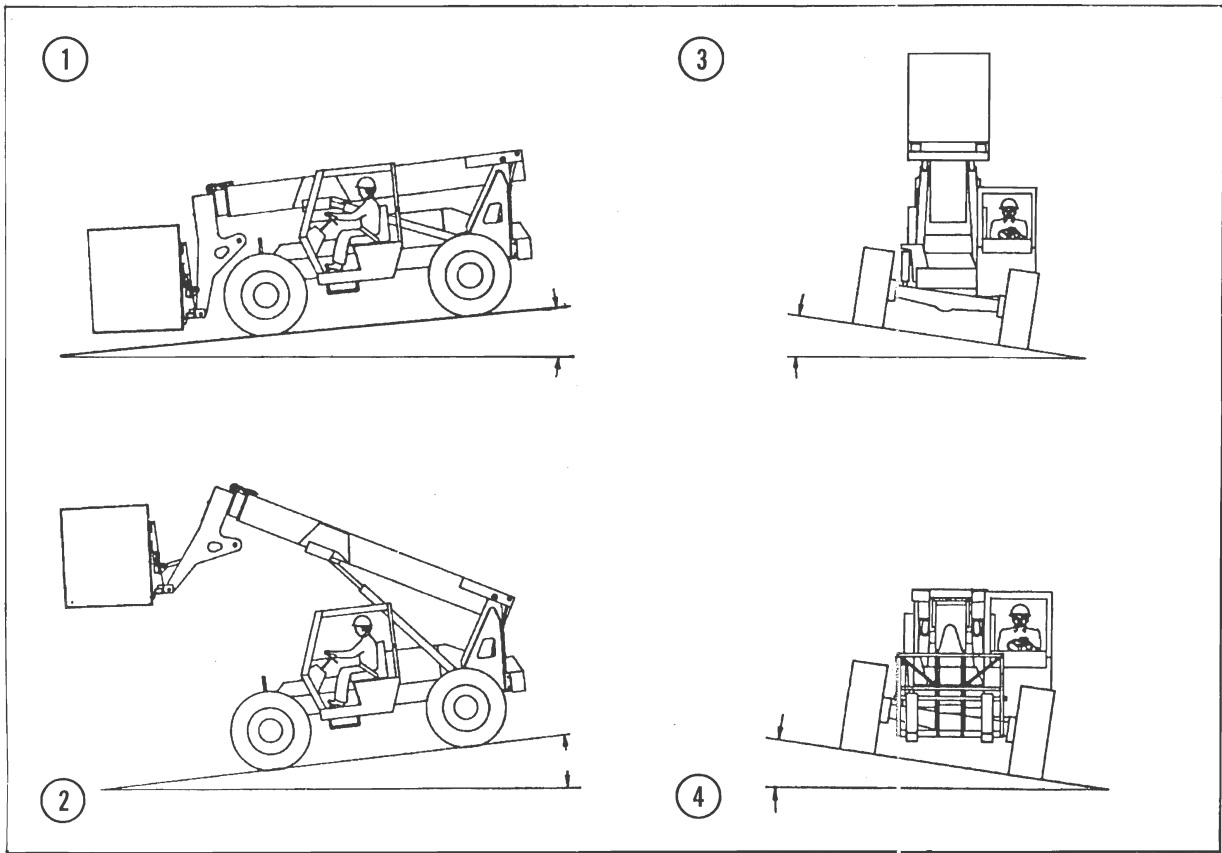


Fig. 6-1

LOAD HANDLING

Never attempt to work controls except from the Operator's Seat. Never jerk or use fast movements. Avoid sudden stops, starts or changes in direction.

Operation of the hydraulic system depends on Engine speed and the distance the controls are moved. When operating these controls it is important to develop a technique called "Feathering". Feathering the control means you start the desired motion by moving the control away from neutral a small amount. After movement has started, the control can be eased to full power. Use the same technique to stop the motion.



CAUTION

Keep all body parts inside the Operator's Station while operating the Forklift Truck. Be sure of clearance of the attachment forks when turning, working around buildings, etc.



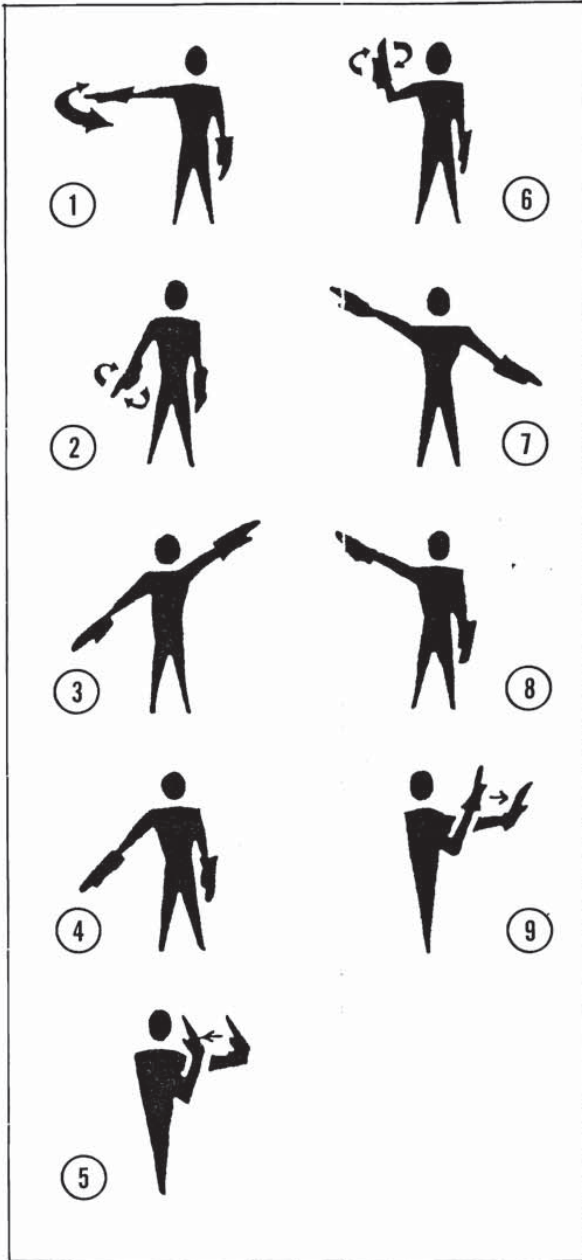
CAUTION

Turning corners too fast can tip the machine and cause a load to lean excessively and tip off the attachment. Sudden slowing or stopping of the machine may cause the load to drop off the attachment.

NEVER leave the Operator's Station without first lowering the attachment to the ground. Set the Park Brake, place controls in neutral, shut off Engine and remove the key. **DO NOT** part the Forklift Truck on a slope or hill side.

Traffic Flow Patterns (Fig. 6-2)

Know and understand the traffic flow patterns of your jobsite and also know all Forklift Truck hand signals for safety. Utilize signal men and make sure you can see the signal man and acknowledge the signals given.



- 1 - Stop
- 2 - Lower Load
- 3 - Tilt Forks Left
- 4 - Tilt Forks Down
- 5 - Move Load Forward
- 6 - Raise Load
- 7 - Tilt Forks Right
- 8 - Tilt Forks Up
- 9 - Move Load Backward

Fig. 6-2

The Backup Alarm automatically sounds with the Travel Selector in reverse. Care should be taken when down shifting or reversing as damage to the transmis-

sion can occur if shifting is forced or attempted while traveling.

When ramps must be utilized in transporting loads with the Forklift Truck, the following shall be minimum widths for safe travel:

Compacted dirt, gravel, etc. - 12 ft.

Woodboard, concrete, etc. - 10 ft.

Permanent aisles, roadways or passageways, floors and ramps shall be defined in some fashion or marked. Permanent or temporary protrusion of loads, equipment, material and construction facilities into the usual operating area shall be guarded, clearly and distinctively marked, or clearly visible.

Maintain a safe distance from the edge of ramps, platforms or other similar working surfaces.

Controlled lighting of adequate intensity should be provided in operating areas. Where operating conditions indicate, the operator/user shall be responsible for having the Forklift Truck equipped with lights.

Provision shall be made to prevent trucks, semi-trailers and railroad cars from being moved during loading and unloading. Wheel stops, hand brakes, or other recognized positive means shall be used to prevent movement during loading and unloading.

DO NOT move railroad cars or trailers with the Forklift Truck. **DO NOT** use the boom and attachment for leverage to push the Forklift Truck out of mud.

Use Of Attachments

When the Telescoping Boom Forklift Truck is equipped with authorized optional attachments, appropriate weight and capacity for the attachments/truck combination must be identified on the Forklift Truck with decals, nameplates or capacity charts.

If the type of load presents a hazard, the operator/user shall equip the Forklift Truck with a vertical load backrest extension manufactured in accordance with ANSI B56.6-1987 or stronger, working with and approved by GEHL Co.

Suspended Loads

DO NOT exceed the Forklift Truck capacity as equipped for handling suspended loads. Only lift the load vertically and never drape it horizontally. Use guy lines to restrain load swing whenever possible.

The handling of suspended loads by means of the Truss Boom or other similar device can introduce dynamic forces affecting the stability of the Forklift Truck that

are not considered in the stability criteria of ANSI B56.6-1987. Grades and sudden starts, stops and turns can cause the load to swing and create a hazard.



WARNING

Modifications or alterations of the Forklift Truck or the use of attachments not authorized by GEHL Co. in writing can void warranty and cause machine damage and/or serious personal injury or death.

The Forklift Truck shall NOT be used to lift or carry personnel other than the operator, or be fitted with any form of personnel work platform.

Load Capacity and Reach Charts (Fig.6-3)

The following example illustrates proper use of the load charts for the Forklift Truck:

1. The operator, using a standard carriage Attachment, must raise a 3000 lb. load 20 ft. high and can only get to within 17 ft. of the load placement.
2. By projecting up the 17 ft. vertical axis the intersection of a line drawn across from the 20 ft. horizontal axis shows an intersection in Zone D.
3. When checking the lift capacity table, Zone D is for up to a 3000 lb. load. The load can be safely placed.

Picking Up The Load

Proceed as follows:

1. Inspect the load. IF it appears unstable, do NOT attempt to move it. DO NOT attempt lifting double-tiered loads, or straddling side-by-side pallets one on each Fork. NEVER add extra unauthorized counterweights to this machine. Consider the additional weight of any attachment as part of the picking load capacity of the Forklift Truck.
2. Approach the load squarely and slowly with the Fork tips straight and level. Adjust the space between Forks if necessary. Engage the load equally on both forks until the load touches the carriage backrest. Tilt the Forks back positioning the load for travel.



CAUTION

Operating conditions can reduce the safe lift of near capacity or capacity loads. Exceeding capacity when lifting or extending the Boom will cause the machine to tip forward.

NEVER drive the machine up to someone standing in front of, beside or on top of a load.

Carrying The Load

If the load obstructs your view get someone to direct you. Maintain ground speed consistent with ground conditions and that permit stopping in a safe manner.



CAUTION

NEVER travel with the Boom above the carry position (Attachment at minimum ground clearance). Boom should be fully retracted.

Use lower gear when traveling down incline. NEVER coast with the transmission in neutral. Travel up and down grades slowly.

DO NOT operate the Forklift Truck on a slope or grade that exceeds 22% or 12.41° of grade.

Load Elevation And Placement

Use the following procedures:

1. For ground level placement, make sure the area under the load and around the Forklift Truck is clear of equipment and personnel. Lower the load to the ground, tilt the forks to the horizontal position, then back away carefully to disengage forks from the load. For elevated or overhead placement, bring the Forklift Truck as close as possible to the landing point.
2. Level the machine BEFORE raising the load. Use extreme caution for high placement. Make sure personnel are clear of the area where the load or the Forklift Truck could tip or fall.
3. Set the Park Brake, hold the Service Brake Pedal in fully depressed position and slowly raise the load maintaining a slight back tilt to cradle the load. As the load approaches the desired height, feather the boom control at minimum speed until the load is slightly higher than the landing point.
4. Continue the feathering technique, lower the load in place until the forks are free. Level the Forks

MAXIMUM LIFT CAPACITIES			663 DYNALIFT LOAD CHART 37'6" LIFT HEIGHT WITH DYNATTACH™	MAXIMUM LIFT CAPACITIES		
ZONE	48"/66" CARR.	ROTATING CARR.		ZONE	BUCKET	WINCH
A	6000 LBS	6000 LBS		A	3500 LBS	3000 LBS
B	5000 LBS	5000 LBS		B	3500 LBS	3000 LBS
C	4000 LBS	3800 LBS		C	3500 LBS	3000 LBS
D	3000 LBS	2500 LBS		D	2000 LBS	3000 LBS
E	1750 LBS	1250 LBS	E	1000 LBS	2000 LBS	

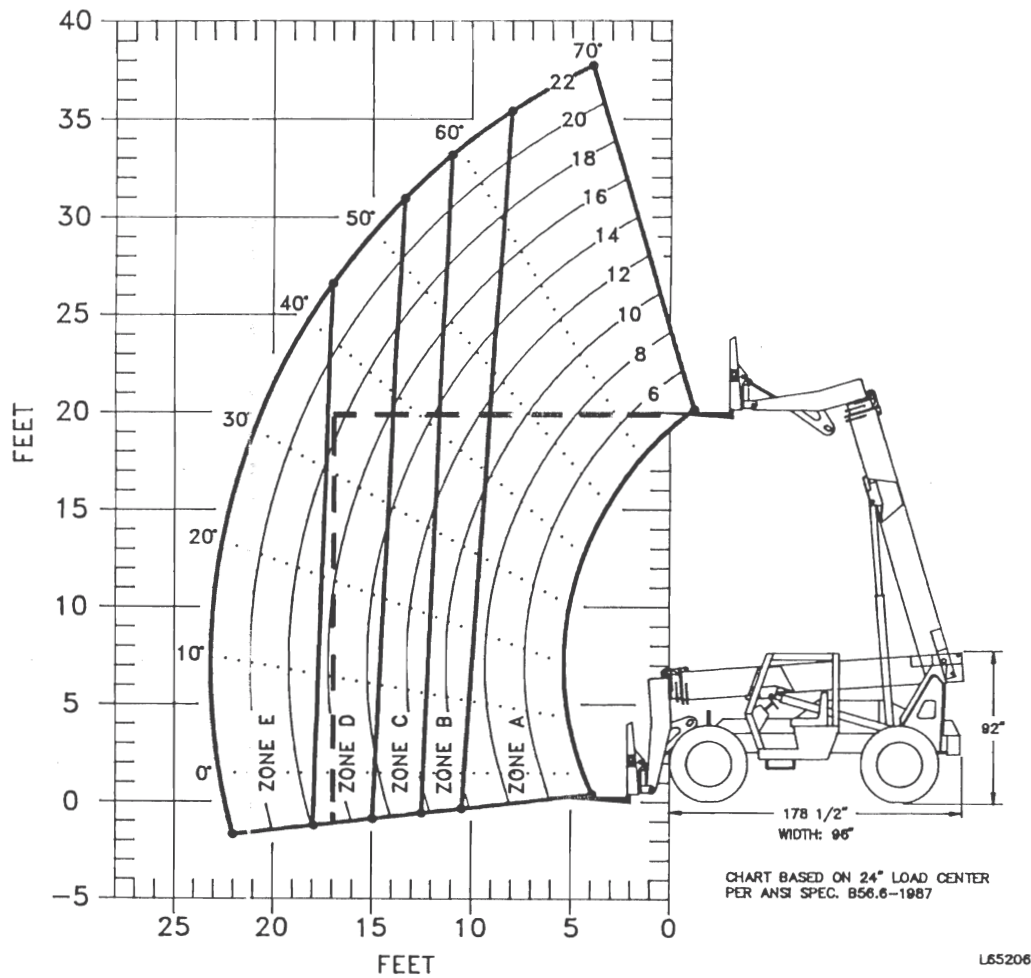


Fig. 6-3

and retract clear of the load. Lower the Forks to travel height before moving the Forklift Truck.



WARNING

NEVER use Frame leveling to position an elevated load. Always lower the load to the ground and reposition the Forklift Truck.

If a hydraulic boom circuit hose should break with the boom up, shut down the machine. Do not attempt to bring down the boom or make repairs. Call your GEHL dealer immediately.

As lift height increases, depth perception decreases. High elevation placement may require a signal man to guide the operator. Telescoping Boom Forklift Trucks become less stable as load is raised higher.

DO NOT ram the lift cylinder to the end of the stroke. Resulting jolt could spill the load.



CAUTION

When extending the Boom, **DO NOT** accelerate Transmission in gear with Service Brake Pedal depressed. Overheating of torque convertor will occur and internal Transmission damage may result. Put Transmission in neutral.

CHAPTER 7

FUELS AND LUBRICATION

FUELS

Use grade No. 1D or No. 2D diesel fuel as defined by ASTM designation D975 for diesel fuels.

NOTE: Use grade No. 2D fuel at ambient temperatures above freezing. Use No. 1D fuel at ambient temperatures below freezing, and for all temperature ranges at altitudes above 5000 ft.

NOTE: NEVER put additives in the fuel used in the Telescoping Boom Forklift Truck unless specifically recommended by your OEM Engine dealer.

Keep dirt, scale, water, etc. out of stored fuel. DO NOT store fuels for any extended periods of time. It is good practice to fill the Fuel Tank after completing work at the end of each day. This will reduce overnight condensation problems which will add to water in the fuel.



WARNING

ALWAYS shut off the Engine when filling the Fuel Tank. Always ground the fuel nozzle against the filler neck to avoid sparks.

NEVER fuel the Forklift Truck when smoking or near a fire or open flame. Avoid spilling fuel. If a spill occurs, wipe it up immediately.

LUBRICATION

It is well to remember that a sufficient amount of the proper type of lubricant will prevent excessive parts wear and early failures.

NOTE: The Service chapter in this manual has provisions for recording the dates and Hourmeter readings after lubrication or other service has been performed; use those spaces to keep a log for maintaining a current service interval record.

HYDRAULIC SYSTEM RESERVOIR*

1. MIL-L-2104C Grade 10W
2. C2 or C3 Grade 10W
3. Dextron or Dextron II

**In extremely cold climates, 5W can be used, but must have the same detergent quality as the 10W oil.*

RESERVE BRAKE RESERVOIR

Use only DOT 3 Brake Fluid

ENGINE OILS

Single Viscosity Oils:

API Service CD/SD
MIL-L-2104C
Series 3

Above 32 F (0 C):

SAE 30 (Single Viscosity)

From -10 F to 32 F (-23 C to 0 C):

SAE 10W (Single Viscosity)
SAE 10W-20 (Multi-Viscosity)

TRANSMISSION OILS**

Above -10 F (-23 C):

MIL-L-2104C (10W); C2 or C3 (10W)
Engine oil API-SE or CD (10W)

From -10 F to -30 F (-23 C to -34 C);
Dextron™ or type "A" Suffix "A"

From -10 F to -60 F (-23 C to -52 C)
MIL-L-46167 (5W)

™Dextron is a registered trademark of General Motors Corp.

***CONOCO "Polar Start" DN600 fluid may be used in all transmission applications, in all temperature ranges shown above. However, it should not be used where prevailing ambient temperatures exceed 70°F for extended periods of time.*

AXLE DIFFERENTIAL/PLANETARY OILS

Above 20 F (7 C):

MIL-L-2105C (80W) or HD Engine oil (50)

Below 20 F (7 C):

Str. mineral gear lube (80W) or
HD Engine oil (30)



CAUTION

NEVER attempt to lubricate or service the Forklift Truck while the Engine is running. ALWAYS BE SURE to exercise the MANDATORY SAFETY SHUTDOWN PROCEDURE (Safety chapter) BEFORE proceeding to lubricate or service the machine.

When venting or filling the hydraulic system, loosen the Filler Cap slowly and remove gradually.

Lubricants

The chart following lists the locations, temperature ranges and types of recommended lubricants to be used when servicing the Forklift Truck.

NOTE: Refer to the Operator Services topics in the Service chapter of this manual for detailed information regarding periodical checking and replenishing of lubricants.

Greasing

NOTE: Use a good grade of No. 2, Lithium based grease.

The following illustrations show the location of all grease fittings. All Fittings lubed daily should also be lubed at the weekly service also.

Wipe dirt from the Fittings before greasing them to prevent the dirt from being forced into the Bearings of the pivot joints. Replace any missing or damaged Fittings, when noted. To minimize dirt build-up, avoid excessive greasing

Grease Daily (Figs. 7-1 and 7-2)

1. Dyna-Tach to Inner Boom Pins (2 Ftgs.)
2. Tilt Cyl. Pivot Fins (2 Ftgs.)
3. Butt End Lift Cyl. Pivot Pin (1 per cyl.)
4. Rod Lift Cyl. Pivot Pin (1 per cyl.)
5. Butt End Level Cyl. (1 Ftg.)
6. Rod End Level Cyl. (1 Ftg.)
7. Rod End Slave Cyl. (1 per cyl.)
8. Boom to Frame Pivot Pins (2 Ftgs.)
9. Butt End Slave Cyl. (1 per cyl.)
10. Remote Zerks, Front Axle Pivot Pins
11. Remote Zerks, Rear Axle Pivot Pins
12. Front Boom Sheave Pin (1 Ftg.)
13. Rear Boom Sheave Pin (1 Ftg.)
14. Boom Ext. Cyl. Pin (1 Ftg.)

Grease Weekly (Fig. 7-3)

15. Rod End Steer Cyl. (2 Ftgs.)
16. Tie Rod Ends (2 Ftgs./Axle)
17. Butt End Steer Cyl. (2 Ftgs./Axle)
18. Transm. End (2 Ftgs./Ea. Driveshaft)
19. Axle End (1 Ftg./Ea. Driveshaft)
20. Foot Control Pedal Bearings (5 Ftgs.)
21. Transm. Shift Linkage (2 Ftgs.)
22. Wheel Spindle (4 Ftgs./Axle)

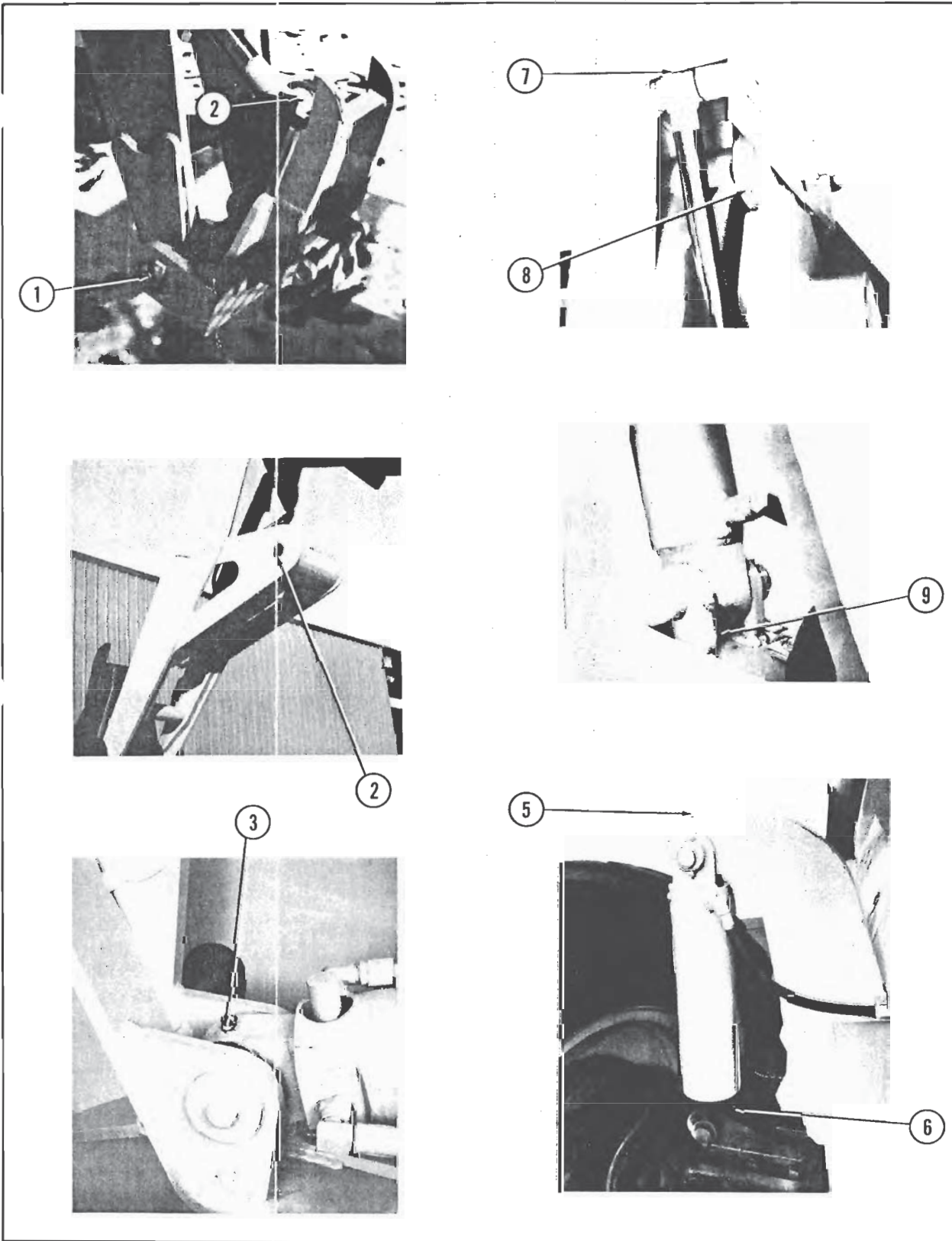


Fig. 7-1: Daily Grease Fitting Locations

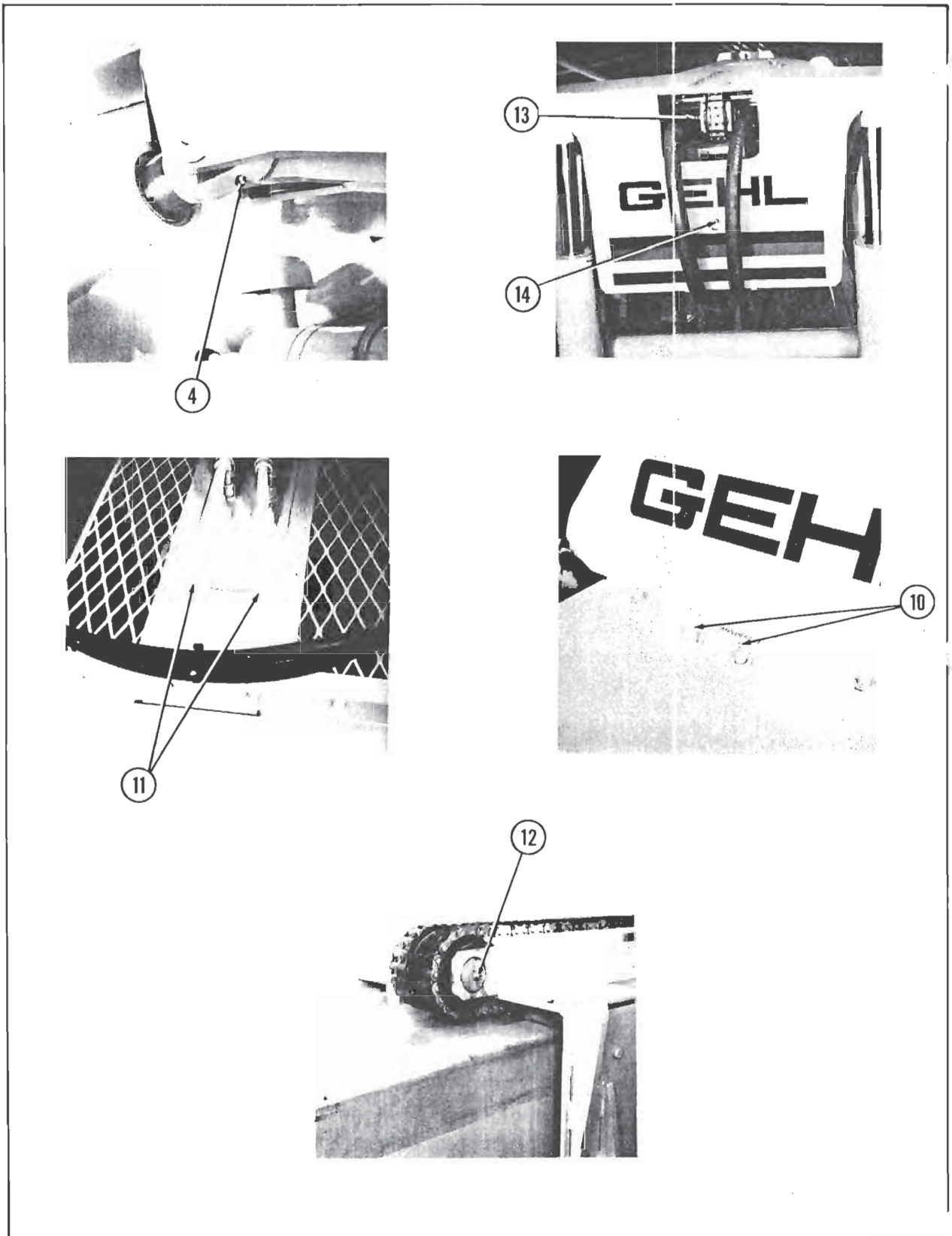


Fig. 7-2: Daily Grease Fitting Locations

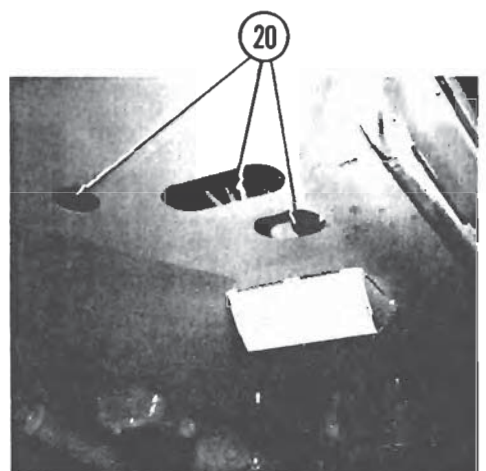
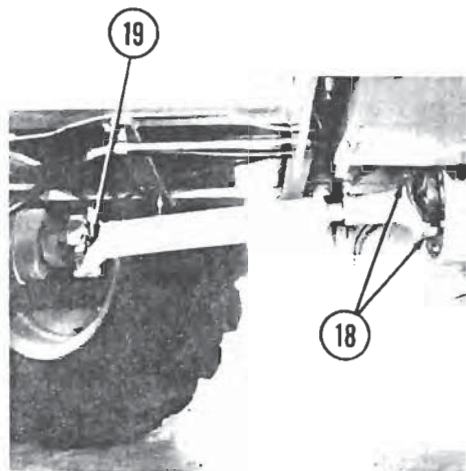
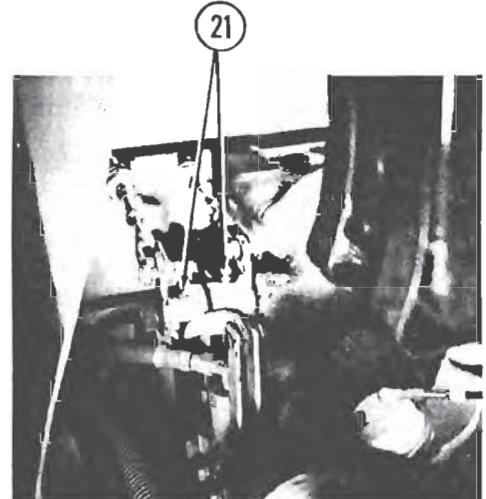
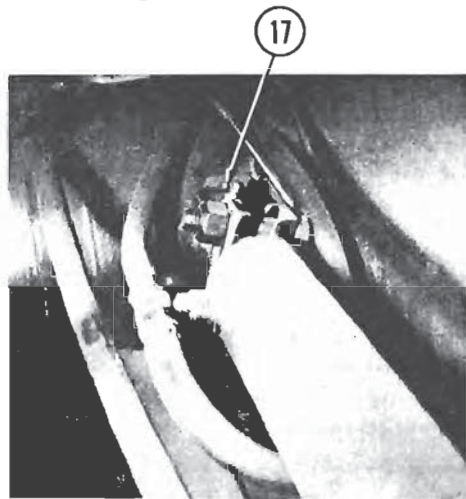
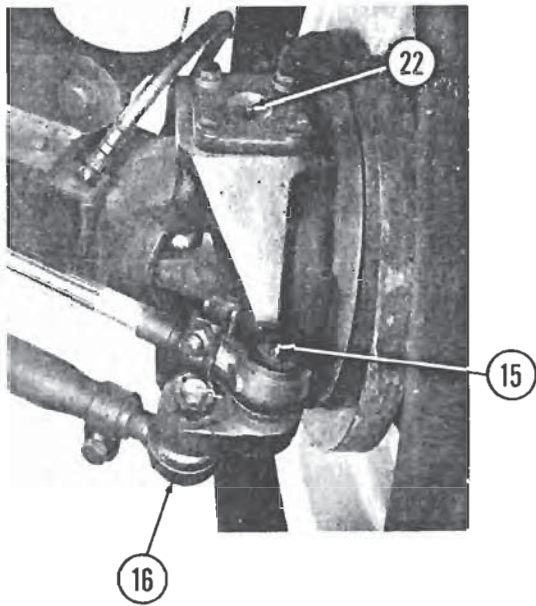


Fig. 7-3: Weekly Grease Fitting Locations

CHAPTER 8

TRANSPORTING AND THEFT DETERRENENTS

TRANSPORTING



CAUTION

ALWAYS follow ALL state and local regulations regarding the operation of equipment on or across public highways! Also, whenever any appreciable distance exists between job-sites or if operation on public highway is prohibited, **BE SURE** to transport the machine using a vehicle of appropriate size and weight.

ALWAYS abide by the following recommended procedures and guidelines when attempting to use ramps to load the Telescoping Boom Forklift Truck onto (or unload it from) a truck or trailer for transporting. Failure to heed can result in damage to equipment and serious personal injury or death!

Loading Forklift Truck Using Ramps (Fig.8-1)

NOTE: A matched pair of ramps is required.

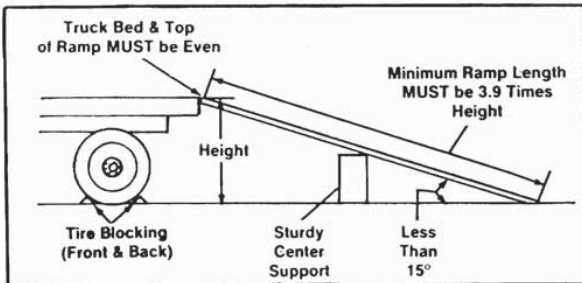


Fig. 8-1

1. The ramps **MUST** be of sufficient strength to support the machine. Whenever possible, the use of strong steel ramps is recommended as well as some type of center supporting block.
2. The ramps **MUST** be firmly attached to the truck or trailer bed with **NO** step between the bed and the ramps.
3. Incline of ramps **MUST** be less than 15 degrees (ramp length **MUST** be at least 16 feet long).

4. Ramp width **MUST** be at least 1-1/2 times the tire width.
5. Block the front and rear of the tires on the truck or trailer (if so equipped, engage the parking brake).
6. Remove the Attachment from the Boom. Position the Forklift Truck (with the Boom facing toward the front of the truck or trailer) so that it is straight in line with the ramps.
7. Slowly (at the lowest Engine speed possible) and carefully drive the Forklift Truck up the ramps.



CAUTION

NEVER attempt to adjust travel direction (even slightly) while traveling on the ramps. **Instead, back down off of the ramps and then re-align the Forklift Truck with the ramps.**

Transporting

When transporting the Forklift Truck, know the overall height to allow clearance of obstructions. Remove or tape over the slow moving vehicle emblem (SMV) if it will be visible to traffic.



CAUTION

NEVER transport the Forklift Truck with the Boom raised or extended. **BE SURE** to secure the machine (including boom) to the truck or trailer bed using chain and binders or steel cables to prevent any movement while transporting.

Unloading Forklift Truck Using Ramps

NOTE: A matched pair of ramps is required.

Use ramps as described in Steps 1 thru 4 above and proceed as follows to unload the machine:

8. If necessary, adjust the Forklift Truck so that the wheels are in line and centered with the ramps.
9. Slowly (at the lowest Engine speed possible) and carefully drive the Forklift Truck down the ramps.

THEFT DETERRENTS

THE CERTAINTY OF APPREHENSION IS A STRONG DETERRENT TO THIEVERY OF CONSTRUCTION EQUIPMENT! GEHL has recorded all Part Numbers and Serial Numbers. Users should take as many of the following actions as possible to discourage theft, to aid in the recovery in the event that the machine is stolen, or to reduce vandalism:

1. Remove keys from unattended machines.
2. Attach, secure, and lock all anti-vandalism and anti-theft devices on the machine.
3. Lock doors of cabs when not in use.
4. Inspect the gates and fences of the vehicle storage yard. If possible, keep machines in well lighted areas. Ask the law enforcement agency having jurisdiction to make frequent checks around the storage or work sites, especially at night, during weekends, or on holidays.
5. Report the theft to the dealer and insurance company. Provide the model, and all serial numbers.
6. Request that your dealer forward this same information to **GEHL Co.**

CHAPTER 9

TROUBLESHOOTING

NOTE: This Troubleshooting guide presents problems, causes and remedies beyond the extent of loose, worn or missing parts and is developed in consideration of the machine being in otherwise good operating condition. Repairs to hydraulic components, electronic systems, engine, transmission should only be done by your GEHL Dealer or authorized OEM Service Dealer.

BOOM TRAVEL

PROBLEM	CAUSE	REMEDY
All cylinder forces reduced	Engine output insufficient Worn or defective hydraulic pump Main relief valve defective Insufficient hydraulic oil level Improper hydraulic oil viscosity Suction filter is clogged	Refer to engine manual Repair or replace hydraulic pump Readjust pressure setting or replace valve Replenish oil supply Allow for longer warm-up or drain and replace with proper viscosity oil Clean or replace suction filter
All cylinders inoperative	Hydraulic pump defective Insufficient hydraulic oil level	Replace pump Replenish oil supply
Extend or retract power insufficient	Main or port relief valve pressure setting too low and/or defective Hydraulic cylinder seals defective Defective cylinder and/or piston Hydraulic pressure too low Too heavy a load	Readjust pressure and/or replace relief valve Replace cylinder seals Replace cylinder and/or piston Pressure checks of relief, pump; re-adjust setting or replace Reduce load weight
Binding, jerking, chatter during movement	Shimming too tight, insufficient grease, foreign matter in pad tracking path	Adjust shims; clean and grease pad tracking path
Sloppy movement	Slide pads worn	Re-shim pads or replace pads
Oil leaking out of boom	Extend Cylinder leaking Broken hose or loose fitting	Replace seals Replace hose(s); tighten fittings(s)

HYDRAULIC CYLINDERS

PROBLEM	CAUSE	REMEDY
Insufficient hydraulic cylinder power	Relief valve pressure setting decreased	Readjust valve pressure setting
	Hydraulic cylinder internal oil leakage	Replace cylinder seals
	Hydraulic cylinder piston or rod defective	Replace piston or rod
	Control valve internal oil leakage	Replace entire valve housing
Hydraulic cylinder external oil leakage	Hydraulic cylinder seals defective	Replace cylinder seals
	Hydraulic cylinder rod damaged	Replace cylinder rod
Piston does NOT move smoothly	Oil temperature is abnormally high	Lower the oil temperature
	Air being taken into system	Replenish oil and retighten suction connections

CONTROL VALVE

PROBLEM	CAUSE	REMEDY
Incapable of maintaining the load	Internal oil leak at the spool	Replace entire valve housing
	Oil leaking at relief valve port	Disassemble and clean or replace relief valve
Load lowers when spool is shifted from neutral to raise position	Load check valve clogged with dirt	Disassemble and clean load check valve assembly
	Load check valve poppet or seat damaged	Replace poppet and seat assembly
Spool sticking or does NOT move	Hydraulic oil contaminated	Drain and replace with fresh oil
	Valve clogged with dirt	Remove dirt and clean assembly
	Inside of plunger cap filled with oil	Replace seal on end of cap
	Port piping joint tightened excessively	Loosen and retorque joint
	Valve housing distorted from misalignment during mounting	Loosen, realign and retighten mounting hardware
	Foreign matter at spool internal stop	Remove foreign matter or replace entire valve assembly
	Pressure too high	Using pressure gauge, readjust pressure

CONTROL VALVE (Continued)

PROBLEM	CAUSE	REMEDY
Spool sticking or does NOT move (cont.)	Lever or link bent	Remove and straighten or replace
	Spool bent	Replace entire valve assembly
	Return spring failing	Replace spring
	Return spring or cap misaligned	Loosen, realign and retighten
	System oil temperature distribution NOT uniform	Allow sufficient warm-up time for entire system
Oil leaking at seals	Paint sticking at seal	Remove and clean the seal
	Back-pressure in valve	Replace hydraulic oil filter
	Dirt in seal	Remove and clean the seal
	Seal plate has loosened	

PRIORITY FLOW DIVIDER VALVE

PROBLEM	CAUSE	REMEDY
No flow thru priority or excess flow ports	Piston is stuck and closing off flow	Disassemble and remove foreign material to restore smooth function
	Dirt is lodged in valve seat	Clean valve
Flow control is unstable	Pilot poppet seat is damaged	Replace damaged parts
	Pilot piston is sticking	Disassemble, clean and/or remove surface flaw
Load sensing relief pressure incorrect	Parts worn	Replace worn parts
Oil leaks have developed	Seats and/or O-rings are worn	Replace defective or worn parts
	Moving parts are stuck due to dirt	Disassemble and check for flaws; clean and reassemble parts

RELIEF VALVE

PROBLEM	CAUSE	REMEDY
Pressure does NOT rise at all	Poppet is stuck and remains open	Disassemble and remove foreign material to restore smooth function
	Dirt is lodged in valve seat	Clean valve
Relief valve function is unstable	Pilot poppet seat is damaged	Replace damaged parts
	Pilot piston is sticking	Disassemble, clean and/or remove surface flaw
Relief pressure incorrect	Parts worn	Replace worn parts
	Locknut and adjusting screw loose	Readjust pressure and tighten locknut and screw
Oil leaks have developed	Seats and/or O-rings are worn	Replace defective or worn parts
	Moving parts are stuck due to dirt	Disassemble and check for flaws; clean and reassemble parts

HYDRAULIC PUMP

PROBLEM	CAUSE	REMEDY
Hydraulic pump does NOT discharge oil	Insufficient hydraulic oil level	Replenish oil
	Suction filter is clogged	Clean or replace filter
Hydraulic pump does NOT develop full pressure	Hydraulic pump internal leakage	Replace hydraulic pump
	Hydraulic pump taking in air	Replenish oil and tighten suction connections
	Main relief valve pressure setting has dropped	Adjust valve
Pump has become abnormally noisy	Cavitation has developed due to collapsed suction hose	Clean filter and replace oil, if contaminated
	Air is being taken in due to loose suction hose connections or because of low oil level	Retighten hose connections and/or replenish oil
	Cavitation has developed due to excessive oil viscosity	Drain and replace with proper viscosity oil
	Bubbles in hydraulic oil	Locate the cause of the bubbles and correct; replace oil

ELECTRICAL SYSTEM

PROBLEM	CAUSE	REMEDY
Starter will NOT turn	Keyswitch is OFF	Turn keyswitch ON
	Faulty wiring and/or terminations	Troubleshoot circuit and repair problem
	Faulty starter switch	Replace switch
	Battery NOT adequately charged	Recharge battery
Battery discharges and/or will NOT recharge	Terminals or cables are loose or corroded, battery is defective, and/or alternator (or regulator) is defective	Clean the battery terminals and cables and retighten them or replace battery; alternator and regulator can be checked by your dealer
	Battery electrolyte level is low	Replenish with distilled water
	Alternator belt defective and/or NOT properly tensioned	Replace belt and/or readjust tension
Operating lights, horn, etc. do NOT function	Circuit breaker(s) open	Check for cause, correct and reset circuit breaker(s)
Alternator lamp goes out before engine starts	Faulty alternator	Replace alternator
	Battery is NOT sufficiently charged	Recharge battery
	Faulty safety relay	Replace relay

TRANSMISSION

PROBLEM	CAUSE	REMEDY
Levers won't function	Linkage disconnected or out of adjustment Binding or travel restriction	Re-connect or re-adjust Check control linkage and valve assembly
Low clutch pressure	Low oil level Regulating valve spool stuck open Faulty charge pump Broken or worn clutch shaft or piston seal rings Clutch piston bleed valve stuck open	Fill to proper level Clean spool and housing Replace Replace seal rings Clean bleed valves
Low converter charging pump output	Low oil level Suction screen plugged Defective oil pump	Fill to proper level Clean suction screen Replace
Overheating	Worn oil seal rings Excessive slipping of torque converter Worn oil pump Low oil level	Requires rebuilding converter assembly Use proper operating techniques Replace Fill to proper level
Noisy converter	Worn oil pump Worn or damaged bearings	Replace Requires complete disassembly for repair
Lack of power	Low engine RPM at converter stall See "overheating", make same checks	Replace See "overheating"

ENGINE

PROBLEM	CAUSE	REMEDY
Engine will NOT turn over	<p>Starter motor defective or faulty wiring connections</p> <p>Starter motor has insufficient power to turn engine over</p> <p>Engine is cold</p> <p>Engine crankcase oil is too heavy</p>	<p>Replace motor and/or repair wiring connections</p> <p>Battery is run down, starter is defective and/or wiring connections are broken or loose</p> <p>Activate glow plugs to pre-heat Perkins engine. Use starting aid for JD and Cummins Engines</p> <p>Drain and replace crankcase oil with proper viscosity oil</p>
Engine cranks-over but will NOT start	<p>Fuel tank is empty</p> <p>Fuel filter is clogged and/or air is trapped in the fuel system</p> <p>Battery is run down</p>	<p>Replenish diesel fuel supply</p> <p>Clean or replace fuel filter and/or deaerate fuel system</p> <p>Recharge battery; if problem continues check electrical system for cause of battery drain (see electrical system section)</p>
Engine cuts-out abruptly	<p>Ran out of fuel</p> <p>Fuel filter is clogged and/or air is trapped in the fuel system</p>	<p>Replenish diesel fuel</p> <p>Clean or replace fuel filter and/or deaerate fuel system</p>
Engine runs rough	<p>Fuel filter is clogged and/or air is trapped in the fuel system</p> <p>Air cleaner is clogged</p>	<p>Clean or replace fuel filter and/or deaerate fuel system</p> <p>Clean or replace air cleaner filter</p>
Engine overheats	<p>Radiator fins blocked</p> <p>Coolant level in radiator is too low</p> <p>Coolant mixture improper for season of operation</p> <p>Fan belt loose and/or slipping</p> <p>Crankcase oil level is too low</p> <p>Exhaust is restricted</p> <p>Excessive slipping of transmission torque converter</p>	<p>Flush-out dirt</p> <p>Replenish coolant level</p> <p>Drain coolant and replace with proper mixture</p> <p>Tighten belt tension and/or clean off belt to eliminate slipping</p> <p>Add oil, as required</p> <p>When engine cools, remove restriction</p> <p>Shift to low gear, shift to neutral when accelerating hydraulics</p>

AXLES

PROBLEM	CAUSE	REMEDY
Noise on drive	Excessive pinion to ring gear backlash	Adjust
	Worn pinion and ring gear	Replace
	Worn pinion bearings	Replace
	Loose pinion bearings	Adjust
	Excessive pinion end play	Adjust
	Worn differential bearings	Replace
	Loose differential bearings	Adjust
	Excessive ring gear run-out	Replace
	Low lubricant level	Replenish
	Wrong or poor grade lubricant	Replace
	Bent axle housing	Replace
Noise on coast	Axle noises heard on drive will usually be heard on coast, although not as loud	Adjust or replace (see above)
	Pinion and ring gear too tight (audible when decelerating and disappears when driving)	Adjust
Intermittent noise	Warped ring gear	Replace
	Loose differential case bolts	Tighten
Constant noise	Flat spot on pinion or ring gear teeth	Replace
	Flat spot on bearings	Replace
	Worn pinion splines	Replace
	Worn axle shaft dowel holes	Replace
	Worn hub studs	Replace
	Bent axle shaft	Replace
Noisy on turns	Worn differential side gears and pinions	Replace
	Worn differential spider	Replace
	Worn differential thrust washers	Replace
	Worn axle shaft splines	Replace

HYDRAULIC PRESSURE CHECKS (Fig. 9-1)

Pressure settings of relief valves is pre-set by the factory. Two Test Ports are provided on the front of the dash. A 3000 psi oil or liquid filled gauge is required to check pressures at the Test Ports.

Normal Pressures at 950 RPM:

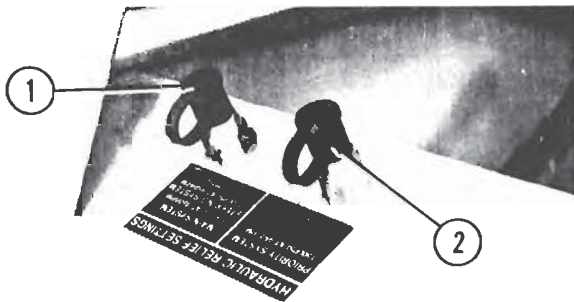
PRIORITY SYSTEM should read 1300 psi

MAIN SYSTEM should read 2750 psi

STEERING SYSTEM should read 2000 psi

With the gauge on the main system Test Port, Attachment tilt operation should read 2750 psi tilted back and 1500 psi tilted forward.

Before conducting any Test Port pressure checks, check the Engine RPM. Engine speed must be 950 to 1000 RPM at idle and 2500 maximum high idle RPM.



- 1 - Main & Steering System
- 2 - Priority System

Fig. 9-1



CAUTION

ALWAYS make sure all pressure is bled off, gauge reading "zero", before moving it to another position.

CHAPTER 10

SERVICE

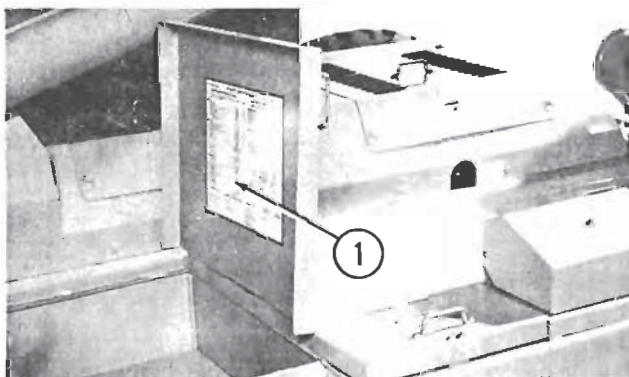
This chapter details the procedures to follow for performing operator service routines and minor repairs, adjustments and replacements. For additional information relating to Engine service and adjustments, refer to the separate Engine Manual provided.



CAUTION

BEFORE attempting to perform any service routines on the Telescoping Boom Forklift Truck or unless expressly instructed to do otherwise, exercise the **MANDATORY SAFETY SHUTDOWN PROCEDURE** (Safety chapter). After service has been performed, **BE SURE** to restore all Guards, Shields and Covers to their original positions **BEFORE** resuming Forklift Truck operation.

NOTE: All maintenance described in this Service chapter subtopics is also referred to by a Decal located on the underside of the Toolbox/Battery Access Cover (Fig. 10-1).



1 - Maintenance Decal

Fig. 10-1

GENERAL PRECAUTIONS

DO NOT Perform any maintenance or repair without prior authorization. Allow only trained personnel to service the Forklift Truck.

WARRANTY repairs can only be done by a **GEHL** Dealer. He will know what portions of the Forklift Truck are covered under the terms of the **GEHL** Warranty and what portions are covered by other vendor OEM warranties.

NOTE: Always dispose of waste lubricating oils, anti-freeze and hydraulic fluids according to local regulations or take them to a recycling center for disposal; **DO NOT** pour them onto the ground or down the drain.



WARNING

DO NOT smoke or allow any open flames in the area while checking and/or servicing hydraulic, battery or fuel systems; all contain highly flammable liquids or explosive gases which can cause an explosion or fire if ignited.

Wear a face shield when you disassemble spring loaded components or work with Battery acid. Wear a helmet or goggles with special lenses when you weld or cut with a torch.

When working beneath a raised Forklift Truck, always use blocks, jack-stands or other rigid and stable supports. Wear appropriate protective clothing, gloves, shoes. Keep feet, clothing, hands and hair away from moving parts.

Always wear safety glasses or goggles for eye protection from electric arcs from shorts, fluids under pressure, and flying debris or loose material when the Engine is running or tools are used for grinding or pounding.

WORK AREA PRECAUTIONS

Choose a clean, level work area. Make sure you have sufficient room, clearances, and adequate ventilation. Clean the walking and working surfaces. Remove oil, grease and water to eliminate slippery areas. Utilize sand or oil absorbing compound as necessary while servicing the Forklift Truck.

Before starting inspection and repair, move the Forklift Truck onto a level surface, shut down Engine, and release all hydraulic pressure. Always block the Boom securely, or lower it to full ground contact. Place all controls in neutral.

Block the Wheels. Disconnect the Battery and remove the Ignition Key. Remove only guards or covers that

provide needed access. Wipe away excess grease and oil.

NEVER weld on forks, boom, support frame or overhead guards without the consent of the manufacturer. Special metals may be used which require special welding techniques or have a design which should not have welded repairs. **NEVER** cut or weld on fuel lines or tanks.



CAUTION

If repair welding is ever required, **BE SURE** to attach the ground (-) cable from the welder as close as possible to the area to be repaired.

Rotating parts must be inspected during repair and replaced if cracked or damaged. Excessively worn or damaged parts can fail and cause injury or death. Care should be taken to assure that all replacement parts are interchangeable with original parts and of equal quality.

Use care not to damage machined and polished surfaces. Clean or replace all damaged or painted over plates, decals that cannot be read.

NOTE: *NEVER* leave guards off or access doors open when the Forklift Truck is unattended. Keep bystanders away if access doors are open.

After servicing, check the work performed, no parts left over, etc. Install all guards, covers and reconnect the Battery.

OPERATOR SERVICES

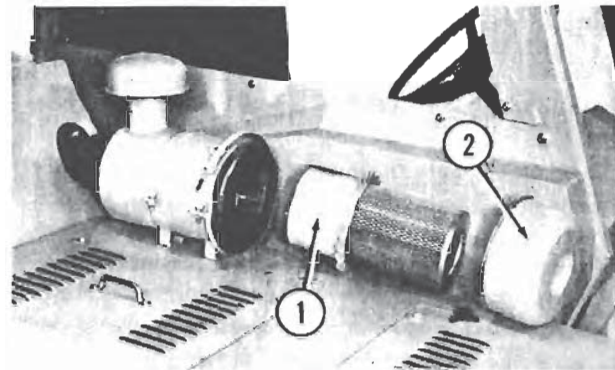
NOTE: *Some of the operator related services will require access to components located inside various superstructure hoods and covers. Refer to the Guards, Shields and Covers topic in the Controls and Accessories chapter of this manual for the locations and proper access procedures relating to these covers.*

As Required Service

Dry Air Cleaner (Fig. 10-2)

This Air Cleaner contains a single Element. This Element is cleanable, but should be replaced after two (2) cleanings, or after six months. This Element does not have a separate safety element so extreme care must be taken when cleaning or inspecting.

NOTE: *See instructions found under 100 Hour Service topics in this chapter for detailed cleaning and replacement instructions.*



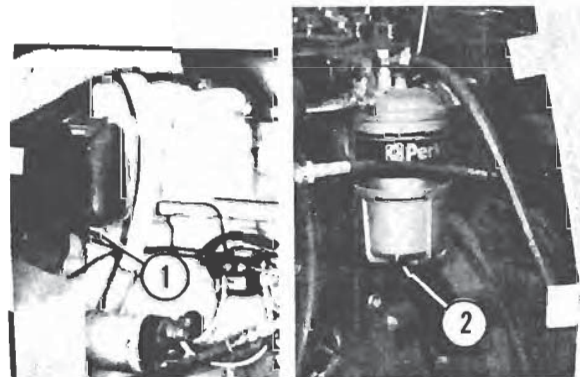
1 - Element
2 = Dust Cap

Fig. 10-2

Fuel Filter (Fig. 10-3)

The Fuel Filter for the diesel Engine will require occasional replacement to maintain a clean and adequate fuel flow for maximum Engine horsepower. The frequency of Filter replacement will be determined by the cleanliness of available fuel, the care used in storing fuel supplies and the operating conditions in which the Forklift Truck is used.

Small amounts of water can be drained from the Fuel Filter. The Drain Plug should be removed weekly to drain off water accumulation. Detailed Fuel Filter replacement instructions can be found under 100 Hour Service topics in this chapter.



1 - Water Drain (J. Deere Engine)
2 - Water Drain (Perkins Engine)

Fig. 10-3

Diesel Fuel Injectors

Whenever faulty or plugged injectors are indicated, see your nearest authorized OEM Engine dealer.

Injection Pump Timing

Whenever Injection Pump timing, or other pump service is indicated by abnormal Engine operation, contact your nearest OEM Engine dealer.

Diesel Bleeding Procedures

When the Fuel Filter is removed and replaced, or the Engine runs out of fuel, air must be bled from the system. Refer to the OEM Engine user manual relative to proper bleeding procedures.



CAUTION

Escaping diesel fuel under pressure can have sufficient force to penetrate the skin. Before applying pressure to the fuel system, be sure all connections are tight and lines and hoses are not damaged. Use a piece of wood or cardboard to search for suspected leaks. If injured by escaping fuel, see a doctor at once.



WARNING

NEVER service the fuel system while smoking, while near an open flame, or after the Engine has been operated and is hot.

If the Engine still will not start, consult your nearest authorized OEM Engine dealer.

NOTE: Only an authorized OEM Engine dealer can perform WARRANTY Service on the Engine.

Belt Tension

With thumb pressure, press the Fan Belt down at the center of the longest span between pulleys and measure the deflection. It should be as follows:

5/8 to 1" for J. Deere Engine

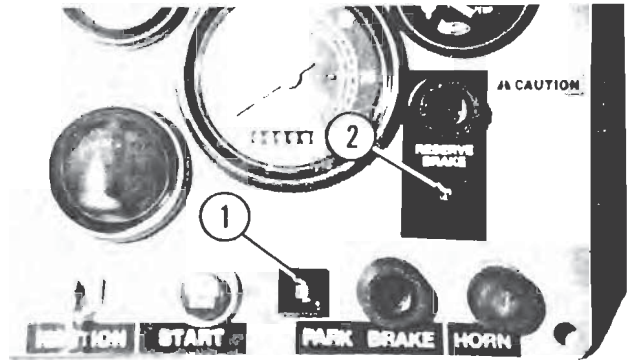
3/8" for Perkins Engine

If the Belt shows wear or cuts it should be replaced. Refer to the OEM Engine manual relative to proper Belt replacement and tension adjustment procedures.

Circuit Breakers, Brake Reserve Lamp (Fig. 10-4)

The left hand Circuit Breaker is for ignition protection to the Dash and Engine electrical system. If it is not in "depressed position", the gauges and indicators will not work and the Engine will shut off.

The right hand Circuit Breaker is for Brake lights and Brake Reserve electrical system protection. This Breaker must be in "depressed position" for the Reserve Brake to operate with the ignition off.



- 1 - L.H. Circuit Breaker
- 2 - R.H. Circuit Breaker

Fig. 10-4



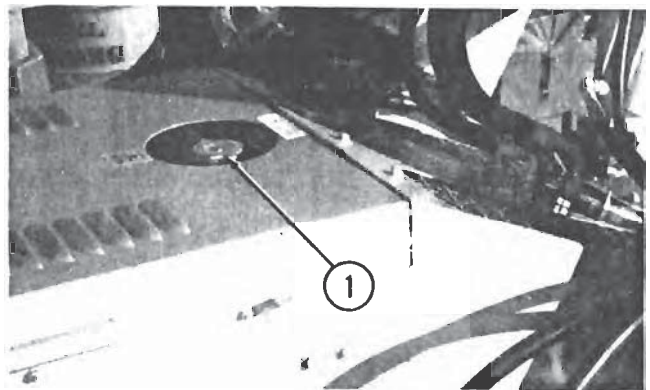
CAUTION

If Reserve Brake Light is ON with the Engine running, a primary Brake system malfunction has occurred. Follow the MANDATORY SAFETY SHUTDOWN PROCEDURE (Safety chapter) in this manual.

10 Hour (or Daily) Services

Radiator Coolant Level (Fig. 10-5)

With the Forklift Truck on level ground, remove the Radiator Cap. Add clean soft water (summer) or 50/50 water and Anti-Freeze mixture (winter) if the coolant level is below the filler neck. Replace the Radiator Cap securely.



- 1 - Radiator Cap

Fig. 10-5



WARNING

DO NOT remove the Radiator Cap when the Engine is running **HOT**, or overheated. Coolant is extremely **HOT** and under pressure and it can burn your skin. Wait for the Engine to cool down **BEFORE** relieving the pressure and removing the Radiator Cap.

NOTE: If the Engine is operated with a loose Radiator Cap, the pressure bypass will not work and the Engine will run hot.

Engine Oil Level

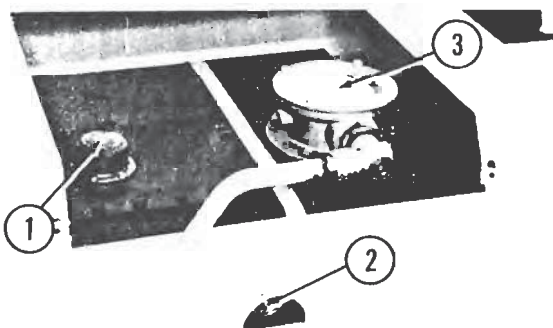
With the Forklift Truck on level ground, and the Engine stopped for ten (10) minutes or more, slide open the Side Engine Panel and remove the Dipstick. Wipe it clean, re-insert it and remove to obtain a reading. If the oil level is down, or below the **ADD** mark, fill with the required amount of oil to bring the level to the **FULL** mark. See the Fuels and Lubrication chapter for the type of oil to use.

Hydraulic Oil Level (Fig. 10-6)

Visually check the level of the hydraulic oil through the Sight Gauge. If low, remove the Hood Access Cover and add hydraulic oil through the Filler Cap.

NOTE: Be careful when removing the Reservoir Filler Cap so that **NO** dirt or other foreign matter enters the hydraulic system while the Cap is removed. **DO NOT OVERFILL.**

See the Fuels and Lubricants chapter of this manual for recommended hydraulic oils.



- 1 - Hyd. Oil Filler Cap
- 2 - Oil Level Sight Gauge
- 3 - In-Tank Filter

Fig. 10-6

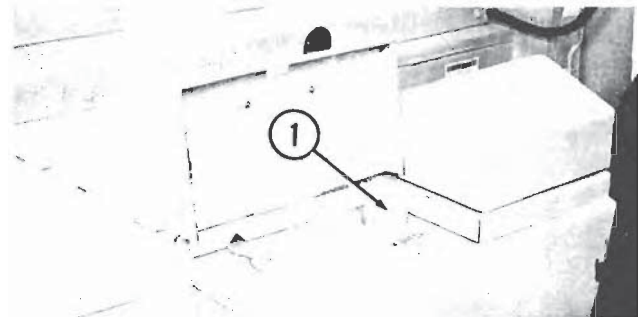
Lubricate Daily Grease Points

Refer to the Fuels and Lubrication chapter of this manual for Daily Grease Fitting locations and other related details.

Fuel Tank Level (Fig. 10-7)

After operation, the Fuel Tank should be filled to prevent water from condensing in the Tank. To fill, flip back the cover, remove the Filler Cap and add fuel through the filler port. After filling, **BE SURE** to install the Filler Cap.

A Drain Plug is provided in the bottom of the Fuel Tank for removing condensation and other foreign materials. Open the Plug and allow water and fuel to drain into a container until only clear fuel is flowing from the Tank.



1 - Filler Cap

Fig. 10-7

Tires

Check the Tire pressure "cold". All 10 ply Tires should be inflated to 55 psi. All 12 ply Tires should be inflated to 70 psi.



WARNING

NEVER attempt to service Tires if the bead lock ring appears loose. Clear the area and call for professional tire repair help.

NOTE: If the Tires have been filled with water or calcium chloride for weight, a chloride gauge must be used to check the tire pressure.

When removing Tires follow industry safety practices. Deflate completely prior to removal. Following assembly of the Tire on the multi-piece rim use a safety cage or restraining device while inflating.

50 Hour (or Weekly) Service

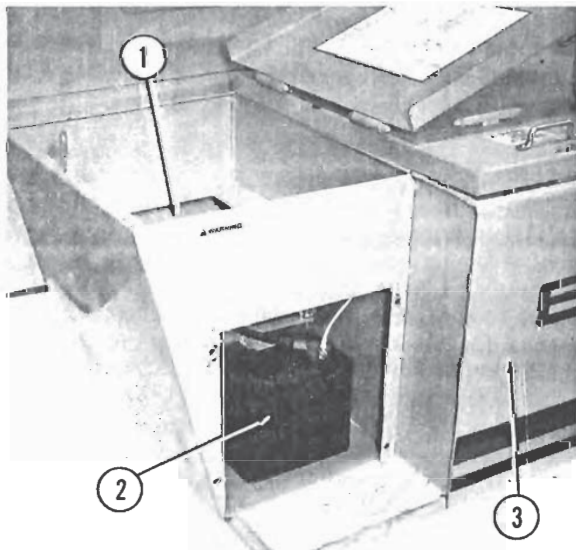
NOTE: The following service checks should be done at the beginning of each working week and in full conjunction with Daily Service.

Air Cleaner

If working in extremely dusty conditions, check and clean per instructions found in 100 Hour service topics of this chapter.

Battery Fluid Level (Fig. 10-8)

The 12 volt high capacity Battery is located under the Toolbox Compartment of the Fuel Tank assembly attached to the right side of the Frame.



- 1 - Remove Plate to Check Fluid Level
- 2 - Remove & Replace Battery Thru This Opening (cover removed)
- 3 - Fuel Tank

Fig.10-8

Always observe the following Battery service precautions:



WARNING

Batteries contain sulfuric acid which can cause severe burns. Avoid contact! Call a doctor immediately if an accident occurs with acid.



WARNING

Batteries will generate explosive mixtures of hydrogen and oxygen gases. Wear eye protection at all times when working around Batteries. Ventilate the area when recharging the Battery. Keep sparks, flame and cigarettes away when servicing the Battery.



CAUTION

ALWAYS use proper meters and hydrometers for check the Battery. When removing the battery, always disconnect the negative (-) cable first. When installing, connect the positive (+) cable first.

NOTE: The Battery in the Forklift Truck is warranted by the supplier. See the punch tag on the top of the Battery for warranty information.

The top of the Battery **MUST** always be kept clean. Clean the Battery with a brush dipped in an alkaline solution (ammonia or baking soda and water). After the foaming has stopped, flush the top of the Battery with clean water. If the terminals and Cable connection clamps are corroded or have a build-up, disconnect the Cables and clean the terminals and clamps with the same alkaline solution.

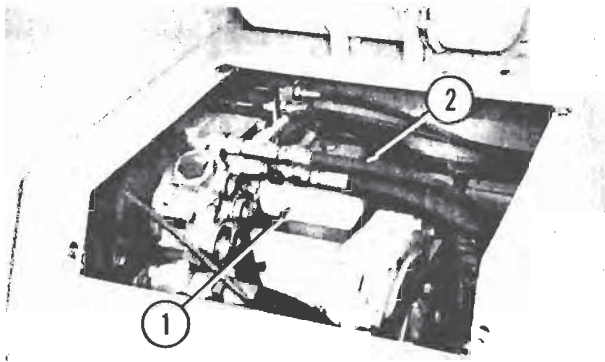
After cleaning the top of the Battery, check the electrolyte level by removing the filler-vent caps. If the level is low, add clean soft water or distilled water. Fluid level is correct when the liquid covers the rings in the filler wells, or is a minimum of 1/4" above the plates.

NOTE: Since water and electrolyte will not mix immediately, **DO NOT** add water in freezing weather unless the Battery is warm. If water is added, the engine should be run for a minimum of two (2) hours.

Transmission Oil Level (Fig. 10-9)

NOTE: The Engine and Transmission should be warmed up before checking this oil. The Engine should be idling with the Shift Control in neutral when checking the level.

Remove the Access Cover to the Transmission and Hydraulic Pump. Remove the Dipstick and check the oil level. Add oil as necessary to bring the level to the full mark. See Transmission oils under Fuels and Lubricants chapter of this manual for proper oil type.



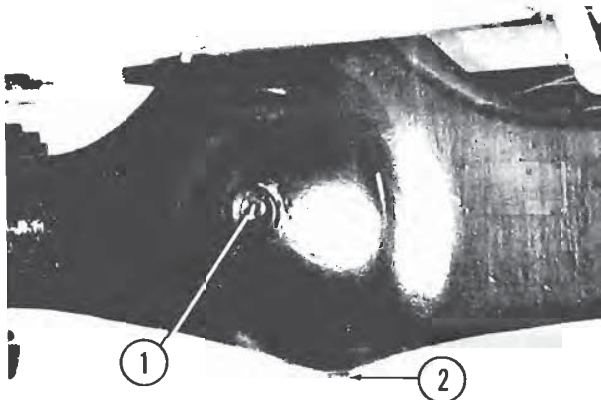
1 - Transmission Filter
2 - Transmission Dipstick (below Filter)

Fig. 10-9

Axle Differential Oil Level (Fig. 10-10)

NOTE: The Forklift Truck should be on a level surface for this procedure.

With a socket wrench, remove the Fill Plug on the side opposite the Driveshaft yoke. The oil should be level to within 1/4" below the fill hole. If low, fill until overflow. See the Fuels and Lubricants chapter of this manual for proper oil to use.

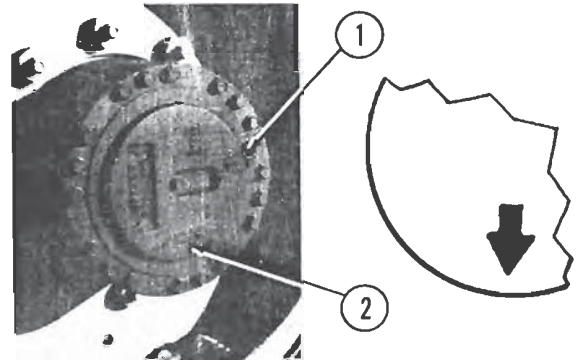


1 - Level Check & Fill Plug
2 - Drain Plug

Fig. 10-10

Planetary Hubs Oil Level (Fig. 10-11)

NOTE: The Planetary Hubs can be checked without jacking up the Forklift Truck.



1 - Plug
2 - Arrow DOWN to Check & Fill

Fig. 10-11

The Planetary Hubs have one plug each used for filling and draining. For checking the level and filling, position the wheel until the arrow points down. Remove the Fill Plug. If oil does not run out, add oil until it overflows. Repeat this procedure on the remaining hubs. Follow oil specifications found in the Fuels and Lubricants chapter of this manual.

Lubricate Weekly Grease Points

NOTE: Weekly lube is to be done in conjunction with daily lube requirements of this chapter.

Refer to the Fuels and Lubrication chapter of this manual for Weekly Grease Fitting locations and other related details.

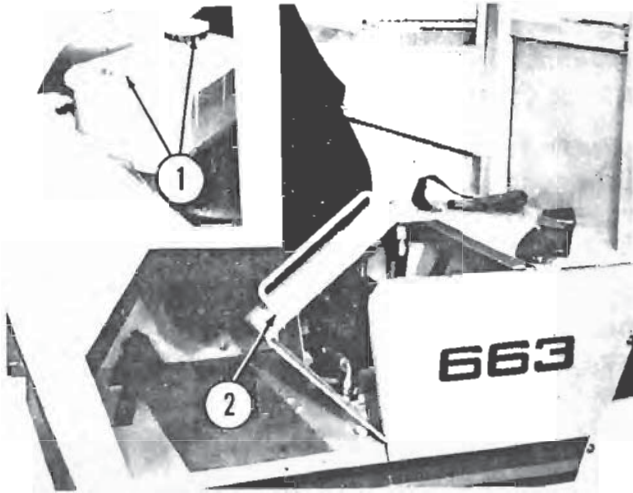
Brake Reservoir Level (Fig. 10-12)

The Brake Booster Master Cylinder Reservoir is under the Seat compartment. This compartment panel tilts forward for access to the Reservoir. Remove the Reservoir Caps to check the level. If low, fill to proper level with hydraulic brake fluid (Type DOT 3) only.

Boom Slide Pads (Fig. 10-13)

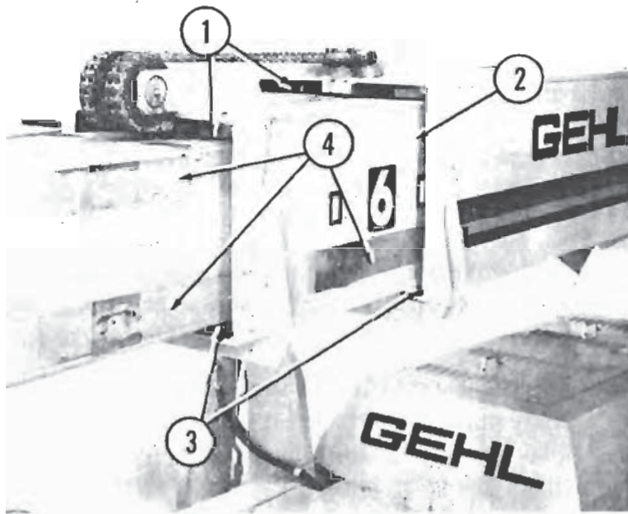
This Boom is equipped with special nylon low friction Slide Pads between the telescopic sections. These are pre-greased and initially worn-in at the factory. Normally greasing is not required, except for maintaining a light film of grease on the pad tracking areas of the boom sections. An exception would be if a Boom section has been replaced.

Visually check for loose Pad bolts. The bolts are torqued to 30 ft.-lbs. If the bolts are re-torqued at any time, loc-tite must be re-applied to the bolts.



- 1 - Reservoir Fill Caps
- 2 - Tilt Forward Seat Section

Fig. 10-12



- 1 - Top Slide Pads
- 2 - Side Slide Pads
- 3 - Front Bottom Intermediate and Outer Sections (4 Slide Pads)
- 4 - Slide Areas
- Not Shown - Top Rear Intermediate and Inner Sections (4 Slide Pads)
- Remove Rear Boom Panel for Access

Fig. 10-13

If the Boom starts to chatter under load, grease the slide pads and wipe off the excess.

NOTE: The Pads at the bottom front and top rear of the Boom sections receive the greatest pressure.

Boom Leaf Chains (Fig. 10-13)

Inspect the Leaf Chains for wear and proper tension. Two of the Chains are on the top of the Boom. A third

is accessible from inside the rear of the Boom. Run the Boom out slowly to inspect. Conditions to look for include cracked or broken plates, protruding or turned pins, excessive wear.

With a steel tape, measure 16 links of the strand that flexes over the sheaves. When the distance measures 12.375", the chain should be discarded. **DO NOT** repair sections of a chain. Replace the complete Chain.

Chain anchors and sheaves also require inspection for worn or broken fingers and worn flanges. If a Chain has been replaced, operate under load condition and recheck the torque. Chains are adjusted by torquing the anchors 30 ft.-lbs.

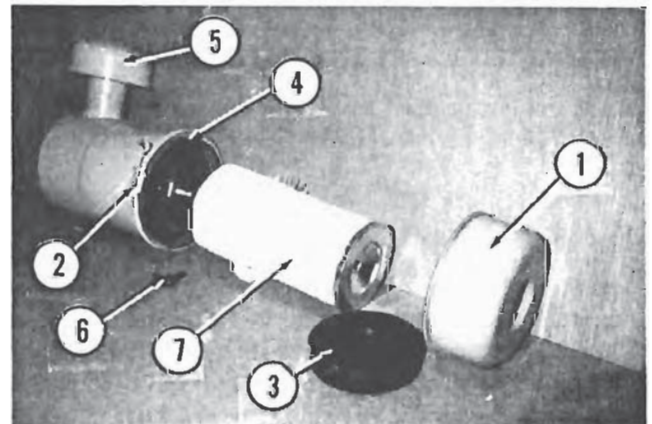
100 Hour Service

Perform all other service requirements up to this point as well as the following.

