05 March 2025

Attn. Environmental Administrator
Florida Department of Environmental Protection
Hazardous Waste Permitting and Programs
2600 Blair Stone Road MS 4548
Tallahassee, Florida 32399-2400

RE: Hazardous Waste Permit Renewal Application & Fee – 006176-HO-XX
FL8570024366
Open Detonation Range C-62, Eglin Air Force Base, Florida

To: Brandie Conner

On behalf of the 96th Civil Engineering Group, Eglin AFB, Florida, KOMAN Government Solutions, LLC (KGS) is pleased to provide the enclosed Resource Conservation and Recovery Act (RCRA) permit application and fee in the amount of **$15,000** for the renewal of RCRA Permit No. 006176-HO-12. The permit application is enclosed electronically and provided via email. Please contact me at (978) 460-9603 or rmccormick@easbio.com if you have any questions or require additional information.

Sincerely,
KOMAN Government Solutions, LLC

Russ McCormick, PG (FL, NH)
Program Manager

Encl: Permit Application

cc: Eric Sculthorpe – Eglin AFB
Kevin Doyle – Eglin AFB
Al Pullen – Eglin AFB
Melissa Shirley – USACE Mobile
Beth Behr – AFCEC
Matthew Higginbotham – AFCEC
KGS File

KOMAN Government Solutions, LLC
1002 N Eglin Parkway
Shalimar, Florida 32579-1776
Phone (850) 613-6800
Fax (508) 366-7445
www.komangs.com

APPLICATION FOR A HAZARDOUS WASTE PERMIT
PART I – GENERAL
TO BE COMPLETED BY ALL APPLICANTS

Please Type or Print

A. General Information [40 CFR Part 270.13 (a)]

1. Type of Facility in accordance with Part 270.13(a)
   X TREATMENT
   Tanks Piles Surface Impoundment
   Incineration Containment Building
   Boiler / Industrial Furnace Type of Unit _____
   X Miscellaneous Unit Type of Unit Open Detonation
   STORAGE
   Containers Tanks Piles
   Surface Impoundment Containment Building
   Miscellaneous Unit Type of Unit _____
   DISPOSAL
   Landfill Land Treatment Surface Impoundment
   Miscellaneous Units Type of Unit _____

2. Type of application [40 CFR Part 270.13 (a)]:
   Construction Permit
   X Operation Permit
   Construction & Operation Permit
   Research, Development & Demonstration (RD&D)
   Permit Postclosure Permit
   Clean Closure Plan
   Subpart H Remedial Action Plan
   Corrective Action

3. Revision Number: 00

4. Date Current Operation Began, or is expected to begin: 07 / 01 / 1973

5. Facility Name [40 CFR Part 270.13 (b)] Eglin Air Force Base (AFB)

6. EPA/DEP I.D. No. FL8570024366

7. Facility Location or Street Address [40 CFR Part 270.13 (b)] Eglin AFB, Range C-62

8. Facility Mailing Address 96 CEG/CEIEC, 700 Range Road, Building 592
   Street or P.O. Box
   Eglin AFB FL 32542
   City State Zip

9. Contact Person Al Pullen Telephone (850) 882-7667

   Title Hazardous Waste Program Manager

   Mailing Address 700 Range Road, Building 592
   Street or P.O. Box
   Eglin AFB FL 32542
   City State Zip

Contact E-mail albert.pullen.1@us.af.mil

10. Operator Name [40 CFR Part 270.13 (d)] Colonel Michelle L. Sterling, USAF, Commander, 96th Civil Engineer Group

Telephone (850) 882-2876

Mailing Address 501 Deleon Street
Street or P.O. Box

Eglin AFB | FL | 32542
City | State | Zip

Operator E-mail michelle.sterling@us.af.mil

11. Facility owner's name [40 CFR Part 270.13 (e)] Brigadier General Mark A. Massaro USAF, Commander, 96th Test Wing

Telephone (850) 882-9600

Mailing address 101 D. Avenue, Building 1
Street or P.O. Box

Eglin AFB | FL | 32542
City | State | Zip

E-mail address mark.massaro@us.af.mil

12. Legal structure [40 CFR Part 270.13 (d)]

Corporation Non-profit corporation Partnership Individual
Local government State government X Federal government Other

13. If an individual, partnership, or business is operating under an assumed name, specify the county and state where the name is registered.

County N/A State N/A

14. If the legal structure is a corporation, indicate the state of incorporation.

State of Incorporation N/A

15. If the legal structure is an individual or partnership, list the owners.

Name N/A

Address N/A
Street or P.O. Box City State Zip

Name N/A

Address N/A
Street or P.O. Box City State Zip

16. Site Ownership Status

Owned To be purchased To be leased _____ years
Presently leased; the expiration date of the lease is ____/____/_____.

If leased, indicate land owner's name. N/A

Address N/A
Street or P.O. Box City State Zip

E-mail address N/A

17. Name of Engineer Patrick Schauble Registration No. PE94640

Address 180 Gordon Drive, Suite 110 Exton PA 19341
Street or P.O. Box City State Zip

Associated with: KOMAN Government Solutions, LLC/Trinity

18. Is the facility located on Tribal land [40 CFR Part 270.13 (f)]? Yes X No

19. Existing or pending environmental permits (attach a separate sheet, if necessary): [40 CFR Part 270.13 (k)]

NAME OF PERMIT	AGENCY	PERMIT NUMBER	DATE ISSUED	EXPIRATION DATE
RCRA Hazardous Waste Operating/Corrective Action Permit	USAF	006176-HO-12	11 March 2022	1 September 2025

B. Site Information [40 CFR Part 270.13 (b)]

1. The facility is located in Walton county.

The nearest community to the facility is Defuniak Springs.

Latitude 30.640742 Longitude -86.228543

Method and datum GIS, WGS84 Decimal Degrees

2. The area of the facility site is ~1,150 acres.

3. Attach a scale drawing and photographs of the facility showing the location of all past, present, and future treatment, storage and disposal areas. Include photographs and the locations of all Solid Waste Management Units and Areas of Concern. Also, show the hazardous wastes traffic pattern including estimated volume and control [40 CFR Part 270.13 (h)].

4. Attach a topographic map which shows all the features indicated in the instructions for this part.

5. Is the facility located in a 100-year flood plain? Yes X No

6. The facility complies with the wellhead protection requirements of Chapter 62-521, F.A.C.

X Yes No

C. Land Use Information

1. The present zoning of the site is Active military test range, Eglin AFB is not zoned.

2. If a zoning change is needed, what should the new zoning be? N/A.

D. Operating Information

1. Is waste generated on-site? X Yes No

2. List the NAICS codes (5 to 6 digits) [40 CFR Part 270.13 (c)] 562211

3. Use the codes and units provided in the instructions to complete the following table. Specify [40 CFR Part 270.13 (i and j)]:

   a. Each process used for treating, storing or disposing of hazardous waste (including design capacities) at the facility, and;

   b. The hazardous waste(s) listed or designated in 40 CFR Part 261, including the annual quantities, to be treated, stored, or disposed by each process at the facility.

PROCESS CODE	PROCESS DESIGN CAPACITY AND UNITS OF MEASURE	HAZARDOUS WASTE CODE	ANNUAL QUANITY OF HAZARDOUS WASTE AND UNITS OF MEASURE
	Average 2,005.37 lbs. Net Explosive Weight (NEW) per event.	D003, D005, D030, D008	16,845.10 lbs. NEW (average)

4. A brief description of the facility [40 CFR Part 270.13 (m)]:

Eglin Air Force Base (EAFB) is located in Okaloosa, Walton, and Santa Rosa counties, north of Fort Walton Beach, Florida, and east of the city of Pensacola, Florida. EAFB consists of a land area covering more than 720 square miles and an associated joint-use airspace and water area covering 86,500 square miles in the Gulf of Mexico.

5. For hazardous debris, a description of the debris category(ies) and contaminant category(ies) to be treated, stored or disposed of at the facility [40 CFR Part 270.13 (n)]:

N/A. The only debris from activities at the facility are metal fragments from open detonation. Metal fragments are collected and recycled.

P. Information Regarding Potential Releases from Solid Waste Management Units (SWMUs) and Areas of Concern (AOCs)

Facility Name Eglin Air Force Base (AFB)

EPA/DEP I.D. No. FL8570024366

Facility location Eglin AFB, Range C-62 (City) FL (State)

1. Are any of the following (SWMUs or AOCs), existing or closed at your facility?

A SWMU is a discernible unit at which solid wastes have been placed at any time, irrespective of whether the unit was intended for the management of solid or hazardous waste. Such units include all areas at a facility where solid wastes have been routinely and systematically released, as described in the July 27,1990 Federal Register (55 FR 30798). The SWMU list in this form does not include all types of SWMUs. These are examples of the more common types of units. If you have a different type of SWMU, mark “yes” under "other".

AOCs are indiscernible units at which solid wastes have been placed at any time, irrespective of whether the unit was intended for the management of solid or hazardous waste. Examples of AOCs include areas where loading and unloading of chemicals may have occurred or an area of contamination with no known source.

Do not include hazardous waste units that are currently being permitted in your Part B Application.

Landfill	X Yes	No
Surface impoundment	X Yes	No
Land farm	Yes	X No
Waste pile	X Yes	No
Incinerator	Yes	X No
Storage tank	X Yes	No
Container storage area	X Yes	No
Injection wells	Yes	X No
Wastewater treatment units	X Yes	No
Transfer station	Yes	X No
Waste recycling operations	Yes	X No
Land treatment facility	Yes	X No
Boiler/industrial furnace	Yes	X No
Satellite accumulation areas	Yes	X No
Less than 90-day storage units	Yes	X No
Stormwater retention ponds	Yes	X No
Septic tanks	Yes	X No
Used oil/oil filter collection units	X Yes	No
Aerosol can/drum crushers	Yes	X No
On-ground areas, pits, ditches	X Yes	No
Other (units not listed above)	X Yes	No

2. For each "yes" answer in one (1.) above, on separate sheet(s) of paper:

   a. Describe the wastes that were stored, treated or disposed of in each unit, and whether the wastes would be considered hazardous wastes or hazardous constituents under RCRA. (Hazardous wastes are those identified in 40 CFR Part 261. Hazardous constituents are those listed in Appendix VIII of 40 CFR Part 261.) Include any available data on quantities or volumes of wastes disposed of and the dates of disposal.

   b. Describe each unit, type of unit including construction details, capacity, dimensions (supply any available drawings), and location at the facility on the topographic map provided under 40 CFR 270.14(b)(19). Provide a site plan, if available, and the dates of operation of the unit [40 CFR 270.14(d)(1)]. If the information has previously been submitted formally to the Department, references to the documents and or summary tables may be submitted to meet this requirement.

   c. Include a copy of federal, state and local permits or authorizations for SWMUs that may be permitted under other environmental programs.

3. For each unit described in two (2.) above, and for each hazardous waste unit in your Part B application [40 CFR 270.14(d)(2)], on separate sheet(s) of paper, provide available data on all prior or current releases of hazardous wastes or constituents to the environment that may have occurred in the past or may still be occurring. If the data has previously been submitted formally to the Department, references to the documents and or summary tables may be submitted to meet this requirement. Provide the following information for each SWMU/AOC:

   a. Date of release
   b. Estimated or known quantity or volume of waste released
   c. Location of the release
   d. Describe the nature of the release (i.e., spill, overflow, ruptured pipe or tank, etc.).

4. Provide, for each unit, all available analytical data that describes the nature and extent of the environmental contamination due to the releases described in three (3.) above, on separate sheet(s) of paper. Focus on the concentrations of hazardous wastes or constituents present in contaminated media (e.g., soil, sediment, surface water and groundwater) [40 CFR 270.14(d)(3)]. If the information has previously been submitted formally to the Department, references to the documents and or summary tables may be submitted to meet this requirement.

RESPONSE TO ITEMS 2, 3, 4: A description of all SWMUs and AOCs and location maps are provided in Appendix M of Part II of this Hazardous Waste Permit Application.

APPLICATION FOR A HAZARDOUS WASTE FACILITY PERMIT
CERTIFICATION
TO BE COMPLETED BY ALL APPLICANTS

Signature and Certification

Facility Name Eglin Air Force Base (AFB)

EPA/DEP I.D. No. FL8570024366

The following certifications must be included with the submittal of an application for a hazardous waste authorization. The certifications must be signed by the owner of a sole proprietorship; or by a general partner of a partnership; or by a principal executive officer of at least the level of vice president of a corporation or business association, or by a duly authorized representative of that person. If the same person is a facility operator, facility owner, and real property owner, that person can cross out and initial the signature blocks under "1. Facility Operator" and "2. Facility Owner," and add the words "Facility Owner and Operator" at the line "Signature of the Land Owner or Authorized Representative."

1. Facility Operator

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. Further, I agree to comply with the provisions of Chapter 403, Florida Statutes, and all rules of the Department of Environmental Protection. It is understood that the permit is only transferable in accordance with Chapter 62-730, Florida Administrative Code (F.A.C.), and, if granted a permit, the Department of Environmental Protection will be notified prior to the sale or legal transfer of the permitted facility.

STERLING.MICHELLE.L.1042832762 Digitally signed by STERLING.MICHELLE.L.1042832762 Date: 2025.02.19 12:54:22 -06'00'

Signature of the Operator or Authorized Representative*****

Colonel Michelle L. Sterling USAF, Commander, 96th Civil Engineer Group
Name and Title (Please type or print)

Date 2/19/25 E-mail address michelle.sterling@us.af.mil

Telephone (850) 882-2876

*** Attach a letter of authorization**

2. Facility Owner

This is to certify that I understand this application is submitted for the purpose of obtaining a permit to construct, operate, or conduct remedial activities at a hazardous waste management facility on the property as described. As owner of the facility, I understand fully that the facility operator and I are jointly responsible for compliance with the provisions of Chapter 403, Florida Statutes, and all rules of the Department of Environmental Protection.

MASSARO.MARK.A.1070256360 Digitally signed by MASSARO.MARK.A.1070256360 Date: 2025.02.24 17:42:44 -06'00'

Signature of the Facility Owner or Authorized Representative*****

Brigadier General Mark A. Massaro, USAF, Commander, 96th Test Wing

Name and Title (Please type or print)

Date 2/24/25 E-mail address mark.massaro@us.af.mil

Telephone (850) 882-9600

*** Attach a letter of authorization**

3. Land Owner

This is to certify that I, as land owner, understand that this application is submitted for the purpose of obtaining a permit for the construction, operation, postclosure or corrective actions of a hazardous waste management facility on the property as described. For hazardous waste facilities that close with waste in place, I further understand that I am responsible for providing the notice in the deed to the property required by 40 CFR 264.119 and 265.119, as adopted by reference in Chapter 62-730, F.A.C.

MASSARO.MARK.A.1070256360 Digitally signed by MASSARO.MARK.A.1070256360 Date: 2025.02.24 17:42:55 -06'00'

Signature of the Land Owner or Authorized Representative*****

Brigadier General Mark A. Massaro, USAF, Commander, 96th Test Wing

Name and Title (Please type or print)

Date 2/24/25 E-mail address mark.massaro@us.af.mil

Telephone (850) 882-9600

*** Attach a letter of authorization**

4. Professional Engineer Registered in Florida

Complete this certification when required to do so by Chapter 471, F.S., or when not exempted by Rule 62-730.220(9), F.A.C.

This is to certify that the engineering features of this hazardous waste management facility have been designed or examined by me and found to conform to engineering principles applicable to such facilities. In my professional judgement, this facility, when properly constructed, maintained and operated, or closed, will comply with all applicable statutes of the State of Florida and rules of the Department of Environmental Protection.

Signature

Patrick Schauble

Name (please type)

Florida Registration Number PE94640

Mailing Address 180 Gordon Drive, Suite 110

Street or P.O. Box

Exton PA 19341

City State Zip

Date _____ E-mail address pschauble@komangs.com

Telephone (610) 400-0619

(PLEASE AFFIX SEAL)

5. Professional Geologist Registered in Florida

Complete this certification when required to do so by Chapter 492, F.S., or when not exempted by Rule 62-730.220(10), F.A.C.

This is to certify that the interpretations of geology at this hazardous waste management facility have been examined by me, and the interpretations conform to sound geological principles. In my professional judgement, this facility, when properly constructed, maintained and operated, or closed, will comply with all applicable statutes of the State of Florida and the rules of the Department of Environmental Protection.

Signature

Andrew M Miller
Name (please type)

Florida Registration Number 2564

Mailing Address KOMAN Government Solutions, LLC.; 1002 N Eglin Parkway
Street or P.O. Box

Shalimar FL 32579
City State Zip

Date _____ E-mail address amiller@komangs.com

Telephone (505) 249-8669

(PLEASE AFFIX SEAL)

HAZARDOUS WASTE PERMIT RENEWAL APPLICATION RANGE C-62 (PART II)

Eglin Air Force Base, Florida

FL8570024366

Permit #: 006176-HO-XX

05 MARCH 2025

Submitted to:

Florida Department of Environmental Protection
Hazardous Waste Permitting and Programs
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Submitted by:

Mr. Eric Sculthorpe, 96 CEG/CEIEC
Chief, Environmental Compliance
700 Range Road, Bldg. 592
Eglin Air Force Base, FL 32542-5120

This page intentionally left blank.

Table of Contents

List of Exhibits vii
List of Figures vii
List of Tables viii
List of Appendices viii
List of Acronyms and Abbreviations ix
Section A General Facility Information 1
Section A.1.a Topographic Map 1
Section A.1.b Traffic Information (40 Code of Federal Regulations [CFR] 270.14(b)(10) 2
Section A.2 Financial Responsibility Information 2
Section A.3 Floodplain Standard 2
Section A.4 Facility Security Information 3
Section A.4.a Security Procedures and Equipment Required (40 CFR 264.14) 3
Section A.4.b Contingency Plan (40 CFR 270.14(b)(7)) 3
Section A.4.c Procedures, Structures, or Equipment Used at Facility 3
Section A.4.d Preparedness and Prevention Procedures (40 CFR 264, Subpart C) 7
Section A.4.e Introductory and Continuing Training Programs (40 CFR 264.16) 8
Section A.5 Chemical and Physical Analyses (40 CFR 270.14(b)(2)) 10
Section A.6 Waste Analysis Plan (40 CFR 270.14(b)(3)) 12
Section A.6.a Introduction 12
Section A.6.b Facility Description 12
Section A.6.c Parameters for Analysis 15
Section A.6.d Test Methods 16
Section A.6.e Sampling Methods 16
Section A.6.f Frequency of Analysis 16
Section A.6.g Managing Wastes Generated Offsite 16
Section A.6.h Methods for Additional Waste Analysis 16
Section A.6.i Off-Site Waste Received 16
Section A.7 Manifest System, Recordkeeping, and Reporting (40 CFR 264 Subpart E) 17
Section A.8 Federal Laws Considered (40 CFR 270.3) 17
Section B Containers 18
Section C Tank Systems 18
Section D Surface Impoundments 18

Section E Waste Piles 18
Section F Land Treatment 18
Section G Landfills 18
Section H Incinerators 19
Section I Miscellaneous Units (40 CFR 264, Subpart X) 19
Section I.1 Detailed Description of Units 19
Section I.1.a Alternative Technology Treatment 21
Section I.2 Hydrologic, Geologic, and Meteorological Assessments 22
Section I.2.a Regional Geology 22
Section I.2.b Local Geology 23
Section I.2.c Soil Conditions 25
Section I.2.d Hydrogeology 25
Section I.2.e Meteorological 26
Section I.2.f Land Use 28
Section I.3 Potential Pathways to Hazardous Waste 29
Section I.4 Effectiveness of Treatment 31
Section I.5 General Requirements for Ignitable, Reactive, or Incompatible Wastes 33
Section I.6 Closure and Post-Closure Plans 33
Section I.7 Groundwater Protection 34
Section I.8 Exposure Information 34
Section I.9 Additional Information 35
Section I.10 Closure Cost Estimates (40 CFR 270.14(b)(14)) 35
Section I.11 Inspection Requirements (40 CFR 264.15) 35
Section J Containment Buildings 36
Section K Closure 36
Section K.1 Closure Plan (40 CFR 264.111) 36
Section K.1.a Closure of Each Hazardous Waste Unit 36
Section K.1.b Final Closure of the Facility 36
Section K.1.c Maximum Inventory of Wastes 37
Section K.1.d Steps to Satisfy the Closure Performance Standard 37
Section K.1.e Other Activities During Closure 37
Section K.1.f Schedule for Closure 37
Section K.1.g Trust Funds Sites 38

Section K.2 Post-Closure Plan (40 CFR 264.118) 38
Section K.3 Approved Plans 38
Section K.4 Application for Closure 38
Section L Compliance Schedule 38
Section M Groundwater Protection 39
Section M.1 Interim Monitoring Data 39
Section M.2 Identification of Aquifer, Hydrogeology 40
Section M.3 Topographic Maps 41
Section M.4 Plumes of Contamination 42
Section M.4.a Vertical and Horizontal Extent of Groundwater Plume 45
Section M.4.b Surface Water and Porewater COPC Concentrations 45
Section M.4.c Soil Concentrations 46
Section M.4.d Concentrations of Hazardous Constituents 47
Section M.5 Groundwater Monitoring Program (40 CFR 264.97) 47
Section M.6 Presence of Hazardous Constituents at Initial Application 48
Section M.7 Compliance Monitoring Program (40 CFR 264.99) 48
Section M.7.a Wastes Handled at the Facility 48
Section M.7.b Characterization of Contaminated Groundwater 48
Section M.7.c Hazardous Constituents 49
Section M.7.d Concentration Limits 50
Section M.7.e Groundwater Monitoring System 50
Section M.7.f Sampling and Analysis 51
Section M.8 Corrective Action Program 51
Section M.9 Provisions of Florida Administrative Code 62-4 51
Section M.10 Additional Groundwater Monitoring Requirements 51
Section M.10.a Use of Filters 51
Section M.10.b Well Construction Reports 51
Section M.11 Quality Assurance Plan 51
Section M.12 Florida Administrative Code 62-4.0050(3) 51
Section N Research, Development and Demonstration 51
Section O Exposure Information 51
Section P Potential Releases from Solid Waste Management Units 52
Section Q Information Requirements for Solid Waste Management Units 52

Section R **Process Vents**.....52
Section S **Requirements for Equipment Leaks**.....52
Section T **Boilers and Industrial Furnaces**.....52
Section U **Requirements for Drip Pads**.....53
Section X **Equivalency Demonstrations**.....53
References

List of Exhibits

Exhibit I-1 Lithologic Occurrence of the Pensacola Clay, Range C-62
Exhibit M-1 Groundwater Protection Standards

List of Figures

Figure 1 Site Location, C-62
Figure 2 Site Layout, C-62
Figure 3 Local Topographic Contours, ODU, Range C-62
Figure 4 Topographic Map of Range C-62
Figure 5 Roads and Gates, Range C-62
Figure 6 Explosives Transportation Route
Figure 7 Flood Map, Range C-62
Figure 8 Aerial Extent of Floridan Aquifer
Figure 9 HERD Facility Hazardous Waste Locations
Figure 10 Protected Species on the ETTC
Figure 11 Physiographic Provinces Showing Locations of Cross-Sections
Figure 12 Regional Geologic Cross-section A-A’
Figure 13 Regional Geologic Cross-section B-B’
Figure 14 Cross Section Plan View, Range C-62
Figure 15 Cross Section A-A', Range C-62
Figure 16 Cross Section B-B’, Range C-62
Figure 17 Cross Section C-C’, Range C-62
Figure 18 Cross Section D-D’, Range C-62
Figure 19 Soil Series on the Eglin Range
Figure 20 General Surface Water Map
Figure 21 Regional Stratigraphic Column
Figure 22 Thickness of the Sand and Gravel Aquifer
Figure 23 Thickness of the Pensacola Clay Confining Bed
Figure 24 Frequency of Wind Speed and Direction
Figure 25 Land Use in the Vicinity of Range C-62, Open Detonation Unit
Figure 26 EAFB Recreation Map
Figure 27 Conceptual Site Model for Exposure Associated with ODU, Range C-62, Eglin AFB
Figure 28 Shallow Groundwater Elevation Contour Map, August 12, 2024
Figure 29 Deep Groundwater Elevation Contour Map, August 12, 2024
Figure 30 Detailed Well Locations/Topographic Contours, Range C-62
Figure 31 RDX Isocontour Concentrations in Groundwater and Porewater, August 2024, Range C-62
Figure 32 Perchlorate Isocontour Concentrations in Groundwater and Porewater, August 2024, Range C-62

List of Tables

Table 1 EOD Personnel Responsibilities and Job Experience
Table 2 EOD Personnel Training Requirements
Table 3 Basic Compositions of Standard and HERD Explosives
Table 4 Physicochemical Properties of the Potential Chemicals of Concern
Table 5 OD Treatment, 2020 through 2024
Table 6 Monthly Average Temperature, Precipitation, and Relative Humidity at Eglin AFB, Florida

List of Appendices

Appendix A General Facility Information/Photographic Log
Appendix B Contingency Plan
Appendix C Water Supply Well Information
Appendix D Career Field Education and Training Plan
Appendix E Biennial Report
Appendix F Evaluation of Alternative Technologies to Open Detonation of Energetic Wastes
Appendix G Human Health and Risk Assessment (HHRA)
Appendix H 1992/1994 Soil Sample Results
Appendix I Compliance Schedule
Appendix J Emissions Modeling
Appendix K Historical Water Quality
Appendix L Range C-62 Monitoring Well and Piezometer Boring Logs
Appendix M Environmental Monitoring Plan
Appendix N Maps of Eglin AFB's IRP Areas of Concern and Points of Interest/ Newly Identified SWMU/AOC Profile Sheets

List of Acronyms and Abbreviations

µg/L	micrograms per liter
°F	degrees Fahrenheit
ADLS	Advance Distributed Learning Service
ADR	Ammunition Disposal Request
AERMOD	American Meteorological Society/EPA Regulatory Model
AFB	Air Force Base
AFLCMC	Air Force Munitions Senior Materiel Leader
AFMAN	Air Force Manual
AFRL	Air Force Research Lab
AFTR	Air Force Training Record
ATAK	Android Tactical Assault Kit
bgs	below ground surface
CFETP	Career Field Education and Training Plan
CFR	Code of Federal Regulations
COPC	chemical of potential concern
DDA	Designated Disposition Authority
DDESB	Department of Defense Explosives Safety Board
DLA	Defense Logistics Agency
DoD	Department of Defense
DTR	Defense Transportation Regulation
EA	EA Engineering, Science and Technology
EAFB	Eglin Air Force Base
EAS	Environmental Assessment Services, LLC
EESOH-MIS	Enterprise Environmental Safety and Occupational Health – Management Information System
EMP	Environmental Monitoring Plan
EMR	Environmental Monitoring Report
EOD	Explosive Ordnance Disposal
EPA	United States Environmental Protection Agency
EPC	exposure point concentration
ES	equipment specialist
F.A.C.	Florida Administrative Code
FDEP	Florida Department of Environmental Protection
FEMA	Federal Emergency Management Agency
FOI	Flight Operating Instruction
ft	feet/foot
ft/day	feet/foot per day
GCTL	Groundwater Cleanup Target Level
gpm	gallons per minute
GWPS	groundwater protection standard

HERD	High Explosive Research and Development
HMX	cyclotetramethylene-tetranitramine
HQ	headquarters
HSWA	Hazardous and Solid Waste Amendments
HHRA	human health risk assessment
hr	hour
HW	Hazardous Waste
IM	item manager
in	inches
IRP	Installation Restoration Program
JTOC	Joint Test and Training Operations Control Center
KOMAN	KOMAN Government Solutions, LLC
K_{OC}	organic partition coefficient
K_{OW}	octanol-water partition coefficient
lbs	pounds
LiDAR	Light Detection and Ranging
LLRM	low-level radioactive material
MASO	Munitions Accountable System Officer
MDAS	material documented as safe
MDEH	material documented as an explosive hazard
MEC	munitions and explosives of concern
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
mi	mile
MPPEH	material potentially presenting an explosive hazard
mph	mile per hour
MSA	munitions storage area
msl	mean sea level
mw	molecular weight
MW	monitoring well
NAICS	North American Industry Classification System
NAVSCOLEOD	Naval School Explosive Ordnance Disposal
NEW	net explosive weight
NRC	Nuclear Regulatory Commission
NRCS	Natural Resources Conservation Service
OB	Open Burn
OD	Open Detonation
ODU	Open Detonation Unit
O&M	operations & maintenance
OSC	On-Scene Commander
OSHA	Occupational Safety and Health Administration
PCB	polychlorinated biphenyl
psi	pounds per square inch
PVC	polyvinyl chloride

QA	quality assurance
R&D	research and development
RDT&E	research, development, test, and evaluation
RCO	Range Control Officer
RCRA	Resource Conservation and Recovery Act
RCW	red-cockaded woodpecker
RDX	Hexaydro-1,3,5-trinitro-1,3,5-triazine
RHA	Range Holding Area
RR	Range Road
RSL	Regional Screening Level
SAA	Satellite Accumulation Area
SCTL	Soil Cleanup Target Level
SLERA	screening level ecological risk assessment
SNQ	spherical nitroguanidine
SWCTL	surface water cleanup target level
SWMU	Solid Waste Management Unit
SVOC	semi-volatile organic compound
TAL	target analyte list
TCL	Target Compound List
TCLP	Toxicity Characteristic Leaching Procedure
TDS	total dissolved solids
TNT	2,4,6-trinitrotoluene
TPH	total petroleum hydrocarbons
UXO	unexploded ordnance
VOC	volatile organic compound
VP	vertical profile
WMM	Waste Military Munitions

Hazardous Waste Permit Renewal Application Eglin Air Force Base, Range C-62 (Part II)

As a renewal, this information is provided as a requirement of Subsection 62-730.291 (1), Florida Administrative Code (F.A.C.). This permit application seeks to renew the current operating Resource Conservation and Recovery Act (RCRA) Permit No. 006176-HO-12. Eglin Air Force Base (EAFB) has not made and is not proposing to make any changes to the current permit open detonation location and facilities. EAFB submitted the required application form, certifications, and renewal fee.

The following text follows the Table of Contents of the Hazardous Waste Facility Permit Application Instructions and Forms document dated 15 MAY 1996, as provided by Florida Department of Environmental Protection (FDEP) Hazardous Waste (HW) personnel. Based on conversations with FDEP personnel, some sections of the application do not apply, and are therefore stated as such below. This document has been reviewed and signed by a Florida Registered Professional Geologist and Florida Registered Professional Engineer.

Section A General Facility Information

A RCRA Part A permit application for Open Burn and Detonation (OB/OD) of explosive wastes at EAFB was submitted to United States Environmental Protection Agency (EPA) Region IV and FDEP in June 1989. Since the original permit was issued, several permit renewals have been applied for and issued, as well as modifications to certain corrective action requirements. On 13 October 2000, however, the FDEP approved a request to remove the OB kettles from Operating Permit HO46-286388. The FDEP's letter is included in **Appendix A**. OB is no longer used for treatment of military munitions and explosives-contaminated items.

This Miscellaneous Subpart X permit renewal application is for continued treatment of excess, obsolete, or unserviceable munitions and energetic waste (i.e., military explosives) by OD at a designated area known as the Open Detonation Unit (ODU), located on the remote active training range, Range C-62, EAFB (refer to **Figure 1** and **Figure 2**). The current operating permit 006176-HO-12, dated 11 March 2022, expires on 01 September 2025. Photographs of the area are in **Appendix A**.

Section A.1.a Topographic Map

Detailed topographic contours generated through Light Detection and Ranging (LiDAR) technology are displayed specific to the ODU on **Figure 3**. A detailed topographic map of the entire Range C-62 and surrounding area showing all site improvements and required information are displayed on **Figure 4**.

Section A.1.b Traffic Information (40 Code of Federal Regulations [CFR] 270.14(b)(10)

The ODU and Range C-62 is located in a remote, restricted, access-controlled area with one major road running through the range along the western border, Range Road (RR)-210. Three (3) local range gates are used to control access to the range. North of the range, one gate is located at the intersection of RR-203 and RR-210. This prevents access to the range from the north. There is another gate located near the Range Tower on RR-210 that prevents further access to the range from the north. There is another gate located at the southern range boundary on RR-210 that prevents access to the range from the south (**Figure 5**). Once through the gates, the range is intersected by clay/dirt roads that provide access to target areas and the ODU.

It is estimated that between 30-50 vehicles per day use the range roads in the vicinity of Range C-62. However, access to the range is limited and controlled by the locked gates. Access is granted only in advance, with a pre-arranged mission number, and the gates must be unlocked by range control. Vehicular traffic within the range is occasional and, typically, with several weeks between visits.

Explosives transport routes within the main base and along the public highways are asphalt paved roads (**Figure 6**). Public-access and range-access roads used as explosives transport routes within the reservation area are hard-surface clay/gravel roads. Examples of vehicles using the roads within the reservation area are pickup trucks, dump trucks, five-ton trucks, and ten-ton trucks. The maximum axle load allowed for hauling equipment operating on the paved streets of EAFB is 12,000 pounds (lbs). The majority of vehicles used within Range C-62 are pickup trucks. Once near the Range, transportation occurs through the southern control gate located on RR-210 at the southern boundary of the range.

Section A.2 Financial Responsibility Information

United States Government installations, like EAFB, are exempt from these requirements, and this information is not addressed in this permit renewal application.

Section A.3 Floodplain Standard

As shown on **Figure 7,** OD detonations do not occur within the 100-year floodplain. The ODU is approximately 0.75-mile south of the northern limit of the 100-year flood plain, 1.2-miles (mi) east of the western limit of the 100-year flood plain, and approximately 0.5 mi north of the southern limit of the 100-year flood plain as shown on Federal Emergency Management Act (FEMA) Flood Insurance Rate Map-Walton County, Panel 12131 C0265G dated 29 September 2010. In addition, treatment occurs approximately 40 feet (ft) above the elevation of the 100-year floodplain. Range C-62 is well beyond the limits of all category-rated storm surge contours as shown on Florida Statewide Regional Evacuation Study Program maps, dated 18 August 2021. Therefore, no flood controls are required.

Section A.4 Facility Security Information

Section A.4.a Security Procedures and Equipment Required (40 CFR 264.14)

Access to the main base at EAFB is limited to authorized personnel with proper identification and is controlled by on-base security. The main base may be entered from three locations: the West Gate at the intersection of Eglin Boulevard (Florida Route 85) and Lewis Turner Parkway (Florida Route 189); the East Gate at John Sims Parkway immediately south of Addie R. Lewis Middle School; and the 33 Fighter Wing Gate on Florida Route 85 approximately one mile north of the Air Force Armament Museum. Security at each gate is provided through a guardhouse, fence, jersey barriers, and lockable gates. The gates remain locked and jersey barriers placed at the gate when the guardhouse is unmanned. Military police are on patrol throughout the main base and are available 24 hours per day. Visitors to the main base are required to obtain passes from the Air Force Armament Museum and must be sponsored onto the base by authorized personnel.

Access to Range C-62 is controlled through range gates at all entrance points, which are secured during the entire period that treatment is being conducted. Since the ODU is located on an active bombing range, access to the treatment area is also restricted during any active bombing/OD missions. The range gates are open during periods when treatment or active training missions are not ongoing. Range gates are clearly marked as entrances to active bombing ranges with the notation "WARNING: MISSION IN PROGRESS. DO NOT ENTER.” Entry through open or closed range gates is not allowed without contacting the Joint Test and Training Operations Control Center (JTOC) and/or the appropriate manned Range Control Officer (RCO)/Test Area Control Officer.

In addition, the aircraft bombing/gunnery training ranges where treatment activities are conducted are surrounded by dense forests, uneven terrain, and surface water drainage basins for several miles, creating a natural barrier that deters unauthorized entry.

Section A.4.b Contingency Plan (40 CFR 270.14(b)(7))

A copy of the Contingency Plan for treatment at the ODU, on Range C-62, EAFB is attached as **Appendix B**, as required by 40 CFR Part 264, Subpart D. There have been no updates to the Contingency Plan or Flight Operating Instruction (FOI) since 2021.

Section A.4.c Procedures, Structures, or Equipment Used at Facility

Section A.4.c.1 Equipment Failure and Power Outages

The Range Control Building does have electricity provided by an onsite new generator which was installed Summer 2024; however, previously scheduled OD missions would not commence if a power outage or unfavorable weather conditions existed. Once a mission is in progress, the OD equipment does not require a permanently installed outside source of electric power and is not directly affected by a power failure. EOD activities are manually prepared and initiated, and, as such, are not potentially impacted by equipment failure or power outage.

All EOD personnel are equipped with hand-held two-way radios that can summon emergency assistance. These radios are also available during waste transport in case of a vehicular breakdown. Communications at the treatment area are maintained by voice or hand-held two-way radio. Communication between EOD personnel and the RCO, JTOC, and EOD Operations are by hand-held two-way radios. Telephones are also available at the RCO and JTOC (40 CFR 264.34).

In the event of an emergency, portable two-way radios or the truck radio will be utilized to summon assistance from the on-base emergency response personnel. The radios will have sufficient range to easily contact the JTOC, who will always be available during OD operations.

Section A.4.c.2 Hazards in Unloading Operations

Munitions loading, unloading, and transportation is common on EAFB. Defense Transportation Regulation (DTR) 4500.9-R Part II – *Cargo Movement* (17 July 2020) (attached to the Contingency Plan in **Appendix B**) contains the general procedures that ensure safety for these operations. In addition, there are specific routes for transporting explosives (refer to **Figure 6**). All EOD personnel receive training in explosives handling and transportation. When using multiple vehicles on a mission, only one vehicle transports explosives unless a compatibility problem exists. The team plans the transportation route to ensure proper explosive routes and range roads are available and open, allowing sufficient time to arrive at the range at least 15 minutes ahead of schedule.

Trucks containing munitions approach from either RR-200 from the south through Range Gate No. 62 or from RR-203 to the east. Once on the range, munitions are unloaded by a minimum of two personnel at the ODU (FOI 32-3001 *Explosive Ordnance Disposal Program* attached to the Contingency Plan in **Appendix B**).. Upon request of the EAFB range services, an all-terrain forklift is made available for on-site unloading if deemed necessary. The below listed EOD procedures are followed in accordance with Air Force Manual (AFMAN) 91-201 *Explosive Safety Standards*. An excerpt of this AFMAN, Section 8G - *Transportation and Movement of Explosives by Motor Vehicle and Material Handling Equipment*, (attached to the Contingency Plan in **Appendix B**) is provided below**.**

- Chock explosives loaded vehicles during loading or unloading operations.
- To the maximum extent possible, position munitions cargo vehicles to permit loading and unloading from each side of the cargo bed. Munitions will be accessed from the side closest to the load unless access can only be obtained from one side.
- Except as required in the event of an electrical storm, do not leave explosives-laden vehicles unattended unless they are parked in a properly designated area, such as the weapons storage area, holding yard or flightline munitions holding area.
- Do not load or unload explosives from a motor vehicle while the engine is running, except under the following conditions:
    - Where the engine is required to provide power to vehicle mechanical handling equipment used in loading and unloading the vehicle.

  - Where necessary for emergency operations or timing for exercises simulating execution of emergency plans. In this case, small loads or packages of explosives delivered to aircraft, requiring only momentary unloading time, may be removed from a vehicle while the motor is running.
  - Engines of diesel-powered vehicles may continue to run during loading or unloading of explosives except when exposed explosives or hazardous locations are involved.
- Do not leave vehicles at storage locations longer than needed to complete explosives loading or unloading. If a delay occurs, move the vehicle from location.
- When using multiple vehicles on a mission, only one vehicle transports explosives unless a compatibility problem exists.
- Refuel trucks before loading explosives.

Section A.4.c.3 Undue Exposure to Hazardous Waste

During treatment, each member of the EOD team wears appropriate protective clothing as prescribed by Occupational Safety and Health Administration (OSHA) training and EOD training. The EOD team chief is responsible for ensuring that the required protective equipment is available, that personnel are familiar with the use of the equipment, and that use of such equipment is enforced as necessary. Clothing for OD operations includes long sleeves, high-top boots, and leather gloves.

During treatment, EOD personnel withdraw to a minimum distance of 2,500 ft from the ODU before initiating operations, as specified in EOD FOI 32-3001 (included as part of the Contingency Plan in **Appendix B**). Personnel are afforded ample time to reach a safe distance prior to detonation. The signal for detonation is given by the EOD team chief after all personnel in the vicinity are confirmed to be protected by a safe distance. The operation is usually observed from the Range Control Building Tower (refer to **Appendix A** for photographs of the Range Control Building Tower).

EAFB does not bury or cover open detonations with soil due to safety concerns regarding buried unexploded ordnance (UXO), munitions potentially presenting an explosive hazard (MPPEH), or munitions and explosives of concern (MEC).

Section A.4.c.4 Prevent Contamination of Water Supplies

The Sand and Gravel Aquifer is used as a regional water supply source for potable water, agricultural and industrial purposes. However, there is no use of the Sand and Gravel Aquifer in the vicinity of the ODU nor on Range C-62. Range C-62 has a water supply well screened in the Floridan Aquifer located in the vicinity of the Range Control Building Tower (refer to **Figure 4**). The well is used for non-potable purposes (i.e., firefighting, if needed). The well is located approximately 1 mile to the northwest (and hydraulically upgradient) from treatment activities.

Water supplied from the Floridan aquifer (**Figure 8**) is unlikely to be impacted due to the presence of the 160 to 250-ft-thick Pensacola clay confining layer, which effectively isolates the Sand and

Gravel Aquifer from the underlying Floridian aquifer. The Floridan aquifer averages about 1,000 ft thick, and freshwater can extend to a depth of 2,000 ft below land surface in the vicinity of the base.

There are no surface water intakes within 15 mi of Range C-62.

Section A.4.c.5 Prevent Run-Off

Materials to be treated by OD remain in containers (bomb cases, shells) until actual detonation. Because of their physical characteristics (i.e., containerized and non-liquid) the wastes treated at the ODU prevents them from being a spill concern.

The natural porosity and permeability of the surficial soil is such that the surface and subsurface promote rapid drainage. Additionally, there is no evidence (e.g., scouring, erosion) of stormwater runoff from the ODU. Following treatment, the area is regarded so that its slopes inwards back towards the ODU. Refer to **Appendix A** for pictures of the ODU.

Section A.4.c.6 Prevent Releases to Atmosphere

Release to the atmosphere is unavoidable during treatment. According to EPA's 2002 *Handbook on the Management of Ordnance and Explosives at Closed, Transferring, and Transferred Ranges and Other Sites,* Section (pg. 5-7); "In OB/OD operations, emissions must be carried away from populated areas, so prevailing winds must be steady. Ideal wind speeds are 4-15 mile per hour (mph), because winds at these speeds are not likely to change direction and they tend to dissipate smoke rapidly." To minimize air emissions, treatment by OD is not conducted by EOD when wind velocity is less than 3 mph or greater than 15 mph.

Section A.4.c.7 Prevent Accidental Ignition (40 CFR 270.14(b)(9))

Due to the explosive nature of the wastes being treated at the ODU, safety is the primary concern when planning OD missions. EOD FOI 32-3001 describes safety provisions for OD operations. EOD personnel are trained in waste compatibility and characteristics, and each team is briefed on the specific wastes to be treated and handling precautions prior to the beginning of each mission. Waste munitions are physically kept separate from initiating sources. Waste munitions are delivered to the range on a different truck than the one carrying the initiating devices. Upon delivery to the range, the waste munitions and initiating devices are staged for detonation. During the pre-operational safety briefing, the smoking and non-smoking areas are clearly defined. No smoking is allowed during handling of explosives.

Munitions become wastes when an ADR form is filed, are marked for detonation, and leave the bunker. If the munitions are reactive, they are classified as hazardous wastes in accordance with RCRA. In accordance with provisions of the existing RCRA Part B permit for EAFB, munitions to be disposed of are properly segregated and stored in designated storage areas of the ammunition supply facility and at the High Explosive Research Development (HERD) facility as shown on **Figure 9**.

Munitions for treatment are transported by the generator to the EAFB ODU where detonation is initiated. Following each detonation, personnel clear the ODU to ensure it is free of any energetic materials and material documented to be safe (MDAS) (i.e., scrap metals). Section A.5 and A.6 of this application addresses the physical characteristics and treatment issues associated with the hazardous nature of the disposed materials.

Section A.4.d Preparedness and Prevention Procedures (40 CFR 264, Subpart C)

The ODU is designed and operated to minimize the possibility of fire, explosion, or any unplanned release of hazardous waste which could threaten human health or the environment.

Treatment does not utilize any type of equipment or engineered treatment units. Detonation occurs at the ODU on top of ground surface within a designated and cleared 100 ft x 200 ft area of land. The designated area is marked by a T-post in each corner.

Craters generated by OD vary in size from 6 ft x 6 x 3 ft deep to as large as 20 ft x 50 ft x 6 ft deep. The size of the craters is proportional to the quantity and size of ordnance items to be detonated (40 CFR 264.31). Craters are backfilled upon conclusion of a treatment event.

There are always at least two EOD personnel present for any OD operation. Each individual present will be equipped with a hand-held radio for emergency communication. In addition, visual contact with other personnel will be maintained. Communications at the ODU is maintained by voice or hand-held two-way radio. Communication between EOD personnel and the RCO, JTOC, and EOD Operations are by hand-held two-way radios. Telephones are also available at the RCO and JTOC (40 CFR 264.34).

In the event of an emergency, portable two-way radios or the truck radio will be utilized to summon assistance from the on-base emergency response personnel. The radios will have sufficient range to easily contact the JTOC, who will always be available during OD operations. As stated in the Contingency Plan (**Appendix B**), the On-Scene Commander (OSC) will be responsible for contacting the RCO and the JTOC, who will notify the Command Post by radio or telephone. The OSC will have the authority to summon the required on-base assistance.

The fire control, spill, and decontamination equipment available at the ODU and base-wide is described in the Contingency Plan (**Appendix B**), as is the on-board emergency equipment for EOD vehicles. During OD operations, EOD vehicles containing fire extinguishers, absorbents, and other emergency equipment are in proximity to the treatment area.

Although spill control equipment is available at the treatment area during OD activities, it is not used because all materials to be treated are non-liquid and remain in their containers (bomb cases, shells, boxes) until actual detonation.

In most scenarios, onsite fire extinguishers would be used for fire control. The fire extinguishers maintained on the range during the OD mission will be used to control the emergency until the on-base fire department arrives. No fire-fighting equipment maintained on the ranges contains

or uses water; therefore, water of a substantial volume or pressure is not required. If EAFB Natural Resources Fire Response equipment is necessary, a truck with a 250-gallon tank capable of dispensing water or Synthetic Fluorine-Free Foam or a crawler tractor with a fire plow will be dispatched to the ODU. There is a water supply well at the Range C-62 Control Building Tower (refer to **Figure 4**) located approximately 1 mile to the northwest of the ODU. The well was drilled in 1966 to a depth of 620 ft bgs and screened within the Floridan Aquifer. It is equipped with an electric submersible pump capable of a discharge rate of 22 gallons per minute (gpm). In the event of an emergency, the well could provide water for fire control equipment (40 CFR 264.32). Additional water supply well information is included in **Appendix C - Water Supply Well Information.**

All communications, alarm, fire protection, spill control, and decontamination equipment will be maintained, checked, and inspected on a regular schedule to ensure proper operation (40 CFR 264.33).

OD operations are conducted in the cleared, designated 100 ft x 200 ft outdoor ODU. Materials designated for OD treatment are not stored or stockpiled at the treatment area prior to conducting detonation activities.

EAFB has cooperative agreements with local emergency response services. Arrangements with local police and fire departments, emergency response teams, and hospitals is addressed in the Contingency Plan (refer to **Appendix B**). In that event local community emergency services are required, the OSC will notify the Command Post, which will authorize the Disaster Preparedness Division to contact the appropriate outside organizations, as required (40 CFR 264.37).