Air Cleaner (Fig. 10-14)

Completely wipe the outside of the Air Cleaner Body with a rag or cloth. Blow off excess dirt and dust with compressed air. Disassemble as follows:

1. Loosen the Clamp Ring and remove the End Cap. Remove the Dust Cup. Wipe the End Cap and Cup completely clean. Reassemble the End Cap.
2. Remove the Element Wing Bolt, rotate the Element 180° and remove it. Wipe the entire inside of the main Body and Inlet Cap Screen.



- 1 - End Cap
- 2 - Clamp
- 3 - Dust Cup
- 4 - Body
- 5 - Inlet Cap
- 6 - Wing Nut
- 7 - Element

Fig. 10-14



WARNING

NEVER use gasoline or solvent to clean the Air Cleaner or its subassemblies.

The Air Cleaner element may be cleaned with **LOW** pressure compressed air or washed with water if extremely dirty.

NOTE: *DO NOT blow air or water from the "outside to the inside" when cleaning the Element.*

If contaminants in the Element contain soot or oily deposits, it may be necessary to wash the Element. Two (2) ounces of detergent soap mixed with a gallon of water makes a good soak/wash solution. Soak for 15 minutes or more and rinse with clear water. Remove excess water with low air pressure. The Element must dry at 70°F for a minimum of 48 hours before re-using.

NOTE: *Keep spare Elements on hand to eliminate down time.*

Make sure the clean Element has no holes or ruptures. Placing a bright light inside the Element and inspecting the outside will show up any holes or tears. Discard the Element if holes or tears are evident.



CAUTION

NEVER use an Element that is damaged. Severe Engine wear and eventual failure can result if dirt gets through a hole in the Element.

Reassemble the Air Cleaner. Make sure the large O-ring is in place between the End Cap and the main Body.

Fuel Filter Replacement

The Fuel Filter will require occasional replacement to maintain a clean and adequate fuel flow for maximum Engine horsepower. The frequency of Filter replacement will be determined by the cleanliness of available fuel, and conditions in which the Forklift Truck is operated.



WARNING

DO NOT service the fuel system while smoking, near a flame or fire, or with the Engine running.

NOTE: *For location and proper servicing procedures for Fuel Filter replacement, refer to the OEM Engine manual relative to the Engine in your machine.*

After Fuel Filter replacement, bleed the air out of the fuel system following the procedures in the OEM Engine manual.

Change Engine Oil & Filter

NOTE: *The Engine oil and Filter should be changed after the first 50 hours of Engine break-in, and every 100 hours thereafter. Use the following procedure:*

1. With the Engine warm, remove the crankcase Drain Plug. Some plugs are equipped with a magnet to gather metal particles. Completely clean and flush away all metallic filings from the Plug, and re-install it.
 2. The Engine oil Filter should be changed at every oil change interval. Remove and discard the throw away Filter canister. Wipe the Gasket sealing area of the block with a clean cloth.
- NOTE:** *Your OEM Engine oil Filters have special by-pass valves built-in. Use only genuine OEM Engine replacement Filters.*
3. Apply a thin coat of clean oil to the new oil filter gasket. Spin tighten. Refill the crankcase with new oil. Follow specifications in the Fuels and Lubrication chapter for type and viscosity of new oil to be put in.
 4. After new oil has been added, run the Engine at idle speed until the oil pressure light is OFF. Check for leaks at the Filter and Drain Plug. Retighten only as much as necessary to eliminate leakage.

200 Hour Service

NOTE: *Perform all other service requirements up to this point, as well as the following.*

Transmission Oil Filter

NOTE: *The Transmission oil itself is to be changed at 600 hour intervals as shown in the 600 hour service topics of this chapter.*

Remove the Access Cover on the top of the Transmission Hood. Run the Forklift Truck so the Transmission oil is warmed up.

Remove and discard the oil filter. Wipe the sealing surface on the Transmission with a clean cloth. Follow in-

struction shown in the 100 hour service topics (Engine Filter replacement) for mounting the new Filter on the Transmission.

NOTE: Use only OEM authorized oil Filter Elements for the Forklift Truck Transmission applications.

Boom Slide Pad Clearance (Fig. 10-15)

The clearance required between the Inner, Intermediate and Outer Sections Slide Pads should be checked every 200 hours and if necessary adjusted by means of 1/16" (.062) or 1/8" (.125) Shims. Proper clearance allows the sections to track smoothly and evenly support the load. Clearance should be kept at 1/16" (.062).

If Slide Pad shows excessive wear, loosen bolts. Insert Shims to each side or top and bottom for even distribution of clearance. Re-apply loc-tite to the bolts and re-torque to 30 ft-lbs.

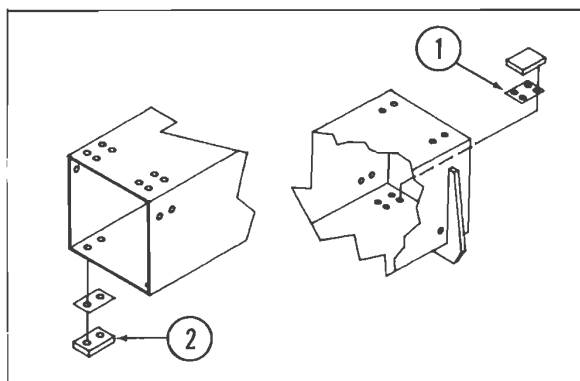


Fig. 10-15

600 Hour Service

NOTE: Perform all other service requirements up to this point, as well as the following.

Transmission Oil

Operate the Forklift Truck long enough to warm up the Transmission oil, then proceed as follows:

1. Drain the Transmission and remove the Sump Screen. Clean the Screen with clean solvent and re-install using a new Gasket. Replace the Drain Plug.
2. Replace the Transmission Oil Filter as shown in 200 hour service topics in this chapter. Remove the Transmission Breather Cap located at the op-

posite end of the Filter mount. Clean it with fresh solvent and re-install it.

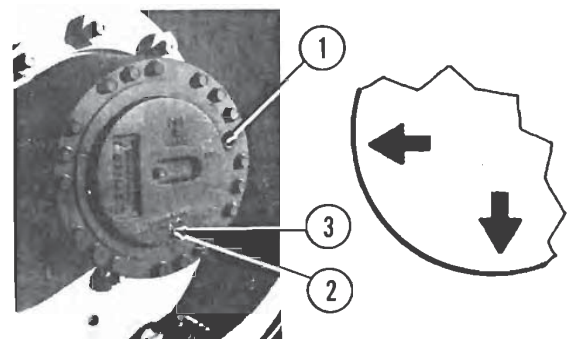
3. Refill the Transmission with new oil as shown in the Fuels and Lubrication chapter of this manual.

NOTE: DO NOT OVERFILL! If the oil level is too high, oil foaming, excessively high oil temperature and oil leakage at the seal could result.

4. Start and run the Forklift Truck long enough for the oil to circulate and warm slightly. Recheck the level with the Dipstick.

Planetary Hubs (Fig. 10-16)

The Planetary Hubs have one Plug each used for draining and filling.



- 1 - Plug
- 2 - Arrow DOWN to Check Level/Fill
- 3 - Arrow to LEFT to Drain

Fig. 10-16

1. Position the Wheel until the arrow points to the left. This positions the Drain Plug and allows the oil to drain out.
2. Re-position the Hub so the arrow points down. Fill with fresh oil as specified in the Fuels and Lubrication chapter. Re-install the Drain/Fill Plug. Repeat this procedure on the three remaining Hubs.

Axle Differentials

1. Remove the Drain Plug (located on the bottom of the housing casting) and the Fill Plug (located on the backside of the housing). Drain out the old oil and replace the Drain Plug only.
2. Fill the Differential with oil as specified in the Fuels and Lubrication chapter. When the oil over-

flows the fill hole, replace the Fill Plug. Repeat this procedure on the remaining Differential.

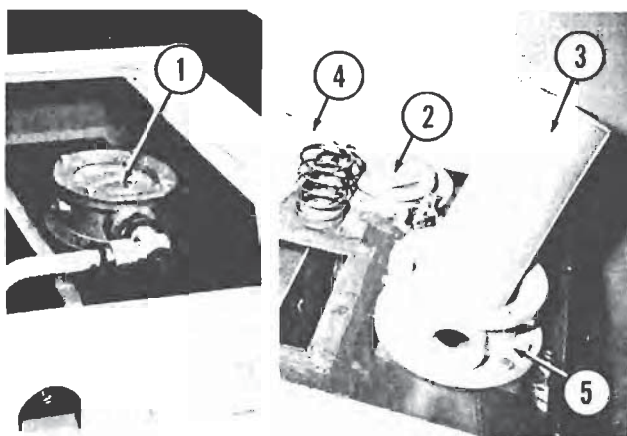
Hydraulic Reservoir Filter (Fig. 10-17)

The hydraulic system Reservoir Tank has the Filter mounted into the top of the Reservoir Cover.



CAUTION

When servicing the hydraulic system, the Boom should be in full ground contact.



- 1 - Filter Assembly
- 2 - Cover
- 3 - Element
- 4 - Gasket
- 5 - Housing

Fig. 10-17

Remove the Top Housing Cover screws and lift off the Cover of the Filter Assembly. This provides access to the Filter Element. Remove and replace the Element and Gasket. Re-install the Housing Cover.

Engine Cooling System



CAUTION

Remove the Radiator Cap only when the Engine is cool, or painful burns could result.

Drain, flush and refill the cooling system as follows:

1. Loosen the Radiator Cap to its stop. This will release any system pressure. Remove the Cap when all pressure is bled off.
2. Open the Radiator Drain Cock. Remove the water jacket Drain Plug from the Engine block. The En-

gine oil Cooler must be drained also. When all coolant is drained, flush the system with clean fresh water. Allow the flush to drain completely.

3. Replace all drain plugs and tighten the Radiator Drain Cock. Clean out the cooling fins in the Radiator with water pressure or steam.

NOTE: When cold weather is expected, fill the cooling system with a 50-50% mixture of water and ethylene glycol anti-freeze. When temperatures are above freezing, water only may be used. Add a summer coolant conditioner to the water to prevent rust and to lubricate the Water Pump.

4. Inspect the Radiator Cap seal before installing it. Replace it if it appears defective. The pressure Cap and Engine thermostat work in conjunction with each other to maintain proper Engine cooling.

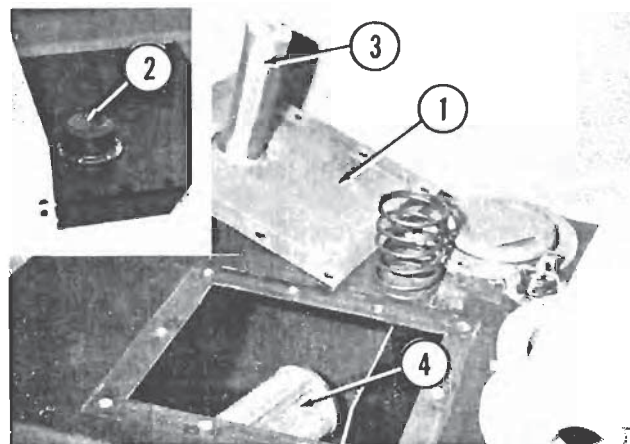
NOTE: Keep an eye on the Engine Temperature Gauge after coolant has been changed. Air pockets can form. It may be necessary to refill the cooling system after a short period of use, as the air will naturally bleed out of the system.

2000 Hour Service

NOTE: Perform all other service requirements up to this point, as well as the following.

Hydraulic Reservoir (Fig. 10-18)

Clean all dirt and debris off the top of the Reservoir, especially around the removeable Cover. Use the following procedure:



- 1 - Cover Plate Removed
- 2 - Fill Cap
- 3 - Filter Screen
- 4 - Strainer

Fig. 10-18

1. Remove the Drain Plug and catch all oil in a clean drain pan. Wash or blow off all collected particles from the Magnetic Drain Plug.
2. Remove the Top of the Reservoir Tank. Wash the Filter Screen with clean solvent. Remove the pickup filtering Strainer from the bottom inside of the Tank. Wash it also.

NOTE: *If the Strainer has any damage, holes, etc. it should be replaced.*

3. Flush out the bottom of the Tank with clean hydraulic oil and wipe out any debris. Re-install all cleaned components and put the Top back on the Tank with a new Gasket. Clean the Fil-

ter/Breather Cap per instructions found in As Required service topics of this chapter.

4. Fill the Tank with fresh oil. Follow specifications found in Fuels and Lubrication chapter of this manual.



CAUTION

Test all hydraulic functions in an open area before allowing the Forklift Truck to be operational.

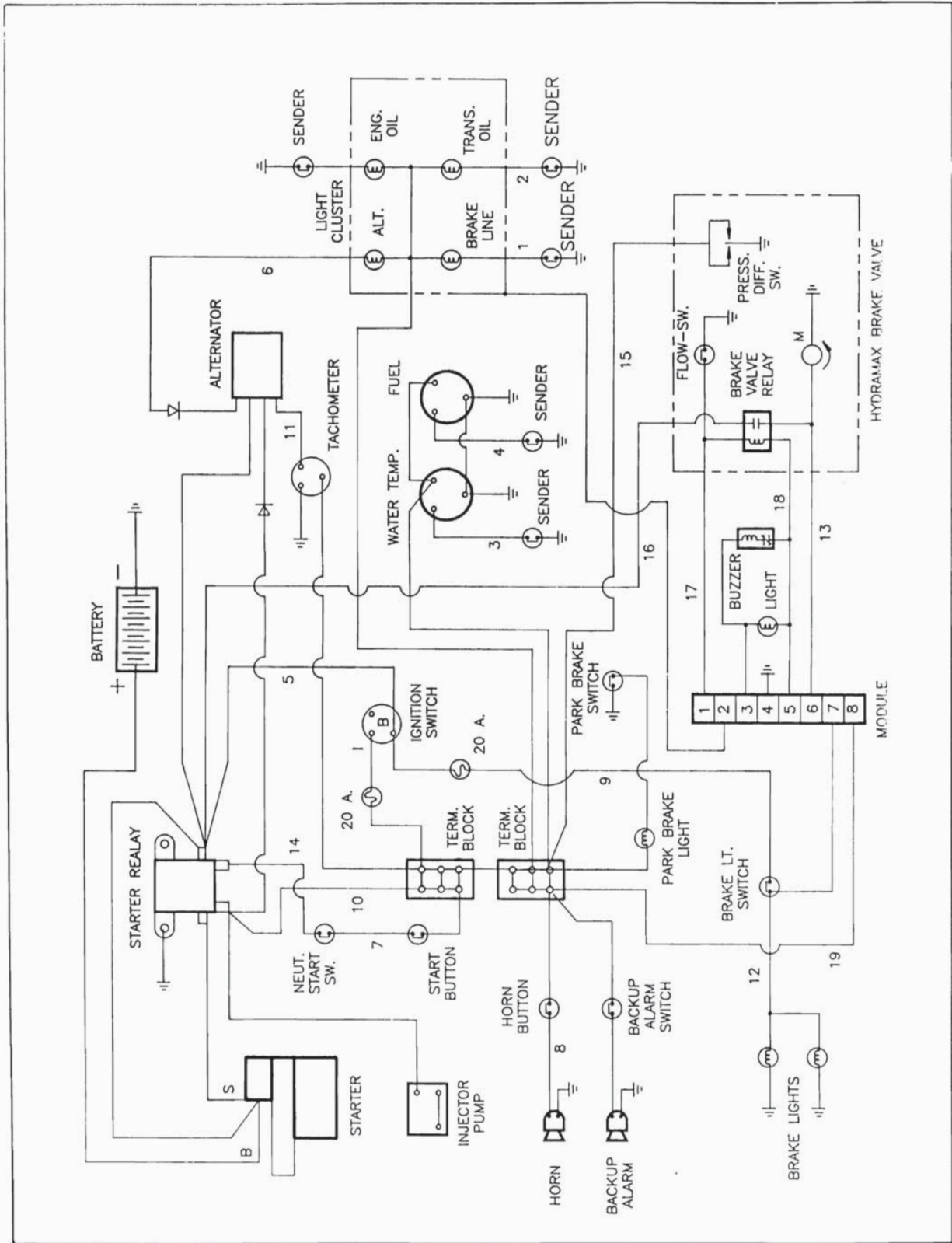


Fig. 10-19: Electrical Diagram

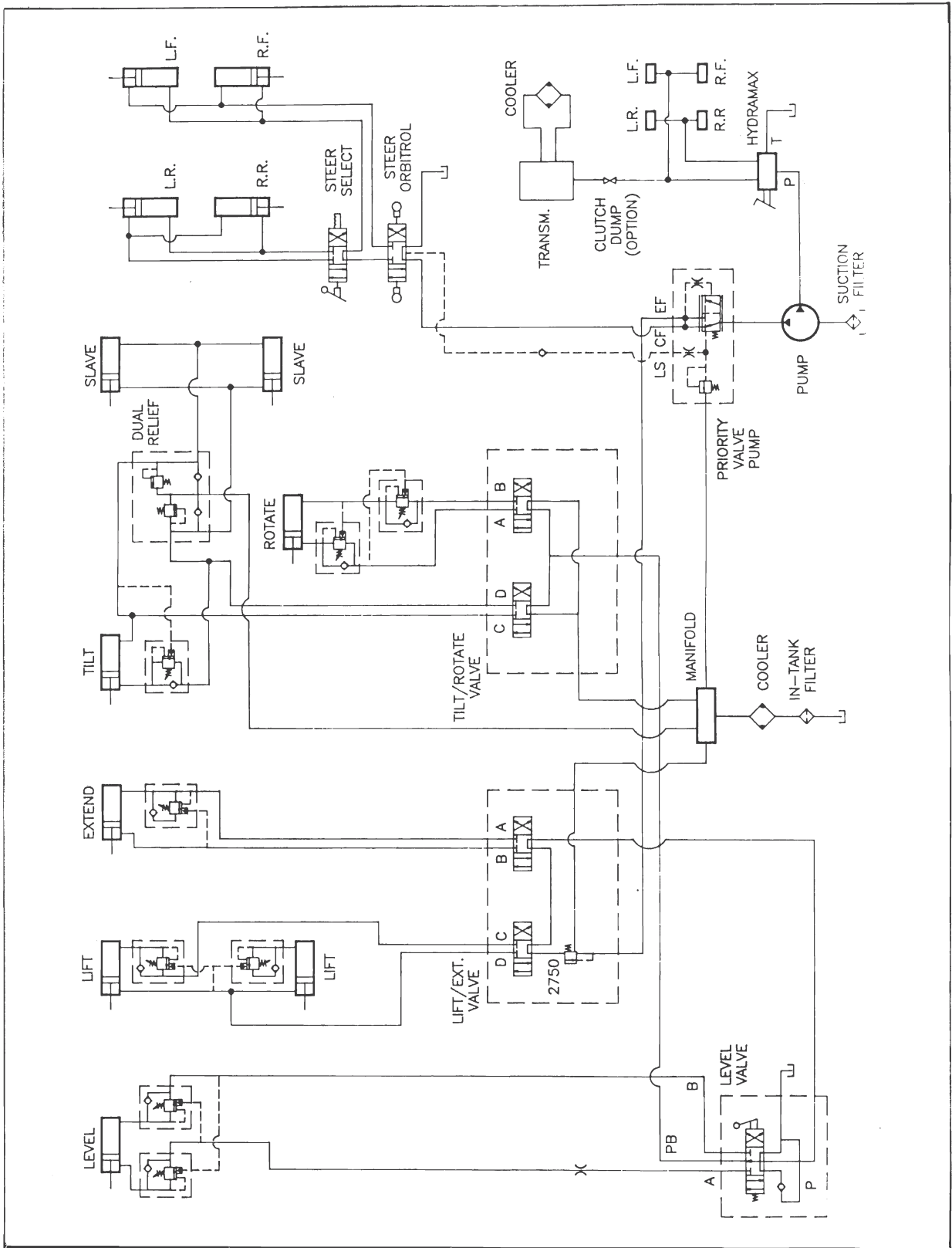


Fig. 10-20: Hydraulic Diagram

CHAPTER 11

STORAGE

If the Telescoping Boom Forklift Truck will NOT be operated for a long period of time, prepare and store it using the procedures as follows.

BEFORE STORAGE

Perform the following prior to placing the Forklift Truck in storage:

1. Wash off the entire machine.
2. Lubricate **ALL** grease fittings as described in the Fuels and Lubrication chapter of this manual.
3. Change Engine oil as outlined in the Service chapter of this manual.
4. Apply grease to all exposed hydraulic cylinder rod areas.
5. Disconnect the battery cable Clamps and cover the Battery or remove the Battery from the Forklift Truck and store it separately.
6. If the ambient temperature (at anytime during the storage period) is expected to drop below freezing, make sure the Engine coolant is either completely drained from the Radiator and Engine block or that the amount of anti-freeze in it is adequate to keep the coolant from freezing. Refer to the separate Engine manual provided for anti-freeze recommendations and quantities.
7. Preferably, store the Forklift Truck inside where it will remain dry. If it must be stored outside, park it on lumber laid on flat, level ground or on a concrete slab and cover with a tarp.

DURING STORAGE

1. About once each month, connect the Battery and check **ALL** fluid levels to make sure they are at the proper level **BEFORE** starting the Engine.

NOTE: *If it is desired to operate the hydraulic cylinders at this time, BE SURE to wipe the protective grease (and any adhering dirt) from the cylinder rods prior to starting the Engine. After operating, BE SURE to recoat the cylinder rods with grease if the Forklift Truck is going to be returned to storage.*

2. Start the Engine and allow it to run until it warms up and then move the machine a short distance to help relubricate the internal parts. Run the Engine until the Battery has a chance to recharge and then shut it off.

AFTER STORAGE

After removing the Forklift Truck from storage and **BEFORE** operating it, perform the following:

1. Change Engine oil and Filter to remove condensation or other residuals.
2. Wipe off grease from cylinder rods.
3. Lubricate **ALL** grease fittings.
4. Review and refamiliarize yourself with all safety precautions as outlined in the Safety chapter of this manual.
5. Follow the starting and warm-up procedures as outlined in the Operation chapter of this manual.

CHAPTER 12

DECAL LOCATIONS

GENERAL INFORMATION

Decal Locations information is provided to assist in the proper selection and application of new decals, in the event the original decal(s) become(s) damaged or the Telescoping Boom Forklift Truck is repainted. Refer to the listing for the illustration reference number, part number, description and quantity of each decal provided in the Kit. Refer to the appropriate illustration(s) for replacement location(s).

To ensure proper selection for correct replacement decal(s), compare all of the various closeup location photographs to your machine, **BEFORE** starting to refinish the unit. Then, circle each pictured decal (on or otherwise applicable to your machine) while checking-off its part number in the listing. After you have verified all the decals needed for replacement, set aside unnecessary decals for disposal.

NEW DECAL APPLICATION

Surfaces **MUST** be free from dirt, dust, grease and other foreign material before applying the new decal. To apply a solid-formed decal, remove the smaller portion of the decal backing paper and apply this part of the exposed adhesive backing to the clean surface while maintaining proper position and alignment. Peel the other portion of the backing paper off slowly while applying hand pressure to smooth-out decal surface. To apply a die-cut decal, first remove the backing paper. Then, properly orient and position the decal onto the clean mounting surface. After the decal is firmly applied and smoothly pressed down, remove the front covering paper.



CAUTION

ALWAYS observe the Safety Rules shown on Decals. If any Decal(s) become(s) damaged, or if the unit is repainted, replace the Decal(s). If repainting, **MAKE SURE** that **ALL** Decals, from the Kit(s), which apply to your machine are affixed to your unit.

PAINT NOTICE

For refinishing, order paint from this list:

903892	One Gal. Industrial Yellow Paint
902873	One Quart Black Paint
903891	Six (12oz) Cans Industrial Yellow Spray Paint
902875	Six (12oz) Cans Black Spray Paint
L97635	One (12oz) Can Industrial Yellow Spray Paint
L93686	One (12oz) Can Black Spray Paint

The Decal Kit for the Telescoping Boom Forklift Truck is L64008. The Kit includes the following:

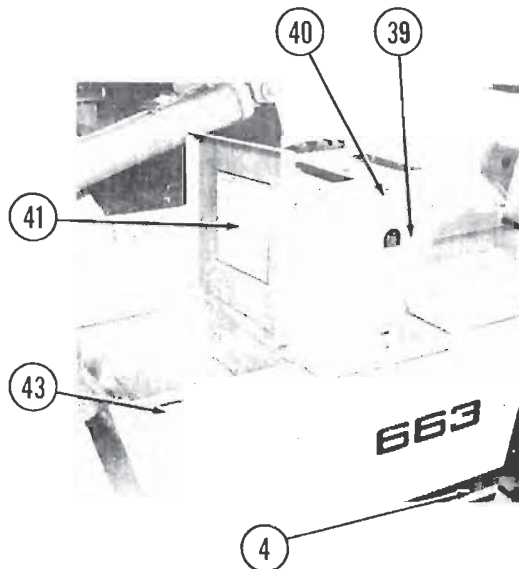
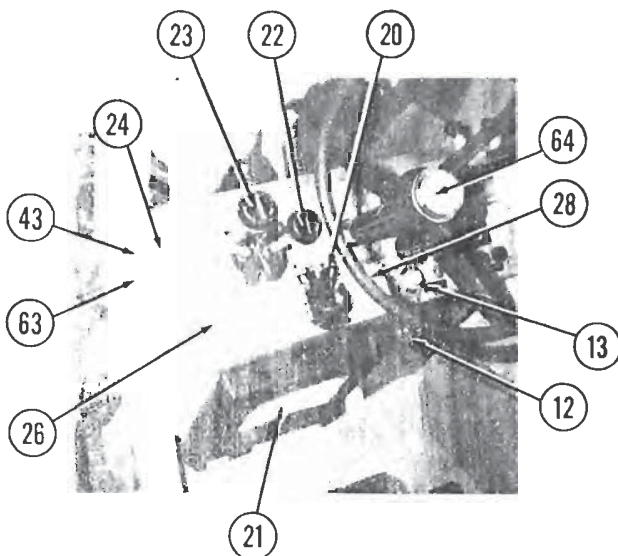
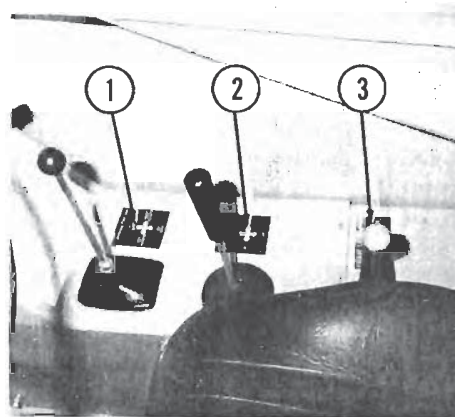
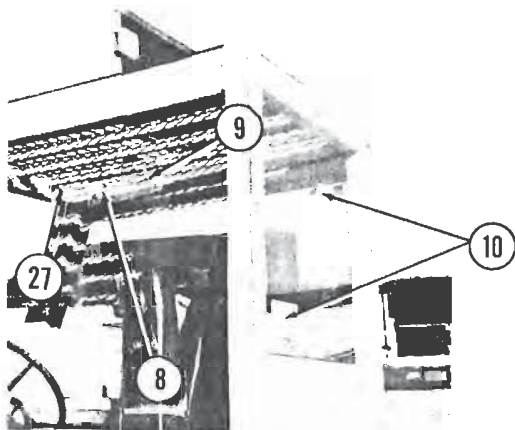
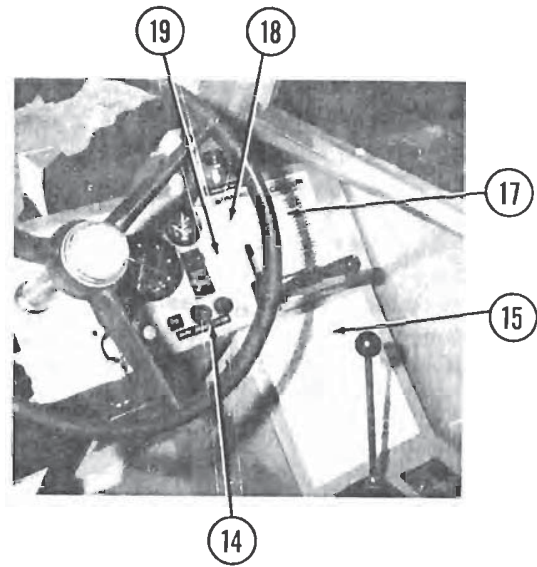
NOTE: *Depending on the overall size of the Forklift Truck, some Decorative Striping may have to be cut-down to match original Stripe lengths.*

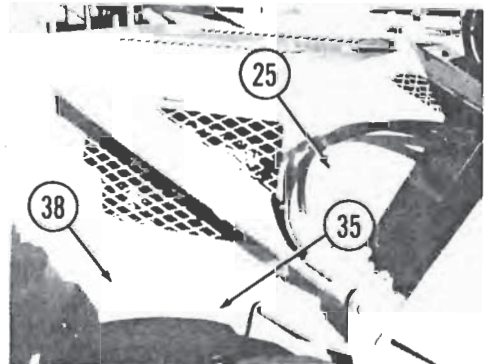
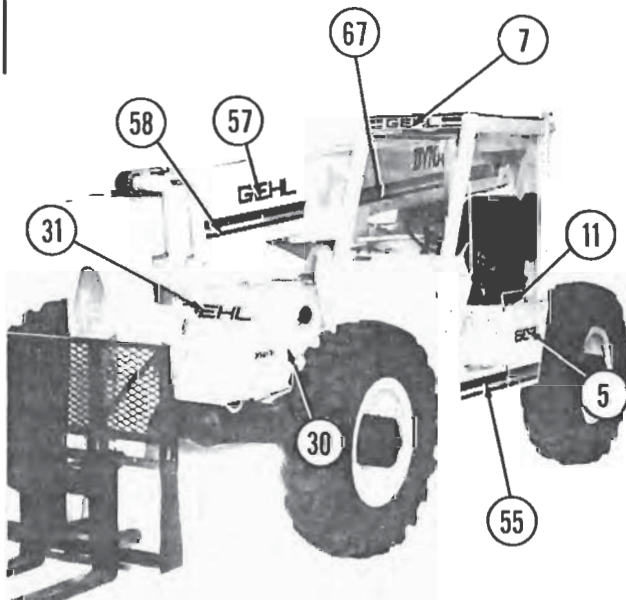
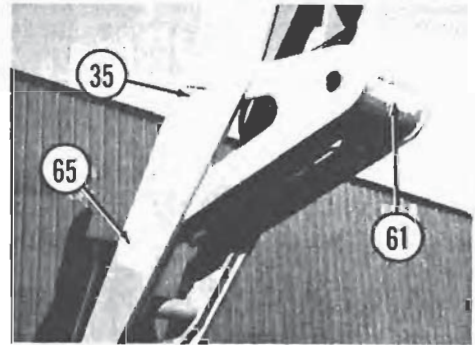
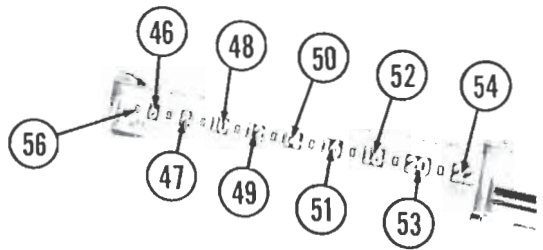
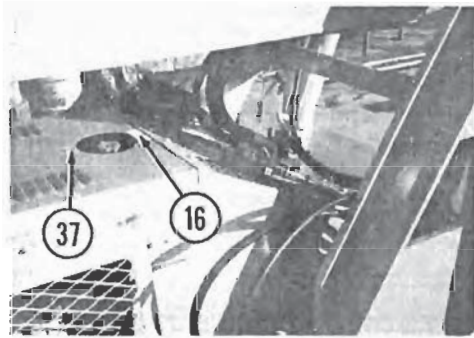
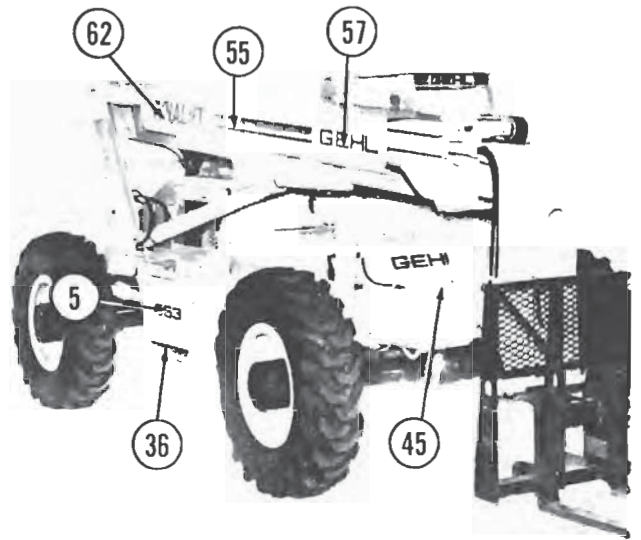
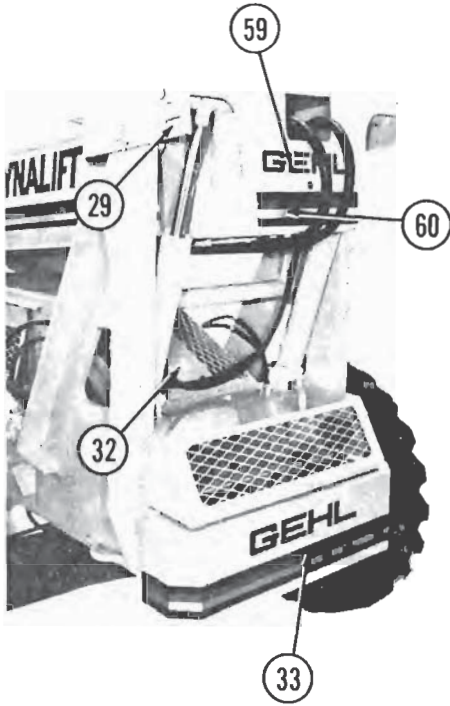
Item. - Part No. - Description & Quantity

1	L65208	Attachment Position
2	L64812	Boom Control
3	L64813	Frame Leveling Control
4	089550	Colored Stripe (Bulk)
5	L64944	663, 2.88" High (ea.side)
6	L64643	Hyd. Press. Settings
7	082346	ROPS GEHL Stripe
8	L64808	Power Lines Danger
9	L64809	Level Warning
10	L64945	Panel In Place Warning (2 Plcs)
11	L65109	Check Brake Reservoir (2 Plcs)
12	L45406	Inspected Verification
13	L64815	Ignition Switch /Start Button
14	L64816	Park Brake Light/Horn Button
15	L65206	Load Chart
16	L56859	Anti-Freeze
17	L64804	Operator Cautions, Part 1
18	L64803	Park Brake Warning
19	L64801	Reserve Brake Caution
20	L64814	Steer Selector
21	L64800	Operator Manual Inside
22	L64945	"1-2-3" Shift
23	L60936	"F-N-R" Shift
24	L65228	Operator Warning
25	L64802	Caution Fan (ea.side)
26	L64806	Operator Cautions, Part 2
27	091024	Carry Load Low Caution
28	L60943	Fasten Seat Belt Caution
29	L64805	Pinch Point Warning (ea.side)
30	L64805	Pinch Point Warning (ea.side)
31	089549	GEHL, 3.25" High
32	L64798	Grease Daily
33	089550	Colored Stripe (Bulk) Cut to 54" Long
34		(No longer used)
35	L64805	Pinch Point Warning (ea.side)
36	089550	Colored Stripe (Bulk) Cut to 24" Long
37	072798	Pressure Cap Warning
38	L65108	Do Not Bypass Warning
39	L64799	Hyd. Oil Level
40	072794	Hyd. Oil Fill
41	L64820	Lube Chart
42	072797	Diesel Fuel Fill
43	L64822	No Riders Warning
44	L64944	663, 2.88: High
45	L64798	Grease Daily
46	L62573	Boom Ext. Marker, 6 Ft.
47	L62574	Boom Ext. Marker, 8 Ft.

Item. - Part No. - Description & Quantity (Cont.)

48	L62575	Boom Ext. Marker, 10 Ft.
49	L62576	Boom Ext. Marker, 12 Ft.
50	L62577	Boom Ext. Marker, 14 Ft.
51	L62578	Boom Ext. Marker, 16 Ft.
52	L62579	Boom Ext. Marker, 18 Ft.
53	L62580	Boom Ext. Marker, 20 Ft.
54	L62581	Boom Ext. Marker, 22 Ft.
55	089550	Colored Stripe (Bulk) Cut to 48" Long
56	L62583	Odd Ft. Boom Ext. Marker (9)
57	089715	GEHL, 4.0" High (ea.side)
58	089550	Colored Stripe (Bulk) Cut to 42" Long
59	089605	GEHL, 2.50" High
60	089550	Colored Stripe (Bulk) Cut to 18" Long
61	073151	Carry Load Low Caution
62	089554	DYNALIFT, (ea.side)
63	L60943	Fasten Lugnuts
64	L65224	GEHL 2" Dia.
65	L65227	Dynattach Diagram
67	089550	Colored Stripe (Bulk) Cut to 87" Long





CHAPTER 13

MAINTENANCE LOG

COMPONENT and SERVICE REQUIRED	PROCEDURE and/or CHAPTER TOPIC REFERENCE (Check Pg. # in Index)
---------------------------------------	--

Service Every 10 Hours or Daily

<ol style="list-style-type: none"> 1. Check Fuel Tank level. 2. Check Fuel Pump Filter. 3. Check Air Cleaner, if extremely dusty conditions. 4. Check Engine oil level. 5. (Check Radiator cooling system. 	<p>Refer to Service Chapter 7 Fuels & Lubrication or Engine Manual for fuel types.</p> <p>Refer to Service chapter 10 Hour Operator Services.</p> <p>Refer to Service chapter 10 Hour Operator Services.</p> <p>Refer to Service chapter 10 Hour Operator Services.</p> <p>Refer to Service chapter 10 Hour Operator Services.</p>
---	--

Record Hourmeter Reading/Date After Service Is Completed

COMPONENT and SERVICE REQUIRED	PROCEDURE and/or CHAPTER TOPIC REFERENCE (Check Pg. # in Index)
---------------------------------------	--

Service Every 50 Hours

<ol style="list-style-type: none">1. Check Battery level and connections.2. Check Fuel Filter, drain water accumulation.3. Check Park Brake handle adjustment4. Check Wheel nuts.5. Check Planetary Hub lubricant level.6. Check Brake Reservoir fluid level.7. Re-Torque/Lube Boom Timing Chains.8. Check Air Cleaner Element, if light dusty conditions.9. Lube required Fittings & Daily Fittings10. Check Transmission Oil Level11. Check Boom Slide Pads.	<p>Refer to Service chapter, 50 Hour Operator Services.</p> <p>Refer to Service chapter, 50 Hour Operator Services.</p> <p>Refer to Service chapter, 50 Hour Operator Services.</p> <p>Refer to Service chapter, 50 Hour Operator Services.</p> <p>Refer to Service chapter, 50 Hour Operator Services.</p> <p>Refer to Service chapter, 50 Hour Operator Services.</p> <p>Refer to Service chapter, 50 Hour Operator Services.</p> <p>Refer to Service chapter, 50 Hour Operator Services.</p> <p>Refer to Lubrication chapter for Grease Fitting Locations and intervals.</p> <p>Refer to Service chapter, 50 Hour Operator Services.</p> <p>Refer to Service chapter, 50 Hour Operator Services.</p>
--	---

Record Hourmeter Reading/Date After Service Is Completed

COMPONENT and SERVICE REQUIRED	PROCEDURE and/or CHAPTER TOPIC REFERENCE (Check Pg. # in Index)
---------------------------------------	--

Service Every 100 Hours

<ol style="list-style-type: none"> 1. Clean Air Cleaner & Element. 2. Change Fuel Filter, if required. 3. Change Engine oil & Filter. 	<p>Replace if required. Refer to Service chapter, 100 Hour Operator Services.</p> <p>Refer to Service chapter, 100 Hour Operator Services.</p> <p>Refer to Service chapter, 100 Hour Operator Services.</p>
--	---

Record Hourmeter Reading/Date After Service Is Completed

Service Every 200 Hours

<ol style="list-style-type: none"> 1. Change Transmission oil Filter. 2. Check Boom Slide Pads. 3. Check Fan Belt. 	<p>Refer to Service chapter, 200 Hour Operator Services.</p> <p>Shim as required. Refer to Service chapter, 200 Hour Operator Services.</p> <p>Refer to Service chapter, 200 Hour Operator Services.</p>
---	--

Record Hourmeter Reading/Date After Service Is Completed

COMPONENT and SERVICE REQUIRED	PROCEDURE and/or CHAPTER TOPIC REFERENCE (Check Pg. # in Index)
--------------------------------	---

Service Every 600 Hours

<ol style="list-style-type: none"> 1. Change Transmission oil. 2. Change Planetary Axle Hub oil. 3. Change Differential oil. 4. Change Hydraulic oil system Filter Element. 5. Change Cooling system. 	<p>Refer to Service chapter, 600 Hour Operator Services.</p> <p>Refer to Service chapter, 600 Hour Operator Services.</p> <p>Refer to Service chapter, 600 Hour Operator Services.</p> <p>Refer to Service chapter, 600 Hour Operator Services.</p> <p>Refer to Service chapter, 600 Hour Operator Services.</p>
--	--

Record Hourmeter Reading/Date After Service Is Completed

Service Every 2000 Hours

<ol style="list-style-type: none"> 1. Change Hydraulic system oil. 2. Clean/Change Hydraulic Tank Strainer. 	<p>Refer to Service chapter, 2000 Hour Operator Services.</p> <p>Refer to Service chapter, 2000 Hour Operator Services.</p>
---	---

Record Hourmeter Reading/Date After Service Is Completed




INDEX

	Page		Page
C		O	
Checklists	3	Operation	26
Controls and Accessories	17	Pre-Start	26
Indicators, Lamps, Switches	17	Engine Break-In	26
Ignition Keyswitch & Start Button	17	Start-Up	27
Alternator Lamp	17	Jump Starting	27
Engine Oil Pressure Lamp	17	After Start Checks	28
Transmission Oil Temp. Lamp	18	Gear Ratio & Travel Selection	28
Tachometer & Hourmeter	18	Stopping Engine	29
Fuel Level Gauge	18	Grade & Slope Precautions	29
Horn Push Button	18	Grade Limits	29
Brake Reserve Lamp & Buzzer	18	Load Handling	30
Unequal Brake Line Press. Lamp	19	Traffic Flow Patterns	30
Park Brake On Lamp	19	Use of Attachments	31
Hyd. Reservoir Oil Level Gauge	19	Suspended Loads	31
Brake Fluid Reservoir	19	Load Capacity & Reach Chart	32
Side Mirror Box	19	Picking Up Load	32
Battery Compartment & Tool Box	19	Carrying Load	32
Function Controls & Accessories	20	Load Elevation & Placement	32
Parking Brake Lever	20	S	
Service Brake Pedal	20	SAFETY	7
Speed Range Selector	20	Service	51
Travel Direction Selector	21	General Precautions	51
Steering Selector	21	Work Area Precautions	51
Frame Leveling	21	As Required Service	52
Boom Lift & Extend	22	Air Cleaner	52
DYNATTACH Nose	22	Fuel Filter	52
Std. Carriage Attachment	23	Fuel Injectors	52
Rotating Carriage Attachment	23	Injection Pump Timing	53
Winch Attachment	24	Diesel Bleeding Procedure	53
Truss Boom Attachment	24	Belt Tension	53
Transmission Clutch Dump Option	24	Circuit Breakers, Brake Reserve Lamp	53
Guards, Shields & Covers	24	10 Hour (or Daily) Service	53
D		Radiator Coolant Level	53
Decal Locations	65	Engine Oil Level	54
General	65	Hydraulic Oil Level	54
New Decal Application	65	Lubricate Daily Grease Points	54
F		Tires	54
Fuels	35	50 (or Weekly) Service	55
I		Air Cleaner	55
Introduction	2	Battery Fluid Level	55
L		Transmission Oil Level	55
Lubrication	35	Axle Differential Oil Level	56
Lubricants	36	Planetary Hubs Oil Level	56
Daily Grease Fitting Locations	36	Lubricate Weekly Grease Points	56
Weekly Grease Fitting Locations	36	Brake Reservoir Fluid Level	56
M		Boom Slide Pads	56
Maintenance Log	68	Boom Leaf Chains	57
MANDATORY SAFETY		100 Hour Service	57
SHUTDOWN PROCEDURE	7	Air Cleaner	57
		Fuel Filter	58
		Engine Oil & Filter	58
		200 Hour Service	58
		Transmission Oil Filter	58

INDEX (Cont.)

	Page		Page
Boom Slide Pad Clearance	59	Troubleshooting	42
600 Hour Service	59	Boom Travel	42
Transmission Oil	59	Hydraulic Cylinders	43
Planetary Hub Oil	59	Control Valve	43
Axle Differential Oil	59	Priority Flow Divider	44
Hyd. Reservoir Filter	60	Relief Valve	45
Engine Cooling System	60	Hydraulic Pump	45
2000 Hour Service	60	Electrical System	46
Hydraulic Reservoir Oil Filter	60	Transmission	47
Electrical Diagram	62	Engine	48
Hydraulic Diagram	63	Axles	49
Specifications	6	Hydraulic Pressure Checks	50
Std. Hardware Torque Data	Inside Back Cover		
Storage	64		
	T		
Table of Contents	1		
Transporting & Theft Deterrents	40		
		W	
		Warranty	Inside Front Cover

TORQUE SPECIFICATIONS FOR STANDARD MACHINE HARDWARE

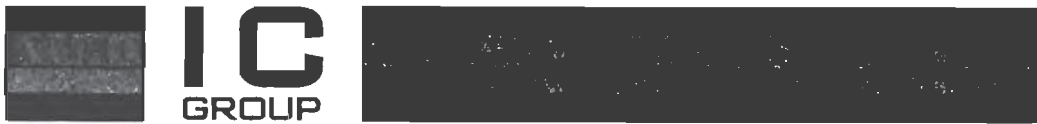
SIZE	SAE GRADE #2 		SAE GRADE #5 		SAE GRADE #8 	
	DRY	LUB.	DRY	LUB.	DRY	LUB.
8 - 32	19 in. Lbs.	14 In. Lbs.	30 In. Lbs.	22 In. Lbs.	41 In. Lbs.	31 In. Lbs.
8 - 36	20 "	15 "	31 "	23 "	43 "	32 "
10 - 24	27 "	21 "	43 "	32 "	60 "	45 "
10 - 32	31 "	23 "	49 "	36 "	68 "	51 "
1/4 - 20	66 "	50 "	9 Ft. Lbs.	75 "	12 Ft. Lbs.	9 Ft. Lbs.
1/4 - 28	76 "	56 "	10 "	86 "	14 "	10 "
5/16 - 18	11 Ft. Lbs.	9 Ft. Lbs.	17 "	13 Ft. Lbs.	25 "	18 "
5/16 - 24	12 "	9 "	19 "	14 "	25 "	20 "
3/8 - 16	20 "	15 "	30 "	23 "	45 "	35 "
3/8 - 24	23 "	17 "	35 "	25 "	50 "	35 "
7/16 - 14	32 "	24 "	50 "	35 "	70 "	55 "
7/16 - 20	36 "	27 "	55 "	40 "	80 "	60 "
1/2 - 13	50 "	35 "	75 "	55 "	110 "	80 "
1/2 - 20	55 "	40 "	90 "	65 "	120 "	90 "
9/16 - 12	70 "	55 "	110 "	80 "	150 "	110 "
9/16 - 18	80 "	60 "	120 "	90 "	170 "	130 "
5/8 - 11	100 "	75 "	150 "	110 "	220 "	170 "
5/8 - 18	110 "	85 "	180 "	130 "	240 "	180 "
3/4 - 10	175 "	130 "	260 "	200 "	380 "	280 "
3/4 - 16	200 "	150 "	300 "	220 "	420 "	320 "
7/8 - 9	170 "	125 "	430 "	320 "	600 "	460 "
7/8 - 14	180 "	140 "	470 "	360 "	660 "	500 "
1 - 8	250 "	190 "	640 "	480 "	900 "	680 "
1 - 12	270 "	210 "	710 "	530 "	1000 "	740 "

Multiply in Lbs. by (0.113) or Ft. Lbs. by (1.355) for metric Nm

NOTE: These torque values are to be used for all hardware excluding: locknuts, self-tapping screws, thread forming screws, and sheet metal screws. Unless otherwise noted, all torque values must meet this specification.

THIS MANUAL SHALL BE PROPERLY STORED IN THE OPERATOR
STATION OF THE MACHINE AT ALL TIMES. IF PAGES ARE MISSING
OR DAMAGED, NOTIFY THE DEALER OR GEHL COMPANY IMMEDIATELY.
GEHL COMPANY/TELEPHONE (414) 334-9461

GEHL®



GEHL COMPANY WEST BEND, WISCONSIN 53095 U.S.A.

CONTENTS

1. GENERAL NOTICES

1-1. Before operating the Tractor	1-1
1-2. For Safety	
(1) Before operating the Tractor	1-2
(2) Notices in operating	1-2
(3) Notices in maintenance	1-5
(4) Before finishing the operation	1-5
1-3. Long term storage	
(1) Preparation for storage	1-6
(2) Check & Maintenance during preservation	1-7
(3) Preparation for reuse	1-7
1-4. Symbol	1-8
1-5. Safety decals	
(1) Classification	1-9
(2) Adhesive position, shape and contents of safety indication decal	1-9

2. The Names of each Part 2-1

3. Operation of each part and Notices

3-1. Instrument board and switch	
(1) The names of each part	3-1
(2) Key switch	3-1
(3) Glow indicator	3-1
(4) Tachometer/Speedometer	3-2
(5) Fuel level gauge	3-2
(6) Engine coolant temperature gauge	3-2
(7) Engine oil warning lamp	3-2
(8) Charging trouble warning lamp	3-2

CONTENTS

3-2. Operating levers and pedals

(1) Shuttle lever	3-6
(2) Hand throttle	3-6
(3) Foot throttle	3-7
(4) Clutch pedal	3-7
(5) Brake pedal	3-7
(6) Parking brake lever	3-8
(7) Main gear shift lever	3-8
(8) Range gear shift lever	3-8
(9) Four wheel drive lever (4WD)	3-9
(10) Differential lock pedal(Diff-Lock)	3-9

3-3. Hydraulic device

(1) Steering device	3-10
(2) Control lever operation	3-10
(3) Position control	3-11
(4) Draft control	3-11
(5) Mixed control	3-11
(6) Hydraulic lift speed control knob	3-12
(7) Handling of front loader	3-12
(8) Remote hydraulic valve operation(option)	3-13
(9) Single/double acting selection valve(option)	3-13
(10) Hydraulic device diagram	3-14

3-4. Safety device

(1) Safety belt	3-15
(2) Safety frame	3-15
(3) Safety covers and guards	3-16

4. How to drive and work

CONTENTS

4-3. Check for new tractor (how to handle new tractor)	
(1) Check point	4-7
(2) Notices in handling new tractor	4-7
(3) Lubrication and replacement period	4-8
4-4. Attaching equipment	
(1) 3 point linkage	4-9
(2) Upper link installation & length adjustment	4-10
(3) Adjustment of lift rod's length (Left/Right)	4-10
(4) Adjustment of check chain's length	4-10
(5) Range of lift rod and upper link	4-11
(6) Reference of implement installation part	4-11
(7) Reference of PTO axle	4-12
(8) PTO safety cover and protection cab	4-12
(9) Drawbar	4-12
(10) Cast iron ballast (optional)	4-13
4-5. Running speed	4-14
5. Check and Maintenance	
5-1. Checking of each part	
(1) Checking part	5-1
(2) Maintenance list	5-2
5-2. Check before start (daily check)	
(1) Engine oil	5-3
(2) Fuel	5-4
(3) Warning lamp	5-5
(4) Light, horn check	5-5
(5) Head lamp/indicating lamp bulb check and replacement	5-5
(6) Fuse check and replacement	5-6
(7) Fusible link check and replacement	5-6

CONTENTS

5-5. Every 100hr check

(1) Tachometer cable cleaning	5-11
(2) Engine oil drain (LT280D/LT360D)	5-12
(3) Engine oil filter replacement (LT280D/LT360D)	5-12
(4) Engine oil injection (LT280D/LT360D)	5-12
(5) Hydraulic filter replacement (LT280D/LT360D)	5-13
(6) Cleaning of fuel filter (LT280D/LT360D)	5-13

5-6. Every 200hr check

(1) Engine oil drain (LT450D)	5-14
(2) Engine oil filter replacement (LT450D)	5-14
(3) Engine oil injection (LT450D)	5-14
(4) Hydraulic filter replacement (LT450D)	5-15
(5) Front axle oil capacity check	5-15
(6) Main transmission oil check	5-15
(7) Valve gap adjustment	5-16
(8) Nozzle injection pressure adjustment	5-16

5-7. Every 400hr check

(1) Changing oil in front axle housing	5-16
(2) Main transmission oil replacement	5-17
(3) Rear axle oil replacement	5-17
(4) Fuel filter element replacement	5-18

5-8. Adjustment of each part

(1) Adjustment of clutch pedal play	5-19
(2) Adjustment of brake pedal play	5-19
(3) Breadth adjustment (rear wheel)	5-20

5-9. Air exhaust from Fuel system

(1) Air exhaust process	5-21
(2) Air exhaust from fuel system	5-22

5-10. Battery handling and notices

(1) Battery check	5-23
(2) Notices in attaching/detaching the battery	

1. General Notices

1-1. Before operating a Tractor



※ Please read this operator's manual thoroughly before operating a tractor. .

◆ Safety Signal

- Followings are several safety signals and its meaning.
- Please comply with the instructions of safety signal attached to the decal or operator's manual of the product.



Danger – This indicates that people would be in dangerous circumstances which cause the death or severe injury if not avoiding it.



Warning – This indicates that people would be in potential dangerous circumstances which cause the death or severe injury if not avoiding it.



Caution – This indicates that people would be in potential dangerous circumstances which cause the light injury or damages if not avoiding it.



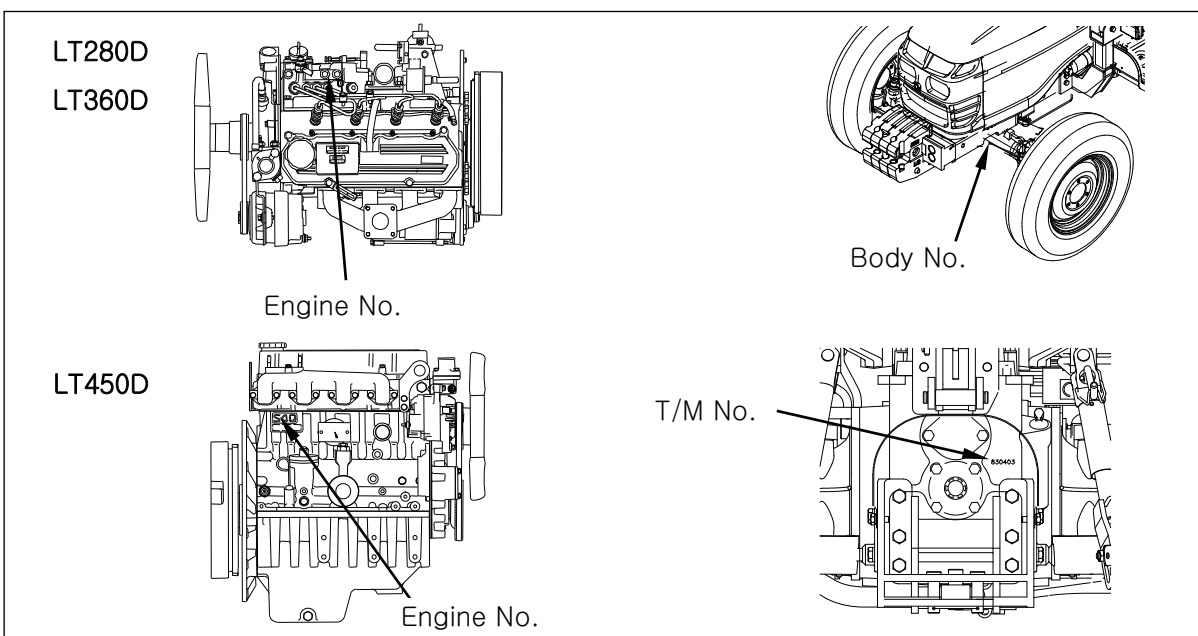
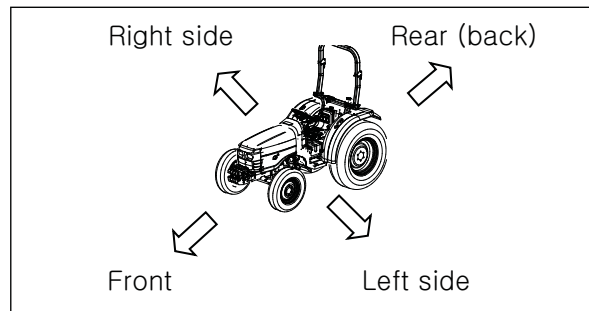
Notice – This indicates the instructions to use the product rightly for the safety of people or property (product) .

◆ Terminology

When reading the operator's manual, refer to the figure on the right for the classification of direction (front/rear, left/right).

◆ Body No. or Engine No.

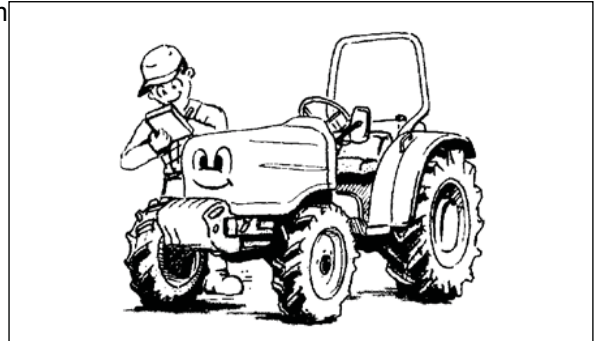
When requesting for maintenance, please inform of body no. and running time of hour meter.



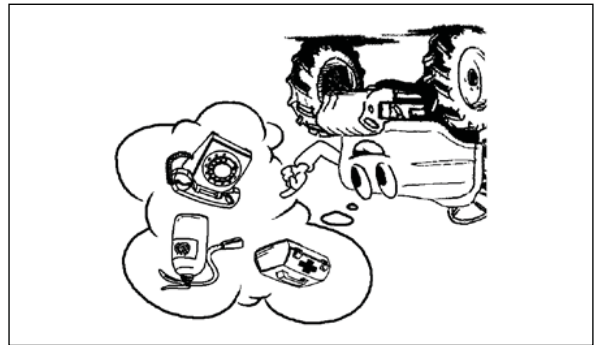
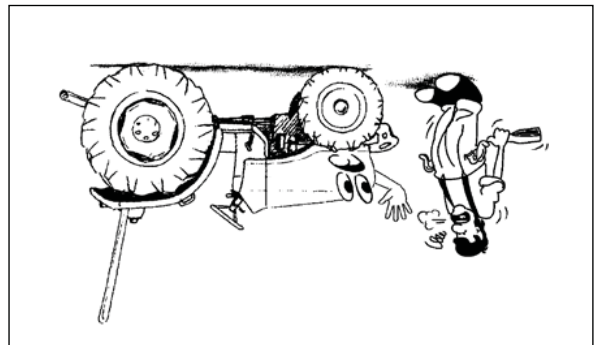
1-2. For safety

(1) Before operating a tractor

- Check each part before operating and if the problem is found, take an action immediately.
- It is not allowed to modify arbitrarily and use for any other purpose out of main function.
- For further information for the handling and operation of tractor, please contact to the agent or service center.

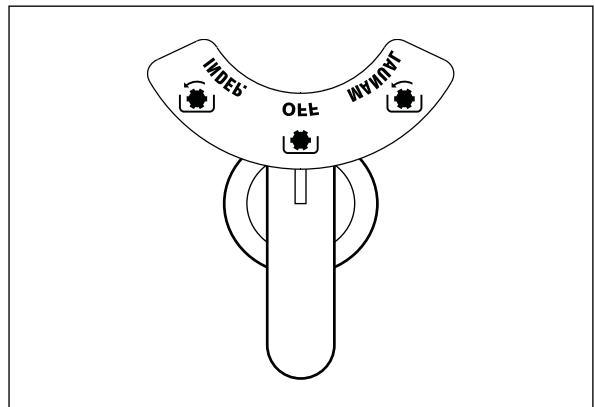


- It is not allowed to operate by the ones who are not able to operate normally.
(patients, drinker, pregnant women, child)
- The poor clothing (loose or long) is prohibited as it is likely to be caught in the rotating part of the machine.
- Wear the sports shoes or low shoes for the safe operation instead of slipper or high shoes.
- Check the emergency aids in case of accident or disaster.





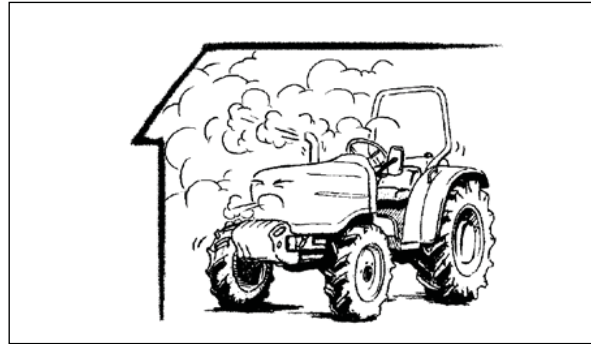
(2) Notices in operating

- Place the PTO selection switch on “OFF” before starting because it is not available to start if the switch is placed on “MANUAL” or “INDEP.” position.

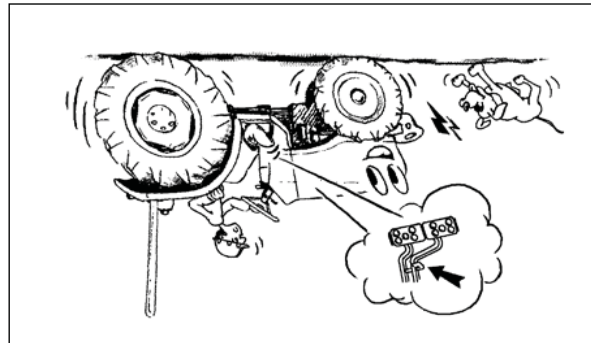


- When starting in the closed place, pay attention to the ventilation.

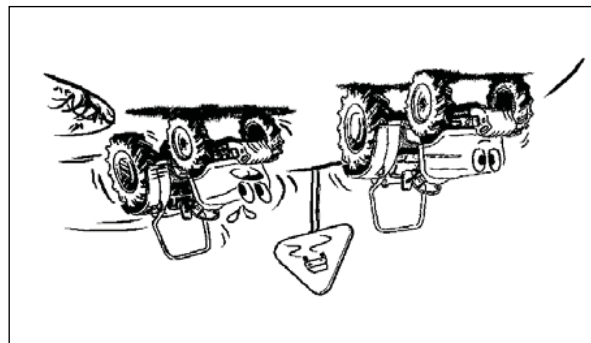
 Warning	► Possible danger of gas poisoning.
	Do not operate indoor or in the place with bad ventilation.



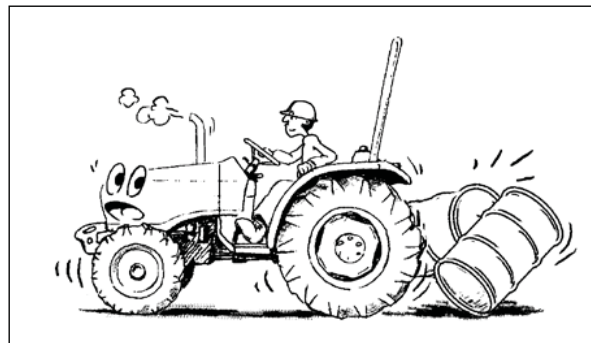
- When running on the road, you should comply with the traffic regulations.
- When running on the road, connect the left/right brake pedals.
- When running on the road, do not use the differential lock device.



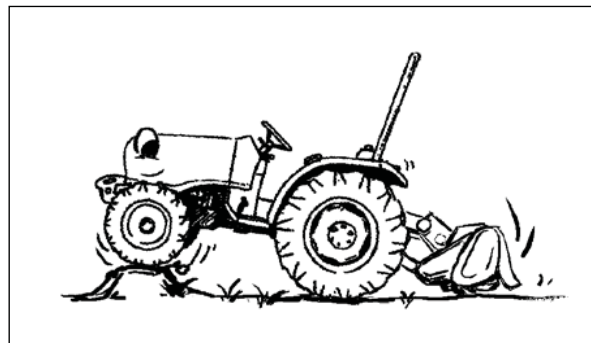
- In case of high speed running, the sudden turning is prohibited.
- When turning with a long attachment installed, make the turning radius largely.



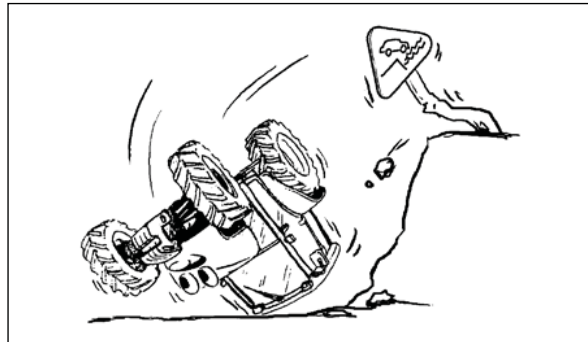
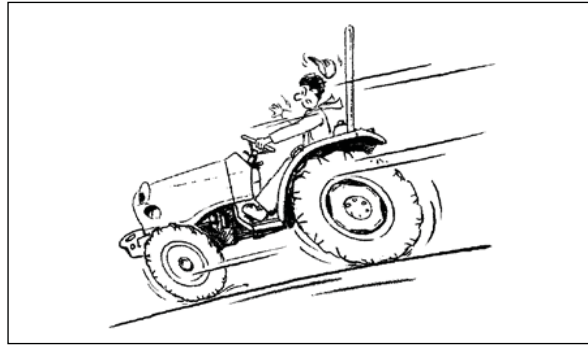
- When running back, lower the engine rpm and check if there is an obstacle in the rear side.



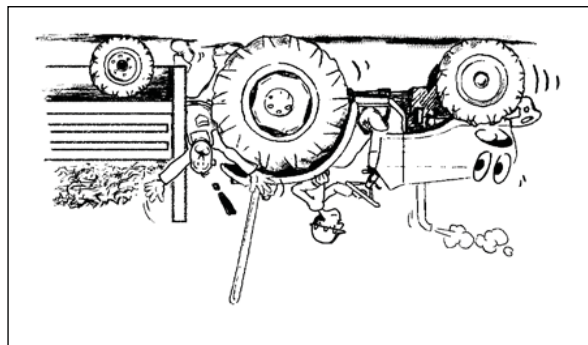
- When crossing the levee of rice paddy, lay down attachment and go straight with low speed at right angles.






- Operate slowly with accelerator and brake pedal on the slope but the inertial operation by placing the gear on neutral is prohibited.
- When going up on the slope, drive in reverse position.
If going up on forward position, there is a danger to be overturned.
- When turning on the slope, special attention should be taken for the safety.
- When working, wear the safety equipments and install the safety frame.



- When attaching or detaching the implements, do not stand between tractor and implements.
- When towing, use the hitch or draw bar.





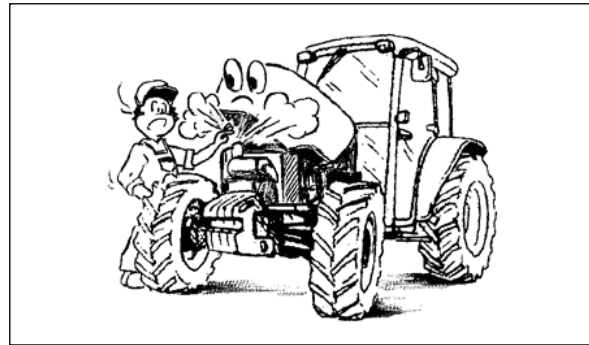
Notice	<ul style="list-style-type: none"> ▶ When attaching or detaching the implements or checking, work at the plain and wide place. ▶ When assembling or disassembling the hydraulic coupling, place down the implements on the earth and carry out the work after releasing the pressure of hydraulic line.
---------------	---

 <p>Warning</p>  	<ul style="list-style-type: none"> ▶ Before attaching the implements or checking... <ul style="list-style-type: none"> -Place the PTO switch (lever) on "OFF" position. ▶ When attaching or detaching the implements, it may cause serious injury. <ul style="list-style-type: none"> -When attaching or detaching, fix the implements and attach each various fixing pin. ▶ If failed to attach the trailer or the implements rightly, it may cause the damage due to the body turnover or separation of implements. <ul style="list-style-type: none"> -When attaching the implements, it is necessary to install in right in 3 point linkage, the approved draw bar or towing hitch.
---	--



(3) Notices in Maintenance

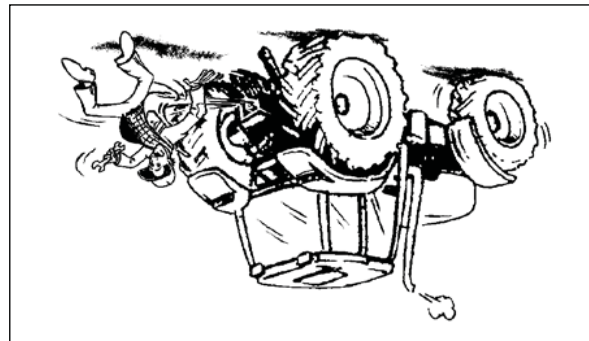
- For maintenance, stop the engine and carry out the work after the engine has cooled sufficiently.
- Radiator cap should be opened after the engine has stopped and cooled over 10 minutes.


 Warning	▶ When opening the cap of radiator, it may cause a burn due to hot cooling water or spouting of steam.
	



- When maintaining, checking or handling the tractor, wear the simple and convenient clothes.

 Warning	▶ If touching the rotating axle, it may cause the severe damage.
	-Don't touch the rotating axle. -don't remove the protection cover.

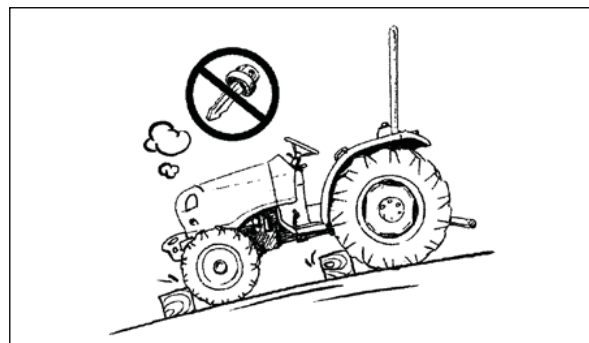



 Warning	▶ Do not disassemble or alter the machine arbitrarily as it may cause the machine failure or safety accident. ▶ Do not ride on except the operator's seat as it may cause the machine damage or safety accident.
---	---

Notice	▶ For repair, the qualified expert's technique is needed. For hard maintenance or repair, please contact to the agent or service center.
---------------	--

(4) Before finishing the operation.

- Stop the engine.
- Place the gear lever on Neutral.
- Apply the parking brake.
- Draw off the start key.
- Apply the fulcrum on the slope.



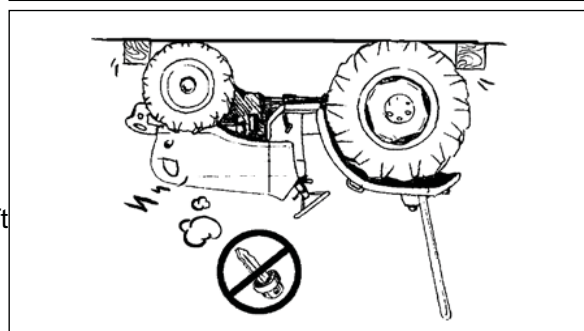
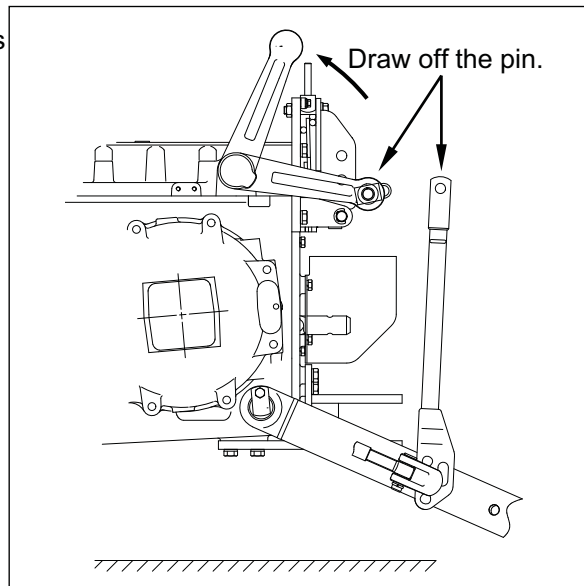
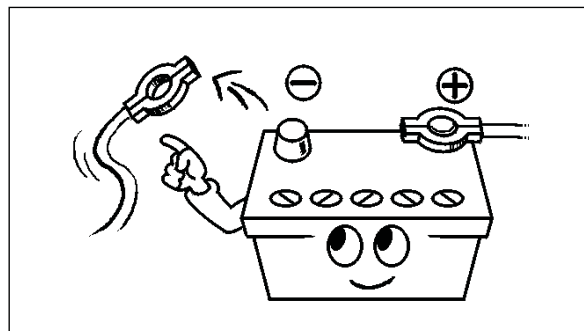
 Notice	▶ In case of parking with a loaded trailer on the slope, as there is a pushing phenomena even with the parking brake, you should support the machine with the fulcrum and apply the low speed gear for the safety. (downward slope ⇒ reverse 1 step / upward slope ⇒ forward 1 step)
---	--

1-3. Long Term Storage

(1) Preparation for Storage

※ To preserve the tractor, wash it clean and take the actions below. (☞ for further information for each item, refer to “Check and Maintenance”.)

- Apply the grease or oil to the part where the paint is peeled off to avoid the corrosion.
- Check the lubricant capacity of each part and lubricate it after starting the engine for 5 min.
- Draw the cooling water off completely. But if there is an antifreeze inside, do not draw it off and check the density.
- Fill the fuel tank fully with a fuel.
- Preserve the implements apart from the ground.
- Preserve it inside building if possible.
- Remove the weight apart.
- Loosen the fan belt.
- Loosen the drainage plug under clutch housing and draw water off.
- Detach the (-) terminal of battery or preserve the battery apart to prevent the fire caused by leakage current during the preservation.
- Apply the fulcrum to lift the tire up from the ground or apply the pressure of tire high to place it on the deviation.
- In case of preserving for 2~3 months, remove the lift rod and place the lift arm to its highest position.
- Draw off the start key.




Warning



- ▶ The exhausted gas has a possibility of poisoning danger.
 - In case of operating the engine in the closed place, extend the exhaust pipe and draw the exhaust gas off.
 - Work in the well-ventilated place.
 - Do not preserve the machine in the place where there is a possibility to generate the flame or spark in the state that the fuel is remained in the fuel tank.
 - Cool the engine before preserving in the closed place.
- ▶ The battery should be removed and preserved in the dry and cool place where is not frozen and kept apart from the children.

(2) Check and Maintenance during Preservation

- Start the engine once a week to prevent the internal rust and charge the battery.
- Apply the rust-preventing solution to the part where the paint is peeled off.
- Check the oil leakage, water leakage and if there is some problem, repair it.
- The battery should be charged once a month to avoid the discharge.
- Before starting the engine, refill the cooling water, fasten the fan belt, and attach the (-) terminal of battery.













































 Notice	<p>▶ As the electrolytic solution of battery is a sulfuric acid, it is dangerous when it penetrates the eyes.</p> <ul style="list-style-type: none">- When handling the battery, wear the safety goggles to protect the eyes.- If the electrolytic solution penetrates the eye, skin, or clothes, wash by water immediately and take the treatment by the doctor..- The battery emits the explosive gas and in case of explosion, the electrolytic solution is splashed all over. <p>(※ For further information, refer to “Check and Maintenance – Battery handling and Notices”.)</p>
--	--

(3) Preparation for reuse

- ※ When using at first after long term storage, check each part before using.
- Refill the cooling water, fasten the fan belt, and attach the (-) terminal of battery to the state before preserving.
- Check enough before using.