Section A.4.e Introductory and Continuing Training Programs (40 CFR 264.16)

At EAFB, all facility personnel handling hazardous waste must successfully complete a program of classroom instruction and on-the-job training to prepare them to operate and maintain the ODU (**Appendix D**). This policy ensures compliance with RCRA requirements. All Department of Defense (DoD) EOD must attend the U.S. Naval School, Explosive Ordnance Disposal (NAVSCOLEOD). This school is the DoD proponent for training of all military personnel in the EOD career field. After this training, EOD personnel continue with on-the-job training under close supervision from senior EOD personnel.

Further training of EOD personnel at EAFB follows the Air Force's standard training approach. to ensure that personnel are trained safely and effectively accomplish their job. The training is documented through the Air Force Training Record (AFTR) in the Advance Distributed Learning Service (ADLS). The training approach is composed of formal classroom, unit conducted, and on-the-job training.

For EOD personnel, formal training consists of, as a minimum, successful completion of high school or an equivalent program, basic and advanced individual training, and completion of Phase I and II of the NAVSCOLEOD. EOD supervisors have successfully completed additional formal Skill

Level 7 training, and Air Force advanced and supervisory career development courses. Unit and on-the-job training are implemented under the philosophy that unit managers and supervisors are responsible for continuous training and development of their subordinates. Under the *Air Force's Career Field Education and Training Plan* (CFETP) (1 January 2020) (refer to **Appendix D**), as implemented for EAFB EOD personnel by CFETP Air Force Specialty Code 3E8X1, supervisors either receive necessary additional training or are augmented by installation support personnel to train their subordinates.

EOD Hazardous Waste (HW) personnel must attend initial RCRA Hazardous Waste training within 6 months of employment. Once the initial training requirements have been met, subsequent RCRA (refresher) HW training will be completed on an annual basis on-line.

EOD supervisory personnel are directly responsible for the proper handling of explosive ordnance. These personnel are generally senior enlisted personnel with many years of experience and formally tested capabilities. Air Force supervisors will have either 7 or 9 Skill Level experience identifiers (highest attainable). This equates to more than 10 years of EOD and supervisory experience. Specific individuals are not named because military personnel are subject to reassignment; however, military personnel job qualifications and assignments are carefully regulated and monitored to ensure replacement personnel meet job qualifications. Senior supervisory personnel also act as emergency coordinators for EOD incidents. Consequently, appropriate information about these individuals will be on rosters maintained at respective command posts. Identification of key EOD personnel responsible for management and/or operations at the ODU are identified in **Table 1**, with major job task responsibilities descriptions and experience requirements in the following subsections.

In addition, all EOD personnel receive formal institutional training on the handling, rendering safe, and disposing of explosives and explosive ordnance and maintaining the equipment necessary to conduct these operations in all types of environments and conditions (**Table 2**). This training is conducted at NAVSCOLEOD. This curriculum has been reviewed by the Department of the Air Force, Office of the Civil Engineer, who has determined that this training meets the requirements of 29 CFR 1910.120(o). In addition, each person operating the RCRA ODU has received, as a minimum, an initial 24 hours of training and the annual RCRA refresher training.

NAVSCOLEOD training program ensures that EOD personnel receive extensive emergency response training. The CFETP requires that units continue refresher training to maintain EOD proficiency. Each EOD member is required to read and be familiar with various publications covering munitions, which are used during monthly training and during the planning and conducting of all treatment operations. Individuals involved in emergency response must also have a thorough understanding of the Contingency Plan and EOD Emergency Management.

Section A.5 Chemical and Physical Analyses (40 CFR 270.14(b)(2))

Inventories of military ordnance items are maintained at EAFB. These items include unserviceable or serviceable excess munitions that are physically intact. If the unserviceable items cannot be reworked, they must be demilitarized or rendered harmless. Demilitarization of both unserviceable and serviceable excess munitions at EAFB is accomplished through treatment by OD.

EAFB does not segregate RCRA treatment residue management from that of training or munition inventory reduction activities.

Serviceable munitions consist of munitions used in military training exercises and specialized weapons testing. These munitions include (but are not limited to) igniters, cartridges, rounds, flares, rockets, smoke canisters, bombs, propellants, and pyrotechnics. Wastes generated by the HERD facility consist of (but are not limited to) research and development (R&D) experimental explosives and traditional explosives such as TNTO II, III, IV, Comp A-5, Octol 75/25, C-4, and Tritonal. R&D explosives include AFX 1100, AFX 453, AFX 931-M, PBXN109, AFX 931-M, and 2,4,6-trinitrotoluene (TNT)/spherical nitroguanidine (SNQ).

Table 3 presents a list of original, basic compositions for standard energetic materials in general use, as well as HERD-generated experimental explosives, and represents the typical components that make up specific munitions items that may be treated at EAFB. EAFB EOD personnel staff will review compositions for standard energetic materials that may contain constituents not listed on **Table 3** or if HERD-generated experimental explosives contain constituents not listed on **Table 3**.

When the Air Force Research Lab (AFRL) HERD facility at EAFB purchases a new molecular or composite explosive from a commercial vendor they will notify the 96 CEG/CEIEC Hazardous Waste Program Manager that a new explosive needs to be added to the *RCRA Subpart X Open Detonation Permit's Table 3 – Waste Analysis Data: Basic Explosive Components and Compositions*. 96 CEG/CEIEC will then notify the FDEP that a new explosive will be added to **Table 3**.

The munitions that are treated by OD generally are composed of a variety of reactive chemical fill materials along with associated metal casings, projectiles, and primer components. The metal components account for most of the weight of the munitions. The reactive materials are usually less than 20 percent of the gross munitions weight. Several energetic compounds are present in the munitions; these compounds fall into four general classes: pyrotechnic compositions, propellants, priming compositions, and high explosives. Propellants, pyrotechnic, and priming compositions are materials that react by deflagration. The high explosive reactions are manifested in the form of detonations. When the munitions are treated at the ODU, various combustion and detonation products are formed.

The pyrotechnic compositions are mixtures of compounds which are designed to emit smoke or light. These munitions primarily consist of a mixture of fuel and oxidizer compounds. The fuels are one of a variety of metal powders including magnesium, aluminum, titanium, or zirconium. Typical oxidizers consist of metal nitrates, ammonium or metal perchlorates, chlorates, or metal peroxides. Secondary constituents that are also present in pyrotechnic mixtures are binders, ignition agents, retardants, and colorants. A variety of chemical compounds are present in these additives. Typical minor components include black powder, chlorinated organics, waxes, sugar, asphalt, polyvinyl chloride, and vegetable oils. Pyrotechnic compositions contain no free liquids. The thermal treatment of pyrotechnics results in gaseous combustion products and solid particulates; liquids are not generated.

The propellant mixtures are typically classified as single-base or double-base. Single-base propellants consist mainly of nitrocellulose. Double-base propellants are mixtures of nitrocellulose and nitroglycerin. Several miscellaneous chemical compounds are added to the propellant charge to control the deflagration characteristics or to promote stability during storage. These additives incorporated into the propellant fuels generally account for 3 percent of the mixture and are oxidized during the deflagration reaction. The amounts of oxidized additive reaction products, including unreacted additives, is considered minimal as compared to the overall OD reaction products generated. Therefore, the impacts of chemical additive oxidation were considered less significant than those from the reaction of primary constituents found in propellants. All the components of military propellants are in solid form and contain no free liquids.

Priming compositions are mixtures that are very sensitive to shock or friction and are used to provide a source of ignition for pyrotechnics, propellants, or explosives. Primers are a mixture of fuel, oxidizers, and explosive compounds. Typical fuels are antimony sulfide and lead thiocyanate; oxidizers include barium nitrate and potassium chlorate. The primary explosives are lead azide and lead styphnate.

High explosives are typically nitrated organic materials that generate large quantities of gaseous reaction products because of detonation. The most common high explosives are TNT, hexahydro-1,2-5-trinitro- 1,2,5-triazine (RDX), trinitrophenylmethylnitramine (tetryl), cyclotetramethylene-tetranitramine (HMX), and various mixtures thereof. Minor additives to high explosive ordnance include waxes and aluminum powder. All constituents are in the solid form.

While a general description of the types of munitions to be treated at the ODU has been described above, the variety and variability of the energetic materials contained in military ordnance is extensive. Similarly, the exact quantities of various compounds associated with the ordnance items which may require treatment in the future cannot be accurately predicted. For these reasons, this application presents a representative list of potentially treated ordnance items which may be detonated at the ODU at EAFB and their chemical composition. **Table 3** presents the list of reactive materials typically treated by OD at EAFB that are potentially subject

to RCRA designation as hazardous waste by the reactive characteristics. The list includes the types of waste energetic materials generated by the HERD facility that would be treated by the EOD personnel at the ODU.

Obsolete and off-specification items are assumed to have the same characteristics as currently acceptable items. Explosive content by weight and type may vary by model. All items contained in these tables are reactive (D003) hazardous wastes and/or toxic due to barium (D005), 2,4-dinitrotoluene (D030), or lead (D008).

Table 4 summarizes the physicochemical properties of the selected inorganic and organic chemicals of potential concern for EAFB, including molecular weight (mw), organic partition coefficient (K_{OC}), log octanol- water partition coefficient (K_{OW}), boiling and melting points, vapor pressure, hazardous waste characteristics, and chemical degradation half-life. There are numerous physical and chemical processes that may be important in affecting the concentration of a chemical in the environment. These properties control the movement and persistence of a chemical in the various environmental media and are important for evaluating the exposure pathways for human and environmental receptors. These properties, such as solubility, Henry's law constant, and partition coefficients, strongly influence the chemical behavior of the contaminants and their susceptibilities to degradation induced by physical and biological agents.

Table 5 summarizes the types and amounts of waste that were treated during the lifetime of the current permit (2020-2024) on a quarterly basis and gives yearly totals.

Section A.6 Waste Analysis Plan (40 CFR 270.14(b)(3))

Section A.6.a Introduction

In accordance with the regulatory requirements set forth in 40 CFR 264.13, EAFB EOD has developed this Waste Analysis Plan as an integral part of the permit application for its ODU. The procedures set forth in this plan dictate that this unit will be in compliance with all requirements of 40 CFR 264.13. A copy of this plan will be available at the facility at all times.

EOD personnel are familiar with the destruction methods of OD waste munitions items. Since the treatment of waste munitions items is specified in Air Force technical documents and detailed physical and chemical parameters are documented at other Air Force installations with similar OD operations, detailed waste analyses are not applicable for the input waste streams to be treated at EAFB. Current and historical data for the munitions and associated energetic materials anticipated for treatment meet the general waste analyses requirements. Additional data will be provided if future operations include additional or different munitions. Due to the variability of the munitions which may be treated, waste analysis is not planned for this operation.

Section A.6.b Facility Description

Munitions become wastes when an ADR form is filed. The disposal process for removing unserviceable/unusable munition(s) is as follows:

- A munitions inspector inspects the asset(s) in accordance with the Item Technical Order or Technical Data Package for serviceability. If the inspector determines that something with that item does not meet the use criteria, then the item is identified as unserviceable.
- Once noted as unserviceable, the data for this item is placed into the EAFB Munitions Management system as an ADR. This request goes from the inspector to the Munitions Accountable System Officer (MASO) and then to the Item Manager (IM)/Equipment Specialist (ES) to determine if it can be used elsewhere. If it cannot be used the IM/ES provide the disposition request and the request is then sent to the Designated Disposition Authority (DDA) for final disposition instructions to either ship the item to a disposal site or dispose of it locally.
- Once the final disposition is received, EAFB either begins the shipment process, if required to be shipped offsite, or EAFB places it on the local destruct listing that is sent to EOD so they can determine whether the item can be disposed of during an upcoming disposal event. EOD reviews the listing and informs EAFB of the scheduled date and the munitions that can be disposed of during that event.
- On the day of the event, the items are loaded on a vehicle to be transported from the Munition Storage Area (MSA) to the ODU located on Range C-62 for treatment. EOD handles the disposal and provides empty containers back to EAFB for processing into the EAFB system if required.
- EOD signs the ADR showing they disposed of the item and that adjusts the item off record in the EAFB system.

If the munitions are reactive, they are classified as hazardous wastes in accordance with RCRA. EAFB uses the Military Munitions Rule published on February 12, 1997 (40 CFR §266.200) to determine when a military munition becomes a solid waste.

Specifically, Section 266.202(b)(2) specifies that a military munition becomes a solid waste for regulatory purposes when it is removed from storage in a military magazine or other storage area for the purposes of being disposed of, burned, or incinerated, or treated prior to disposal. Unused military munitions, in EPA's view, are unused "products" comparable to unused commercial products stored by manufacturers or their customers. Under RCRA, unused products do not become "waste" until they have become "discarded material".

Also noted, DoD's complex system of accounting and management controls and the numerous options available to DoD for reconditioning, reuse, and sale, make it difficult to determine at what point there is an ''intent to discard'' a particular unused munition. DOD's classification of a munition in one of the various DOD ''demilitarization'' accounts does not, in EPA's view, constitute a decision to discard the material because, pursuant to DoD's practices, such a classification does not necessarily evidence an intent to discard that munition. Ammunition classified as ''Condition Code H'' or as ''unserviceable,'' or in a demilitarization account (such as the Army's Resource Recovery and Disposition Account) for example, may be either returned to service after further review, or in some cases after reprocessing; sold for nonmilitary purposes

or to nations that maintain weapons that utilize these munitions; or otherwise reused, reclaimed, or recycled. Even usable munitions scheduled for disposal may be called back into service, if needed, and thus may still also serve a deterrent purpose. Therefore, in EPA's view, inclusion of a munition in a ''demilitarization'' account or a military determination that a munition is ''unusable'' for its intended purpose does not, by itself, constitute an intent to discard that munition. For these reasons, today's rule does not define stored, unused military munitions as ''solid waste'' subject to Subtitle C, except as provided in paragraphs 266.202(b) (3) and (4).

In EPA's view, the appropriate point at which to consider most unused military munitions to be a solid waste is when the material is finally removed from storage for the purpose of disposal or treatment prior to disposal. In practical terms, this provision means that storage of unused munitions is, for the most part, not subject to RCRA regulation; however, once a munition is removed from a magazine for the purpose of disposal or treatment prior to disposal, it is a solid waste and is potentially regulated under Subtitle C of RCRA. EPA emphasizes that this provision will trigger RCRA coverage only where a decision to treat or dispose of the munition has clearly been made.

In many cases, munitions classified as ''unserviceable'' are removed from storage and sent to central arsenals for evaluation to determine whether they are, in fact, unusable; whether they can be sold for use; whether they can be reconditioned for use; whether they can be recycled or processed for other uses; or whether they should be disposed of. In these cases, the munition is not being shipped for the purposes of treatment or disposal, but rather for evaluation. The munition is to be handled as a waste only if no further evaluation takes place and the decision to destroy has already been made. Similarly, ammunition may be removed from storage for the purpose of reconditioning, recycling or materials recovery without triggering RCRA.

EPA's approach, as supported by many of the public comments, is also based on the recognition that DoD has in place extensive storage and transportation standards that, in providing for explosives safety and security, are also protective of human health and the environment; and that the military Services' safety record in storing and transporting all munitions, including waste munitions, has been good. EPA further believes that there is no compelling environmental or legal reason to establish an earlier point at which unused munitions are a solid waste. The Agency has selected this final approach, in part, because it involves a minimum of interference with the military's established and proven system for managing unused munitions, and it will not conflict with the Services' logistical needs or constraints.

Waste munitions are properly segregated and stored in designated hazardous waste storage areas of the ammunition supply facility and at the HERD facility in accordance with provisions of the existing RCRA Part B permit for EAFB. Munitions for treatment are transported by the generator to the EAFB ODU where treatment is initiated. All treatment is completed the same day, so these items do not sit out at the range or staging area. They are taken from the MSA out to the range and disposed of by OD. These unserviceable/unusable munitions never become

waste through the ADR process. If they are determined to be Waste by the DDA then they would have to be managed as waste throughout the process. The MASO must identify that unserviceable munitions are not Waste Military Munitions (WMM) and the MASO at EAFB does not have the singular authority to categorize unserviceable munitions as waste without DDA final disposition authority. DAFMAN 21-210 Paragraphs 3.12 and 3.13 explains the requirements for disposal.

DAFMAN 21-201, Para 3.12.5. DDA's are designated in writing by the Air Force Munitions Senior Materiel Leader (AFLCMC/EBH) for conventional munitions, and by the Chief, Armament Sustainment Division (AFLCMC/EBW) for missiles. DDAs have final disposition authority. DAFMAN 21-201, Para 3.12.6. Identification of WMM. Units will not identify unused military munitions as WMM unless directed by an Air Force DDA. (T-1). DAFMAN 21-201, Para 3.12.6.1. Only when directed by a DDA to identify a munitions item as WMM, units shall assign CC-V, Unserviceable (waste military munitions) to track WMM from point of generation through final disposition and comply with all applicable environmental requirements. (T-0).

EOD personnel are trained in waste compatibility and characteristics, and each team is briefed on the specific wastes to be treated and handling precautions prior to the beginning of each mission. Waste munitions are physically kept separate from initiating sources. Waste munitions are delivered to the range on a different truck than the one carrying the initiating devices. Upon delivery to the range, the waste munitions and initiating devices are staged for treatment. During the pre-operational safety briefing, the smoking and non-smoking areas are clearly defined. No smoking is allowed during handling of explosives.

No devices were designed or engineered for use in the OD operations, as this ODU is a cleared land area, designated by a metal post in each corner, and approximately 100 ft x 200 ft, where explosive materials are placed on open ground and remotely detonated.

C4 plastic explosives are used to initiate and augment the detonation as required. Over time, a shallow depression has been formed due to the explosive nature of the materials detonated. Craters, artifacts from detonations, vary in dimension from 6 ft x 6 ft x 3 ft deep to 20 ft x 50 ft x 6 ft deep, based on the number and size of ordnance items to be detonated (40 CFR 264.31). The craters are backfilled following a detonation.

Section A.6.c Parameters for Analysis

Residues generated at the ODU consist of:

- Metallic items not containing partially burned/detonated energetic materials
- Metallic fragments containing partially burned/detonated energetic materials

These residue items are visually inspected to determine the presence or absence of energetic materials. Chemical analyses are not needed to make this determination due to the training requirements of the unit operators. If energetic material is visible within the ODU after the completion of the detonation, it will be detonated again that same day within the ODU until no

energetic materials are present. Large metallic fragments (greater than 2-inch x 2-inch) not containing energetic material that remain present after detonation shall be collected and transported to Field 5 for recycling. Munitions and materials disposed of in the quarterly operations vary each time. A disposal plan is devised for each operation to minimize the amount of metallic scrap remaining. Due to the variety of disposal operations, an estimate of fragments remaining cannot be qualified.

Section A.6.d Test Methods

There are no test methods specified in 40 CFR Part 261.23(a) for reactivity. Hazardous waste treated at the ODU exhibits the characteristic of reactivity in accordance with 40 CFR Part 261.23(a)(6) because a representative sample of the waste is capable of detonation or explosive reaction if it is subjected to a strong initiating source or if heated under confinement. No test methods are necessary to demonstrate the characteristics of reactivity.

Section A.6.e Sampling Methods

Sampling of the hazardous waste is not performed because the material meets the characteristic of reactivity (refer to Section A.6.d).

Section A.6.f Frequency of Analysis

Sampling of the hazardous waste is not performed because the material meets the characteristic of reactivity.

Section A.6.g Managing Wastes Generated Offsite

All waste munition items treated at the ODU have been generated at EAFB or any DoD installation in the US with valid support agreements with EAFB. All waste munitions are removed from packaging and containers on site and packaging is recycled back to the originator. Full-up projectile shells are safely disposed of intact as a unit (i.e., they are not disassembled prior to treatment). The only non-DoD wastes generated offsite that are managed at EAFB Range C-62 are those highly unstable items that require emergency treatment to prevent "an imminent and substantial threat of discharge of hazardous waste." Management of these latter wastes is not subject to the RCRA regulations of this section as specified in 40 CFR 264.l(g)(8)(i).

At no time will treatment at the EAFB ODU be allowed for non-DoD offsite wastes or energetic materials not meeting this specific exemption.

Section A.6.h Methods for Additional Waste Analysis

No additional analyses are required to ensure that potentially reactive wastes are managed using safe handling methods (refer to Section A.6.d).

Section A.6.i Off-Site Waste Received

In the rare circumstances when EAFB receives munitions, explosives, and explosive-contaminated items from other military installations, the manifest is reviewed in the same manner in which EOD personnel review AF Form 191’s. EAFB will only accept offsite waste under

emergency situations and in accordance with F.A.C. 62-730.320 *Emergency Detonation or Thermal Treatment of Certain Hazardous Waste* (23 April 2013).

Section A.7 Manifest System, Recordkeeping, and Reporting (40 CFR 264 Subpart E)

This section does not apply to this permit renewal application, per 40 CFR 266.203, Subpart M – Military Munitions. Per 40 CFR Part 266.203(a)(1)(i)-(iv) there are specific conditional exemptions that must be met. Military munitions slated for treatment are transported on approved military manifests by the originating/owning organization to the permitted treatment site. EAFB EOD pre-inspects the manifests and all items scheduled for treatment. EAFB EOD takes possession of all items at the treatment site from the owning organizations. All ADR records are kept on file at EAFB EOD and Eglin's Environmental office for seven years. In accordance with 40 CFR 264.75, a biennial report is included with this permit as **Appendix E**.

Section A.8 Federal Laws Considered (40 CFR 270.3)

The following Federal laws may be applicable to the issuance of this permit renewal:

National Historic Preservation Act

There are no known structures on Range C-62 that are listed or eligible for the National Register of Historic Places. Extrapolation from investigations in other similar environmental zones on EAFB indicate that there is a very low probability of the presence of cultural resources. The type of activities (i.e., bombing) that have been carried out in the last 80 or more years occur only in previously disturbed areas.

Endangered Species Act

Forty-two (42) plant and 17 animal endangered/threatened species are known to thrive in Walton County, FL. Examples of the endangered/threatened animal species found in Walton County include: the red-cockaded woodpecker, piping plover, Okaloosa darter, Choctawhatchee beach mouse, Eastern indigo snake, Gopher tortoise, and 5 turtle species. As shown on **Figure 10**, there are no documented protected species on Range C-62.

Red-cockaded woodpeckers (RCWs) are the only woodpecker species in the southeast to excavate cavities in live pine trees. They require old growth pines for cavity excavation due to the greater presence of heartwood in older trees and prefer longleaf pines in particular, which have a greater incidence of red heart disease and makes cavity construction easier.

The EAFB RCW population is divided into two subpopulations: the eastern subpopulation, which comprises all clusters east of Highway 85, and the western subpopulation, which comprises all clusters west of Highway 85 (**Figure 10**).

The two populations are demographically separate, and each subpopulation is in a different state of health. The western subpopulation is large and increasing. The eastern subpopulation is

smaller and stable but not increasing. It is expected that the RCW population will continue to grow as a result of habitat improvements associated with prescribed fire and forest restoration efforts.

The eastern subpopulation is near Range C-62. However, **Figure 10** indicates that neither the habitat or RCW trees are present within the ODU nor on Range C-62.

It is critical that there is population monitoring of RCW activity, reproduction, and survival as well as habitat monitoring of the status and trends in sandhill habitat available for foraging. Habitat scale monitoring of the status and trends in RCW foraging habitat is accomplished annually through an ecological monitoring program and the following integrated strategies will be used to facilitate population growth and stabilization: cluster rehabilitation (mechanical removal of midstory hardwoods and sand pine), sand pine eradication, hardwood control, thinning of overstocked longleaf pine or slash pine stands, pine plantation management (reforestation), invasive non-native plant control, prescribed burning, artificial cavity construction, and translocation of juveniles.

Section B Containers

Containers are not used at EAFB for OD operations. Therefore, 40 CFR 264 Subpart I does not apply and Sections B.1 through B.7 do not apply.

Section C Tank Systems

Tank systems are not used at EAFB for OD operations. Therefore, 40 CFR 264 Subpart J does not apply.

Section D Surface Impoundments

Surface impoundments are not used at EAFB for OD operations. Therefore, 40 CFR 264 Subpart K does not apply

Section E Waste Piles

Waste piles are not used at EAFB for OD operations. Therefore, 40 CFR 264 Subpart L does not apply

Section F Land Treatment

Land treatment is not used at EAFB for OD operations. Therefore, 40 CFR 264 Subpart M does not apply.