1-4. Symbol

The below figures indicate the symbols and its meaning for the tractor.

	Refer to the operator's manual.		low speed adjustment		Lamp switch
	Warning!		High speed adjustment		Breadth lamp
	Battery charge		Engine speed adjustment		Head lamp (low)
	Fuel level		Engine speed adjustment		Head lamp (high)
	Fuel filter		Shuttle		Work lamp
	Engine cooling Water temperature		Forward drive		Parking brake
	Transmission Oil pressure		Reverse drive		Emergency lamp
	Engine oil pressure		4 wheel drive connection		Window wiper
	Diesel engine glow		4 wheel drive		Window wiper / washer (front)
	Engine start		Position control (rise)		Window wiper / washer (back)
	Engine stop		Position control (fall)		Hydraulic rod small
	PTO stop		Draft control (deep)		Hydraulic rod large
	PTO run		Draft control (shallow)		Hydraulic rod floating
	Differential lock device		Direction indicating lamp		Gear neutral
	Horn		Direction indicating lamp		

1-5. Safety Decals

(1) Classification



Danger - This indicates that people would be in dangerous circumstances which can cause the death or serious injury if not avoiding it.



Warning - This indicates that people would be in potential dangerous circumstances which can cause the death or serious injury if not avoiding it.



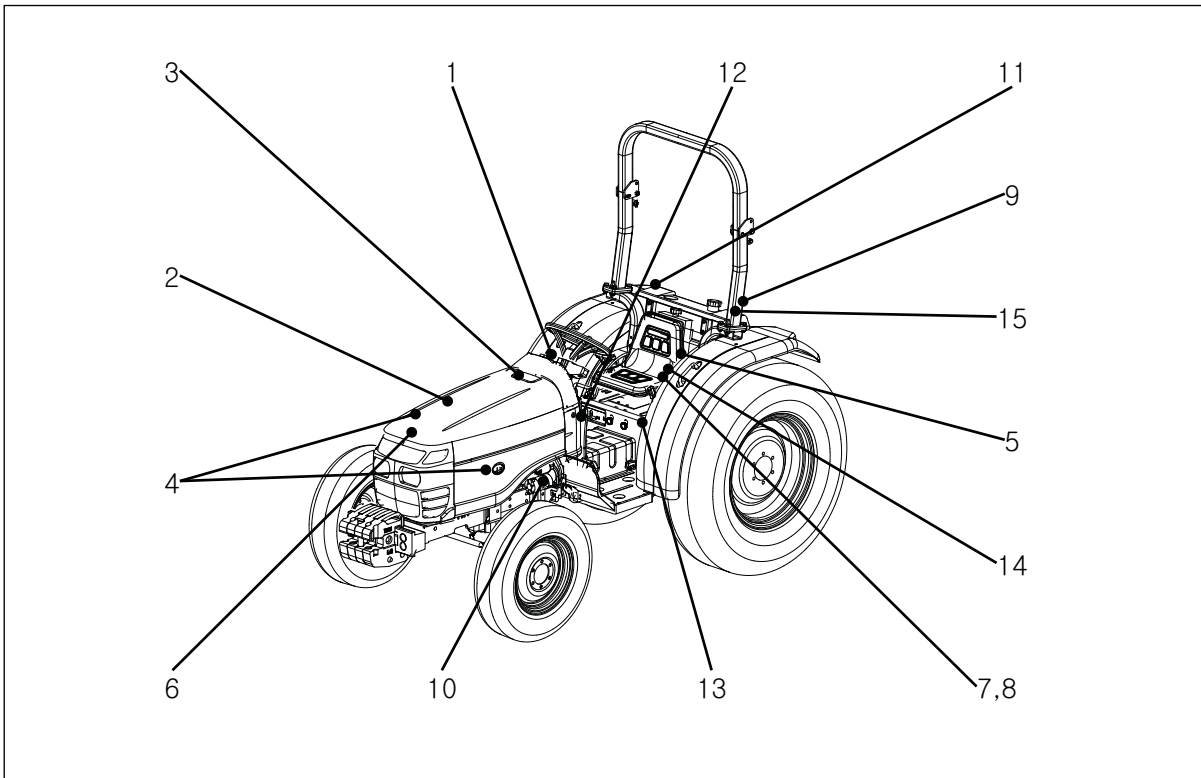
Caution - This indicates that people would be in potential dangerous circumstances which can cause the light injury or damages if not avoiding it.



Notice - This indicates the instructions to use the product rightly for the safety of people or property (product).

Notice	<ul style="list-style-type: none">▶ The instructions informed in the safety indication decal are very important for the safety of operator and the workers around. Check the decal position and its content and pay attention to prevent from detaching and damaged.▶ If detached or damaged, ask the maintenance center to attach it again.▶ If failed to comply with the safety instructions described, it may cause the death or injury.
--------	---

(2) Adhesive position, shape and contents of safety indication decal



1. Adhesive position : on PTO switch



2. Adhesive position : radiator



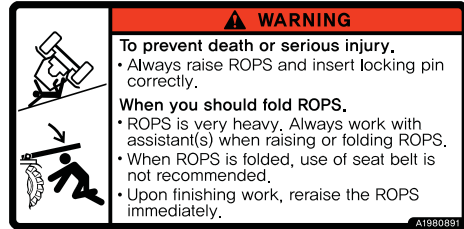
3. Adhesive position : beside muffler



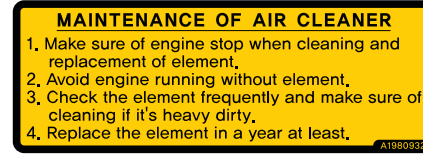
4. Adhesive position : beside cooling pan



5. Adhesive position : fender



6. Adhesive position : air cleaner



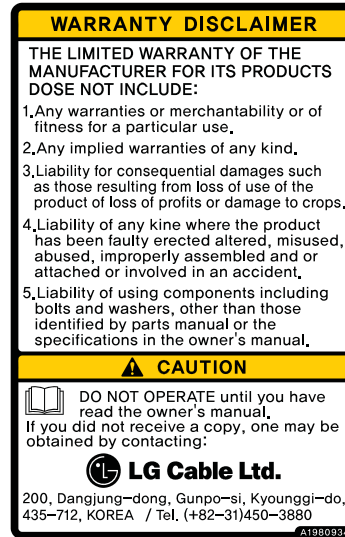
9. Adhesive position : PTO cover



7. Adhesive position : fender



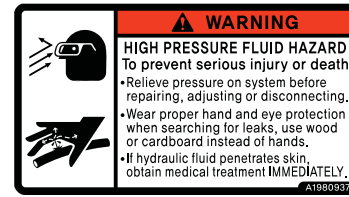
8. Adhesive position : fender



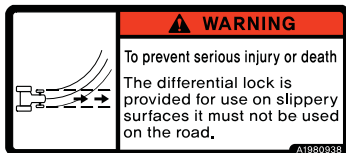
10. Adhesive position : mud guard



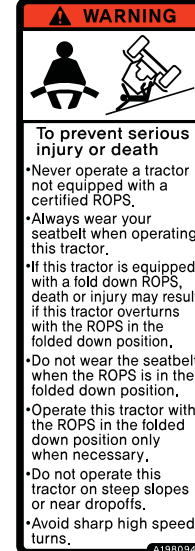
11. Adhesive position : behind fender



12. Adhesive position : beside differential lock pedal



15. Adhesive position : ROPS



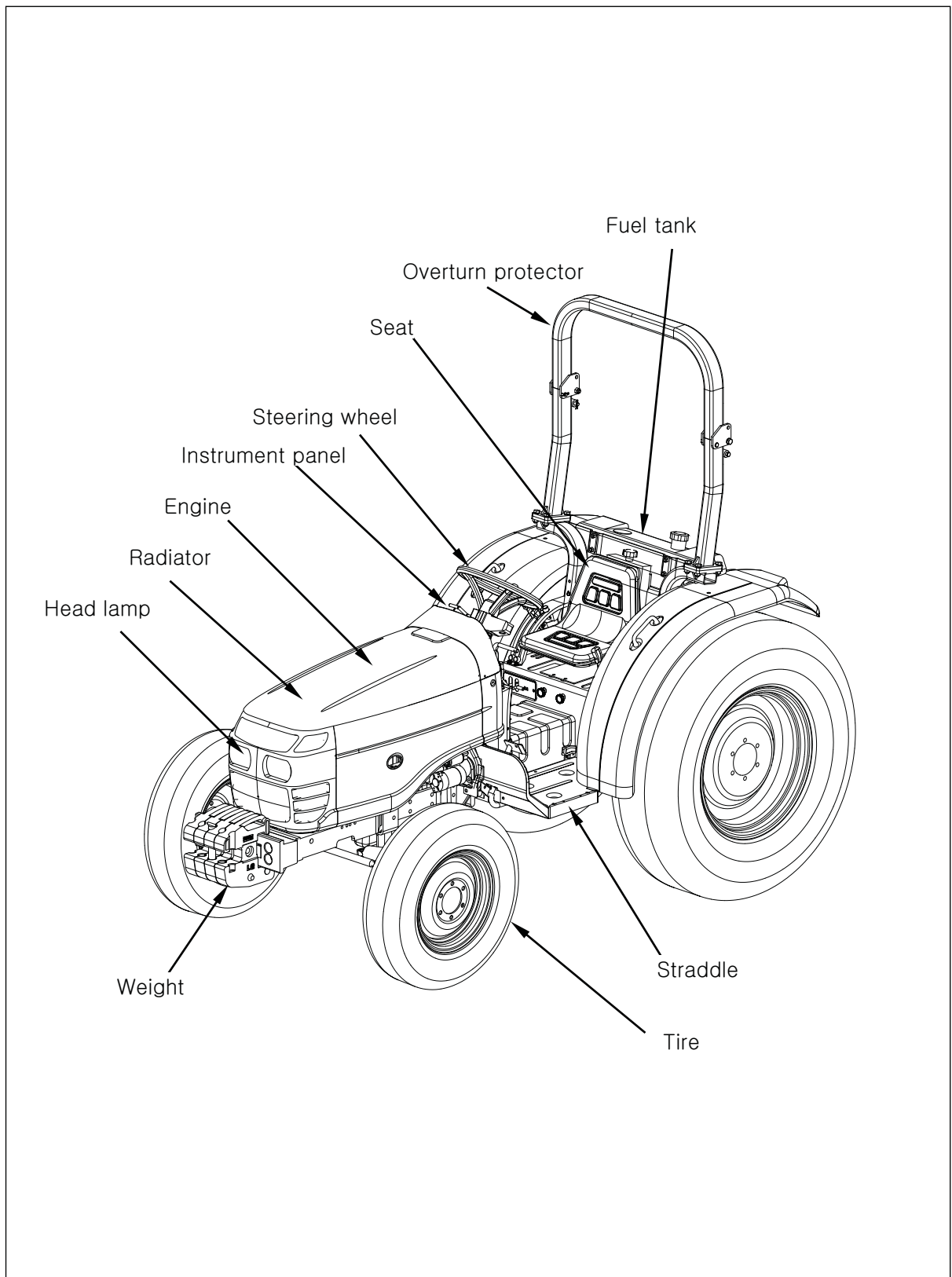
13. Adhesive position : fender



14. Adhesive position : fender



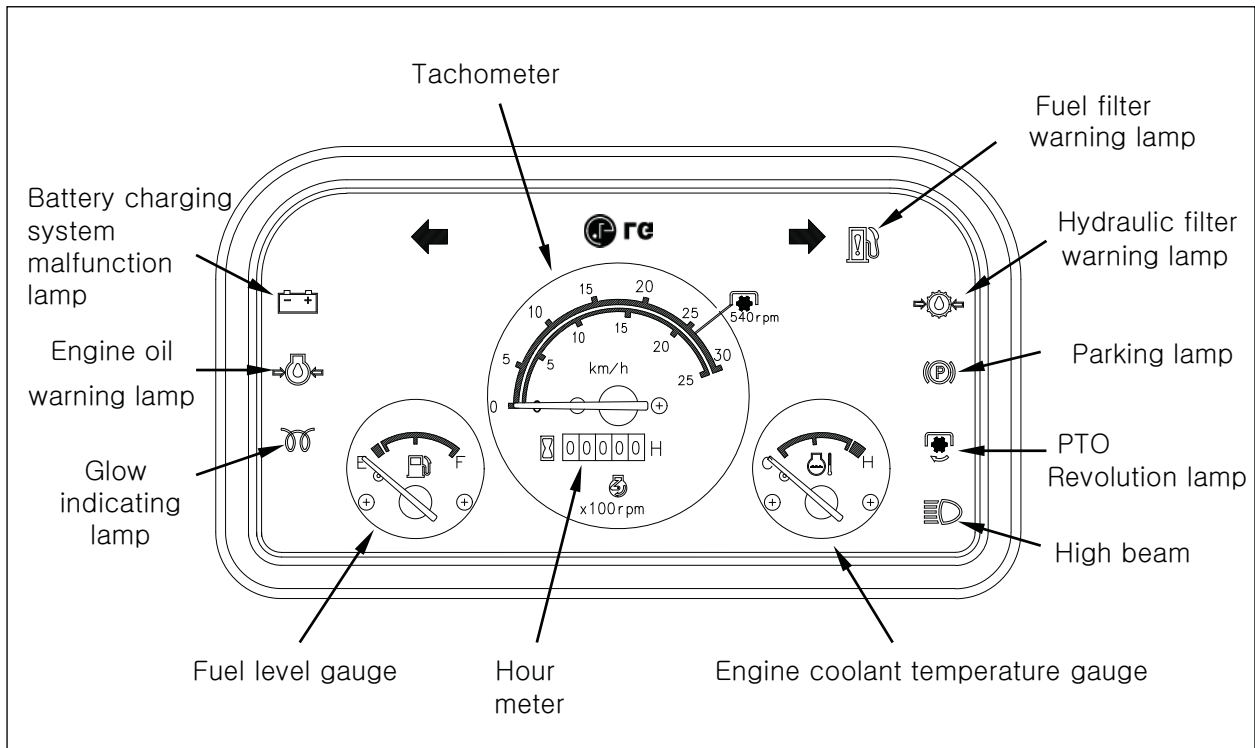
2.The Names of Each Part



3. Operation of each part and Notices

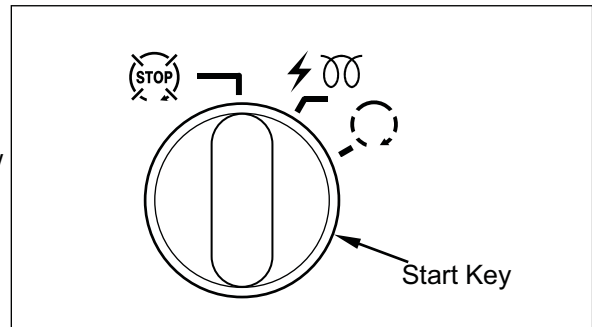
3-1. Instrument board and Switch

(1) The Name of Each Part



(2) Key switch

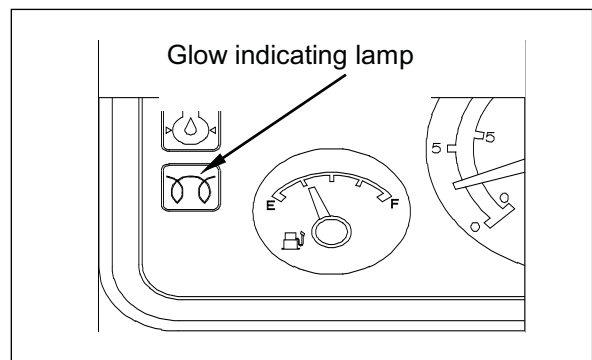
- (STOP) ENGINE STOP – power off
- ⚡️ GLOW/RUN – power on & automatic glow
- (START) START – engine start



Notice	<ul style="list-style-type: none"> ▶ Apply the start by pressing clutch pedal as the safety switch for start is engaged. ▶ If the tractor is not used, the start key should be drawn off .
--------	--

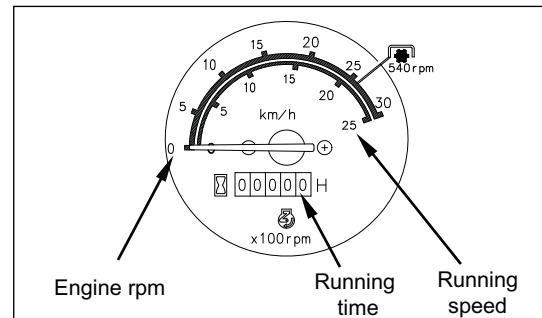
(3) Glow indicator

- If placing the key switch on “GLOW/RUN” position, the glow indicating lamp is ON and after 10 seconds, the glow lamp shall be OFF and then the engine starts.



(4) Tachometer / speedometer

- The speed indicates the engine speed at high 4th gear.
- The running time 00191 means that 19.1hr (19 hr 6 min.) are operated.
- This shows travel speed at the highest lever in Km/n(only for reference)

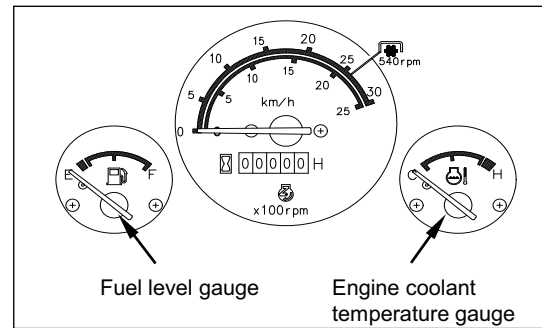


(5) Fuel level gauge



- This indicates the remaining amount of fuel.
- If the needle indicates “E”, fill the fuel immediately.

(6) Engine coolant temperature gauge

- This indicates the temperature of cooling water during operation.
- The closer the needle approaches “H”, the higher the temperature of cooling water of engine is.



Notice	<p>▶ If the needle of engine coolant temperature gauge indicates the red part.</p> <ul style="list-style-type: none"> - Stop the engine immediately and check the cooling water capacity and if lack of cooling water, fill it in. - Clean the radiator net if foreign materials (dry glasses etc.) are attached. - If the trouble is repeated, contact to the agent or service center for check.
--------	--

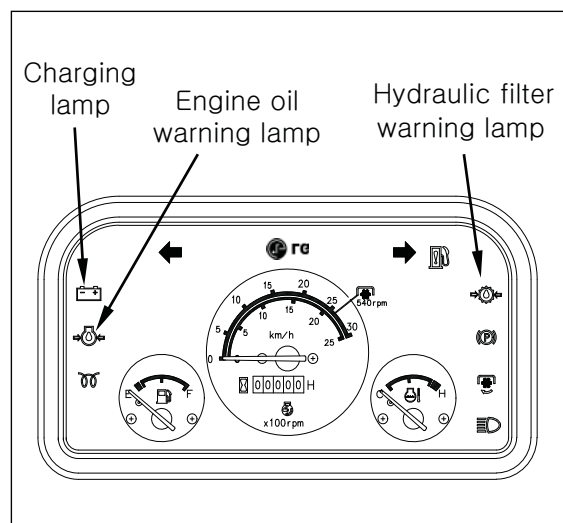
<p> Warning</p> <p></p>	<p>▶ When opening the cover of radiator, it may cause the danger of a burn due to the spout of hot cooling water or steam.</p> <p>▶ Cool the cooling water sufficiently before opening.</p>
---	---

(7) Engine oil warning lamp

- If the lamp is ON while the engine stops, this means ‘normal’.
- If the lamp is ON while the engine is running, stop the engine and check the engine oil capacity. -If the lamp is ON even if the oil capacity is normal, this means ‘the failure’. In this case, contact the agent for check.

(8) Charging trouble warning lamp

- If the engine starts, the lamp is OFF.
- If the lamp is ON while the engine is running, this means the trouble in the charging system. In this case, contact the agent for check and repair.



(9) Fuel filter humidity warning lamp (LT450D)

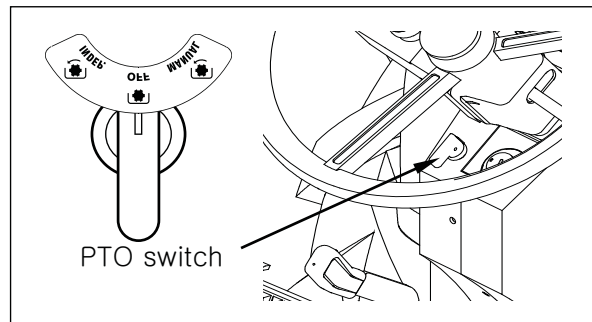
- If the humidity reaches the arranged level inside fuel filter, the warning lamp shall be ON and the engine stops and thus the engine stop warning lamp shall be ON.
- If the fuel filter warning lamp is ON, remove the humidity inside fuel filter.

(10) Hydraulic filter warning lamp


- If the hydraulic filter is blocked, the lamp will be turned "ON". At this time change the filter.
- When it's cold, the lamp is turned "ON" till the hydraulic oil gets warm, which is not abnormal.

(11) Independent PTO drive and Engine start

- The engine starts only when PTO selection switch is placed on "OFF" position.
- When applying the engine start, PTO speed selection lever should be on Neutral and PTO selection switch should be on "OFF" position.





- After starting the engine, PTO operation should be performed as follow.
 1. Operate the PTO selection switch to "INDEP." or "MANUAL" position. (LT450D)
When the PTO selection switch is placed on "MANUAL" position, if you press main clutch pedal, the PTO will not be engaged.
If it is placed on "INDEP." position, the PTO will be engaged.
 2. If you want to stop temporarily while the PTO axle is running, place the PTO selection switch on "OFF" position.
- If selecting the PTO "INDEP." or "MANUAL", "PTO indicating lamp" of instrument panel shall be ON and if selecting "OFF", the lamp shall be OFF.


 Warning	▶ Before connecting or checking the implements, - Place the PTO selection switch on "OFF" position.
--	--

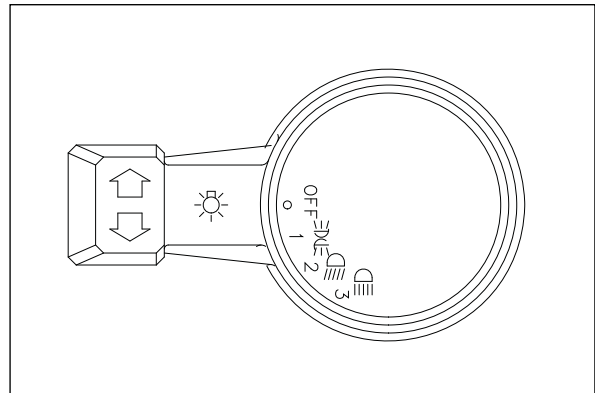
(12) Lamp switch

- OFF – Instrument panel, lamp OFF

 -Gauge lamp and breadth lamp ON

 -Gauge lamp, breadth lamp, head lamp (low) ON

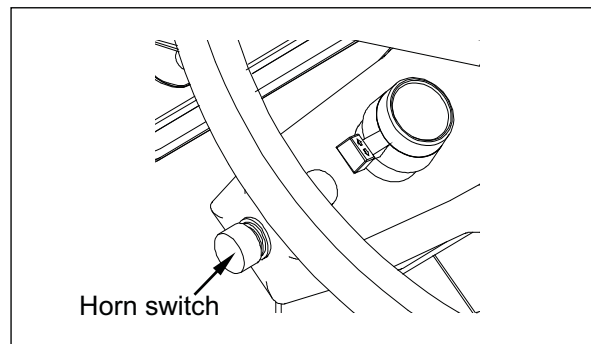
 -Gauge lamp, breadth lamp, head lamp (high) ON



Notice	▶ When crossing with other vehicles on the opposite at night, light the head lamp downward not to disturb the proceeding of the oncoming car.
--------	---

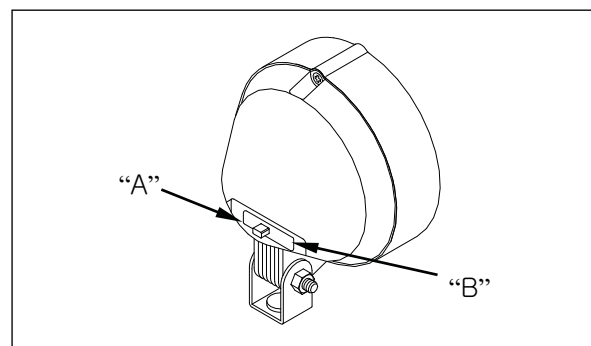
(13) Horn switch

- If you press the horn switch, it gives the alarm whistle.



(14) Work lamp switch

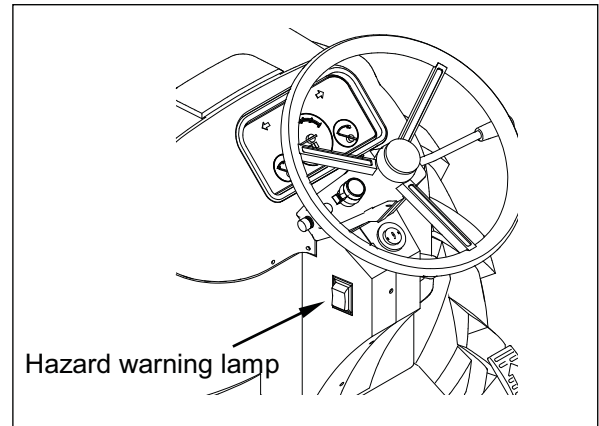
- This is to light the front/rear work lamp ON.
- ON – Push the switch to the left and the work lamp shall be ON. (“A” in the figure).
- OFF – Push the switch to the right and the work lamp shall be OFF. (“B” in the figure)



Notice	▶ When running on the road at night, do not let the rear work lamp “ON”. It may cause the disturbance for the driver of the following car.
--------	--

(15) Hazard warning lamp switch

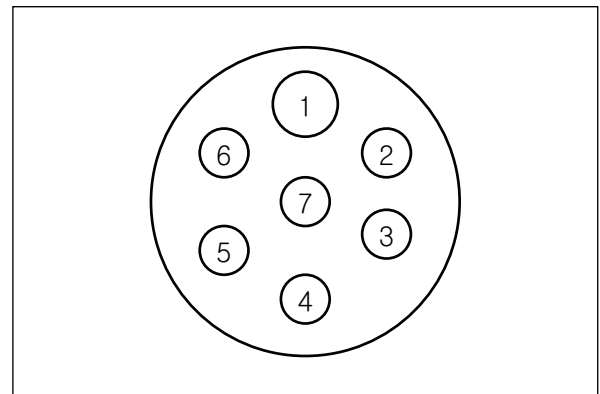
- Use the flashing hazard warning lights whenever encountering any trouble on the tractor or when driving on public roads.



(16) Seven-terminal outlet

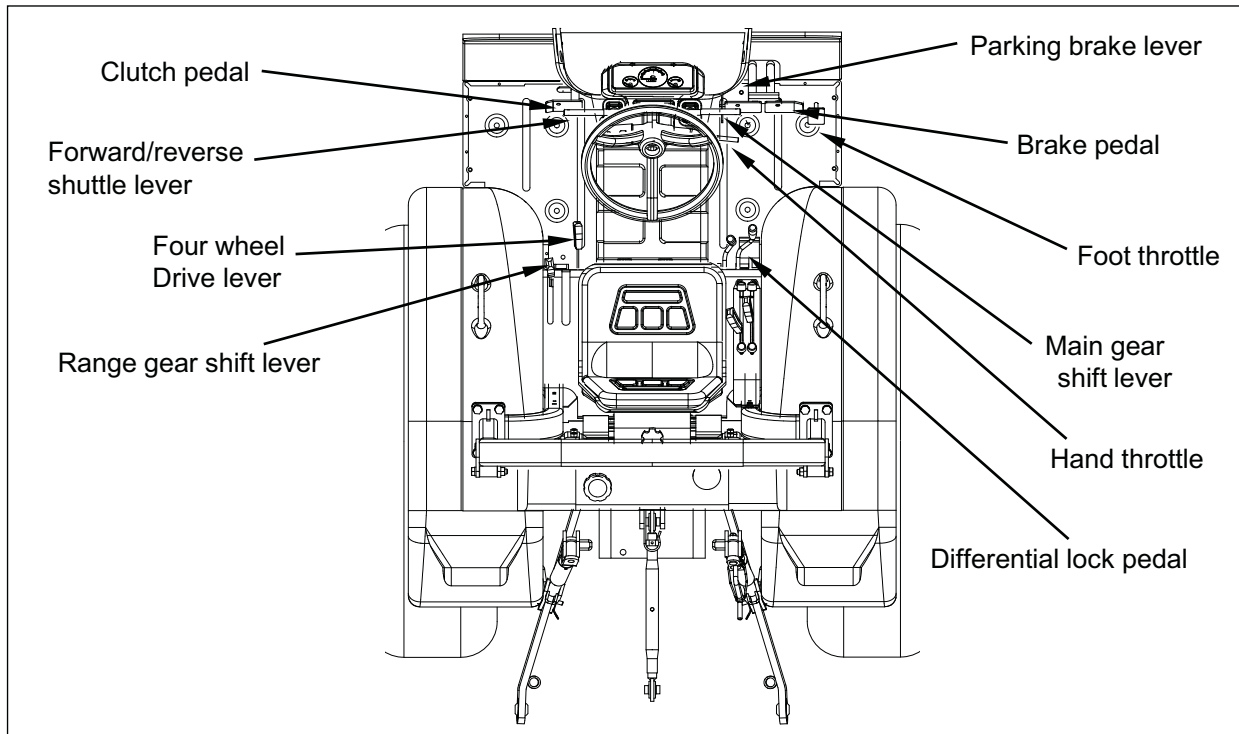
- This outlet is used to connect lights, turn signals, and remote electrical equipment on trailers or implements.
- Always use auxiliary lighting on towed implements when tractor lights are obscured.

Terminal	Function	Wire Color
1	Ground	White
2	Work lights	Black
3	Left turn	Yellow
4	Accessory	Red
5	Right turn	Green
6	Tail Lamp	Brown
7	Accessory	Blue



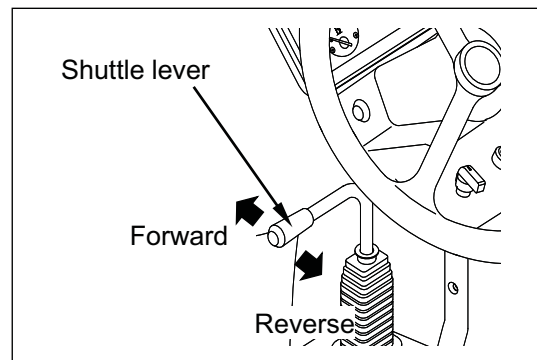
3-2. Operating levers and pedals

Operating levers and pedals



(1) Shuttle lever

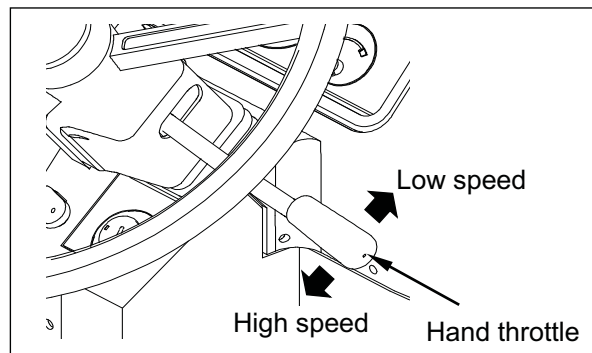
- This is used to select forward/reverse.
- If you push the lever forward, it runs “forward” and if you pull the lever back, it runs backward.
- When running backward, lower the engine rpm and after stopping completely, check the rear safety.



- The operation of shuttle lever should be done after the tractor has stopped completely.
Don't operate while the tractor is running.

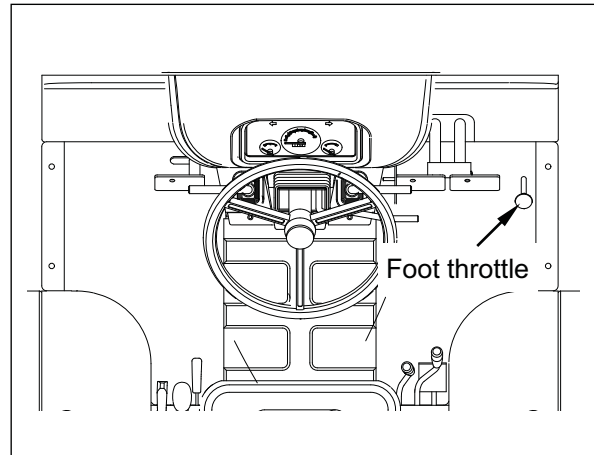
(2) Hand throttle

- The lever should be used only for the work and not allowed to use while running.
- If you pull the lever, it means “low speed”, and if you push it forward, it means “high speed”.



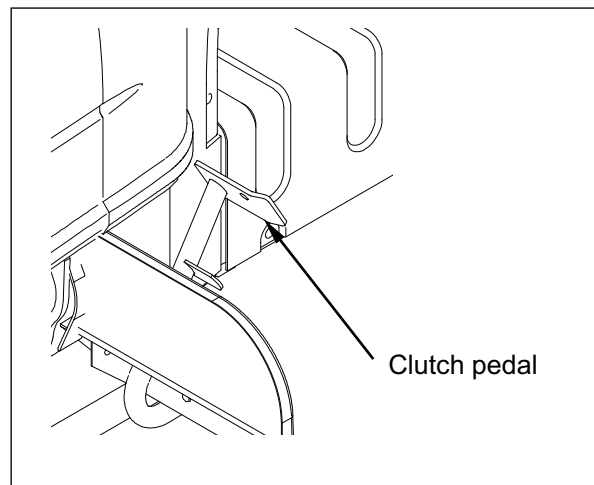
(3) Foot throttle

- This is used when running on the road.
- When using the foot throttle, the hand throttle should be placed on “low speed”.



(4) Clutch pedal

- This is used for engine start, transmission stop.
- Work a pedal completely to cut off the clutch and if the PTO selection switch is placed on “MANUAL”, the PTO axle will stop.

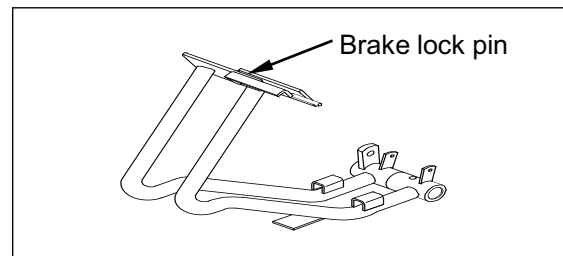


Caution

- ▶ Press a clutch pedal quickly and depress it slowly.
- ▶ As the start safety switch is installed for the operator's safety, if you don't press the pedal completely, it does not start.

(5) Brake pedal

- If separating the left/right pedal and pressing one side pedal, the brake is applied on the rear wheel of the pressed pedal.
- When stopping, press the clutch pedal together.
- When working, remove the brake pedal lock pin and use the left/right pedal independently, the turning radius shall be reduced. When turning, apply the brake till the wheel stops completely.

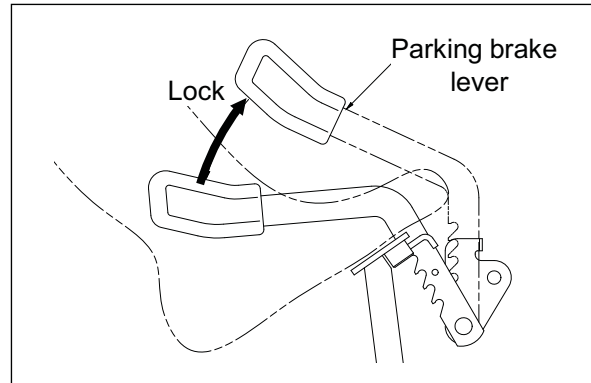


Caution

- ▶ When running on the road, engage the left/right pedal by the lock pin..
 - If pressing one side brake when running, the tractor may turnover.
- ▶ While running, depress the foot from clutch pedal and brake pedal.
 - If using in the state of putting the foot, it may cause the failure.

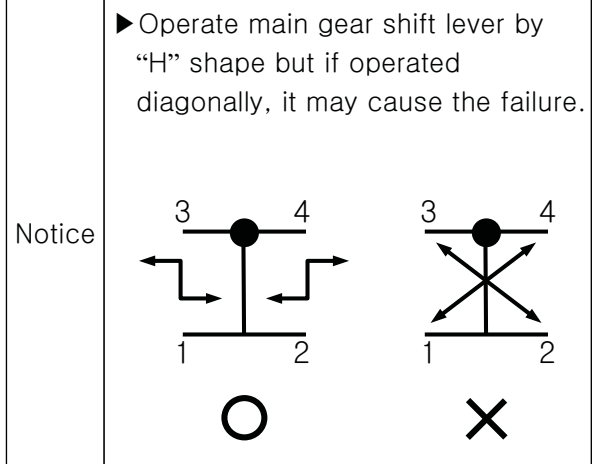
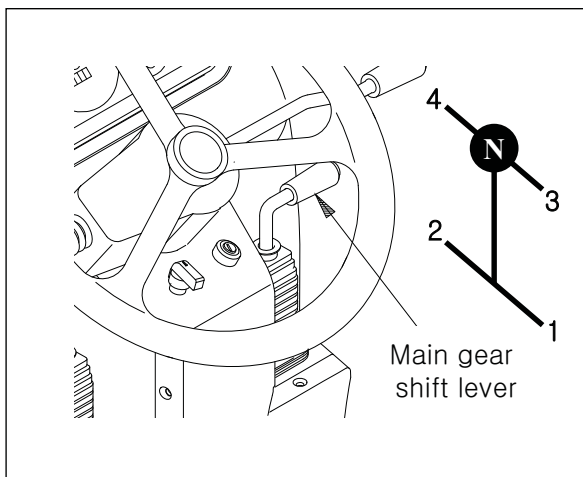
(6) Parking brake lever

- When parking or stopping temporarily, use the parking brake.
- Pull the parking brake lever up while pressing the left/right brake pedal for easy operation.
- To loosen the parking brake, press the left / right brake pedal and pull the lever down.



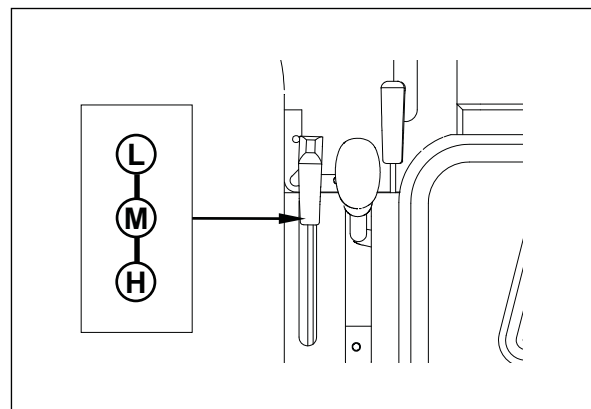
(7) Main gear shift lever

- Main gear shift lever is available to operate by 4 stage transmission. If using range gear shift lever, shuttle lever together, the transmission of forward 12 stage and reverse 6 stage shall be available.
- Main gear shift lever 1~4 stage shall be available for changing the speed while running if working the clutch pedal.



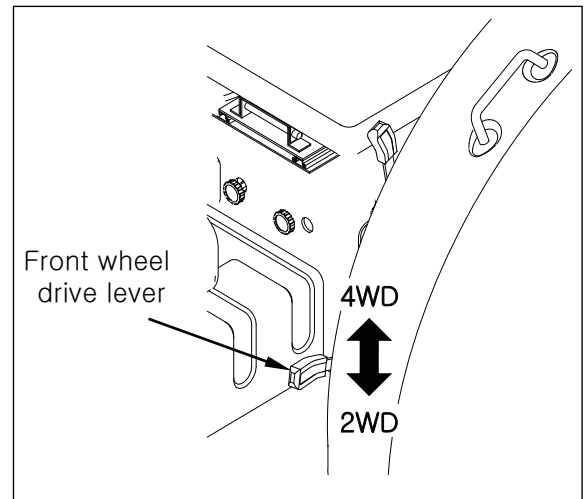
(8) Range gear shift lever

- 2 stage speed selection (high speed, low speed) is available.
- Front is for low speed, middle for neutral and rear for high speed.
- Range gear shift lever should be operated after the tractor has stopped completely.



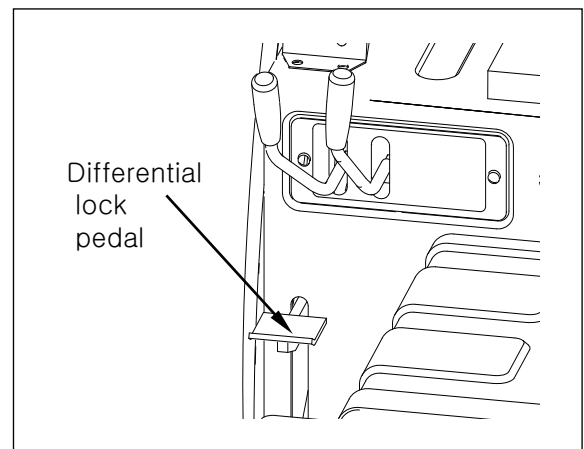
(9) Four wheel drive lever (4WD)

- If you pull the lever back, the front wheel drives.
- In case of the front axle driving, press a clutch pedal and stop the tractor completely and then operate the lever.
- 4 wheel drive is powerful in the following cases.
 - When the towing power is needed such as slope, damp, trailer, front loader, plow work etc.
 - In case of working in sandy place
 - To prevent the bouncing when doing the rotavator work in the hard ground.
 - When crossing the field footpath



(10) Differential lock pedal (Diff-lock)

- When the forwarding does not work as one wheel is slipped, press the differential lock pedal..
- More effective in the following cases.
 - Humid ground
 - Plow work
- If pressing this pedal, the direction turning is not available as the left/right rear wheels turn together.
- If depressing the pedal, it will be loosened automatically.
If the fixing is not loosened, press the sole brake in a moment and depress the brake.



Warning

- ▶ Do not turn by pressing the differential lock pedal.
- ▶ Do not use when running on the road.
- ▶ If the turning difference of wheel of both side is big, depress the clutch once and operate it.

3-3. Hydraulic device

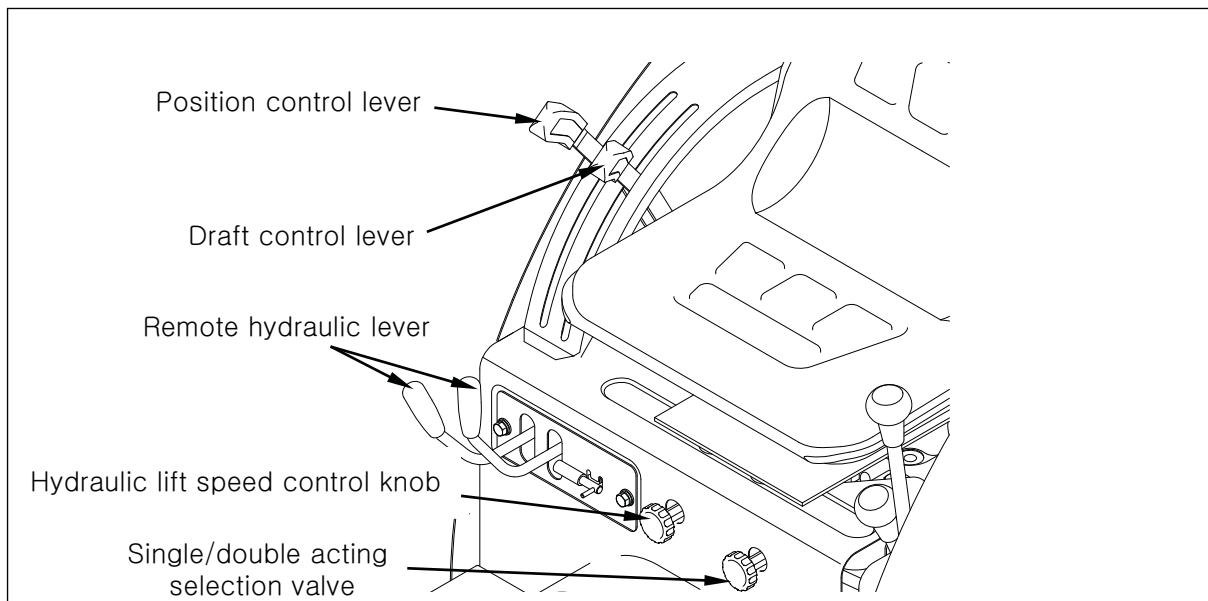
(1) Steering device

- As the steering device of LG tractor has a hydraulic device, it is much lighter to take the steering wheel than others. Thus, it is not necessary to force to operate the steering wheel. And the wheel load blocking system was applied to avoid the moving of the steering wheel by the impact of the wheel on the hard ground.
- When using the steering device, pay attention to the following instructions.
 - 1.If too much loaded in case of front loader working, it is not available to operate the steering wheel. In this case, reduce the loading amount or operate the steering wheel by moving forward or back.
 - 2.After turning the steering wheel fully, do not turn the steering wheel to the same direction again. The life of tractor may be reduced by applying the unnecessary force. Or do not operate the steering wheel by force if the front wheel is mired in a ditch. In this case, the rim will be affected very bad.
 - 3.If it sounds abnormal when operating the steering wheel, this means that there is the air in the hydraulic circuit. In this case, turn the steering wheel to the left or right side fully and hold it for 5 seconds and the air shall be exhausted and the abnormal sound does not generate. If the sound keeps to generate, contact to Service center for repair.
 4. If starting the engine in the cold weather, the abnormal sound may be generated. In this case, allow the engine warm up before using it as the viscosity of oil has increased.
 - 5.If using the machine for a long time by turning the steering wheel fully, the temperature of oil will rise which may cause the life reduction or the failure of hydraulic device.

Notice	<ul style="list-style-type: none">▶ If the engine stops, the operation of steering handle become heavy as the hydraulic steering device does not work. But this does not mean ‘the failure’.▶ After operating the steering wheel during running, if you want to restore, you should return the steering wheel again.
---------------	---

(2) Control lever operation

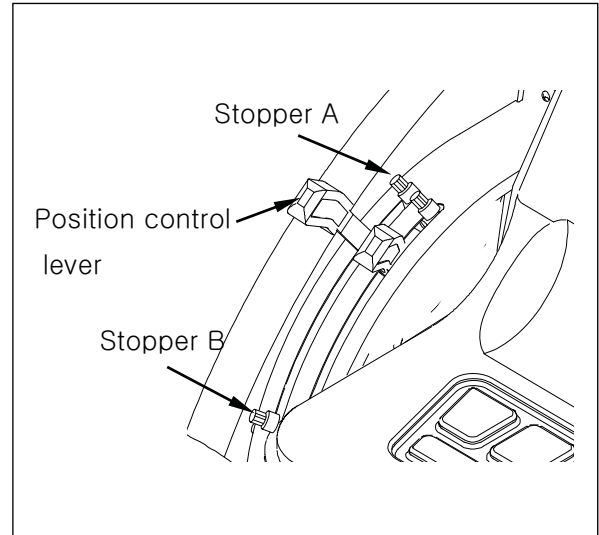
- The hydraulic lift system is operated by the way of position control and towing control.



(3) Position control

- This mode sets the position of the implements freely by the operation of lever. Generally, this mode is used for rotavator, fertilizer distributor, mower, rake etc. In this case, operate the lever as follows.

1. Push the position control lever forward and the implement falls down by its own weight.
2. If the position control lever is on the random position, the implement stops at the height corresponding to the lever position.
3. To keep the height of implement in the desired range, restrict the lever to the lowest position with stopper B and to the highest position with stopper A.



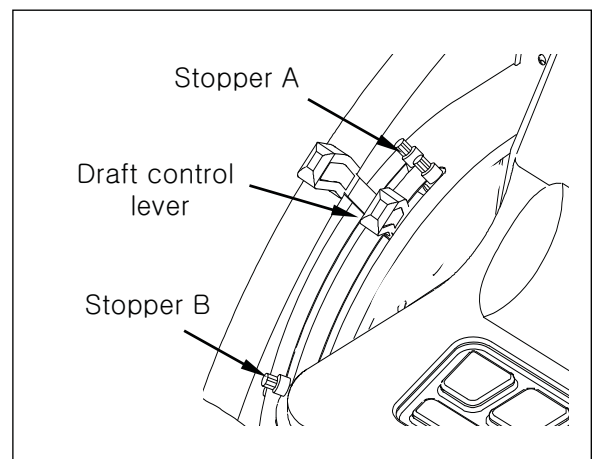
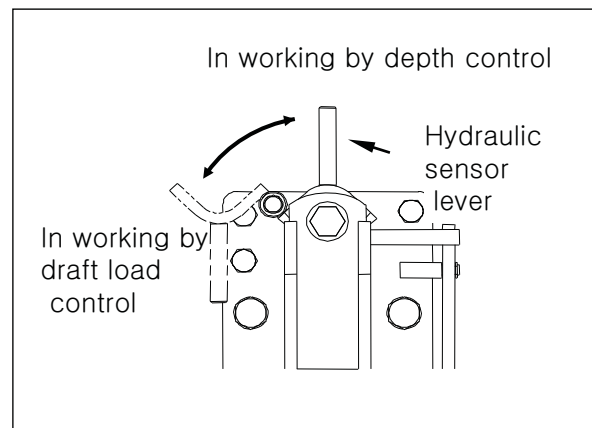
(4) Draft control

- This mode maintains the load of the implement consistently by detecting the draft load and transmit it to the hydraulic valve.

Generally, this mode is used for the implement which receives the draft load.

In this case, operate the lever as follows.

1. Remove the hydraulic sensor lever of upper link bracket.
2. Move the position control lever forward fully (Down) and the implement falls down by its own weight.
3. The volume of load that the implement receives shall be determined according to the position of draft control lever. That is, the more the lever moves back (up), the more the implement rises up just by a little draft resistance.
4. If you want to lift the implement, use the position control lever instead of draft control lever.

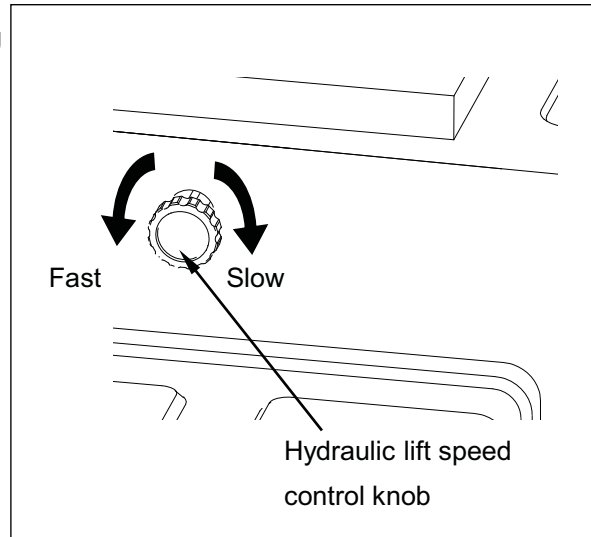



(5) Mixed control

- This mode uses both position and draft control lever. In this case, the position of implement is controlled by the position control lever and the draft load is controlled by the draft control lever.

(6) Hydraulic lift speed control knob

- Turn the valve knob right to lower the implement slowly and turn the valve knob left to rise the falling speed fast. If turning right fully, the hydraulic pressure shall be fixed and even if pulling down the control lever, the implement does not fall down.
- Rotavator work
 - Slow in falling speed
- Plow work
 - Fast in falling speed
- When working in the hard ground, slow down the falling speed to avoid the bounding of the implement.



 Warning	<ul style="list-style-type: none">▶ When running on the road, turn right the hydraulic lift speed control knob slightly to lock.▶ When changing the blade of rotavator or removing the grass or dry grass, stop the engine and turn right the hydraulic lift speed control knob slightly to adjust the hydraulic pressure. (the valve knob may operate twice rounding.)
---	--

(7) Handling of front loader

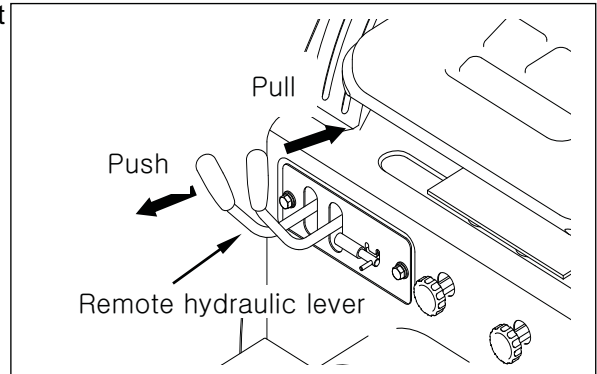
- When working the front loader, attach the rotavator to the rear to maintain the front and rear balance of the tractor. Otherwise, the front wheel axle will be strained by the heavy weight of bucket loadings.
- When working the front loader, place the attached rotavator to the highest position and lock the hydraulic lift speed control knob.

Notice	<ul style="list-style-type: none">▶ When installing the front loader, do not operate the setting pressure of body relief valve at random. In that case, the hydraulic device may be broken or the life may be reduced.
--------	--

(8) Remote hydraulic valve operation (Option)

※ By using the remote hydraulic valve, the implement (i.e. dump trailer, hydraulic conversion plow etc.) to be attached to the tractor shall be operated by the hydraulic pressure.

- Push the remote hydraulic lever forward and the hydraulic pressure operates to the right coupling. In this case, the left coupling shall be connected to the drain.
- Inside and outside lever is operated respectively and at the same time when operating the lever, the one received less force begins to start first.



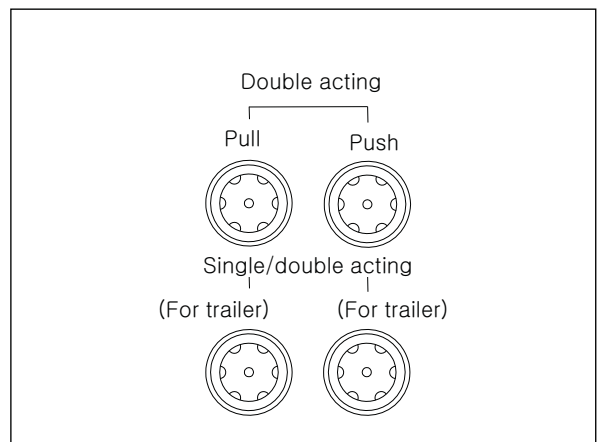
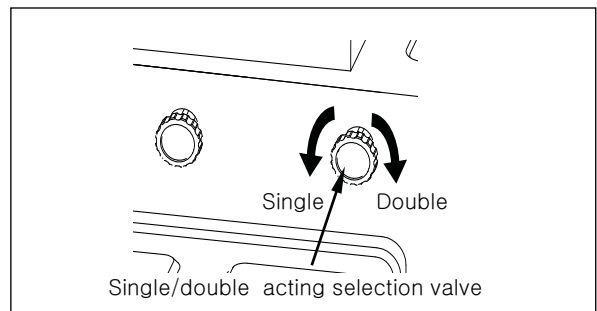
Notice

▶ Be sure to release the fixing pin if assistant hydraulic lever is not used.

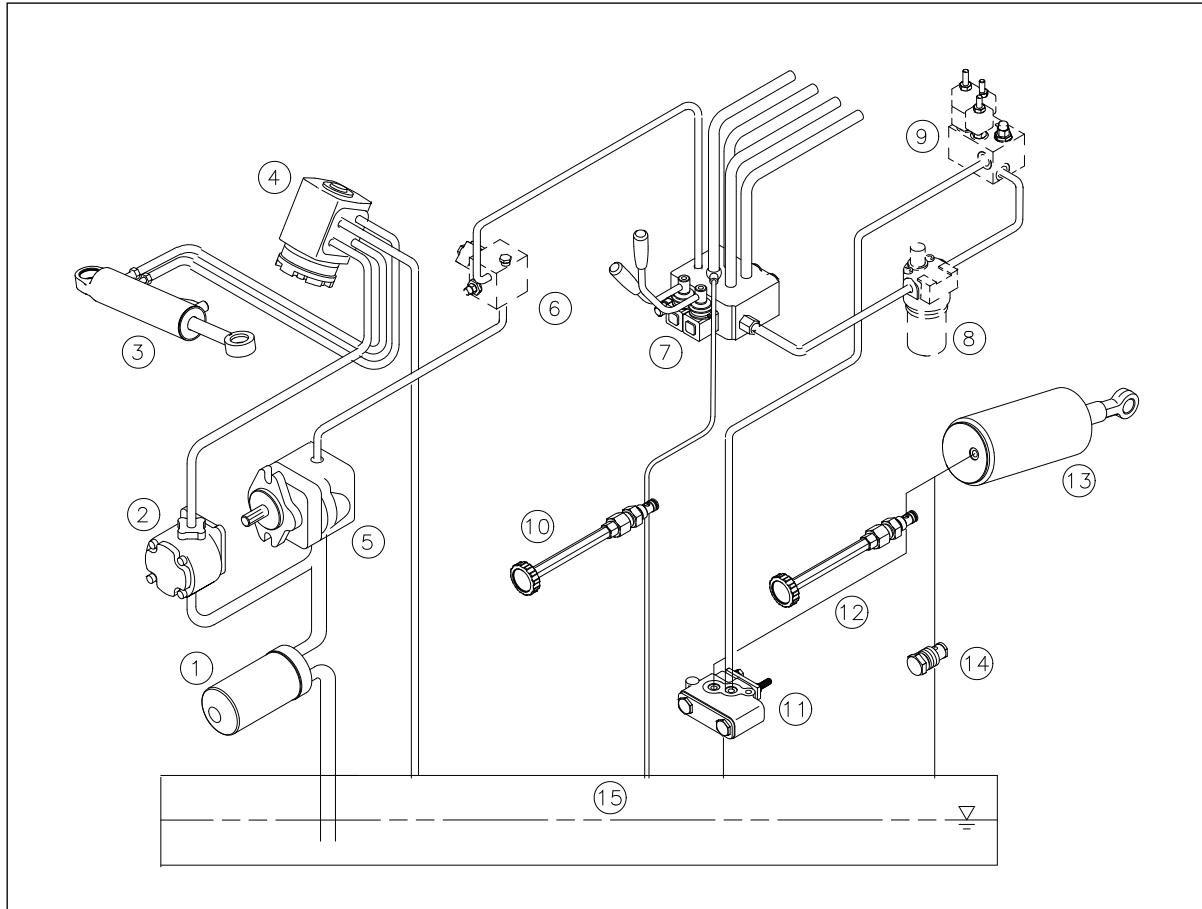
(9) Single, double acting selection valve (Option)

※ Outside remote control valve is used by selecting the single or double acting.

- Single/double acting selection valve operation
 - Turn left single/double acting selection valve knob fully and it operates by single acting while turning right the knob fully, it operates by double acting.
- Dump trailer (single acting cylinder type)
 - Single acting (connecting the hose to the left coupling : for trailer)
- Hydraulic conversion plow (double acting cylinder type)
 - Double acting



(10) Hydraulic device diagram





- | | | |
|----------------------------------|--|---------------------------------------|
| 1. Hydraulic oil filter | 6. Independent PTO valve | 11. Hydraulic lift control valve |
| 2. Steering hydraulic pump (P/S) | 7. Aux. control valve(option) | 12. Hydraulic lift speed control knob |
| 3. Steering hydraulic cylinder | 8. In-line filter (option) | 13. Hydraulic lift cylinder |
| 4. Power steering unit(P/S Unit) | 9. Horizontal control device (option) | 14. Safety valve |
| 5. Lift hydraulic Pump(Lift) | 10. Sing/double acting selection valve(option) | 15. Oil tank |

3-4. Safety device

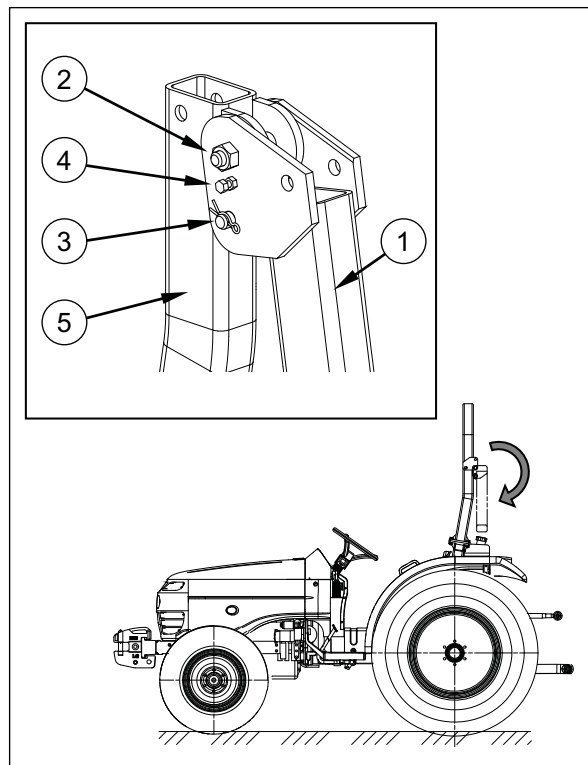
(1) Safety belt


- Wear the safety belt before operating the tractor and adjust the belt to fit the operator.



 Warning	<ul style="list-style-type: none"> ▶ If not wearing the safety belt, it may cause serious injury in case of accident.
	<ul style="list-style-type: none"> - During operation, it should be required to wear the safety belt. - After wearing the safety belt, adjust the belt to fit the operator. ▶ But, in case of general type tractor, do not wear the safety belt when the safety frame is folded.


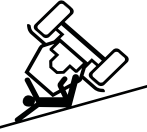

(2) Safety frame

- The safety frame is of the folding type and can be folded backwards when working in areas with limited headroom.
- To lower safety frame, proceed as follow
 1. Loosen securing bolts ② and extract locking pins ③ on both sides.
 2. Loosen bolt & nut ④.
 3. Fold the safety frame ①, backwards.
 4. Align holes ① and ⑤, and insert the pins ③ to safety frame in the lowered position.
 5. Tighten up bolts & nut ② ④.



 Warning	<ul style="list-style-type: none"> ▶ When not working in areas with limited headroom, always work with the safety frame raised, as shown in the figure.
---	--

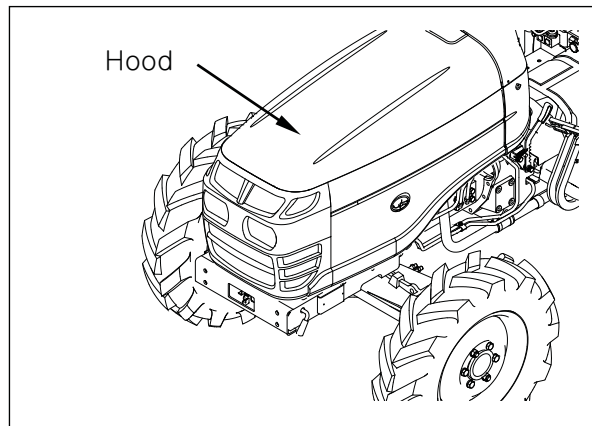
 Caution	<ul style="list-style-type: none"> ▶ If used incorrectly, the tractor may overturn. ▶ The safety frame may only be lowered when working in areas with limited headroom. ▶ With the safety frame lowered the driver is unprotected, therefore it is essential that the safety frame is raised after working in areas with limited headroom. ▶ When the safety frame is raised, always use the seat belt. ▶ Do not use the seat belt when the safety frame is lowered.
 Caution	<ul style="list-style-type: none"> ▶ Do not attach chains or cables to the safety frame as this may cause the tractor to tip backwards. ▶ Only tow using the specific devices provided on the tractor.

 <p>Warning</p>  	<ul style="list-style-type: none"> ▶ As the safety frame is very important structure for the safety of operator, do not modify at random or disassemble it. ▶ If the safety frame is not installed correct, it may cause serious injury in case of turnover. <ul style="list-style-type: none"> - Erect the safety frame fully and insert the fixing pin correctly. ▶ In case of bending the safety frame <ul style="list-style-type: none"> - As the safety frame is heavy to bend or erect, it is necessary to do it by at least 2 persons. - As the safety frame is heavy, it may bend suddenly back and cause the serious injury. - In bending or disassembling the safety frame, do not wear the safety belt. - If finishing the work, erect the frame again immediately.
---	--

(3) Safety covers and guards

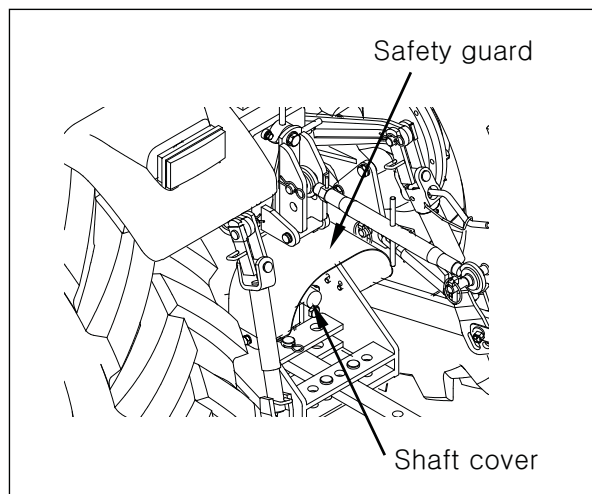
① HOOD


- The hood, covers the engine's moving parts. It must be closed before the engine is started and the tractor is used.



② PTO SHAFT COVER AND GUARD

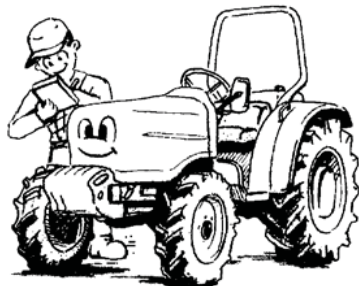
- Shaft cover must always be mounted on the PTO shaft when PTO is not being used.
- Keep it correctly when not in use. Safety guard covers the PTO shaft.



 <p>Notice</p>	<ul style="list-style-type: none"> ▶ The guard must never be removed when the tractor is being used and never be modified.
--	---

4. How to drive and work

4-1. Engine start and stop



Caution

- ▶ Check each part before starting the engine.
- ▶ Check if there is some other people around before start.
- ▶ Place the lever or switch on Neutral(N) or Stop(OFF) position.

(1) Start

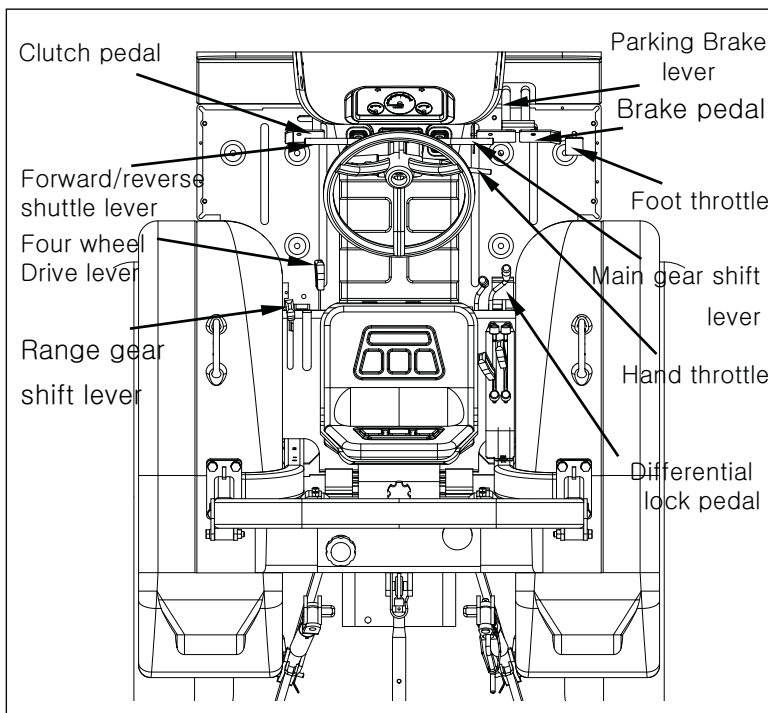
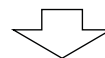
1. Apply the parking brake.



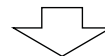
2. Place the main gear shift lever, shuttle lever on Neutral.



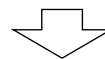
3. Pull hand throttle to the middle position.



4. Place key switch on "Drive(RUN)" and check if engine oil warning lamp, battery charging system malfunction lamp, glow indicator is ON.



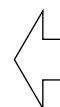
5. Wait till glow indicator is OFF. (about 10 seconds)







8. Carry out warming operation for 5 minutes at engine rpm 1500.



7. Check if oil warning lamp, charging warning lamp is OFF. If any of these lamps is ON, stop the engine and check.



6. Depress the clutch completely and turn the key switch to "Start" position. After the engine has started, if releasing the key switch, the key returns to "RUN" position automatically.

 Warning	<p>▶ The start should be done by pressing the clutch in the neutral state of transmission gear from the seat. Do not apply the start by connecting the terminal of start motor.</p> <p>If starting in the state that the gear is applied, it may cause the severe injury by the sudden start.</p>
 	
 Caution	<p>▶ If not pressing the clutch pedal fully, the start safety switch does not work even if turning the key switch to “START” position.</p> <p>▶ The running time of start switch should be within 10 seconds and if it does not start, take a time for 1~2 minutes and then restart.</p> <p>▶ When the engine is turning, do not turn the start key to “START” position. It may cause the failure of start motor.</p> <p>▶ In the cold weather, carry out warming operation. If the machine is used in the state that the engine does not reach the normal temperature, the engine life shall be reduced.</p>

(2) Start in the cold weather (winter time)

- Pull the hand throttle up to maximum.
- If the engine starts, carry out warming operation for about 10 minutes at engine rpm 1500.
- If using the engine oil as below, it shall be easier to start the engine.

Temperature (°C)	-20	-10	0
Engine oil	10W-30	SAE 20	SAE 30
	10W-30		

- In winter time or in severe cold time, use the diesel oil for winter time.

Notice	<p>▶ The battery should be preserved in the cool and dry place where is not frozen and kept apart from the children.</p> <p>▶ When preserving the tractor in the cold weather, the battery should be detached and preserved in the warm place.</p>
---------------	--

(3) Engine stop

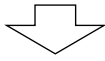
- Push the hand throttle forward to reduce the engine speed and place the key switch on “OFF” position to stop the engine.

Notice	<p>▶ To stop the engine after finishing the work, turn the engine for 5 minutes in low speed revolution. If you stop the engine suddenly, the engine life shall be reduced.</p>
---------------	---

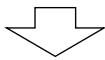
4-2. How to drive and how to stop

(1) How to drive

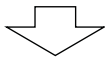
1. Pull the hydraulic position control lever back and lift the implement up.



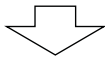
2. Fix the engine rpm at 1500 RPM.



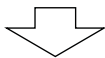
3. Press the clutch pedal completely.



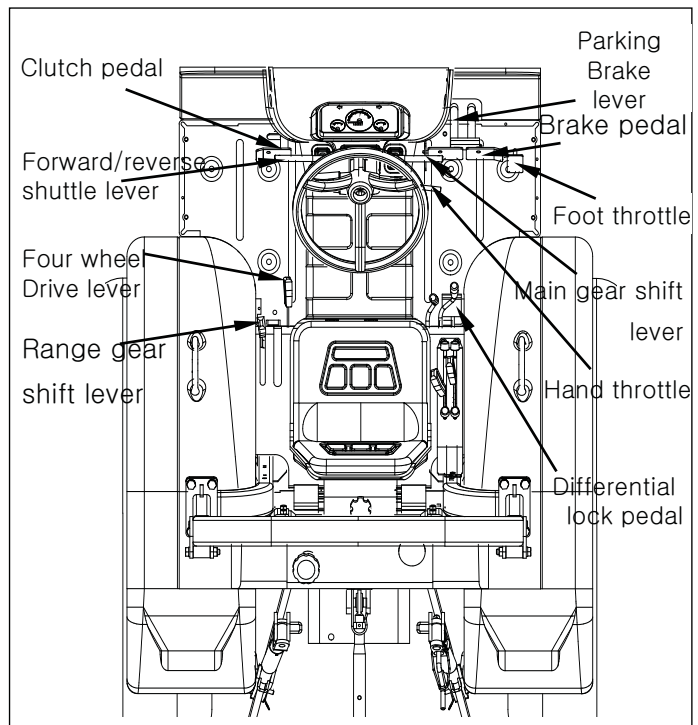
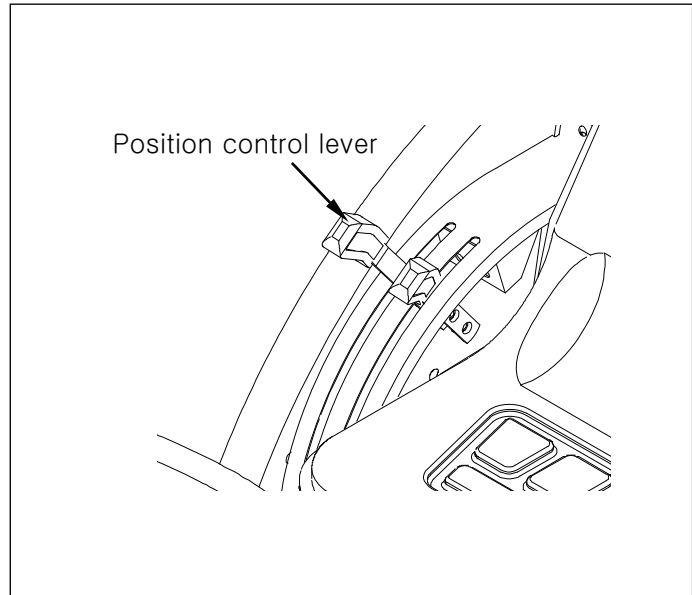
4. Place each gear lever (main, range, forward/reverse shuttle lever) on the desired position.



5. Press the brake pedal and release the parking brake lever.



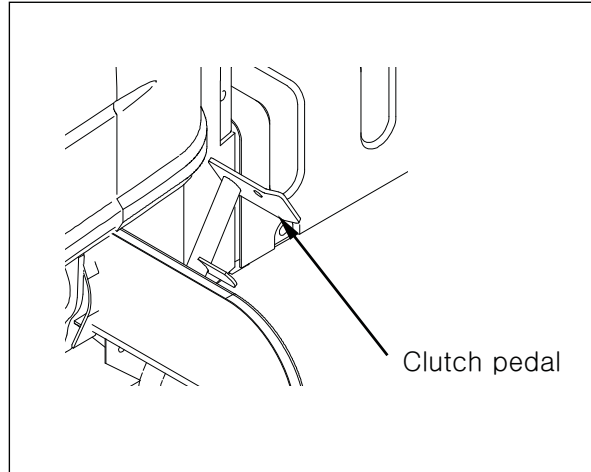
6. Release the clutch pedal slowly and the tractor starts.



Notice	▶ Release the clutch pedal slowly.
	If you release the clutch pedal promptly, the gear life shall be reduced and it may cause the sudden start.

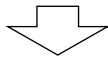
(2) Transmission

- Press the clutch pedal completely and operate the gear shift lever for transmission.