Section G Landfills

Landfills are not used at EAFB for OD operations. Therefore, 40 CFR 264 Subpart N does not apply.

Section H Incinerators

Incinerators are not used at EAFB for OD operations. Therefore, 40 CFR 264 Subpart O does not apply.

Section I Miscellaneous Units (40 CFR 264, Subpart X)

Section I.1 Detailed Description of Units

Hazardous waste treatment by OD is performed at the ODU located at Range C-62.

The ODU is a cleared land area (i.e., free from vegetation), 100 ft x 200 ft and designated by a metal T-post in each corner. Explosive materials are placed on open ground and remotely detonated. C4 plastic explosives are used to initiate and augment detonation. Blasting initiators are transported separately from ADR materials in military EOD vehicles. The Net Explosive Weight (NEW) for any one OD is limited to 3,000 lbs, in accordance with EOD FOI 32-3001 (refer to **Appendix B**). To determine the NEW of a munition, only the weight of the actual explosive material in the munition is weighted and accounted for. The NEW for a specific munition is provided by the Munitions Manager. As an example, a 500-lb bomb that contains 250-lbs of explosive material inside of it has a NEW of 250 lbs. No engineered treatment technologies, pollution controls, or control devices were designed and none are currently employed for use in OD operations at the ODU. Therefore, no engineering assessment as to the adequacy of such technologies or devices is included in this permit application.

Over time, a shallow depression has formed at the ODU due to the explosive nature of the materials detonated. After a detonation, craters are filled in and the surrounding the ODU area is regraded so that it slopes inwards toward the 100 x 200 ft area. EAFB does not bury munitions due to safety concerns.

OD operations are not scheduled or conducted during inclement weather due to safety precautions. If inclement weather is unavoidable, cover is not provided at the ODU; support vehicles are permitted to depart to standby in a safe area.

Following each treatment session, trained EOD personnel clear the ODU to ensure it is free of energetic materials and is MDAS (i.e., scrap metals). Treatment will continue until no energetic material remains. Section A.5 and A.6 of this application addresses the physical characteristics and treatment processes associated with the hazardous nature of the disposed red

Post Detonation Procedures:

Following a test or a series of tests or training requirements, EOD personnel perform maintenance on targets and ranges in accordance with established Air Force procedures identified as DODI 4160.62, and E-OMS 2310-7001. Both of these documents govern the post-detonation steps. The following excerpts are taken from the above referenced documents. The following is a summary of post-detonation procedures:

Inert munitions residue and unserviceable targets deemed MDAS by trained EOD personnel are retrieved and transported to a Range Holding Area (RHA). The RHA will contain scrap materials in single or multiple piles. Management strategies in sorting the material may vary between ranges. All range residues shall be checked for radioactivity prior to removal. Since residue and trash may contain explosives, ignitable residue, Low-Level Radioactive Materials (LLRM) and RCRA managed hazardous wastes, it requires the following handling procedures:

- Segregate, inspect and validate that Material is free of energetic material according to DoDI 4160.62, *Material Potentially Presenting an Explosive Hazard*. MPPEH does not leave the ODU. Continuous treatment occurs until only MDAS remains.
- Screen for LLRM or RCRA regulated material before it leaves the range in accordance with Nuclear Regulatory Commission (NRC), Eglin Air Force Base, and the E-OMS Operations & Maintenance (O&M) contractor radiation protection procedures and plans.
- Temporarily halt processing activities and notify the appropriate function if MPPEH, LLRM, or RCRA materials are suspected or identified.
- Return material rendered non-hazardous back for processing.
- Demilitarize targets, systems, munitions, and equipment in accordance with DoD 4160.28, V3, *Defense Demilitarization: Procedural Guidance* and DoD 4160.21, V1 *Defense Material Disposition: Disposal Guidance and Procedures*.
- Optimize the value of recyclable materials when economically feasible.
- Dispose of all material in accordance with applicable regulations and requirements.

PROCESSING

Eglin will develop work plans to address the work to be performed, procedures to be followed, and the resources necessary and relevant to the accomplishment of the project objectives. Once 96 TW Weapons Safety Office approves the work plan, it shall become the description of work to be performed under this effort. The work plan shall describe the work to be performed in great detail, including demilitarization procedures, safety concerns, and all other pertinent information.

All range residues will be evaluated by handheld radiological equipment before removal from the range. If LLRM are found, segregate and notify the Base Radiation Safety Officer. EOD personnel will evaluate all range residues before processing. Final determination will be certified and validated on a DD Form 1348-1A, Issue/Release and Receipt Document, by a combination of contractor and government EOD personnel or certified contractor team.

Any suspect UXO item shall be assessed by the on-site EOD personnel. If deemed other than inert, and if the item can be safely removed, EOD personnel will safely segregate UXO for treatment. If EOD personnel deem the material unsafe to move, the area will be cordoned off. All UXOs and suspected UXOs must be destroyed on-site by government EOD technicians and will not be moved off-range by the contractor. Once EOD certification and validation has been made, the

contractor must ensure this material is secure in an area where it cannot be contaminated with uncertified/non-validated residue. This material should be identified as MDAS and it is controlled in a manner to prevent comingling of MPPEH or Material Documented as an Explosive Hazard (MDEH). See DESR 6055.09 Edition 1, *Defense Explosives Safety Regulation*.

The process that will demilitarize munitions shall leave them in a condition where they will not be recognizable as munitions. Procedures will also follow DoD 4160.21, V1, *Defense Material Disposition: Disposal Guidance and Procedures* and DoD 4160.28, V3**,** *Defense Demilitarization: Procedural Guidance.* All processed material shall be accompanied by a completed DD Form 1348-1A**,** *Issue/Release and Receipt Document*. All munitions that have been rendered safe and demilitarized shall be secured in an area where it cannot be contaminated with uncertified or non- validated residue. Recyclable materials will be transported to an approved recycling facility for final disposition.

Additional procedures are provided in *Attachment 5/Work Plan 5 of the E-OMS 2310-7001, Removal of Range & Munitions Residue on Eglin Air Force Base Land Test Areas*.

Containerization Procedures: Metallic range residue that has been certified as MDAS is stored in steel roll-off boxes located at Field 5 within a locked chain-link fence. Once MDAS scrap metal is added to the container it is covered with a tarp and locked to ensure that non-MDAS material has not been added. The contractor will then optimize the value of recyclable materials and when economically feasible recycle it through a Defense Logistics Agency (DLA) contract. Metallic range residue is not containerized at the ODU and no containers are utilized at the ODU.

Section I.1.a Alternative Technology Treatment

During the development of this OD permit renewal application, EAFB reviewed the EPA Alternative Treatment Technologies to OB/OD of Energetic Hazardous Waste – Final Report (December 2019). EAFB performed a detailed evaluation on alternative technologies to OD of Energetic Wastes. The full evaluation is provided as **Appendix F**. The intent of the evaluation was to identify, screen, and evaluate the initial feasibility of potential alternatives to OD generated from the research, development, test, and evaluation (RDT&E) mission activities at EAFB using a six-step approach. Please refer to **Appendix F** for the details of the full evaluation. In summary, none of the identified alternative technologies are suited to address EAFB's energetic waste stream. OD remains the safest, most flexible, simplest, and most effective method for treating EAFB's energetic hazardous waste stream, and the only treatment method that does not negatively impact the mission. In addition, EAFB is developing a formal risk assessment to evaluate human and environmental impacts from the ODU. All assumptions concerning treatment frequency, unit operation, and waste stream constituents will be defined and used to establish permit conditions which will ensure the unit is operated in accordance with the environmental performance standards established in 40 CFR Part 264.

Although the evaluation was unable to identify any feasible alternatives to the OD of energetic wastes at EAFB, technology development is far from stagnant. Alternatives to OD are continuously being reviewed at the DoD level for applicability to the military's energetic waste streams. As appropriate alternatives are identified at the DoD level, EAFB will evaluate each for applicability to the EAFB explosive waste stream and coordinate with the DoD Explosives Safety Board (DDESB) accordingly. The EAFB energetic waste stream will continue to be monitored for changes to the energetic waste stream mix that could make alternatives more applicable.

Section I.2 Hydrologic, Geologic, and Meteorological Assessments

Section I.2.a Regional Geology

The following geology discussion is from the *Final Application for RCRA Part B Subpart X Permit, Open Burning/Open Detonation (OB/OD) at Eglin Air Force Base, Florida* (EA Engineering , Science and Technology [EA], 1995a).

EAFB is located in the Gulf Coast Geosyncline, a regional depositional basin which has been receiving sediments since the Jurassic Period (about 200 million years ago). The sediments of the Gulf Coast Geosyncline are approximately 12,000 ft thick at EAFB. The formations underlying the Base tend to dip and thicken to the southwest. The older, deeply buried sediments of the geosyncline consist of evaporates, carbonates, sandstones, and shales of Jurassic through early Eocene age.

The early Eocene sediments are overlain by low permeability shales and limestones of the Claiborne Group. This unit, in turn, overlain by the Ocala Group, a light gray, permeable fossiliferous limestone (*Water Resources of Southern Okaloosa and Walton Counties, Northwest Florida* Barr et. al, 1981). The top of the Ocala Group is an unconformity on which the middle Oligocene Bucatunna Clay (a dark gray, soft silty or sandy clay) was deposited. The Bucatunna Clay is overlain by Oligocene and lower Miocene limestones of the Chickasawhay and Tampa formations. These formations consist of gray, vesicular limestone and dolomite whose pores and fractures have been enlarged through solution (Barr et. al, 1981). The Tampa Formation is overlain by the Pensacola Clay. The Pensacola Clay is a dark gray, hard, micaceous sandy clay, having very low permeability. The Pensacola Clay increases in thickness to the southwest.

The uppermost geologic units at EAFB are surficial sands and gravels of the Plio-Pleistocene Citronelle Formation and Pleistocene terrace deposits. The units unconformably overlie the Pensacola Clay. The Citronelle Formation is a white to tan sand with discontinuous beds of clay, clayey sand, and gravel. The Citronelle is overlain by marine terrace deposits. The terrace deposits consist of fine to coarse, well-sorted, white to tan sand. These deposits cannot always be clearly distinguished from the underlying Citronelle Formation but are generally better sorted with less gravel and very little clay. The thickness of both surficial formations is highly variable due to erosion ranging from approximately 50 to 200 ft thick and generally increasing in thickness to the southwest. A cross-section location map and cross sections A-A' and B-B' showing the

regional geology of EAFB from *Final Application for RCRA Part B Subpart X Permit, Open Burning/Open Detonation (OB/OD) at Eglin Air Force Base, Florida* (EA, 1995a) are displayed on **Figure 11** (plan view)**, Figure 12,** and **Figure 13.**

Section I.2.b Local Geology

Between 1994 and May 2024, the following boreholes and/or wells have been installed in the vicinity of the ODU:

- One (1) pilot hole (C62N) – 1994.
- Nine (9) well screens (MW-94-62-01 thru MW-94-62-05, MW-2021-62-01A, -02A, -03A, -06A) were set within the shallow water table zone – 2021.
- Two (2) well screens (MW-2021-62-04B, MW-2021-62-05B) were set within the last transmissive zone (deep zone) above the Pensacola Clay – 2021.
- Four (4) shallow "Type A" piezometers (i.e., well screens [62-PZ01A; -02A; 04A; and -05A) were set within the shallow water table zone) – 2024.
- Four (4) mid-zone "Type B" piezometers (i.e., well screens [62-PZ01B; -02B; -04B; and -05B) were set within a transmissive zone at roughly the mid-point of the saturated zone) – 2024.
- Five (5) deep zone "Type C" piezometers (well screens [62-PZ01C; -02C; -03; -04C; and -5C) were set within the last transmissive zone (deep zone) above the Pensacola Clay – 2024.

Generally, in the vicinity of the Western Branch, sand of varying grain size (i.e., fine to medium to coarse) is from ground surface to a depth of approximately 34.5 ft below ground surface (bgs). Below the sand, a laterally consistent layer of relatively low permeability silt with minor amounts of fine sand (herein referred to as the "mid-zone silt"), was encountered to a maximum depth of approximately 44 ft bgs. Below the mid-zone silt, the lithology transitions to medium to coarse sand to a maximum depth of approximately 60 ft bgs.

A relatively low permeability yellow/pale brown silt (herein referred to as the lower-zone silt) occurs from 60 to approximately 68 ft bgs. Below about 68 ft bgs, the Pensacola Clay is present. The Pensacola Clay is easily identified by a sharp contact between the overlying yellow/pale brown lower-zone silt, and olive gray to gray, micaceous silt of the Pensacola formation.

Along the Eastern Branch, sand of varying grain size (i.e., fine to medium to coarse) is from ground surface to a maximum depth of approximately 42 ft bgs. Below the sand is the mid-zone silt to a maximum depth of approximately 50 ft bgs. Below the mid-zone silt, it transitions to coarser grained sand (medium to coarse) to a maximum depth of approximately 64 ft bgs. From 64 to approximately 81.5 ft bgs, the lower-zone silt is encountered. Below 80 to 81.5 ft bgs, the Pensacola Clay is present.

Based on the descriptions in the 1994 boring logs (EA, 1995b), the 2021 borings logs (KOMAN Government Solutions, LLC [KGS], 2022), and now the new piezometer logs, the thickness of the Citronelle Formation follows ground surface contours, decreasing from approximately 98 ft bgs near the ODU to 67.8 ft bgs towards the Western Branch, and to 80 ft bgs towards the Eastern Branch.

Updates to localized plan view (**Figure 14**) and cross-sections (**Figures 15** through **18**) have been made based on the new lithology encountered during the installation of the piezometers. The cross-sections also incorporate lithology inferred from the vertical profile (VP) program that is reported in the Phase I VP report (Environmental Assessment Services, LLC [EAS], 2023) and Phase II VP report (EAS, 2024).

Exhibit I-1 below provides a summary of the location, depth, and lithologic description of the lower-zone silt and Pensacola Clay as these layers define the bottom of the shallow aquifer and, along with upward hydraulic gradients, prevent deeper migration of contaminants. As shown in **Exhibit I-1**, the occurrence of the relatively low permeability silt and Pensacola Clay is relatively consistent (i.e., approximately the same elevation) across the site. This is consistent with the depositional history of the unit (i.e., marine-terrestrial).

Exhibit I-1 Lithologic Occurrence of the Pensacola Clay, Range C-62

Location	Ground Surface Elevation (NAVD88)	Lithologic Description	Top of Sample Interval (ft bgs)	Bottom of Sample Interval (ft bgs)	Top of Interval Elevation (NAVD88)
MW-2021- 62-04B	178.3	Lower-Zone SILT, medium pale brown (2.5Y 7/4), low plastic, wet, few mica, few fine grained sand.	80	90	98.3
		Pensacola Clay, medium dense dark gray (5Y 4/1), CLAY, low plasticity, wet some medium plasticity clay, little mica.	90	100	88.3
MW-2021- 62-05B	177.3	Lower-Zone SILT, medium, olive yellow (2.5Y 6/6), moist, little plastic clay, trace mica.	80	89	97.3
		Pensacola Clay, medium, dark gray (5Y 4/1), CLAY, little plastic clay, moist, trace mica.	89	95	88.3
PH-62	185*	Pensacola Clay, medium bluish gray, CLAY, very soft, small stringers of sand present.	98	110	87
PZ-01	157.7	Lower-Zone SILT, yellow (2.5Y 7/6) light yellowish brown (2.5 6/3), moist, trace clay, medium dense.	60	67.8	97.7
		Pensacola Clay, greenish gray (1 GY 5/5), CLAYEY SILT, moist, micaceous, low plasticity	67.8	70	89.9
PZ-02	145.5	Lower-Zone, SILT, yellow (2.5 Y 7/6), trace fine sand, soft wet, non-plastic, micaceous	50	68	95.5

Location	Ground Surface Elevation (NAVD88)	Lithologic Description	Top of Sample Interval (ft bgs)	Bottom of Sample Interval (ft bgs)	Top of Interval Elevation (NAVD88)
		Pensacola Clay, olive gray (5 Y 5/2), SILT, trace fine sand, trace clay, micaceous, wet, soft, non plastic	68	70	77.5
PZ-03	151.2	Lower-Zone SILT, yellow (10 YR 7/8), trace to little fine sand, medium soft, moist, non-plastic, micaceous	55.8	67.5	95.4
		Pensacola Clay, dark gray (5 Y 4/1), SILT, trace to little fine sand, trace clay, micaceous, moist, stiff	67.5	70	83.7
PZ-04	158.2	Lower-Zone SILT, yellow (2.5 Y 7/6), trace fine sand, soft, moist, non-plastic,	64	81.5	94.2
		Pensacola Clay, dark gray (5 Y 4/1) , SILT, little fine sand, stiff to very stiff, micaceous, moist, stiff	81.5	90	76.7
PZ-05	158.6	Lower-Zone SILT, yellow (10 YR 8/8) pale brown (10 YR 6/3), trace fine sand, soft, moist to wet, non-plastic, micaceous	63.5	80	95.1
		Pensacola Clay, dark gray (5 Y 4/1) , SILT, trace to little fine sand, stiff, micaceous, moist, nonplastic	80	85	78.6

Notes:
*denotes ground surface elevation estimated based on Google Earth and topographic maps.
bgs = below ground surface; ft = feet; NAVD88 = North American Vertical Datum 1988; PH = pilot hole

Section I.2.c Soil Conditions

Soil conditions at Range C-62 are defined primarily by Lakeland Sand (Natural Resources Conservation Service Web Soil Survey ([NRCS], 2019) (**Figure 19**). Lakeland Sand is excessively drained, belongs to a very low runoff class, and has a high to very high capacity to transmit water. The typical profile is comprised of very dark grayish-brown crushed, unconsolidated sand grains from 0-3 inches, yellowish brown to pale brown sand from 3 to 64 inches, and pale brown sand with yellowish red iron staining and nodules from 64 to 80 inches. Ponding and flooding are rare due to the soil being so well-drained. Photographs of the ODU are provided in **Appendix A**.

Section I.2.d Hydrogeology

Rainfall is the principal source of water that drives the hydrologic cycle in northwest Florida. Some rainfall percolates through the ground surface to recharge the groundwater and some is lost to the atmosphere through evapotranspiration. In some environments, surface runoff is an additional component of stream flow. However, surface runoff has not been observed at the site, even during, and shortly after, heavy rainfall events. The lack of rainfall runoff is consistent with the characteristics of Lakeland Sand and the result of relatively permeable surface sediments consisting of sand, relatively flat topography, and vegetated surfaces in areas of steeper topography that promote rainfall infiltration. The ODU is regraded following treatment so that

the immediate surrounding area slopes inwards towards the ODU, thus preventing a potential migration pathway.

The Eastern Branch and Western Branch are the two streams in the vicinity of the ODU. Flow is perennial and fed by groundwater inflow. A lack of surface water runoff, the perennial nature of the streams, and shallow piezometers in the stream beds that show an upward gradient, confirm groundwater contribution to the streams. However, the streams intercept only a portion of the groundwater flowing through the aquifer. Stream flow measurements (EAS, 2024, Final Environmental Monitoring Report, February 2024, Open Detonation Unit, Range C-62, Eglin Air Force Base, Florida, June) compared to aquifer flow estimates confirm that only a small portion of groundwater becomes stream flow. The remainder of groundwater flows beath the streams.

The following discussion on hydrogeologic conditions is from the *Final Application for RCRA Part B Subpart X Permit, Open Burning/Open Detonation (OB/OD) at Eglin Air Force Base, Florida (*EA 1995). There are three major drainage basins on the EAFB Reservation in Walton County: Rocky Creek, Basin Creek, and Alaqua Creek. These drainage basins carry surface water in a generally southern direction with discharge into Choctawhatchee Bay, as shown on **Figure 20**. The Alaqua drainage system carries runoff from 12 streambeds which originate in the vicinity of the Range C-62 ODU.

Sediment, approximately 1,500 ft thick, ranging in age from Middle Eocene to Holocene, compose the system of aquifers and confining beds in Walton County. This stratigraphic sequence is divided into six hydrogeologic units which, in descending order, are the Sand and Gravel aquifer (surficial aquifer), the Pensacola Clay confining bed, the Upper Floridan aquifer, the Bucatunna Clay confining bed, the Lower Floridan aquifer, and the Claiborne confining bed (*Hydrology of the Sand-and-Gravel Aquifer, Southern Okaloosa and Walton Counties*, Hayes and Barr, 1983; **Figure 21**)**.** Most of the water used in the Walton County area is derived from ground-water sources with approximately 95 percent from the upper limestone of the Floridan aquifer and 5 percent from the Sand and Gravel aquifer (*Modeling of Ground Water Flow in Walton, Okaloosa and Santa Rosa Counties, Florida,* Barr et al. 1985). From Hayes and Barr (1983), **Figure 22,** and **Figure 23** depict the thickness of the Sand and Gravel aquifer and the thickness of the Pensacola Clay, respectively.

The Sand and Gravel Aquifer in the vicinity of the ODU is not used for irrigation or water supply.

Section I.2.e Meteorological

Range C-62 is in the west central portion of Walton County, Florida, approximately 30 mi east of Pensacola, Florida. The climate of the Pensacola area is moderated by the Gulf of Mexico, which tempers the cold Northers of the winter and creates cool sea breezes during the daytime in summer.

The EAFB/Valparaiso weather station (No 722210) is located on the main base in the south-central portion of EAFB, approximately 4 mi southwest of Niceville, Florida. Station elevation is 85 ftt above mean sea level (msl). The general topography in the area surrounding the weather station is flat. The weather station is approximately 22 mi southwest of Range C-62.

Meteorological data collected at the EAFB/Valparaiso weather station are expected to be representative of the meteorological conditions at ODU. Topography in the region is generally flat, and similar trends in temperature, winds, humidity, and precipitation are expected. Some differences in wind speed and direction are expected at Range C-62 from the weather station due to terrain and localized effects. However, long-term wind data collected at the EAFB/Valparaiso weather station is adequate for evaluation conditions at the ODU.

Additional meteorological and atmospheric conditions will be presented when the new air modeling will be completed with the new human health risk assessment (HHRA) / screening level ecological risk assessment (SLERA) (Section L).

Frequency of Inversions [40 CFR 264.601 (c)(4)]

Inversion frequency for the EAFB area tends to be moderate, with increased occurrence during the winter months. *Low-Level Inversion Frequency in the Contiguous United States* (Holser, 1961) reported that inversions or isothermal conditions based below 500 ft occurred in the Florida panhandle area approximately 25 percent of the time during the summer, and 35 percent of the time during the winter months. However, the light coastal breezes aid in the dispersion of pollutants. The most unfavorable meteorological conditions for pollutant dispersal occur during the months of July and August, when the winds are calmest and average wind speeds are below 3.6 knots (4.1 mph).

Annual and 24-Hour Rainfall Data [40 CFR 264.601 (c)(4)]

Monthly average rainfall for 2024 is shown on **Table 6**. The data are from Weather Underground VALPARAISO EAFB, FL US at an approximate location of Latitude 30.483 / Longitude -86.517. This location is approximately 20 mi southwest of the ODU.

The annual total precipitation for 2024 was 47.30 inches with an annual average precipitation of 3.94 inches. The wettest month in 2024 was July with a total monthly precipitation of 7.73 inches and the driest is December with 0.02 inches.

Seasonal Temperatures [40 CFR 264.601 (c)(4)]

Temperatures recorded at EAFB during 2024 indicated that the annual average maximum temperature was 88 degrees Fahrenheit (°F). The annual lowest average minimum temperature was 78 °F, with an average annual temperature of 72 °F. The hottest month was August with a maximum temperature of 100°F. The coldest month was December with a minimum

temperature of 60 °F. The average daily maximum, minimum, and mean temperatures observed at EAFB are presented in **Table 6.**

Relative Humidity [40 CFR 264.601 (c)(4)]

Due to its proximity to the Gulf of Mexico, the relative humidity is usually high, and typically ranges from 0 - 100 percent throughout the year. The average daily maximum, minimum, and mean relative humidity observed at EAFB is presented in **Table 6**.