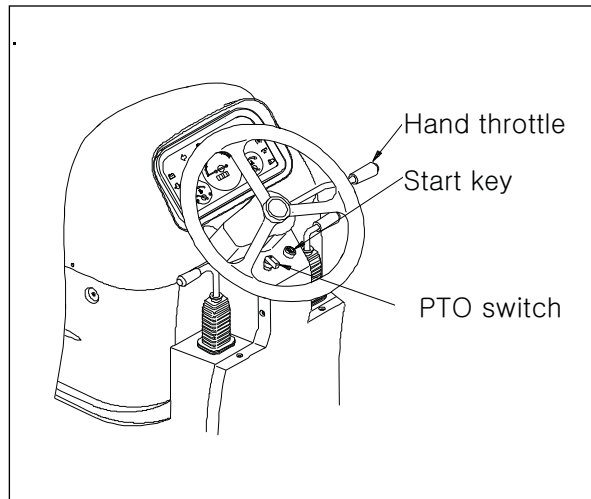


(3) Stop (During running)

1. Push the hand throttle forward to reduce the engine speed.

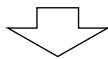


2. Press the clutch pedal and brake pedal at the same time to stop the tractor.

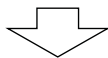


(4) Engine stop

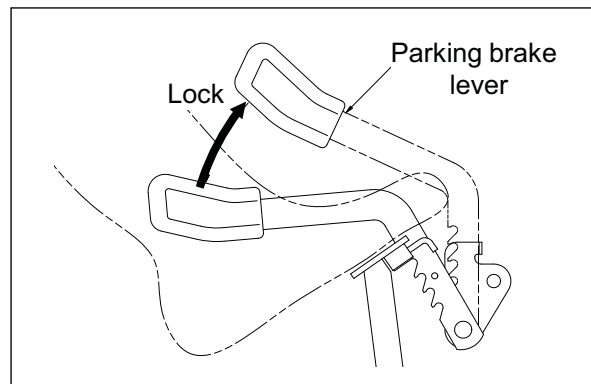
1. Place the forward/reverse shuttle lever, main gear shift lever, on Neutral position and release the clutch pedal.



2. Place the key switch on "Engine Stop" position.



3. Apply the parking brake lever and release the brake pedal slowly.



Notice ▶ You should apply the parking brake lever when parking or stopping temporarily.

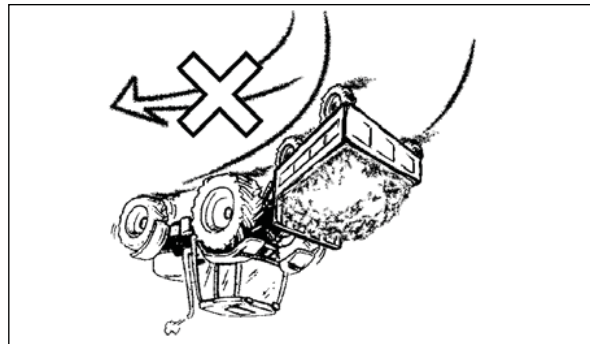
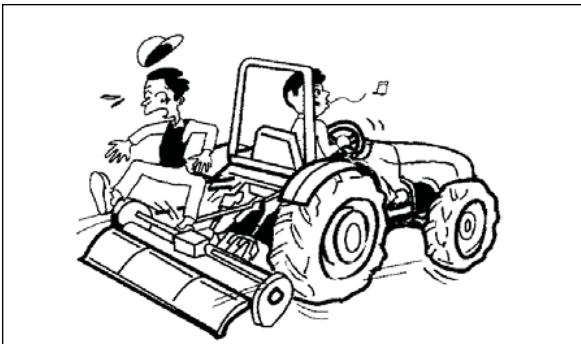
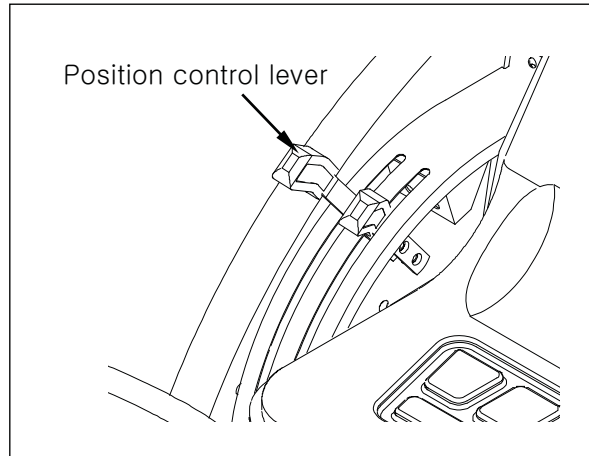
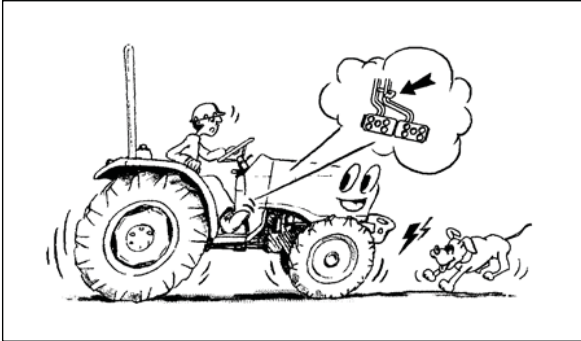


Caution

▶ To avoid the physical injury or property damage, it is prohibited to leave the tractor in the state that the transmission gear is placed on Neutral(N) but the parking brake is not applied during engine running or stop. In the "Neutral(N)" position, the wheels may roll down.

(5) Running

- When facing the downhill, use the engine brake and do not place the gear lever on Neutral position.
- When running on the unpaved road by attaching the implement to 3 point linkage, place the running speed to the low speed and do not lift the position control lever to the highest position. When running in the highest position, it may cause the vibration of implements and the trouble or failure of hydraulic device. (In this case, it is advised to place the position control lever on $\frac{3}{4}$ rising position of guide for the safety.)



Caution

◆ Notices in running

- Connect the left/right brake pedal before running.
- Sudden start, sudden brake, sudden turning is not allowed.
- To get on or to place any baggage on the tractor or any other implements by other people is not allowed.
- Cut off four wheel driving.(2WD use)
- Do not use the differential lock device.
- When running with 3 point linkage and implements installed, tighten the left/right sub link by check link completely to avoid the left/right shaking.
- When running with implements installed, turn slowly by large turning radius.
- While running, do not put the foot on the clutch pedal or brake pedal.
- While running, do not manipulate various implements such as rotary, loader etc.

(6) Seat adjustment

- The seat has suspension, forward and back adjustment for your comfort.
- Adjust the level of seat according to body size before operating the tractor.

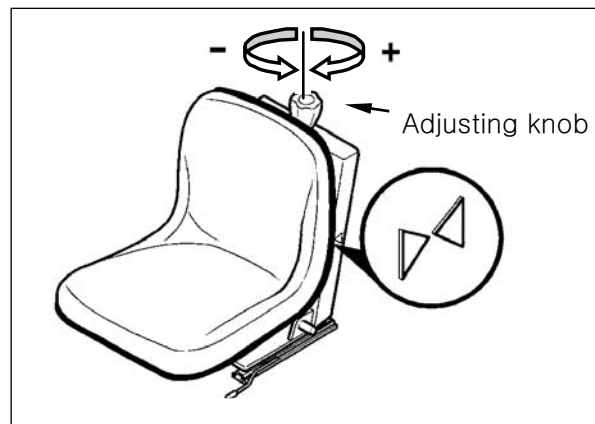
- SEAT ADJUSTMENT

- To move the seat forward or back, lift the lever and move seat in the desired direction.
- Release the lever to lock the seat in position.




- SEAT SUSPENSION ADJUSTMENT

- To adjust the suspension, turn knob clockwise or counter-clockwise based on your weight.
- When the driver is sitting on the seat, the two arrows should be at the same level.



(7) Parking

- Select the flat place for parking.
- Apply the parking brake and place each transmission lever on Neutral (N).
- When parking on the slope, apply the fulcrum to the tire.

 Caution	<p>► In case of parking with a loaded trailer on the slope, it may occur the push phenomena even if the parking brake is applied. In this case, apply the fulcrum to the tire and apply the gear in low speed. (downward slope ⇒ reverse 1 step / upward slope ⇒ forward 1 step)</p>
--	--

4-3. Check for new tractor (How to handle new tractor)

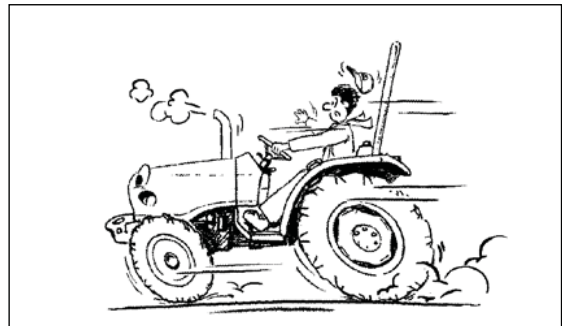
(1) Check point

※ For new tractor, the following should be checked once again even if there was sufficient quality management, inspection, regulating of each part in the factory.

- Appearance check
 - Is there any damage while transporting ?
- Engine cooling system check
 - Is there any anti-freeze in the radiator ? And any leakage ?
- Fuel system check
 - Is there any leakage of fuel in the fuel system ?
- Oil capacity check
 - Is there optimal oil amount in each part ?
- Manipulation device check
 - Is there any problem to operate the manipulation device ?
- Electrical system check
 - Is there any cut-off in the wiring ? Or any problem ?
 - Is there any problem to operate the instruments ?
 - Is the state of battery charging sufficient ?

(2) Notices in handling new tractor

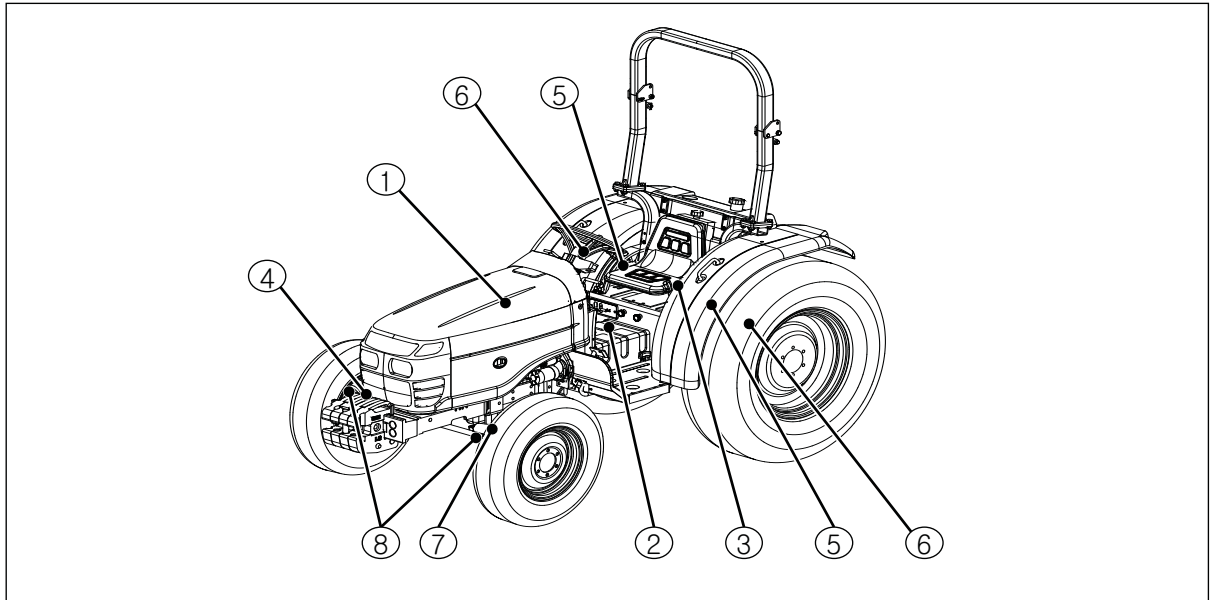
- To carry out the best performance, comply with the following.
 - Sudden start, sudden stop is not allowed.
 - Do not carry out the heavy loaded work and do not lift up the engine rpm to high speed suddenly.
 - Despite of warm temperature outside, carry out warming operation (1500rpm) for 5 minutes after starting the engine.



- After using the first 50hrs,
 - Replace the lubricant and filter at first by the reference of “Lubrication and replacement period of lubricant”. (for further information, refer to “5. Check and Maintenance”).
 - Contact to the agent you purchased or service center for check.

(3) Lubrication and replacement period

- Check, supplement, or replace the lubricant according to lubrication table.

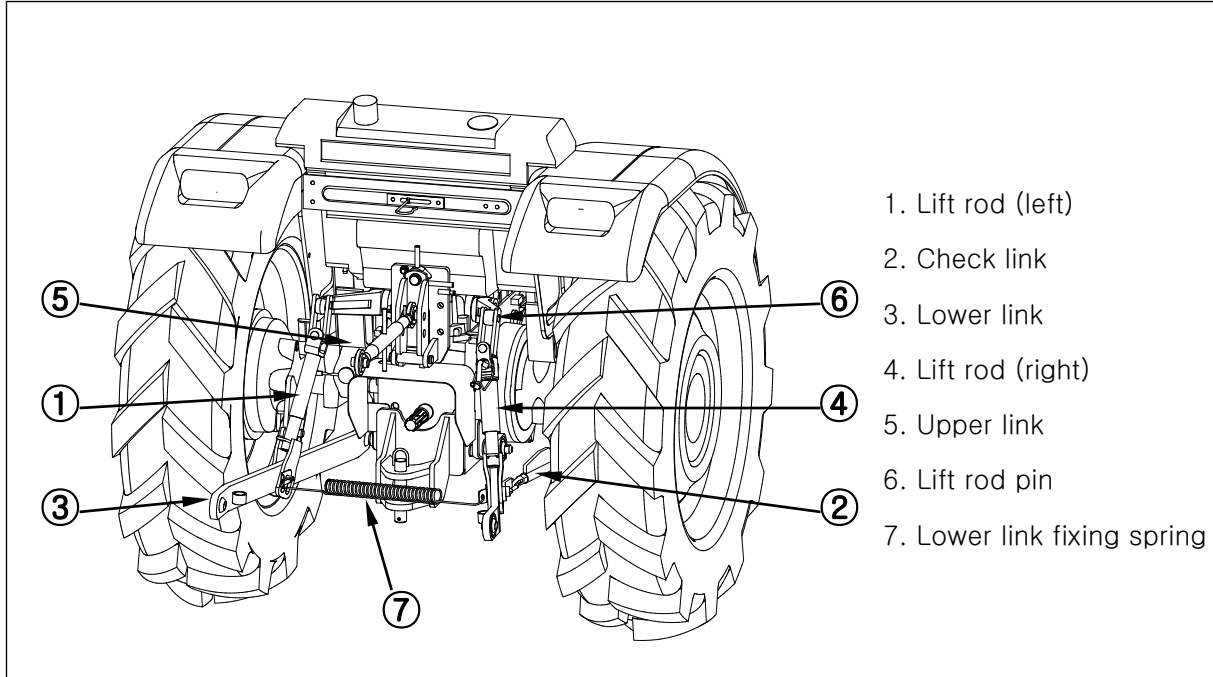


Sign	Lubrication position	Type	Lubrication time (interval)				
			Daily	50	100	200	400
1	Engine (crank case)	LT280D/360D : Engine oil 4.5ℓ	▲	★	●		
		LT450D : Engine oil 7ℓ	▲	★		●	
2	Main transmission	Transmission oil 23ℓ		★		▲	●
3	Auxiliary transmission						
4	Front axle	Transmission oil 8ℓ		★		▲	●
5	Rear axle (inside)	Transmission oil 2.5ℓ		★		▲	●
6	Rear axle (outside)	Transmission oil 2ℓ		★		▲	●
7	Steering cylinder pin	Grease		▲			
8	Front axle arm holder	Grease			▲		

★ : First change ● : Change ▲ : Check and supplement




4-4. Attaching equipment

(1) 3 Point linkage



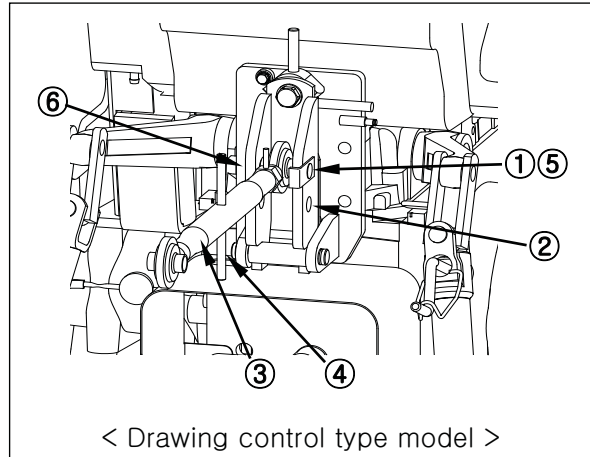
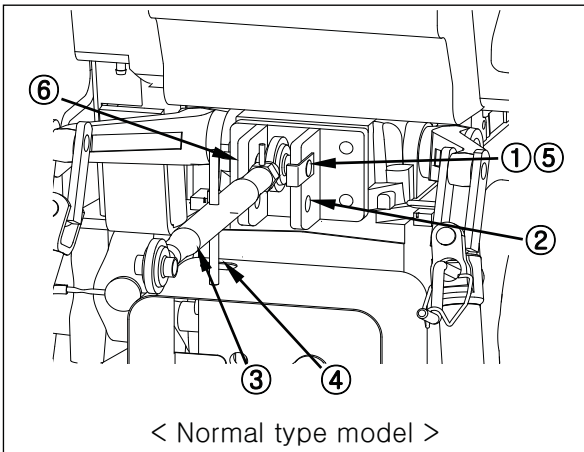
- When running without attaching the implements, carry out the followings.
 1. Fix ⑤ upper link to the fixing hook.
 2. Connect ② check link to ③ lower link.
 3. Connect ⑦ lower link fixing spring to ③ lower links (left, right).
 - When working without using 3 point linkage like trailer working, remove the 3 point linkage as below.
 1. Remove ⑤ upper link.
 2. Draw ⑥ lift rod pin. (left, right)
 3. Detach the fixed part of ② check link body. (left, right)
 4. Detach the fixed part of ③ lower link body. (left, right)
- ※ 3 point linkage should be fixed on the suitable position according to the weight of implements to be attached.

Notice	▶ Before connecting or checking the implements... - Place the PTO switch on "OFF" position.
--------	--

 Caution	▶ When attaching/detaching the implements, the serious damage may occur. - When attaching/detaching, tighten the implements thoroughly and attach the fixing pin after attaching.
 	▶ If trailer or implements is not connected right, it may cause the body turnover or separation of the implements which results in the serious injury. - When installing the implements, it is required to install it to 3 point linkage, the approved draw bar or towing hitch correctly.

(2) Upper link installation & length adjustment

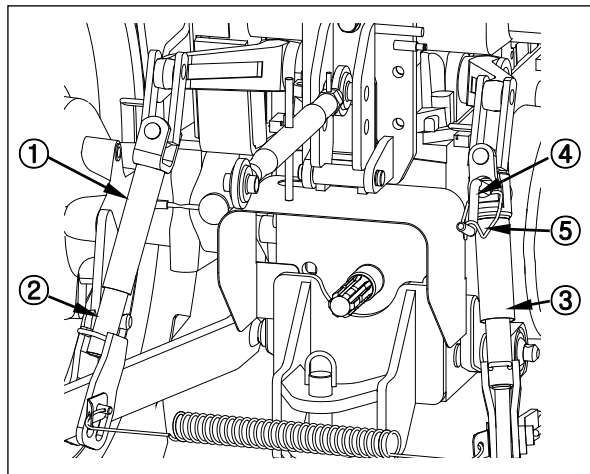
- Use the upper link (③) according to the height (①High, ②Low) and the working(drawing) load (①Sensible, ②Insensible) of the implements.
- Adjust the length of the upper link(③) using the knob(④).



Notice ▶ To keep the upper link fixing pin(⑤) from escaped, be sure to fix the snap pin(⑥).

(3) Adjustment of lift rod's length (Left/Right)

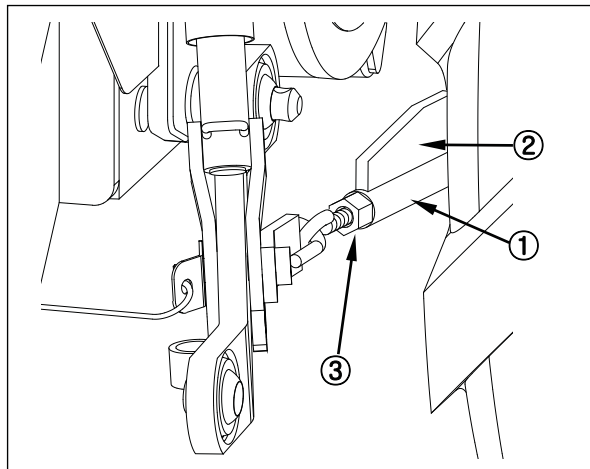
- Separate lift rod from the lower link and then turn lower lift rod (②) to adjust the length of the lift rod(left-①).
- Release fixing spring (⑤) and then use the knob (④) to adjust the length of the lift rod(right-③). After adjustment, fix the knob(④) with fixing spring(⑤).



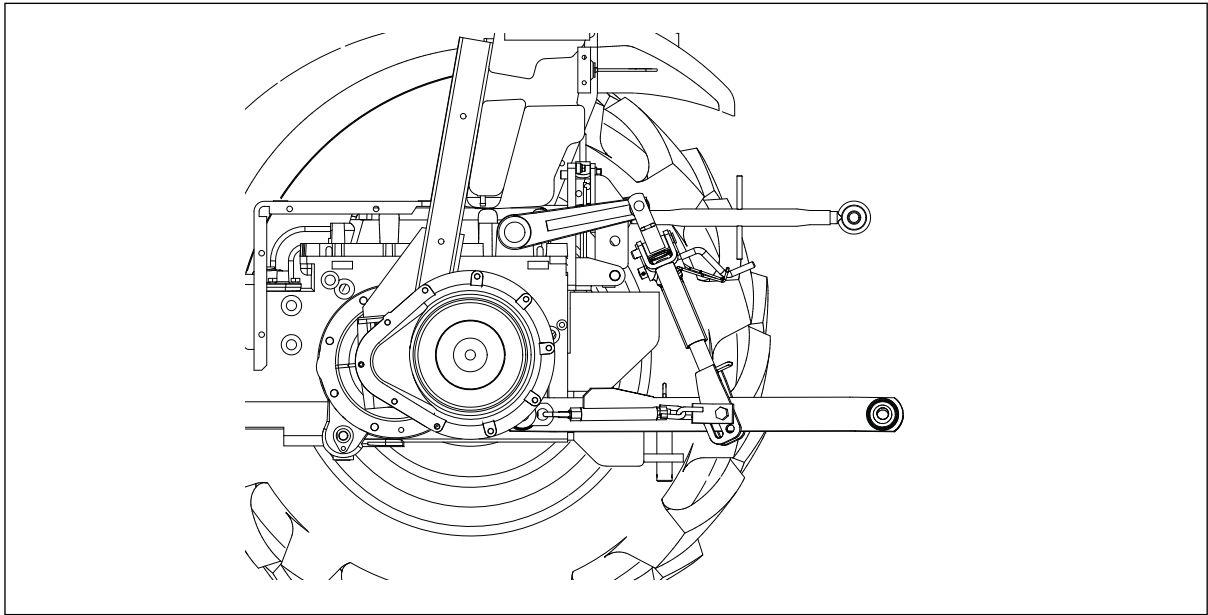
(4) Adjustment of check chain's length

- Turn the knob (②) to adjust the length of the check chain(①). After adjustment, let it tightened firmly by fixing nut(③).

Notice ▶ When adjusting the check chain's length, adjust the implements' swinging clearance to be 2~4cm left and right.



(5) Range of lift rod and upper link



Adjustment range	Lift rod	Upper link
	430 ~ 540 mm	480 ~ 700 mm

(6) Reference of implement installation part

Sign Classification	A	B	C (Max.)	D (Min.)	E (Max.)	F (Min.)	G	H	J	K (Min.)	L	N
CAT. 1	$19 \begin{smallmatrix} 0 \\ -0.084 \end{smallmatrix}$	$19.3 \begin{smallmatrix} +0.21 \\ 0 \end{smallmatrix}$	44	76	69	44.5	$22 \begin{smallmatrix} 0 \\ -0.21 \end{smallmatrix}$	$22.4 \begin{smallmatrix} +0.33 \\ 0 \end{smallmatrix}$	$35 \begin{smallmatrix} 0 \\ -0.2 \end{smallmatrix}$	39 (51)	∅12	683 ± 1.5

A technical drawing of the implement installation part, showing a cross-section of a shaft with various components. Dimension lines A through N are used to specify the sizes of different parts. A is the diameter of a small hole, B is the diameter of a larger hole, C is the width of a component, D is the diameter of the shaft, E is the diameter of a component, F is the diameter of a component, G is the diameter of a hole, H is the diameter of a hole, J is the diameter of a hole, K is the diameter of a hole, L is the diameter of a hole, and N is the total length of the shaft.

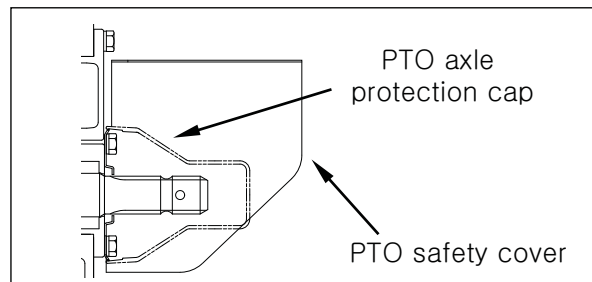
Unit : mm

(7) Reference of PTO axle

PTO rpm / engine rpm	540 / 2520 rpm
Revolution direction	Front Right (direction from which looks the PTO axle)
PTO axle ground level	608mm
PTO axle dimension (Unit : mm)	

(8) PTO safety cover and protection cap

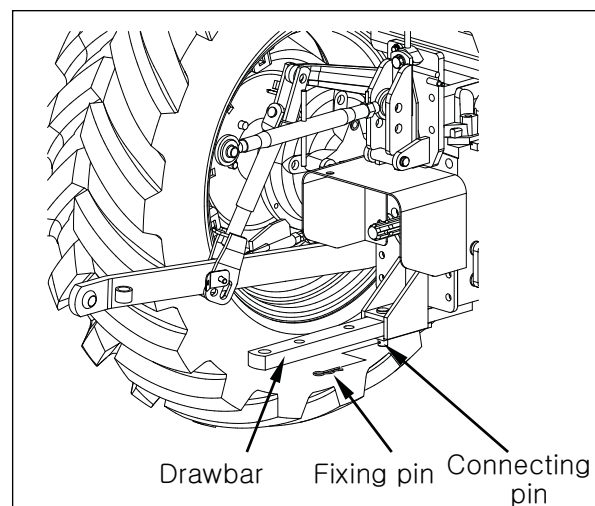
- Attach the PTO cover when using the universal joint.
- When the PTO is not used, apply the grease and insert the axle protection cap.



	<p>Warning ▶ When contacting to the rotating axle, it may cause serious injury.</p> <ul style="list-style-type: none"> - Do not contact to the rotating axle. - Do not use the auxiliary cover (operation cover). - Wear the simple and suitable clothes.

(9) Drawbar

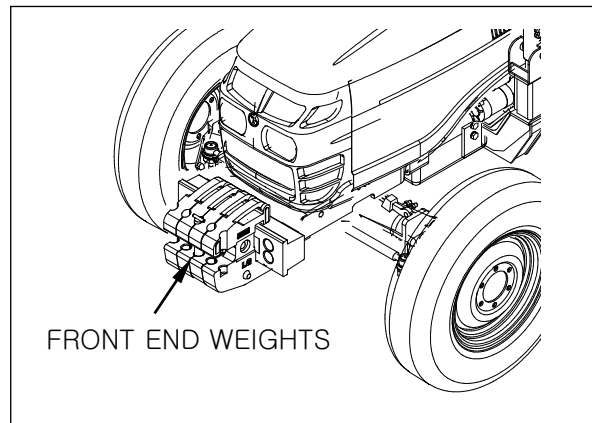
- Use the hitch when towing yield. If you use other parts, the main body may be turn over.
- Length of the drawbar can be available to adjust in accordance with user's application.
- After the change of the length or to use the drawbar, be sure to tighten the drawbar with connecting pin and fixing pin



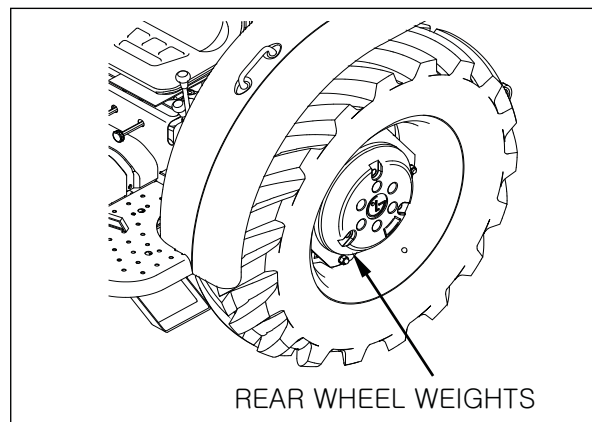
(10) Cast iron ballast (optional)

- If your tractor drive wheels slip due to insufficient grip on the ground, loss of power and speed, increased fuel consumption and premature tire wear may result. To prevent this, optional wheel weights are available for mounting on the rear disc.
- For front ballast to eliminate tipping, optional front weights are available for mounting on the tractor engine frame.
- When using heavy implements which could affect the stability of the tractor, ballast tractor by mounting the appropriate cast-iron counterweights.

- FRONT END WEIGHTS (optional)
4 cast-iron counterweights with handles,
each weighing 20kg , for a total of 80kg.



- REAR WHEEL WEIGHTS
2 cast-iron rear wheel weights with handles,
each weighing 50kg , for a total of 100kg.



4-5. Running speed

- The running speed of tractor or the revolution speed of PTO depends on the contents of the work or ground condition.
For the safety, operate it with the most suitable speed.
- Table of running speed (unit: Km/h)

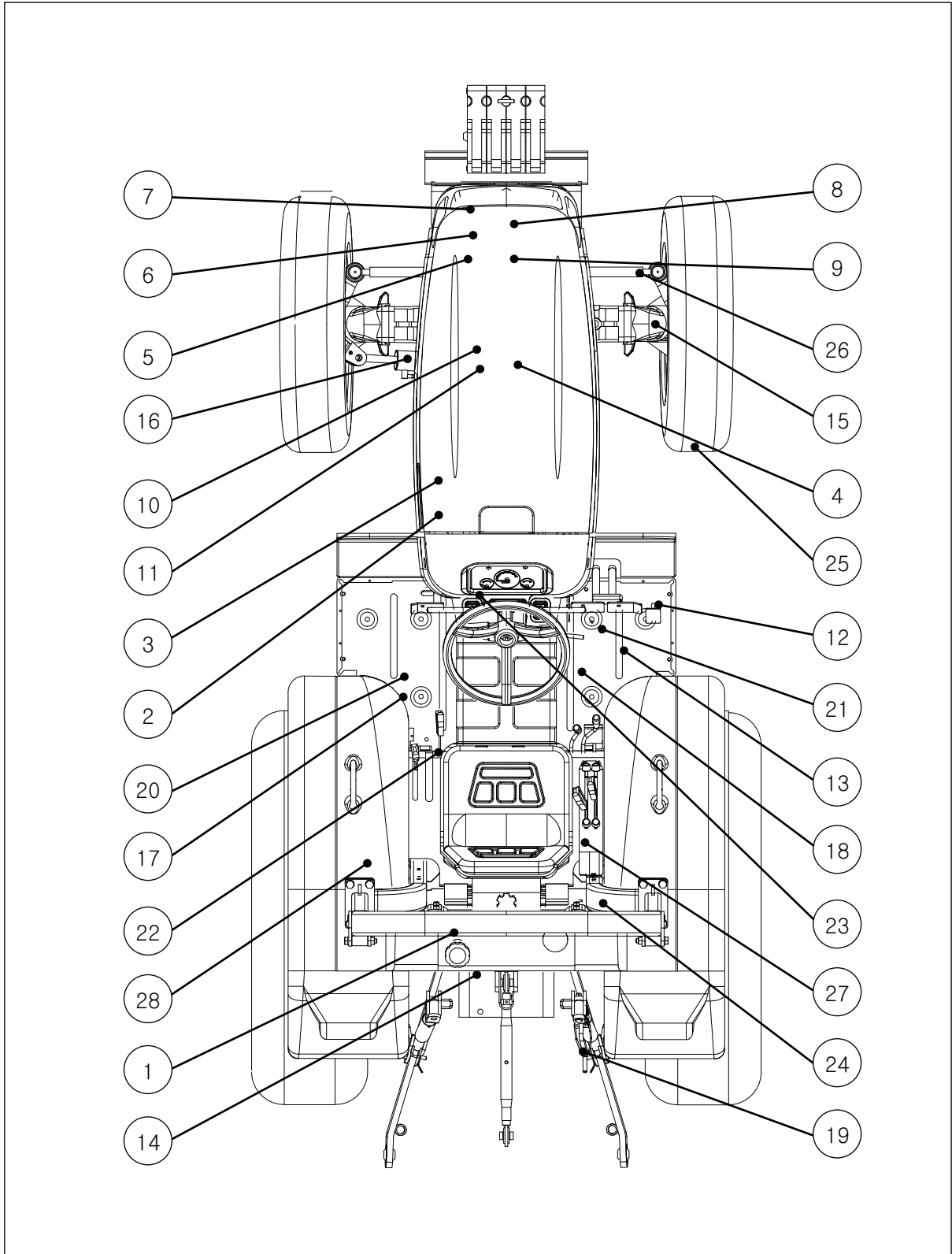
Model	Trans mission	Low speed				Middle speed				High speed			
	Step	1	2	3	4	1	2	3	4	1	2	3	4
LT360D	Front	0.8	1.1	1.5	2.1	2.4	3.4	4.8	6.7	8.0	11.2	15.6	21.9
	Rear	1.0	1.3	-	-	3.1	4.3	-	-	10.1	14.2	-	-
LT280D LT450D	Front	0.7	1.0	1.4	2.0	2.3	3.3	4.6	6.4	7.7	10.7	15.0	21.1
	Rear	0.9	1.3	-	-	3.0	4.2	-	-	9.7	13.6	-	-

Note) LT280D : When ENGINE rating 2600, Tire Dyn. R/R 560mm
 LT360D : When ENGINE rating 2700, Tire Dyn. R/R 560mm
 LT450D : When ENGINE rating 2600, Tire Dyn. R/R 560mm

5. Check and Maintenance

5-1. Checking of each part

(1) Checking part



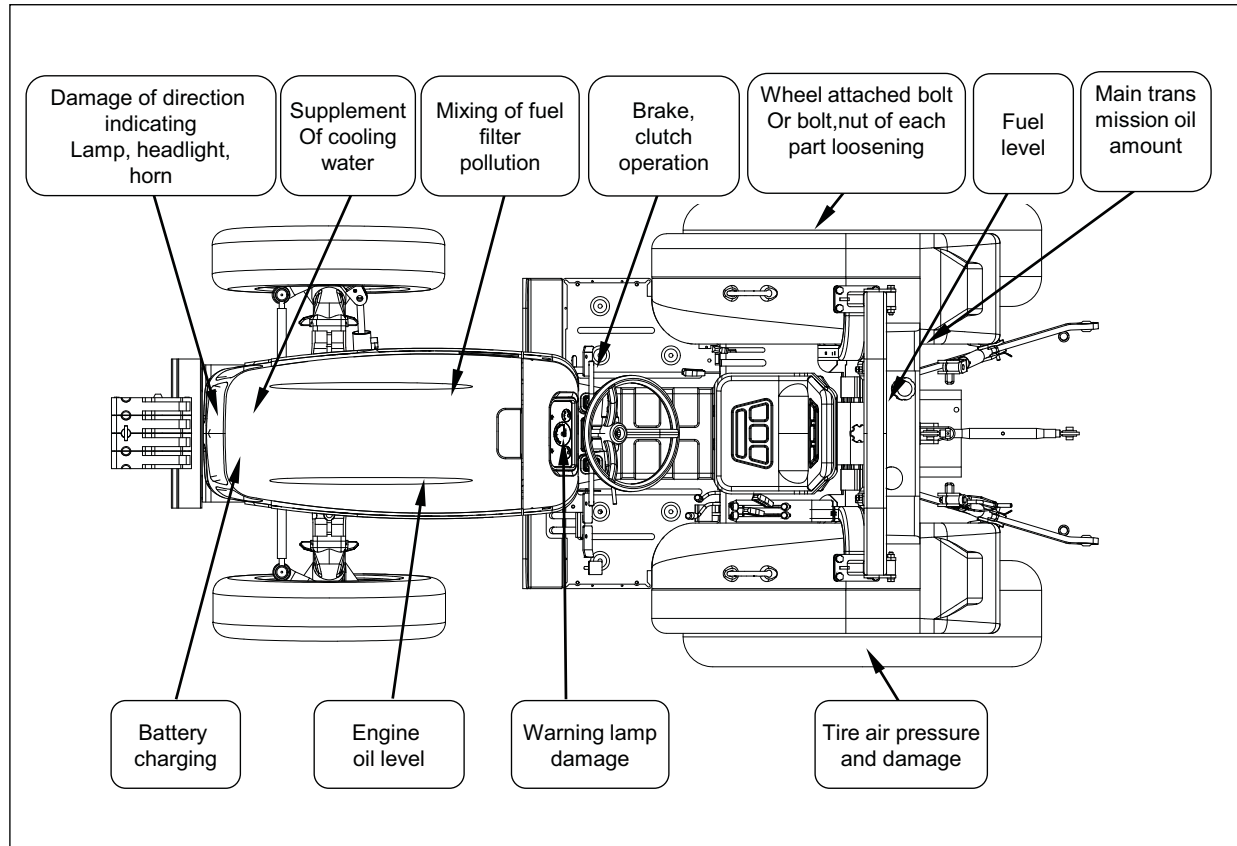
(2) Maintenance list

No.	Checking part	Type	Capacity & Dimension	Checking period (time)				
				Daily	50	100	200	400
1	Fuel tank	Diesel oil	40 ℓ	▲			■	
2	Fuel filter	Element	LT280D/LT360D			■		●
			LT450D					●
3	Engine oil	CC, CD class	LT280D/LT360D : 4.5 ℓ	▲	★	●		
			LT450D : 7 ℓ	▲	★		●	
4	Engine oil filter	Element	LT280D/LT360D : 0.5 ℓ		★	●		
			LT450D : 0.5 ℓ		★		●	
5	cooling water	Soft water	LT280D/LT360D : 4.9 ℓ LT450D : 6.1 ℓ	▲				
6	Radiator net			■				
7	Air cleaner			■	(change : ref.to air cleaner check)			
8	battery			▲				
9	Fan belt tension		Press 10~12 mm		▲			
10	Valve interval		0.25 mm				▲	
11	Nozzle injection pressure		LT280D/LT360D:140Kg/cm ² LT450D : 120 Kg/cm ²				▲	
12	Speed gauge cable	Engine oil	Small application			▲		
13	Hydraulic filter		LT280D/LT360D		★	●		
			LT450D		★		●	
14	T/M oil (main transmission)	LG T/M & HYD. OIL	23 ℓ		★		▲	●
15	Front axle oil	T/M oil	8 ℓ		★		▲	●
16	Steering cylinder(L/R)	Grease	Proper amount		▲			
17	Clutch pedal boss	Grease	Proper amount		▲			
18	Brake pedal boss	Grease	Proper amount		▲			
19	Lift rod (L/R)	Grease	Proper amount		▲			
20	Clutch pedal clearance		20~30 mm	▲				
21	Brake pedal clearance		50~60 mm	▲				
22	Operation of each lever			▲				
23	Instrument, accessory			▲				
24	Bolt, nut			▲				
25	Tire air pressure			▲				
26	Towing		0~5 mm			▲		
27	wiring	Connection, damage					▲	
28	Final drive oil (rear axle)	T/M OIL	Left,right each 4.5 ℓ (inside:2.5ℓ/outside:2ℓ)		★		▲	●

★ First change ● Change ▲ Check, Adjustment and Supplement ■ Cleaning

5-2. Check before start (Daily check)

- Check the following check point before using to avoid the failure.



(1) Engine oil

- Oil capacity :

LT280D/LT360D : 4.5 ℓ

LT450D : 7 ℓ

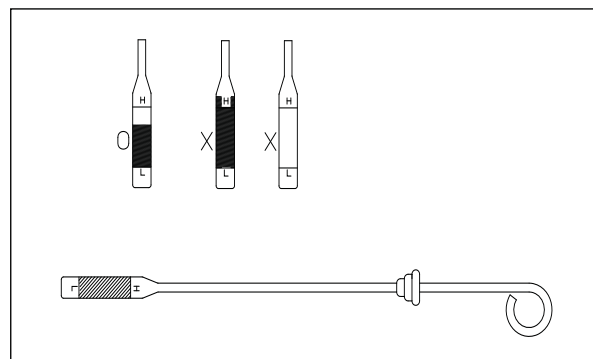
- Use oil

- Diesel engine oil (CC, CD class). Select it according to temperature by the reference of table.

- Check

- Check before starting the engine or 5 minutes later after stopping the engine.
- If the oil level is between the “L” and “H” marks, it means ‘correct level’.
- Check only when the engine is stopped.

Season	Temperature	Lubricant No.
Winter	0°C~-20°C	SAE 10W 30
Spring/ Fall	0°C~20°C	SAE 10W 30, SAE20
Summer	more than 20°C	SAE 20W /40



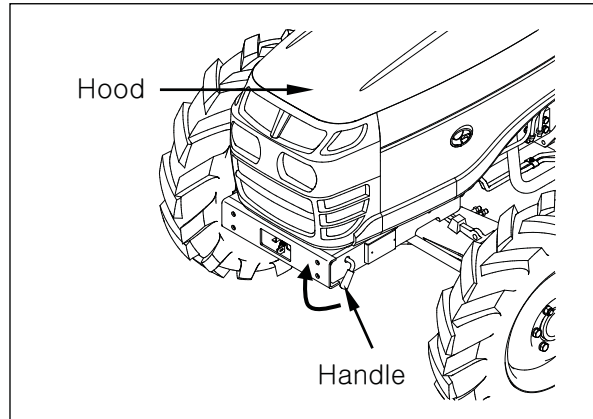
● **ACCESS FOR INSPECTION AND MAINTENANCE**

To access the engine components for inspection, lubrication and maintenance operations, the hood must be opened.

The following instructions describe the procedure to be followed.

● **OPENING THE HOOD**

The hood is hinged at the rear to allow easy and safe access to the various engine components. Pull the handle and lift the hood by its front as shown by the arrow. Put the strut in the link to hold the hood open.



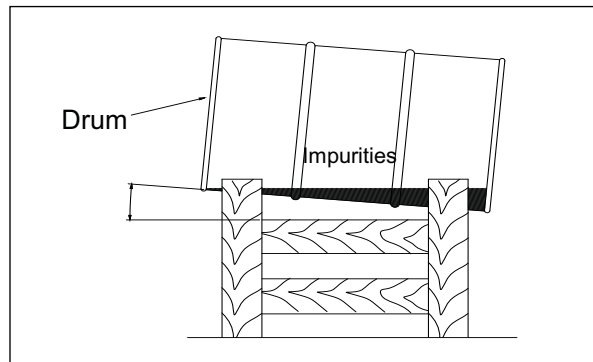
Notice	▶ Use a suitable pair of gloves to prevent burning your hands when you open the hood.
--------	---

(2) Fuel

① **Tank capacity : 40ℓ**

② **Use fuel**

- Use the low sulfuric diesel oil.
- If water or dust is mixed, it may cause the severe failure of the engine. To save or use the fuel, the fuel saving facility should be equipped as shown on the figure. If possible, it is preferred to supply the oil in the gas station directly.



③ **Diesel oil handling in winter time**

- General diesel oil tends to generate paraffin dregs in winter time which may cause the poor start. Thus, it is preferred to use diesel oil for winter in winter time.
- During mid winter, mix diesel oil with white lamp oil as shown on the left.

Temperature	More than -15°C	Less than -15°C
Fuel	Diesel oil for winter 100%	20% white lamp oil added

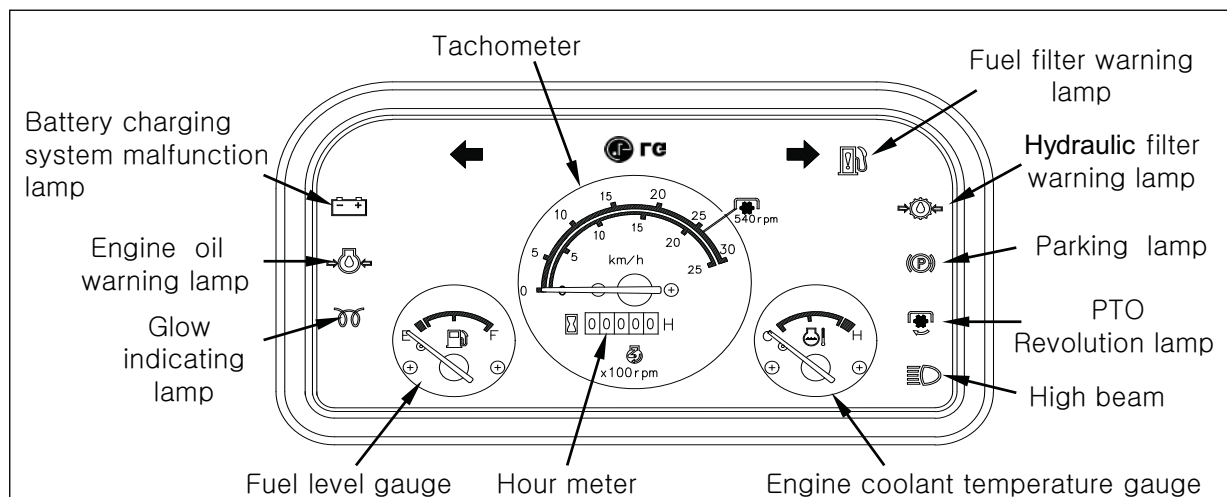
④ **Check**

- Check the fuel gauge and if insufficient, fill the fuel tank with the fuel.

Notice	▶ if the engine stops after finishing the work, fill the fuel tank with the fuel and then preserve it separately. As the temperature falls down, the humidity in the fuel tank is condensed and may mix with the fuel.
--------	---

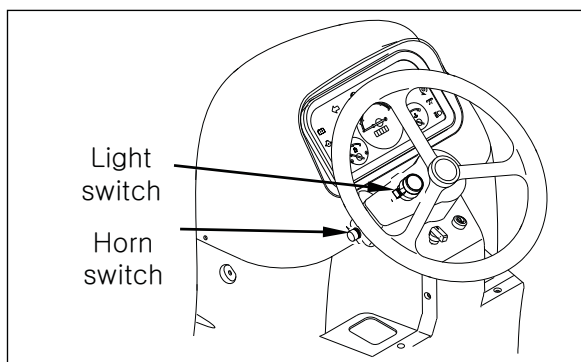
(3) Warning lamp

- Place the key switch on “RUN” position and check if the engine oil, hydraulic filter warning lamp or battery charging system malfunction lamp is ON.
- Place the key switch on “RUN” position and press the operating button to check if the warning lamp shown below is ON. (Direction indicating lamp, low beam / high beam, parking lamp, PTO turning lamp will not be ON)



(4) Light, horn check

- Check the operation status of light, horn etc.



(5) Head lamp/Indicating lamp bulb check and replacement

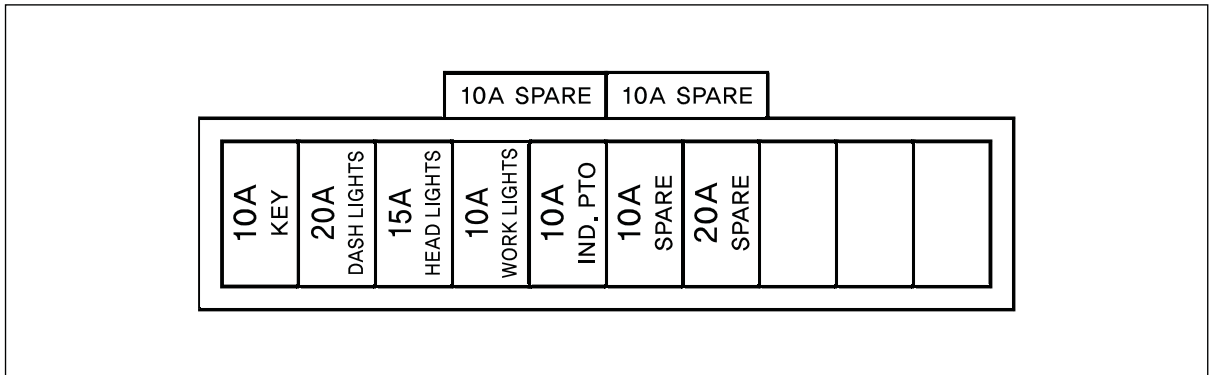
- If the lamp is OFF despite of operation of switch of head lamp or indicating lamp,
 1. Check the corresponding fuse in the fuse box.
 2. If there is no problem in the fuse, check the bulb of the corresponding lamp or change it.

N O T I C E	▶ Use the bulb of rated capacity.
	▶ In case of using the bulb except the above described, it may cause the failure of electric system.

illuminating lamp	LT280D/LT360D	LT450D
Headlight (low beam / high beam)	12V 35W / 35W	12V 40W / 45W
Direction indicating lamp (rear)	12V 8W	12V 21W
Brake lamp / tale lamp (rear)	12V 10W / 5W	12V 21W / 5W
Working lamp	12V 23W	
Instrument panel lamp	12V 3.4W	
Instrument panel lamp, warning lamp	14V 3.4W, 1.4W	

(6) Fuse check and replacement

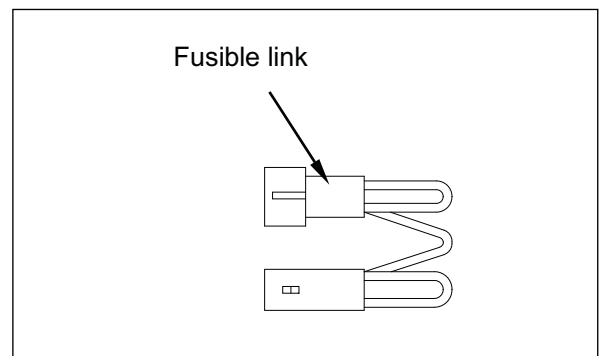
- How to change the fuse
 1. Remove the cover of fuse box.
 2. Check each fuse and remove the damaged fuse.
 3. Change with new one same as damaged one.
- The capacity and function of each fuse is described in the cover of fuse box.



Notice	<ul style="list-style-type: none"> ▶ If the same function fuse is damaged often, contact to the service center near you to check instead of using the alternatives such as wire or aluminum foil. ▶ If using the alternatives instead of the rated capacity fuse, it may cause the fire which results in the damage of tractor or injury accident.
--------	--

(7) Fusible link check and replacement

- Fusible link is attached to the wiring of right side of the engine.
LT280D/LT360D : Left / LT450D : Left & Right
- If fusible link is damaged, remove the connector from the wiring.
- As fusible link is a device to protect the electric device and wiring, if damaged, check if there is a trouble in the electric system and change with LG tractor genuine products if necessary.



Notice	<ul style="list-style-type: none"> ▶ If fusible link is cut off often, contact to the service center near you to check. ▶ If used the alternatives instead of the rated capacity fusible link, it may cause the fire which results in the damage of tractor or injury accident. ▶ The direct wire connection to the battery outlet may cause the fire.
--------	---

(8) cooling water

① Capacity

LT280D/LT360D : 4.9 ℓ, LT380D : 6.1 ℓ

② Check

- Check the coolant when the engine is cold.
The coolant level should be below the radiator neck. The level of coolant in the sub tank must always be above the “LOW” mark.
- If necessary, top up and add coolant through fill point.
- Do not open the radiator cap except the cases to check the cooling water or change it.

③ Supplement

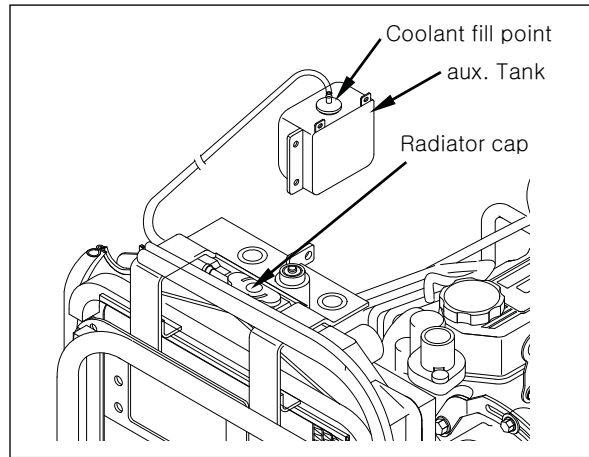
- In case of supplement of cooling water, use the clean soft water.
If not, the cooling water jacket shall be corrupted or the rust shall be generated.



④ Replacement

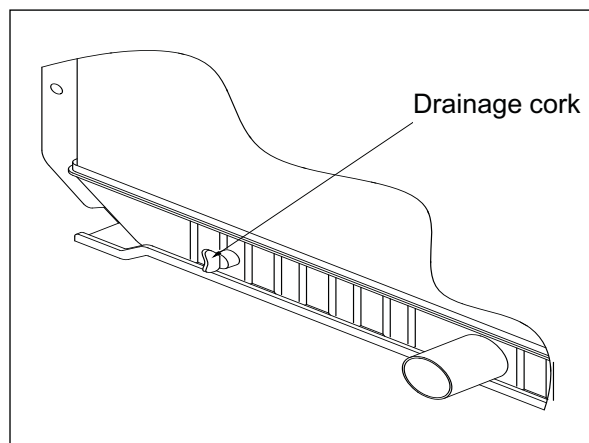
- When draining the cooling water of engine or radiator, open the drainage cork under the radiator to drain the cooling water.
- When supplying the water, attach the overflow pipe and supply the water up to the inlet of radiator. For aux. Tank, supply the proper amount of water separately.
- Anti-freeze is loaded in the release.
After passing the first winter after purchasing, change the cooling water.
- For further information, contact to the agent.
The cooling water cork should be opened only when the engine is cooled down.

⑤ Anti-freeze

- If the density of anti-freeze in the cooling water is low, the cooling water may be frozen and the engine or radiator may be broken.
- Use the anti-freeze always and if no anti-freeze, drain the cooling water in the winter time.(drainage outlet :radiator – drainage cork, engine – cooling water drain plug)
- Wash the radiator or jacket 2~3 times with clean water before charging the anti-freeze.
- The amount of anti-freeze depends on temperature, cooling water amount.
- Start the engine for 5 minute after injecting the anti-freeze to mix it with water well.



 Warning	▶ When opening the radiator cap, there is a possibility of a burn due to hot cooling water or steam.
	 ▶ Cool down the cooling water sufficiently before opening.

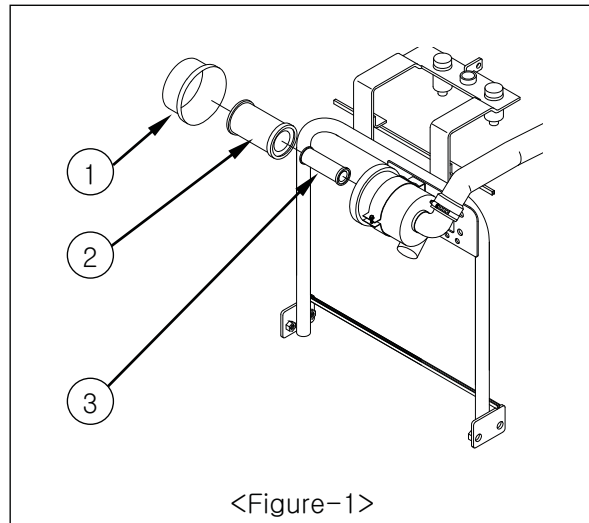


(9) Air cleaner

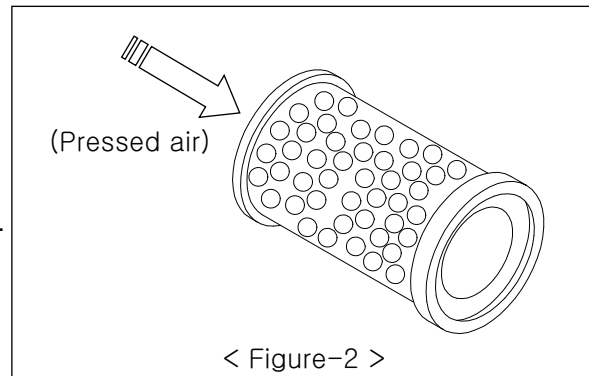
① 1st filter element cleaning

- Remove the cover ① and pull out the 1st filter element and clean it as below. (Fig.-1)
- When cleaning the element in the working field, tap the element by hand to remove the dust.

Notice	<ul style="list-style-type: none"> ▶ Do not tap the element on the hard place when cleaning. ▶ If the element is cracked, change it with new one.
---------------	---



- If the dust is not removed by tapping, use the pressed air (less than 500kPa (5bar; 72psi)) from up to down and outside to inside as shown on "Fig. 2" to remove the dust and foreign materials.
And clean inside the filter element with wet clothes.
- When washing the element with tepid water, let it soaked fully for 10 min., after that clean it up for 5 min.



Notice	<ul style="list-style-type: none"> ▶ Do not assemble the wet filter element. ▶ Do not dry the wet filter element by using the pressed air. ▶ Do not start the engine in the state that 1st filter is not assembled.
---------------	--

② Safety filter element

- Safety filter element (Fig.1) shall be changed
 - When it is damaged
 - Every 3 times of 1st filter element cleaning
 - At least once a year.

Notice	<ul style="list-style-type: none"> ▶ Do not reuse the safety filter element after cleaning it. (replace it during the change period.)
---------------	--




③ Filter assembly

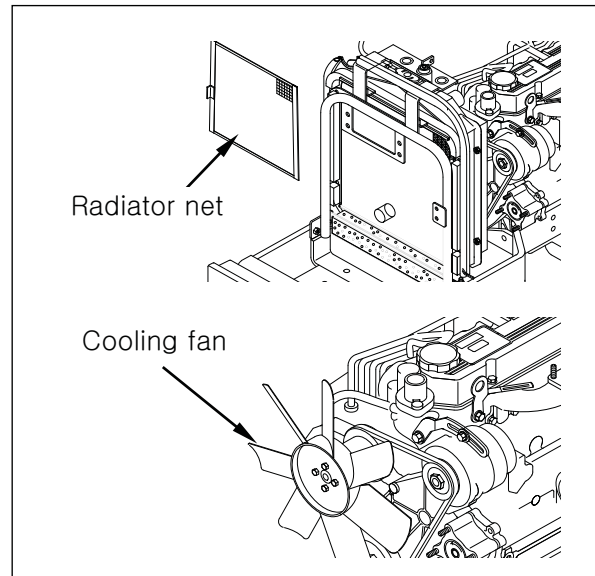
- After cleaning the filter or when changing the filter, assemble the filter by pushing it deeply into the filter housing.
- Check the following instructions before assembling the filter element.
 - Check if there is a damage inside filter element by using the light. If founded the tiny crack or small hole in the filter element or the gasket is damaged, change it with new one to assemble.

Notice	<ul style="list-style-type: none"> ▶ Do not start the engine or close the hood in the state that filter element is not assembled.
---------------	--

(10) Cleaning of Radiator

- With a jet of compressed air (not exceeding 500 kPa (5 bar ; 72.5psi)), clean off any dirt accumulated on the radiator screen and cooling fan.

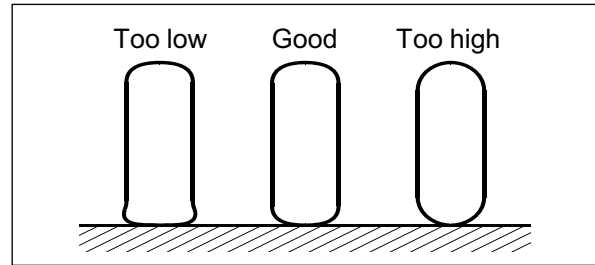
 Caution	<p>► For efficient cooling, the radiator screen must be kept clean. Remove any dust or oil and carefully straighten any bent fins. Reinstall screens.</p>
 Warning	<p>► Radiator should be cleaned only in the state that the engine stops.</p>
	




(11) Tire air pressure and damage

① Check

- Check the air pressure or the damage.
If the tire is damaged, change it with new one.



 Caution	<p>► It is not allowed to remove/attach or change the tire voluntarily. Carry out the work in the tire repair center equipped with the expert and special safety tools.</p>
---	---

② Standard air pressure

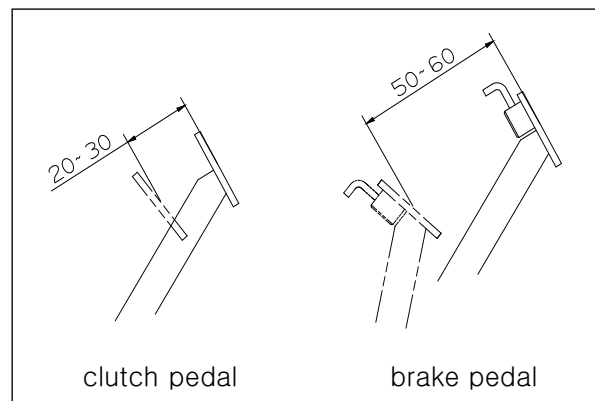
Front wheel	1.4 kgf/cm ²
(front rod) working	1.6 kgf/cm ²
Rear wheel	2.2 kgf/cm ²

(12) Tightening state of bolt and nut of each part

- Check if the bolt or nut is loosened and if loosened, tighten it again.

(13) Brake and clutch adjustment

- Check the distance of brake and clutch pedal play.
- Distance of brake pedal play : **50 ~60mm**
(When applying the brake, it is not allowed to exceed 60mm. In this case, adjust the rod.)
- If the distance of clutch pedal play is too small or too big, adjust it through the joint of clutch rod.
The proper distance shall be **20~30mm**.



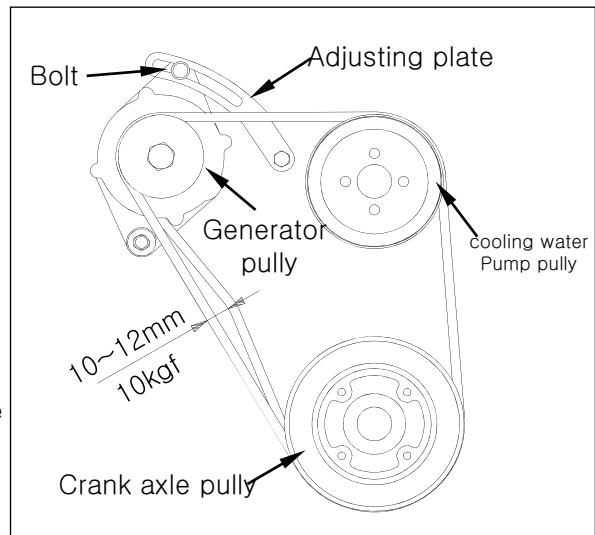
5-3. First 50hr check

- Change the engine oil and engine oil filter. (⇒refer to every 100hr check for LT280D/LT360D, every 200hr check for LT450D)
- Change the hydraulic filter. (⇒refer to every 100hr check for LT280D/LT360D, every 200hr check for LT450D)
- Change the front axle oil and main transmission, rear axle oil. (⇒ refer to every 400hr check)
- After operating the first 50hr, contact to the agent or service center to check if there is a trouble.

5-4. Every 50hr check

(1) Tension adjustment of Fan belt

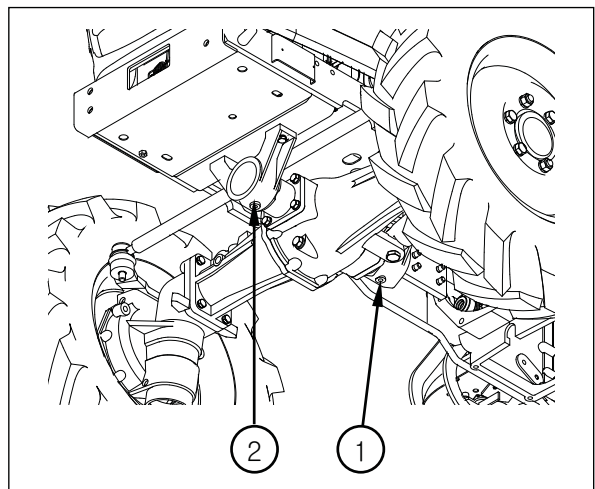
- If the tension of fan belt exceeds the standard value, loosen the bolt and adjust the tension.
 - Belt tension : crank axle pulley ~ generator pulley
 - **Standard value : approx. 10~12mm** (if pressed by 10Kgf)
- When adjusting the tension,
 1. Loosen 2 fixing bolt of generator and insert the bar between crank case and pull the bar to apply the tension to the belt.
 2. With proper tension, tighten the bolt attached to the adjusting plate of generator.
 3. If the tension of belt becomes standard value, tighten the bolt which fixes the generator.



(2) Lubricating front axle support

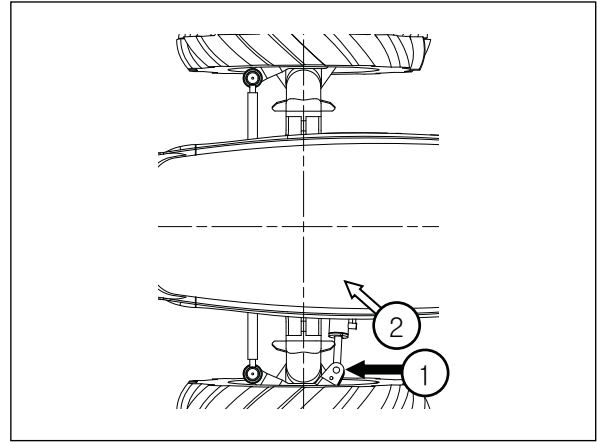
- Using a grease gun, apply general purpose grease in two lubricating nipples (1) and (2). Continue greasing until grease is seen being expelled.

Notice	▶ Carry out this service after every ten hours of operation when working under very wet and muddy condition.
--------	--



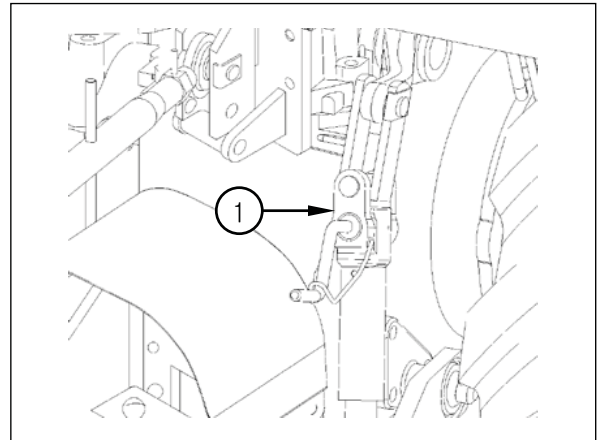
(3) Lubricating steering cylinders

- Using a grease gun, apply general purpose grease in two lubricating nipples (1) and (2). Continue greasing until grease is seen being expelled.



(4) Lubricating lift linkage

- Using a grease gun, apply general purpose grease in the lubricating nipple (1). Continue greasing until grease is seen being expelled.



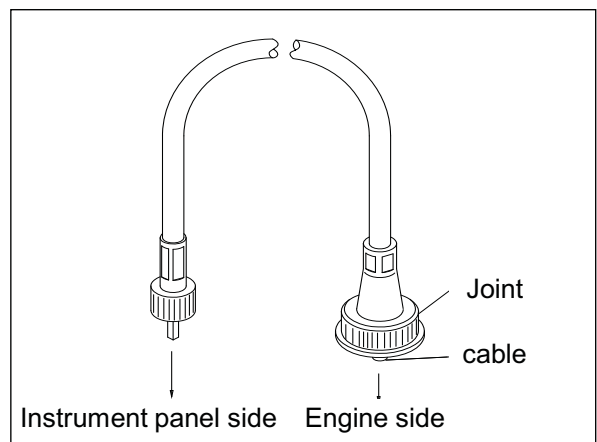
Notice

► Thoroughly clean all grease fittings prior to greasing and replace damaged grease fittings immediately.

5-5. Every 100hr check

(1) Tachometer cable cleaning

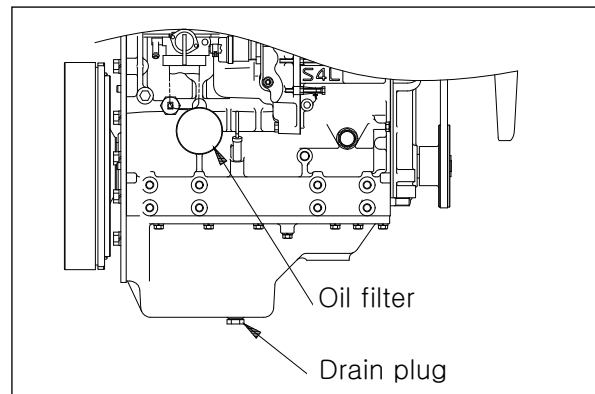
- Loosen the joint in engine side and remove the cable and clean it with clothes.
- When cleaning, put it in the engine oil for 1~2 minutes and get it out and 5 minutes later, dry the oil of the cable and then assemble it.
- Before assembling the engine, turn the cable by hand to check if the needle of tachometer moves.



(2) Engine oil drain (LT280D/LT360D)

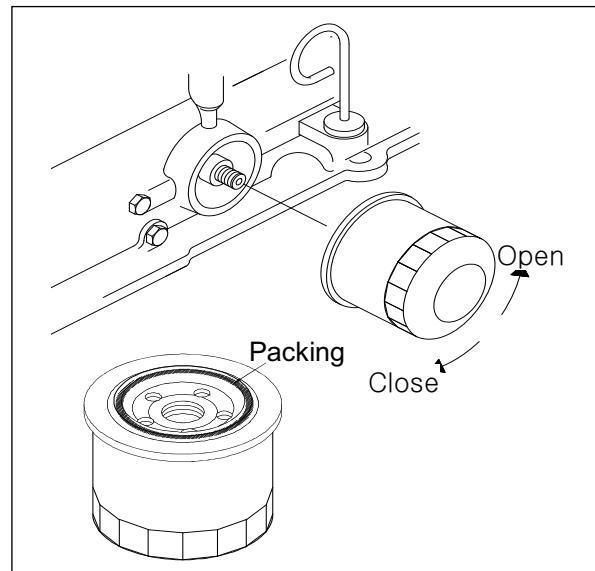
- When the engine stops and the oil stays still warm, loosen the drain plug of oil fan to drain the oil completely.

Notice	▶ If you drain the engine oil when the engine stays still warm, the impurities shall be drained completely.
--------	---



(3) Engine oil filter replacement(LT280D/LT360D)

- Disassemble the oil filter using the filter wrench.
- Remove the oil stained to the oil filter of crank case by blowing.
- When assembling the new oil filter, check if the rubber packing is fixed in the groove completely.
- Apply the engine oil to the packing.
- When assembling the oil filter to the bracket, attach it so that it can be turned by $\frac{3}{4}$ ~1 revolution after the packing and filter case are contacted.

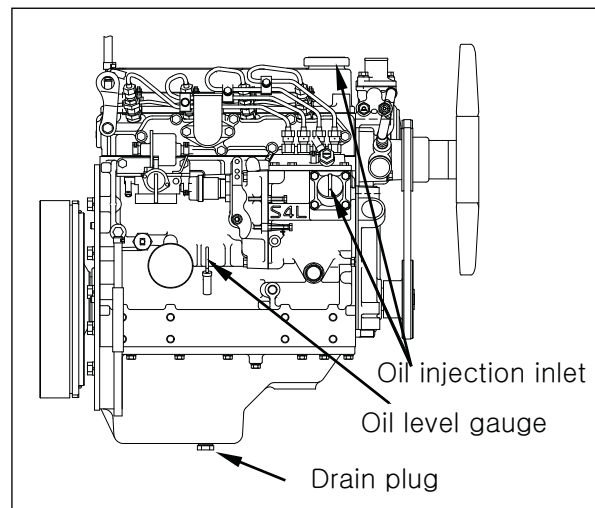


(4) Engine oil injection (LT280D/LT360D)

- Attach the drain plug and tighten the normal torque. (normal torque : $4.0 \pm 0.5 \text{Kg.m}$)
- Inject the oil into oil injection inlet by normal capacity.

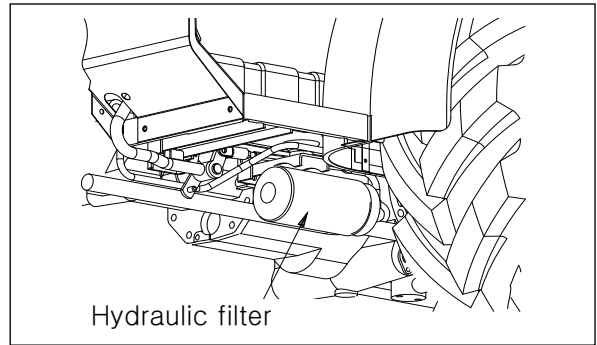
Engine oil capacity : 4.5ℓ



- After starting the engine, check if there is oil leakage through idle operation for several minutes. If founded oil leakage, tighten the filter once again.
- After stopping the engine, check the oil level again after passing about 30 minutes. If the oil level is between high limit and low limit of oil level gauge, it is 'normal'.
- If the iron is attached to the element of oil filter to be disassembled, contact to the agent.



(5) Hydraulic filter replacement (LT280D/LT360D)

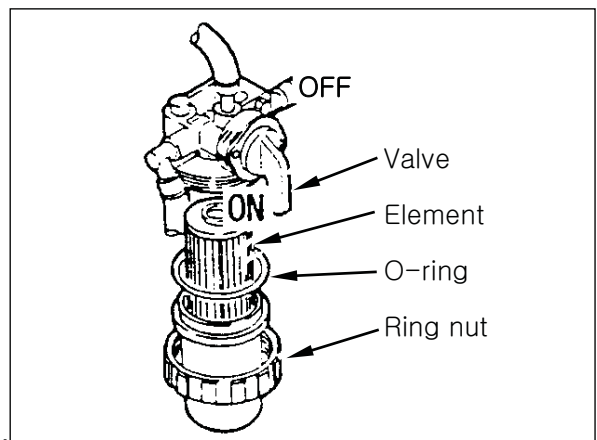
- If hydraulic filter is clogged, hydraulic action does not work. When changing the the transmission oil, change the hydraulic filter together.



 Warning	<p>▶ When checking or repairing the hydraulic device, the high pressure oil may cause the injury.</p> <ul style="list-style-type: none">- When repairing, adjusting or removing the hydraulic device, the engine should be stopped.- When finding the leakage or repairing, wear the protection equipment for the eyes or hands.- If the oil penetrates the skin, take the necessary action from a doctor.
	

(6) Cleaning of fuel filter (LT280D/LT360D)

- Place the valve on "OFF" position.
- Release the ring nut to remove the cup.
- Wash the impurities out of the element with diesel oil.
- Put the washed element into the cup and let them assembled. At this time tighten the ring nut taking care of O-ring to be assembled exactly.
- Place the valve on "AIR" position, perform air-bleeding and then place the valve on "ON" position.

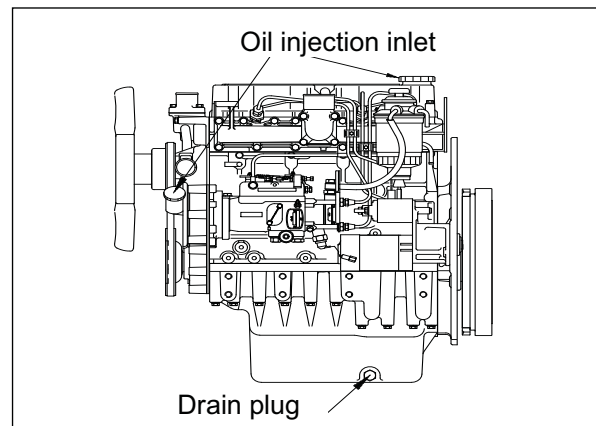


5-6. Every 200hr check

(1) Engine oil drain (LT450D)

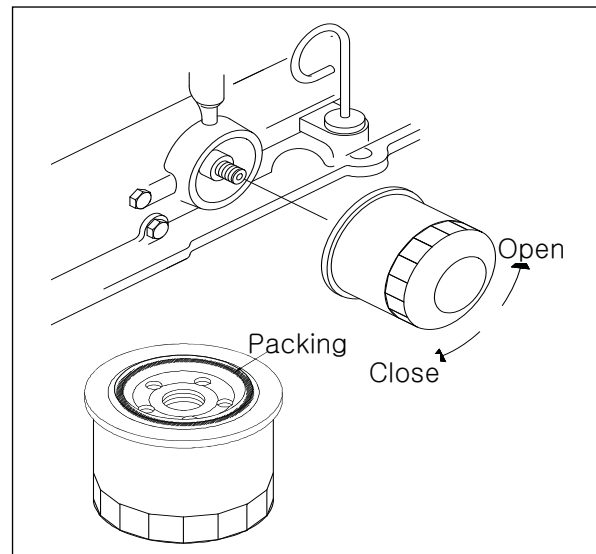
- When the engine stops and the oil stays still warm, loosen the drain plug of oil fan to drain the oil completely.

Notice	▶ If you drain the engine oil when the engine stays still warm, the impurities shall be drained completely.
--------	---



(2) Engine oil filter replacement(LT450D)

- Disassemble the oil filter using the filter wrench.
- Remove the oil stained to the oil filter of crank case by blowing.
- When assembling the new oil filter, check if the rubber packing is fixed in the groove completely.
- Apply the engine oil to the packing.
- When assembling the oil filter to the bracket, attach it so that it can be turned by $\frac{3}{4}$ ~1 revolution after the packing and filter case are contacted.

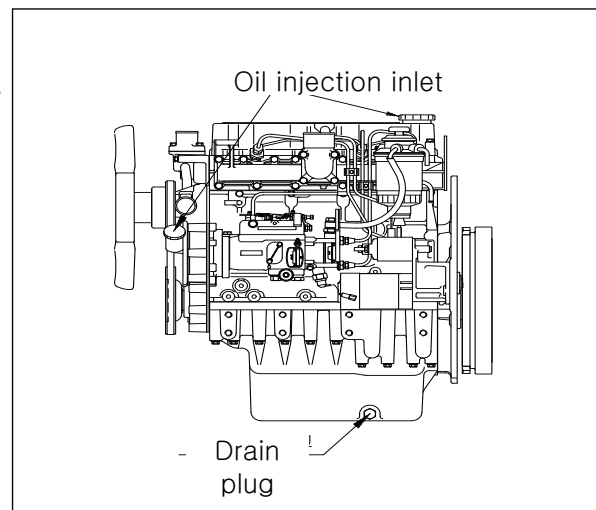


(3) Engine oil injection (LT450D)

- Attach the drain plug and tighten the normal torque. (normal torque : $4.0 \pm 0.5 \text{Kg.m}$)
- Inject the oil into oil injection inlet by normal capacity.

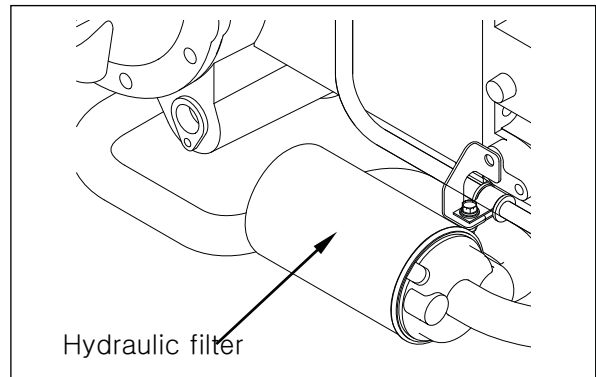
Engine oil capacity : 7 ℓ

- After starting the engine, check if there is oil leakage through idle operation for several minutes. If founded oil leakage, tighten the filter once again.
- After stopping the engine, check the oil level again after passing about 30 minutes. If the oil level is between high limit and low limit of oil level gauge, it is 'normal'.
- If the iron is attached to the element of oil filter to be disassembled, contact to the agent.



(4) Hydraulic filter replacement (LT450D)

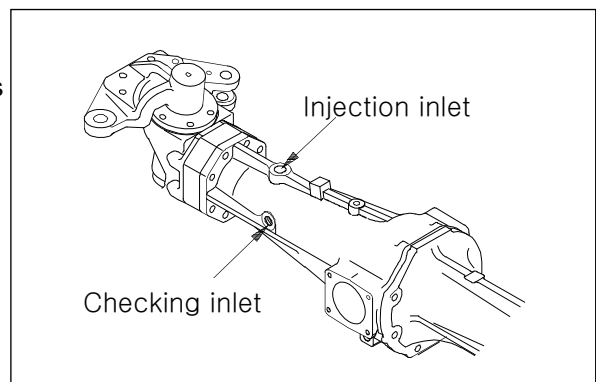
- If hydraulic filter is clogged, hydraulic action does not work. When changing the the transmission oil, change the hydraulic filter together.



	<p>Warning</p>
<p>▶ When checking or repairing the hydraulic device, the high pressure oil may cause the injury.</p> <ul style="list-style-type: none"> - When repairing, adjusting or removing the hydraulic device, the engine should be stopped. - When finding the leakage or repairing, wear the protection equipment for the eyes or hands. - If the oil penetrates the skin, take the necessary action from a doctor. 	

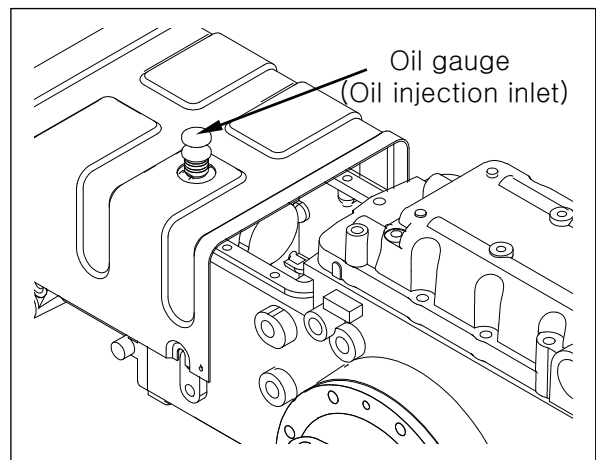
(5) Front axle oil capacity check

- Open the plug of checking inlet and check if there is oil leakage.
- If insufficient, inject the oil into injection inlet.
(check the state by using the checking inlet 5~10 minutes later after injecting.)
- For use oil, refer to capacity table.
- **Normal capacity : 8ℓ**



(6) Main transmission oil check

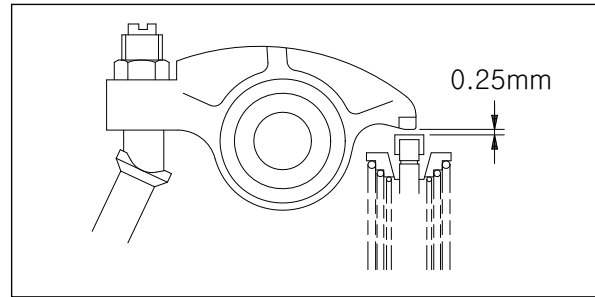
- When checking, stop the engine.
- If it is within the deviant line of oil check inlet, it is 'proper level'.
- For use oil, refer to capacity table.



	<p>Warning</p> <p>▶ Before checking the oil level, park the tractor on the level ground.</p> <p>▶ If oil is polluted, it may cause the early wearing of machine and the failure of hydraulic device. Keep around oil injection inlet clear and then open the cap.</p>
--	--

(7) Valve gap adjustment

- Ask the LG agent to check the valve gap.
normal gap : 0.25mm
if the gap is big, the noise is generated and if the gap is too small, it is hard to compress by which the engine output falls down.



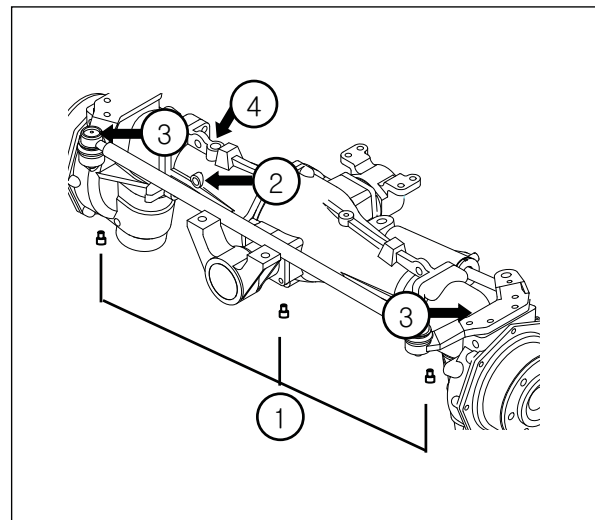
(8) Nozzle injection pressure adjustment

- Ask the LG agent to adjust.
Normal injection pressure : LT280D/LT360D ⇒ 140 Kg/cm²
LT450D ⇒ 120 Kg/cm²

5-7. Every 400hr check

(1) Changing oil in front axle housing

- Park tractor on level ground.
- Drain oil into a suitable container by removing the three drain plugs (1) and two air bleeding plugs (3).
- After all oil has been drained from the housing, install drain plugs.
- Remove oil level plug (2) and filler plug (4) and fill the housing through the filler hole until oil comes out of the oil level hole.
Normal capacity : 8ℓ
- Install the air bleeding plugs, oil level plugs and filler plug.

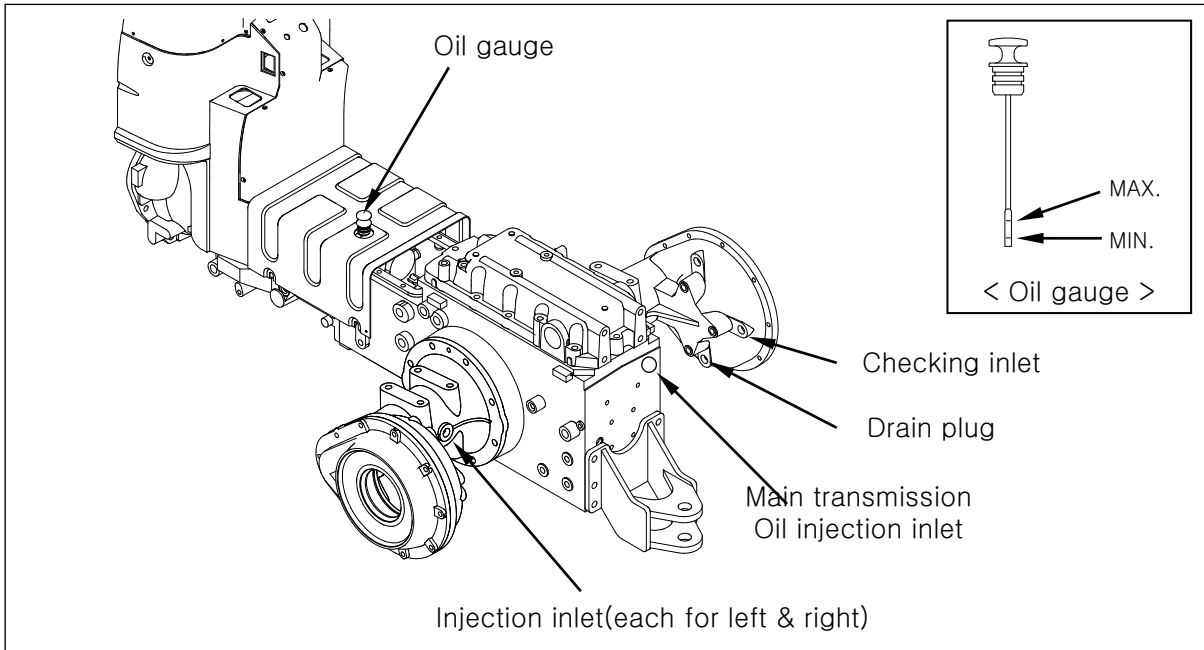


Notice	▶ Change the front axle oil regularly after every 400 hours of operation hereafter.
--------	---

(2) Main transmission oil replacement

- Loosen the clutch or drain plug under the axle housing and drain the oil completely.
- Clean the iron powder attached to the drain plug.
- Insert the copper packing to the plug and tighten it completely.
- Inject the oil as much as the oil level stays between low limit and high limit.

Transmission oil normal capacity : 23ℓ



(3) Rear axle oil replacement

- Loosen the left/right drain plug and drain the oil..
- Inject the new oil into the injection inlet.
- Wind the left/right drain plug with sealed tape and tighten it completely.
- For use oil, refer to the capacity table.

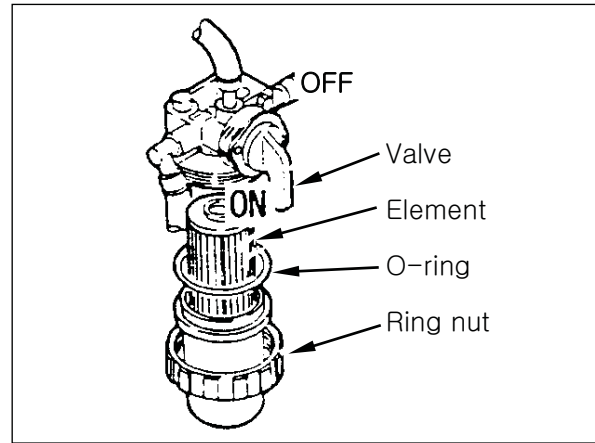
Normal capacity : each 4 ~ 4.5 ℓ for left/right

Notice	▶ The first oil change for front axle, rear axle, main transmission should be done after 50 hr.
--------	---

(4) Fuel filter element replacement

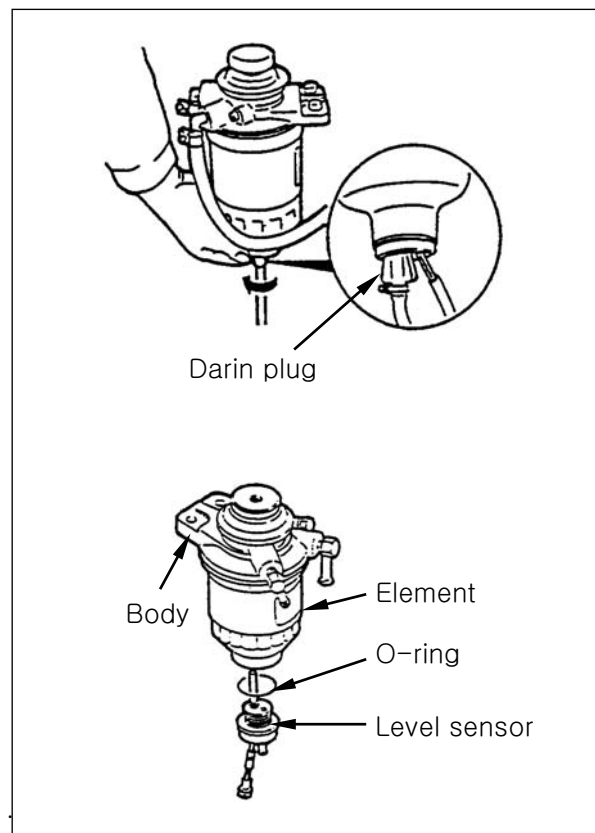
① LT280D/LT360D

1. Place the valve on "OFF" position.
2. Release the ring nut to remove the cup.
3. Remove the element.
4. Put the new element into the cup and let them assembled. At this time tighten the ring nut taking care of O-ring to be assembled exactly.
5. Place the valve on "AIR" position, perform air-bleeding and then place the valve on "ON" position.



② LT450D

1. Release the drain plug to drain the fuel inside the filter out.
2. Separate connected part of the level sensor.
3. Remove the element from the body.
4. Remove the level sensor from the element.
5. Engage the level sensor on new element.
6. Attach the element on the body.
7. Let the connector of the level sensor connected with.
8. Check the connected area including drain plug for sure.
9. Perform air-bleeding surely after the element is replaced.

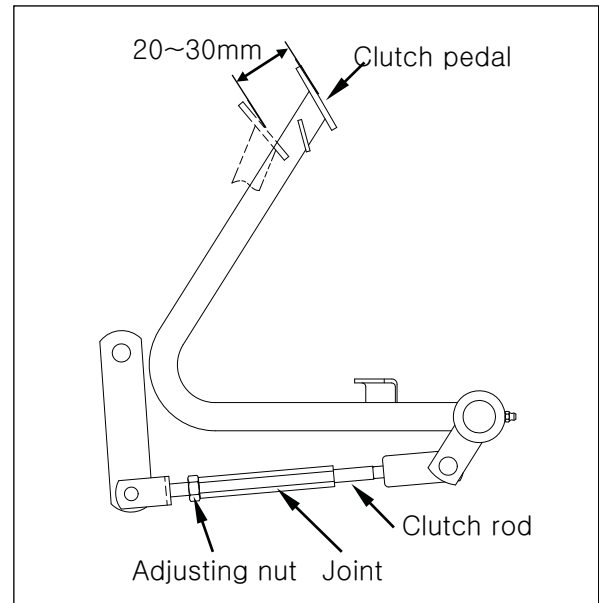


5-8. Adjustment of each part

(1) Adjustment of clutch pedal play

- Normal clearance is **20~30mm** and if the clearance is less than **20mm**, adjust it as below.

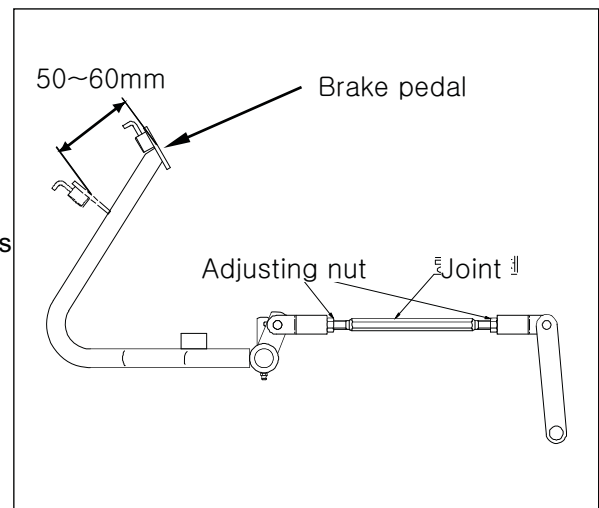
1. Loosen the adjusting nut and adjust it by a joint.
2. In this case, if the joint is tightened, the clearance shall be reduced and if the joint is loosened, the clearance shall be large.



(2) Adjustment of brake pedal play

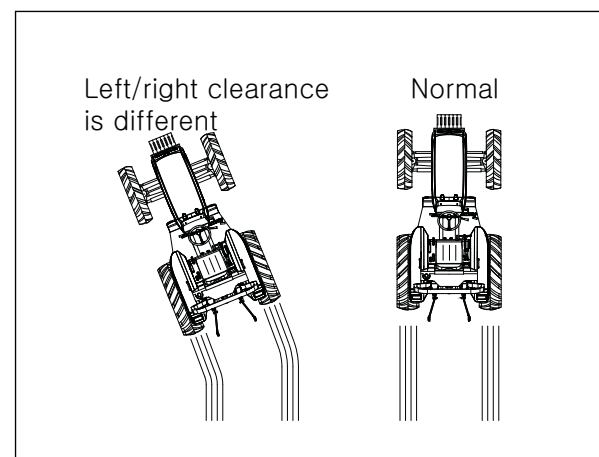
- Normal clearance is **50~60mm**. If the clearance is more than **60mm**, adjust it as below.

1. Loosen the adjusting nut.
2. Tighten or loosen the joint. In this case, if the joint is tightened, the clearance shall be small and if the joint is loosened, the clearance shall be large.
3. After adjusting, tighten the adjusting nut. After adjusting, check if the clearance of left/right brake is same as below.



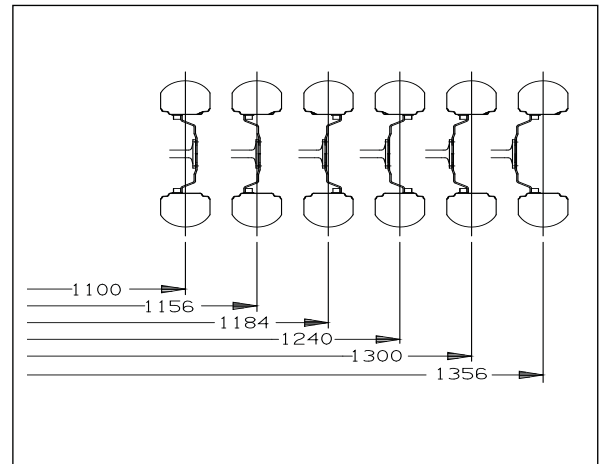
- Brake clearance check

1. Connect left/right brake pedal by the connecting pin.
2. Drive with normal speed and press the pedal to check the slipped trace of a tire.
3. If founded that the left/right clearance is different as shown on the figure, adjust the brake rod again.

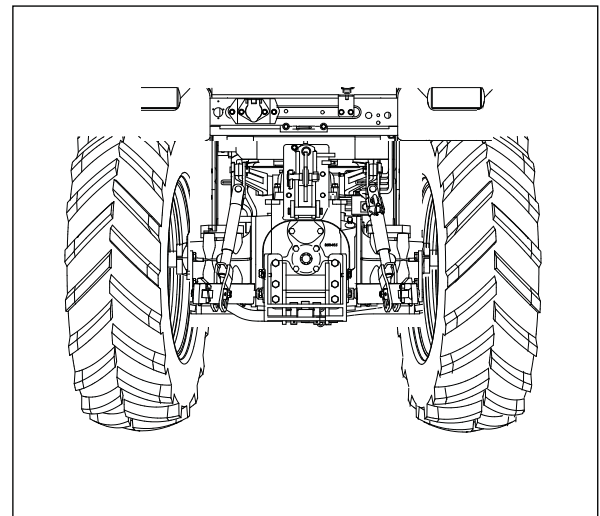


(3) Breadth adjustment (Rear wheel)

- The breadth of rear wheel shall be adjusted by 6 step within the range 1100~1356mm.



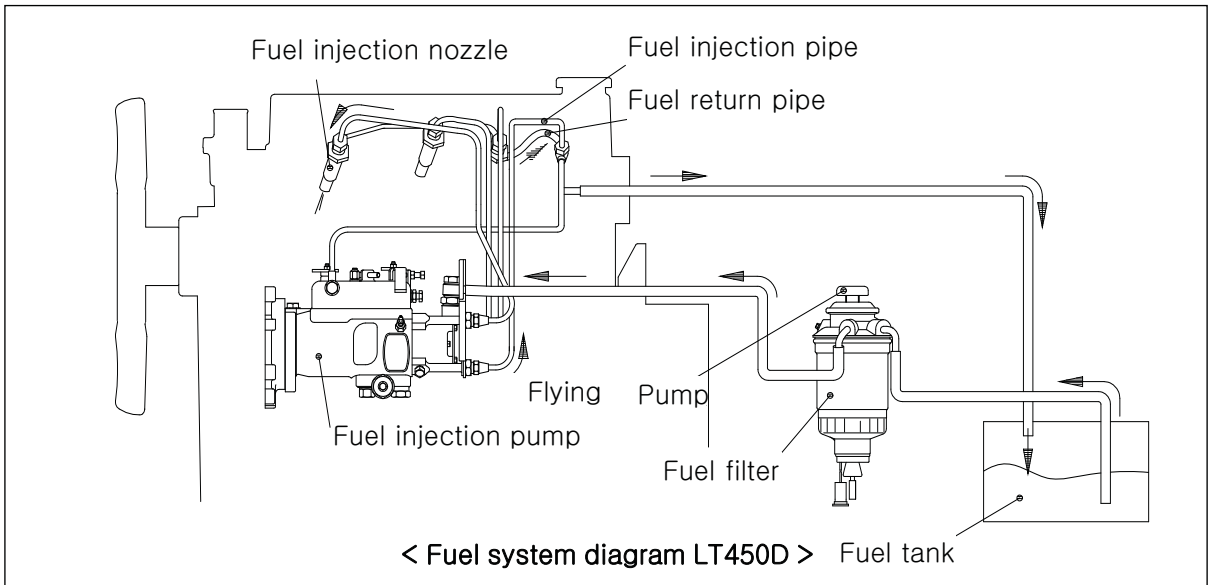
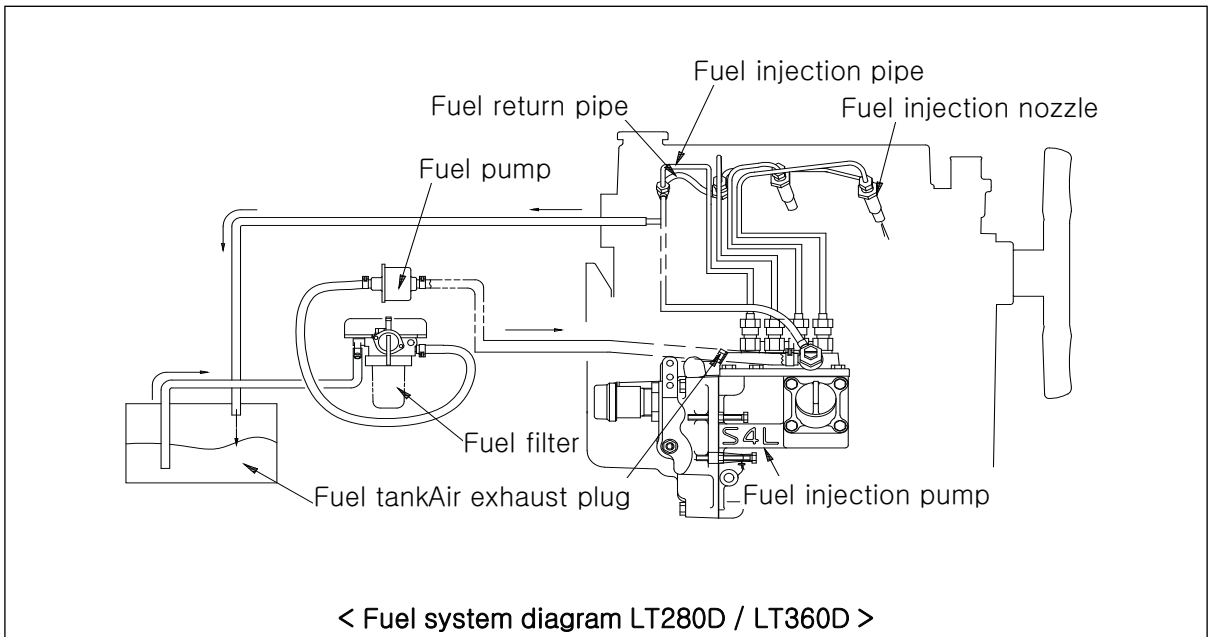
Notice	▶ When adjusting the breadth, pay attention to the direction of tire lug.
	▶ If it shows “八” shape when looked behind, it means 'normal'.



5-9. Air Exhaust from Fuel system

(1) Air exhaust process

- The air in the fuel may cause the weak injection or the failure of engine start or stop. To prevent such failure, it should be requested to exhaust the air after caring the fuel system.

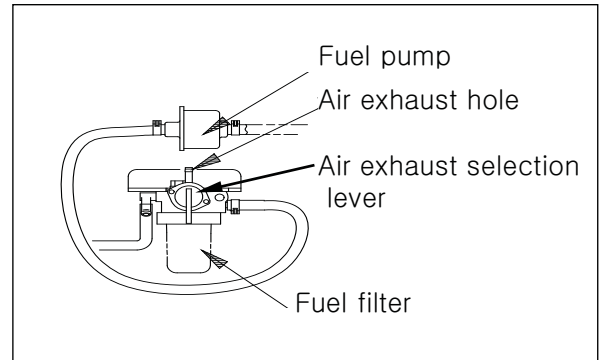


Notice ▶ When changing the fuel filter, it is not needed to exhaust the air from the high pressure pipe.

(2) Air exhaust from fuel system

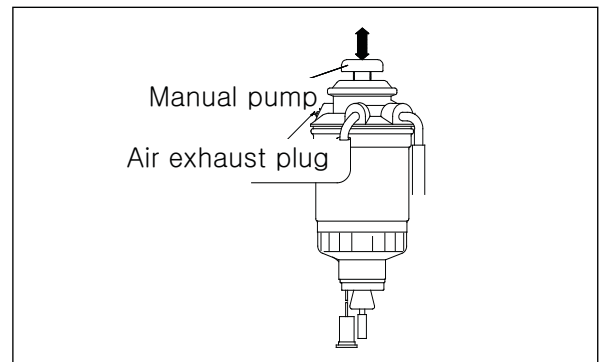
① Air exhaust of fuel filter (LT280D/LT360D)

1. Remove rubber cap of the air exhaust hole of fuel filter.
2. Place the air exhaust selection lever on "AIR" and supply fuel.
3. If there is no bubble in the fuel through air exhaust hole, the air exhaust is completed.
4. Place the air exhaust selection lever from "AIR" onto "ON" and insert the rubber cap into the air exhaust hole.



② Air exhaust of fuel filter (LT450D)

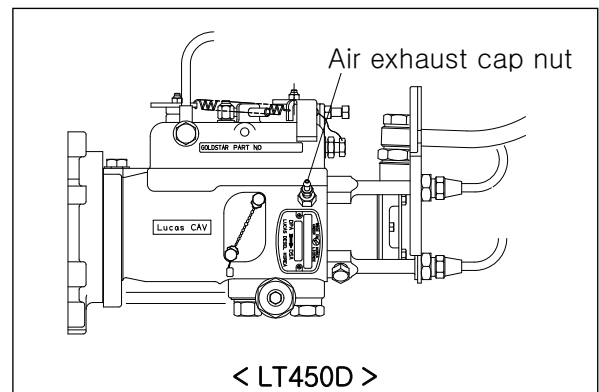
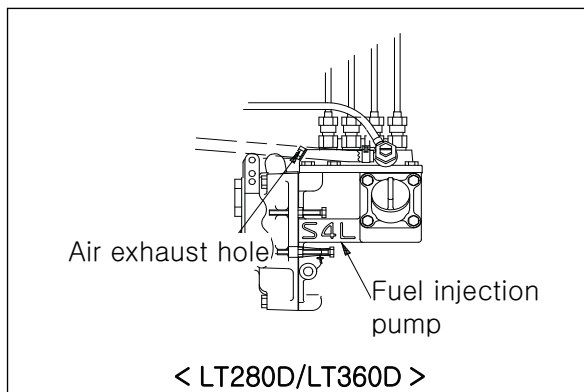
1. Loosen the air exhaust plug of fuel filter by a spanner
2. Press several times the manual pump with cloth on the air exhaust plug area. If there is no bubble in the fuel through air exhaust plug, the air exhaust is completed.
3. Attach the air exhaust plug again completely



③ Air exhaust of fuel injection pump

1. Place the start switch on "ON" position.
2. Loosen the air exhaust cap nut by a spanner and turn it by hand until it is stopped.
3. After the fuel with no bubble is drained through the air exhaust cap completely, place the start switch on "OFF" position and then attach the air exhaust cap nut.

Attachment torque : 80 Kgf.cm

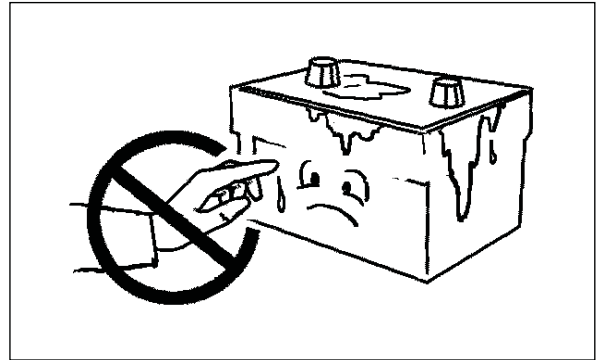
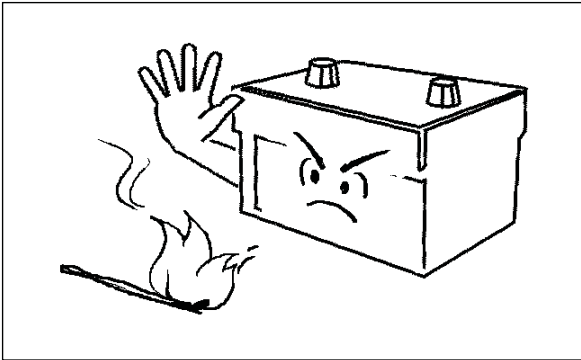






Notice ▶ Cover the exhausted fuel with vinyl so that it is not stick to other components.

5-10. Battery Handling and Notices



(1) Battery check

- Indicator shows the battery state.
 - “Green” indicates ‘normal’ state.
 - Even if “Green” is indicated, if the life of battery is ended, it is needed to change the battery as the engine does not start.
 - “White” indicates the lack of charging and it is needed to charge the battery.
 - “Red” indicates that the life of battery is ended or the electrolytic solution is dried up by overcharging and thus it is needed to change the battery after checking the vehicle.
- If the terminal is loosened, tighten it completely.
If the terminal is corrupted, clean it with warm water and apply the grease.

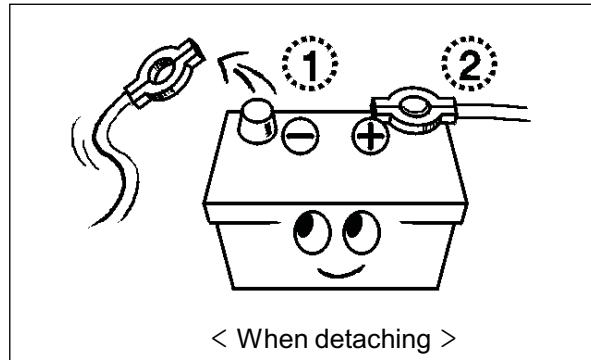


<p> Caution</p>	<p>▶ The gas generated from the battery is explosive and there is a possibility of danger that the electrolytic solution may be splashed with the explosion.</p> <ul style="list-style-type: none"> - In case of checking the indicator of battery, use the flashlight instead of match, lighter or cigarette etc. - In case of checking the charging capacity, never connect the battery terminal by the metal. Instead, use a voltmeter or gravimeter.
<p></p>	<p>▶ The electrolytic solution inside the battery is sulfuric which may cause a burn, damage in the clothes or the loss of eyesight if it penetrates the eye.</p> <ul style="list-style-type: none"> - Never disassemble the battery. - If the electrolytic solution is stained to the skin, wash it by water immediately for 20 minutes and if someone drink it or put it in the eyes, take the actions by a doctor immediately.
<p></p>	<p>▶ In case of repairing the electric device without detaching the (-) terminal of battery, it may cause the failure or severe damage by the spark (flame).</p> <ul style="list-style-type: none"> - In case of repairing the electric device, detach the (-) terminal of battery. - Remove the (-) terminal first and if connecting it, it should be connected last.
<p></p>	<p>▶ In case of replacement, change it with LG tractor genuine products or the battery with the same capacity.</p>

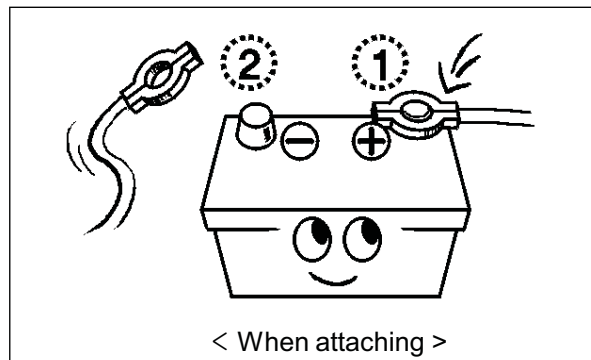
(2) Notices in attaching/detaching the battery

	Warning ▶ When attaching/detaching the battery, stop the engine and place the key switch on “Engine stop” position.
	▶ When checking the battery, detach the (-) terminal first and when connecting it, it should be connected last.

- When detaching the battery, detach the (-) terminal first .
If not, when the tool is contacted between (+) terminal and the body, it may cause the generation of the spark (flame).



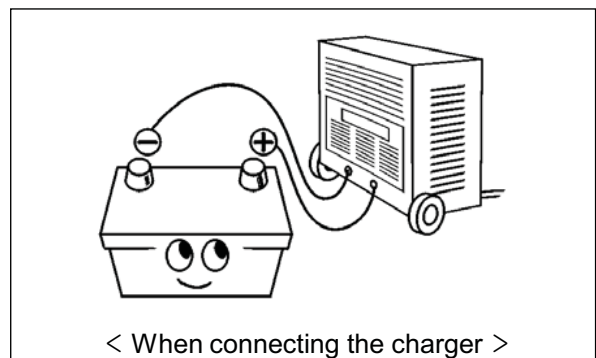
- When attaching it, (+) terminal should be attached first and (-) terminal should be connected last.




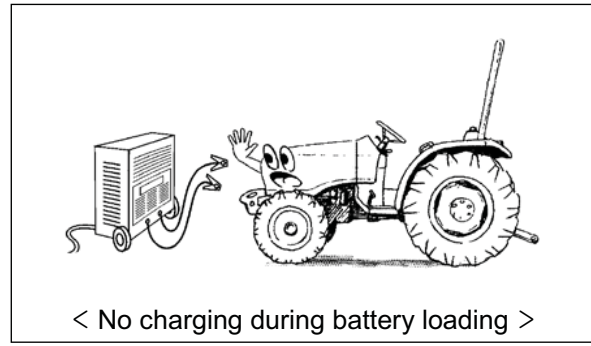
(3) Notices in charging the battery using separate charger

- When charging, comply with the following instructions as the hydrogen gas may generate.

1. Detach the battery from the tractor.
2. Wait until the battery becomes warm to the ambient temperature.
3. Connect the clamp of charger to the (+), (-) terminal correctly.
(+) terminal : Red
(-) terminal : Black
4. Put the charger cord in the plug.
5. When the battery is charged, apply the charging rate slowly.
6. Disconnect the cord of charger and remove the clamp of charger.
7. Install the battery to the tractor.



 Caution	<ul style="list-style-type: none"> ▶ Detach the battery from tractor in case of charging. ▶ Plug off the charger cord from the socket before connecting or disconnecting the charger clamp to or from the battery
---	---



Notice	<ul style="list-style-type: none"> ▶ Carry out the charging in the well-ventilated place. ▶ Do not charge the frozen battery. ▶ Use the rating 12V-8A of charger. ▶ Read the safety instructions thoroughly before charging the battery.
--------	--

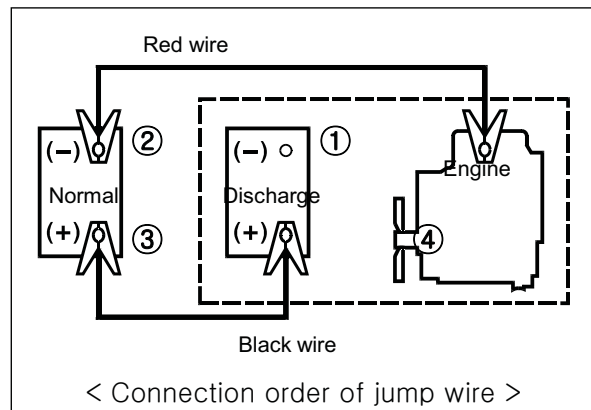
(4) How to use Jump cable



※ If the battery mounted in the body is discharged and needs to connect other battery to start, it should be requested to follow the instructions as below.

① Connection of jump cable

- Check the following before connecting the cable.
 - Is the spring of clamp normal ?
 - Is the cable and clamp cut-off ?

- 1.If aux.battery is mounted in the tractor, stop the engine.
- 2.Connect the red cable to (+) terminal of both battery. (discharged -①, aux.battery-②)
- 3.Connect the black cable to (-) terminal of aux. battery (③) and to the block of tractor engine to start.(④)
- 4.Start the engine. If the engine does not work, start the tractor engine mounted with aux. battery and then try to start the engine again.

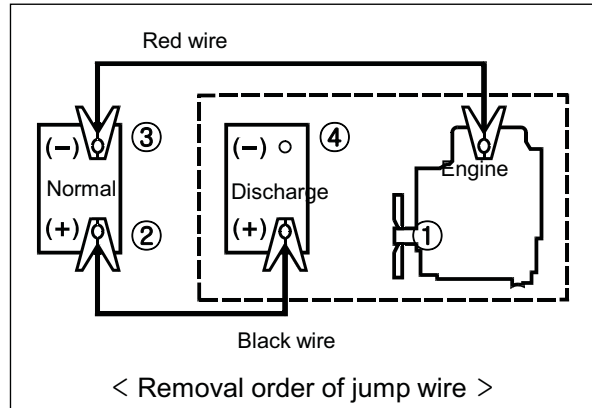


 Caution	<ul style="list-style-type: none"> ▶ The gas generated from the battery may be explosive.
	<p>Do not connect (-) cable of aux.battery to (-) terminal of tractor battery to start. (connect to the engine block)</p>

② Removal of jump cable

- Remove the jump cable according to the order of figure "removal order of jump cable".


Notice	<p>▶ When charging or changing the battery, pay attention not to change the (+) pole and (-) pole.</p> <p>In case of wrong connection, it may cause the failure of electric circuit or the damage of wiring and even the polarity of battery shall be changed in the state of overcharge.</p>
--------	---



(5) Correct handling of battery and Notices

Classification	Description	Actions	Notices	Electrolyte	Explosion
Check	Indicator "white"	Charge	Refer to 'charging'	○	○
	Indicator "red"	Replace	Refer to 'waste'	○	○
	If changing the battery for repair			○	
	Non-discharging warning lamp ON	Charge	Spark		○
	Appearance check	Remove the soil		○	
		Change if transformed			
	If changing with battery for repair			○	○
	Terminal check	Tighten if loosened		Spark	○
Wash if corrupted					
Charge	Connect the charge cable correct before switch ON		Charging in well-ventilated place	○	○
	After switch OFF, Remove the charge cable		Check the charging current & temp. of electrolyte	○	○
Attach/detach	Terminal	Detach the ground cable first and attach it last.	Spark	○	○
Pre serve	Usable	Keep it in the dry place with no direct ray apart from children	Spark	○	○
		Regular charging (more than once a month)		○	○
	Waste	Ask the agent	Cut-off	○	

5-11. Troubleshooting

 Warning	▶ In case of checking the starting circuit to avoid the injury by the sudden start of engine, depress the parking brake and place the gear shift on Neutral.
--	--

Classification	Problems	Main causes	Action
E N G I N E	The start motor does not turn despite of turning the key switch.	<ul style="list-style-type: none"> ▲ The clutch pedal does not work. ▲ Discharge of battery ▲ Terminal loosened ▲ Switch failure ▲ Start motor failure 	<ul style="list-style-type: none"> ▲ Depress the clutch pedal up to maximum. ▲ Charge or replace ▲ Tighten ▲ Repair or replace ▲ Repair or replace
	Start motor runs but does not turn.	<ul style="list-style-type: none"> ▲ Battery is weak ▲ Poor grounding ▲ Improper viscosity of engine oil 	<ul style="list-style-type: none"> ▲ Charge or replace ▲ Tighten the ground ▲ Replace the oil with proper viscosity
	Start motor turns but does not start.	<ul style="list-style-type: none"> ▲ Air inflow in fuel system ▲ Fuel filter closed ▲ Engine body abnormal ▲ Fuel cork closed 	<ul style="list-style-type: none"> ▲ exhaust the air ▲ Clean or replace the filter ▲ Repair ▲ Open the cork
	Engine rpm is irregular.	<ul style="list-style-type: none"> ▲ Air inflow in fuel system ▲ Fuel filter closed ▲ Injection nozzle closed ▲ Fuel leakage ▲ Irregular fuel injection amount 	<ul style="list-style-type: none"> ▲ Air exhaust ▲ Clean or replace the filter ▲ Repair or replace ▲ Tighten the clip, replace the pipe or cooper washer ▲ Repair
	Engine stops at low rpm	<ul style="list-style-type: none"> ▲ Poor injection pump ▲ Valve gap does not match ▲ Poor nozzle 	<ul style="list-style-type: none"> ▲ Repair ▲ Adjust the gap ▲ Repair
	Engine rpm is more than max. speed	<ul style="list-style-type: none"> ▲ Impurities in governor 	<ul style="list-style-type: none"> ▲ Repair
	Engine stops suddenly during operation.	<ul style="list-style-type: none"> ▲ Lack of fuel ▲ Poor nozzle ▲ Lack of engine oil or poor lubrication, acting part broken 	<ul style="list-style-type: none"> ▲ Exhaust the air after fuel charge ▲ Repair or replace ▲ Repair

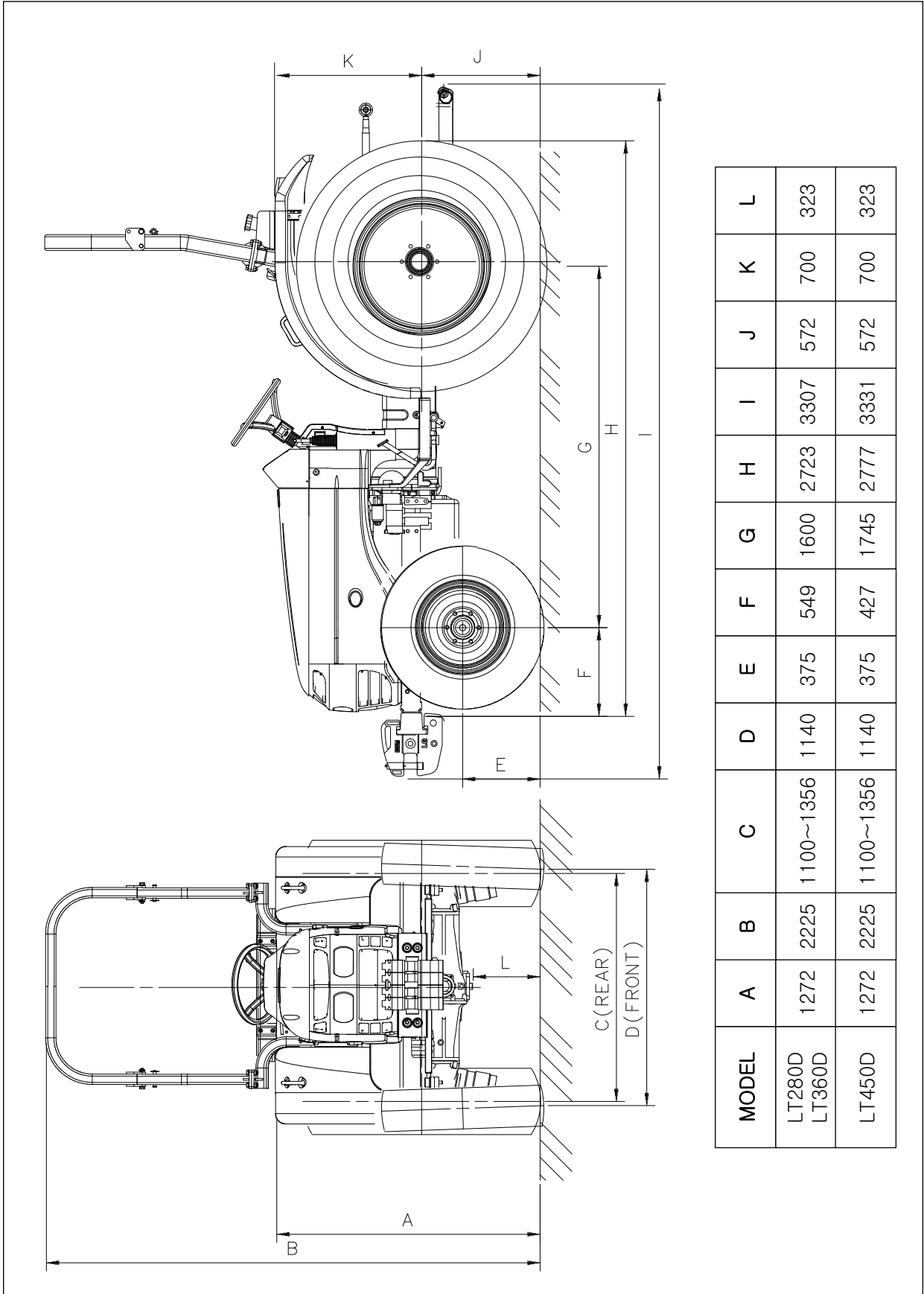
Classification	Problems	Main cause	Actions
E N G I N E	Engine overheating	<ul style="list-style-type: none"> ▲ Lack of cooling water ▲ Lack of fan belt tension or broken ▲ Soil attached to the radiator 	<ul style="list-style-type: none"> ▲ Supplement ▲ Adjust belt tension or replace ▲ Clean
	White smoke	<ul style="list-style-type: none"> ▲ Air cleaner clogged ▲ Engine oil exceeded ▲ Lack of fuel supply 	<ul style="list-style-type: none"> ▲ Clean the element ▲ Adjust in proper level ▲ Repair
	Black smoke	<ul style="list-style-type: none"> ▲ Bad fuel quality ▲ Oversupply of fuel ▲ Poor nozzle 	<ul style="list-style-type: none"> ▲ Use good quality fuel ▲ Repair ▲ Repair
	Engine power is off.	<ul style="list-style-type: none"> ▲ Nozzle injection clogged ▲ Lack of pressure accumulation ▲ Carbon accumulation ▲ Wrong valve clearance ▲ Poor injection timing ▲ Lack of fuel supply ▲ Air cleaner clogged 	<ul style="list-style-type: none"> ▲ Repair ▲ Repair ▲ Repair ▲ Adjust ▲ Repair ▲ Check fuel system ▲ Check element or repair
	Engine oil warning lamp OFF	<ul style="list-style-type: none"> ▲ Lack of engine oil ▲ Low viscosity of engine oil ▲ Warning lamp switch failure ▲ Oil pump failure ▲ Oil filter element is clogged 	<ul style="list-style-type: none"> ▲ Supplement ▲ Change the proper oil ▲ Replace ▲ Repair ▲ Change the element
	Non charging warning lamp ON during operation	<ul style="list-style-type: none"> ▲ Abnormal wiring ▲ Poor operator ▲ Poor battery ▲ Lack of tension of fan belt or broken 	<ul style="list-style-type: none"> ▲ Check the tightening of terminal grounding, repair ▲ Repair ▲ Change the battery ▲ Adjust belt tension or replace
C L U T C H	Clutch is slipping.	<ul style="list-style-type: none"> ▲ Wrong pedal clearance ▲ Friction lining worn or broken 	<ul style="list-style-type: none"> ▲ Adjust ▲ Replace
	The clutch does not cut off	<ul style="list-style-type: none"> ▲ Lining fixed ▲ Wrong pedal clearance 	<ul style="list-style-type: none"> ▲ Repair or replace ▲ Adjust

Classification	Problems	Main causes	Action
BRAKE	Brake does not work or only one side works.	<ul style="list-style-type: none"> ▲ Pedal clearance is big ▲ Lining worn or broken ▲ Left/right clearance is different 	<ul style="list-style-type: none"> ▲ Adjust ▲ Replace ▲ Adjust
	After brake pedal working, it does not return.	<ul style="list-style-type: none"> ▲ Return spring damaged ▲ Lack of grease in acting part 	<ul style="list-style-type: none"> ▲ Replace the spring ▲ Remove the rust, apply the grease
HYDRAULIC DEVICE	Lift arm does not raise.	<ul style="list-style-type: none"> ▲ Lack of transmission oil ▲ Air inflow in the suction pipe ▲ Hydraulic filter clogged ▲ Hydraulic pump failure ▲ Control valve failure ▲ Cylinder or cylinder related parts broken 	<ul style="list-style-type: none"> ▲ Fill it in regular level ▲ Tighten the filter or replace O-ring of connecting part ▲ Clean the filter or replace ▲ Repair ▲ Repair ▲ Replace
	Oil leakage	<ul style="list-style-type: none"> ▲ Connecting part loosened ▲ Oil seal broken ▲ Pipe binding 	<ul style="list-style-type: none"> ▲ Tighten ▲ Replace ▲ Replace
	If lever is placed on the rising position, acting sound of relief valve.	<ul style="list-style-type: none"> ▲ Change of stop position 	<ul style="list-style-type: none"> ▲ Adjust the position
	Lift arm does not lower.	<ul style="list-style-type: none"> ▲ Lowering speed control valve locked ▲ Control valve failure ▲ Cylinder damaged ▲ Lift axle turning part worn 	<ul style="list-style-type: none"> ▲ Operate (open) ▲ Repair ▲ Replace ▲ Repair
Hydraulic Steering device	Hydraulic device does not work.	<ul style="list-style-type: none"> ▲ Pump worn or part damaged ▲ Control valve fixed, damaged or worn ▲ Oil leakage by steering cylinder piston damaged or worn ▲ Seal damaged ▲ Oil leakage by pipe damage 	<ul style="list-style-type: none"> ▲ Repair, replace ▲ Repair, replace ▲ Repair ▲ Replace ▲ Repair or replace

Classification	Problems	Main causes	action
HYDRULIC STEERING DISEASE	Hard to operate the steering wheel.	<ul style="list-style-type: none"> ▲ Control valve (steering unit) <ul style="list-style-type: none"> - acting core of steering unit spool line and column spool line does not match - worn by foreign material mixing to spool, sleeve - Excessive attachment torque of end cap tightening bolt (in case of reassembly) ▲ Pump <ul style="list-style-type: none"> - Does not move - Wearing, failure ▲ Relief valve <ul style="list-style-type: none"> - Poor operation (failure) - Low pressure setting 	<ul style="list-style-type: none"> ▲ - Modify (acting core is the cause if it is easy to operate the steering wheel when loosening the bolt attached to steering unit) <ul style="list-style-type: none"> - Replace - Attach by regular attachment torque ▲ <ul style="list-style-type: none"> - Repair - Replace ▲ <ul style="list-style-type: none"> - Replace - Reset (adjust)
	Hard to operate the cylinder for turning the steering wheel.	<ul style="list-style-type: none"> ▲ Air inflow to steering unit as not used for a long time ▲ Air inflow inside cylinder ▲ Piston seal damaged (cylinder) 	<ul style="list-style-type: none"> ▲ Exhaust the air. ▲ Exhaust the air. ▲ Replace
	The steering wheel turns to the opposite.	<ul style="list-style-type: none"> ▲ Poor assembly of control valve timing of steering unit (in case of reassembling) ▲ Poor assembling of hydraulic pipe(4PORT) assembly 	<ul style="list-style-type: none"> ▲ Modify ▲ Modify
	Steering unit oil leakage 1.Axle (spool, inside Spool line, outside Surrounding part) 2.Connecting side (housing, gap, between rotor Assembly end cap)	<ul style="list-style-type: none"> ▲ Oil seal worn ▲ operation leakage polluted ▲ O-ring damaged (in case of reassembling) 	<ul style="list-style-type: none"> ▲ Replace, repair ▲ Replace the oil ▲ Replace
	Noisy sound	<ul style="list-style-type: none"> ▲ Lack of oil ▲ Suction resistance exceeding 	<ul style="list-style-type: none"> ▲ Fill ▲ Repair, replace what is clogged such as the pump, pipe or filter etc.

Classification	Problems	Main causes	Action
E L E C T R I C A L D E V I C E	Battery is not charged	<ul style="list-style-type: none"> ▲ Abnormal wiring ▲ Generator failure ▲ Lack of fan belt tension or Damaged ▲ Poor battery function 	<ul style="list-style-type: none"> ▲ Check the fixing state of terminal, grounding ▲ Repair or replace ▲ Repair or replace ▲ Tighten terminals, replace the battery
	Headlight is dark.	<ul style="list-style-type: none"> ▲ Lack of battery capacity ▲ Poor wiring or poor contact 	<ul style="list-style-type: none"> ▲ Charge or replace ▲ Check and tighten outlet grounding
	Headlight does not Switch ON.	<ul style="list-style-type: none"> ▲ Filament of bulb blown ▲ Fuse blown 	<ul style="list-style-type: none"> ▲ Replace ▲ After checking the cause, replace
	Horn does not work	<ul style="list-style-type: none"> ▲ Switch failure ▲ Abnormal wiring ▲ Horn failure 	<ul style="list-style-type: none"> ▲ Replace ▲ Repair ▲ Repair or replace
	Direction indicating lamp does not work.	<ul style="list-style-type: none"> ▲ Filament blown ▲ Poor contact 	<ul style="list-style-type: none"> ▲ Replace ▲ Tighten terminals
	Glow indicating lamp does not work.	<ul style="list-style-type: none"> ▲ Poor glow relay ▲ Poor glow timer ▲ Glow indicating bulb blown ▲ Poor contact of glow plug wiring 	<ul style="list-style-type: none"> ▲ Replace ▲ Replace ▲ Replace ▲ Tighten
	Other illuminating lamp, warning lamp does not work.	<ul style="list-style-type: none"> ▲ Fuse blown ▲ Filament blown 	<ul style="list-style-type: none"> ▲ After removing the cause, replace ▲ Replace

5-12. Dimension



Classification		LT280D	LT360D	LT450D
Tire	Front	8-16(4PR)		
	Rear	12.4-24(8PR)		
Body weight		1540kg		1780kg
E N G I N E	Model	MHI S4L	MHI S4L2	LG S4QS
	Type	4 strokes, water cooling- whirling serial type		
	Number of cylinder	4		
	Diameter x stroke	78 x 78.5mm	78 x 92mm	88 x 95mm
	Displacement (cc)	1500cc	1758cc	2311cc
	Rated speed(rpm)	2600rpm	2700rpm	2600rpm
	Maximum (rpm)	2800rpm	2900rpm	2750rpm
	Engine Power	30.5ps/2600rpm	38.5ps/2700rpm	43ps/2600rpm
Fuel Injection pump	Type	BOSCH M(Inline)		Rotary
	Speed regulating method	Mechanical		
	Fuel filter	Replaceable cartridge type		
	Air cleaner filter	Dry element type		
	Injection order	1-3-4-2		
Lubricant system	Type	Compressed type		
	Pump	Gear pump type		
	Filter	Replaceable cartridge type		
	Filtering method	Filtering type for all oil capacity		
Cooling system	Type	Forced circulation type		
	Pump	Centrifugal type		
	Temperature control	Thermostat		
Clutch	Type (main clutch, PTO clutch)	Dry type, single =dry single, switch		
	Operation mode (main clutch, PTO clutch)	Pedal, switch		
	Return spring	Diaphragm		

Classification			LT280D / LT360D	LT450D
TRANSMISSION	Gear type	Main shift	Spur	
		Sub-shift	Spur	
	Chain type	Main shift	Synchronous chain type	
		Sub-shift	Optional chain type	
	Transmission stage	Main shift	4 stage	
		Sub-shift	3 stage	
	Forward/reverse		Full shuttle type	
Differential lock	Gear type		Spiral bevel	
	Differential lock device		Mechanical pedal operation	
PTO	Type		Independent type, engine proportional type	
	Transmission stage (standard)		1 stag	
	PTO rpm / engine rpm		540 rpm / 2520 rpm	
Lift Device	3 point linkage		CAT1	
	lowering speed control and cylinder fixing device		Lock valve	
	Oil tank		Main gear shift housing use	
	pump		Gear type, engine drive	
Remote hydraulic device	Number of valve		2 ea	
	Valve operation mode		Double acting or single/double acting selection	
	hydraulic outlet		4 ea	
Generator	Rated output		12V-50A	12V-45A
	Voltage control		Built-in (IC type)	
Battery	Voltage		12V	
	Capacity		80AH	
Start motor	Output		12-2.0KW	12-2.2KW
	Operation mode		Solenoid type	

Classification		LT280D / LT360D	LT450D	
Illumination lamp	Headlights (low /high)	12V 35W / 35W	12V 40W / 45W	
	Direction indicating lamp (rear)	12V 8W	12V 21W	
	Brake lamp / tale lamp (rear)	12V 10W / 5W	12V 21W / 5W	
	Work lamp (rear)	12V 23W		
O T H E R	Instrument panel lamp	12V 3.4W		
	Direction indication lamp, warning lamp	14V 3.4W, 1.4W		
	Cold drawing start device	Preheat plug heating type		
Wheel breadth	Front wheel	Adjustment stage	No	No
		Adjustment range	No	No
	Rear wheel	Adjustment stage	6stage	
		Adjustment range	1100~1356mm	
wheel	Steering	Position	Central	
		Type	All hydraulic type	
		Min. turning radius (when operating the brake)	2.50m	2.70m
		Use oil	Transmission oil	

5-13. Capacity table

Corresponding part	Capacity	Use solution	Recommended items
Cooling water	LT280D/LT360D : 4.9 ℓ LT450D : 6.1 ℓ	Soft water	
Fuel	40 ℓ	Good quality of diesel oil	
Engine	LT280D/LT360D : 4.5 ℓ LT450D : 7 ℓ	CC, CD class winter : 10W/30 summer : 20W/40	LGCaltex RPM Dello 200
Main transmission (oil common use for hydraulic hydraulic steering device)	23 ℓ	SAE #80	Only for LG tractor T/M and hydraulic oil Manufacturer: LG Caltex
Final drive axle (inside)	Left/right angle 2.5 ℓ		
Final drive axle (outside)	Left/right angle 2 ℓ		
Front wheel axle	8 ℓ	SAE #80, 90	
Grease nipple	Proper level	NLG 1 or 2	Caltex multi performance purpose or Caltex wool performance minitute

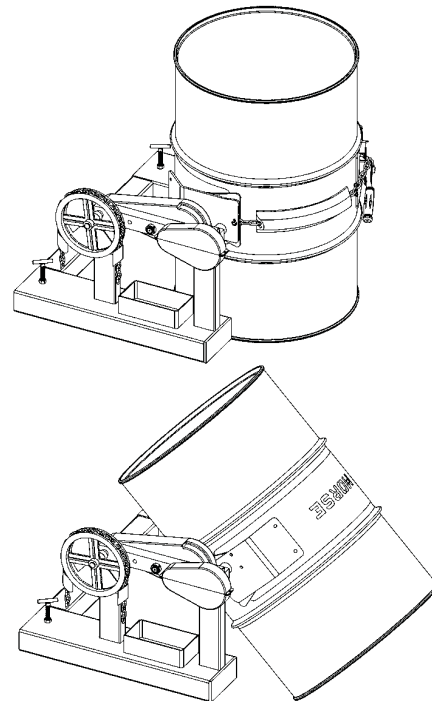
This Page Intentionally Left Blank

Contents

	Page
Receiving Procedures.	1
Warranty.	1
Safety Information.	1 - 2
Machine Description.	3 - 4
Operating Instructions.	4 - 5
Maintenance.	5
Parts Lists and Diagrams.	6 - 7

Operator's Manual
for Morse Heavy-Duty Forklift-Karrier
Model 285A-HD

Serial Number 0613 to 1114 (MMYY)



Receiving Procedures

Every Morse drum handler is inspected prior to shipping. However, damage may be incurred during transit.

- Check for visible damage. If you choose to accept damaged freight, always sign noting the damage on the **Bill of Lading**.
- Document the damage and have the truck driver sign. We recommend keeping a digital camera at your receiving dock for this purpose.
- Open packages expeditiously to check the condition of the goods. There is only a 24 hour window to notify the carrier of any concealed damage.
- Immediately **report all damage to the shipping company!** Then you may contact Morse for assistance with your freight claim.
- Morse Manufacturing will not be held responsible for any damaged freight that is not signed for as damaged.

Limited 2 Year Warranty

Morse drum handling equipment is guaranteed against defects in workmanship or materials for two years when used properly within its rated capacity. Warranty does not cover wear from normal use or damage from accident or abuse. Motors and other purchased parts carry the warranties of their manufacturers.

For warranty claims, contact your Morse Dealer to obtain a return authorization number, and for return freight advice. Return freight must be prepaid.

In all instances, liability is limited to the purchase price paid or to repairing or replacing the product. Customer assumes liability for any modifications, unauthorized repairs or parts substitution.

Safety Information

While Morse Manufacturing Co. drum handling equipment is engineered for safety and efficiency, a high degree of responsibility must be placed upon the machine operator to follow safe practices, based primarily on common sense, upon which true safety depends.

Failure to follow the safety precautions in this manual can result in personal injury or property damage. Observe the same precautions as with similar machinery where carelessness in operating or maintenance is hazardous to personnel. Carefully read the safety precautions below and throughout this manual.

Review the Material Safety Data Sheet(s) for the material(s) in the drum(s) and take all necessary precautions. Safety shoes, work gloves, hard hat and other personal protective devices are recommended.

Prior to initial use, inspect all moving parts and test rotation of chain wheel and saddle assembly. Inspect saddle assembly for proper operation. Perform necessary load test, inspections, operator training, etc.

Operator's Manual for Morse Heavy-Duty Forklift-Karrier Model 285A-HD
Serial Number 0613 to 1114 (MMYY)

Safety Information (continued)



DANGER - Indicates a situation which, if not avoided, will result in serious injury or death. This signal word is limited to the most extreme situations.



WARNING - Indicates a situation which, if not avoided, could result in serious injury or death.



CAUTION - Indicates a situation which, if not avoided, can result in damage to the machine.



WARNING - The Heavy-Duty Forklift-Karrier is designed to handle one drum of the types listed at the top of page 3. Machine Description. DO NOT attempt to handle any other type of drum or object. DO NOT exceed the weight capacity of 1500 Lb. Exceeding these ratings is unsafe and could result in equipment damage, excessive wear or awkward handling.



WARNING - Do Not Modify the Unit. Under no circumstances should any modifications be made to the Morse machinery without factory authorization. Any modifications may void the warranty. This machine was designed to perform a specific job and alterations may result in injury to operator or machine.



WARNING - No Loose Fitting Clothing. Wear close-fitting clothing and safety equipment appropriate to the job. Loose fitting clothing may become caught on the machinery and cause severe personal injury.



CAUTION – Do Not Transport with Drum Raised. Always lower the drum holder to lowest position before transporting.



CAUTION - Wear safety shoes with non-slip soles and hard toe protection.



CAUTION: DO NOT allow drum to impact on floor, ground, or dumping station, etc.

**Operator's Manual for Morse Heavy-Duty Forklift-Karrier Model 285A-HD
Serial Number 0613 to 1114 (MMYY)**

Machine Description

The Model 285A-HD Heavy-Duty Forklift-Karrier is designed to lift, transport, and dispense a ribbed 55-gallon steel or fiber drum 22" to 23.5" in diameter. The maximum full-drum capacity is 1500 Lb. The capacity is derated to 800 Lb. for a half-full drum. The half-full rating is based on the tilt mechanism's capacity for handling an unbalanced bottom-heavy drum.



Options

- A smaller diameter drum can be handled with the correct size 55/30 Series Diameter Adaptor installed (see [Diameter Adaptor literature](#)).
- The **Bracket Assembly** (Part # 4556-P) is **required** to handle a plastic drum without a top rim (see figure 2.1). It is also recommended to more securely handle a fiber drum. You can use the Bracket Assembly with a 55-gallon plastic, steel or fiber drum. The brace at top and bottom of the drum prevent it from slipping lengthways through the drum holder. It adjusts for a drum 31" to 39" tall.
- The **Top Rim Clamp** (Part # 4560-P) grips the upper rim of your drum to prevent it from slipping through the drum holder (see figure 2.2). To handle a 55-gallon plastic drum with top rim, you **must** install either the Bracket Assembly or the Top Rim Clamp. You can use the Top Rim Clamp with a 55-gallon plastic, steel or fiber drum with suitable top rim.

Important

1. Please read all instructions thoroughly before attempting to operate your new Morse drum handler.
2. When loading, unloading, operating, or maintaining your MORSE drum handler, always use care and good judgment. Maintain secure footing and a firm hold. Keep hands and loose clothing away from all moving parts. Never allow anyone to be below any part of a raised drum handler or drum. Read operating instructions and review the pictures in the sales brochure before operation.
3. This model is a front-end attachment for a forklift, OSHA recommends that "... the truck (forklift) be marked to identify the attachment(s) and show the approximate weight of the truck and attachment combination at maximum elevation with load laterally centered." See center of gravity dimensions on page 5 for calculating lost load on your equipment.

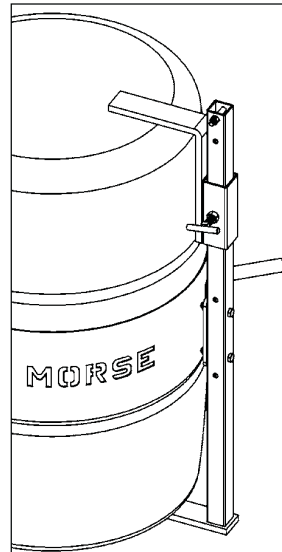


Figure 2.1
Plastic drum being lifted with part number 4556-P Bracket Assembly installed.

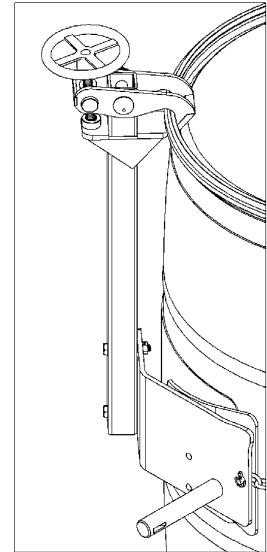
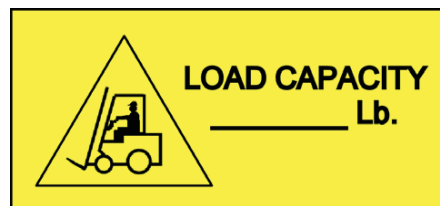


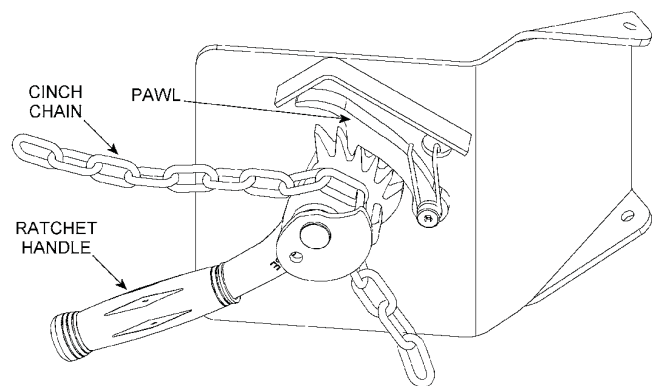
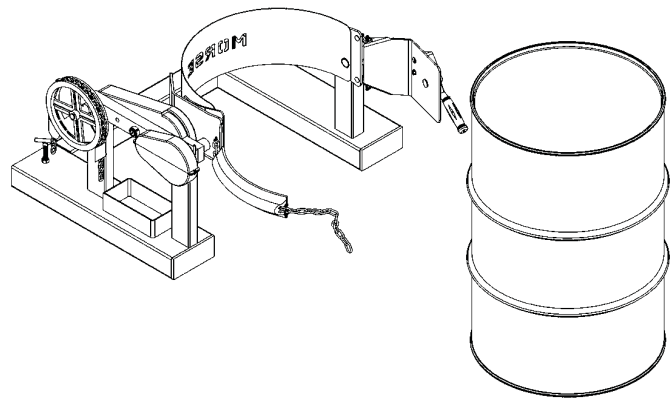
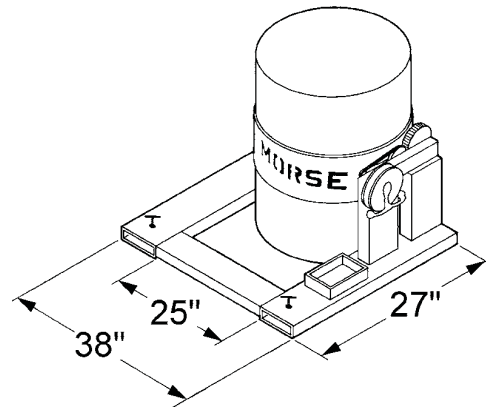
Figure 2.2
Plastic drum being lifted with part number 4560-P Top Rim Clamp Assembly installed.



**Operator's Manual for Morse Heavy-Duty Forklift-Karrier Model 285A-HD
 Serial Number 0613 to 1114 (MMYY)**

Operating Instructions

1. Before sliding forklift forks into the fork tubes, adjust forks to an inside spread of 25" minimum. Lock forks into position on the forklift carriage.
2. Drive the forklift forward to slip the forks into the fork tubes. Tighten tee screws (item #8) to secure the Forklift Karrier to the forks.
3. Release the cinch chain (item #112) and hang the loose end from the upright peg on the front of the gear block. Swing the ratchet hinge plate to the open position.
4. Drive the forklift with the Forklift Karrier near floor level to position the saddle band around the middle of the drum between the ribs.
5. Drape the cinch chain across the front of the drum and insert one link into the slot on the ratchet handle (shown right). Turn the ratchet handle clockwise to tighten the cinch chain around the drum (see detail).
6. Remove pull chain (item #11) from chain box on base frame and place end of loop near operator's seat.
7. Raise forks to clear the floor and transport drum in vertical position to dispensing location.
8. To pour drum: pull on chain (item #11), rotating drum to angle required for dispensing. To control the pouring angle of the drum, pay out one side of chain and pull the other side to prevent the drum from free-wheeling.
9. If the Heavy-Duty Forklift-Karrier is equipped with the MORStop Tilt-Brake, there is no need to hold tension on both sides of the chain loop. Braking is immediate and self-actuating, without additional steps by the operator. To add the MORStop Tilt-Brake to your Heavy-Duty Forklift-Karrier, order kit for field installation (part # 3900-P).
10. When dispensing is completed, rotate the drum back to vertical and return drum. While transporting, ensure that the drum is raised away from the floor to prevent the drum bottom from interfering with a pallet or other obstacle.



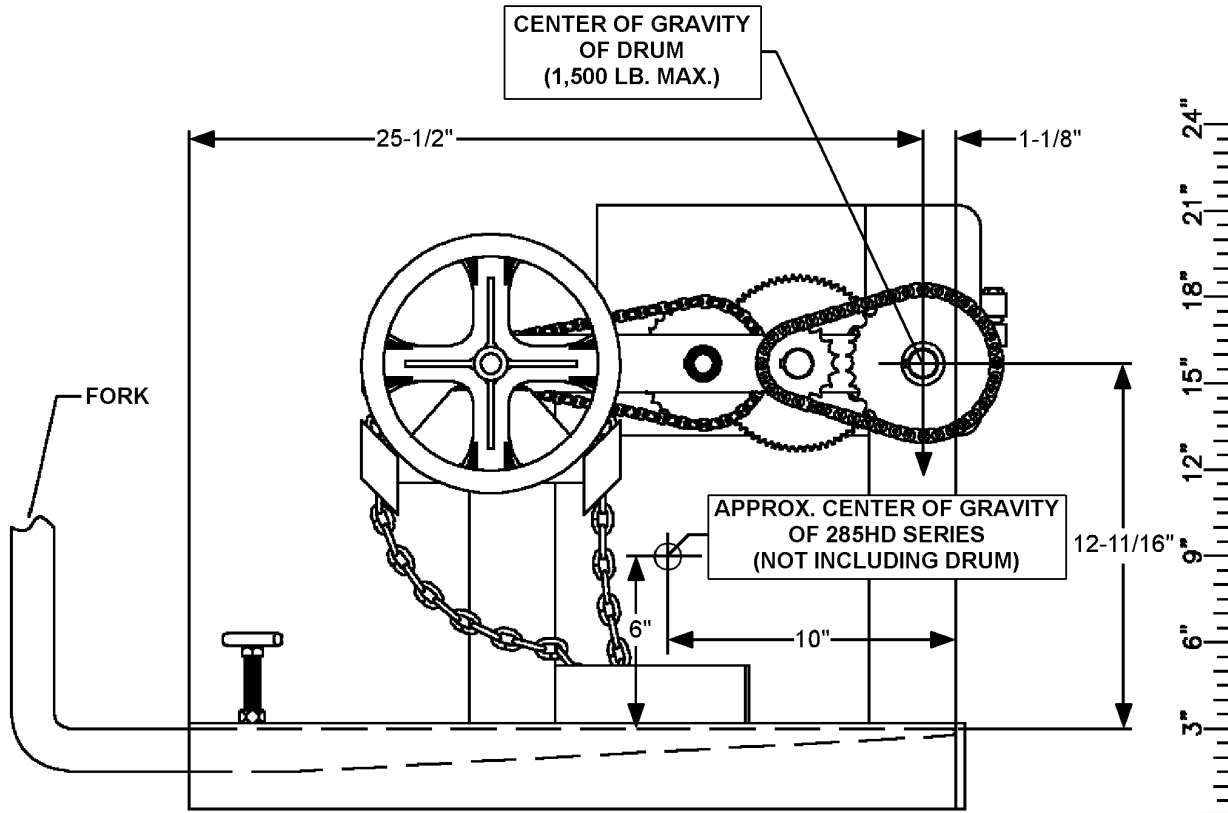
Maintenance

Periodic inspection for the general condition of structural and mechanical components is imperative for safe and efficient operation.