Wind Rose [40 CFR 264.601 (c)(4)]

Wind data recorded at EAFB and developed by 14th Weather Squadron Asheville, NC for the 96th Weather Squadron, EAFB, FL, period of record from January 2009 – December 2018. On an annual basis, winds are predominantly from the north and are less than 9 knots (10 mph) in velocity. Mean annual windspeed is approximately 4.8 knots (5.5 mph). Winds are generally from the north and are strongest during the fall and winter months. During the spring and summer winds are lighter in velocity and are generally from the south. Annual and seasonal wind roses showing the frequency of wind direction as a function of wind speed for EAFB are displayed on **Figure 24**.

Section I.2.f Land Use

Land use at Range C-62 is industrial under the North American Industry Classification System (NAICS, 2017) Major Group 97: National Security and International Affairs. Land use is not likely to change in the future.

Range C-62 is restricted to access by unauthorized personnel. Range C-62 is closed to hunting, fishing, and other outdoor recreation activities. A map showing land use in the vicinity of Range C-62 is shown on **Figure 25.** Range C-62 is also bordered to the west and south by an area restricted for use as a ricochet area.

Areas surrounding the range are primarily EAFB reservation lands (3-mi radius from Range C-62). Other land uses beyond the military reservation boundary are primarily forestry and mining with few residences. Hunting and fishing are permitted on much of the EAFB reservation lands but are not permitted at Range C-62 and much of the area surrounding the range. Hunting and fishing areas near Range C-62 is shown on **Figure 26**.

Numerous range roads traverse the military reservation property. These roads are accessible to permitted, non-military personnel, although range gates are located throughout the reservation and the entrances to each of the active bombing/training ranges are blocked during training missions or OD activities. These roads are also blocked at designated locations and monitored by security police and other personnel, as required.

Section I.3 Potential Pathways to Hazardous Waste

An exposure pathway is the route that a chemical or physical substance could take from a source to a potentially exposed population or individual (receptor) and describes the mechanism by which the potential receptor may be exposed to possible chemical or physical substances at or originating from the site. For an exposure pathway to be complete, each of the following elements must be present: source of contamination, release mechanism, receiving media, transport mechanism to receiving media, exposure points, routes of exposure, and a receptor.

The potential exposure pathways at EAFB Range C-62 were described and evaluated in the May 1995 *Final Application for RCRA Part B Subpart X Permit – Open Burning/Open Detonation (OB/OD) at Eglin Air Force Base, Florida* (EA, 1995a), as outlined in Figure III-10: Conceptual Site Model for Exposure Associated with OD Areas at EAFB. That figure is recreated herein as **Figure 27**. The activities at, and land use of, EAFB Range C-62 and vicinity have not changed since development of the 1995 conceptual site model and there are no plans to change the land use in the future. Therefore, **Figure 27** is an accurate representation of the exposure model.

A HHRA was prepared for the OD Operations at Range C-62 in 2019 (LRS Federal, LLC, 2019; attached as **Appendix G**). The HHRA followed guidance outlined in the *USEPA's Risk Assessment Guidance for Superfund: Volume I, Human Health Evaluation Manual, Part A* (EPA, 1989), which is consistent with United States Army Corps of Engineers (USACE) EM-200-1-15: *Technical Guidance for Military Munitions Response Actions* (USACE, 2015), EM 200-1-4: *Risk Assessment Handbook - Volume I: Human Health Evaluation* (USACE, 1999), and other relevant EPA guidance cited throughout the HHRA.

The 2019 HHRA examined HMX and RDX in groundwater. Additional contaminants of potential concern (COPCs) and potential pathways exist and additional assessment activities (e.g, soil sampling, surface water sampling, pore water sampling) were conducted to support an updated HHRA and SLERA (see Section L). When the new HHRA/ERA has been completed (the work plan is currently under review by regulatory agencies as of the writing of this permit application), the permit will be updated to include the new HHRA/SLERA. Refer to Section L of this application for compliance schedule.

Based on the 2019 HHRA, the following general pathway evaluation was developed for the site to determine whether any complete exposure pathways are present. The following elements were evaluated:

- Chemical source: Sources of chemical release are particulates and vapors emitted from OD activities. Sampling of the media at the site has determined that HMX and RDX are the COPCs detected above screening levels at the site (Sections 1.1 and 1.2 of the HHRA).
- Release mechanism: Particulates and vapors are emitted from open detonation activities at the site.

- Receiving media: Media that may become cross-contaminated from the chemical sources (particulates and vapors) may include air, soil, surface water, and foliage.
- Fate and transport in receiving material: The primary transport of the COPCs following detonation activities is deposition onto surrounding soil, surface water, and foliage within Range C-62 and possibly the surrounding areas. The secondary transport of the COPCs is to groundwater.
- Exposure points and routes of exposure: Soil and foliage associated with the ODU are not potential exposure routes to the public. OD activities are conducted on remote bombing/training ranges within the reservation area of EAFB. Access to the range by the public is prohibited, therefore, no exposure pathway exists. The ODU on Range C-62 is remote and more than 9,500 ft from the nearest public-access road and 2.8 mi from the reservation boundary.
- The primary potential exposure point at EAFB Range C-62 is groundwater. RDX and HMX can migrate through subsurface soil and both are moderately to weakly soluble in water. The secondary exposure point is surface water which might receive impacted groundwater.

Potential exposure pathways identified for public exposure were groundwater within Range C-62 and off-site surface water bodies. As part of the HHRA, the Risk Characterization reviewed the likelihood and magnitude of adverse health effects that were estimated for each applicable exposure scenario.

The HHRA identified HMX and RDX in groundwater as the COPCs for the site (Section 1.2 of the HHRA), calculated the exposure point concentrations (EPCs) (Section 1.3 of the HHRA), and utilized BIOSCREEN-AT to model fate and transport of HMX and RDX to estimate concentrations of COPCs in groundwater at the point of contact with downgradient surface water bodies (Section 1.4 of the HHRA). The Human Health Conceptual Model presented in detail in Section 2.1 of the HHRA identifies the following two potential exposure pathways:

- Groundwater Pathway: The ODU is located on Range C-62 and site conditions enable site-related munitions constituents to enter the groundwater system. However, groundwater in the surficial aquifer is currently not used as a potable water supply at EAFB. Therefore, potentially complete exposure pathways at the site include hypothetical future onsite worker exposure to groundwater via future potable wells and hypothetical future onsite resident exposure to groundwater via future potable wells. Exposure to RDX in tap water includes ingestion and dermal contact.
- Groundwater Discharge to Surface Water Pathway: Blount Mill Creek is located downgradient of the ODU plume on Range C-62. Based on BIOSCREEN-AT modeling (Attachment 2 of the HHRA), RDX in surficial groundwater beneath the site has the potential for migration into downgradient surface water bodies. Therefore, additional exposure pathways associated with the site include future recreator exposure to groundwater discharged to downgradient surface water bodies and, although it is highly unlikely, offsite residential exposure to downgradient surface water used as a potable

supply. These hypothetical exposure pathways are more conservative than base personnel occasional exposure during work or training. Exposure to RDX in both tap water and surface water includes ingestion and dermal contact.

Section 4.0 of the HHRA presents the non-cancer hazards and cancer risks for future on-site site workers (Section 4.1), future hypothetical on-site residents (Section 4.2), off-site recreators (Section 4.3), and off-site residents (Section 4.4). As described in the individual sections of the HHRA and presented, all cancer risk estimates, and non-cancer hazard indices were below or within their respective acceptable EPA limits.

The conclusion of the HHRA states: "The HHRA evaluated conservative hypothetical exposure scenarios to err on the side of conservatism and to overstate rather than understate the potential for risk. Estimated cancer risks and noncancer health indices for all receptors were below or within the EPA acceptable risk levels. RDX will not migrate offsite above the Groundwater Cleanup Target Level (GCTL), with the possible exception of groundwater that daylights into the headwaters of Blount Mill Creek downgradient of the ODU at Range C-62. However, mixing with surface water and photodegradation of RDX are anticipated to limit any potential impacts to surface water from this source area. Additionally, since exposure to RDX in the surficial aquifer via a potable use scenario is highly unlikely, comparing modeled concentrations at the point of groundwater discharge (into the downgradient streams) to the FDEP Surface Water Cleanup Target Levels (SWCTLs) provides useful information. Although exposure to surface water is also less likely than assumed in this HHRA, maximum detected concentrations of both RDX and HMX are less than the SWCTLs. Based on these considerations and the results of the HHRA, RDX and HMX in the surficial aquifer at C-62 is unlikely to pose unacceptable risk to human receptors."

Section I.4 Effectiveness of Treatment

Soil sampling at the ODU occurred on three occasions, 1992, 1994, and 2024. Results from the soil analyses are indicative of the effectiveness of treatment by OD. Zero residual COPCs indicates full treatment.

1992 Sampling: Surficial soil samples were taken in 1992. The first set of two soil samples were taken before an OD event took place and the second set of two soil samples were taken immediately after an OD event. The samples were analyzed for reactivity, Toxicity Characteristic Leaching Procedure (TCLP) metals (including mercury), and TCLP volatile and semi-volatile organic compounds (VOCs/SVOCs). None of the parameters were above laboratory detection limits in all four soil samples. In addition, data from post-treatment analyses demonstrated that the OD residue samples are non-reactive (**Appendix H**).

1994 Sampling: Ten surficial and subsurface soil samples were collected and analyzed for target compound list (TCL) SVOCs, explosives, metals, and common anions in 1994. The only compounds detected were 1,3-dinitrobenzene and cadmium (**Appendix H**).

2024 Sampling: Soil sampling was performed April and May 2024. The following is a summary of the results. An expanded summary is provided in Section M.4.c of this permit application. Full details are described in *Final Phase I Soil Sampling Site Assessment Report, April/May 2024, Open Detonation Unit, Range C-62, Eglin Air Force Base, Florida* (EAS, 2024).

A total of 261 soil samples were collected at twenty-nine (29) locations within, and in the vicinity, of the ODU. Samples for laboratory analyses were collected from 0-0.5-ft bgs, 0.5-2 ft bgs, and in 2-ft intervals thereafter (e.g., 2-4 ft bgs, 4-6 ft bgs, 6-8 ft bgs, 8-10 ft bgs) until the water table was reached (either 15 or 16 ft bgs).

Soil samples were analyzed for: perchlorate (EPA SW6850), explosives (EPA SW8330B), VOCs (EPA SW8260D), SVOCs (EPA SW8270E), metals/mercury (EPA SW6010/7470), and general chemistry parameters (ammonia, cyanide, sulfate, sulfide, nitrate, nitrite, chloride, and phosphorus). Polychlorinated biphenyls (PCBs) (EPA SW8082), and dioxins/furans (EPA SW8290) were also sampled at areas suspected to contain the greatest variety and magnitude of potential contaminants (i.e., the locations of former OD craters).

VOCs, SVOCs, PCBs, Dioxins/Furans, and general chemistry parameters were mostly non-detect and below FDEP Residential/Industrial Direct Exposure and FDEP Leachability based on Groundwater Criteria. Perchlorate was detected in nearly every sample at concentrations that ranged from 0.00055 milligrams per kilogram (mg/kg) to 8.02 mg/kg. There are no FDEP criteria for perchlorate, and these concentrations are well below EPA Residential and Composite Worker Direct Exposure Regional Screening Levels (RSLs). There is no Soil to Groundwater RSL for perchlorate.

The following specific exceedances were identified:

FDEP Residential Direct Exposure Exceedances

- 2,4-Dinitrotoluene in five of the samples.
- 2,6-Dinitrotoluene in two of the samples.
- Tungsten in 36 of the samples.
- Copper in six of the samples.
- Arsenic in one of the samples.

FDEP Industrial Direct Exposure Exceedances

- Arsenic in three of the samples.

FDEP Leachability Based on Groundwater Exceedances

- 2,4-Dinitrotoluene in 30 of the samples. 2,4-Dinitrotoluene is not found in groundwater, indicating that leaching is not occurring from soil to groundwater.
- 2,6-Dinitrotoluene in nine of the samples. 2,6-Dinitrotoluene is not found in groundwater, indicating that leaching is not occurring from soil to groundwater.

- 2,4,6-Trinitrotoluene in one of samples. 2,4,6-Trinitrotoluene is not found in groundwater, indicating that leaching is not occurring from soil to groundwater.
- RDX in 18 of the samples. Most of the detection limits were above the FDEP Leachability Based on Groundwater Criteria. RDX is found in groundwater, indicating leaching from soil to groundwater.
- HMX in seven of the samples. HMX is found in groundwater, indicating leaching from soil to groundwater.
- Chromium in 15 of the samples. Chromium is found in groundwater, indicating that leaching is occurring from soil to groundwater.
- Tungsten in 76 of the samples. Tungsten is not found in groundwater, indicating that leaching is not occurring from soil to groundwater.
- Zirconium in 105 of the samples. Zirconium was found in groundwater on two occasions (there is no GCTL for zirconium), indicating that leaching is occurring from soil to groundwater on a limited basis.
- Cyanide (total) in one sample. Cyanide is not found in groundwater, indicating that leaching is not occurring from soil to groundwater.

Phase I Soil Sampling has adequately defined the nature and extent of COPCs in soil within the ODU and immediate surrounding area. The ODU is not a significant source of soil contamination, leachability from soil to groundwater, or a significant exposure risk to human health given the frequency of use, and limited exposure to soils during OD events. These statements will be further evaluated in the updated HHRA/SLERA. OD is an effective treatment method. Headquarters (HQ) EPA recognizes operational ranges are inherently variable with different contaminants based upon the mission. Hence the HQ EPA withdrawal of the Range Rule and the creation of the DoD Operational Range Assessment Program to monitor for contamination with potential to migrate off range. This program includes an assessment of each Range Complex at least once every five years to meet the DoD requirements. When issues are identified, steps are taken to address the contamination to protect both human health and the environment. EAFB's ODU is within the EAFB Range Complex and is included in the assessment process.

Section I.5 General Requirements for Ignitable, Reactive, or Incompatible Wastes

As stated in Section A.4.c.7, EOD personnel are trained in waste compatibility and characteristics, and each team is briefed on the specific wastes to be treated and handling precautions prior to the beginning of each mission. Waste munitions are physically kept separate from initiating sources. Waste munitions are delivered to the range on a different truck than the one carrying the initiating devices. Upon delivery to the range, the waste munitions and initiating devices are staged for treatment.

Section I.6 Closure and Post-Closure Plans

See Section K for this information.

Section I.7 Groundwater Protection

See Section M for this information.

Section I.8 Exposure Information

An Exposure Assessment was included as part of the HHRA submitted to FDEP in 2019. The objective of the assessment was to estimate the type and magnitude of human exposure to COPCs in groundwater with Range C-62, as well as in offsite surface water bodies. This was accomplished by establishing assumptions about the potential for human exposure to groundwater. For COPCs, representative exposure point concentrations were calculated and used to model potential human exposure in the form of daily chemical intakes and dermally absorbed doses (refer to **Appendix G**). However, an updated HHRA/SLERA will be performed that will use more recent and comprehensive data set that will include adding perchlorate and environmental media groundwater, surface water, porewater, soil, and air modeling. Ultimately, once the new HHRA/SLERA has been completed (the work plan is currently under regulatory review as of the writing of this permit application), the results will supplement this permit. Refer to Section L of this application for compliance schedule.

Results from sampling site media and potential exposure pathways can imply the level of risk.. Detailed information is presented in Section M; a summary is provided below:

- Groundwater: A plume of RDX and perchlorate have been identified at the site. The plume is defined as concentrations that exceed the Groundwater Protection Standard (GWPS). Groundwater is not used at the site, therefore no pathway or risks to groundwater exposure exist.
- Surface Water and Porewater: Potential exposure to surface water and pore water are at the Eastern Branch and Western Branch. Surface water RDX concentrations are less than detection limits or well below the FDEP SWCTL of 180 µg/L. RDX in porewater samples are mostly not-detected or detected below the GWPS (10 micrograms per liter [µg/L]), with the exception of two locations, 62-PW02 and 62-PW15. Perchlorate has been detected in surface water. However, SWCTLs have not been developed by FDEP for either freshwater or marine environments. Perchlorate was detected above the GWPS (4 µg/L) within the Western Branch and within the Eastern Branch. The new HHRA/SLERA will determine if exposure to porewater presents risks. There are no human health exposure pathways from porewater.
- Soil: Soil sampling performed in 2024 within the ODU shows that VOCs, SVOCs, PCBs, Dioxins/Furans, and general chemistry parameters were mostly non-detect and below FDEP Residential/Industrial Direct Exposure and FDEP Leachability Based on Groundwater Criteria. Perchlorate was detected in nearly every sample at concentrations that ranged from 0.00055 mg/kg to 8.02 mg/kg. There are no FDEP criteria for perchlorate, and these concentrations are well below EPA Residential and Composite Worker Direct Exposure RSLs. There is no Soil to Groundwater RSL for perchlorate. Other results show that the ODU is not a significant source of soil contamination, leachability from soil to

groundwater, or a significant exposure risk to human health. Current land use is industrial with limited exposure to soils during and shortly after OD events.

- Air: Modeling will be performed as part of the updated HHRA/ERA.

Section I.9 Additional Information

No additional information is provided.

Section I.10 Closure Cost Estimates (40 CFR 270.14(b)(14))

This section does not apply to this permit renewal application. Currently, there are no cost estimates available, because EAFB does not have plans to close the site.

Section I.11 Inspection Requirements (40 CFR 264.15)

Inspections of safety, emergency, and operating equipment of the particular OD treatment area in use for an EOD mission occur both before and after operations at the site. EOD has detailed procedures, personnel safety and responsibility checklists, and emergency procedures. The pre-OD and post-OD inspections are critical to identify and correct deficiencies that may threaten human health or the environment or interfere with the safe progress of the treatment process.

EOD FOI 32-3001, 15 May 2017, Attachment 5 included as part of the Contingency Plan (in **Appendix B**, *Site Inspection Record* pages 55-56) contains a checklist for pre-operation and post-operation inspections, including specific items to be inspected, potential problems for each item, and frequency of inspection. The ODU includes inspection requirements (procedures and schedule) as follows:

- Inspection of physical integrity of unit/treatment device.
- Inspection of secondary containment devices, berms, erosion control devices, etc.
- Inspection of safety and emergency equipment specific to the ODU.
- Inspection for untreated energetic items, UXO, etc.
- Inspection to determine brush fire potential (e.g., vegetation cleared from treatment area and condition of surrounding area).

The ODU will be inspected immediately before and following each use (after the designated cool down period), in addition to regular range inspections performed in conjunction with active bombing/training use of the ranges.

The following inspections are conducted periodically:

- Inspection of the general area (e.g., fences, gates, locks, warning signs, monitoring devices)
- The unit is inspected (regularly) for signs of erosion and other conditions that might result from washouts.
- The condition of the monitoring well casing, cap, and lock should be checked when the well is sampled.

- The integrity of surveyed benchmarks should be inspected regularly

Inspection log sheets contain information such as name of inspector, area/location inspected, specific item inspected, condition of item, problems observed, date and time of inspection, and date corrective action was taken. Inspection log sheets will be retained at the EAFB EOD office (Building No. 914) for three years from the date of inspection.

If inspections reveal that non-emergency maintenance is needed, then EOD personnel will initiate action(s) to preclude further damage and reduce the need for emergency repairs. Where a hazard is imminent or has already occurred, remedial action will be taken immediately. Appropriate authorities will be notified according to the Contingency Plan (**Appendix B**).

No stacks, emission control devices, or associated equipment are present on the ODU.

When wastes are loaded, transported, and off-loaded, the loading and off-loading points and the transportation routes are be inspected for spilled or discarded wastes each day that these activities are conducted.

Section J Containment Buildings

This section does not apply to this permit renewal application, because no containment buildings are used.

Section K Closure

EAFB intends to operate the ODU until it is no longer required, which is expected to be until the Air Force ceases operation at the base. Groundwater monitoring and corrective action (40 CFR Part 264.100) will continue as long as is needed after closure, and until corrective action, if necessary, is completed. Closure activities associated with soil decontamination or removal will be deferred until the ODU and target areas are closed. Under the current rules and guidance, closure may be completed under Hazardous and Solid Waste Amendments (HSWA) corrective action in lieu of 40 CFR Part 264 Subpart G requirements. However, groundwater monitoring, and other monitoring and/or corrective actions on and off the target range will continue.

Section K.1 Closure Plan (40 CFR 264.111)

Section K.1.a Closure of Each Hazardous Waste Unit

Range C-62 will be closed by treating the final volume of hazardous waste, treating the explosive residues generated during the last treatment, and removing all metallic debris from the surface for treatment as scrap or in accordance with applicable regulations. A final round of groundwater sampling will be conducted. Upon removal of contaminated and UXO materials, the ODU will be backfilled and regraded.

Section K.1.b Final Closure of the Facility

Final closure of the ODU will be based on the most effective and practical treatment available at the time of closure. It may consist of removing and/or decontaminating all structures, soil, and

other materials contaminated with hazardous waste or hazardous constituents. The closure process may be phased to provide for the most effective use of labor and equipment to accomplish the tasks. Critical decisions will be made in partnership with FDEP throughout the process regarding subsequent steps, based on analysis conducted during closure to determine the extent of contamination and effectiveness of closure procedures.

Section K.1.c Maximum Inventory of Wastes

The maximum inventory of hazardous waste at the ODU is based on the allowable range limitation on the NEW of unserviceable munitions. The maximum amount of unserviceable munitions accommodated by the ODU at one time is 3,000 lbs NEW per OD event. As previously mentioned, the weight of the actual explosive material in the munition represents the NEW. No wastes are stored or stockpiled at the ODU at any time. Wastes are brought to the ODU at the time that OD activities will be performed. Once the munitions are brought to the ODU, they are treated until they are rendered non-hazardous, metallic debris is collected and then shipped to an approved treatment area. During closure, any remaining hazardous waste at the ODU would be treated and disposed of, as described above. Disposal of any remaining equipment is accomplished through the DLA recycling program.

Section K.1.d Steps to Satisfy the Closure Performance Standard

The first phase of the closure activities will consist of identification and removal of metallic debris and UXO materials. Metallic materials will be forwarded to the DLA for proper handling, storage, and recycling. UXO will be collected for final treatment by detonation.

The second phase of the closure will investigate potential contamination of soil and ground water. Since a regular monitoring plan will be in effect, any contamination at the ODU will have been previously identified. Sampling of groundwater and surface soil will be conducted at three separate intervals during the closure period: immediately preceding closure procedures, during closure, and after closure procedures have been completed. Once the additional assessment activities have been completed, a final Environmental Monitoring Plan (EMP) will be developed detailing sampling analytical requirements, locations, and frequency.

Section K.1.e Other Activities During Closure

A final round of groundwater sampling/analysis for parameters to be identified after the completion of additional assessment activities (Section L) will be performed. Once the additional assessment activities have been completed, a final EMP will be developed detailing sampling analytical requirements, locations, and frequency.

Leachate is not generated at the ODU and therefore, no leachate is anticipated.

Section K.1.f Schedule for Closure

A final round of groundwater sampling/analysis for the Notification of Intent to Close the OD units will be sent to FDEP and the Regional EPA Administrator 180 days before beginning final

closure. Final closure will be supervised and certified by an independent Florida registered Professional Engineer and Florida registered Professional Geologist.

Section K.1.g Trust Funds Sites

This section does not apply to this permit renewal application.

Section K.2 Post-Closure Plan (40 CFR 264.118)

In the event that the ODU needs to be closed, it is anticipated that the soil removal procedures described above (if needed) will result in clean closure. In the event that clean closure is not achieved, the closure plan will be amended at that time to include criteria to ensure that any waste constituents remaining at closure will not cause adverse effects to human health or the environment.

If the ODU has contaminated soil or groundwater that cannot be completely removed or remediated during closure, post-closure care mechanisms will ensure that human health and the environment are protected. Groundwater monitoring, reporting, and other related post-closure care requirements will apply. The groundwater monitoring program that was conducted during the active life of the areas might continue into post-closure. Once the additional assessment activities have been completed, the final EMP will be developed detailing sampling, analytical requirements, locations, and frequency.

At the time of post-closure, the EAFB Installation Restoration Program (IRP) will become the primary point of contact.

Section K.3 Approved Plans

This section does not apply to this permit renewal application.