1. Lubricate gear teeth and roller chain.
2. Clean and oil ratchet, pawl and other moving parts periodically. Clean and lubricate more often in environments where dust, dirt or other foreign particles will effect the performance of moving parts.
3. Periodically inspect all moving parts, framework, drum holder and contact areas for signs of wear, fatigue, or loosening. Tighten, adjust, or replace parts as necessary to prevent failure and maintain proper function.
4. Worn or damaged parts must be properly replaced with the correct, genuine Morse parts.

Operator's Manual for Morse Heavy-Duty Forklift-Karrier Model 285A-HD
Serial Number 0613 to 1114 (MMYY)

CENTER OF GRAVITY DIMENSIONS FOR CALCULATING LOST LOAD ON EQUIPMENT

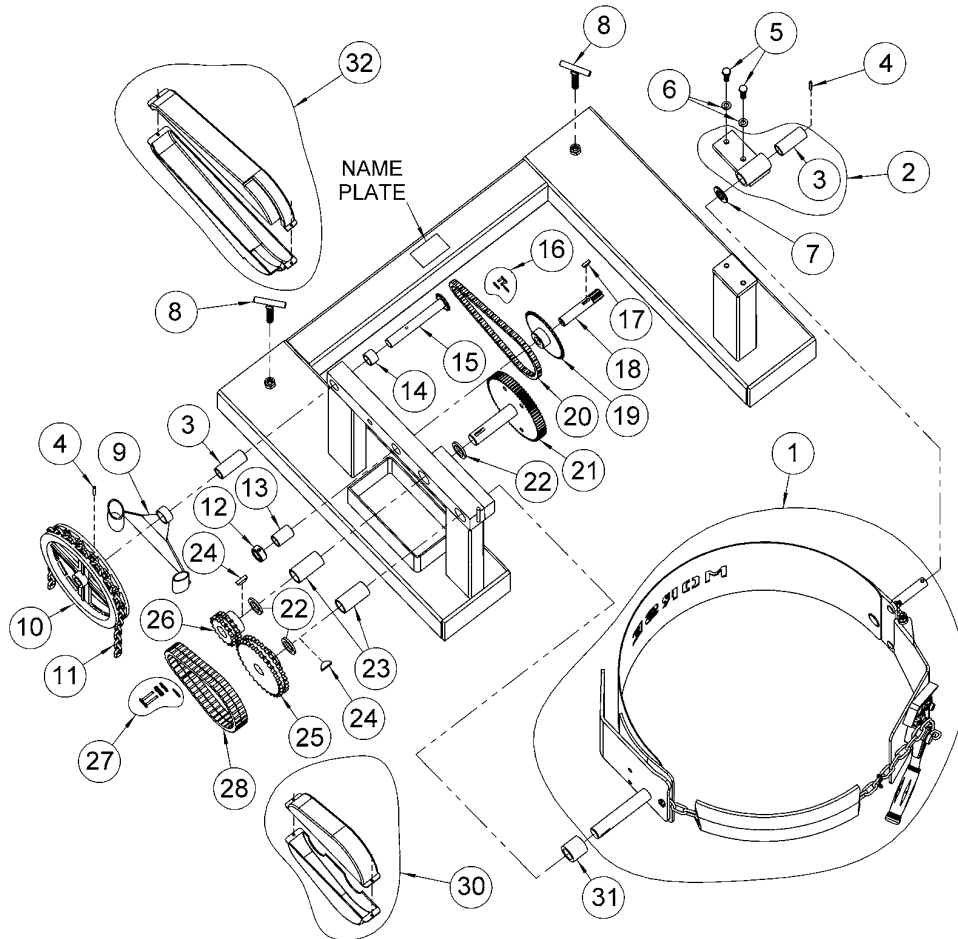


DIMENSIONS ARE MEASURED FROM INSIDE OF FORK TUBE END. THIS WILL GIVE A FIXED POINT TO WHICH LOST LOAD DATA CAN BE DETERMINED. (FORKS MUST BE TOUCHING THIS FORK TUBE END.)

MODEL	NET WEIGHT
285A-HD	156 Lb.
285AM-HD	156 Lb.
285G-HD	160 Lb.

OPTION	ADD TO MODEL
X01	4 L.B.
X02	0 L.B.
X03	4 L.B.
X04	10 L.B.

Operator's Manual for Morse Heavy-Duty Forklift-Karrier Model 285A-HD
Serial Number 0613 to 1114 (MMYY)

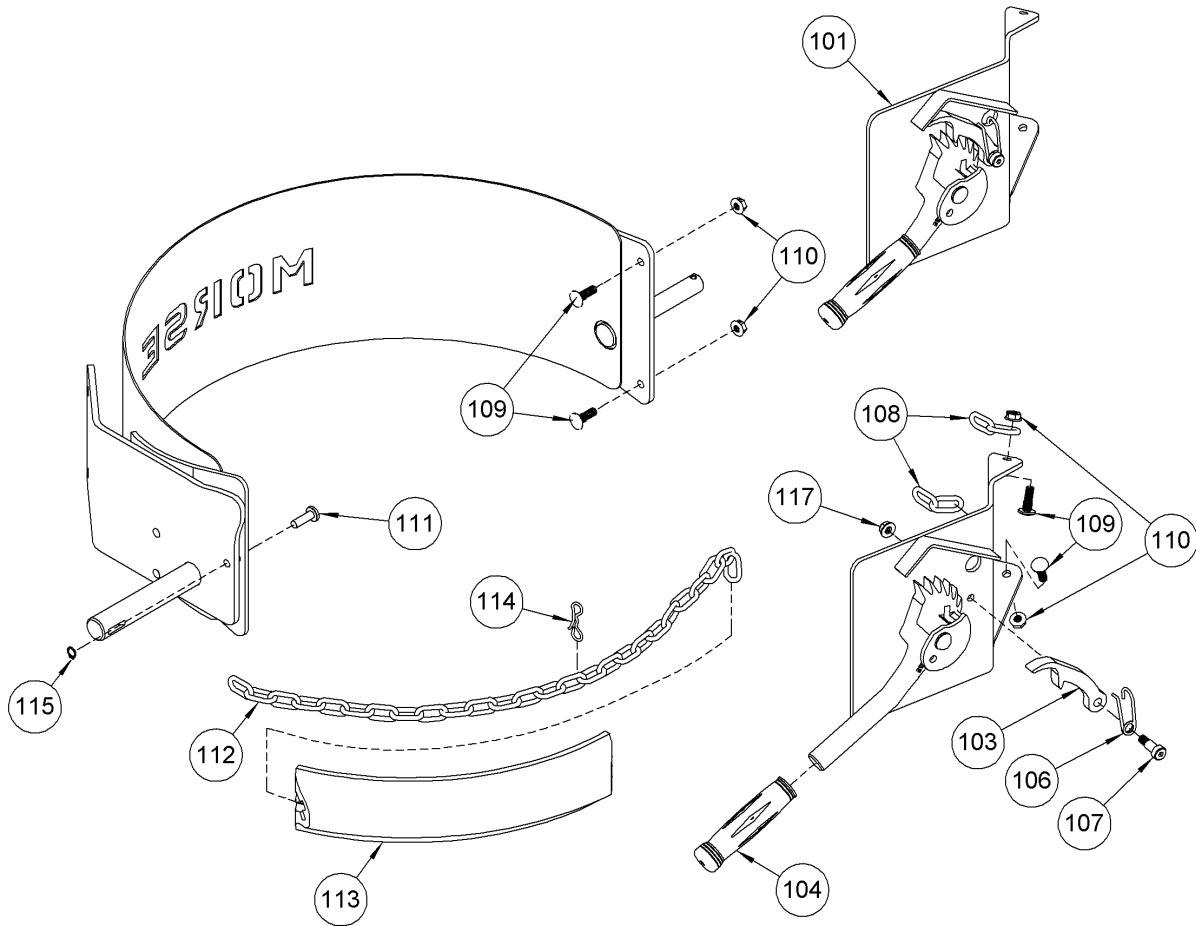


ITEM	QTY.	PART #	DESCRIPTION
1	1	5000-P	SADDLE ASM, MORCINCH, MOR
2*	1	3849B-P	BEARING BLOCK, SLIDING IDLER
3*	2	19-P	BEARING, 3/4" ID X 2-1/2"
4*	2	64-P	ROLL PIN, 3/16 X 1-1/4
5	2	535-P	HHCS, 3/8-16 X 1-1/4 GR5
6	2	1474-P	WASHER, 3/8 SPLIT LOCK
7	1	55-P	WASHER, 3/4 SAE FL 1-1/2 OD
8	2	58-P	SET SCREW, LOCK TEE, 285
9*	1	1304-P	GUIDE, POCKET CHAIN WHEEL
10*	1	1303-P	POCKET CHAIN WHEEL, 3/4 BORE
11*	1	3-285-P	CHAIN, PULL, POCKET 20' LENGTH
12	1	15-P	COLLAR, 3/4" ID
13*	1	7-P	BEARING, 3/4" ID X 1-1/2"
14*	1	1411-P	SPACER, SHAFT W/ 12T SPROCKET
15*	1	1302-P	SHAFT W/ 12T SPROCKET, POCKET
16	1	795-P	LINK, MASTER, #35 CHAIN

ITEM	QTY.	PART #	DESCRIPTION
17*	1	735-P	KEY, WOODRUFF, SIZE 9, ASA606
18*	1	14-P	GEAR, PINION, 7 TOOTH
19*	1	13-P	SPROCKET #35 36T, 3/4" BORE
20*	1	12-P	CHAIN, ROLLER, #35 W/ M LINK
21*	1	27-P	SPUR GEAR W/ 1" SHAFT, HD TYPE
22	3	29-P	SPACER, SPUR GEAR .15"
23*	2	18-P	BEARING, 1" ID X 2-1/2"
24*	2	736-P	KEY, WOODRUFF, SIZE 15, ASA808
25*	1	32-P	SPROCKET #40D 32T, 1" BORE
26*	1	30-P	SPROCKET #40D 16T, 1" BORE
27	1	796-P	LINK, MASTER, #40D CHAIN
28*	1	31-P	CHAIN, ROLLER, #40D W/ M. LINK
29	4	2182-P	WIRE / CABLE TIE, 4-33/64 (not shown)
30	1	4284-P	COVER SET, 40D SPROCKETS
31	1	4372-P	SPACER, HD DRIVE SHAFT 1.4"
32	1	4286-P	COVER SET, 30:1 GEARS, HD

* Recommended spare parts.

Operator's Manual for Morse Heavy-Duty Forklift-Karrier Model 285A-HD
Serial Number 0613 to 1114 (MMYY)



ITEM	QTY.	PART #	DESCRIPTION
101*	1	4214A-P	RATCHET PLATE CPT, MOR
103	1	168-P	PAWL, WITH DRILLED HOLE
104	1	136-P	GRIP, HANDLE 7/8" X 4-3/4"
106	1	169-P	SPRING, PAWL
107	1	170-P	SCREW, 3/8 DIA X 5/8 SHOULDER
108*	2	5019-P	CHAIN, HINGE, 9/32 ALLOY 2 LK
109*	4	4177-P	BOLT, 5/16-18 X 1 CARRIAGE RIB

ITEM	QTY.	PART #	DESCRIPTION
110*	4	4178-P	NUT, 5/16-18 FLANGE LOCK, MOR
111*	1	4172SP-P	PIN, S.P., CINCH CHAIN, 5000-P
112*	1	5017-P	CHAIN, CINCH, 9/32, 38 LINK
113*	1	4414-P	COVER, CINCH CHAIN, FLEX PVC
114	1	4710-P	PIN, BOW TIE COTTER, MOR
115*	1	4744-P	SNAP RING, EXTERNAL, 3/8"
117	1	1634-P	NUT, 5/16-18 WHIZ LOCK

* Recommended spare parts.

This Page Intentionally Left Blank

Attachment 4
Infrared Thermometer Manual

This Page Intentionally Left Blank

FLUKE®

566/568

Infrared Thermometers

Getting Started

PN 2812159

August 2007

© 2007 Fluke Corporation. All rights reserved. Printed in China.

All product names are trademarks of their respective companies.

LIMITED WARRANTY AND LIMITATION OF LIABILITY

This Fluke product will be free from defects in material and workmanship for two years from the date of purchase. This warranty does not cover fuses, disposable batteries, or damage from accident, neglect, misuse, alteration, contamination, or abnormal conditions of operation or handling. Resellers are not authorized to extend any other warranty on Fluke's behalf. To obtain service during the warranty period, contact your nearest Fluke authorized service center to obtain return authorization information, then send the product to that Service Center with a description of the problem.

THIS WARRANTY IS YOUR ONLY REMEDY. NO OTHER WARRANTIES, SUCH AS FITNESS FOR A PARTICULAR PURPOSE, ARE EXPRESSED OR IMPLIED. FLUKE IS NOT LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES OR LOSSES, ARISING FROM ANY CAUSE OR THEORY. Since some states or countries do not allow the exclusion or limitation of an implied warranty or of incidental or consequential damages, this limitation of liability may not apply to you.

Fluke Corporation
P.O. Box 9090
Everett, WA 98206-9090
U.S.A.
11/99

Fluke Europe B.V.
P.O. Box 1186
5602 BD Eindhoven
The Netherlands

Table of Contents

Title	Page
Introduction.....	1
Using the Thermometer.....	3
Connecting the Type K Thermocouple, USB Cable (568 Only), and Changing Batteries	3
Menu Overview	3
Specifications Summary.....	5

List of Tables

Table	Title	Page
1.	Top-Level Menu Description	4

List of Figures

Figure	Title	Page
1.	Laser Safety Markings.....	2
2.	Thermocouple and USB Connection and Changing Batteries.....	3
3.	Menu Navigation	4

Infrared Thermometers


Introduction

The 566 and 568 Infrared Thermometers (“the thermometers”) are for non-contact temperature measurement. These thermometers determine an object’s surface temperature by measuring the amount of infrared energy radiated by the object’s surface. The thermometers also support contact-temperature measurement via K-type thermocouple. See the Users Manual CD for complete operating instructions.

Safety Information

Warning

A Warning identifies conditions and actions that pose hazards to the user. To avoid personal injury, follow these guidelines:

-  Do not point laser directly at eye or indirectly off reflective surfaces.
- Replace the batteries as soon as the low-battery indicator appears.
- Do not use the thermometer if it operates abnormally. Protection may be impaired. When in doubt, have the thermometer serviced.
- Do not operate the thermometer around explosive gas, vapor, or dust.
- Do not connect the optional external probe to live electrical circuits.

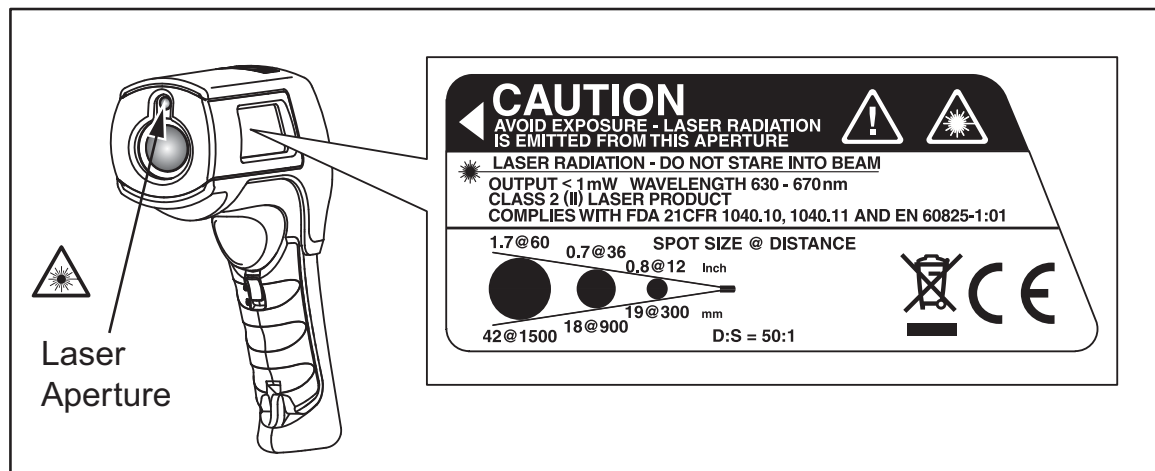
566/568 Getting Started

- To avoid a burn hazard or fire, know that reflective objects may be much hotter than the indicated temperature reading.
 - Do not leave the thermometer on or near objects of high temperature.
 - Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous laser radiation exposure.

⚠ Caution

To avoid damaging the thermometer or the equipment under test, protect them from the following:

- EMF (electro-magnetic fields) from arc welders, induction heaters, etc.
- Static electricity
- Thermal shock (caused by large or abrupt ambient temperature changes- for highest accuracy, allow 30 minutes for thermometer to stabilize before use).



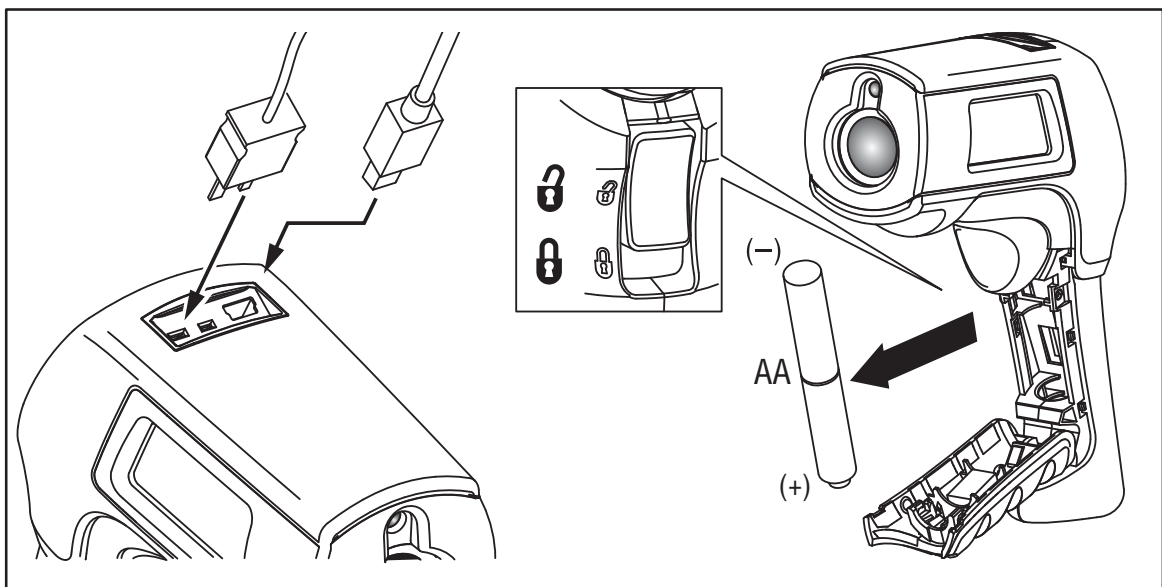
ewm08b.eps

Figure 1. Laser Safety Markings

Using the Thermometer

To take a temperature reading, point the Thermometer at the desired object and pull the trigger. You can use the laser pointer to help aim the Thermometer. You may also insert the K-type thermocouple probe for contact measurement.

Connecting the K-Type Thermocouple, USB Cable (568 Only), and Changing Batteries

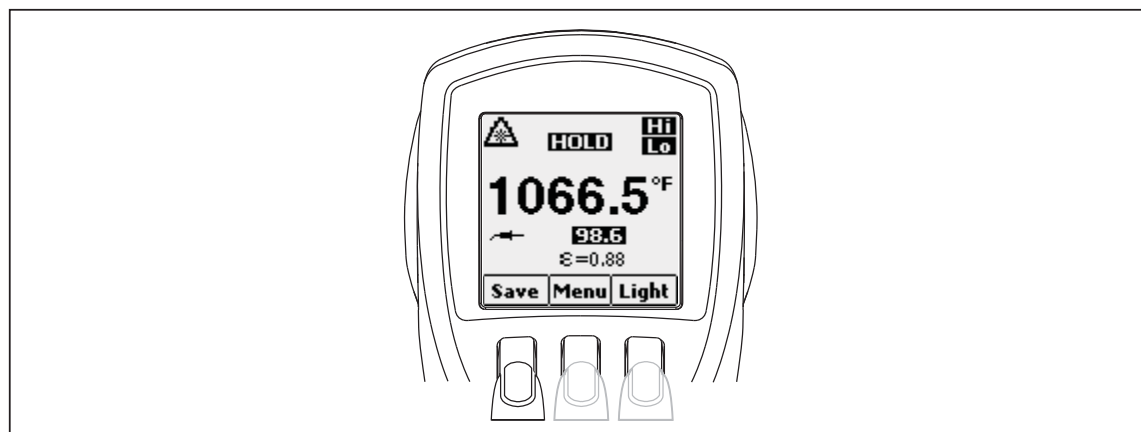


ewm04.eps

Figure 2. Thermocouple and USB Connection and Changing Batteries

Menu Overview

There are many settings that can be easily changed by using the menu. Table 1 is a top-level description. Selecting the **Menu** button advances the menu to the next level. Figure 3 shows the LCD and menu interface. The Users Manual explains the menus in full detail.



ewm01a.eps

Figure 3. Menu Navigation

Table 1. Top-Level Menu Description

Level	Left Softkey	Description	Center Softkey	Right Softkey	Description
1	Save	Save reading to memory	Menu	Light	Turn on bright backlight
2	Mem	Review / delete memories	Menu	ϵ	Set emissivity
3	MnMx	Enables Min/Max	Menu	Avg	Enable Avg/Diff
4	°F/°C	Toggle between C and F	Menu	Alarm	Set and enable alarms
5	🔒 (Lock)	Lock the thermometer on	Menu	Laser	Toggle the laser on/off
6	Setup	<ul style="list-style-type: none"> - Turn off backlight - Change Time/Date - Change Language 	Menu		

Infrared Thermometers Specifications Summary

Specifications Summary

See Users Manual on CD for full specifications.

Feature	566	568
IR Temperature Range	-40 °C to 650 °C (-40 °F to 1202 °F)	-40 °C to 800 °C (-40 °F to 1472 °F)
Accuracy above 0 °C (32 °F)	> 0 °C: $\pm 1\%$ or $\pm 1.0\text{ °C}$ (> 32 °F: $\pm 1\%$ or $\pm 2\text{ °F}$), whichever is greater	
K T/C Temperature Range	-270 °C to 1372 °C (-454 °F to 2501 °F)	
K T/C Input Accuracy	-270 °C to -40 °C: $\pm(1\text{ °C} + 0.2\%/1\text{ °C})$ (-454 °F to -40 °F: $\pm(2\text{ °F} + 0.2\%/1\text{ °F})$) -40 °C to 1372 °C: $\pm 1\%$ or 1 °C (-40 °F to 2501 °F: $\pm 1\%$ or 2 °F), whichever is greater	
Distance:Spot (90 % energy)	30:1	50:1
Laser sighting	Offset single laser < 1 mW	
Minimum spot size	19 mm	19 mm
Emissivity	Digitally adjustable from 0.10 to 1.00 by 0.01	
Data storage	20 points	99 points
Communication	None	USB 2.0
Operating Altitude	3000 meters above mean sea level	
Storage Altitude	12,000 meters above mean sea level	
Relative Humidity	10 % to 90 % RH non-condensing up to 30 °C (86 °F)	
Operating Temperature	0 °C to 50 °C (32 °F to 122 °F)	
Storage Temperature	-20 °C to 60 °C (-4 °F to 140 °F)	
Power	2 AA /LR6 Batteries	2 AA /LR6 Batteries or USB connection when used with a PC
Battery Life	12 hours with laser and backlight on; 100 hours with laser and backlight off, at 100 % duty cycle (continuously on)	

566/568
Getting Started

Feature	K-Type Thermocouple Probe (Bead Type)
Measurement Range	-40 °C to 260 °C (-40 °F to 500 °F)
Accuracy above 0 °C (32 °F)	±1.1 °C (±2.0 °F)

This Page Intentionally Left Blank

Attachment 5
Safety Manual for the Use of Propane

This Page Intentionally Left Blank

Compressed Gas Cylinder Policy

Table of Contents

List of Acronyms	2
Section 1 Introduction	3
Section 2 Definitions	3
Section 3 Responsibilities	5
3.1 Health and Safety Director.....	5
3.2 Health and Safety Manager.....	5
3.3 Health and Safety Representative	6
3.4 Project Manager/Supervisor.....	6
3.5 Staff.....	6
Section 4 Policy Elements.....	6
4.1 Storage of Compressed and Liquefied Gas.....	6
4.1.1 Storage Requirements	6
4.2 Compressed and Liquefied Gas Transportation and Handling.....	7
4.3 Compressed and Liquefied Gas use	8
4.4 Labeling	9
4.5 Manifolds, Valves, and Regulators.....	10
4.6 Gases with Specific Hazard Classes	10
4.6.1 Corrosive Gases	10
4.6.2 Cryogenic liquids and Gases.....	11
4.6.3 Flammable Gases	11
4.6.4 Fuel, High Pressure, and Oxidizing Gases.....	12
4.6.5 Toxic and Highly Toxic Gases.....	12
4.7 Gas Cylinder Servicing and Disposal	13
4.8 Handling Compressed Gas Cylinder Leaks and Emergencies.....	13
4.8.1 Preplanning	13
4.8.2 Minor Leaks	13
4.8.3 Major Leaks	14
4.8.4 Fire and Fire-Related Emergencies.....	14
4.9 Training.....	15
Section 5 References	15

List of Acronyms

°C	degree Celsius
°F	degree Fahrenheit
CFR	Code of Federal Regulations
DOT	Department of Transportation
HSD	Health and Safety Director
HSM	Health and Safety Manager
kPa	kilopascal
MSDS	Material Safety Data Sheet
MT	empty
NFPA	National Fire Protection Association
OSHA	Occupational Safety and Health Administration
PM	Project Manager
PSI	pounds per square inch
SOP	Standard Operating Procedure

Section 1 Introduction

Compressed and liquefied gases have the potential for creating hazardous working environments. This Compressed Gas Cylinder Policy contains information on the proper storage, handling, use and disposal of compressed and liquefied gas cylinders. Most of the information is general and applies to all compressed and liquefied gases. Specific information for selected hazard classes is contained in Section 4.6.

The purpose of this safety policy is to establish guidelines for the protection and safety of authorized and qualified employees who handle and use compressed gases. Compressed gases are typically stored under pressure in metal cylinders. These cylinders are designed and constructed to withstand high pressures. Improper handling and use of compressed gases can result in devastating consequences.

This safety policy provides guidelines for the safe handling and use of compressed gases. It includes provisions for training and presents safe handling guidelines. This policy also presents the types, uses, inspection, and marking requirements of compressed gas cylinders. Additionally, this safety policy presents transportation requirements for compressed gas cylinders.

Section 2 Definitions

Absolute Pressure – Based on a zero pressure reference point, the perfect vacuum. Measured from this point, standard atmospheric pressure at sea level is 14.7 pounds per square inch (psi) or 101.325 kilopascals (kPa). This is usually expressed as psia where the ‘a’ indicates an absolute measurement or kPa.

Asphyxiant Gas – Any non-toxic gas which displaces atmospheric oxygen below limits required to support life. These gases are usually colorless, odorless and tasteless and include, nitrogen, argon and helium.

Compressed Gas – a compressed gas is any gas which when enclosed in a container gives:

- an absolute pressure reading greater than 276 kPa (40 psi) at 21°C (70°F);
- an absolute pressure greater than 717 kPa (104 psi) at 54°C (129.2°F); or
- any flammable liquid having a vapor pressure greater than 276 kPa (40 psi) at 38°C (100.4°F).

Compressed Gas Cylinder – A compressed gas cylinder is any metal cylinder of the type approved by the U.S. Department of Transportation (DOT) for storage and transportation of gases under pressure, including liquefied gases. Metal cylinders are the only approved DOT packaging for compressed gases.

Corrosive Gas – A gas that in contact with living tissue causes destruction of the tissue by chemical action.

Cryogenic Liquid – A liquid with a normal boiling point below -150°C (-238°F)

Cryogenic Liquid Cylinder – Pressurized container designed and fabricated to hold cryogenic fluids. There are three common types of liquid cylinders: gas dispensing, liquid dispensing, or gas and liquid dispensing.

Cylinder Valve – A mechanical device attached to a compressed gas cylinder that permits flow into or out of the cylinder when a device is in the open position and prevents flow when in the closed position.

Dewar – Is an open-mouthed, non-pressurized, vacuum-jacketed container used to hold cryogenic fluids.

Flammable gas – A substance that meets the definition of a compressed gas which:

- is flammable in a mixture of 13% or less (by volume) with air, or
- has a flammable range with air wider than 12%, at atmospheric temperature and pressure, regardless of the lower limit.

Gauge Pressure – The pressure above or below atmospheric pressure. Therefore absolute pressure minus local atmospheric pressure equals gauge pressure and is usually abbreviated as psig or kPa.

Handling – Moving, connecting, or disconnecting a compressed or liquefied gas container under normal conditions of use.

Highly Toxic Gas – A compressed gas that has a median lethal concentration (LC₅₀) in air of ≤200 ppm. A National Fire Protection Association (NFPA) Health Hazard rating of 4 is given to gases having a LC₅₀ in air ≤1000 ppm. An example of a highly toxic gas is fluorine with a LC₅₀ of 185 ppm.

High Pressure Gas – A gas in a container that has a pressure of 3448 kPa (500 psig) or higher at 21.1°C (70°F).

Inert Gas – A gas which is chemically inactive.

Liquefied Gas – A fluid within a pressurized container, other than in solution, which exists both as a liquid and gas at 20°C (68°F). Examples include propane, butane, ammonia, carbon dioxide, and sulfur dioxide.

Manifold – A gas distribution system which transfers product through multiple outlets/inlets to or from compressed gas containers.

Nonflammable Gas – a gas which, within the packaging, exerts an absolute pressure of 280 kPa (40 psi) or greater at 20°C (68°F) but is not a flammable gas as defined previously.

Oxidizing Gas – A gas that can support and accelerate combustion of other materials.

Pressure Regulator – A mechanical device used to safely control the discharge pressure of a compressed gas from a container.

Pressure Relief Device – A pressure and/or temperature activated device used to prevent the pressure from rising above a predetermined maximum and thereby prevent rupture of a pressurized container.

Pyrophoric Gas – A gas that will spontaneously ignite in air at/or below 54.4°C (130°F). Examples include silane and phosphine.

Standard Cubic Foot (SCF) – One standard cubic foot of gas at 21°C (70°F) and 101.325 kPa (14.696 psia)

Storage – Holding of gas, in its packaging, either on a temporary basis or for an extended period in such a manner as to not constitute usage of the gas.

Toxic Gas – A gas having a Health Hazard of 3 or 4 as defined in NFPA 704, *Standard System for the Identification of the Fire Hazards of Materials*.

Valve protective Cap – A rigid, removable cover provided for compressed gas cylinder valve protection

Valve Protection Device – A device attached to the neck ring or body of the cylinder for the purpose of protecting the cylinder valve from being struck or damaged from impact resulting from a fall or an object striking the cylinder.

Section 3 Responsibilities

3.1 Health and Safety Director

The Health and Safety Director (HSD) shall ensure compliance with the requirements identified in this Compressed Gas Cylinder policy by conducting periodic audits within the organization. The HSD shall also act as a resource regarding compressed gas cylinder compliance.

3.2 Health and Safety Manager

The Health and Safety Manager (HSM) shall ensure that all workplaces within their organization are familiar with the Compressed Gas Cylinder policy and that its policy elements are implemented at each location. Specifically, the HSM shall perform the following duties:

- communicate policy requirements to those employees who may use compressed gas cylinders in the performance of their work;
- provide for the necessary compressed gas cylinder training; and
- maintain chemical inventories and Material Safety Data Sheets (MSDS) files as appropriate within their respective office.

3.3 Health and Safety Representative

The health and safety representative will provide prompt assistance to HSMs, supervisors, or Project Managers (PMs) as applicable on any matter concerning this safety policy. Health and safety representatives will assist in developing the required training and will also work with purchasing to ensure that all newly purchased compressed gas cylinders, equipment, and supplies comply with current safety regulations and this safety policy. Health and safety representatives will conduct regular audits and inspections to ensure safe operation and compliance.

3.4 Project Manager/Supervisor

The PM and/or supervisor shall ensure that the compressed gas cylinder policy requirements have been identified and addressed within any the health and safety project planning documents that are used for that project. This task may include, but not limited to, the following:

- identification of work tasks (routine and non-routine) and performance of an associated hazard analysis;
- completion of a chemical inventory for the project;
- procurement of MSDSs for chemicals used exclusively for the project;
- labeling of containers used on site for hazardous materials; and
- identification of any additional compressed gas cylinder training requirements.

3.5 Staff

Staff will be responsible for continuous adherence to the health and safety procedures during the performance of assigned work. In no case may work be performed in a manner that conflicts with the intent of this policy.

Section 4 Policy Elements

4.1 Storage of Compressed and Liquefied Gas

Proper storage is critical for the safe usage of compressed and liquefied gases. Cylinder storage areas should be prominently posted with hazard information regarding the gases stored. The NFPA 704 diamond with a cylinder indicated in the “specific hazard” (white) section of the diamond and the corresponding flammability, health, and reactivity hazard sections also marked is an accepted method of signage. Other storage requirements are outlined below.

4.1.1 Storage Requirements

All gas cylinders shall:

- not be stored in exits or egress routes;

- be stored within a well-ventilated area;
- not be stored in damp areas, near salt or corrosive chemicals, fumes, heat, or where exposed to the weather;
- be stored in an upright position;
- be secured with a chain or appropriate belt above the midpoint, but below the shoulder. Cylinders less than 18” tall may be secured by approved stands or wall brackets.
- be capped when not in use or attached to a system (if the cylinder will accept a cap);
- be kept at least 20 feet away from all flammable, combustible, or incompatible substances unless used as a fuel source. Storage areas that have a noncombustible wall at least 5 feet in height and with a fire resistance rating of at least 30 minutes may be used to segregate gases of different hazard classes in close proximity to each other.
- be stored so that cylinders are used in the order in which they are received;
- be stored so that gases with the same hazard class are stored in the same area. Inert gases are compatible with all other gases and may be stored together.
- not be stored longer than one year without use; and
- be stored so that full cylinders remain separate from empty cylinders.

4.2 Compressed and Liquefied Gas Transportation and Handling

The following requirements shall apply to the handling of compressed gas cylinders:

- Compressed gases shall be handled only by properly trained persons. Training must include the contents of this guideline as well as any specific information relevant to the gas being used.
- Safety shoes are required when moving compressed gas cylinders.
- Cylinders should not be dragged or physically carried unless specifically designed to be carried (portable propane tank). Transport cylinders with a handtruck designed for the transport of cylinders. Cylinder caps shall be secured during transport.
- Prevent damage to cylinders. Locate cylinders where they will be protected from physical damage by striking or falling objects, corrosion, or damage from public tampering.
- No person other than the gas supplier shall attempt to mix gases in a cylinder.
- Cylinders shall not be subjected to artificially created low temperatures without approval from the supplier.

- Containers shall not be used for any other purpose than holding the contents as received.
- Damaged or leaking cylinders must be reported immediately to a health and safety representative for proper disposal.
- Cylinders should not be transported without safety caps. A cylinder's cap should be screwed all the way down on the cylinder's neck ring and should fit securely. Cylinders shall not be picked up by the cap. The cap is for protection only.
- Ropes, chains, and slings shall not be used to suspend cylinders, unless cylinder was designed for such.
- Magnets shall not be used for lifting cylinders.
- Where appropriate lifting attachments have not been provided on the cylinder/container, suitable cradles or platforms to hold the containers shall be used for lifting.
- The user shall not paint cylinders.
- Leaking, defective, fire burned, and corroded containers shall not be shipped without the approval of the supplier.

4.3 Compressed and Liquefied Gas use

Listed below are general "good practice" guidelines to follow when using gas cylinders and compressed gases.

- Ensure that regulator pressure control valve is relieved before attaching to tanks.
- Close valves on gas cylinders when a system is not in use.
- Remove all pressure from regulators not currently used (by opening equipment valves downstream **after** the regulators are closed).
- Shut-off valves must not be installed between pressure relief devices and the equipment they are to protect.
- Use pressure relief valves in downstream lines to prevent high pressure buildup in the event that a regulator valve does not seat properly and a tank valve is left on.
- Relief valves should be vented to prevent potential buildup of explosive or toxic gases.
- Never allow flames or concentrated heat sources to come in contact with a compressed gas cylinder.
- Never allow a compressed gas cylinder to become part of an electrical circuit.
- Never partially open a tank valve to remove dust or debris from the cylinder inlet.
- Never use cylinder gas as compressed air.

- Pressurize regulators slowly and ensure that valve outlets and regulators are pointed away from all personnel when cylinder valves are opened.
- Cylinders which require a wrench to open the main valve shall have the wrench left in place on the cylinder valve while it is open. Use adequately sized hand wrenches (12” long) to minimize ergonomic stress when turning tight tank valves. Never apply excessive force when trying to open valves. Cylinders with “stuck” valves should be returned to suppliers to have valves repaired.
- Do not attempt to open a corroded valve; it may be impossible to reseal.
- Valves should only be opened to the point where gas can flow into the system at the necessary pressure. This will allow for quicker shutoff in the event of a failure or emergency.
- Use a cylinder cap hook to loosen tight cylinder caps. Never apply excessive force or pry off caps. Return to supplier to remove “stuck” caps.
- Keep piping, regulators, and other apparatus gas tight to prevent gas leakage.
- Confirm gas tightness by using compatible leak test solutions or leak test instruments.
- Release pressure from systems before connections are tightened or loosened and before any repairs.
- Do not use Teflon tape on straight thread fittings where the seal is made by metal-to-metal contact. Use of Teflon tape causes the threads to spread and weaken, increasing the likelihood of leaks.
- Never use adapters or exchange fittings between tanks and regulators.
- Fluorescent light can be used to check for grease or oil in regulators and valves.

4.4 Labeling

The following labeling requirements shall apply to all gas cylinders:

- Know the contents of each compressed gas cylinder you are using.
- Use only the vendor label for positive identification of contents of the cylinder. Be aware that color coding may be inconsistent from vendor to vendor.
- Mixed gases shall be clearly labeled with the contents of the cylinder.
- Empty cylinders shall be labeled with the word empty or the abbreviation MT.

Preferred labeling includes the identity of the material, statement of hazard and associated signal work. For example the preferred label for nitrogen would be:

Nitrogen
CAUTION: HIGH PRESSURE GAS
CAN CAUSE RAPID SUFFOCATION

Excellent sources of information for the warning and hazard information that should be contained on cylinders are the manufacturer or distributor of the compressed gas cylinder.

4.5 Manifolds, Valves, and Regulators

The following information applies to the use of manifolds, valves and/or regulators:

- Where compressed gas containers are connected to a manifold and its related equipment, such as regulators, shall be of proper design for the product(s) they are to contain at the appropriate temperatures, pressures and flows.
- Use only approved valves, regulators, manifolds, piping and other associated equipment in any system that requires compressed gas. Care must be taken to ensure that pressure gauges on regulators are corrected for the pressure of the gas cylinder used. With the exception of lecture bottles, threads, configurations and valve outlets are different for each class of gases to prevent mixing of incompatible gases.
- Valves and regulators should undergo periodic maintenance and repair. A visual inspection should be performed before each usage to detect any damage, cracks, corrosion or other defects. Long term maintenance or replacement periods vary with the types of gases used, the length of use, and conditions of usage. Consult the cylinder, regulator, or gas supplier for recommended valve and regulator maintenance schedules.
- Valves and regulator maintenance histories should be known before usage. Valves that pass visual inspection are still subject to failure, therefore it is critical that toxic or poisonous gases are used in ventilated enclosures and have local exhaust ventilation in place for downstream pressure relief valves, etc.
- Valves and regulators should only be repaired by qualified individuals. Valve and regulator manufacturers, gas supply companies, or valve and regulator specialty shops should be consulted for any repair needs.

4.6 Gases with Specific Hazard Classes

The following information regarding specific classes of gases is offered as additional guidance to be used in conjunction with the general usage requirements listed in Section 4.3.

4.6.1 Corrosive Gases

The following information is provided for corrosive gases. Examples include chlorine, hydrogen chloride, fluorine, hydrogen fluoride, hydrogen sulfide, carbon monoxide, and carbon dioxide.

- Metals become brittle when used in corrosive gas service, check equipment and lines frequently for leaks.
- A diaphragm gauge should be used with corrosive gases that would destroy a steel or bronze gauge. Check with a gas supplier for recommended equipment.

- Remove regulators after use and flush with dry air or nitrogen.

4.6.2 Cryogenic liquids and Gases

Cryogenic liquids and their boil-off vapors rapidly freeze human tissue and cause embrittlement of many common materials which may crack or fracture under stress. All cryogenic liquids produce large volumes of gas when they vaporize (at ratios of 600:1 to 1440:1, gas:liquid) and may create oxygen-deficient conditions. Examples of common cryogenic liquids include liquid oxygen, hydrogen, helium, and liquid neon. The following information applies to the use and handling of cryogenics:

- Use appropriate personal protective equipment (PPE) including insulated gloves and eye protection (goggles and a face shield) during any transfer of cryogenic liquid.
- In the event of skin contact with a cryogenic liquid, do not rub skin, place the affected part of the body in a warm water bath (not to exceed 40°C [105°F]).
- Use only equipment, valves and containers designed for the intended product and service pressure and temperature.
- Inspect containers for loss of insulating vacuum. If the outside jacket on a container is cold or has frost spots, some vacuum has been lost. Empty the contents into another cryogenic container and remove the damaged unit from service. Repairs should be made by the manufacturer or an authorized company.
- Transfer operations involving open cryogenic containers such as dewars must be conducted slowly to minimize boiling and splashing of the cryogenic fluid.
- Ice or other foreign matter should not be allowed to accumulate beneath the vaporizer or the tank. Excessive ice buildup could result in the discharge of excessively cold gas or structural damage to the cryogenic container or surrounding.
- All cryogenic systems including piping must be equipped with pressure relief devices to prevent excessive pressure build-up. Pressure reliefs must be directed to a safe location. Do not tamper with pressure relief valves or the settings for the valves.
- Hot air, steam, or hot water should be used to thaw frozen equipment. DO NOT USE water to thaw liquid helium equipment.

4.6.3 Flammable Gases

The following information applies to the use and handling of flammable gases. Some common examples of flammable gases include acetylene, hydrogen, methane, propane, and iso-butane.

- Flammable gases, except for protected fuel gases, shall not be used near ignition sources. Ignition sources include open flames and sparks, sources of heat, oxidizing agents, and ungrounded or non-intrinsically safe electrical or electronic equipment unless intended as a fuel source.
- Portable fire extinguishers shall be available for fire emergencies. The fire extinguisher must be compatible with the apparatus and the materials in use.

- Flames shall not be used for detecting leaks. A compatible leak detection solution shall be used for leak detection.
- Spark proof tools shall be used when working with or on a flammable compressed gas cylinder or system.
- Access doors to areas which use or store flammable gases shall be posted “No Open Flames.”
- Manifold systems shall be designed and constructed by competent personnel who are thoroughly familiar with the requirements for piping of flammable gases. Consultation with the gas supplier before installation of manifolds is recommended.

4.6.4 Fuel, High Pressure, and Oxidizing Gases

The following information applies to the use and handling of fuel, high pressure, and oxidizing gases:

- Fuel gases often use a combination of flammable and oxidizing gases. Use of fuel gases must comply with Occupational Safety and Health Administration (OSHA) 29 DFR 1910.253 – Oxygen-Fuel Gas Welding and Cutting, 29 CFR 1910.102 – Acetylene and 29 CFR 1910.103 – Hydrogen.
- High pressure gases can be rated up to 3000 psi. Typical uses include MIG welding gas mixtures, cryogenics, non-toxic gas distribution, medical gas distribution, and emergency oxygen services. In addition to any gas specific hazards, high pressure gases should carry the following hazard label:

CAUTION: HIGH PRESSURE GAS

- Oxidizing gases are non-flammable gases (e.g. oxygen chlorine, fluorine, and nitrous oxide), but in the presence of an ignition source fuel can support and vigorously accelerate combustion. Do not use oil in any apparatus where oxygen will be used. Gauges and regulators for oxygen shall bear the warning “OXYGEN – USE NO OIL”

4.6.5 Toxic and Highly Toxic Gases

The following information applies to the use of toxic and highly toxic gases.

- All gases with a NFPA Health Hazard rating of 3 or 4 MUST be stored and used in accordance with the regulations.
- Unless otherwise indicated, all gases must be stored in a continuously mechanically ventilated gas cabinet, fume hood or other enclosure.
- Audible alarms should be utilized in ventilated hoods that are dedicated to toxic gas usage or storage.
- Standard Operating Procedures (SOPs) for processes or procedures which use corrosive, toxic, or highly toxic gases shall be developed that include emergency

response actions. All affected employees shall be trained on the contents of these procedures.

4.7 Gas Cylinder Servicing and Disposal

The following information applies to the disposal of compressed gas cylinders:

- If possible, purchase compressed gas only from manufactures that will agree to take back the empty cylinder.
- A cylinder is considered empty when the container pressure is at atmospheric pressure.
- Refillable cylinders should be returned to material handling personnel or directly to the vender.
- Maintain manufacturer labels and label the cylinder with an “Empty” or “MT” tag.
- Proper identification of the contents of all cylinders is required and is the responsibility of the cylinder owner.

4.8 Handling Compressed Gas Cylinder Leaks and Emergencies

4.8.1 Preplanning

Users of compressed gas cylinders must be familiar with necessary safety precautions. SOPs for activities using compressed gases shall include a discussion of possible accident scenarios, appropriate employee responses and should take into account the following factors:

- The nature of the operation.
- The potential location of a release or spill.
- The quantities of material that might be released and the type of containment.
- The chemical and physical properties of the compressed gas.
- The hazardous properties of the compressed gas.
- The availability and locations of emergency supplies and equipment.
- A contingency plan which identifies building evacuation routes, emergency telephone numbers, chemical containment procedures, fire extinguisher usage, etc., should be available.

4.8.2 Minor Leaks

Occasionally a gas cylinder or one of its component parts may develop a leak. Most of these leaks occur at the top of the cylinder in areas such as the valve threads, pressure safety device, valve stem, or valve outlet. The following information applies to the remediation of minor leaks:

- If possible, verify suspected leaks using a flammable gas detector or soapy water solution (a flame should not be used for detection). If the leak cannot be stopped by tightening a valve gland or packing nut, emergency action procedures should be initiated.
- For flammable, inert, or oxidizing gases, move the cylinder to an isolated, well-ventilated area and use suitable means to direct the gas into an appropriate chemical neutralizer. Post signs that describe the hazards.
- If it is necessary to move a leaking cylinder through populated areas, place a plastic bag, rubber shroud, or similar device over the top and tape it to the cylinder to confine the leaking gas.

4.8.3 Major Leaks

In the event of a large gas release or if an accident takes place in which readily available PPE is inadequate to ensure worker safety, activate the following emergency procedures:

- Immediately call 911 and report the incident.
- Activate a building or area fire alarm.
- Evacuate the area, securing entrances and providing assistance to others on the way out.
- Provide emergency response officials with details of the problem upon their arrival.

For accidents involving personnel injury activate the following emergency procedures:

- For medical emergencies, call 911.
- Assist persons involved and administer immediate first aid which may include:
 - washing under a safety shower;
 - removing contaminated clothing;
 - irrigating the eyes at an eyewash; or
 - administering artificial respiration.
- Notify personnel in adjacent areas of any potential hazards.
- Move injured personnel only if necessary to prevent their exposure to further harm.

4.8.4 Fire and Fire-Related Emergencies

Small isolated fires may be extinguished using the appropriate portable fire extinguisher if personnel are confident that they can safely extinguish the fire. For large or rapidly spreading fires, the following procedures should be followed:

- Call 911 to report the fire.
- Activate building or area alarms.

- Evacuate the building, shutting doors and providing assistance to others on the way out.
- Provide fire or police officials with the details of the problem upon their arrival.

4.9 Training

All personnel involved with handling, transporting, or the use of compressed gas cylinders will be trained and will have reviewed this policy.

Section 5 References

Occupational Safety and Health Standards for General Industry 29 CFR 1910.101.

This Page Intentionally Left Blank

Attachment 6
Safety Manual for Utility Torches

This Page Intentionally Left Blank

DANGER

CARELESS USE OF LP-GAS AND RELATED EQUIPMENT CAN RESULT IN DEATH OR SERIOUS BODILY INJURY FROM ASPHYXIATION, FIRE AND/OR EXPLOSION.

Warning and Safety Instructions

Do not use in unventilated areas.

Use of torches in unventilated, tightly enclosed areas or living quarters may cause death or serious bodily injury due to asphyxiation. Adequate ventilation and air is essential to safe operation.

If the flame in your torch becomes extinguished, shut off the gas immediately and wait five minutes or until you are certain the gas has cleared away before relighting. Torches equipped with safety control valve and thermocouple assembly are designed to automatically shut off the gas supply if the flame is extinguished. Models 124, 162, 163, 164 and 165 are equipped with safety control valve and thermocouple assembly, are the only models appropriate for use in an enclosure, such as a kiln. If the model is not equipped with these devices, **DO NOT USE THE TORCH IN ENCLOSURES**. Even with safety controls, 100% supervision of the torch, when in operation, is required.

Do not operate above prescribe operating pressure. Excessive pressure may cause blowout, explosion and result in death or serious bodily injury.

Do not direct flames toward the gas cylinder as heat causes increase pressure and the safety valves may open releasing gas into the air, which can explode if ignited by the flame. Keep temperature of all gas cylinders below 125 degrees F and if possible, install cylinders outside of enclosed areas.

Use regulators and the hoses supplied with the torches and connect a regulator to the LP tank so that gas pressure in the hose is regulated at all times.

Use of incorrect hose, regulator, and Prest-O-Lite (POL) or excess flow valve may lead to gas and explosion or asphyxiation. If the torch is purchased without a hose, POL, excess flow valve, or regulator or any of these items are lost or damaged, contact the manufacture.

Check for gas leaks. Incorrect assembly of torch can result in fire, explosion, death or serious bodily injury from asphyxiation due to gas leaks.

Follow assembly and operating instructions in owner's manual supplied with each torch, before using torch.

If you suspect a leak, or smell gas odor, **EXTINGUSH ALL FLAMES AND SPARKS IMMEDIATELY**.

LP-gas is heavier than air and settles in low areas. **DO NOT INSTALL LP-GAS burning equipment in an area where gas may settle.**

Inspect torch regularly.

Inspect torch at time of installation for gas leaks and at least once a month and whenever accidental damage occurs.

If the gas burning equipment is not working properly, remove from service immediately. Have equipment repaired and tested by an authorized person before placing it back into service.

Gas pipe joint compound that is resistant to liquefied petroleum gases should be used on all connections.

Use only the manufacturer's replacement parts on the torches

Torch models with safety control valves and thermocouple assemblies use part number 02285, safety control valve.

Torch models with pilot safety control valves, thermocouple assemblies use part number 01233, pilot safety control valve.

Regulator Safety Instructions

WARNING

FIRE, BURN, EXPLOSION HAZARD LP-gas and natural gas are extremely flammable and explosive. Only properly trained personnel shall install service and maintain gas pressure regulators. Failure to follow these instructions may result in a fire or explosion, causing property damage, severe personal injury or death.

All gas regulators must be installed and used strictly in accordance with the instructions of the manufacturer, with government codes and regulations, and local codes and practices.

Do not use any gas regulator if it appears to have been flooded or exposed to excessive water or other liquids, high temperature, damage or take apart. Any of these conditions (and possibly others not listed) may damage the regulator in turn causing leaks or improper operation and thereby cause potentially dangerous conditions.

Always install the regulators with gas flowing as indicated by the arrow on the regulator's body.

Always use pipe thread compound, properly threaded pipes and proper assembly procedures so that cross threading does not occur. Cross threading will cause damage and subsequent gas leakage.

Make sure the regulator is installed so its vent is facing down and under a protective cover.

To prevent regulator contamination, make sure all piping is clean and free from foreign material (such as dirt, corrosion, pipe compound, etc) when installing.

Apply wrench pressure only to the areas surrounding the inlet and outlet connections of the regulator to avoid possible fracture of the regulator's body with subsequent leakage of the regulator.

Carefully check the regulator for gas leaks after installation and after the gas is turned on. Do this before lighting any heaters. Use approved leak detectors to check all pipe joints and connections, regulator diaphragm, flanges, and vent openings. Any leaks must be repaired. Leaking regulators must be replaced. Gas leaks can lead to fires or explosions.

Venting of regulators must be controlled in accordance with applicable government and plumbing codes and regulations to avoid the danger of escaping gas should there be internal leakage. All vent lines must be kept open and the open end protected against entry of foreign matter (such as water, ice, snow, insects, etc.)

The regulator's vent line shall be at least the same size as the outlet of pressure relief vent on the regulator.

All regulator vents must be kept open and fully clear at all times. If the regulator's vent is clogged or its screen is missing, cleaning of the vent and screen replacement is necessary. If there is evidence of foreign material inside the vent, the regulator should be replaced.

The outlet pressure of the regulator must be checked to make sure it is supplying proper gas pressure to the inlet of the heater.

The gas regulator selected must be compatible with the fuel type being used. It must also have sufficient capacity to support the heat load and maintain proper regulation, and must be compatible with inlet pressure it will receive and provide outlet pressures to the heater(s) that it supplies.

Operation instruction for propane and natural gas torches

FOR YOUR SAFETY

Do not use this torch in a space where gasoline or other liquids having flammable vapors are stored or used.

CAUTION

The appliance area shall be kept clear and free from combustible materials, gasoline, and other flammable vapors and liquids.

WARNING

Do not use open flame (matches, torches, candles, etc) in checking for gas leaks. A fire or explosion may result.

WARNING

LP-gas is extremely flammable, heavier than air and does not disburse readily. If gas is smelled, evacuate the area immediately and call your fire department.

Model	Output (BTUH)	Fuel
156	250,000	LP Vapor Withdrawal
162	400,000	LP Vapor Withdrawal
163	400,000	LP Vapor Withdrawal
164	365,000	Natural Gas
166	500,000	LP Vapor Withdrawal
168	200,000	LP Vapor Withdrawal
169	200,000	LP Vapor Withdrawal
171	500,000	LP Vapor Withdrawal

SAFETY PRECAUTIONS

General Hazard Warning

Failure to comply with the precautions and instructions provided with this torch can result in death, serious bodily injury and property loss or damage from hazards of fire, explosion, burn, asphyxiation, carbon monoxide poisoning, and/or electrical shock.

WARNING

Fire, burn, inhalation, and explosion hazard. Keep solid combustibles such as building materials, paper or cardboard a safe distance away from the torch as recommended by the instructions. Never use the torch in spaces which do or may contain volatile or airborne combustibles, or products such as gasoline, solvents, paint thinner, dust particles or unknown chemicals.

All torches should meet the requirements of local, state and natural LP gas and natural gas, electrical and safety codes. The local gas supplier, local licensed electrician, Fire department, and government agencies can help determine these requirements. In absence of local codes, comply with the Standard for Storage and Handling of Liquefied Petroleum Gas, ANSI/NFPA 58-Latest Edition or contact the manufacture.

Do not use the torch in unventilated areas. Adequate ventilation must be provided. Use of torches in unventilated, tightly enclosed areas or living quarters may cause death or serious bodily injury due to asphyxiation.

If the flame in the torch becomes extinguished, shut off the gas immediately and wait until you are certain the gas has cleared away before relighting. Torches equipped with a safety control valve and thermocouple assembly are designed to automatically shut off the gas supply if the flame is extinguished.

Constant supervision of the torch is required when in operation.

Ensure the torch receives the proper operating pressure as given in the specification table for the specific torch. Do not operate torch above prescribed operating pressure. Excess pressure may cause blowout of flame, resulting in explosion with death or serious bodily injury.

Do not direct flame towards the gas cylinder as heat causes increased pressure. The safety valves on the cylinder may open releasing gas into the air, which can explode if ignited by the torch flame.

Keep the torch and its exposed flame away from all combustible materials.

Keep temperature of all gas cylinders below 100 degrees F. Keep all cylinders out of enclosed areas.

Some torch models are required a regulator to be connected to the gas supply to provide proper operating pressure. Other torches operate with direct tank pressure. Refer to the following Table 1 below to determine if the torch requires a regulator for operation.

Table 1

Torch Model	Regulator Required	Regulator Not Required
156	X	
162	X	
163	X	
164	X	
166	X	
168	X	
169		X
171		X

Use of an incorrect hose, regulator, and POL fitting, or excess flow valve may lead to gas leaks and explosion or asphyxiation.

The hose assembly shall be visually inspected prior to each use of the torch. If it is evident there is excessive abrasion or wear or if the hose is cut, it must be replaced prior to the torch being put in to operation. The hose assembly shall be protected from traffic, building materials and contact with hot surfaces during use and while in storage. The replacement hose shall be that specified by the manufacture.

WARNING

Do not use a pressure washer, water or liquid cleaning solution on any safety control components. Use of a pressure washer, water or liquid cleaning solution on the safety control components can cause severe personal injury or property damage due to water and/or liquids: Causing corrosion, which can result in gas leaks and fire or explosion from the leak. Clean all components of the torch with a dry brush or dry cloth.

INSTALLATION INSTRUCTIONS

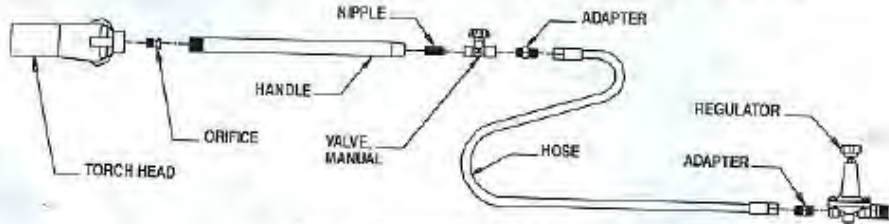
Read all Safety Instructions and follow the manufacture when installing this torch.

Assemble according to the instructions provided below.

The unit's gas regulator (with pressure relief valve) must be installed so its vent is pointed downward.

Models 166 (BIG BERTHA) and 168 (LITTLE BERTHA)

1. Connect nipple into handle of torch. Tighten securely.
2. Connect manual valve to nipple. Note gas flow arrow on valve body. Tighten securely.
3. Connect hose adapter to inlet of manual valve. Tighten securely.
4. Connect hose to adapters at needle valve and regulator outlet. Tighten securely.



Specifications and Part Numbers

Model	Heat Output	Operating Pressure/Fuel	Torch Head with Orifice	Orifice	Handle	Nipple	Manual Valve	Hose Adapter	Hose	Regulator
166	500,000 BTUH	25 PSIG	320-02856 Cast Iron 2 3/8 in. OD x 8 in.	310-01016	330-05169 11 in.	130-01142	130-20229	310-01098	550-20703 1/4 in. OD x 10 ft.	550-21788 25 PSI
168	299,000 BTUH	LP Vapor	320-02854 Cast Iron 2 in. OD x 7 in.	310-10132						

Attachment 7
MTDU Operating Manual

This Page Intentionally Left Blank



Reactive & Explosive MATERIALS TRAINING CORPORATION

133 Route 206 • Branchville, New Jersey 07826 • 973-948-0270 • Fax: 973-948-5972 • 1-800-REMTTC95

1. Preoperational Precautions

Preoperational Health and Safety Meeting. The Site Health and Safety Supervisor (SHSS) will hold a preoperational meeting with all personnel involved in MTDU operations to assess and identify potential hazards, ensure compliance with the Health and Safety Plan, to ensure clarity of communications and to confirm the chain of command.

Preoperational MTDU Requirements

- a.) The MTDU must be grounded if burning static sensitive material
- b.) Check all gas hoses and valves for leaks, splits or malfunctions
- c.) Check that the MTDU is empty of any unwanted materials
- d.) Assemble the propane fuel source, torches and connect the apparatus to the MTDU
- e.) Install “straight tube” for items and when there is no appreciable “projectile” hazard
- f.) Ignite and adjust the rate of fuel feed and venting to ensure reliable ignition of introduced material
- g.) Allow the MTDU to preheat for a minimum of five minutes before reliable ignition of hazardous material can be expected

2. MTDU Operations Required Documents:

- a.) Reactive & Explosive Materials Training Corporation’s Operation of Portable Mobil Thermal Destruction Unit (MTDU)
- b.) Required MSDS(s)
- c.) Hazards Assessment Work Sheet
- d.) Job and Site Specific Work Instructions
- e.) Operators Training Certification

MTDU Equipment

- a.) Inner Box
- b.) Main Containment Chamber
- c.) Optional Recombustion Chamber
- d.) Propane Fuel Source
- e.) Propane Torches
- f.) Propane Igniter

3. Personal Protective Equipment (onsite operational personnel)

- a.) Nomex Coveralls
- b.) Nomex Hood
- c.) Fire Resistant Gloves
- d.) Kevlar Helmets with Face Shield
- e.) Conductive Safety Shoes (Steel Toe)
- f.) ABC Fire Extinguisher (2)
- g.) Remote Arm or Probe
- h.) Safety Glasses
- i.) Hearing Protection (if required for audio out-put protection)
- j.) Level of PPE can be downgraded depending on material being disposed

4. Safety Distance Perimeter

- a.) Technicians/Operations/Qualified Work Personnel (immediate work zone area).
- b.) Technicians/Operators cannot stand directly in line with the door
- c.) Observers (100 feet, radius)

5. Acceptable Materials for MTDU Disposal

- a.) Small caliber ammunition (up to and including 50 caliber)
- b.) Drugs, CN/CS Grenades, Reactive Chemicals, Distress Flares, Consumer Grade Fireworks.
- c.) Not intended for explosives.

6. Operating Precautions

- a.) **The MTDU operator must monitor the gas supply and flame constantly during operations.** In the event that the flame blows out for any reason during operation of the MTDU, the gas must be turned off and the MTDU must vent for five minutes before the torches are reignited.
- b.) The MTDU will not function properly if the wind is greater than fifteen (15) mph. It is unsafe to operate the MTDU with wind greater than fifteen mph.

- c.) MSDS(s) for the materials to be destroyed will be reviewed by the operators prior to the destruction of said material to ensure that the potential hazards presented by the hazardous substances contained in the materials to be destroyed are understood.
- d.) The main door is designed to be the weakest section of this unit. In the event that something is placed in the unit that shouldn't be, overpressure may cause the door to open. **As a result, personnel should not stand in the area of the door when burning material.**

7. Loading of MTDU Chamber

- a.) Single Load: (before the application of heat to the MTDU, open front doors and access the (burn box). Load the burn box with the material to be thermally destroyed, keeping the amounts of material within the safe handling limits. Shut and toggle the doors after which the torches are ignited. After the torches are ignited all personnel will move to designated safe areas within the prescribed work zones for the period of time required to complete the destruction of the material placed in the MTDU. The MTDU will begin to react with materials within fifteen (15) minutes at which time the chamber will reach 600° F - 1500° F.
- d.) After the last sign of reaction (audible or visual). Allow the system to burn for 30 minutes ensuring consumption of all reactive materials contained in the chamber. To remove any material remaining after the burn, the chamber must cool down for a minimum of thirty (30) minutes after the torches are turned off. If the MTDU is at a temperature that allows the operator to open the chamber without risk of burning oneself, the chamber doors may be opened for final inspection. Final inspection is required at the end of every operational cycle of the MTDU. Final inspection will be done before the loading or reloading of the chamber for additional burns. All spent material and ashes must be removed in order to ensure that no hot or glowing material remains that could inadvertently ignite new material that is being introduced to the MTDU. To restart the single load cycle the same steps that have been defined in this paragraph will be followed.
- d.) **Direct (continuous) feed:** (Before the application of heat to the MTDU) - open front doors and access the (burn box). Check that the amount of spent material in the chamber to ensure that there is not a quantity of sufficient mass to adversely affect the heating of the burn box or block the progress of unrelated material being introduced to the MTDU by way of the continuous feed tube. Shut and toggle the doors after which the torches are ignited. After the torches are ignited all personnel will move to designated safe areas within the prescribed work zones for the period of time required to complete the destruction of material placed

in the MTDU. The MTDU will begin to react within fifteen (15) minutes at which time the chamber will reach 600° F. Ensure that materials introduced to the tubes are small enough as is or as packaged to prevent the material from becoming lodged in the tube. If the straight tube gets jammed with material, said material may “cook-off” in the tube and possibly cause a “mortar effect” expelling materials from the tube. The supervisor will review the materials to be destroyed and set acceptable quantities of said material that can be introduced at any one time into the tube. These quantities may under no circumstance be exceeded nor shall a second amount of material be introduced into the tube before complete consumption of the previously introduced material (Wait one minute after last visual or audible report). After the last sign of reaction (audible or visual) allow the system to burn for thirty minutes ensuring consumption of all reactive materials contained in the chamber. To remove any material remaining after the burn the chamber must cool down for a minimum of thirty (30) minutes after the torches are turned off. If the MTDU is at a temperature that allows the operator to open the chamber without risk of burning oneself the chamber doors may be opened for final inspection. Final inspection is required at the end of every operational cycle of the MTDU.

8. Site Operational Requirements

- a.) Work Zone
- b.) Exclusion Zone will include the footprint of the MTDU
- c.) The Hotline will be a line running ten (10) feet around the MTDU
- d.) The Support Zone shall extend from the edge of the hotline & contamination control line out to 100 feet from the MTDU
- e.) At a pre-approved location outside support zone an over watch station will be located with line of sight and audible contact with the MTDU and associated work zones.

9. Personnel Access to Work Zones

- a.) General Site Workers will have access to all work zones and the over watch station.
- b.) Onsite Management Supervisor will have access to all work zones and the over watch station.
- c.) Visitors may be granted access to all work zones after the hazards to the health and safety of those individuals has been studied and characterized and the PPE of said individuals offers sufficient levels of protection.
- d.) Emergency Personnel may be granted access to all work zones after the hazards to the health and safety of those individuals has been studied and characterized and the PPE of said individuals offers sufficient levels of protection. Emergency personnel may have access to the over watch station without PPE.

- e.) The Site Health and Safety Supervisor will have access to the over watch station at anytime before, during or after operations.
- f.) Guest or unexposed off-site observers may be granted access to the over watch station after they have met with the site health and safety supervisor and information covering potential hazards, alarm signals and evacuation plans.
- g.) Only individuals with the specified level of training will have access to active work zones other than the over watch station.

10. Preliminary Survey

- a.) The survey that deals with the hazards presented by the materials to be destroyed will be reviewed each time there is a change in materials or the manner in which the material is being processed
- b.) Exposure duration vs. ambient heat for site worker wearing PPE as specified in this document
- c.) A break is defined as helmet off, hood off, and vest open as a minimum at 60° F to 40° F: 10 minute break every 50 minutes of work time minimum.
- d.) At 75° F to 60° F: 10 minute break every 40 minutes of work time minimum.
- e.) At 80° F to 75° F: 10 minute break every 25 minutes of work time minimum.
- f.) At 90° F to 80° F: 10 minute break every 1 minutes of work time minimum.
- g.) At 91° F or above the immediacy and intensity of the work to be done will be weighed against the prevailing environmental conditions to determine if said work will take place under those conditions. If a positive determination of work is made, the individuals required to wear PPE will be continually monitored for signs of heat fatigue and or heatstroke. Frequency of breaks and duration of breaks will occur as warranted by the nature of the work and the environmental conditions.
- h.) Portable water will be available in marked containers, as conditions require.

11. Potential Health and Safety Hazards Associated

- a.) With the operation of MTDU and associated operations process safety management. The MTDU is not an Explosive Containment chamber and will not withstand a detonation or deflagration. No explosives can be introduced into the unit.
- b.) The materials that will be introduced into the MTDU for destruction are classified as reactive material components and therefore present the expected hazards of explosion and burns. **(Remedy):** The correct employment of PPE, work procedures and the use of common commercial best practices will limit the hazards presented by this material.
- c.) The materials also may present varied levels of toxicity when burnt. **(Remedy):** The correct utilization of this procedure, to ensure that there is no exposure to hazardous levels of said materials.

- d.) The utilization of PPE with temperature levels in excess of 70° F or more may lead to heatstroke or heat fatigue if the break schedule is not followed. **(Remedy);** Strict adherence to and timely monitoring of the break schedule, in conjunction with annual medical monitoring will ensure that conditions contributing to heatstroke and/or heat fatigue do not adversely affect individuals utilizing PPE during the operation of the MTDU.
- e.) Standing in front of the door may expose the operator to the possibility of explosively ejected material. **(Remedy):** The operator will wear the correct PPE and will not stand in line with the mouth of the door at any time during the operation of the MTDU.
- f.) Standing in the down-wind exhaust plume of the MTDU may expose the operator to hazardous levels of fumes that may be hazardous to the operator's health and/or safety. **(Remedy):** Do not stand in the down wind area.

12 Alarm System

- a.) Audio Alarms: Air Horn or Car Horn
 - One (1) continuous long horn blast - emergency.
 - Two (2) short horn blast - commencing operations, explosives shot or test, operations/test on going
 - Three (3) short horn blasts - all clear.

Visual Alarms: Flags

 - Orange - emergency
 - Red - commencing operations, explosive shot or test, operations/test on going
 - Green - all clear.
- b.) Cellular phones may be authorized for emergency use only after review of the benefits derived from the intended use of the phone is weighed against the hazards presented by the use of the cellular phone. Two-way radios may be authorized only when there is an extreme threat to life and all operations that may be affected by the two-way radios. The supervisor will grant authorization for the specific use of two-way radios.

FINAL
X-RAY OPERATIONS
STANDARD OPERATING PROCEDURE UXO-07

Munitions and Explosives of Concern Remedial Action
Former Waikane Training Area
Southeastern Region Munitions Response Site
Kāneʻohe, Oʻahu, Hawaiʻi

RMIS ID: H09HI035401

Prepared by:

GSI Pacific Inc.
181 South Kukui Street, First Floor
Honolulu, HI 96813

December 2016

This Page Intentionally Left Blank

Section 1 Standard Operating Procedure Approvals

This page provides a record of the signatures and dates of personnel who developed, reviewed, validated, and approved this Standard Operating Procedure (SOP).

Table 1-1: Contractor Approvals

Name and Signature	Role	Date
  Mike Coyle Corporate Health and Safety Manager	Review/Approval	11/23/16
 Daniel C. Haines Quality Control Manager	Review/Approval	11/29/16
 Brian Stepp Senior Project Manager	Review/Approval	11/28/16

Section 2 Scope and Application

This SOP is for use by GSI Pacific Inc. (GSIP) personnel who are trained and assigned to use the Field Radiographic Unit (X-ray), Golden Engineering Model XRS-3. This SOP makes provisions for the use, testing, maintenance, and storage of the unit. It is the responsibility of the User to know and follow all applicable Federal, state, and local laws and regulations regarding the use of the Radiographic Unit. This SOP is not a stand-alone document and is to be used with other applicable reference material.

Section 3 Materials Required

The following lists identify special and critical tools, equipment, and supplies used for X-ray operations during munitions and explosives of concern (MEC) projects.

Special and Critical Tools:

- Golden Engineering Model XRS-3 X-ray kit;
- Film processing equipment;
- Dosimeters (*i.e.*, PEN 200MR dosimeter);
- Film Badges and Radiation Alert Charger; and
- Nitro gloves (when handling film pods).

Supplies:

- Logbooks; and
- Forms.

Personnel Protective Equipment:

GSIP and all personnel on site will have all necessary modified Level D personal protective equipment (PPE) as per 29 Code of Federal Regulations (CFR) Part 1910.120. The equipment listed below comprises modified Level D PPE for this project:

- Normal work clothes (long pants and shirt);
- Safety glasses;
- Leather gloves; and
- Boots (leather, ankle stability).

Section 4 Related Procedures

Related SOPs include the following:

- *Field Documentation*, SOP G-1;
- *Project Quality Control*, SOP G-5;
- *Surface and Subsurface Clearance*, SOP UXO-01;
- *Explosive Disposal Operations*, SOP UXO-02;
- *Material Potentially Presenting an Explosive Hazard*, SOP UXO-03;
- *Demilitarization Operations*, SOP UXO-05; and
- *Batch Burner Thermal Treatment*, SOP UXO-06.

Section 5 Procedures

5.1 Safety

5.1.1 Protection

It is important that protection methods be applied when working with X-ray producing equipment. For protection from X-ray producing machines, GSIP subscribes to the concept of as low as reasonably achievable (ALARA). ALARA is an acronym, essentially meaning a commitment to keep radiation exposure to all project personnel “As Low As Reasonably Achievable.” During the activation of X-ray equipment, there are three major ways to protect ourselves from exposure to radiation and maintain ALARA. These fundamental principles of radiation protection involve time, distance, and shielding:

- Time - The less time spent near radiation, the lower would be the radiation exposure. Thus, you want to limit your time in an area where X-ray producing equipment is being used;
- Distance - You want to maintain your distance from sources of radiation. The energy released from a source of radiation decreases rapidly with distance; and
- Shielding - Shielding is an important component to safety as plastic and lead materials are used to contain/shield sources of radiation and provides a high-level of protection to all personnel.

In addition to ALARA, the first step to working safely with radiation producing equipment is to understand the type of equipment you are operating, how to operate the system properly, and what radiological and other safety hazards are associated with the equipment.

When operating an X-ray machine, never place your hand or other body part in the path of the X-ray!

Written operating procedures detailing routine operation of the equipment and steps for set-up and X-ray activation procedures for the X-ray unit is available to the Authorized User (AU). The AU will be familiar with these procedures before beginning work with the unit. These operating procedures are the responsibility of the Radiation Safety Officer (RSO) and are dependent on the unit being operated. Questions regarding proper use of the unit will be directed to the responsible RSO.

5.1.2 Safety Procedures

Radiation is extremely hazardous to the human body, and unnecessary exposure to radiation, no matter how small, is too much. Safety is the most important consideration when using X-ray equipment. Therefore, to ensure the safety of all personnel, the following safety procedures and precautions will be adhered to when X-ray equipment is utilized on a project site:

1. Prior to mobilization, the X-ray unit will be registered/licensed with the State and a copy of the registration will be kept on site (Attachment 1 and Attachment 2);

2. The X-ray unit's calibration/leak test must be current and documentation maintained on file (Attachment 3);
3. Only trained, AU personnel will operate the equipment;
4. A minimum of two AUs shall be present for X-ray operations. At least one of the AUs present shall be a Radiographer Instructor;
5. AU personnel will be familiar with Federal, state, and local laws or regulations governing this type of equipment;
6. AU personnel will receive refresher training if more than 90 days has elapsed between usage;
7. AU personnel must be enrolled in a dosimeter/film badge program;
8. AU personnel will maintain control of the unit and key at all times when in use. AU personnel must establish a 100-foot minimum restricted area before use. Never use the X-ray unit with unauthorized personnel in the restricted area;
9. The X-ray unit will not be used in an unauthorized, unlawful, or unsafe manner. Personnel in the unrestricted work area will be informed of the hazards prior to use;
10. Only an appropriate number of pulses will be used to radiate a given item;
11. AU personnel will stay at a minimum of 10 feet to the rear of the unit during operation or the fullest extension of the remote control cable (up to 20 feet) when used;
12. The X-ray unit will be properly stored and secured when not in use;
13. Personnel will report all violations or any known or suspected overexposure immediately to the Unexploded Ordnance (UXO) Safety Officer (UXOSO), and the RSO;
14. Be aware that the X-ray unit contains printed circuits, capacitors, and other electronic components which generate high voltage and X-rays;
15. Remove all electrical power to the X-ray unit before removing the X-ray tube;
16. Film developer pods contain jellied, caustic chemical reagents. If contact with the skin occurs, wipe off immediately and wash the affected area with plenty of water; and
17. Use care when discarding or disposing of materials still containing pod chemicals. Misuse or carelessness during operation could result in injury or death.

5.2 *UXO Qualified Personnel*

Anyone who procures, uses, possesses, transports, transfers, or disposes of radioactive materials or radiation generating devices shall:

- Notify, in writing, the Government Designated Authority (GDA) of the nature of the material or device, a description of intended use, the location of use and storage, and all transportation and disposal requirements; and

- Provide to the GDA a copy of all United States (U.S.) Nuclear Regulatory Commission (NRC) or Agreement State licenses, the Army Radiation Authorization (ARA), Army Radiation Permit, and reciprocity forms (to include NRC Form 241), as applicable.