Section K.4 Application for Closure

This section does not apply to this permit renewal application.

Section L Compliance Schedule

A proposed schedule for achieving compliance with any standards that have not been met in accordance with Rule 62-730.280(4), F.A.C. and 40 CFR 270.14(c)(8)(v) and 270.33 is included in the compliance schedule (**Appendix I)**. The activities that need to be included and that are further described below include; stormwater runoff assessment; installation of additional delineation monitoring wells; conducting sediment sampling; and conducting the air model and HHRA/SLERA.

Additional soil sampling was performed in October 2024 to evaluate whether potential stormwater runoff pathways exist between the ODU and the Western Branch. The report will be provided to FDEP under separate cover. Additional monitoring wells are planned to be installed and are awaiting regulatory approval. Sediment sampling within the streams is proposed as part

of the HHRA/SLERA. A proposed schedule for completing the sediment sampling is provided in **Appendix I**.

An updated air model (deposition/disposition) and HHRA/SLERA are requirements for this permit. A combined air model and HHRA/SLERA work plan (at the time of this permit application) is under review with State and Federal regulatory agencies. Once the work plan is approved, air modeling and the subsequent risk assessment will be performed. The air modeling and risk assessments will evaluate the risks using current air modeling procedures, risk protocols, wastes and hazardous constituents, meteorological and atmospheric data, operations frequency and NEW treatment volumes. The risk assessment will include worst case concentrations of all potential hazardous constituents in waste munitions EAFB expects to treat in the ODU and will carry constituents that are risk-drivers through the actual and potential exposure pathways.

Until the air model is approved, the previous air model performed is in **Appendix J – Emissions Modeling**. In conjunction with discussions with EAFB EOD personnel, representative "worst case" treatment scenarios were developed to characterize potential adverse impacts associated with explosives treatment using OB and OD (OB is no longer utilized and not part of this permit application). A total of eight scenarios for OD were developed. The waste treatment scenarios were used as input data for subsequent air emissions and dispersion modeling. Air pollutant emissions resulting from OD operations were calculated using the POLU13G computer model and mass balance techniques in conjunction with published emission factors. Air pollutant emissions resulting from OD operations are expected to be transported and dispersed beyond the immediate vicinity of the OD ranges. Downwind concentrations were predicted using standard EPA modeling technique (i.e., American Meteorological Society/Environmental Protection Agency Regulatory Model [AERMOD]). The results of the older air model indicated that concentrations were well below standards in all scenarios (i.e., 1-hr, 8-hr, 24-hr; and annual). The currently proposed air model is expected to produce similar results.

A schedule that documents when FDEP is expected to receive the report has been provided in **Appendix I**.

Section M Groundwater Protection

Additional groundwater assessment has been performed including soil sampling, monitoring well and piezometer installations, vertical groundwater profile sampling, surface water and pore water sampling, stream flow measurements, staff gauge installation, and synoptic water level readings. The data collected helps to further refine the conceptual site model, including plume boundaries, and groundwater flow directions, gradients, and velocities. Further groundwater investigations will be conducted to continue to characterize the nature and extent of groundwater contamination.

Section M.1 Interim Monitoring Data

Laboratory analytical data from the lifetime of the current permit is summarized in **Appendix K**.

Section M.2 Identification of Aquifer, Hydrogeology

See **Section I.2** above for a discussion of the area aquifers and hydrogeology. The following is a summary of the information.

The uppermost aquifer in the vicinity of the ODU is the Sand and Gravel Aquifer (also referred to as the surficial aquifer). The surficial aquifer is generally regionally classified as a G-II aquifer, as defined by Chapter 62-520.410, F.A.C. G-II aquifers are suitable for potable water use with a total dissolved solids content is less than 10,000 milligrams per liter (mg/L). The water ranges in pH from 5.0 to 6.9.

Although suitable for potable use, groundwater in the surficial aquifer is not used at EAFB. There are no wells screened within the surficial aquifer within a 4-mi radius of the ODU other than the monitoring wells and piezometers installed for this permit. Lithologic logs and well construction details are shown in **Appendix L**.

The surficial aquifer is underlain by the Pensacola clay, a thick, low permeability confining layer (estimated to be 160 ft thick at C-62). The *Records of Hydrologic Data, Walton County, Florida* (Pascale et al, 1972) presents detailed lithologic logs of cores taken near C-62. The location of Cores W8004 and W8352 and their lithologic logs are included as **Appendix L**. These lithologic logs from these cores help document the thickness and continuity of the confining unit in the area. The Floridan aquifer system behaves as one aquifer over much of its extent (refer to **Figure 8**) and underlies the Pensacola clay but is not hydraulically connected to the surficial aquifer due to the thickness and low permeability of the Pensacola Clay.

At Range C-62, eight borings have been drilled to the top of the Pensacola Clay between 1994 and 2024. Lithologic information from the borings shows that ground surface to the top of the Pensacola Clay ranges from about 50 ft (along the Western Branch) to about 100 ft (in the upland areas). Depth to water in the shallow portion of the aquifer ranges from about ground surface (along the Eastern and Western Branches) to about 20 ft bgs (in the upland areas). The piezometric surface adjacent to the Eastern and Western Branches in deep piezometers and deep zones during vertical profile sampling shows that the piezometric surface is above ground surface. The thickness of the surficial aquifer ranges from about 50 to 80 ft.

The top of the Pensacola Clay and thickness of the aquifer was implied through the installation and sampling of a number of DPT borings installed in 2022 and 2024. Lithologic information was not collected from the DPT borings. However, groundwater sampling purge rates demonstrated the presence of the aquifer and the depth to the top of the Pensacola Clay. No flow and silt filled the sampling equipment at the top of the Pensacola Clay.

The borings show an upper permeable zone and lower permeable zone within the surficial aquifer at Range C-62. The upper and lower zones are separated by a less permeable zone consisting of silt or sand and silt. Site-specific hydraulic conductivity from previous studies was

determined to be 1.8 ft per day (ft/day) and effective porosity was estimated at 0.20 (LRS Federal LLC, 2019).

Following is a summary of information from the *Final Environmental Monitoring Report (EMR), August 2024, Open Detonation Unit, Range C-62, Eglin Air Force Base, Florida (KGS, 2024)*. Groundwater flow directions, gradients, and velocities are as follows:

Shallow Zone (**Figure 28**):

- Groundwater flow generally mimics topography, flowing from higher to lower elevations and toward the Western and Eastern Branches of Blount Mill Creek.
- Hydraulic gradient ranges from 0.022 to 0.063 ft/ft.
- Groundwater velocity ranges from 0.20 to 0.56 ft/day.

Mid-Zone:

- Groundwater flow is toward the southwest.
- Hydraulic gradient is 0.026 ft/ft.
- Groundwater velocity is 0.24 ft/day.

Deep Zone (**Figure 29**):

- Groundwater flow is toward the southwest.
- Hydraulic gradient ranges from 0.017 to 0.026 ft/ft.
- Groundwater velocity ranges from 0.16 to 0.24 ft/day.

A portion of shallow groundwater at the site discharges to the Eastern Branch and Western Branch indicated by the perennial nature of streams, the lack of surface water runoff, the presence of RDX and perchlorate in the streams, and porewater samplers that generally show an upward gradient. The remainder of groundwater flows under the streams based on stream flow measurements versus aquifer flow estimates. Approximately 14 percent of the aquifer discharges to the Western Branch and 6 percent of the aquifer discharges to the Eastern Branch (KGS, 2024).

Additional assessment will be performed as described in **Appendix M**, the EMP. The EMP describes additional plume delineation monitoring well installations and continued groundwater sampling and synoptic water level events. The data collected will assist with the delineation of the lateral and vertical extent of the plumes, and update groundwater flow directions, gradients, and velocities.

Section M.3 Topographic Maps

A detailed well location/topographic map of Range C-62 showing all site improvements and required information as requested in Section M.2 of this renewal application is attached as **Figure 30.** This map shows the locations of all existing monitoring wells.

Section M.4 Plumes of Contamination

RDX and perchlorate form the two groundwater plumes at the site. The plumes are defined by the GWPS, which is 10 µg/L for RDX and 4 µg/L for perchlorate. The RDX plume is shown on **Figure 31**; the perchlorate plume is shown on **Figure 32**. Refer to **Figure 15** through **Figure 18** for cross sectional views of geology and concentrations of RDX and perchlorate. The following information is from *Final Environmental Monitoring Report (EMR), August 2024, Open Detonation Unit, Range C-62, Eglin Air Force Base, Florida (KGS, 2024)*.

RDX PLUME

ODU: RDX concentrations in monitoring wells and the VP borings ranged from non-detect to 78.2 µg/L. The maximum groundwater concentration from all VP borings was measured at the second sample collected at VP07 (24.4 – 27.9 ft bgs). VP07 is approximately 300 ft southeast of the center of the ODU. The highest concentration of RDX was detected in a surface water sample collected within an OD crater (sample ODC-01, 683 µg/L). The crater was subsequently filled in following collection of the sample.

The source of the RDX plume is from operations within the ODU. Some RDX originates from upgradient of the ODU, but upgradient concentrations are less than the GWPS. Concentrations in groundwater are less than the concentration in the former OD crater indicating that dilution and possibly additional attenuation mechanisms are reducing RDX concentrations.

Western Branch: RDX exceeds the GWPS in the upper portion of the aquifer at VP12 and VP13. RDX is detected in VP14 and VP15 but at concentrations less than the GWPS. RDX was detected in VP borings west of the Western Branch, but at concentrations less than the GWPS. The RDX plume migrates southwest of the ODU.

Eastern Branch: Monitoring wells and VP borings southeast of the ODU show concentrations of RDX below detection limits or less than the GWPS. Concentrations of RDX were below detection limits or well below the GWPS at VP17, VP18, VP19, and VP20 which were installed on the east bank of the Eastern Branch to evaluate if COPCs are travelling beneath the Eastern Branch. The RDX plume is limited to the area southwest of the ODU.

Vertical Extent: Concentrations of the RDX in monitoring wells and VP borings show that the RDX plume is limited to the upper portion of the aquifer.

Summary: The source of the RDX plume is the ODU. Some RDX is in groundwater upgradient of the ODU, but at concentrations less than the GWPS of 10 µg/L. The RDX plume migrates to the southwest of the ODU toward the Western Branch. RDX is present in groundwater southeast of the ODU but at concentrations less than the GWPS. The RDX plume is limited to the upper portion of the aquifer.

The downgradient (i.e., southwest) extent of the RDX plume is defined by concentrations that are below detection limits or less than the GWPS at VP22. The southwestern extent of the

groundwater plume is defined by the Western Branch where RDX discharges into the branch. Concentrations of RDX in surface water are significantly less than the Freshwater Surface Water Criteria of 180 µg/L. Some RDX migrates below the branch, but concentrations are less than the GWPS on the west side of the Western Branch.

PERCHLORATE PLUME

ODU: Perchlorate concentrations in monitoring wells and the VP borings ranged from non-detect to 466 µg/L. The maximum groundwater concentration was measured at VP04 (Phase I). VP04 is approximately 1,000 ft southeast of the center of the ODU. The highest concentration of perchlorate was detected in a former OD crater (sample ODC-01, 4,090 µg/L).

The source of the perchlorate plume is from operations within the ODU. Some perchlorate originates from upgradient of the ODU, and concentrations are greater than the GWPS. Concentrations in groundwater are less than the concentration in the former OD crater indicating that dilution and possibly additional attenuation mechanisms are reducing perchlorate concentrations.

Western Branch: The perchlorate plume is present from VP12 (upgradient location) to VP22 (downgradient location) along the east side of the Western Branch. It is present in VP23 which is on the west side of the Western Branch, indicating that the perchlorate plume migrates under the Western Branch. Most of the plume discharges to the Western Branch based on perchlorate detections in the surface water and lack of detections in the shallow intervals at VP23. The highest perchlorate surface water concentration detected during the semiannual sampling event in August 2024 was 3.6 µg/L (EAS, 2024b). Perchlorate surface water CTLs have not been developed by FDEP for either freshwater or marine environments.

The lateral extent of the groundwater plume, as it migrates toward the Western Branch, is not fully defined downgradient of VP22 and downgradient of VP23.

Eastern Branch: The perchlorate plume is present from VP06 (upgradient location) to VP21 (downgradient location) along the west side of the Eastern Branch. It is present in VP18 which is on the east side of the Eastern Branch, indicating that some of the perchlorate plume migrates under the Eastern Branch. Some of the plume discharges to the Eastern Branch based on perchlorate detections in the surface water. Perchlorate surface water CTLs have not been developed by FDEP for either freshwater or marine environments.

Vertical Extent: The vertical extent of the perchlorate plume is from the top of the water table to the top of the Pensacola Clay, dependent upon location.

Summary: The primary source of the perchlorate plume is the ODU. Some perchlorate is in groundwater upgradient of the ODU at concentrations greater than the GWPS of 4 µg/L. The perchlorate plume migrates southwest, south, and southeast of the ODU toward the Western

Branch and the Eastern Branch. The perchlorate plume is present throughout the thickness of the aquifer, from the water table to the top of the silt above the Pensacola Clay.

The southern extent of the perchlorate plume is about 1,700 ft south of the ODU, between VP21 and VP22 (Phase II borings) and VP08 (Phase I boring). Portions of the perchlorate plume discharge into the Western Branch and Eastern Branch. Perchlorate SWCTLs have not been developed by FDEP for either freshwater or marine environments. Portions of the perchlorate plume migrate below the Western Branch (specifically at VP23) and the Eastern Branch (specifically at VP18).

FATE AND TRANSPORT

Plume Attenuation: As contaminants travel though the groundwater system, in general, they are influenced by mechanisms that include dilution, dispersion, adsorption, and biodegradation. RDX and perchlorate are mainly resistant to adsorption and biodegradation. Therefore, the primary fate and transport mechanisms in groundwater are dilution and dispersion.

Dilution, dispersion, adsorption, and biodegradation also apply to contaminant migration through porewater and surface water. Due to the resistance of RDX and perchlorate to adsorption and biodegradation, the primary fate and transport mechanisms in surface water and porewater are dilution and dispersion. Surface water also has aeration and photodegradation as additional mechanisms, as well as phytoremediation.

Attenuation of RDX and perchlorate is demonstrated through comparing the concentrations at the source to downgradient or downstream concentrations. A water sample was collected from standing water located within a former OD crater and designated ODC-01 in August 2022. The concentration of RDX was 683 µg/L; the concentration of perchlorate was 4,090 µg/L. RDX and perchlorate concentrations decrease by a factor of 10 within the groundwater plumes as groundwater approaches the branches. RDX and perchlorate concentrations decrease by a factor of 10 to 100 when in surface water (EAS, 2024a and EAS, 2024b).

Plume Configuration: OD operations in the vicinity of the current configuration of the ODU have been in operation since January 1995, or approximately 30 years (i.e., about 10,900 days). Estimates of groundwater velocity were made for 12 sets of wells and it ranges from 0.16 to 0.56 ft/day. The mean and median velocities are 0.24 ft/day and 0.23 ft/day, respectively.

Using the mean velocity of 0.24 ft/day, the plume would have migrated approximately 2,600 ft from the ODU (i.e., 10,900 days at 0.24 ft/day). However, the extent of perchlorate and RDX from the OD crater to the Eastern Branch and Western Branch is about 1,800 ft. This indicates that the plumes would have reached the Eastern Branch and Western Branch approximately 20 years ago and have been in the vicinity of the branches for about 10 years.

Statistical trend analyses for perchlorate and RDX concentrations in groundwater are described in detail in *Final Environmental Monitoring Report (EMR), August 2024, Open Detonation Unit,*

Range C-62, Eglin Air Force Base, Florida (KGS, 2024). The trend analyses show that groundwater, surface water, and porewater COPC concentrations are either stable, show no trend, are probably decreasing, or are decreasing. The only exception is MW-2021-62-01A where perchlorate shows probably increasing.

Groundwater velocity calculations that show the plumes would have reached the branches about 20 years ago. Plume concentrations are stable, show no trend, probably decreasing, or decreasing trends indicate that the plumes are likely in a steady-state configuration. Alternatives to a steady state configuration are an increasing trend (which would result from the plume not reaching its endpoints or the addition of COPCs to the source area), or a decreasing trend (which would result from elimination of the source area or a mechanism such as biodegradation). Groundwater velocity estimates and COPC concentration trends support a steady-state plume configuration where COPC inputs into the hydrologic system are about equal to dilution and dispersion.

Section M.4.a Vertical and Horizontal Extent of Groundwater Plume

The RDX plume, based on the GWPS of 10 µg/L, is shown on **Figure 31**. The plume originates at the ODU and travels southwestward to where it terminates at the Western Branch. Concentrations of the RDX in monitoring wells and VP borings show that the RDX plume is limited to the upper portion of the aquifer (approximately 28 ft below the water table).

The perchlorate plume, based on the GWPS of 4 µg/L, is shown on **Figure 32**. The plume originates at the ODU and travels southwestward toward the Western Branch and southeastward toward the Eastern Branch. There appears to be an upgradient contribution to the plume, based on concentrations of perchlorate in VP05 and VP11. The perchlorate plume is present throughout the thickness of the aquifer, from the water table to the top of the silt above the Pensacola Clay.

Section M.4.b Surface Water and Porewater COPC Concentrations

The following information is from the most recent sampling results and a summary of information contained in the *Final Environmental Monitoring Report (EMR), August 2024, Open Detonation Unit, Range C-62, Eglin Air Force Base, Florida (KGS, 2024)*.

Surface Water: RDX has not been recently sampled in surface water because it has been below detection limits or well below the FDEP freshwater surface water criteria of 180 µg/L.

Perchlorate was detected at all surface water sample locations within the Western Branch at concentrations ranging from 0.42 µg/L to 3.6 µg/L. Perchlorate was detected at all surface water sample locations within the Eastern Branch at concentrations ranging from 0.36 µg/L to 1.5 µg/L. It was also detected in the sample taken from slightly downstream of the confluence of the Wester and Eastern Branches at a concentration of 1.8 µg/L. Perchlorate SWCTLs have not been developed by FDEP for either freshwater or marine environments.

Porewater: Although not specifically groundwater or surface water, porewater is compared to the GWPS for RDX and perchlorate. RDX concentrations in porewater samples ranged from non-detect to 22.8 µg/L in the Western and Eastern Branches.

Perchlorate concentrations in the Western Branch ranged from 0.55 µg/L to 235 µg/L. Perchlorate concentrations in the Eastern Branch ranged from 0.24 µg/L to 109 µg/L.

Section M.4.c Soil Concentrations

Soil sampling was performed April and May 2024, and is described in *Final Phase I Soil Sampling Site Assessment Report, April/May 2024, Open Detonation Unit, Range C-62, Eglin Air Force Base, Florida* (EAS, 2024). The soil sampling data will be used to support an update to the new HHRA/SLERA.

The following is a summary of the information contained in the report.

A total of 261 soil samples were collected at twenty-nine (29) locations within, and in the vicinity, of the ODU. Of the 29 locations, twenty-three (23) were within the ODU on a 50-foot spacing sampling grid and six (6) locations were outside the ODU on 100-foot spacing. At each location, a soil boring was installed by continuous core sonic drilling techniques.

Borings were advanced using a four-inch diameter core barrel. Samples for laboratory analyses were collected from 0-0.5-ft bgs, 0.5-2 ft bgs, and in 2-ft intervals thereafter (e.g., 2-4 ft bgs, 4-6 ft bgs, 6-8 ft bgs, 8-10 ft bgs) until the water table was reached. Depth to the top of the water table was determined by periodic measurements in a nearby monitoring well and a temporary piezometer installed in a soil boring on the west side of the ODU.

Soil samples were analyzed for perchlorate (EPA SW6850), explosives (EPA SW8330B), VOCs (EPA SW8260D), SVOCs (EPA SW8270E), metals/mercury (EPA SW6010/7470), and general chemistry parameters (ammonia, cyanide, sulfate, sulfide, nitrate, nitrite, chloride, and phosphorus). Polychlorinated biphenyls (PCBs) (EPA SW8082), and dioxins/furans (EPA SW8290) were also sampled at select locations suspected to represent former craters (i.e., areas suspected to contain the greatest variety and magnitude of potential contaminants).

VOCs, SVOCs, PCBs, Dioxins/Furans, and general chemistry parameters were mostly non-detect and below FDEP Residential/Industrial Direct Exposure and FDEP Leachability Based on Groundwater Criteria. Perchlorate was detected in nearly every sample at concentrations that ranged from 0.00055 mg/kg to 8.02 mg/kg. There are no FDEP criteria for perchlorate, and these concentrations are well below EPA Residential and Composite Worker Direct Exposure RSLs. There is no Soil to Groundwater RSL for perchlorate.

The following specific exceedances were identified:

FDEP Residential Direct Exposure Exceedances

- 2,4-Dinitrotoluene in five of the samples.

- 2,6-Dinitrotoluene in two of the samples.
- Tungsten in 36of the samples.
- Copper in six of the samples.
- Arsenic in one of the samples.

FDEP Industrial Direct Exposure Exceedances

- Arsenic in three of the samples.

FDEP Leachability Based on Groundwater Exceedances

- 2,4-Dinitrotoluene in 30 of the samples. 2,4-Dinitrotoluene is not found in groundwater, indicating that leaching is not occurring from soil to groundwater.
- 2,6-Dinitrotoluene in nine of the samples. 2,6-Dinitrotoluene is not found in groundwater, indicating that leaching is not occurring from soil to groundwater.
- 2,4,6-Trinitrotoluene in one of samples. 2,4,6-Trinitrotoluene is not found in groundwater, indicating that leaching is not occurring from soil to groundwater.
- RDX in 18 of the samples. Most of the detection limits were above the FDEP Leachability Based on Groundwater Criteria. RDX is found in groundwater, indicating leaching from soil to groundwater.
- HMX in seven of the samples. HMX is found in groundwater, indicating leaching from soil to groundwater.
- Chromium in 15 of the samples. Chromium is found in groundwater, indicating that leaching is occurring from soil to groundwater.
- Tungsten in 76 of the samples. Tungsten is not found in groundwater, indicating that leaching is not occurring from soil to groundwater.
- Zirconium in 105 of the samples. Zirconium was found in groundwater on two occasions (there is no GCTL for zirconium), indicating that leaching is occurring from soil to groundwater on a limited basis.
- Cyanide (total) in one sample. Cyanide is not found in groundwater, indicating that leaching is not occurring from soil to groundwater.

Phase I Soil Sampling has adequately defined the nature and extent of COPCs in soil within the ODU and immediate area. The ODU is not a significant source of soil contamination, leachability from soil to groundwater, or a significant exposure risk to human health. Current land use is industrial with limited exposure to soils during and shortly after OD events.

Section M.4.d Concentrations of Hazardous Constituents

The nature and extent of hazardous constituents in groundwater, surface water, pore water, and soil are discussed in Sections M.4.a through M.4.c.

Section M.5 Groundwater Monitoring Program (40 CFR 264.97)

The groundwater monitoring plan is part of the EMP and is attached as **Appendix M**. Included in the plan is sampling of groundwater from existing and proposed monitoring wells. Sampling of

surface water and pore water is not included because COCs are either well below standards or standards have not been established.

Frequency of monitoring and analytical parameters are included in the plan. Procedures will follow FDEP's Standard Operating Procedures.

Section M.6 Presence of Hazardous Constituents at Initial Application

This section does not apply to this permit renewal application.

Section M.7 Compliance Monitoring Program (40 CFR 264.99)

EAFB's Compliance Monitoring Program is described in **Appendix M.** The plan includes installation of additional monitoring wells, periodic sampling, and periodic synoptic water level events.

Section M.7.a Wastes Handled at the Facility

Wastes treated at the EAFB ODU are classified as hazardous by the reactivity characteristic of the explosive constituents. Explosive content by weight and type may vary by model. All items are reactive (D003) hazardous wastes and/or toxic due to barium (D005), 2,4-dinitrotoluene (D030), or lead (D008).

Munitions treated by the ODU include serviceable and unserviceable munitions. Serviceable munitions consist of munitions used in military training exercises and specialized weapons testing. These munitions include (but are not limited to) igniters, cartridges, rounds, flares, rockets, smoke canisters, bombs, propellants, and pyrotechnics. Waste generated by the HERD facility consist of (but are not limited to) R&D experimental explosives and traditional explosives. Obsolete and off-specification munitions are assumed to have the same characteristics as serviceable munitions.