5.2.1 Responsibilities

Authorized User (AU):

- Be fully trained and competent with the X-ray equipment;
- Follow all safety requirements during X-ray operations; and
- Assist the Radiation Supervisor during X-ray operations.

Radiation Supervisor:

- Be fully trained and competent with the X-ray equipment; and
- Follow all safety requirements during X-ray operations.

Unexploded Ordnance Quality Control Specialist (UXOQCS) will:

- Conduct inspections of the procedures used by X-ray team for X-ray operations.

Radiation Safety Officer (RSO) will:

- Operations shall be performed under the direct supervision of a RSO, who is qualified and responsible for radiological safety;
- Be formally trained in radiation protection topics;
- Have hands-on training in the uses of equipment, instrumentation, procedures and theory used in the unit;
- Have knowledge of applicable regulations including those of the NCR, U.S. Environmental Protection Agency (EPA), U.S. Department of Energy (DOE), Department of Transportation (DOT) and Department of Defense (DoD);
- Needs to know the proper use of instrumentation and dosimetry;
- Need to have a Radiation Safety Program; and
- Know their rights and responsibilities.

Senior UXO Supervisor (SUXOS) will:

- Be responsible for ensuring the operational safety and quality of the procedures and responsibilities for X-ray operations.

Radiation Safety Committee (RSC):

- Shall be established in accordance with (IAW) 10 CFR 20 and DA PAM 385-24.

5.2.2 Training

All AU will have performed documented training on the following topics before use:

- X-Ray Operations SOP;
- Proper use of the XRS-3 X-Ray kit, film processing equipment, and dosimeters with operator manuals (Attachment 4);
- Radiation Safety Program;
- Ionizing Radiation Hazards & Safety; and
- Per the State of Hawaiʻi Department of Health, “A written record is required indicating all operators have been trained in atomic theory, radiation protection, operation of the specifically licensed industrial radiography unit(s), transportation, calibration, maintenance, survey techniques, and emergency procedures.”
 - “Date, location, training provider, length of training, completion of training, and signature of the operator(s) shall be indicated on the written record.”

5.3 X-Ray Operations

The X-ray unit will be operated in a manner consistent with the manufactures recommendations, owner’s/operator’s manual, Federal, state and local laws and regulations, and within the limitations of the unit. All AU personnel will be trained in the proper use of the unit and assigned and enrolled into a dosimeter/film badge program prior to their use of the unit. AU personnel will read the operator’s manual prior to initial use and will receive refresher training when more than 90 days has elapsed since their last usage of the unit.

5.3.1 Preparation and Process

1. Ensure all necessary components are present;
2. Ensure the battery is charged;
3. Ensure the key is in the AU’s possession;
4. Issue and ensure dosimeter/film badges are worn by AU personnel;
5. If not installed, install battery in IAW the operator’s manual;
6. Attach the remote cable (if this method is being used);
7. Prepare the film cassette IAW the operator’s manual or directions below in Section 5.3.2;
8. Prepare the processor IAW the owners/operators manual;
9. Establish the 100-foot minimum restricted area of operations and post warning signs as required;
10. Inform personnel in the unrestricted area of the hazards associated with this type of operation; and
11. Proceed to the items location.

5.3.2 X-Ray Film Preparation (8 x 10 Inch)

1. Place the cassette front-down with pressure plate unlocked. Press the blue latch buttons simultaneously and open back, laying it out flat;
2. Place negative envelope, with printed side up and arrows pointing away from orange tongue, between two (2) blue guidelines in cassette. Hook the tab fold of envelope over the end of orange tongue;
3. Close cassette back, pushing down on edge of back just beyond blue buttons, so that both buttons latch shut;
4. With the pressure plate still unlocked, slowly pull on the bottom of the negative envelope (area with printed arrows), withdrawing the envelope from the cassette; and
5. Press pressure plate down on side near hinges, then on side near blue buttons, so that all pressure plate locks move forward and hold the pressure plate down. All four (4) locks must be locked to ensure maximum intensifying screen/film contact.

NOTE: When the pressure plate is locked, the pressure release bar will protrude from the end of the cassette and a blue stripe will be visible.

5.3.3 Process X-Ray Film (8 x 10 Inch)

1. Slide an 8 x 10 inch film positive sheet into the loading tray, with developer-pod-side up and pod-end into tray. Slide sheet below metal slide until distinct resistance is felt and sheet lies within the recessed area of the tray;
2. Insert the loading tray into the processor insertion slot until fully seated;
3. With the cassette front upward and pressure plate downward, slide the cassette into the loading tray with film tab inward. Tab must feed between the metal lip and the metal slide. Press down on the cassette edges and slide the cassette in until fully seated;
4. Turn the handle four (4) full turns in a clockwise manner or until the film drops into the processing tray and allow film to remain in the processing tray for one (1) minute; and
5. Lift the processing tray lid and remove X-ray film from tray, view results, being careful of the pod development chemicals. Apply film protective coating if necessary.

NOTE: Clean rollers after approximately every third print and before placing the unit into storage. Use warm-soapy water, alcohol swabs, or travel type wipes and dries.

5.3.4 Use of Model XRS-3

1. Place film cassette for operational use. Do not move item being X-rayed. Utilize proper excavation techniques. If the item cannot be safely accessed for film or unit placement, DO NOT USE X-RAY. Report as a potential explosive disposal operation item;
2. Attach remote cable. If remote cable is not being used, skip this step and proceed to step 3 below;

3. Place X-ray unit for operational use. Do not move item being X-rayed, unless the proper notifications have been made with the SUXOS, UXOSO, and U.S. Army Corps of Engineers (USACE) Ordnance and Explosives Safety Specialist (OESS);
4. Check restricted area (100-foot minimum) for unauthorized personnel. IF UNAUTHORIZED PERSONNEL ARE IN THE RESTRICTED AREA, STOP OPERATIONS. NOTIFY UXOSO OR SUPERVISOR. DO NOT RESUME OPERATIONS UNTIL SITUATION HAS BEEN CORRECTED;
5. Insert key into unit battery and turn the key ¼ turn clockwise to the “on” position;
6. Select number of pulses;
7. Re-check restricted area;
8. Operate “Delay” if remote cable is not used (either 60 or 15 second countdown);
9. Retire to a 10-foot minimum safe distance behind the unit or retire to the extended length of the remote cable (up to 20 feet), remaining behind the unit, and operate cable button;
10. Remain at a safe distance until operation (pulses) has functioned;
11. After unit operates, return to unit and turn the key ¼ turn counter-clockwise to “off” position and remove;
12. Retrieve unit and film cassette;
13. Process film IAW owner’s/operator’s manual or 5.3 or 5.5, review Troubleshooting of Film in Attachment 5 if necessary;
14. Record the number of pulses used in the control log (Attachment 6);
15. Repeat PREPARATION AND PROCESS steps 7) and 10) and USE OF MODEL XRS-3 steps 1) through 14) if necessary, if not proceed to next step;
16. Inform personnel of completed operations and “release” restricted area;
17. Remove battery, clean and secure unit and cassette components;
18. Complete the control log entries (Attachment 6); and
19. Collect dosimeters/film badges and enter data into dosimeter log IAW 5.3.9.

5.3.5 Maintenance

1. Remove all components from the carrying case(s) and clean case(s);
2. Clean individual components IAW owners/operators manual;
3. Report any damage/defects to the UXOSO, RSO, and Supervisor; and
4. Record maintenance performed and findings in the maintenance log. Do not insert battery or key during maintenance.

5.3.6 Battery Charging

Due to several different charges being available for the Model XRS-3, see the Operators Manual Section 4.5 for charging instructions.

5.3.7 Testing and Registration

1. Ensure State license is current; if not current, cease use and submit for new registration;
2. Ensure leak test is current, if not current, cease use and submit unit for leak testing; and
3. Leak testing is performed by the manufacturer; leak test every 25,000 pulses or 24 months whichever is sooner. Ensure current licensing documentation is maintained on site with the unit for review.

5.3.8 Storage

1. X-ray unit will be stored in a safe and secure manner against theft and unauthorized use;
2. Ensure key or battery is not installed in the unit during storage;
3. Ensure units carrying case is locked (either internal lock or external padlock). Ensure carrying case is secured against unauthorized removal. Only designated AUs will have access to the X-ray unit and will inform the RSO prior to removal from storage for any reason; and
4. Perform and record an inspection and inventory (Attachment 7) of the unit and its components upon receipt at the project site, on a monthly basis, and before shipment to another location or upon completion of the project.

5.3.9 Dosimeter and Film Badge

1. Complete entries in the log for each individual issued a dosimeter and film badge;
2. The PEN 200MR dosimeter will be utilized for direct readings of real time accumulation. The manual will be on hand and procedures for testing, calibration, and use will be followed;
3. In addition to the direct read dosimeter, each AU will be issued a thermoluminescent dosimeter (TLD) “whole body” film badge that must be assigned to specific AUs for use and secured in a lock box when not in use;
4. Package and ship film badges IAW to National Voluntary Laboratory Accreditation Program (NVLAP) lab requirements at the quarterly interval for review by the film badge X-ray exposure monitoring service. After two to three weeks, the service will provide detailed exposure reports for each AU to the RSO for review;
5. Package and ship film badge(s) immediately to the lab if a known or suspected radiation incident or overexposure has occurred;
6. Notify the appropriate personnel as required (UXOSO, RSO, Project Manager, *etc.*); and

7. The PEN 200MR direct reading dosimeter will be charged and zeroed out using the Radiation Alert Charger by the AU and will report any defect to the RSO. At that time, the RSO will take the dosimeter out of service and arrange shipment to the manufacture to be repaired or replaced.

5.3.10 Special Instructions

Due to the hazards associated with radiation, AU personnel must assume responsibility for the proper use of this equipment. Special care will be taken to ensure personnel are not intentionally or accidentally radiated. The use of safety measures such as dosimeters/film badges, restricted areas, safe distances, proper pulse usage, engineering controls and training are paramount in keeping with SAFE WORK PRACTICES.

Personnel are to report any safety or operational violations immediately to the proper authority.

Exposure records will be maintained on all User personnel. These records will be kept IAW Occupational Safety and Health Administration (OSHA) 29 CFR 1910.96 (n), OSHA 29 CFR 1926.53 (p) and EM 385-1-1, Section 6.E.10.

The OSHA Permissible Exposure Limit (PEL) for X-rays is a “whole body limit” of 1.25 Roentgen equivalent man (rem) per quarter or 5 rem per year (approximately 2.5 millirems per hour for all work hours). GSIP UXO personnel will use the ALARA whole body exposure limits as listed in the EM 385-1-1 Table 6; this value is 0.1 rem annually. Any exposure over this limit will be investigated by the RSO. The RSO will evaluate AU quarterly calculations in order to identify limit breaches or significant readings. AUs will also monitor direct readings before, during, and after exposure for significant readings and cease operations and notify the RSO immediately. Due to the distance and remote operation of the X-ray device, no readings should be observed and, although not above limits, any readings should be reported to the RSO.

5.3.10.1 Emergency Procedures and Contact Persons

In the event of an accident or emergency, the AU will follow the Emergency Action listed below and initiate contact with personnel or agencies listed in the Emergency Contacts table below.

-PERSONNEL PROTECTION ALWAYS TAKES PRIORITY-

EMERGENCY ACTIONS

Potential or Known Exposures:

1. Cease operations and remove power/key to X-ray unit;
2. Notify coworkers and call “Code Red” over radio if applicable;
3. Secure device;
4. Coordinate higher notifications with RSO; and
5. Survey report (who, what, when, where, and why).

GSIP EMERGENCY CONTACTS

Emergency Telephone Numbers	OFFICE	CELL
Health and Safety Manager	(808) 887-1131	(808) 354-3783
Radiation Safety Officer (primary)	(808) 887-1131	(808) 354-3783
Radiation Safety Officer (alternative)	(808) 887-1131	(808) 266-0962
MEC Division VP	(808) 833-2225 x1034	(808) 754-1914

The AU will maintain proper documentation of all activities related to the use of the X-ray machine. This includes accurate documentation of the following:

- Correspondence with Federal or state authorities and the RSO;
- Receipt, utilization, transfer, and/or disposal of instruments or tubes;
- Inventory dates and results;
- Reference to Control Logs and Inventory Records;
- Reference to dosimeters receipt, loss, use, or shipment (as required); and
- Additional miscellaneous entries deemed appropriate or required by regulating authorities.

The AU will use the Field Radiographic Control Log (Attachment 6) and Field Radiographic Inspect and Inventory Record (Attachment 7).

Section 6 Documentation

6.1 List of Forms

For X-ray operations, the AU will, at a minimum, complete the following:

- Field Logbook entries recording X-ray operations;
- Field Radiographic Control Log (Attachment 6); and
- Field Radiographic Inspection and Inventory Record (Attachment 7).

6.2 Field Logbook

Daily field activities will be documented in a Field Logbook. Refer to SOP G-1 *Field Documentation* for field logbook procedures.

6.3 Radiographic Control Log

The Radiographic Control Log (Attachment 6) is used to document X-ray use. Example guidance for filling out each field on the form is provided below:

- **Project Location** - Provide name of the project location;
- **Task Number** - Provide task number if applicable;
- **Instrument Make** - Golden Engineering;
- **Instrument Model** - Model XRS-3;
- **Instrument Serial Number** - Provide instrument serial number;
- **State Registration Number** - Provide instrument registration number;
- **Tube Serial Number** - Not Applicable (N/A);
- **Technical Expiration Date** - Provide expiration Date for calibration test;
- **# of Pulse Counts Brought Forward** - Provide total number of pulses prior to use;
- **Date** - Provide date of the X-ray use (mm/dd/yy);
- **Site/Grid #** - Provide numeric of the grid stake;
- **Item Description** - Provide nomenclature of item X-rayed;
- **# of Pulses Used** - Provide number of pulses used for X-ray;
- **Initials of AU** - Provide initials of the AU performing operations;
- **Remarks** - Provide any comments;
- **# of Pulses This Page** - Provide total number of pulses on field radiographic control log;
- **Balance Brought Forward** - Provide number of pulses prior to use;

- **Total** - Provide total of pulses used on machine; and
- **Signature of Ending AU** - Provide signature of the last AU on the sheet.

USE SEPARATE ENTRY FOR EACH X-RAY PRINT TAKEN.

6.4 Field Radiographic Inspection and Inventory Record

The Field Radiographic Inspection and Inventory Record (Attachment 7) is used to document equipment inspection and inventory. Example guidance for filling out each field on the form is provided below:

- **Project Location** - Provide name of the project location;
- **Date** - Provide date the inspection/inventory was conducted (mm/dd/yy);
- **Performed By** - Provide name of the person who performed the inspection/inventory;
- **Signature** - Provide signature of the person who performed the inspection/inventory;
- **Instrument Make** - Golden Engineering;
- **Instrument Model** - Model XRS-3;
- **Instrument Serial Number** - Provide instrument serial number;
- **Technical Expiration Date** - Provide expiration date for calibration test;
- For the following items, indicate if the item is **Present**, state the **Condition**, and list any **Remarks**:
 - **X-Ray Carrying Case**;
 - **Carrying Case Keys (2)**;
 - **X-Ray Unit**;
 - **X-Ray Unit Keys (2)**;
 - **AC Power Cable**;
 - **Remote Control Cable**;
 - **Battery**;
 - **Cassette, 3 x 4 inch**;
 - **Cassette, 8 x 10 inch**;
 - **Loading Tray, 8 x 10 inch**;
 - **Processor For 8 x 10 inch**; and
 - **Processor Carrying Case**.

Optional Use Items:

- **Polyvinyl-Lead Sheet (4);**
- **Penetrameter (1);**
- **Tape;** and
- **Ruler.**

Spare Items:

- **X-Ray Tube;**
- **O-Ring (2);**
- **8-AMP Fuse (2);**
- **15-AMP Fuse (2);**
- **¼-AMP Fuse (2);** and
- **Incandescent Lamp (2).**

Section 7 References

10 CFR Part 20. *Standards for Protection Against Radiation.*

29 CFR 1910. *Occupational Safety and Health Standards.*

29 CFR 1926.53. *Ionizing Radiation.*

Department of the Army (DA), 2011. *The Army Radiation Safety Program.* 24 August 2007;
Rapid Action Revision issued 22 September 2011.

_____, 2015. DA PAM 385-24. *The Army Radiation Safety Program.* 30 November.

Hawaiʻi Administrative Rules (HAR) 11-45. *Radiation Control.*

Operator's Manual. Golden Engineering XRS-3 Electronic Pulse X-Ray Kit.

USACE, 2010. ER 385-1-80. *Ionizing Radiation Protection.* 30 June.

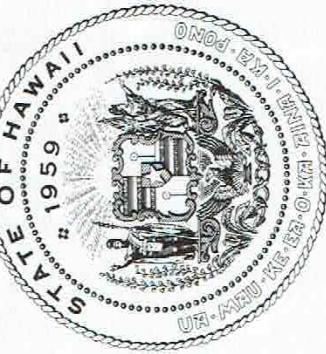
_____, 2014. EM 385-1-1. *Safety and Health Requirements Manual.* 30 November

This Page Intentionally Left Blank

Attachment 1
X-Ray License

This Page Intentionally Left Blank

ver8/99



Department of Health

Radiation Facility License

Pursuant to the provisions of the Hawaii Revised Statutes, Chapter 321, and Hawaii Administrative Rules, Chapter 11-45, this license is hereby granted to:

**Environet, Inc.
Munitions Response Facility
64-1002 Mamalahoa Highway
Kamuela, HI 96743**

License No: 10015

Expiration Date: March 31, 2017

This license is granted upon the expressed provision that the holder shall comply with Hawaii Administrative Rules, Chapter 11-45, orders of the Department, and the conditions precedent to the granting of this license.

See APPENDIX of this license for specific sources of radiation and conditions specified by the Department


for DIRECTOR OF HEALTH

March 12, 2015
Date

REVOCABLE FOR CAUSE

NON-TRANSFERABLE This license shall be posted in a location visible to users of the facility

NON-TRANSFERABLE

This Page Intentionally Left Blank

Attachment 2
Memorandum of Agreement

This Page Intentionally Left Blank

Memorandum of Agreement

I. Purpose of the Agreement

This Memorandum of Agreement (MOA) sets out the terms by which Environet Inc. and GSI Pacific Inc. will work together to determine the filler of Munitions of Concern (MEC) which cannot be determined by engraved nomenclature, measurements, or other detailed reconnaissance techniques.

This agreement will remain in effect from October 8, 2015 to October 7, 2017. Daniel C Wolf, MEC Program Manager will be the key contact for GSI Pacific Inc. for this Project. Brian Stepp Vice President MEC Division will be the key contact for Environet Inc. These individuals are responsible for ensuring the conduct of activities listed below.

Through this agreement, Environet Inc. agrees to provide in full all radiological support and equipment required to determine MEC fillers when necessary anywhere within the State of Hawaii not prohibited by law.

II. Roles and Responsibilities

Responsibilities of Environet Inc.

1. Environet Inc. will provide all radiological equipment and x-ray film.
2. Environet Inc. will provide authorized users and their dosimeters and film badges.
3. Environet Inc. will provide the Radiation Safety Officer and required radiation warning signs.
4. Environet Inc. will provide all required written procedures and regulations necessary for safe operation of the equipment and the program.
5. Environet Inc. will provide the State of Hawaii Radiation Facility License necessary to use this equipment in Hawaii.
6. Environet Inc. will provide the necessary security to ensure the safe keeping of all radiological equipment.

Responsibilities of GSI Pacific Inc.

1. GSI Pacific Inc. will notify Environet Inc. when radiological support is required.
2. GSI Pacific Inc. will provide transport for all personnel and radiological equipment to MEC location.
3. GSI Pacific Inc. will be responsible for the safety and security of personnel and MEC items on site.
4. GSI Pacific Inc. will be responsible for all actions and procedures accomplished on the MEC item except x-ray.

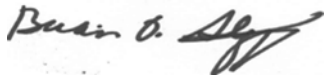
III. Duration of the Agreement

This agreement will be in effect from October 8, 2015 to October 7, 2017 and may be updated at any time through written agreement of each partner. Either party can terminate the agreement with 30 days written notice.

IV. Signatures of Parties' Principals

If the terms of this Memorandum of Agreement are acceptable, please sign and date both copies of this letter. Keep one copy for your records and return the other to Environet Inc.

Thank you very much.



BRIAN STEPP, Vice President MEC Division Environet, Inc., 10/8/2015



DANIEL C. WOLF, MEC Program Manager GSI Pacific Inc., 10/8/2015

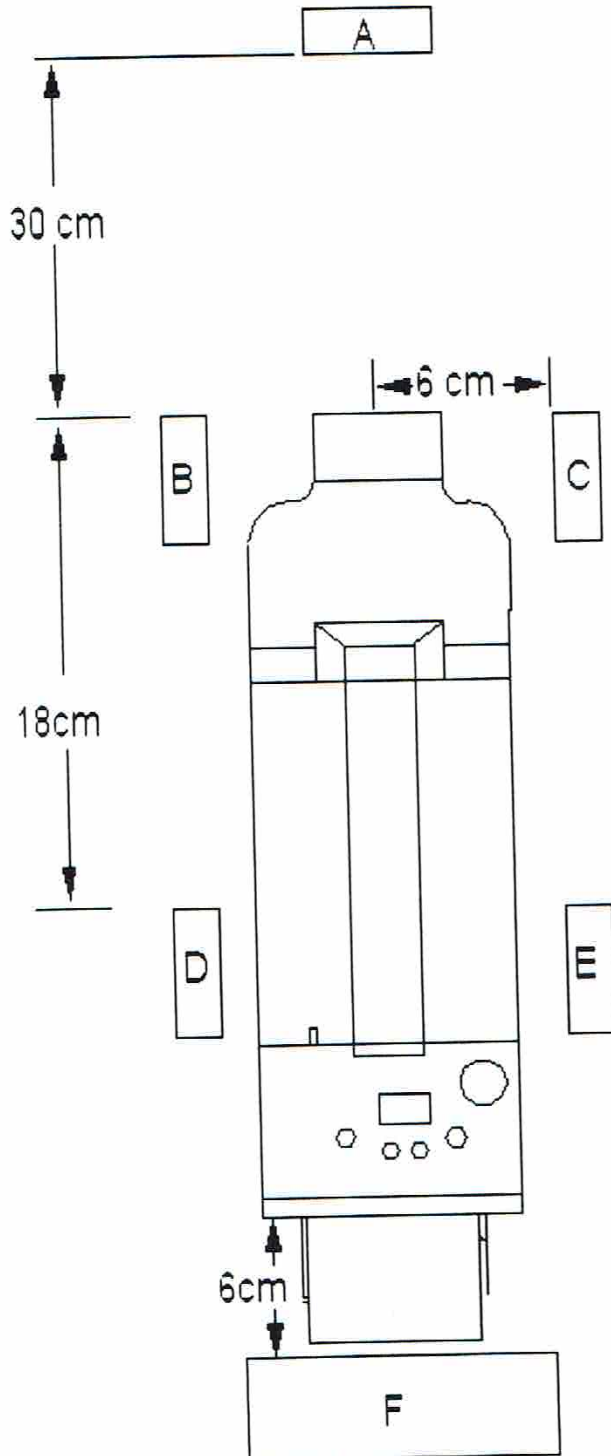
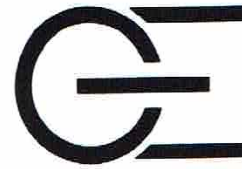
Attachment 3
X-Ray Calibration

This Page Intentionally Left Blank

X-RAY LEAKAGE TEST

MODEL: XRS-3

Repair



RADIATION PROBE # PULSES MEASURED RADIATION ALLOWED

PROBE #	PULSES	MEASURED	RADIATION ALLOWED
A	10	26	20-40*
B	10	1.96	4.50 MAX
C	10	1.65	4.50 MAX
D	10	<0.80	1.50 MAX
E	10	<0.80	1.50 MAX
F	10	0.00	0.70 MAX

* Radiation units measured in milliroentgens

Precision: 0.07 milliroentgens

Radiation probe: Radcal 20X6-6

DATE TESTED: 7/30/2015

SERIAL #: 5791

TUBE CODE:

TESTED BY:

Jerry Wright

GOLDEN ENGINEERING INC.

(765)855-3493

FAX:(765)855-3492

www.goldenengineering.com

REVISION DATE 03 /19/12

File Path: S:\Quality Manual\Access DB\Repairs and Unit Testing\Form\XRS-3 Leakage Sheet"

This Page Intentionally Left Blank

Attachment 4
Dosimeter Instruction Manual

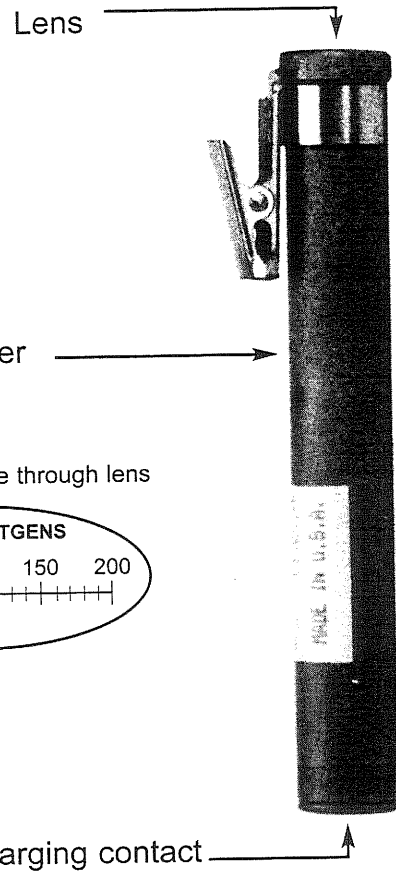
This Page Intentionally Left Blank

PEN Dosimeter Instruction Manual

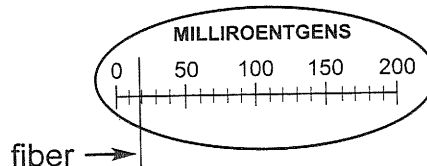
The PENS are rugged direct-reading carbon fiber dosimeters that measure and directly display the radiation dose or quantity of gamma and x-ray exposure.

Procedure For Dose Measurement Using PEN Dosimeters

- 1) Look through lens of dosimeter towards a bright light.
- 2) Fiber should be at zero. If it is not, record measurement, or use Radiation Alert® Charger to charge dosimeter before using.
- 3) Once fiber is on zero, clip dosimeter to person or object to be monitored.
- 4) Record time and date.
- 5) When monitoring is complete, record time, date, and dosimeter measurement. To obtain dosimeter measurement;
 - Look through lens towards light.
 - Read scale.
- 6) To clean the lens and charging contact use only water on a damp cloth or swab. Distilled water is preferable. **Do not use any chemical substance such as; alcohol, glass cleaner, etc..**



View of PEN200 scale through lens



Specifications

Exposure Range:

PEN200	0 to 200mR (gamma and x-rays).
PEN500	0 to 500mR (gamma and x-rays).
PEN2	0 to 2R (gamma and x-rays).
PEN5	0 to 5R (gamma and x-rays).
PEN20	0 to 20R (gamma and x-rays).
PEN2mSv	0 to 2mSv (gamma and x-rays).
PEN5mSv	0 to 5mSv (gamma and x-rays).

Accuracy:

±10% of true dose for Cs-137 or Co-60 gamma.

Energy Dependence:

±10% maximum change in sensitivity for x and gamma ray energies from 20 keV to 2 MeV.

Rate Response:

Dosimeters are dose rate independent.

Electrical Leakage:

In the absence of radiation, the dosimeters leakage or self discharge is less than 0.5% of full scale in 24 hours at 50° C. At 20° C dosimeters will read background radiation. After gross over exposure totaling up to 2000 R the leakage is less than 5% of full scale in 48 hours at 20° C. Thereafter, the leakage will decrease to original values.

Charging Voltage:

Dosimeters are capable of being charged to "zero" with 140 to 195 volts.

Operational Characteristics:

1. A maximum change in sensitivity of ±10% may occur under any probable combination of the following; A) Temperature range of -20° C to +50° C, B) Greater than 50,000 foot altitude for one month, C) 95% Relative humidity. 2. Highly resistant to shock and vibration.

Weight:

Approx. 19 grams (0.7 oz.)

Size:

PEN- 200, 500, 2mSv, 5mSv Length; 11 cm (4.48 inches)
Diameter: 1.5 cm (0.6 inches)

PEN- 5, 2, 20 Length; 11.5 cm (4.52 inches)
Diameter: 1.5 cm (0.6 inches)

Material:

Barrel - carbon fiber-filled high strength electrically conducting plastic with metal clip.

Warranty:

2 year limited warranty

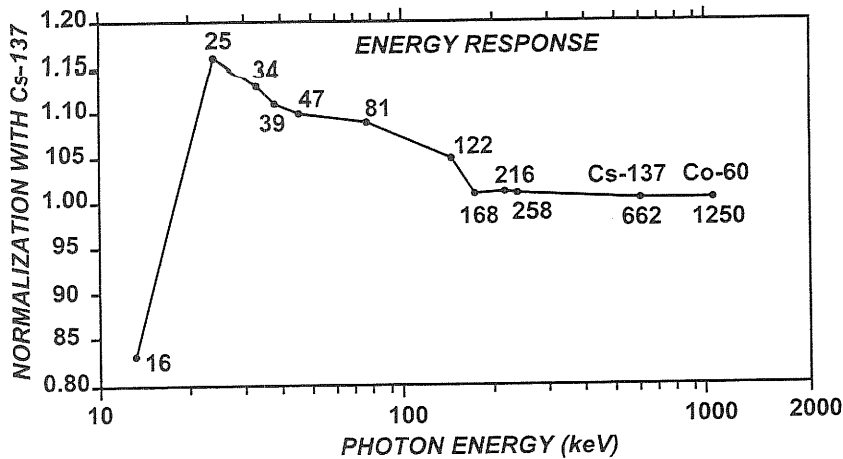
Made in U.S.A.

Specifications subject to change



S.E. INTERNATIONAL, INC.
P.O. Box 39
Summertown, TN 38483-0039 USA

Tel: 931-964-3561 Fax: 931-964-3564 E-mail: seintl@seintl.com



LIMITED WARRANTY

ELEMENTS OF WARRANTY: This warranty covers all materials and craftsmanship in this product to be free from defect for a period of two years with only the limitations or exclusion set out below.

WARRANTY DURATION: This warranty shall terminate and be of no further effect two years after the original date of purchase of the product or at the time the product is: a) damaged or not maintained as is reasonable or necessary, b) modified, c) repaired by someone other than the warrantor for the defect or malfunction covered by this Warranty, d) used in a manner or purpose for which the instrument was not intended or contrary to the written instructions or e) is contaminated with radioactive material. This warranty does not apply to any product subject to corrosive elements, misuse, abuse, or neglect.

STATEMENT OF REMEDY: In the event the product does not conform to this warranty at any time while this warranty is effective, the Warrantor will replace the defective and return instrument to you prepaid, without charge for parts or labor.

NOTE: While the product will be remedied under this warranty without charge, this warranty does not cover or provide for reimbursement or payment of incidental or consequential damages arising from the use of the inability to use this product. The liability of the company arising out of the supplying of this instrument, or its use, whether on warranties or otherwise, shall not in any case exceed the cost of correcting defects in the instrument, and after the said two year period, all such liability shall terminate. Any implied warranty is limited to the duration of this written warranty.

PROCEDURE FOR OBTAINING PERFORMANCE OF WARRANTY: In the event that the product does not conform to this warranty, please contact your local distributor. Defective product must be returned to the factory for replacement.

NOTE: Before using this instrument, the user must determine the suitability of the product for his or her intended use. The user assumes all risk and liability connected with such use.



Instruction Manual

BASIC OPERATION

The Radiation Alert Charger (fig. 1) is used to zero a variety of quartz or carbon fiber dosimeters. The Charger controls the movement of the hairline fiber inside the dosimeter. When the fiber is on zero, the dosimeter is fully charged/zeroed. It is powered by a piezoelectric generator. The CHARGER requires absolutely no batteries.

To charge a dosimeter you simply squeeze the lever a few times. If the fiber passes zero and is still visible, a discharge button allows the operator to discharge the dosimeter and set it exactly on zero. The clamp is adjustable and self-locking and automatically holds the dosimeter for you. By squeezing the trigger, you can easily position a dosimeter into or remove it from the charger.

POSITIONING THE DOSIMETER IN THE CHARGER.

1. Hold the charger upright as shown in fig. 1. Lift the clamp and pull it back to the approximate length of the dosimeter. Place the dosimeter in the clamp with the recessed end (opposite the lens) over the charging contact. This allows for the electrical contact between the dosimeter and the Charger.
2. While squeezing the trigger and push the clamp against the lens end of the dosimeter and release the trigger. **Important:** If the clamp is not pushed against the lens end of the dosimeter before releasing the trigger, electrical contact may not be adequate to charge the dosimeter. **DO NOT PUSH TOO HARD.** You may damage the dosimeter.
3. Check that the position of the dosimeter provides a good view of the scale through the lens. Refer to fig. 2

CHARGING THE DOSIMETER

4. With the dosimeter locked in place, look through the dosimeter at a light source such as a light bulb, window or a small flashlight to view the scale shown in fig. 3.
5. Squeeze and release the charging lever until you see the fiber appear on



Figure 2

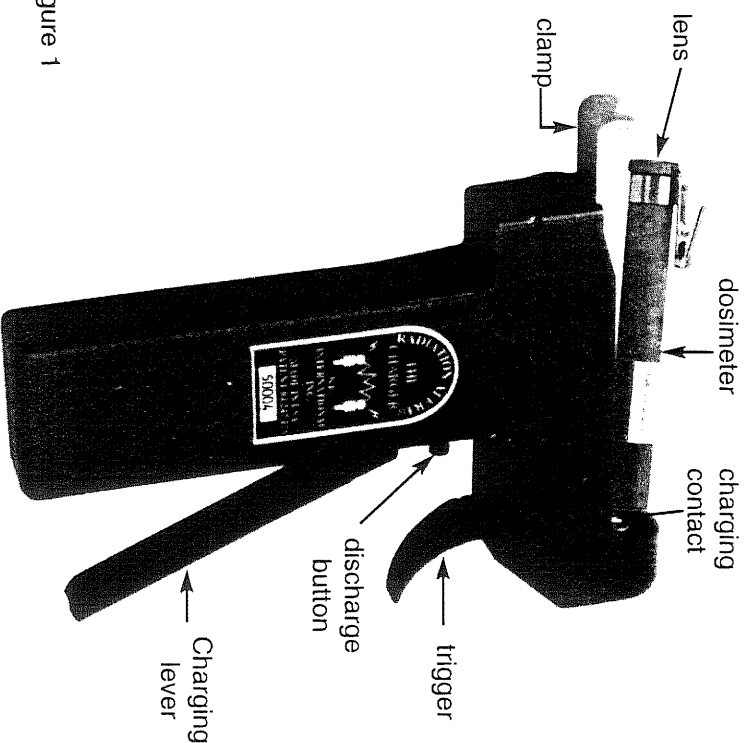


Figure 1

the scale. The fiber appears from the right of the scale and moves towards zero. Once you see the fiber, partial squeezes of the charging lever will be enough to control its movement. If the dosimeter is not responding, repeat step 2.

If the fiber has traveled to the left of zero but is still visible, push the discharge button until the fiber is on zero. If the fiber is not visible, repeat Step 2.

6. To remove the dosimeter, squeeze the trigger, lift the dosimeter to just above the end of the clamp. Pull dosimeter straight back to disengage it from the charging contact. If your dosimeters are all the same length, you should not have to adjust the clamp as described in steps 1 and 2. The length setting of the clamp will not change unless the clamp is manually adjusted.

NOTE: The ideal operating range for the charger is between 40-60% humidity. If operation occurs outside of these specific conditions, you may notice the fiber move away from zero (discharge) at faster rate. In this case, once the dosimeter is fully charged, remove it immediately from the charger and recheck it to make sure the fiber is on zero.

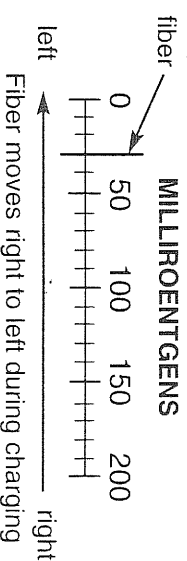


Figure 3

This Page Intentionally Left Blank

Attachment 5
Troubleshooting Radiographic Film

This Page Intentionally Left Blank

Attachment 5

TROUBLESHOOTING RADIOGRAPHIC FILM

The following list contains problem indicators associated with exposure and/or processing of radiographic film. Below each indicator is a possible reason(s) for the AU to review for possible corrective action.

- Black radiograph (no exposure)
 - Negative envelope not removed;
 - Faulty x-ray source (no x-rays emitted), check source.
- Radiograph too dark
 - Film underexposed.
- Clear radiograph (extreme overexposure)
 - Negative loaded backwards.
- Radiograph too light
 - Film overexposed.
- Repeated dot pattern
 - Process rollers dirty.
- White specks
 - Dust on positive sheet;
 - Felt strips on cassette not clean.
- Black specks
 - Intensifying screen in cassette dirty.
- Black line along narrow edge of radiograph
 - Negative sheet not engaged on orange tongue of cassette.
- Blotch, V-shape, crescent shape or “static trees”
 - Negative sheet not handled with sufficient care (squeezed or kinked).
- Blurred image
 - Cassette pressure plate not locked or not fully locked;
 - Subject or cassette in motion during exposure to x-rays.
- Poor image quality
 - Radiograph processed for too short a time;
 - Unsuitable processing temperature.

- Portion of image too light, or missing (x-ray fog)
 - Loaded cassette was exposed to extraneous radiation.
- Image washed out, gray cast over entire radiograph (chemical fog)
 - Positive sheet stored at high temperature (affecting chemicals in pod).
- Outer edge of radiograph too light (light fog)
 - Negative sheet stored too long in cassette without envelope, with pressure plate locked.
- Light area in a line on radiograph (light fog)
 - Light leak in the processing chamber of the processor (keep processor out of direct sun).
- Horizontal dark lines across radiograph
 - “Hesitation” marks caused by uneven roller speed with manual drive; Dirt located on rollers.
- Overall vertical streaks
 - Radiograph was coated improperly, or coated in a cold environment (coat in warmer temperature).
- Bits of developer adheres to the radiograph
 - Positive sheet was peeled away too slowly from the negative sheet (if possible, blot developer off carefully with a paper towel immediately after separation, or do not coat that portion of the radiograph).
- Negative sheet envelope difficult to remove
 - Negative sheet not loaded between the two (2) blue guidelines in cassette.
- Mask adheres to the radiograph border
 - Positive sheet not peeled away from negative sheet correctly.

Attachment 6
Field Radiographic Control Log

This Page Intentionally Left Blank

FIELD RADIOGRAPHIC CONTROL LOG

(X-RAY)

PROJECT LOCATION:			TASK NUMBER:		PAGE: 1
INSTRUMENT MAKE: Golden Engineering		INSTRUMENT MODEL: Model XRS-3		INSTRUMENT SERIAL NUMBER: (TBD)	
STATE REGISTRATION NUMBER: (TBD)			TUBE SERIAL NUMBER: NA		
TECHNICAL EXPIRATION DATE:			# OF PULSE COUNTS BROUGHT FORWARD:		
DATE:	SITE/GRID #:	ITEM DESCRIPTION:	# OF PULSES USED: *	INITIALS OF AU:	REMARKS:
# Of Pulses This Page:				Signature of Ending AU:	
Balance Brought Forward:					
Total:				Carry This Total Forward To The Next Page.	

* USE SEPARATE ENTRY FOR EACH X-RAY PRINT TAKEN.

This Page Intentionally Left Blank

Attachment 7
Field Radiographic Inspection and Inventory Record

This Page Intentionally Left Blank

FIELD RADIOGRAPHIC INSPECTION AND INVENTORY RECORD (X-RAY)

PROJECT LOCATION:					
DATE: / /		INSTRUMENT MAKE: Golden Engineering		INSTRUMENT MODEL: Model XRS-3	
PERFORMED BY:			INSTRUMENT / TUBE SERIAL NUMBER (TBD)		
SIGNATURE:			TECHNICAL EXPIRATION DATE:		
ITEM	COMPONENT	DESCRIPTION	PRESENT	CONDITION	REMARKS
1.	X-RAY CARRYING CASE	Case used to hold the unit and accessory items.			
2.	CARRYING CASE KEYS (2)	Identical keys used to secure the carrying case.			
3.	X-RAY UNIT	Operating and control unit with X-Ray tube.			
4.	X-RAY UNIT KEYS (2)	Identical keys used to turn unit on and off.			
5.	AC POWER CABLE	Provides ac power to the unit.			
6.	REMOTE CONTROL CABLE	Provides for remote operation of the unit.			
7.	BATTERY	Supplies operational power to the unit.			
8.	CASSETTE, 3 X 4 INCH	Holds the radiographic film, 3 x 4 inch.			
9.	CASSETTE, 8 X 10 INCH	Holds the radiographic film, 8 x 10 inch.			
10.	LOADING TRAY 8 X 10 INCH	Holds the cassette in the processor.			
11.	PROCESSOR FOR 8 X10 INCH	Processes the radiographic film, 8 x 10 inch.			
12.	PROCESSOR CARRING CASE	Case used to hold processor and accessory items			
OPTIONAL USE ITEMS					
13.	POLYVINYL-LEAD SHEET (4)	Shields film from radiation scatter.			
14.	PENETRAMETER (1)	Aid for exposure, size, and orientation of item.			
15.	TAPE	Used to secure the penetrometer or cassette.			
16.	RULER	Used to measure unit to cassette distance.			
SPARE ITEMS					
17.	X-RAY TUBE	Replacement tube, X-Ray Unit.			
18.	O-RING (2)	Replacement O-ring, X-Ray tube cap.			
19.	8-AMP FUSE (2)	Replacement fuse, ac power cable receptacle.			
20.	15-AMP FUSE (2)	Replacement fuse, dc circuitry.			
21.	¼-AMP FUSE (2)	Replacement fuse, ac charger circuitry.			
22.	INCANDESCENT LAMP (2)	Replacement bulbs, radiation warning light.			

This Page Intentionally Left Blank

FINAL
***INSTRUMENT VERIFICATION STRIP AND GEOPHYSICAL
SURVEY EQUIPMENT
STANDARD OPERATING PROCEDURE UXO-08***

**Munitions and Explosives of Concern Remedial Action
Former Waikane Training Area
Southeastern Region Munitions Response Site
Kāneʻohe, Oʻahu, Hawaiʻi**

RMIS ID: H09HI035401

Prepared by:

GSI Pacific Inc.
181 South Kukui Street, First Floor
Honolulu, HI 96813

December 2016

This Page Intentionally Left Blank

Section 1 *Standard Operating Procedure Approvals*

This page provides a record of the signatures and dates of personnel who developed, reviewed, validated, and approved this Standard Operating Procedure (SOP).

Table 1-1: Contractor Approvals

Name and Signature	Role	Date
  Mike Coyle Corporate Health and Safety Manager	Review/Approval	11/23/16
 Daniel C. Haines Quality Control Manager	Review/Approval	11/29/16
 Brian Stepp Senior Project Manager	Review/Approval	11/28/16

Section 2 Scope and Application

This SOP provides the details on the approach, methods, and operational procedures employed for setup and use of the Instrument Verification Strip (IVS) and geophysical survey equipment while performing analog geophysical surveys for the Remedial Action (RA) at the 36-acre area within the Southeastern Region Munitions Response Site (MRS), former Waikane Training Area (WTA), Kāneʻohe, Oʻahu, Hawaiʻi.

The objective of the RA is to locate munitions and explosives of concern (MEC) and Material Potentially Presenting an Explosive Hazard (MPPEH) equivalent to, or greater than the diameter of the smallest munitions of concern (SMC) known to have been used/found on the MRS (*i.e.*, 37 millimeter [mm]), to a depth of 2 feet (ft) below ground surface (bgs) within the limitations in detection technology.

The data quality objectives (DQOs) are provided in Worksheet #11 of the Uniform Federal Policy Quality Assurance Project Plan (UFP-QAPP). IVS procedures are also summarized in Worksheets #12, #17 & 18, #22, 24, & 25, and #34, 35, & 36 of the project UFP-QAPP.

The analog geophysical surveys will be conducted as follows:

- A surface and subsurface clearance will be performed using handheld analog metal detectors in the 36-acre RA area. The surface and subsurface clearance will locate and remove MPPEH, MEC, munitions debris (MD), and range-related debris (RRD) to a depth of 2 ft bgs within the limitations in detection technology; and
- In clearance areas that are cluttered with metallic contamination, the Geonics EM61-MK2 detector will be used in analog mode of operation to reduce the number of small anomalies. Since the Minelab Explorer (or equivalent) detects many very small metallic pieces, the EM61-MK2, which is designed for larger items, will be used to focus detection and removal efforts. The EM61-MK2 will be utilized as a secondary application after the Minelab Explorer SE sweep team has flagged anomalies and anomalous areas. In areas where the EM61-MK2 is utilized to reduce anomalies, digital geophysical mapping (DGM) will be utilized after the initial removal efforts to verify that detector responses are below threshold. Any remaining anomalies above threshold will be reacquired, investigated and resolved.

A grid system of 50 meter (m) square grids will be utilized across the project site. Partial grids will be utilized for area and project boundaries. The final 36-acre boundary will be determined during fieldwork after survey mapping.

The IVS will be installed at the beginning of the project to test and verify the detection capabilities of analog instruments selected for use and document in an IVS Letter Report approved by the Project Geophysicist and United States (U.S.) Army Corps of Engineers (USACE) Geophysicist. The IVS will be utilized daily to verify the functionality and detection capability of each analog detector utilized for the geophysical surveys. The utilization of the Minelab handheld analog detector is based on the previous successful site utilization and results of the Geophysical Prove-Out (GPO) performed during the previous previous Non-Time Critical Removal Action (NTCRA) (USACE, 2011).

Section 3 Materials Required

The following lists identify special and critical tools, and equipment and supplies used during the IVS operations:

Special and Critical Tools:

- Primary Detector- Minelab Explorer SE (or similar all metals detectors);
- Secondary Detector- EM61-MK2 in analog and DGM mode (for limited use in grid areas with high background noise [*e.g.*, rust flakes, nails, and/or small metallic clutter]);
- Survey grade Global Positioning System (GPS) unit; and
- Digital camera.

Safety Supplies:

- First aid kit;
- Bloodborne pathogen kit;
- Eye wash (for immediate field use);
- Insect repellants containing 33 percent (%) N,N-diethyl-meta-toluamide (DEET) (if required);
- Sunscreen;
- Two-way radio;
- Cellular phone;
- Water and/or hydrating drinks; and
- Electrolyte packets.

Tools/Equipment:

- Field logbooks,
- Field forms;
- Flagging tape;
- Measuring tape;
- Small, medium , and large steel pipe nipples;
- Tool pouches;
- Pin flags;
- Grid stakes;
- Buckets;

- Water jugs;
- Batteries;
- Vegetation clearance equipment, as needed;
- Hand tools (*e.g.*, shovel, pick, handpick); and
- Heavy equipment and earth moving machinery, as needed.

Personnel Protective Clothing:

GSI Pacific Inc. (GSIP) and all personnel on site will have all necessary modified Level D personal protective equipment (PPE) as per 29 Code of Federal Regulations (CFR) Part 1910.120. The equipment listed below comprises modified Level D PPE for this project:

- Normal work clothes (long pants and shirt);
- Safety glasses;
- Leather gloves;
- Boots (leather, ankle stability); and
- Reflective short or long sleeve shirts and/or Class II reflective vest.

Section 4 Related Procedures

Related SOPs include the following:

- *Field Documentation*, SOP G-1;
- *Anomaly Avoidance*, SOP G-2;
- *Surveying and Mapping*, SOP G-3;
- *Project Quality Control*, SOP G-5;
- *Surface and Subsurface Clearance*, SOP UXO-01; and
- *Heavy Equipment and Earth Moving Machinery Operations*, SOP UXO-04.

Section 5 Procedures

5.1 Safety Procedures

IVS installation will require anomaly avoidance procedures utilizing an unexploded ordnance (UXO) qualified escort as prescribed in SOP G-2 *Anomaly Avoidance*.

When analog geophysical survey equipment is utilized during surface and subsurface clearances, the work will be performed in accordance with (IAW) this SOP and SOP UXO-01 *Surface and Subsurface Clearance*.

During MEC clearance operations, GSIP personnel will strictly adhere to the Accident Prevention Plan (APP)/Site Safety and Health Plan (SSHP) and the following general safety practices:

- SAFETY IS PARAMOUNT;
- Do not move or disturb unidentified items;
- Do not collect souvenirs;
- Do not smoke except in designated areas outside the RA site;
- Do not carry fire or spark producing devices into the site;
- All operations will utilize the “Buddy” system;
- Prohibit non-essential personnel from visiting the site without approval from the UXO Safety Officer (UXOSO) and an UXO-qualified escort in uncleared areas;
- Operations will be conducted during daylight hours;
- Access to operating areas will be limited to only those personnel necessary to accomplish the specific operation;
- All personnel will attend the daily safety briefing (tailgate safety briefing) prior to entering the operating area;
- Anyone can stop operations for an unsafe act or situation; and
- Safety violations and/or unsafe acts will be immediately reported to the UXOSO.

5.2 Geophysical Project Personnel

All geophysical investigations will be managed and executed by the UXO-qualified personnel presented in this section. All technical staff will report to the project team’s Project Manager.

5.2.1 Project Geophysicist

The project team will manage the geophysical operations including oversight by a Project Geophysicist with a degree in geology, geophysics, or a closely related field and minimum of five years of experience directly related to geophysical mapping and the detection and

discrimination of buried military munitions. This individual will have overall responsibility for design, implementation, and management of all geophysical investigations required for the work effort related to military munitions, but may not necessarily be on site full time. The Project Geophysicist will verify that all of the blind seeds have been detected and targeted. The Project Geophysicist will be the project geophysicist-of-record.

The Project Geophysicist will have overall responsibility for monitoring scoped geophysical work including but not limited to the following:

- Quality of the metal detection and coverage;
- Ensure that all blind seeds have been detected, targeted, and recovered; and
- Work has been documented appropriately.

5.2.2 Geophysical Survey Teams

5.2.2.1 Geophysical Technicians

Geophysical Technicians will be overseen by the Senior UXO Supervisor (SUXOS) along with the Project Geophysicist. Geophysical technician responsibilities may be fulfilled by a UXO Technician. Responsibilities of the Geophysical Technicians will include:

- Performance of detection including daily instrument checks (quality control [QC] tests, IVS, production data); and
- Documentation of all field work.

5.2.2.2 UXO Technicians

UXO-qualified personnel who meet or exceed the qualification requirements listed in Department of Defense Explosives Safety Board (DDESB) Technical Paper (TP)-18 will be present for all field operations to provide MEC safety and anomaly avoidance support.

5.2.2.3 Team Organization

Each analog geophysical team will be comprised of at least one UXO Technician III and UXO Technician II to allow for the real time intrusive investigation of anomalies identified during the analog surveys. Because intrusive activities will occur, only UXO-qualified personnel will be present during intrusive activities. Alternatively, a Geophysical Technician and UXO Technician II may complete the analog geophysical survey by placing a flag near, but not on top of, any observed anomalies for subsequent intrusive investigation by a UXO Technician II and UXO Technician III.

5.3 *Site Conditions Affecting Geophysical Operations*

5.3.1 **Background Geophysical Noise**

General site background noise will be recorded during the IVS setup and documented in the IVS Letter Report. Cultural background noise is expected to be minimal due to the lack of site utilities and development within and around the site. The basaltic terrain predominant at the former WTA will often oxidize and weather in a similar manner as oxidized ordnance. Secondary iron oxides (such as maghemite) cause geophysical “false positives” in the detection of subsurface ordnance. Not only will metal detection equipment indicate ferrous ordnance, it will also detect iron rich basalt cobbles, sub-crops, or changes in the iron composition from lava flow to flow. For the EM61-MK2 detector, the primary source of geological false positives in typical basaltic Hawaiʻi terrain seem to arise from terrain features and loose rocks that cause temporary reductions in the coil to ground distance. The interference can usually be determined and eliminated by an operator moving the EM61-MK2 coil in different directions and observing the terrain. The handheld detector planned for use, the Minelab Explorer SE, has a feature to adjust the iron mask which reduces the amount of false positive anomalies. In some cases, soil or rocks may need to be removed following intrusive protocols to verify that an anomaly has a geophysical source.

5.3.2 **Site-Specific Dynamic Events Affecting Geophysical Production**

The site is located in an area with a wet climate characterized by intense precipitation events. The substrate has high clay content and tendency to retain moisture long after precipitation. Rainfall and resulting slippery conditions will impede or delay geophysical detection operations during precipitation events.

5.4 *Geophysical System Verification*

The initial phase of the Geophysical System Verification (GSV) is to locate and remove MEC as well as non-munitions related metallic items in the subsurface. The proposed geophysical system will be verified using GSV process per the Environmental Security Technology Certification Program (ESTCP) guidance, *Geophysical System Verification (GSV): A Physics-Based Alternative to Geophysical Prove-Outs for Munitions Response, July 2009*. The GSV process is two-fold and consists of:

- **IVS:** The objective is to verify that the geophysical detection and navigation system is operating properly. The IVS will contain Industry Standard Objects (ISOs) facilitating comparison of responses in the collected data with both historical measurements and physics-based model predictions.
 - ISOs
 - The ISO (see Figure 5-1) to be used in the IVS are 1 inch (2.54 centimeter) by 4 inches (10.16 centimeter) steel pipes (part number 44615K466) from the McMaster-Carr on-line catalog (<http://www.mcmaster.com/>):

- Shape: Straight nipple, threaded both ends;
- Schedule: 40;
- Pipe Size: 1 inch (1.315-inch outer diameter);
- Length: 4 inches; and
- Finish: Black welded steel.

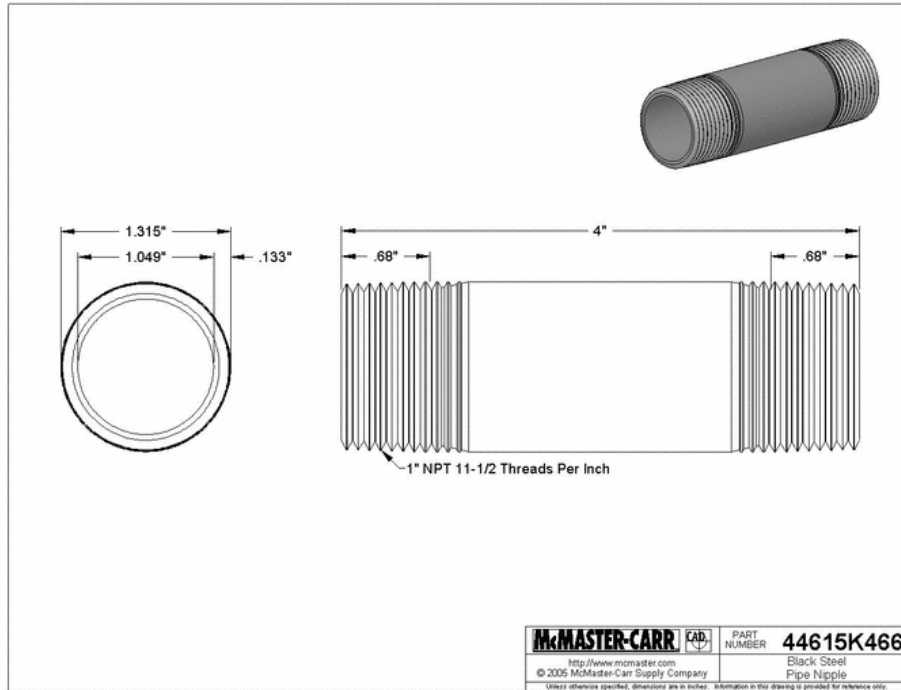


Figure 5-1: Industry Standard Object

- **Blind Seeding Program:** The blind seeding program is an integral part of the GSV process. The production site will be seeded with ISOs at surveyed locations that are blind to the data collection and processing teams. The objective of the seed program is to provide ongoing monitoring of the quality of the geophysical data collection and target selection process as it is performed in the production survey throughout the project. The failure to detect a seed target will allow the project team to recognize that problems exist and provide a means to identify root causes and undertake corrective action while data collection is on-going. The seeds will be planted at a depth and orientation that is conservatively within the expected detectable range of the sensors (similar depths and orientations as seeded in the IVS).

5.4.1 Analog and DGM IVS

The IVS strip may be shared for analog and DGM surveys during project activities depending on field work sequence. A verbal concurrence on equipment, procedures and threshold may be utilized to begin fieldwork while IVS Letter Report formal comments and edits are pending. An

IVS schematic is provided in Figure 5-2. Below is a list of protocols that will be followed depending on whether an analog or DGM survey is being conducted.

5.4.1.1 Analog IVS

The same detection equipment and settings that will be used in analog detection operations will be deployed over the Analog IVS. The IVS process is outlined in the following steps:

1. The Analog IVS will be placed in a convenient location found to be relatively clear of subsurface metal and will provide for daily calibration tests. Preparation, background survey, installation, and measurement of ISOs will be similar to process described in Section 5.4.2 with the exception that analog detection instruments will be utilized. Additional strips may be emplaced to expedite operations (*e.g.*, allow operators to complete multiple IVS's concurrently);
2. Following verification that the Analog IVS area is clear of subsurface anomalies (or that existing anomalies can be avoided during seeding), six ISOs will be buried alternating in orientations (*i.e.*, vertical, 45 degrees, and horizontal) depths of approximately 3 and 7 times their diameter (4 and 9 inches, respectively) measured to the center of the item. Following the emplacement of the ISOs the IVS area will be identified with start and stopping points (*i.e.*, stake, flags for start and stopping points);
3. Following Analog IVS emplacement the UXO Quality Control Specialist (UXOQCS) will verify that all ISOs are detectable from all angles;
4. Each analog detection operator will proceed over the IVS before and after geophysical operations each day. The operator will verify that the detector output (tone) are clearly detectable and uniform from day to day;
5. Geophysical technician leads will record each operator's completion of the Analog IVS and any deviations or equipment replacements. UXOQCS or Project Geophysicist may move, add, and/or remove blind items on a regular basis to avoid operator complacency with daily checks;
6. The IVS Letter Report and Final Geophysical Report will contain documentation of all Analog IVS field activities, data and results; and
7. All geophysical activities associated with the IVS will conform to the methods and procedures outlined in this SOP and the project UFP-QAPP.

5.4.1.2 DGM IVS

The IVS process for utilization of the EM61-MK2 as a DGM instrument (as utilized for anomaly reduction) is outlined in the following steps:

1. The IVS will be placed in a convenient location found to be relatively clear of subsurface metal and will provide for daily calibration tests;

2. Site Preparation and Limited Metal Debris Removal: If necessary, vegetation will be cleared from the IVS area to the same extent as anticipated for the field areas. The actual location of the test line will be checked using an EM61-MK2 prior to the burial of any seed items to ensure that other metallic contaminants are not present. In order to reduce the level of interference of non-munitions related metal debris during the geophysical investigation, removal of surface debris is planned;
3. A “background” DGM survey will be performed with the instrumentation to be validated over the IVS. This step will allow background geophysical conditions to be recorded, will help determine the appropriateness of the location (for example, few existing anomalies), and will verify that ISOs are not seeded near existing anomalies. The data will be post-processed and provided for evaluation;
4. Following verification that the IVS area is clear of subsurface anomalies (or that existing anomalies can be avoided during seeding), six ISOs will be buried alternating in orientations (*i.e.*, vertical, 45 degrees, and horizontal) depths of approximately 3 and 7 times their diameter (4 and 9 inches, respectively) measured to the center of the item. The Personnel will emplace ISOs and record the emplacement data (depth, orientation, and azimuth). Background survey data and anomaly avoidance techniques will be used to ensure that ISOs are not placed on top of or near existing anomalies;
5. Real-Time Kinematic (RTK) GPS equipment will be used to record ISO locations to the center of the targets. The location of the endpoints of the IVS will also be recorded;
6. A DGM survey will be performed over the IVS as specified in the *Geophysical System Verification (GSV): A Physics-Based Alternative to Geophysical Prove-Outs for Munitions Response*, July 2009. The data will be processed and interpreted by Data Processor. Data packages will be provided to the client for evaluation;
7. If the initial Measurement Performance Criteria (MPCs), described in Worksheet #12 of the project UFP-QAPP, have not been met, the geophysical project team will discuss whether modifications to instrumentation or procedures can be made to the DGM system in order to meet the MPCs;
8. Once the surveys have been performed and the system has been found to meet the initial (or modified) MPCs, the IVS will be complete;
9. The IVS Letter Report and Final Geophysical Report will contain documentation of all DGM IVS field activities, data processing procedures, and results; and
10. All geophysical activities associated with the IVS will conform to the methods and procedures outlined in the UFP-QAPP.

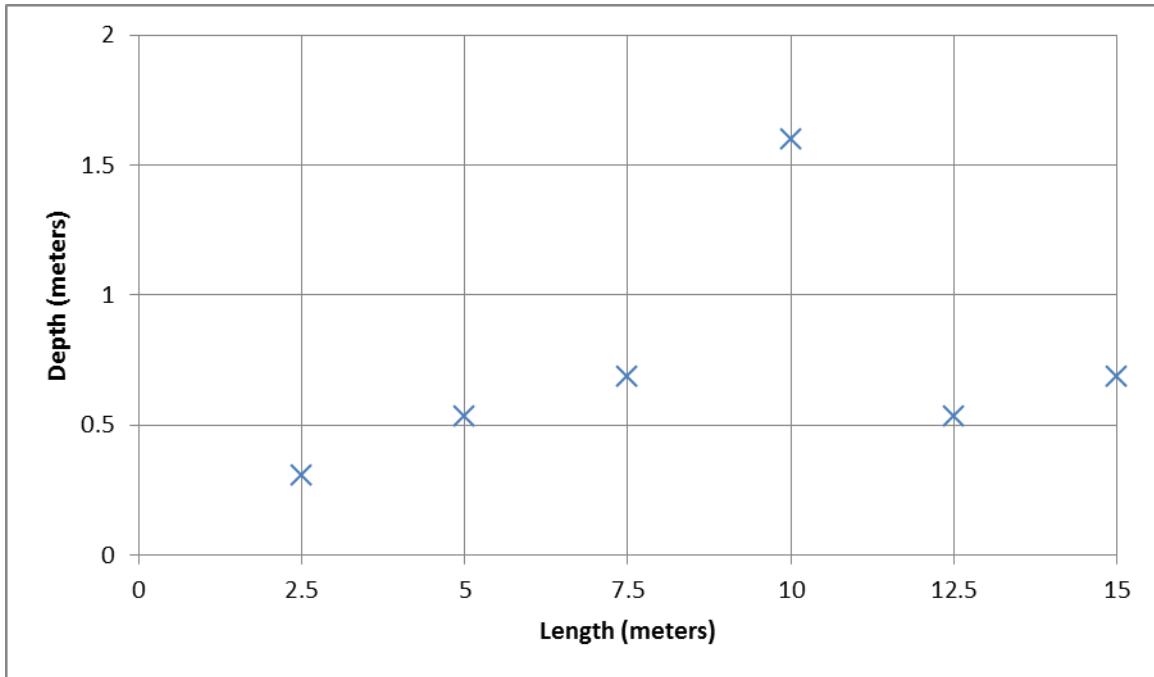


Figure 5-2: IVS Design Layout

5.4.2 Blind Seeding

5.4.2.1 Analog Blind Seeding

The blind seeds for the project will be numerous enough to be encountered at a rate of one seed per team per day. For additional geophysical blind seeding parameters and specific details, refer to the MPC, described in Worksheet #12 of the project UFP-QAPP and SOP G-5 *Project Quality Control*.

5.4.2.2 DGM Blind Seeding

Known seeds will be buried at RTK GPS surveyed locations that are blind to the survey and data processing teams, at a sufficient frequency for one seed covered per DGM team per day.

5.5 Geophysical Survey

5.5.1 Survey Type and Procedures

Analog handheld and DGM detectors will be utilized for the surface and subsurface clearance.

5.5.1.1 *Analog Instrument Setup*

Below are the steps for setting up the analog instruments in the field for detection of metallic items:

- Ensure that serviceable batteries have been installed in the instrument;
- Utilize the instrument standard settings (*e.g.*, sensitivity, gain, and tone) as determined by the IVS Letter Report;
- Move to a clear area adjacent to the Analog IVS;
- Turn on the instrument and position the sensor head away from the metallic objects on the body, especially boots. Perform the internal noise cancelation feature and frequency channel adjustment to eliminate ambient noise or interference from other detectors in the sweep line;
- Perform a personnel metal test by checking each other for audible tone interference due to metallic sources on a daily basis;
- Perform a modified cable shake test as a coil and instrument shake/bump test for the handheld detectors (due to the internal cable location in a fixed protected tube). Check cable connection to coil for pinch points and unimpeded movement;
- Perform pre-survey QC function tests at the Analog IVS;
- Do not readjust the sensitivity over the work period without clearance from QC personnel; and
- Document this setup procedure in the Daily Operator Test Report.

5.5.1.2 *Analog Geophysical Surveys*

- During analog geophysical surveys, the UXO Technicians will begin walking the grid with the analog detector. Personnel will start at one end of each line and will move forward toward the opposing baseline;
- During the forward movement, the individual will move the detector from one side of the lane to the other. Both forward movement and the swing of the detector will be performed at a pace that ensures that the entire lane is covered and that the instrument is able to appropriately respond to subsurface anomalies;
- Metallic debris excavated during the investigation will be managed IAW MPPEH procedures outlined in Engineer Manual (EM) 385-1-97; and
- All results will be annotated on appropriate data collection device (*e.g.*, GPS unit with mapping capabilities).

5.5.1.3 DGM Instrument Setup and Survey

The following procedures will be accomplished during each work day of DGM surveys:

- Morning health and safety brief;
- Equipment set-up and warm-up (minimum 15 minutes);
- Morning QC Checks & IVS;
- Acquire morning survey data;
- Download morning survey data with morning QC check, lunch break;
- The EM61-MK2 will be warmed up for at least 15 minutes before use following lunch;
- Acquire afternoon survey data;
- Acquire afternoon QC checks & IVS;
- Download afternoon data with afternoon QC checks;
- Equipment disassembly;
- Review data for completeness and quality; and
- Upload data to project database.

Data files will be named consistently and clearly to identify the type of data contained within and when or where it was collected. The first QC file of the day will contain the cable shake, vehicle/personnel, static and spike tests, while subsequent files will only contain static and spike tests. Production data will be named logical manner based on the area of collection.

5.5.2 Geophysical and Navigation Sensors

5.5.2.1 Analog Detectors

A handheld Minelab frequency domain electromagnetic detector (Explorer, E-TRAC, or CTX series) with full band spectrum technology will be utilized to assist the field teams during the surface and subsurface clearance.

The Minelab is an all-metals, multi-frequency electromagnetic metal detector. It simultaneously operates on 28 frequencies within the range of 1.5 to 100 kilohertz (kHz), and can be set to operate on any 1 of 11 channels. Each channel is comprised of 28 frequencies spread over the 1.5 to 100 kHz range. The Minelab is designed to locate metal objects in a wide variety of ground conditions including the highly mineralized ground conditions. A larger coil (EXcelerator 15 inch by 18 inch) may be utilized with the Minelab for increased depth of detection and sweep coverage.

5.5.2.2 DGM Detectors

The EM61-MK2 will be mounted on wheels and connected to an RTK GPS unit in order to provide real-time positional tracking capabilities. The equipment will be used to focus detection and removal efforts. The EM61-MK2 is a high-resolution time-domain electromagnetic induction sensor that is capable of detecting both ferrous and non-ferrous metallic objects. In comparison with other metal detectors, especially magnetometers, the EM61-MK2 is much better suited for work in close proximity to buildings, vehicles, metal fences, and underground utilities. The EM61-MK2 system consists of an air-cored coil, a digital data recorder, batteries, and processing electronics. The EM61-MK2's transmitter generates a pulsed primary magnetic field, which then induces eddy currents in nearby metallic objects. These eddy currents are measured by the same coil acting as a receiver. Secondary voltages are measured in mV at four separate time gates.

5.5.2.3 Navigation and Mapping System

As required, for documenting MEC or other features of interest, a RTK GPS will be used to obtain a horizontal accuracy of +/-30 centimeters. The RTK GPS receiver will be mounted directly above the center of the EM61-MK2 system so that accurate geolocation of the data can be achieved. QC procedures will be conducted to ensure the GPS equipment is functioning properly. At the start of each day, the field team will compare the position that the GPS receiver is reporting to a known control point location to ensure the GPS instrumentation is operating within the project accuracy specifications for each task. The quality of GPS location data can be affected by overhead vegetation cover, local topography, the elevation of the satellites in the sky, weather, and other factors. If the quality of the GPS location data is poor, locations will be determined and recorded by additional measures such as fixed point bearings and distance markings.

5.5.3 Production Rates

The proposed work week is expected to consist of 10-hour days. It is estimated that the surface and subsurface clearance team (seven-person team) will be able to detect (handheld analog instruments) and remove anomalies for approximately 1 acre per day, while the DGM surveys will be able to map approximately 0.5 acres per day.

5.5.4 Anomaly Selection Threshold and Sensitivity

The Minelab will be operated at a sensitivity of 14 utilizing the larger coil (15 inch by 18 inch) or sensitivity of 18 utilizing the manufacturer's 12 inch diameter "Double D" coil. The metal detector threshold and sensitivity may be adjusted with the concurrence of the Project Geophysicist and UXOQCS. The EM61 anomaly selection criteria for DGM will be established slightly above background noise levels to allow for detection of all possible ordnance items. The exact targeting parameters (*i.e.*, milivolt values and time gates utilized) will be laid out in a targeting memo based on the smallest munitions of interest (37mm).

5.5.5 Spatial Density and Coverage

The handheld instruments are continuously operating frequency or time domain detectors with an immediate response. As utilized in analog mode, there will be sufficient spatial response for operator feedback. DGM data will be collected at an approximate rate of 10 readings per second to ensure that the MPC (Worksheet #12 of the project UFP-QAPP) for downline data density is met. Coverage will be controlled in the grid with temporary lane markers such as non-metallic flags or ropes utilized as a ground guide. Blind seeds will be utilized to confirm coverage.

5.5.6 Analog Anomaly Post-Intrusive Resolution

Every excavation hole will be checked thoroughly during the removal process to identify and remove the anomaly source. The audio response in conjunction with the display on the instrument panel will be used to verify that the anomaly has been removed. The UXOQCS will perform a final verification check of each selected target prior to declaring the anomaly clear. In addition to checking the excavated area, the spoils pile will be checked for the presence of metal. Additional details on QC requirements including verification sampling are provided in the SOP G-5 *Project Quality Control*.

5.5.7 DGM Anomaly Reacquisition and Post-Intrusive Resolution

Once the DGM data is processed and target list identified, the Project Geophysicist will analyze the data to review the selected targets for intrusive investigation by the UXO Teams. The UXO Teams will reacquire the anomaly locations using RTK GPS equipment and a handheld detector. The spatial locations will be verified by acquiring the peak response over the center of the anomaly location within a 1 meter search radius.

Every excavation hole will be checked thoroughly with an EM61-MK2 during the DGM removal process to identify and remove the anomaly source. The audio response in conjunction with the display on the instrument panel will be used to verify that the anomaly has been removed. The UXOQCS will perform a final verification check of each selected target prior to declaring the anomaly clear.

The Project Geophysicist will review both the recorded peak response offset location and the intrusive metallic results compared with the DGM anomaly amplitude values. For anomalies with excessive offsets, mismatched results or no metallic discoveries, the anomaly location will be re-checked with an EM61-MK2 for any remaining response or excavated to the maximum project depth.

5.6 Quality Control – Instrument Standardization

In addition to the Instrument Standardization procedures in this section, for geophysical QC please refer to Section 5.4 on GSV. Additionally, please refer to the MPC described in Worksheet #12 and the SOP G-5 *Project Quality Control*.

5.6.1 Geophysical Sensor Standardization

Below are the Minelab instrument standardization tests for the analog geophysical survey:

1. **Equipment Set and Initialization:** Ensure that serviceable batteries have been installed in the instrument. Utilize the instrument standard settings (*e.g.*, sensitivity, gain, and tone) as determined by the QC personnel, and turn on the instrument and position the sensor head away from the metallic objects on the body, especially boots. Perform the internal noise cancelation feature and frequency channel adjustment to eliminate ambient noise or interference from other detectors in the sweep line;
2. **Personnel Test:** Perform a personnel metal test by checking each other for audible tone interference due to metallic sources on a daily basis;
3. **Cable Shake:** Perform a modified cable shake test as a coil and instrument shake/bump test for the Minelab Explorer SE (due to the internal cable location in a fixed protected tube). Check cable connection to coil for pinch points and unimpeded movement; and
4. **Dynamic Response Test:** Perform QC function tests at the IVS.

The following are the EM61-MK2 instrument standardization tests for the analog geophysical survey:

1. **Equipment Warm-Up:** The EM61-MK2 standard warm-up time is 15 minutes. Equipment warm-up will be performed the first time an instrument is turned on for the day or has been turned off for a sufficient amount of time for the specific instrument to cool down;
2. **Personnel Test:** This test verifies that the person operating the detector is not introducing extraneous noise that might potentially affect the detector response. On a daily basis, the instrument coils/sensors for those instruments being used that day will be checked for their response to the person towing the system. The Personnel Test will be performed at the start of each survey day and following any crew change;
3. **Cable Shake:** The primary reason for conducting the cable shake test is to ensure that movement of cables on the survey equipment/platform does not introduce significant noise. It also ensures that there are no loose connections or shorts in the cables that could potentially cause noise spikes in the geophysical and positional data during survey execution. If significant noise is present as a result of cable movement, it will be addressed appropriately before proceeding with data collection. Faulty cables or connectors will be replaced prior to data collection. Loose cables will be taped to prevent excessive movement during data collection. The vibration test will be performed daily, prior to the start of survey; and
4. **Static Background and Static Spike:** Static tests will be performed by positioning the survey equipment within or near the survey boundaries in an area free of metallic contacts and collecting data for (minimally) a 1-minute period. During this time, the instrument will be held in a fixed position without a spike (small ISO) and then with a small ISO spike. The purpose of the static test is to determine whether unusual levels of

instrument or ambient noise exist. The static background and static spike test will be conducted at the beginning and end of each survey operation.

5.7 *Corrective Measures*

All QC processes and procedures conducted independently, both in the field and office during the geophysical investigations will be fully documented and made available upon request. The QC documentation will also be included as part of the final reporting. While site-specific requirements may dictate site-specific processes and procedures, the following general principals will be adhered to:

- The Project Geophysicist will oversee all geophysical corrective actions and report any significant issues to the Quality Control Manager;
- All personnel conducting specific QC tasks will have the appropriate training and understanding of their responsibilities. Additionally, these personnel will have the authority to stop work and the organizational freedom to identify, evaluate, initiate, recommend or provide solutions, and approve corrective actions to ensure all work complies with stipulated contractual requirements;
- The Project Geophysicist will be responsible for oversight of geophysical QC checks during fieldwork. A daily log will be maintained that will serve to document any instrument malfunction or other conditions that may adversely affect data quality or production. If any significant discrepancies exist in the positioning or repeatability of the data, the problem will be identified, resolved, and documented. The UXOQCS will work with the Project Geophysicist as needed to monitor the geophysical aspects of the intrusive process; and
- Internal QC procedures will be conducted during data processing to ensure data integrity. These checks will include but are not limited to qualitative analysis or repeat data, examinations of data drift for possible instrument malfunction, and consistency of interpretation and targeting among processors. The geophysical subcontractors will be responsible for management and oversight of all QC data associated with post-processing and deliverables.

Section 6 *Documentation*

6.1 *Geophysical Records Management*

The geophysical records management plan includes field survey records management and geographic information system (GIS) records management. Additional details are provided in the Data Management Plan (Worksheet #29 of the project UFP-QAPP).

6.1.1 *DGM Data management*

Geophysical field data will be provided in delineated fields as x, y, z, v(1), v(2), *etc.*, for delivery upon request. After completion of survey and processing activities, all geophysical data will be provided in ASCII XYZ format to include both raw, processed data and final target lists. Geophysical data deliveries will include daily IVS and sensor standardization tests. The database and all final geophysical maps will be provided following completion of the field work. Maps that display geophysical anomalies and identified physical features shall be delivered in both a .pdf and a spatially referenced Oasis Montaj Geosoft map format.

6.1.2 *Field Survey Records Management*

All Field information (field forms [survey and QC information]) will be stored by the data manager and recorded as appropriate in the project Access Database IAW Data Item Description (DID) MMRP-09-004. For geophysical operations, this documentation will include the Daily Operator Test Report and other forms that include detection components. The UXOQCS will work with the Project Geophysicist to review the database records daily for consistency, accuracy, and quality.

6.1.3 *GIS Records Management*

All final GIS data generated will be submitted in non-proprietary Spatial Data Transfer Standard (SDTS) format at the close of the project, as well as in the Environmental Systems Research Institute (ESRI) data format. All formal GIS data submittals will be made on CD-ROM and provided to USACE.

6.2 *List of Forms*

For IVS and sensor standardization operations, the following will be completed:

- Field Logbook; and
- Daily Operator Test Report.

6.3 *Field Logbook*

Daily field activities will be documented in a Field Logbook. Refer to SOP G-1 *Field Documentation* for field logbook procedures. DGM field logbooks will be utilized to document all file names, times and appropriate notes for field collection of IVS, sensor standardization and grid data.

6.4 Daily Operator Test Report

To ensure operator proficiency and that quality data is collected, an operator instrument proficiency test will be conducted on the handheld geophysical instruments that will be used for project operations. This test will be documented using the Daily Operator Test Report form (Attachment in SOP G-2). Guidance for filling out each field on the form is provided in Section 7 of SOP G-2 *Anomaly Avoidance*.

Section 7 References

DDESB, 2015. TP-18. *Minimum Qualifications for Personnel Conducting Munitions and Explosives of Concern-Related Activities*. 1 September.

ESTCP, 2009. *Geophysical System Verification (GSV): A Physics-Based Alternative to Geophysical Prove-Outs for Munitions Response*. July.

USACE, 2009. DID MMRP-09-004. *Geophysics*. 19 August.

_____, 2011. *Geophysical Prove-Out Letter Report for Munitions and Explosives of Concern (MEC) Removal Action & Supporting Functions, Waikane Training Area, Island of Oʻahu, Hawaiʻi*. 16 May.

_____, 2015. EM 200-1-15. *Environmental Quality Technical Guidance for Military Munitions Response Actions*. 30 October.

This Page Intentionally Left Blank

Appendix H
Archaeological Monitoring Plan

The Final Archaeological Monitoring Plan (AMP) was submitted separately to the POH Senior Archaeologist.

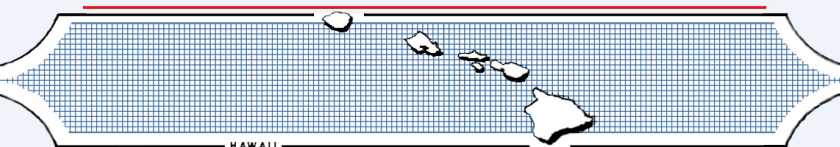
This Page Intentionally Left Blank

**AN ARCHAEOLOGICAL MONITORING PLAN FOR
MUNITIONS AND EXPLOSIVES OF CONCERN (MEC)
CLEARANCE IN A 36-ACRE PARCEL IN THE
FORMER WAIKĀNE TRAINING AREA (WTA),
WAIKĀNE AHUPUA‘A, KO‘OLAU POKO DISTRICT,
O‘AHU ISLAND, HAWAI‘I
[TMK (1) 4-8-006:001, 008]**

Prepared by: **Alexander D. Hazlett**
and
Robert L. Spear, Ph.D.
November 2016
FINAL

Prepared for:
U.S. Army Corps of Engineers
Honolulu District
Building 230
Fort Shafter, Hawai‘i 96858
RMIS ID: H09HI035401

SCIENTIFIC CONSULTANT SERVICES Inc.



1347 Kapiolani Blvd., Suite 408 Honolulu, Hawai‘i 96814

TABLE OF CONTENTS

TABLE OF CONTENTS.....	I
LIST OF FIGURES	I
ACRONYMS AND ABBREVIATIONS.....	II
INTRODUCTION	1
PHYSICAL SETTING	1
CULTURAL AND HISTORICAL BACKGROUND.....	5
EARLY SETTLEMENT AND EXPANSION	5
THE MĀHELE	7
MILITARY TRAINING.....	8
ARCHAEOLOGICAL EXPECTATIONS.....	10
MONITORING CONVENTIONS AND METHODOLOGY.....	11
ARCHAEOLOGICAL MONITORING.....	12
DATA ANALYSIS AND PROJECT DOCUMENTATION.....	12
LABORATORY ANALYSIS	12
CURATION.....	13
PROJECT DOCUMENTATION.....	13
ARCHAEOLOGICAL CONTRIBUTIONS TO THE MASTER GEOGRAPHIC INFORMATION SYSTEM (GIS).....	14
PREVIOUS ARCHAEOLOGY (FOUO; SEE APPENDIX A).....	14
REFERENCES CITED.....	15
APPENDIX A: FOR OFFICIAL USE ONLY (FOUO).....	18

LIST OF FIGURES

Figure 1: USGS Showing Former Waikāne Valley Training Area.	2
Figure 2: Tax Map Key showing the Project Area.	3
Figure 3: Client-Provided Map Showing the Project Area in the Southeastern Impact Area.	4
Figure 4: Modified 1897 Map, M.D. Monsarratt, Surveyor, Entitled: <i>Portion of Waikane, Koolaupoko, Showing hui Divisions.</i>	9

ACRONYMS AND ABBREVIATIONS

AMSL	Above Mean Sea Level
AMP	Archaeological Monitoring Plan
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CRM	Cultural Resources Manager/Archaeologist
CSH	Cultural Surveys Hawai‘i, Inc.
DERP-FUDS	Defense Environmental Restoration Program for Formerly Used Defense Sites
GIS	Geographic Information System
GPS	Global Positioning System
LCA	Land Commission Awards
MEC	Munitions and Explosives of Concern
m	Meters
mm	Millimeters
MRS	Munitions Response Site
NRHP	National Register of Historic Places
POH	Honolulu District
SCS	Scientific Consultant Services, Inc.
SHPD	State Historic Preservation Division
SUXOS	Senior UXO Supervisor
TMK	Tax Map Key
U.S.	United States
USACE	U.S. Army Corps of Engineers
UXO	Unexploded Ordnance
WTA	Waikāne Training Area

INTRODUCTION

Scientific Consultant Services, Inc. (SCS) has prepared this Archaeological Monitoring Plan (AMP) to conduct archaeological survey and monitoring within the Southeastern Region Munitions Response Site (MRS) work area of the former Waikāne Training Area (WTA) in Waikāne Ahupua‘a, Ko‘olau Poko District, Island of O‘ahu, Hawai‘i Tax Map Keys (TMK): (1) 4-008-006: 001, and 008 (Figures 1 to 3).

Archaeological monitoring will be conducted in conjunction with munitions and explosives of concern (MEC) detection and removal conducted under the Defense Environmental Restoration Program for Formally Used Defense Sites (DERP-FUDS), and in accordance with Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) laws and regulations.

PHYSICAL SETTING

The former WTA consists of an approximate 933 acre land section located on the coastal plain adjacent to Kāne‘ohe Bay and on the slopes of the Ko‘olau Mountain Range. The WTA ranges between 80 and 2,265 feet (24 to 691 meters (m)) above mean sea level (amsl) at the top of Pu‘u ‘Ōhulehule. Vegetation is dense and includes endemic, native and Polynesian introduced trees and shrubs.

The Remedial Action area consists of approximately 36 acres in the Southeastern Region (Figure 3).

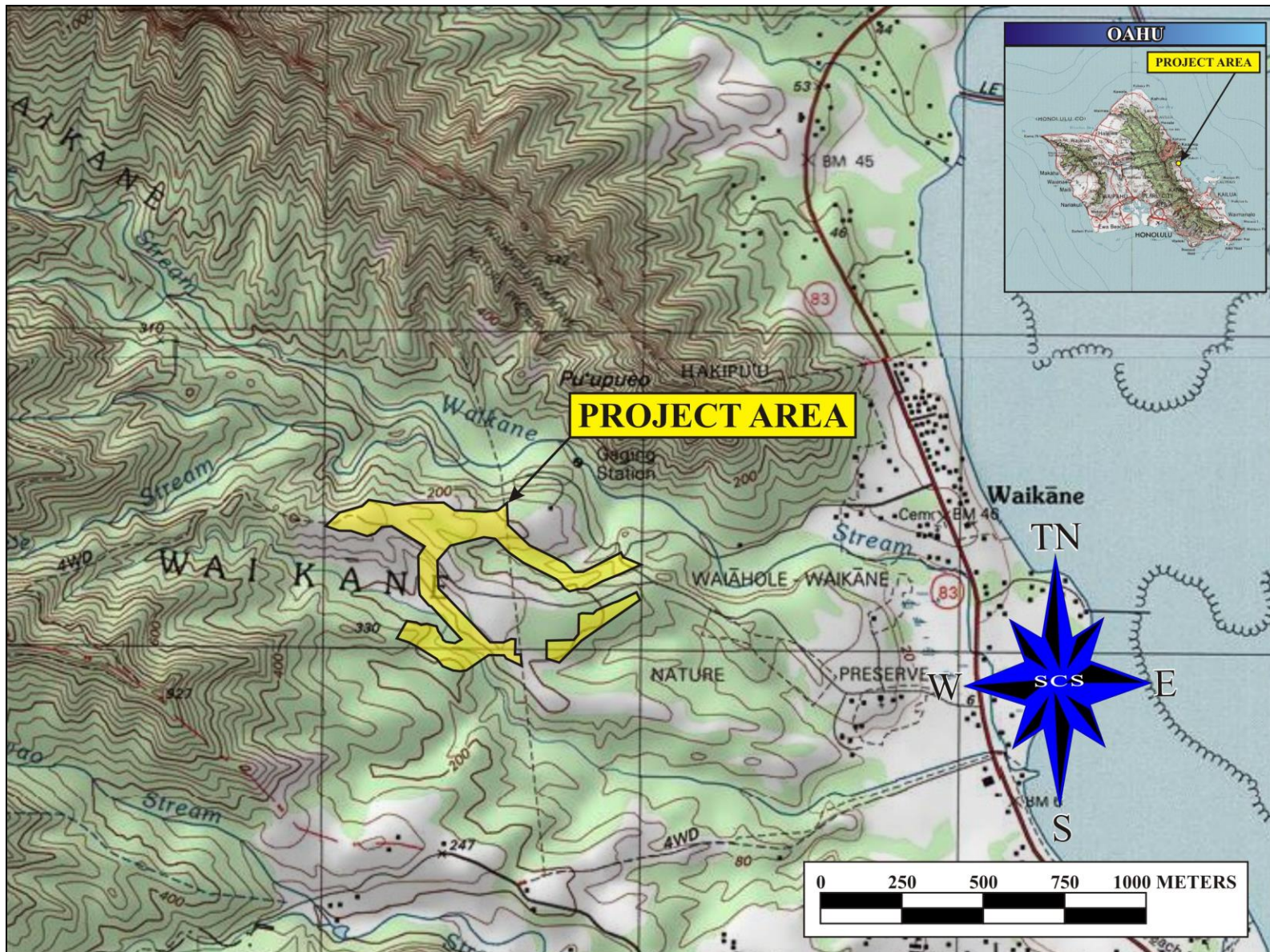
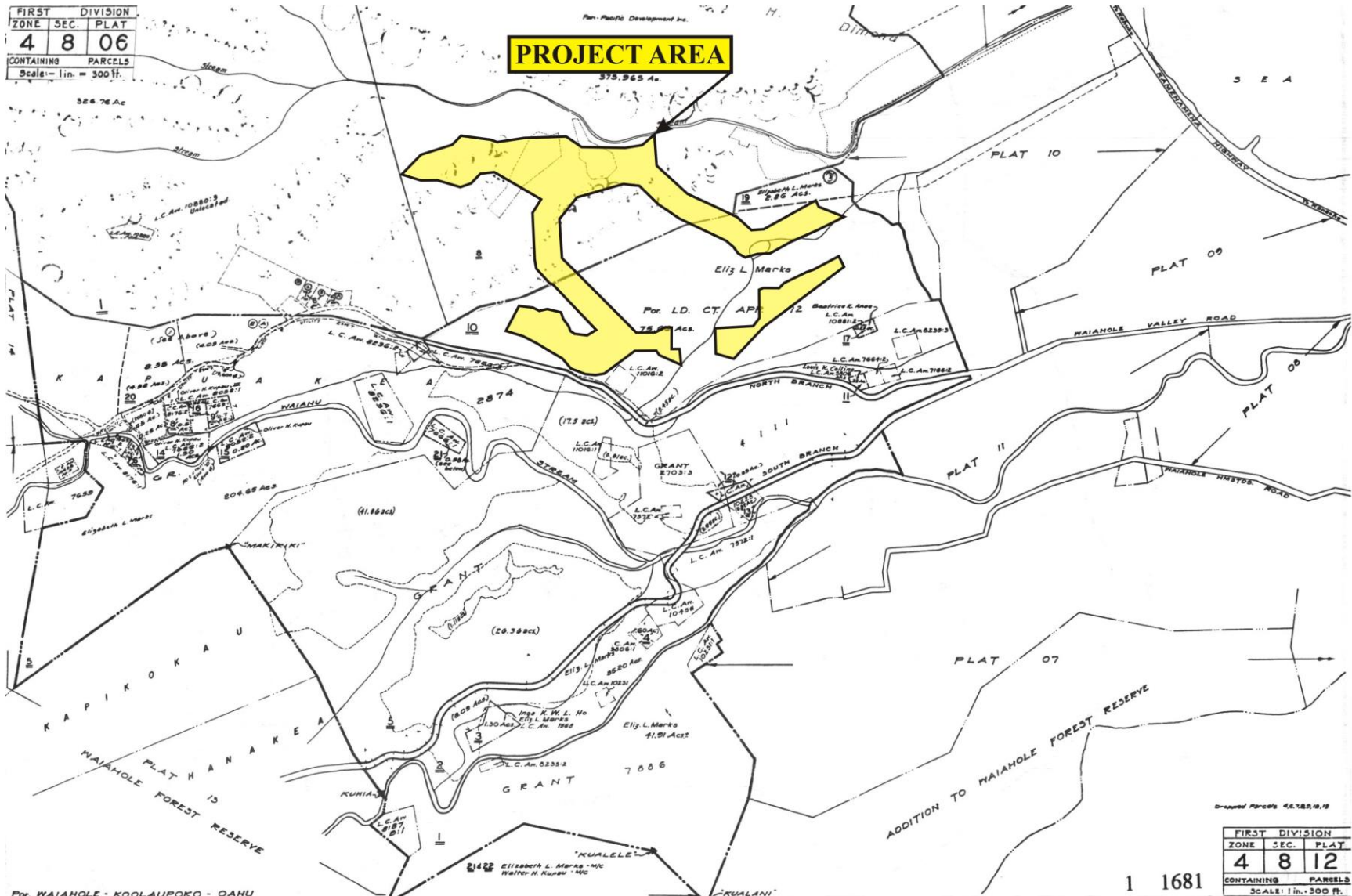


Figure 1: Portion of USGS 1998 Kaneohe Quadrangle Map Showing Former Waikāne Valley Training Area.

FIRST DIVISION		
ZONE	SEC.	PLAT
4	8	06
CONTAINING		PARCELS
Scale: 1 in. = 300 ft.		



Dropped Parcels 46,185,9,15

FIRST DIVISION		
ZONE	SEC.	PLAT
4	8	12
CONTAINING		PARCELS
SCALE: 1 in. = 300 ft.		

1 1681

Figure 2: Tax Map Key showing the Project Area.

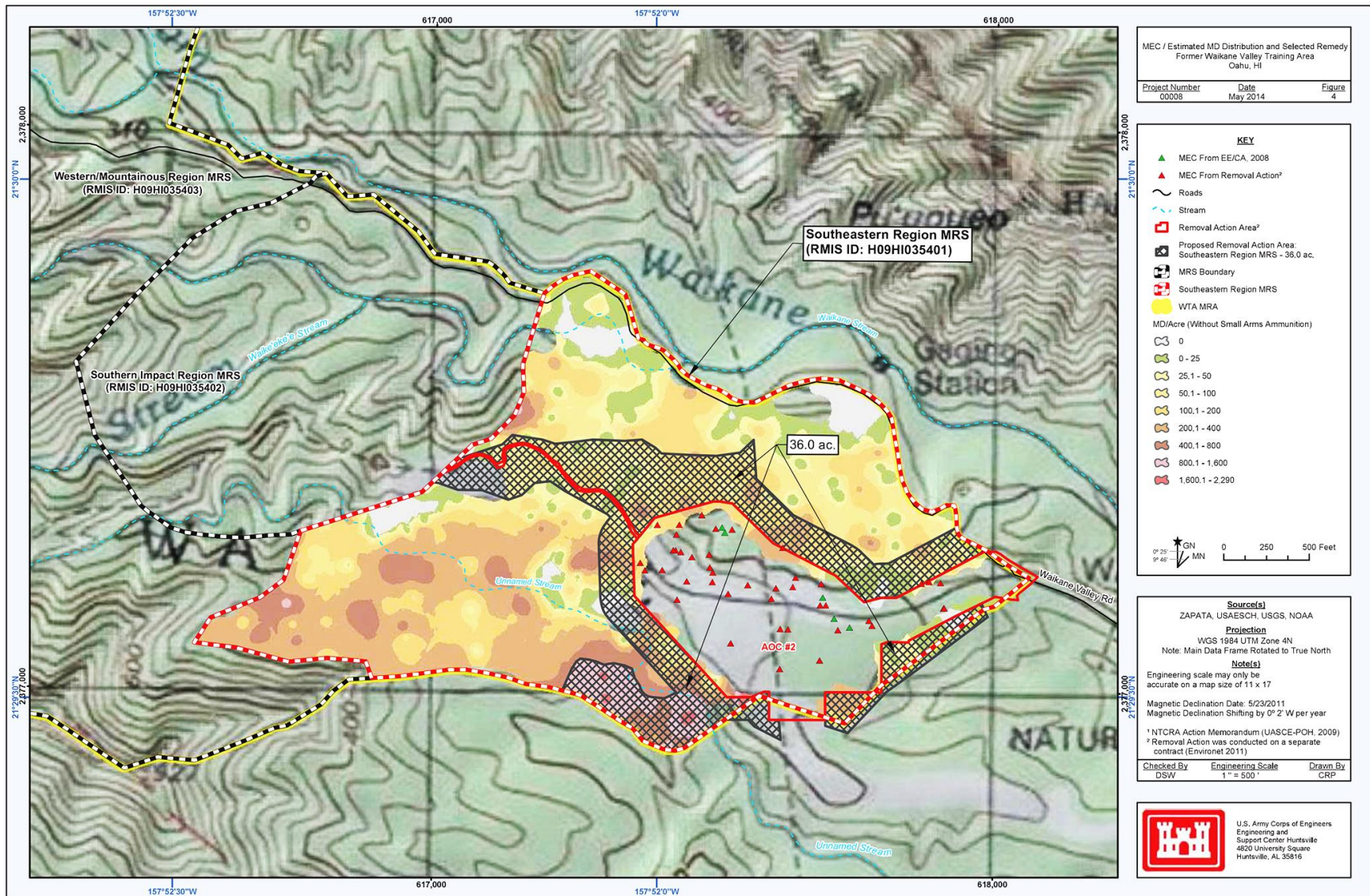


Figure 3: Client-Provided Map Showing the Project Area (the cross-hatched area) in the Southeastern Impact Area.

CULTURAL AND HISTORICAL BACKGROUND

EARLY SETTLEMENT AND EXPANSION

Archaeological evidence suggests O‘ahu Island was first settled between A.D. 0 and 600 by Polynesians sailing most likely from central East Polynesia (Kirch 1985:298; Cordy 2002:8). As the Hawaiian culture developed, land became the property of the king or *ali‘i ‘ai moku* (the *ali‘i* who eats the island/district), which he held in trust for the gods. His title of *ali‘i ‘ai moku* ensured rights and responsibilities to the land, but did not confer absolute ownership. The king kept the parcels he wanted, his higher chiefs received large parcels from him and, in turn, distributed smaller parcels to lesser chiefs. The *maka‘āinana* (commoners) worked the individual plots of land.

In general, several terms, such as *moku*, *ahupua‘a*, *‘ili* or *‘ili‘āina* were devised to describe various land sections. A district (*moku*) contained smaller land divisions (*ahupua‘a*), which customarily continued inland from the ocean and upland into the mountains. Extended household groups living within the *ahupua‘a* were, therefore, able to harvest from both the land and the sea. As the Polynesian economy was based on agricultural production and marine exploitation, as well as raising livestock and collecting wild plants and birds, this situation ideally allowed each *ahupua‘a* to be self-sufficient by supplying needed resources from different environmental zones (Lyons 1875:111). The *‘ili ‘āina* or *‘ili* were smaller land divisions next in importance to the *ahupua‘a* and were administered by the chief who controlled the *ahupua‘a* in which it was located (*ibid*: 33; Lucas 1995:40). The *mo‘o‘āina* were narrow strips of land within an *‘ili*. The land holding of a tenant or *hoa ‘āina* residing in an *ahupua‘a* was called a *kuleana* (Lucas 1995:61).

Oral history notes that the division of O‘ahu’s lands into districts (*moku*) and sub-districts was solidified by the *ali‘i nui*, Mā‘ili-kūkahi during the early part of the 16th century (Kamakau 1991:53-56; Cordy 2002:23). O‘ahu contained six districts including Wai‘anae, ‘Ewa, Waialua, Ko‘olauloa, Ko‘olau Poko, and Kona.

During pre-Contact times, there were primarily two types of agricultural traditions, wetland and dry land, both of which were dependent upon geography and physiography. River valleys provided ideal conditions for wetland *kalo* (*Colocasia esculenta*) cultivation that incorporated pond fields and irrigation canals (*‘auwai*). In valleys like Waikāne, *mai‘a* (banana, *Musa* sp.), *‘awa* (*Piper methysticum*), *Olanā* (*Touchardia latifolia*), *kō* (sugar cane, *Saccharum officinarum*) and certain varieties of dry land *kalo* were often planted *mauka* (Kamakau 1976:38, 39, 41, 44). Other cultigens, such as *‘uala* (sweet potato, *Ipomoea batatas*) and *ipu* (gourds,

Lagenaria siceraria) were grown in drier, hotter conditions, on *kula* land (Krauss 1993: 290,302). This was the typical agricultural pattern seen during traditional times on all the Hawaiian Islands (Kirch and Sahlins 1992, Vol. 1:5, 119; Kirch 1985: 215-231).

The fertile windward valleys of O‘ahu offered prime agricultural land and ocean resources were abundant for the Polynesian settlers. The amphitheater-shaped basins of Waimānalo, Maunawili, He‘eia, Kahalu‘u, Waīahole and Waikāne offered fresh water and ample opportunities for the cultivation of native plants. Formed from the Ko‘olau volcano millions of years ago, the windward side, with its bays and reefs, abundant fresh water for taro, excellent conditions for establishing fishponds for cultivating fish, gentle slopes for dry land crops, and an easily accessible forest to complete a subsistence economy, became the ideal location for habitation (Handy and Handy 1972:435).

According to Handy and Handy, Waikāne Valley was a major source of Ko‘olau taro:

. . . especially in the broad area between the highway and the sea, and as much as half a mile inland there was extensive *lo‘i* cultivation. The northern (and larger) section, extending *mauka* for two or more miles, used to have cultivated *lo‘i* and home sites all along its Waikane Stream. The southern section of the valley, divided off by a low ridge, comprises a gulch where there were old terraces watered by Waike‘eke‘e Stream . . . [1972:442]

Based on several early estimates, the population within the Ko‘olaupoko District was probably near 10,000 in 1779 (Devaney *et al.* 1982:9). With the introduction of foreign diseases after Western Contact, the population of the nine *ahupua‘a*, from Kualoa to Kāne‘ohe in the Ko‘olaupoko District, fell to 3,019 by 1831-32 (*ibid.* p.9). The earliest census for Waikāne and Waiāhole Ahupua‘a (1831-32), recorded a total of 419 people, 67 of whom were children (*ibid.* p.9).

With the arrival and establishment of Western culture, the traditional subsistence economy rapidly shifted to one of a market economy. Many moved from the country to Honolulu where there was a constant influx of new foreign goods and opportunities to procure them. However, the most effective eliminator of the native population were the epidemics in the first half of the 1800s, that included measles, whooping cough, diarrhea, and influenza, occurring in epidemic proportions (*ibid.*:9). In 1855, it was reported that:

Many houses were left without an inhabitant, and of those who survived, many of them had relapsed into a state of indifference and stupidity, from which there seemed to be little hope that they would ever be recovered [Parker in Devaney 1982:11].

THE MĀHELE

In the 1840s, a drastic change in the traditional land tenure resulted in a division of island lands and a system of private ownership based on Western law. While it is a complex issue, many scholars believe that in order to protect Hawaiian sovereignty from foreign powers, Kamehameha III (Kamehameha III) was forced to establish laws changing the traditional Hawaiian society to that of a market economy (Daws 1968:106-112; Kuykendall 1938:145 *et passim*; Kamehameha III 1992:169). Among other things, the foreigners demanded private ownership of land to secure their investments (Kuykendall 1938:138 *et passim*; Kamehameha III 1992:169; Kelly 1983:44, 1998). Once Article IV of the Board of Commissioners to Quiet Land Titles was passed in December 1845, the legal process of private land ownership was begun. The land division, called the Māhele, began in 1848. The lands of the kingdom of Hawai'i were divided among the king (crown lands), the *ali'i* and *konohiki*, and the government. After this initial division and the establishment of private ownership, lands were made available for the *maka'āinana* (commoners). The awarded parcels were called Land Commission Awards (LCAs). These claims did not include any previously cultivated but presently fallow land, *'okipū* (on O'ahu), stream fisheries, or many other resources necessary for traditional survival (Kelly 1983:46-47; Kamehameha III 1992:295; Kirch and Sahlins 1992:187, 212). If occupation could be established through the testimony of witnesses, the petitioners were issued a Royal Patent number and could then take possession of the property (Chinen 1961:57).

Waikāne Ahupua'a became government lands and 42 claims were registered by those living within its precincts (Waihona`Aina 2000). Only 20 of the claims were awarded and included, garden plots, house sites, and *kula* (dry land fields). Although there were some *lo'i* (pond field) along the stream, most of the claims were awarded within 1km of the shoreline, out of the project area (*ibid.*). Figure 4 shows land use, including *hui*, purchased, and awarded land parcels, in the late 1800s.

By the 1860s, sugar cane had become a commercial enterprise on O'ahu, especially the windward side. The abandonment of land, either through disease or not awarded, left vast areas for sale or lease, and were quickly bought up by foreigners. Chinese laborers were brought to work in the cane fields, which they left as soon as they were able, to lease deserted pond fields for the cultivation of rice. There were three rice plantations in Waikāne Valley by 1880 and by 1892, there were over 200 acres of land planted in rice in the Waikāne region (Coulter and Chun 1937:72). From this time on, however, the rice industry was on the decline (Devaney *et al.* 1982:52). The increase of rice production from California destroyed the Hawaiian rice market. Many land parcels were purchased in both Waikāne and Waiāhole by Lincoln L. McCandless beginning in 1897. He used his land for pasture, as well as eventually digging a system of tunnels through the mountains with which to carry water from Waikāne and Waiāhole to support the sugar cane expansion occurring on the leeward

side. This diverted a great deal of water that would have flowed in the streams and affected the cultivation of rice and taro further down the valley (Magnuson *et al.* 2004:52). In addition, a blight destroyed a majority of the rice crop, so that by 1925, very little was being grown and the Chinese farmers had relocated. Perhaps it was at this time that taro once again became an important crop. Handy described the broad area of terraces at Waikāne where large crops of taro were being raised to sell to poi factories, as late as 1935 (1940:97). Situated between Waikāne and Waike‘eke‘e Streams, were inland terraces, also producing taro for milling (*ibid.*:97, 98).

MILITARY TRAINING

In 1942, the McCandless heirs and the Waiahole Water Company leased their land in Waikāne and Waiāhole to the United States Army establishing the right to use approximately 1,061 acres in Waikāne Valley for advanced offensive warfare training due to the valley’s geographical location and terrain. Authorization for the Army to use Waikāne Valley continued until July 1953, when the United States (U. S.) Marine Corps was substituted as lessee. The Marine Corps continued use of the area until 1976. Waikāne Valley was used as a training and artillery impact area from 1942 to 1976. Originally, only 873.64-acres were considered eligible under DERP-FUDS. During the EE/CA investigation, the Munitions Response Sites were refined and acreage increased to 933-acres.

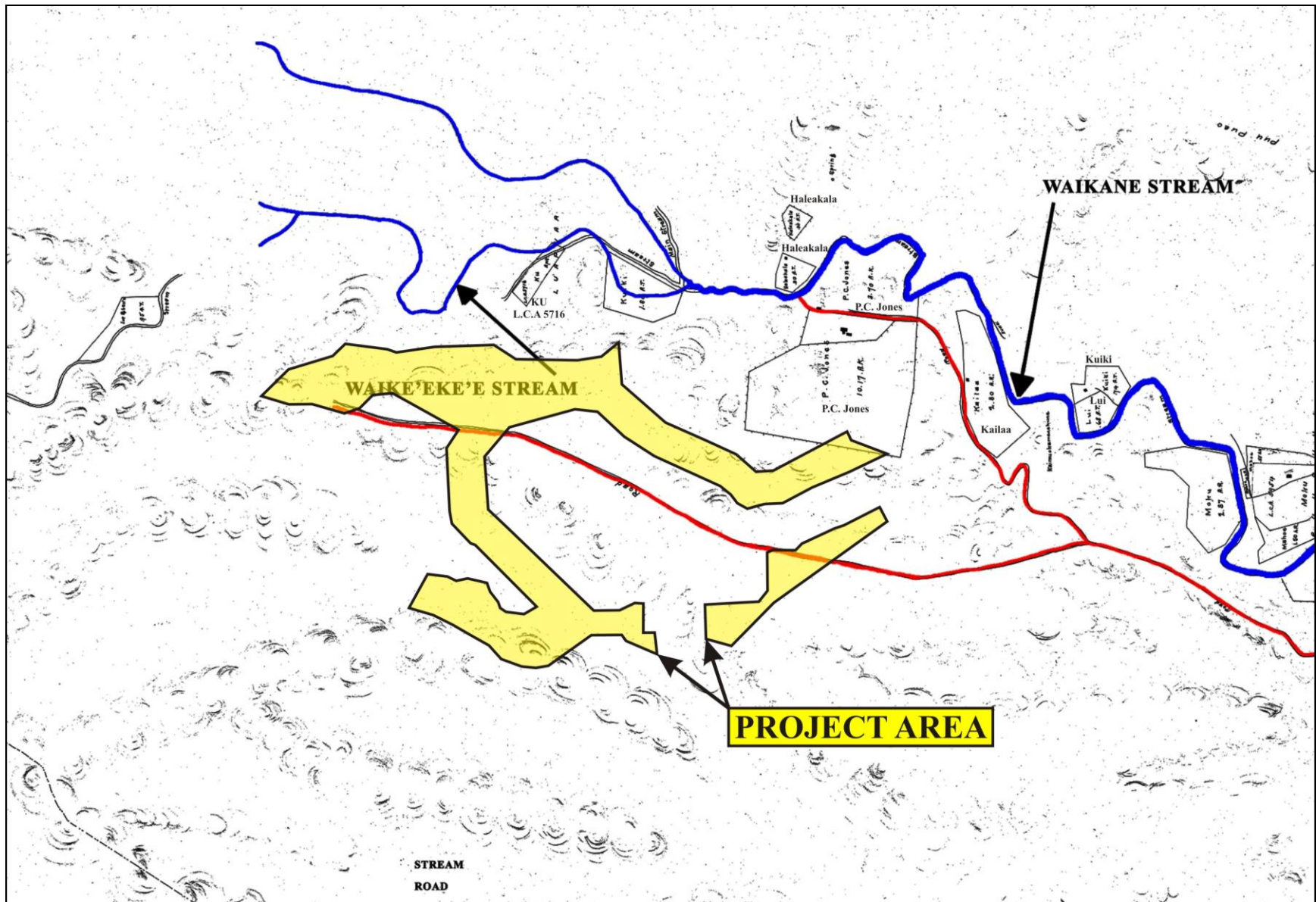


Figure 4: Modified 1897 Map, M.D. Monsarratt, Surveyor, Entitled: *Portion of Waikane, Koolaupoko, Showing hui Divisions.*

ARCHAEOLOGICAL EXPECTATIONS

Based on prehistoric and early historic accounts, as well as previous archaeological studies pertaining to land use in Waikāne, it is likely that archaeological site density in the project area could be high. The project area is located at around 200 feet amsl in the south and southeastern section of the valley floor in close proximity to Waikē'eke'e and Waikāne Streams and their tributaries. The Remedial Action area consists of approximately 36 acres in the Southeastern Region (Figure 3).

In general the archaeological evidence reflects a typical Hawaiian landscape found along the streams and valleys throughout the islands. Previously identified sites containing habitation, religious, and agricultural features, confirm a settlement population within Waikāne Valley, as do the historic land documents claiming *kuleana* along the banks of Waikāne and Waikē'eke'e Streams, and the early population estimates.

More specifically, the project area encircles the area surveyed by SCS in 2011 (Pestana and Spear 2012) identified six new archaeological sites including pre-contact, historic, and modern-era features. Cultural resources encountered during prior work in the immediate vicinity included an agricultural *lo'i* complex with eight terrace features; a boulder terrace and boulder alignment; a Historic to Modern Era rubbish deposit; and a modified boulder feature. It is highly possible that similar types of cultural resources will be identified during the current project's monitoring activities.

MONITORING CONVENTIONS AND METHODOLOGY

The reconnaissance survey and monitoring will be performed during surface and subsurface MEC operations including, but not limited to, sweeping, removal and earth-disturbing activities, and implementing other protection measures for significant sites to be affected by clearance activities.

The primary objective of archaeological monitoring work during MEC clearance operations is to identify and protect historic properties that will potentially be impacted by MEC clearance activities.

MEC clearance is comprised of three phases: Phase I, initial staking of MEC survey grids; Phase II, toning and intrusive investigation of anomalies; and Phase III, if necessary, in-place detonation of MEC. In Phase I, an archaeological monitor will locate, identify, take global positioning system (GPS) readings, flag, and record at reconnaissance-level previously documented significant archaeological sites, as well as any newly located cultural resources assessed as historically significant. In Phase II, after all MEC toning and clearance activities have been completed, the archaeological monitor will investigate all intrusive work by MEC clearance teams to identify and record any subsurface cultural resources assessed as potentially significant. In Phase III, the archaeological monitor will ensure that all necessary engineering controls are in place to protect all historically significant as well as any other potentially significant cultural resources that may be impacted by in-place as well as any other MEC detonation actions. After detonation of any MEC, the archaeological monitor will record and perform data recovery on significant cultural resources impacted by MEC detonation. Data Recovery will include as necessary, areal excavation, sampling, and collection of charcoal, artifacts, cultural items, and relevant data that will assist in the determination of site function and significance.

In the Phase I investigation, the project archaeologist will conduct, with appropriate MEC support, a walk-through reconnaissance of each area to determine what, if any, cultural resources and/or historic properties exist within the area. The purpose of this survey will be to locate, GPS, mark, and briefly identify/describe/document all archaeological and/or cultural resource features within the project area. The U.S. Army Corps of Engineers Honolulu District (USACE POH) Cultural Resources Manager/Archaeologist (CRM) will be notified of all potentially significant cultural resources identified present in the project area. All data collected for each newly discovered archaeological site and cultural resources will be provided to the government. For all

newly identified archaeological site and/or cultural resources, the CRM, or his authorized agent, will make the initial determination of significance based on the criteria specified in 36 Code of Federal Regulations (CFR) Part 63, Determinations of Eligibility for Inclusion in the National Register of Historic Places.

Utilizing the information provided by these reconnaissance surveys and by previous archaeological investigations, the project archaeologist will brief clearance teams going into a work area as to the locations and types of cultural resources, including artifacts, they may encounter and the methods by which they can minimize impacts to these properties.

ARCHAEOLOGICAL MONITORING

Archaeological monitoring is conducted during the Phase I staking survey. During Phase II, human safety concerns prevent a monitor from being present on site during the MEC toning and removal action, during the excavation of subsurface anomalies, or during the *in situ* detonation of MEC. For this reason, the project archaeologist will work closely with the Senior UXO Supervisor (SUXOS) and with team leaders to ensure that potential impacts to historic properties are avoided as much as possible during clearance operations. Where appropriate, the project archaeologist will regularly brief teams as to the types of historic properties and artifacts they may encounter in their work area and the best means by which to avoid impacting these properties. The project archaeologist will also maintain open lines of communication with MEC personnel so that any concerns a MEC team may have regarding historic properties in their grid can be discussed and resolved, ensuring the protection of the properties.

DATA ANALYSIS AND PROJECT DOCUMENTATION

LABORATORY ANALYSIS

All artifacts identified during the project will be photographed, measured, and documented in the field and their locations documented with GPS coordinates. All artifacts will be left in the field after recording. All stratigraphic profiles will be drafted for presentation. Representative plan view sketches showing the location and morphology of identified sites/features/deposits will be compiled and illustrated. All analyses will be organized and consolidated within the final project documentation, most likely as a confidential section, chapter, or appendix.

CURATION

Photographs, illustrations, and all notes accumulated during the project will be curated at the Honolulu laboratory until a permanent, more suitable curation locale is identified.

PROJECT DOCUMENTATION

All stages of the archaeological reconnaissance survey and monitoring will be fully documented in daily logs and photographic form, using standardized and accepted field survey protocols and techniques for cultural resources data recording methods and terminology including documentation of wall profiles of all excavations containing cultural layer(s) using Munsell Soil and Color notations.

Brief verbal progress reports will be provided to the USACE upon completion of archaeological field investigations, laboratory analyses, project documentation, and on the discovery of potentially significant findings. The following shall be submitted as separate components of the project documentation:

- An End of Field Letter upon completion of fieldwork, and
- Final project documentation.

The results of all archaeological reconnaissance survey and monitoring, including excavation results performed under this contract shall be documented in archaeological reports. Based on the usual sensitive nature of archaeological, cultural and historic resources, the Contractor shall coordinate with the Government to ensure that, where necessary, individual archaeological reports for each TMK and/or property owner would be prepared.

Draft reports shall be reviewed by the Government then finalized by the Contractor incorporating the review comments. Three (3) hard copies and 3 CD copies of each of the draft and final report shall be submitted to the Government for review and records, respectively.

Project documentation shall include all project findings, functional interpretations of archaeological sites and/or cultural resources, and their approximate location. This project documentation will be submitted within 180 days of the completion of fieldwork to POH only. This time line is requested to account for any radiocarbon age determinations (typically 60 days), if necessary. Because the project area(s) is not Federally but privately-owned, the project

documentation cannot be distributed to any other agency, government or otherwise, but to POH only; the project documentation cannot be and will not be for general public distribution.

ARCHAEOLOGICAL CONTRIBUTIONS TO THE MASTER GEOGRAPHIC INFORMATION SYSTEM (GIS)

SCS, Inc. archaeologists will convert all archaeological and cultural resource data collected during the course of the contract (including GPS locations and other documentation on archaeological sites) into a GIS compatible format, and will provide this data to the GSI Pacific, Inc., GIS Manager for integration directly into the master GIS database for the MEC Removal project solely for the purpose to ensure protection of the archaeological and cultural resources during the fieldwork portion of the MEC removal. Once the fieldwork for the MEC removal is completed, the GPS location and GIS data base shall be deleted from any GSI Pacific, Inc., and MEC Removal Project database containing the information. Because this set of information is proprietary, the information shall not be submitted to any person, organization, or agency without the express written concurrence of the POH Office of Counsel.

PREVIOUS ARCHAEOLOGY (FOR OFFICIAL USE ONLY (FOUO)); SEE APPENDIX A)

REFERENCES CITED

- Barrera, W.
1984 *Waikane, Oahu: Archaeological Survey at Proposed Well Locations*. Prepared VTN Pacific. Chiniago Inc., Honolulu. On file in the Hawai`i State Historic Preservation Office, Kapolei.
- Chinen, Jon
1961 *Original Land Titles in Hawaii*. Copyright 1961 Jon Jitsuzo Chinen. Library of Congress Catalogue Card No. 61-17314.
- Coulter, J.W. and Chee Kwan Chun
1937 *Chinese Rice Farmers in Hawaii*. University of Hawaii Research Publication, No. 16. University of Hawaii Press. Honolulu.
- Cordy, Ross
2002 *The Ancient History of Wai`anae*. Mutual Publishing. Honolulu.
- Daws, G.
1968 *Shoal of Time: History of the Hawaiian Islands*. University of Hawai`i Press. Honolulu.
- Devaney, Dennis M., Marion Kelly, Polly J. Lee, and Lee S. Motteler
1982 *Kaneohe: A History of Change (1778-1950)*. Rev. edition. Bess Press. Honolulu.
- Dunn, A.E., A.E. Haun, and S. Goodfellow
1992 *Archaeological Inventory Survey, Proposed SMF HDI Golf Courses, Land of Waikane, Koolaupoko District, Island of Oahu (TMK:4-8-06: Por. 1; 4-8-14: Por. 5)*. Prepared for Land Plan Associates. On file at SHPD, Kapolei.
- Griffin, P.B. and D. Pyle
1974 *The Archaeology of Koolau-Poko, O`ahu from the Ahupua`a of Waiahole to the Ahupua`a of Waikane: Archaeological Reconnaissance of the Makai 2.5 Square Miles of Waiahole and Waikane*. Prepared for Environmental Communications, Incorporated. Archaeological Research Center Hawaii, Lawai, Kaua`i. On file in SHPD. Kapolei.
- Handy, E.S.C.
1940 *The Hawaiian Planter, Vol. I. His Plants Methods and Areas of Cultivation*. Bishop Museum Bulletin 161. Bishop Museum Press. Honolulu.
- Handy, E.S.C. and E.G. Handy
1972 *Native Planters in Old Hawaii: Their Life, Lore, and Environment*. Bishop Museum Bulletin No. 233. Bishop Museum Press. Honolulu.

Hazlett, Alexander D, and Hallett H. Hammatt

- 2011 *Final Archaeological Monitoring Plan for Archaeological Support during Formerly Used Defense Site Investigations, Former Waikane Valley Training Area, Waikane, Island of Oahu, Hawaii (TMK 4-8-006:001 and 009, 4-9-006:008, and 4-8-014:005)*. Prepared for the U. S. Army Corps of Engineers, Honolulu District. Cultural Surveys Hawai'i, Inc. Kailua.

Kamakau, Samuel

- 1991 *Tales and Traditions of the People of Old, Nā Mo`olelo a ka Po`e Kahiko*. Bishop Museum Press. Honolulu.
- 1976 *The Works of the People of Old, Na Hana a ka Po`e Kahiko*. Bishop Museum Press. Honolulu.

Kame`eleihiwa, Lilikalā

- 1992 *Native Land and Foreign Desires: Pehea La E Pono Ai?* Bishop Museum Press, Honolulu.

Kelly, Marion

- 1983 *Nā Māla o Kona: Gardens of Kona*. Dept. of Anthropology Report Series 83-2. Bishop Museum, Honolulu.
- 1998 A Gunboat Diplomacy, Sandalwood Lust and National Debt. In *Ka Wai Ola o OHA*, Vol. 15, No. 4, April 1998.

Kirch, Patrick

- 1985 *Feathered Gods and Fishhooks: An Introduction to Hawaiian Archaeology and Prehistory*. University of Hawaii Press, Honolulu.

Kirch, Patrick V. and Marshall Sahlins

- 1992 *Anahulu*. Vol. 1 and 2. University of Chicago Press, Chicago.

Krauss, Beatrice

- 1993 *Plants in Hawaiian Culture*. University of Hawaii Press. Honolulu.

Kuykendall, R.S.

- 1938 *The Hawaiian Kingdom*. Vol. 1. University of Hawai'i Press, Honolulu.

Lucas, Paul F. Nahoa

- 1995 *A Dictionary of Hawaiian Legal Land-terms*. Native Hawaiian Legal Corporation. University of Hawai'i Committee for the Preservation and Study of Hawaiian Language, Art and Culture. University of Hawai'i Press, Honolulu.

Lyons, C.J.

- 1875 Land Matters in Hawaii. *The Islander*, Vol. I. Honolulu.

- Magnuson, Coral M., John A. Peterson, and Mike T. Carson
2004 *Cultural Resource Assessment for the Waikane Valley Impact Area, Island of O`ahu, Hawaii, TMK: 4-8-14. Prepared for U.S. Army Engineer District, Honolulu, Fort Shafter, Hawai`i.* IARI, Inc., Honolulu.
- McAllister, J.G.
1933 *Archaeology of Oahu.* Bishop Museum Bulletin 104. Bishop Museum Press, Honolulu.
- Newman, T.S.
1973 National Register of Historic Places Nomination for Site 50-80-06-1078, Waikane Taro Flats. On file in the Hawai`i State Historic Preservation Division, Kapolei.
- Pestana, Elizabeth, and Robert L. Spear
2012 An Archaeological Monitoring Report for Munitions and Explosives of Concern (MEC) Removal Action and Supporting Functions Area of Concern Waikāne Training Area, Waikāne Ahupua`a, Ko`olaupoko District, O`ahu Island, Hawai`i [TMK: (1) 4-8-006:008]. Prepared for Environet, Inc. Scientific Consultant Services, Inc. Honolulu.
- Rasmussen, Coral M.
2008 *Archaeological Surveying and Monitoring During the Engineering Evaluation/Cost Analysis for the Former Waikane Training Area, Island of O`ahu, Hawai`i.* Prepared for U.S. Army Engineer District, Honolulu, Fort Shafter, Hawai`i. International Archaeological Research Institute, Inc. Honolulu.
- Shapiro, W.A., J.D. Mayberry, and A.E. Haun
1988 *Archaeological Reconnaissance Survey and Limited Subsurface Testing, Waikane Golf Course Project Area, Land of Waikane, Koolaupoko District, Island of Oahu (TMK: 4-8-04: 4, 5; 4-8-06: 8; 4-8-14:4).* Prepared for Norman Quon. PHRI, Inc. Hilo Hawai`i.
- Stauffer, Robert H.
2004 *Kahana: How the Land was Lost.* University of Hawai`i Press. Honolulu.
- Waihona Aina Corporation
2000 Mahele Data Base. Internet Address: <http://www.waihona.com>.
- Walker, A.T., and P.H. Rosendahl
1990 *Intensive Archaeological Survey, Waikane Fence Corridor, Land of Waikane, Koolaupoko District, Island of Oahu.* Prepared for Belt Collins and Associates, Honolulu. PHRI, Inc., Hilo, Hawai`i.
- Welch, D.J. and C.F. Streck
1984 *A Hawaiian Shrine in Waikane Valley, O`ahu.* Prepared for U.S. Marine Corps Air Station Kāne`ohe. University of Hawaii-Manoa. Department of Anthropology. Honolulu.

Appendix I
Explosives Management Plan

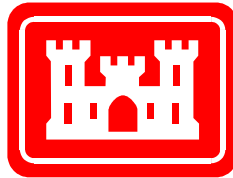
This Page Intentionally Left Blank

FINAL
EXPLOSIVES MANAGEMENT PLAN

**Munitions and Explosives of Concern Remedial Action
Former Waikane Training Area
Southeastern Region Munitions Response Site
Kāneʻohe, Oʻahu, Hawaiʻi**

RMIS ID: H09HI035401

Prepared for:



**U.S. Army Corps of Engineers
Honolulu District
Building 230
Fort Shafter, Hawaiʻi
96858-5440**

December 2016

This Page Intentionally Left Blank

Table of Contents

<i>Acronyms and Abbreviations</i>	<i>iii</i>
<i>Section 1 Explosives Management Plan</i>	<i>1-1</i>
1.1 Introduction	1-1
1.2 Acquisition	1-1
1.3 Initial Receipt.....	1-1
1.4 Storage	1-2
1.5 Transportation	1-2
1.6 Receipt Procedures.....	1-3
1.7 Inventory	1-3
1.8 Lost, Stolen, or Unauthorized Use of Explosives	1-3
1.9 Demolition Consumption/Daily Issues and Return of Excess Daily Issues	1-4
1.10 Disposal of Unused Explosive Materials	1-4
1.11 Economic Analysis for Different Alternatives.....	1-4
<i>Section 2 References</i>	<i>2-1</i>

Appendices

Appendix A UXO Clearance Certifications

This Page Intentionally Left Blank

Acronyms and Abbreviations

ATF	Bureau of Alcohol, Tobacco, Firearms, and Explosives
CFR	Code of Federal Regulations
COF	Certificate of Fitness
DA	Department of the Army
DID	Data Item Description
DoD	Department of Defense
DOT	Department of Transportation
EM	Engineer Manual
EMP	Explosives Management Plan
FAR	Federal Acquisition Regulation
IME	Institute of Makers of Explosives
MEC	Munitions and Explosives of Concern
MPPEH	Material Potentially Presenting an Explosive Hazard
MRS	Munitions Response Site
OESS	Ordnance and Explosives Safety Specialist
PM	Project Manager
RA	Remedial Action
SLP	Safety Library Publication
SUXOS	Senior UXO Supervisor
U.S.	United States
USACE	U.S. Army Corps of Engineers
UXO	Unexploded Ordnance
WTA	Waikane Training Area

This Page Intentionally Left Blank

Section 1 Explosives Management Plan

1.1 Introduction

This Explosives Management Plan (EMP) has been developed for the Remedial Action (RA) at the 36-acre area within the Southeastern Region Munitions Response Site (MRS), former Waikane Training Area (WTA), Kāneʻohe, Oʻahu, Hawaiʻi.

This EMP and all Material Potentially Presenting an Explosive Hazard (MPPEH) disposal operations will comply with Engineer Manual (EM) 385-1-97, *Explosives - Safety and Health Requirements Manual*, (United States [U.S.] Army Corps of Engineers [USACE], 2013); Federal Acquisition Regulation (FAR) 45.5; state and local laws and regulations; Bureau of Alcohol, Tobacco, Firearms, and Explosives (ATF) Publication 5400.7 (ATF, 2012); Department of Defense (DoD) 6055.09-M (DoD, 2010); U.S. Department of Transportation (DOT) regulations; and Data Item Description (DID) MMRP-09-002 *Explosives Management Plan* (USACE, 2009), and Department of the Army (DA) Pamphlet 385-64 (DA, 2013). Unexploded ordnance (UXO) clearance certifications are provided in Appendix A.

1.2 Acquisition

Explosive materials used during the commission of munitions and explosives of concern (MEC) disposal actions at the Southeastern Region MRS will be obtained from a commercial source. These explosive materials will be for the specific purpose of disposal of live or suspect MEC items, if required, which are located during the MEC clearance action. A firing system that has 100 percent control will be utilized. An electrical system will be used unless within minimum safe distance from transmitters or within 155 meters of energized power lines. In these cases, a non-electric system of shock tube and non-electric detonators will be used. Quantities of explosive materials required to conduct a single-day operation will be drawn from the commercial supplier storage magazines and transported and stored in a vehicle mounted day box and approved blasting cap container on site.

1.3 Initial Receipt

The explosives will be acquired as necessary from the Energy Enterprise in Waikane, Oʻahu, Hawaiʻi. Explosives will be delivered or picked up upon the request of the Project Manager (PM). The PM will coordinate with the Senior UXO Supervisor (SUXOS) to determine the quantity of donor explosives on an as-needed basis. The proper permits, licenses, and trained personnel records will be made available to the USACE Ordnance and Explosives Safety Specialist (OESS) for approval.

Upon receipt of donor materials, an inventory will be conducted to ascertain the correct type and serviceable condition.

If during the initial receipt inventory a discrepancy is found between the quantity listed on the invoice and the quantity being delivered, the quantity received will be annotated on the invoice.

The Demolition Supervisor will notify the supplier of any discrepancy as soon as possible. The PM will be notified and provided a copy of the memorandum and a copy of the invoice.

1.4 Storage

No explosives will be stored on site with the exception of the vehicle mounted day box and container mentioned above. All unused explosives will be returned daily to the supplier on Oʻahu, Hawaiʻi.

1.5 Transportation

Vehicles used for transportation of explosive materials shall not be loaded beyond their rated capacity and the explosive materials shall be secured to prevent shifting of load or dislodgment from the vehicle; when explosive materials are transported by a vehicle with an open body, a day box or closed container shall be securely mounted on the bed to contain the cargo. All vehicles transporting explosive materials shall display all placards, lettering, and/or numbering as required by DOT and the State of Hawaiʻi. The vehicle will have a minimum of two Class 2A:10B:C fire extinguishers on board.

Explosive materials and blasting supplies shall not be transported with other materials or cargoes. Blasting caps (including electric) shall not be transported inside the vehicle or conveyance with other explosives unless the conditions of 49 Code of Federal Regulations (CFR) 177.835(g) are met (*i.e.*, an Institute of Makers of Explosives [IME]-22/Safety Library Publication [SLP]-22 container is used to transport the blasting caps).

All vehicles used for the transportation of explosive materials shall be in the charge of and operated by a person who is an ATF Possessor and or Certificate of Fitness (COF) license holder, physically fit, careful, reliable, able to read and understand safety instructions, and not under the influence of intoxicants or narcotics. Only the authorized driver and his or her helper shall be permitted to ride on any conveyance transporting explosive materials or detonators. Vehicles transporting explosive materials shall be operated with extreme care; full stops shall be made at approaches to all main highways and the vehicles shall not proceed until it is known that the way is clear.

No vehicle shall be refueled while explosive materials are on the motor vehicle except in an emergency. Explosives shall not be exposed to sparking metal during transportation of materials and all electric wiring shall be completely protected and securely fastened to prevent short circuits; a written record of such inspection shall be kept on file. Persons employed in the transportation, handling, or other use of explosive materials shall not smoke or carry on their persons or in the vehicle, matches, firearms, ammunition, or flame-producing devices.

Provisions shall be made for safe transfer of explosive materials to the storage magazine including substantial ramps or walkways free of tripping hazards. Vehicles transporting explosive materials shall not be left unattended.

1.6 Receipt Procedures

Only the Demolition Manager is authorized to request to order explosives from the ATF-licensed supplier. Only the onsite Disposal Team is authorized to issue donor explosives from the supplier. The following individuals are authorized to transport and use donor explosive:

- Demolition Supervisor; and
- Demolition Team Personnel.

A copy of the invoice(s) for the incoming donor materials will be kept in the onsite donor materials accountability file. Upon receipt, a separate memorandum will be prepared and retained on site.

If during the initial receipt inventory a discrepancy is found between the quantity listed on the invoice and the quantity being delivered, the quantity received will be annotated on the invoice. The Demolition Supervisor will notify the supplier of any discrepancy as soon as possible. The PM will be notified and provided a copy of the memorandum and a copy of the invoice.

1.7 Inventory

As detailed above, upon initial receipt of materials, a physical inventory will be conducted to verify the accuracy of the amounts received from the supplier.

If a theft or loss has occurred, the procedures in Section 1.8 will be followed.

1.8 Lost, Stolen, or Unauthorized Use of Explosives

Upon discovery, lost, stolen, or unauthorized use of explosive materials will be reported as follows:

1. Within 24 hours, the PM will give an immediate notification by telephone to the USACE PM, followed by a written report.
2. The PM will notify the Honolulu ATF Field Office at (808) 566-4800 within 24 hours of discovery, complete ATF Form 5400.5, Report of Theft or Loss-Explosive Materials and mail to:

*U.S. Department of Justice, ATF, Los Angeles Field Division
550 North Brand Avenue, 8th Floor
Glendale, CA 91203*

3. The PM will notify the local law enforcement agency.

1.9 Demolition Consumption/Daily Issues and Return of Excess Daily Issues

All materials used for disposal operations will be inventoried with a list of leftover materials. An Energy Enterprise (explosives supplier) employee will verify the return inventory of any unused explosives after every disposal operation.

1.10 Disposal of Unused Explosive Materials

Daily, unused explosive materials will be returned to the supplier located in Waikele, Oʻahu. All procedures outlined in the section above on transportation of explosive materials will be followed.

1.11 Economic Analysis for Different Alternatives

This requirement is not required for Firm Fixed Price contracts.

Section 2 References

ATF, 2012. ATF Publication 5400.7. *ATF Explosives Law and Regulations, Section 55.206.*

DA, 2013. DA Pamphlet 385-64. *Ammunition and Explosives Safety Standards.* 24 May 2011;
Rapid Action Revision issued on 10 October 2013.

DoD, 2010. 6055.09-M. *DoD Ammunition and Explosives Safety Standards: Criteria for Unexploded Ordnance, Munitions Response, Waste Military Munitions, and Material Potentially Presenting an Explosive Hazard.* Volume 7, August.

USACE, 2009. DID MMRP-09-002. *Explosives Management Plan.*

_____, 2013. EM 385-1-97. *Explosives - Safety and Health Requirements Manual.* 17 May.

This Page Intentionally Left Blank

Appendix A
UXO Clearance Certifications

This Page Intentionally Left Blank



NOTICE OF CLEARANCE

for individuals transporting, shipping, receiving, or possessing explosive materials.

ISSUED TO: GSI PACIFIC INC

Federal Explosives license/permit no.: 9-HI-001-20-8G-00109

NOTICE DATE: 10/05/2015

Expiration Date: **July 1, 2018**

EXPIRATION DATE: This Notice expires when superseded by a newer Notice which will list all current responsible persons and employee possessors, or when the license or permit expires - whichever comes first.

Explosives License/Permit Type: 20-MANUFACTURER OF EXPLOSIVES

- 1 WARNING.** Only those individuals listed below as **RESPONSIBLE PERSONS** and **EMPLOYEE POSSESSORS** with a background clearance status of "CLEARED" or "PENDING" are authorized to transport, ship, receive, or possess explosive materials in the course of employment with you.
- 2 "DENIED" STATUS.** If an employee possessor has a background clearance status of "DENIED", you **MUST** take immediate steps to remove the employee from a position requiring the transporting, shipping, receiving, or possessing of explosive materials. Also, if the employee has been listed as a person authorized to accept delivery of explosive materials, you **MUST** remove the employee from such list and immediately, and in no event later than the second business day after such change, notify distributors of such change, as stated in 27 CFR 555.33(a).
- 3 CHANGE IN RESPONSIBLE PERSONS.** You **MUST** report any change in responsible persons to the Chief, Federal Explosives Licensing Center, within 30 days of the change and new responsible persons **MUST** include "appropriate identifying information" as defined in 27 CFR 555.11. Fingerprints and photos are **NOT** required, however they will be required upon renewal of the license or permit.
- 4 CHANGE OF EMPLOYEES.** You **MUST** report any change of employee/possessors to the Chief, FELC, within 30 days. Reports relating to newly hired employees must be submitted on ATF Form 5400.28 for **EACH** employee.

Premises Address: 64 1002 MAMALAHOA HWY
 KAMUELA, HI 96743

Mailing Address:

GSI PACIFIC INC
 600 QUEEN STREET STE 2909
 HONOLULU, HI 96813

This 'Notice of Clearance' is provided to you as required by 18 U.S.C. 843(h) and **MUST** be retained as part of your permanent records and be made available for examination or inspection by ATF officers as required by 27 CFR 555.121. If you receive a Notice subsequent to this Notice, this Notice will no longer be valid.

In accordance with 27 CFR 555.33, Background Checks and Clearances, and 27 CFR 555.57, Change of Control, Change in Responsible Persons, and Change of Employees, ATF's Federal Explosives Licensing Center (FELC) has conducted background checks on the individual(s) you identified as a responsible person(s) and an employee/possessor(s) on your application, or reported after the issuance of your license/permit.

The following is a SUMMARY of the results of the background checks conducted on the individuals you reported as responsible persons and employee/possessors. ATF will be notifying ALL individuals listed on this document of their respective status by separate letter mailed to their residence address.

PLEASE BE ADVISED THAT IT IS UNLAWFUL FOR ANY PERSON REFLECTING A STATUS OF "DENIED" TO TRANSPORT, SHIP, RECEIVE, OR POSSESS EXPLOSIVE MATERIALS.

Please carefully review this Notice to ensure that all the information is accurate. If this Notice is incorrect, please return the Notice to the Chief, FELC, with a statement showing the nature of the error(s). The Chief, FELC, shall correct the error, and return a corrected Notice.

Number of RESPONSIBLE PERSON(S) : 2
Number of EMPLOYEE POSSESSOR(S): 11

LAST NAME, First Name, Middle Name	Clearance Status
RESPONSIBLE PERSONS: 2	
0001 PICKARD, JOESEPH GORA	Cleared
0002 WOLF, DANIEL CLAY	Cleared

LAST NAME, First Name, Middle Name	Clearance Status
EMPLOYEE POSSESSORS: 11	
0001 BELTRAN, MARCO ANTONIO JR	Cleared
0002 COLLEADO, RICK H	Cleared
0003 REED, ROBERT MONROE	Cleared

continued

LAST NAME, First Name, Middle Name	Clearance Status
0004 RIVERA, SAMUEL KEITH	Cleared
0005 ROBLES, ARMANDO C	Cleared
0006 SEWELL, AUKAI E	Cleared
0007 STIMPSON, TIMOTHY WAYNE	Cleared
0008 TURNER, RICKEY	Cleared
0009 WALL, BRANDON LYNN	Cleared
0010 WERSTLER, FREDRICK RYAN	Cleared
0011 REECE, MATTHEW DAVID	Pending

9-HI-001-20-8G-00109 expiration date: July 1, 2018 GSI PACIFIC INC OF: 64 1002 MAMALAHOA HWY, KAMUELA, HI 96743

Federal Explosives License/Permit
(18 U.S.C. Chapter 40)

In accordance with the provisions of Title XI, Organized Crime Control Act of 1970, and the regulations issued thereunder (27 CFR Part 555), you may engage in the activity specified in this license or permit within the limitations of Chapter 40, Title 18, United States Code and the regulations issued thereunder, until the expiration date shown. **THIS LICENSE IS NOT TRANSFERABLE UNDER 27 CFR 555.53.** See "WARNINGS" and "NOTICES" on reverse.

Direct ATF Correspondence To	ATF - Chief, FELC 244 Needy Road Martinsburg, WV 25405-9431	License Permit Number	9-HI-001-20-8G-00109
Chief, Federal Explosives Licensing Center (FELC)	<i>Christopher R. Reers</i>	Expiration Date	July 1, 2018

Name
GSI PACIFIC INC

Premises Address (Changes? Notify the FELC at least 10 days before the move.)
**64 1002 MAMALAHOA HWY
KAMUELA, HI 96743-**

Type of License or Permit
20-MANUFACTURER OF EXPLOSIVES

Purchasing Certification Statement
The licensee or permittee named above shall use a copy of this license or permit to assist a transferor of explosives to verify the identity and the licensed status of the licensee or permittee as provided by 27 CFR Part 555. The signature on each copy must be an original signature. A faxed, scanned or e-mailed copy of the license or permit with a signature intended to be an original signature is acceptable. The signature must be that of the Federal Explosives Licensee (FEL) or a responsible person of the FEL. I certify that this is a true copy of a license or permit issued to the licensee or permittee named above to engage in the business or operations specified above under "Type of License or Permit."

Mailing Address (Changes? Notify the FELC of any changes.)
GSI PACIFIC INC
600 QUEEN STREET STE 2909
HONOLULU, HI 96813-

Joseph Gore Pickard
Licensee/Permittee Responsible Person Signature
Joseph Gore Pickard
Printed Name

CEO
Position/Title
6/29/2015
Date

Federal Explosives License (FEL) Customer Service Information

Federal Explosives Licensing Center (FELC) 244 Needy Road Martinsburg, WV 25405-9431	Toll-free Telephone Number: (877) 283-3352 Fax Number: (304) 616-4401 E-mail: FELC@atf.gov	ATF Homepage: www.atf.gov
--	--	---------------------------

Change of Address (27 CFR 555.54(a)(1)). Licensees or permittees may during the term of their current license or permit remove their business or operations to a new location at which they intend regularly to carry on such business or operations. The licensee or permittee is required to give notification of the new location of the business or operations not less than 10 days prior to such removal with the Chief, Federal Explosives Licensing Center. The license or permit will be valid for the remainder of the term of the original license or permit. **(The Chief, FELC, shall, if the licensee or permittee is not qualified, refer the request for amended license or permit to the Director of Industry Operations for denial in accordance with § 555.54.)**

Right of Succession (27 CFR 555.59). (a) Certain persons other than the licensee or permittee may secure the right to carry on the same explosive materials business or operations at the same address shown on, and for the remainder of the term of, a current license or permit. Such persons are: (1) The surviving spouse or child, or executor, administrator, or other legal representative of a deceased licensee or permittee; and (2) A receiver or trustee in bankruptcy, or an assignee for benefit of creditors. (b) In order to secure the right provided by this section, the person or persons continuing the business or operations shall furnish the license or permit for that business or operations for endorsement of such succession to the Chief, FELC, within 30 days from the date on which the successor begins to carry on the business or operations.

(Continued on reverse side)

Cut Here ✂

Federal Explosives License/Permit (FEL) Information Card

License/Permit Name: **GSI PACIFIC INC**

Business Name:

License/Permit Number: **9-HI-001-20-8G-00109**

License/Permit Type: **20-MANUFACTURER OF EXPLOSIVES**

Expiration: **July 1, 2018**

Please Note: Not Valid for the Sale or Other Disposition of Explosives.

Appendix J
Waste Management Plan

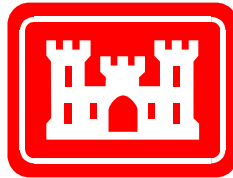
This Page Intentionally Left Blank

FINAL
WASTE MANAGEMENT PLAN

Munitions and Explosives of Concern Remedial Action
Former Waikane Training Area
Southeastern Region Munitions Response Site
Kāneʻohe, Oʻahu, Hawaiʻi

RMIS ID: H09HI035401

Prepared for:



U.S. Army Corps of Engineers
Honolulu District
Building 230
Fort Shafter, Hawaiʻi
96858-5440

December 2016

This Page Intentionally Left Blank

Table of Contents

Acronyms and Abbreviations..... iii

Section 1 Introduction 1-1

Section 2 Waste Generation, Management, and Disposal 2-1

 2.1 Nonhazardous Waste..... 2-1

 2.2 Hazardous Waste..... 2-2

Section 3 Green Sustainable Remediation Practices 3-1

Section 4 References 4-1

This Page Intentionally Left Blank

Acronyms and Abbreviations

APP	Accident Prevention Plan
DoD	Department of Defense
EM	Engineer Manual
EPA	U.S. Environmental Protection Agency
ESS	Explosives Safety Submission
GPS	Global Positioning System
GSR	Green Sustainable Remediation
IAW	In Accordance With
IDW	Investigation-Derived Waste
MD	Munitions Debris
MDAS	Material Documented as Safe
MEC	Munitions and Explosives of Concern
MPPEH	Material Potentially Presenting an Explosive Hazard
MRS	Munitions Response Site
NRMD	Non-Munitions Related Debris
OESS	Ordnance and Explosives Safety Specialist
PPE	Personal Protective Equipment
RA	Remedial Action
SDS	Safety Data Sheet
SOP	Standard Operating Procedure
SSHP	Site Safety and Health Plan
UFP-QAPP	Uniform Federal Policy Quality Assurance Project Plan
U.S.	United States
USACE	U.S. Army Corps of Engineers
UXO	Unexploded Ordnance
WMP	Waste Management Plan

This Page Intentionally Left Blank

Section 1 Introduction

This Waste Management Plan (WMP) has been developed for the Remedial Action (RA) at the 36-acre area within the Southeastern Region Munitions Response Site (MRS), former Waikane Training Area, Kāneʻohe, Oʻahu, Hawaiʻi. The purpose of this WMP is to describe the management practices and procedures that will be followed for the types and quantities of waste expected to be generated during RA field activities.

The WMP will be implemented in accordance with (IAW) Engineer Manual (EM) 200-1-15 *Technical Guidance for Military Munitions Response Actions* (United States [U.S.] Army Corps of Engineers [USACE], 2015), Department of Defense (DoD) memorandum for *Consideration of Green and Sustainable Remediation Practices in the Defense Environmental Restoration* (DoD, 2009) and utilizing the U.S. Environmental Protection Agency (EPA) *Green Remediation Best Management Practices: Site Investigations* (EPA, 2009).

This Page Intentionally Left Blank

Section 2 Waste Generation, Management, and Disposal

Several different types of waste will be generated during the RA field activities. Anticipated wastes generated during field operations include:

- Nonhazardous Waste:
 - Solid Waste Trash - items such as personal protective equipment (PPE), plastic/paper bags, cardboard, plastic containers, and paper;
 - Green Waste - biodegradable waste such as grass and brush cuttings; and
 - Munitions-Related Waste - munitions-related metallic debris that has been certified as Material Documented as Safe (MDAS).
- Hazardous Waste - as diesel fuel, gasoline, motor oil, or other regulated liquids for equipment operation.

No disposal of waste will occur without approval of the disposal method and location by the USACE. If additional types of investigation-derived waste (IDW) are generated, the project team will notify USACE personnel regarding proper management and disposal alternatives. All wastes will be managed and disposed IAW local, state, and Federal regulations.

2.1 Nonhazardous Waste

2.1.1 Solid Waste

Generation of solid waste will be kept to a minimum and every effort will be made to segregate and recycle materials where appropriate. Solid waste consisting of trash items such as latex gloves, plastic/paper bags, cardboard, plastic containers, and paper will be stored in designated trash bins and disposed in municipal waste receptacles. Likewise, construction debris (e.g., stakes, flagging, expended paint cans) will be segregated and disposed consistent with the method used for municipal solid waste. Disposal of significant volumes of trash items will only occur at receptacles designated by the USACE or procured trash removal service.

Solid waste trash is considered non-hazardous and does not require characterization analyses for disposal purposes. Nonhazardous solid waste materials will be removed and transported off site for disposal through the municipal waste system as described above. Routine disposal of municipal solid waste (at least weekly) will be performed to avoid incurring excess waste storage within the work area.

Non-munitions related debris (NMRD) such as cars, washers, and rubbish, may be present on the site due to illegal public dumping. As agreed upon during the project kick-off meeting, the project team will not be removing any illegal public dumping related NMRD found at the site. If encountered, these items will be moved to the side and the area beneath will be checked for munitions and explosives of concern (MEC)/munitions debris (MD)/Material Potentially Presenting an Explosive Hazard (MPPEH) to a depth of 2 feet below ground surface.

2.1.2 Green Waste

Green waste will be generated during the vegetation clearance activities. Unexploded ordnance (UXO) Teams will remove only vegetation that will hamper a safe MEC removal action using hand tools or powered machinery while practicing anomaly avoidance techniques. Qualified Botanists will survey the vegetation for presence of threatened or endangered species prior to vegetation removal. The removal of endangered species will be prohibited until alternatives and a biological consultation can be discussed with the USACE Ordnance and Explosives Safety Specialist (OESS) and/or USACE Project Manager.

Grasses, small scrubby brush, and trees less than 3 inches diameter will be cut and left in place (*i.e.*, piled in an area on site that has been cleared of MEC hazards). In-line with green sustainable remediation practices, the cleared vegetation debris will be allowed to biodegrade to eliminate offsite disposal.

Detailed procedures regarding vegetation clearance will be provided in the project Uniform Federal Policy Quality Assurance Project Plan (UFP-QAPP) and standard operating procedure (SOP) G-4 *Vegetation Clearance* (Appendix G of the project UFP-QAPP).

2.1.3 Munitions-Related Waste

Munitions-related waste generated during the explosive disposal operations or recovered during removal activities will be handled by UXO qualified personnel and managed IAW EM 385-1-97 (USACE, 2013b). Although MEC items are hazardous, once detonated, the remaining material requiring disposal will be scrap metal. All MDAS certified items will be stored in locked drums and/or inside a locked metal container. The storage location at each point of waste generation shall be coordinated with and approved by USACE personnel. Each container shall be properly stored, labeled, and inventoried for subsequent offsite disposal.

The local fire and police departments may be notified of the location and types of materials stored, as appropriate, until final disposition of the materials is complete. Records will be maintained for all recycled scrap metal generated during the RA activities including inspections, explosive-free certification, government property transfer form, and disposal facility receipt and treatment certifications for MDAS final disposition.

Detailed procedures regarding MPPEH inspections, explosive disposal, certification, and disposition of MDAS will be provided in the project UFP-QAPP and SOP UXO-03 *Material Potentially Presenting an Explosive Hazard Management* (Appendix G of the project UFP-QAPP) and the Explosives Safety Submission (ESS).

2.2 Hazardous Waste

Site preparation and vegetation clearance activities require the use of hazardous substances such as diesel fuel, gasoline, motor oil, or other regulated liquids for equipment operation. These substances may be present in contained conditions as part of internal combustion engines or in designated containers (*e.g.*, labeled gas cans). All chemicals brought on site will be properly

labeled. An inventory of all chemicals brought on site and a Safety Data Sheet (SDS) for each will be maintained at the site. Site personnel will comply with the storage, handling, and use requirements stated on the SDS for each chemical brought on site by the project team or its subcontractors (refer to the Hazard Communication Program provided in the Accident Prevention Plan [APP] and Site Safety and Health Plan [SSHP] [Appendix F of the project UFP-QAPP]). Flammable lockers will be utilized to store any fuels brought on site. If generated, used oil can be absorbed (*e.g.*, poured in an oil change box) and disposed of in the trash, which will go to the City's H-POWER waste-to-energy facility (City and County of Honolulu's Department of Environmental Services, 2005). Disposal of diesel fuel or gasoline is not anticipated as most will be consumed during equipment use. However, in case a spill occurs due to vehicle or equipment malfunction that could result in a release of fuel, grease, motor oil, or other lubricants while personnel are conducting field operations, a spill containment kit will also be maintained on site. Refer to the Spill Plan in the SSHP (Attachment B of the APP [Appendix F of the project UFP-QAPP]).

This Page Intentionally Left Blank

Section 3 Green Sustainable Remediation Practices

In support of the USACE mission of green design and comprehensive sustainability management and following DoD's policy on consideration of Green and Sustainable Remediation (GSR) practices, the project team plans to conduct RA activities IAW EPA's guidance for *Green Remediation Best Management Practices: Site Investigation* (EPA, 2009). Specific actions that will be taken to achieve these goals are as follows:

- Use rechargeable batteries for all field survey equipment such as Global Positioning System (GPS) units and detection/anomaly avoidance equipment;
- Dispose of IDW at nearest permitted facility to reduce fuel consumption and air emissions;
- Restore any disturbed areas that may impact storm water runoff based on any equipment use;
- Limit vegetation removal to clearing without grubbing to minimize impacts to land and natural resources. Any cleared vegetation debris will be allowed to biodegrade to eliminate offsite disposal. Stumps to be left in place;
- Recycle paper, packaging, and shipping materials such as cardboard boxes and plastic containers; and
- Conduct remote meetings that incorporate online collaboration, teleconferencing, and video conferencing options to the extent practical to limit travel to site and reduce fuel consumption and air emissions.

This Page Intentionally Left Blank

Section 4 References

City & County of Honolulu's Department of Environmental Services, 2005. *Household Hazardous Waste*. Accessed at http://www.opala.org/solid_waste/Household_Hazardous_Waste.html#absorb.

DoD, 2009. *Memorandum, Consideration of Green and Sustainable Remediation Practices in the Defense Environmental Restoration*. August.

EPA, 2009. *Green Remediation Best Management Practices: Site Investigation. Office of Solid Waste and Emergency Response*. Publication 542-F-09-004. December.

USACE, 2013. EM 385-1-97. *Explosives - Safety and Health Requirements Manual*. 17 May.

_____, 2015. EM 200-1-15. *Environmental Quality Technical Guidance for Military Munitions Response Actions*. 30 October.

This Page Intentionally Left Blank