See Section A.5 for additional information.

Section M.7.b Characterization of Contaminated Groundwater

The *Final Environmental Monitoring Report (EMR), August 2024, Open Detonation Unit, Range C-62, Eglin Air Force Base, Florida (KGS, 2024)*, provides the most recent characterization of groundwater. The groundwater plumes consist of RDX and perchlorate in excess of the GWPS of 10 µg/L and 4 µg/L, respectively (**Figure 31** and **Figure 32**). A summary of the results is described in Section M.4.

The source of the RDX plume is the ODU. Some RDX is in groundwater upgradient of the ODU, but at concentrations less than the GWPS of 10 µg/L. The RDX plume migrates to the southwest of the ODU toward the Western Branch. RDX is present in groundwater southeast of the ODU but at concentrations less than the GWPS. The RDX plume is limited to the upper portion of the aquifer.

The downgradient (i.e., southwest) extent of the RDX plume is defined by concentrations that are below detection limits or less than the GWPS at VP22. The southwestern extent of the groundwater plume is defined by the Western Branch where RDX discharges into the branch. Concentrations of RDX in surface water are significantly less than the Freshwater Surface Water Criteria of 180 µg/L. Some RDX migrates below the branch, but concentrations are less than the GWPS on the west side of the Western Branch.

The primary source of the perchlorate plume is the ODU. Some perchlorate is in groundwater upgradient of the ODU at concentrations greater than the GWPS of 4 µg/L. The perchlorate plume migrates southwest, south, and southeast of the ODU toward the Western Branch and the Eastern Branch. The perchlorate plume is present throughout the thickness of the aquifer, from the water table to the top of the silt above the Pensacola Clay.

The southern extent of the perchlorate plume is about 1,700 ft south of the ODU, between VP21 and VP22 (Phase II borings) and VP08 (Phase I boring). Portions of the perchlorate plume discharge into the Western Branch and Eastern Branch. Perchlorate SWCTLs have not been developed by FDEP for either freshwater or marine environments. Portions of the perchlorate plume migrate below the Western Branch (specifically at VP23) and the Eastern Branch (specifically at VP18).

Section M.7.c Hazardous Constituents

Groundwater

Groundwater from monitoring wells and vertical profile locations has been analyzed for explosives compounds, perchlorate, target analyte list (TAL) metals (including mercury, tungsten, and zirconium), VOCs, SVOCS, and general chemistry parameters (chloride, cyanide, ammonia (as nitrogen, nitrate), nitrate, nitrite, total phosphorus, total dissolved solids [TDS], sulfate, and sulfide). Monitoring well MW-94-62-05 was also sampled for Appendix IX parameters (KGS/Trinity, 2022). MW-94-62-05 was selected for Appendix IX parameters because it is a well-known contaminated portion within the highest concentrations of the plume.

Results from groundwater investigations shows that, in some monitoring wells, perchlorate, RDX, and aluminum are above their respective groundwater criteria (4 µg/L for perchlorate, 10 µg/L for RDX, and 200 µg/L for aluminum).

Porewater

Porewater has been analyzed for perchlorate and RDX. Porewater analytical results are compared to groundwater criteria for the purposes of the permit. Perchlorate and RDX are above their respective groundwater criteria (4 µg/L for perchlorate, 10 µg/L for RDX) in some of the porewater sampling locations.

Surface Water

Surface water is sampled at the porewater locations and downstream of the confluence of the Eastern Branch and Western Branch. Samples have been analyzed for perchlorate, RDX, and hardness. RDX has never exceeded the FDEP SWCTL for freshwater (180 µg/L) and is no longer monitored. The highest perchlorate surface water concentration during the August 2024 sampling event was 3.6 µg/L. Perchlorate has no FDEP SWCTL. Hardness has no FDEP SWCTL.

Soil

Soil samples within and close to the ODU (i.e., the source of COPCs) have been analyzed for perchlorate, explosives, VOCs, SVOCs, metals, mercury, and general chemistry parameters (ammonia, cyanide, sulfate, sulfide, nitrate, nitrite, chloride, and phosphorus). Polychlorinated biphenyls (PCBs) and dioxins/furans were also sampled at locations suspected to represent former craters (i.e., areas suspected to contain the greatest variety and magnitude of potential contaminants).

Soil sample results were compared to FDEP Soil Cleanup Target Levels (SCTLs) for Residential (0 to 2 ft bgs) and Industrial (2 to 15 ft bgs) Direct Exposure scenarios. Analytical results were also compared to FDEP Leachability to Groundwater criteria.

VOCs, SVOCs, PCBs, Dioxins/Furans, and general chemistry parameters were mostly non-detect and below FDEP Residential and Industrial Direct Exposure criteria and FDEP Leachability Based on Groundwater criteria. Perchlorate was detected in nearly every sample, however, there are no FDEP criteria for perchlorate, and there is no perchlorate EPA Soil to Groundwater RSL.

The concentrations are well below EPA Residential and Composite Worker Direct Exposure RSLs. VOCs, SVOCs, dioxins/furans, PCBs, and general chemistry parameters were either non-detect or below applicable comparison criteria. Additionally, in some samples, arsenic, copper, 2,4-dinitrotoluene, 2,6-dinitrotoluene, and tungsten were above FDEP Residential Direct Contact Exposure criteria, arsenic was above FDEP Industrial Direct Contact Exposure criteria, and HMX was above the EPA Soil to Groundwater RSL; HMX has no FDEP leachability criteria.

Section M.7.d Concentration Limits

The permitted GTCLs for each hazardous constituent is listed below.

Exhibit M-1 – Groundwater Protection Standards

Matrix	Constituent	GWPS (µg/L)
Groundwater	Perchlorate	4
Groundwater	RDX	10

Section M.7.e Groundwater Monitoring System

See Section M.5, and **Appendix M** for this information.

Section M.7.f Sampling and Analysis

See **Appendix M** for the EMP which also contains a Compliance Monitoring Plan. At a minimum, sampling under the Compliance Monitoring Plan will be performed, until a final EMP has been developed and approved.

Section M.8 Corrective Action Program

The need for a corrective action program will be determined after the HHRA/SLERA are completed.

Section M.9 Provisions of Florida Administrative Code 62-4

EAFB will follow the procedures set forth in F.A.C. 62-4 for the renewal application of the existing permit, as well as F.A.C. 62-4.540 that describes the general conditions for all general permits.

Section M.10 Additional Groundwater Monitoring Requirements

Section M.10.a Use of Filters

Filters will not be used when taking groundwater samples. This is included in the EMP/Compliance Monitoring Plan in **Appendix M**.

Section M.10.b Well Construction Reports

Monitoring Well Construction Summary Reports are included as **Appendix L**.

Monitoring wells installed during the early phases of assessment were drilled using hollow stem augers. More recent monitoring wells (beginning in 2021) were installed using sonic drilling techniques. All wells are constructed of Schedule 40 polyvinyl chloride (PVC); no solvent of glue was used. Well screens are mill-slotted with 0.010-inch slots.

Well construction reports for any additional wells that will be installed as part of the assessment activities, will be submitted under a separate environmental monitoring report(s).

Section M.11 Quality Assurance Plan

The quality assurance (QA) Plan is not required. EAFB will follow F.A.C., Chapter 62-160 Quality Assurance for analytical sampling and field activities.

Section M.12 Florida Administrative Code 62-4.0050(3)

This renewal permit application is signed by a Florida registered Professional Engineer and Florida Professional Geologist.

Section N Research, Development and Demonstration

This section does not apply to this permit renewal application.

Section O Exposure Information

This section does not apply to this permit renewal application.

Section P Potential Releases from Solid Waste Management Units

All information for each Solid Waste Management Unit (SWMU) has been submitted and/or discharge modification forms for each are on file with FDEP.

Appendix N includes several overlapping maps showing an updated list of all of EAFB's IRP Areas of Concern and Points of Interest. Two new additional SWMUs have been added, the F-22 crash site, and the F-35 crash site. Both profile sheets have been included in **Appendix N**.

EAFB electronically tracks SWMUs, 90 Day storage facilities, and Satellite Accumulation Areas (SAA) through two different systems. The Enterprise Environmental Safety and Occupational Health - Management Information System (EESOH-MIS) is an electronic database that all HW SAA's and SWMU's data is stored in. EAFB also uses the Android Tactical Assault kit (ATAK) developed by the AFRL, which shows aerial building Imagery, building fire plans, emergency evacuation distances, and SAA waste site information that is pulled from EESOH-MIS. EESOH-MIS data and maps are available for regulatory review during in person inspections.

Appendix N includes several overlapping maps showing an updated list of all of EAFB's IRP Areas of Concern and Points of Interest. Two new additional SWMUs have been added, the F-22 crash site, and the F-35 crash site. Both profile sheets have been included in **Appendix N**.

EAFB electronically tracks SWMUs, 90 Day storage facilities, and Satellite Accumulation Areas (SAA) through two different systems. The Enterprise Environmental Safety and Occupational Health - Management Information System (EESOH-MIS) is an electronic database that all HW SAA's and SWMU's data is stored in. EAFB also uses the Android Tactical Assault kit (ATAK) developed by the AFRL, which shows aerial building Imagery, building fire plans, emergency evacuation distances, and SAA waste site information that is pulled from EESOH-MIS. EESOH-MIS data and maps are available for regulatory review during in person inspections.

Section Q Information Requirements for Solid Waste Management Units

All information for SWMUs has been submitted and is on file with FDEP.

Section R Process Vents

This section does not apply to this permit renewal application.

Section S Requirements for Equipment Leaks

This section does not apply to this permit renewal application.

Section T Boilers and Industrial Furnaces

This section does not apply to this permit renewal application.

Section U Requirements for Drip Pads

This section does not apply to this permit renewal application.

Section X Equivalency Demonstrations

This section does not apply to this permit renewal application.

References

Barr, D.E., Maristany, A., and Kwader, T. 1981. Water Resources of Southern Okaloosa and Walton Counties, Northwest Florida. Water Resources Assessment 81.1. Northwest Florida Water Management District.

Barr et al. 1985. Hydrology of the Sand-and-Gravel Aquifer, Southern Okaloosa and Walton Counties, Modeling of Ground Water Flow in Walton, Okaloosa and Santa Rosa Counties, Florida.

EA Engineering, Science and Technology (EA), 1995a. Final Application for RCRA Part B Subpart X Permit, Open Burning/Open Detonation (OB/OD) at Eglin Air Force Base, Florida.

EA, 1995b. Data Summary Report For Ranges C-52N and C-62, Open Burn/Open Detonation (OB/OD) Units, Eglin Air Force Base, Florida. March.

Environmental Assessment Services, LLC (EAS), 2023. Final Site Assessment Report, Vertical Profile Sample Results, November 2022/January 2023, Open Detonation Area, Range C-62, Eglin Air Force Base, Florida. April.

EAS, 2024a. Final, Site Assessment Report, Phase II Vertical Profile Sample Results, July – September 2024, Open Detonation Area, Range C-62, Eglin Air Force Base, Florida. November.

EAS, 2024b. Final, Final Phase I Soil Sampling Site Assessment Report, April/May 2024, Open Detonation Unit, Range C-62, Eglin Air Force Base, Florida. November.

Hayes and Barr, 1983. Thickness of the sand and gravel aquifer.

Holser, 1961. Low-Level Inversion Frequency in the Contiguous United States.

KOMAN Government Solutions, LLC/Trinity (KGS/Trinity), 2022. Range C-62 Plume Delineation Site Assessment Report, Open Detonation Range C-62, Eglin Air Force Base, Florida. March.

KGS, 2024. Final, Environmental Monitoring Report, August 2024, Open Detonation Unit, Range C-62, Eglin Air Force Base, Florida. November.

LRS Federal, LLC, 2019. Human Health and Risk Assessment, Open Burn/Open Detonation Units, Range C- 52 North and Range C-62, Eglin Air Force Base, Florida, Operational Permit No. 006176-HO-007. February.

Natural Resources Conservation Service Web Soil Survey ([NRCS], 2019).

North American Industry Classification System (NAICS, 2017) Major Group 97: National Security and International Affairs.

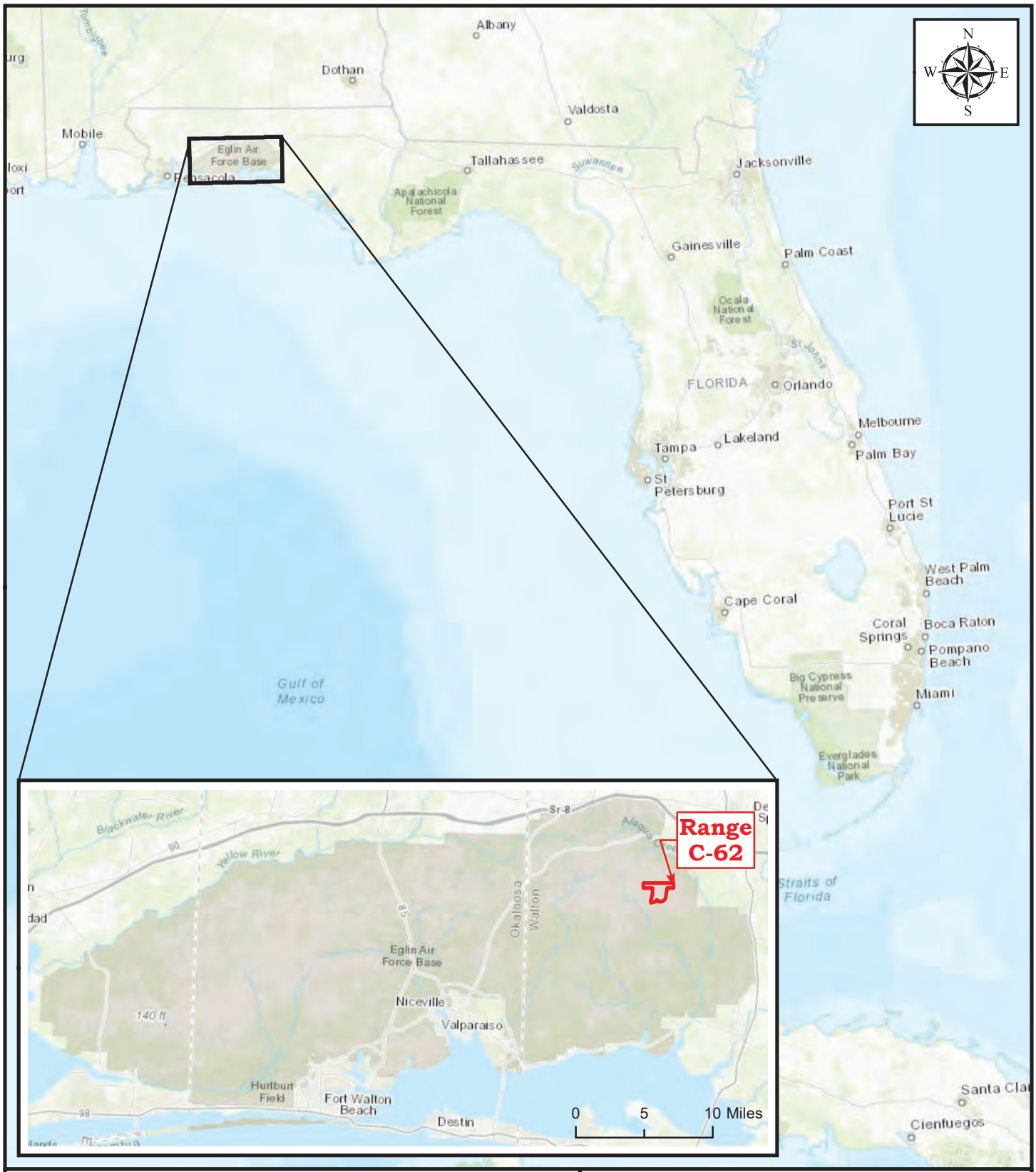
Pascale et al, 1972. Records of Hydrologic Data, Walton County, Florida.

United States Army Corps of Engineers (USACE), 1999. EM 200-1-4: Risk Assessment Handbook - Volume I: Human Health Evaluation.

USACE, 2015. EM-200-1-15: Technical Guidance for Military Munitions Response Actions.

EPA, 1989. USEPA's Risk Assessment Guidance for Superfund: Volume I, Human Health Evaluation Manual, Part A.

Figures



Legend

Range Area

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

Site Location
Range C-62

Range C-62
Eglin AFB, Florida

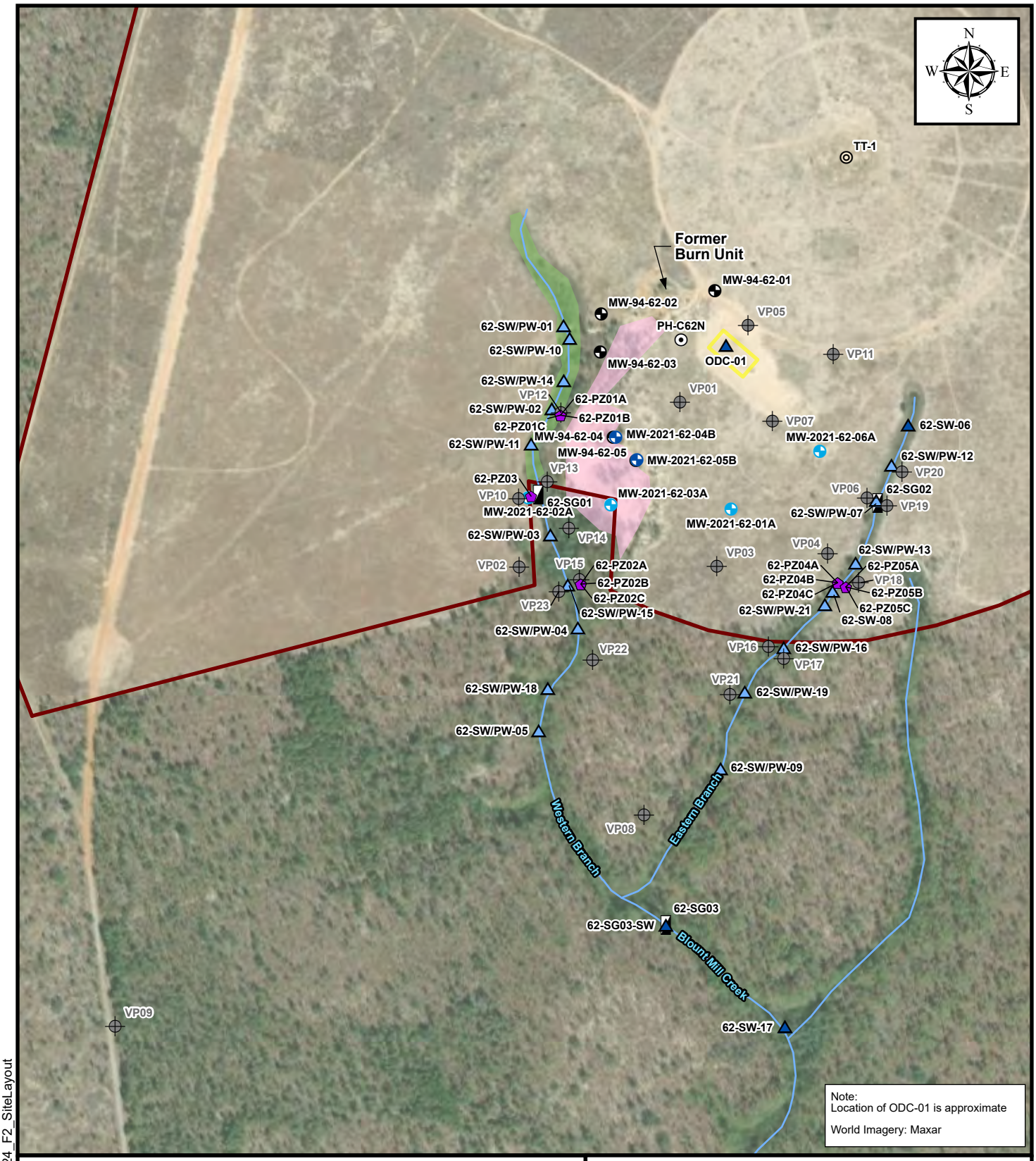
KOMAN Government Solutions, LLC
293 Boston Post Road West, Suite 100, Marlborough, MA 01752

0 40 80
Miles

Date: 02/05/2025

Figure 1

File: EglinAFB_F1_Site.mxd



Legend

- Deep Wells Installed by KGS
- Shallow Wells Installed by KGS
- Monitoring Well Installed by Others
- Pilot Hole
- Newly Installed Staff Gauges
- Newly Installed PZs - May 2024
- Bombing Target
- Surface Water / Porewater Location
- Surface Water Location
- Vertical Profile Location
- Seepage Bog
- Erosion Impact Area
- Open Detonation Unit (ODU)
- Range C-62 Boundary

Site Layout
Range C-62

Open Detonation Unit
Eglin AFB, Florida

KOMAN Government Solutions, LLC
293 Boston Post Road West, Suite 100, Marlborough, MA 01752

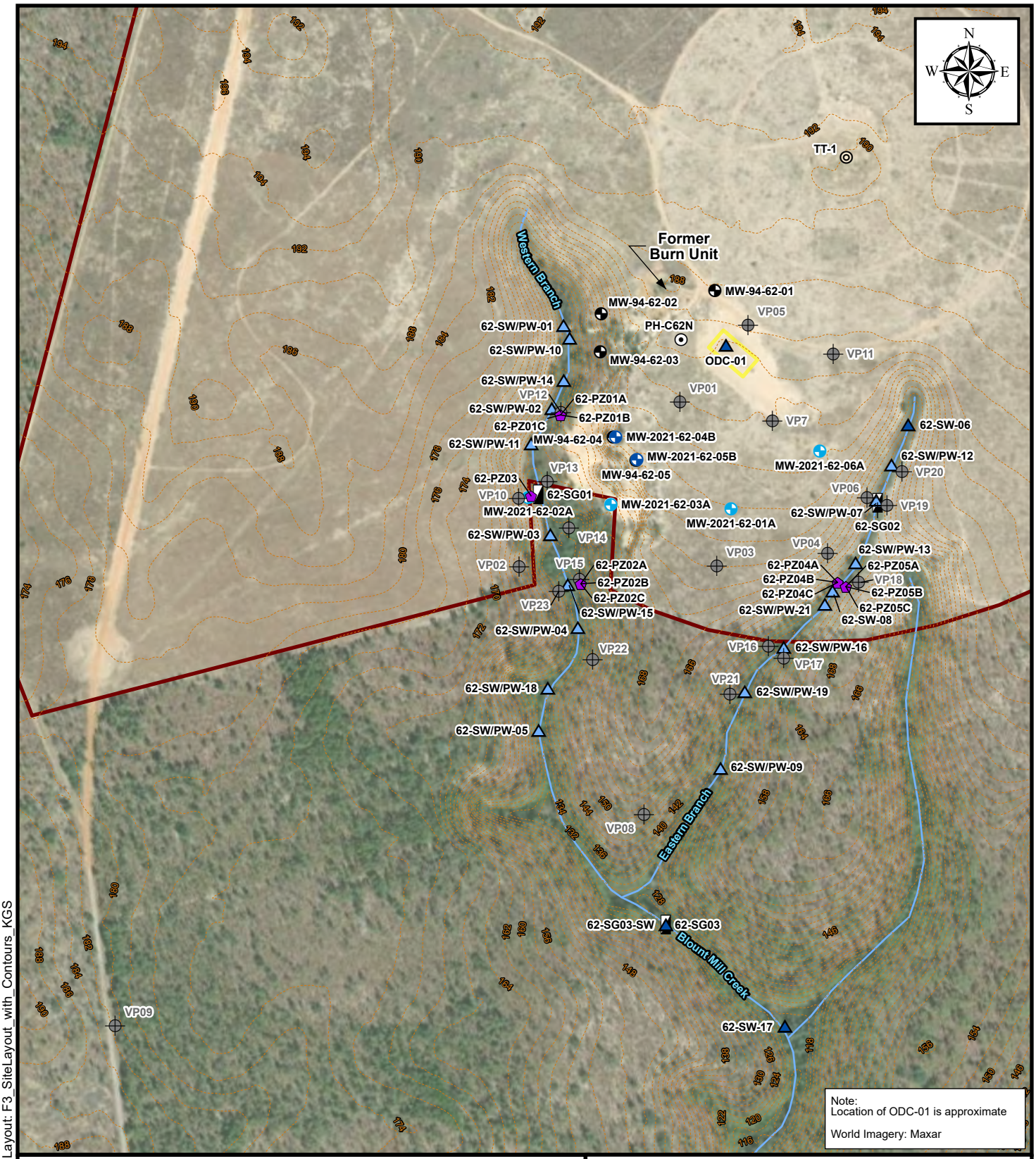
0 300 600
Feet

Date: 02/06/2025

Figure 2

EAS Environmental Assessment Services
Wholly Owned Subsidiary of Natives of Kodiak

File: 0524_Eglin.aprx Layout: 1224_F2_SiteLayout



Legend

- Deep Wells Installed by KGS
- Shallow Wells Installed by KGS
- Monitoring Well Installed by Others
- Pilot Hole
- Newly Installed Staff Gauges
- Newly Installed PZs - May 2024
- Surface Water / Porewater Location
- Surface Water Location
- Vertical Profile Location
- Bombing Target
- Open Detonation (OD) Unit
- Range C-62 Boundary
- LIDAR Contour North Central (Walton County, Florida) Contour Interval = 2 feet World Geodetic System of 1984 (WGS84) vertical datum

Local Topographic Contours
ODU, Range C-62

Open Detonation Unit
Eglin AFB, Florida

KOMAN Government Solutions, LLC
293 Boston Post Road West, Suite 100, Marlborough, MA 01752

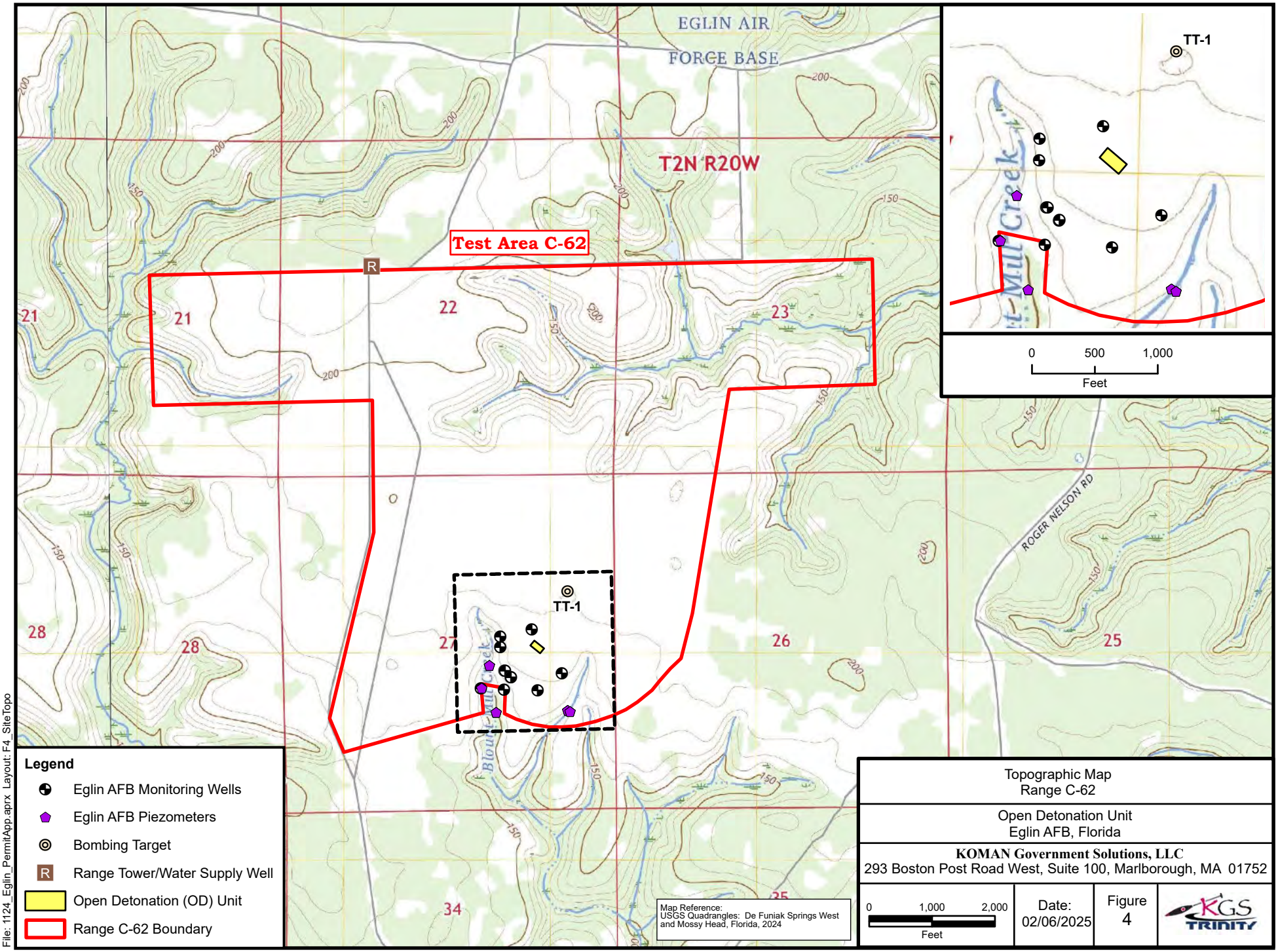
0 300 600
Feet

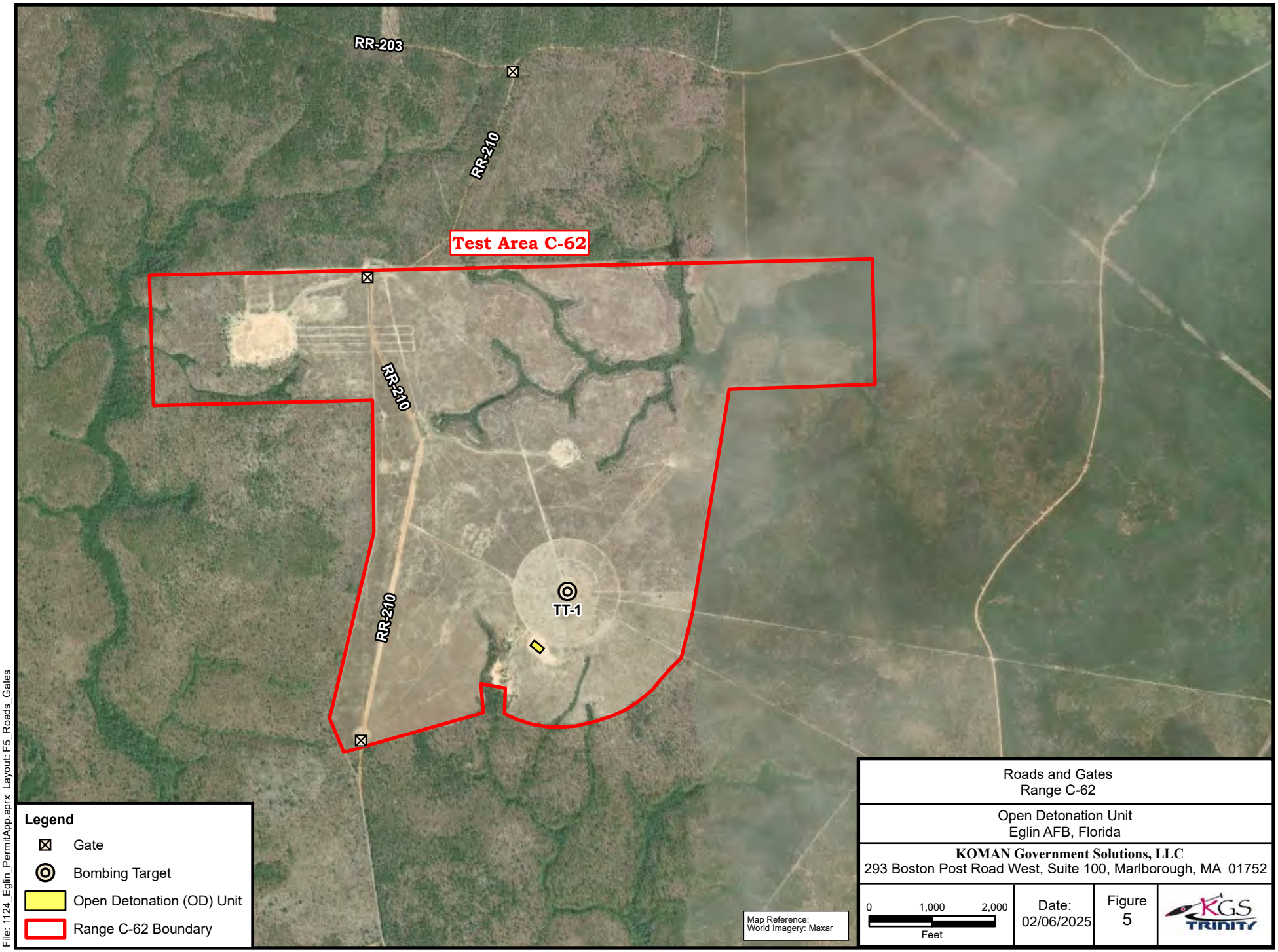
Date: 12/19/2024

Figure 3

KGS

File: 1124_Eglin_PermitApp.aprx Layout: F3_SiteLayout_with_Contours_KGS


EGLIN AIR
FORCE BASE
T2N R20W
Test Area C-62
TT-1
ROGER NELSON RD
Blount Mill Creek
Mill Creek
0 500 1,000
Feet
Legend
Eglin AFB Monitoring Wells
Eglin AFB Piezometers
Bombing Target
Range Tower/Water Supply Well
Open Detonation (OD) Unit
Range C-62 Boundary
Map Reference:
USGS Quadrangles: De Funiak Springs West and Mossy Head, Florida, 2024
0 1,000 2,000
Feet
Topographic Map
Range C-62
Open Detonation Unit
Eglin AFB, Florida
KOMAN Government Solutions, LLC
293 Boston Post Road West, Suite 100, Marlborough, MA 01752
Date:
02/06/2025
Figure
4
KGS TRINITY
File: 1124_Eglin_PermitApp.aprx Layout: F4_SiteTopo


RR-203
RR-210
Test Area C-62
RR-210
RR-210
TT-1
Legend
Gate
Bombing Target
Open Detonation (OD) Unit
Range C-62 Boundary
Map Reference:
World Imagery: Maxar
0
1,000
2,000
Feet
Roads and Gates
Range C-62
Open Detonation Unit
Eglin AFB, Florida
KOMAN Government Solutions, LLC
293 Boston Post Road West, Suite 100, Marlborough, MA 01752
Date:
02/06/2025
Figure
5
KGS
TRINITY
File: 1124_Eglin_PermitApp.aprx Layout: F5_Roads_Gates

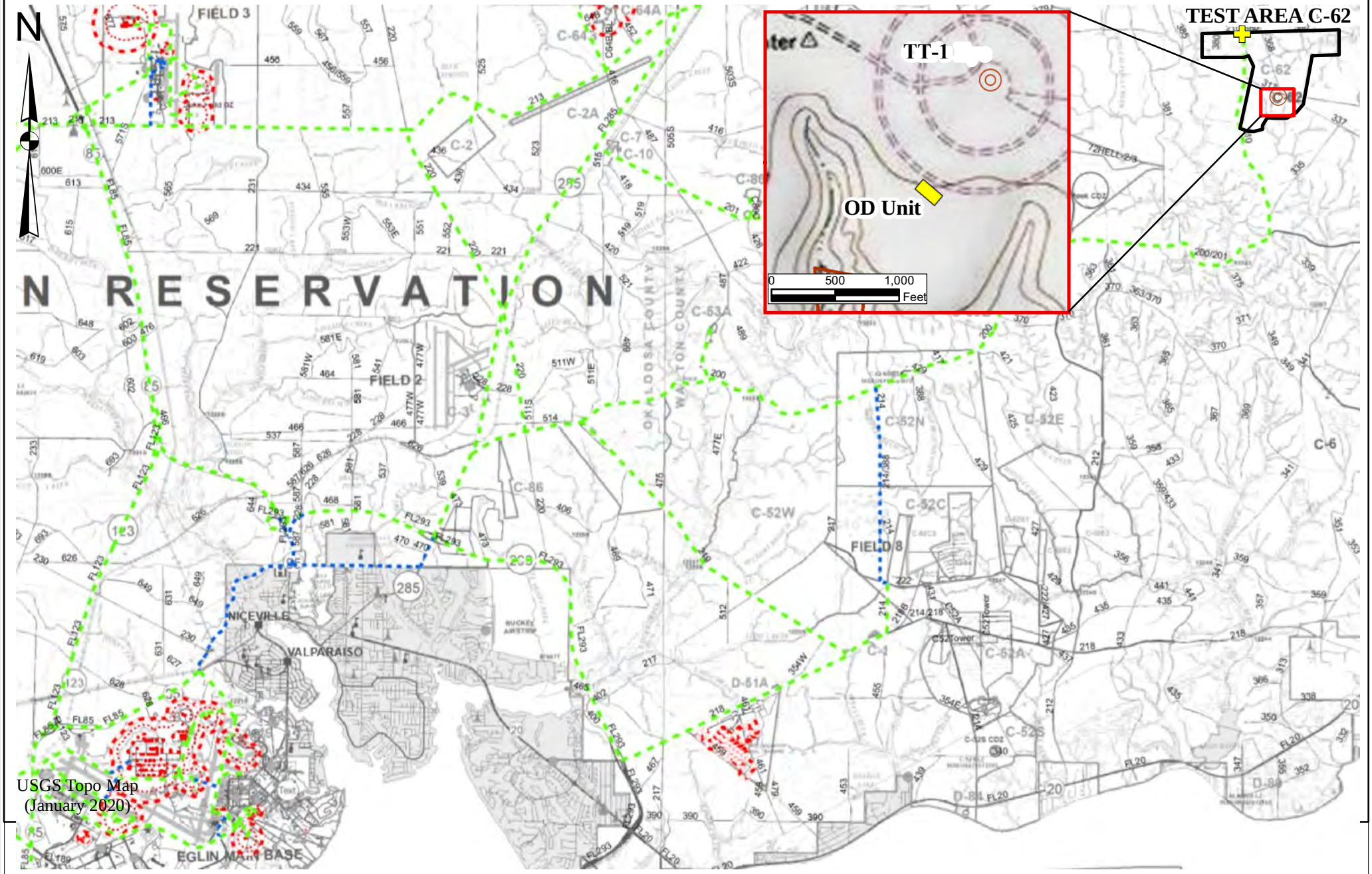


FIGURE 6
EXPLOSIVE TRANSPORTATION ROUTE

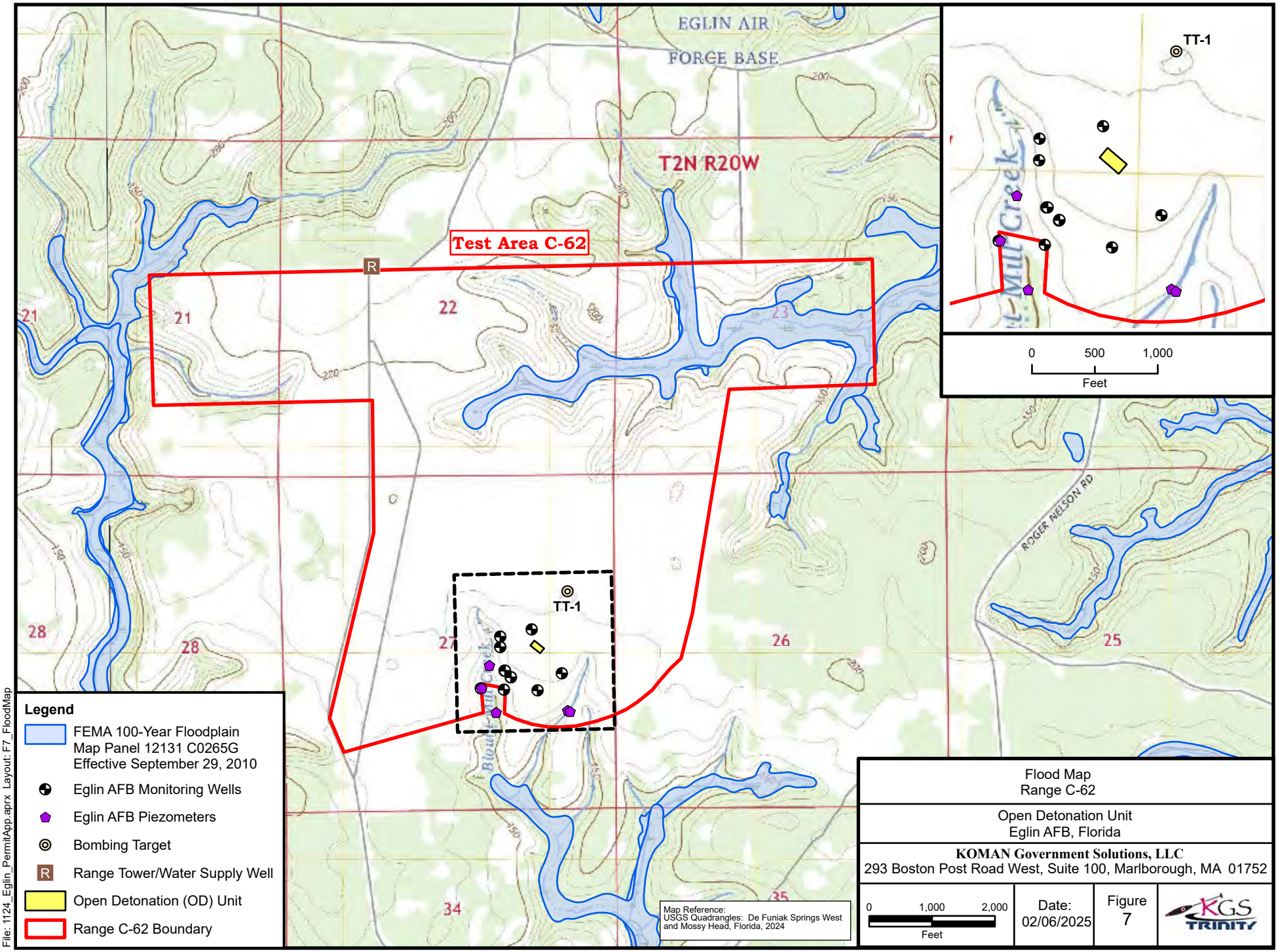
Test Area C-62
Eglin AFB, Florida

96TH CIVIL ENGINEER GROUP

1 0.5 0 1 2 3 Miles

- Primary Transportation Route
- Alternate Transportation Route
- Quantity Distance Arcs for Ammunition Safety
- Open Detonation (OD) Unit
- Range Tower

TT-1 demarks the location of the Bombing Target



Flood Map
Range C-62

Open Detonation Unit
Eglin AFB, Florida

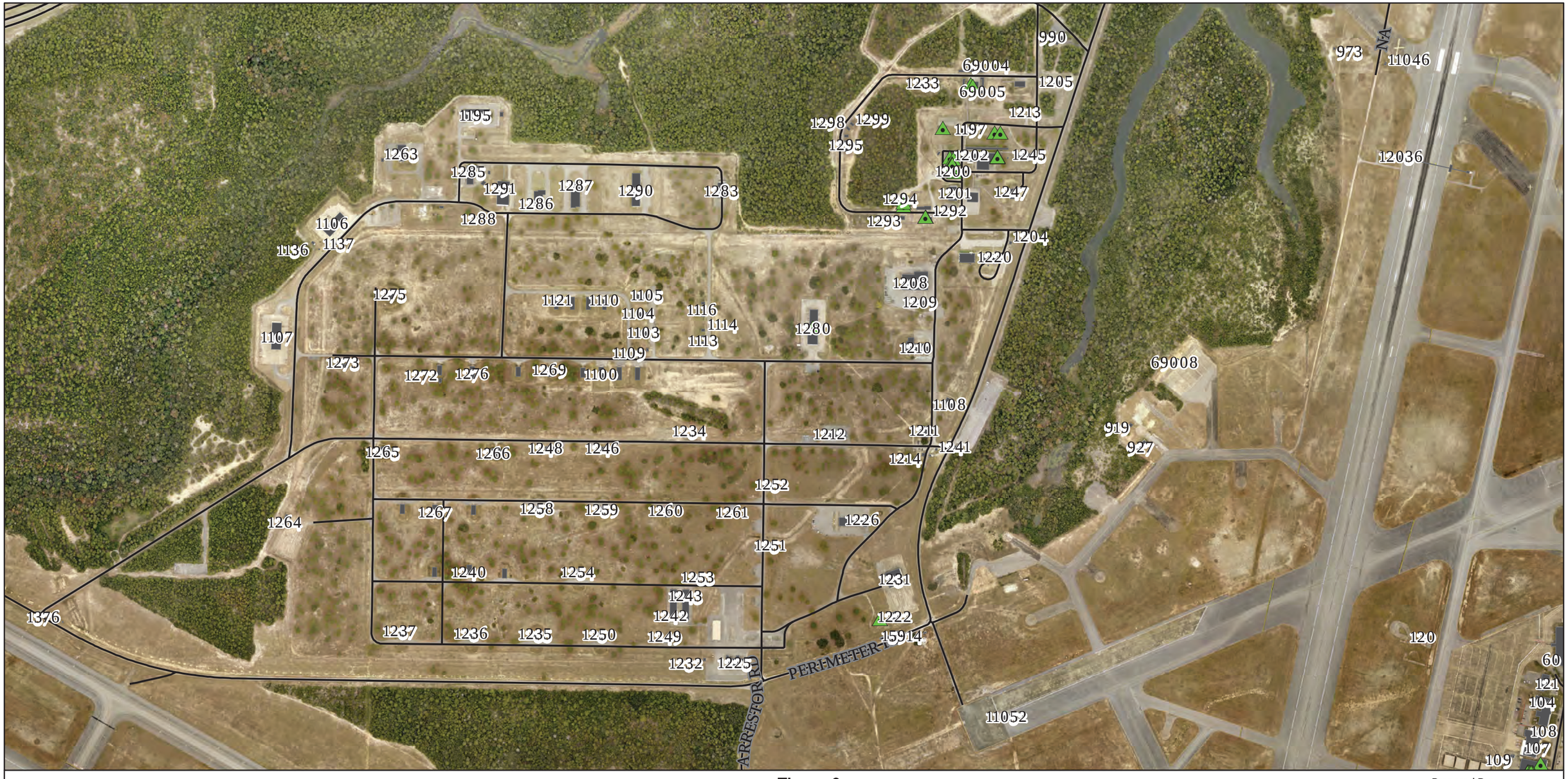
KOMAN Government Solutions, LLC
293 Boston Post Road West, Suite 100, Marlborough, MA 01752

Date:	Figure
02/06/2025	7

File: 1124_Eglin_PermitApp.aprx Layout: F7_FloodMap

FIGURE 8
AERIAL EXTENT OF
FLORIDAN AQUIFER

Open Detonation (OD) Unit
Eglin AFB, Florida



Haz Waste Site

Building

Road Centerline

Figure 9

HERD Facility Hazardous Waste Locations

EGLIN AIR FORCE BASE

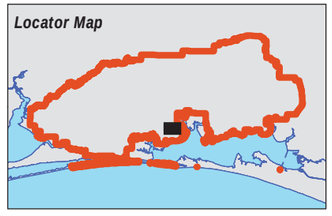
Scale: 1:9,000

Coordinate System: WGS 1984 World Mercator

0 1,000 2,000 Feet

N

Locator Map



Prepared By:
Casper Blossom
CSU-CEMML GIS Analyst
casper.blossom.ctr@us.af.mil 2283433838

Last Save Date: 12/10/2020

Cooperative Agreement Number:
W9126G-14-2-0018 -
W9126G-20-2-0004

Map created for presentation purposes only. Although efforts have been made to verify data, accuracy cannot be guaranteed

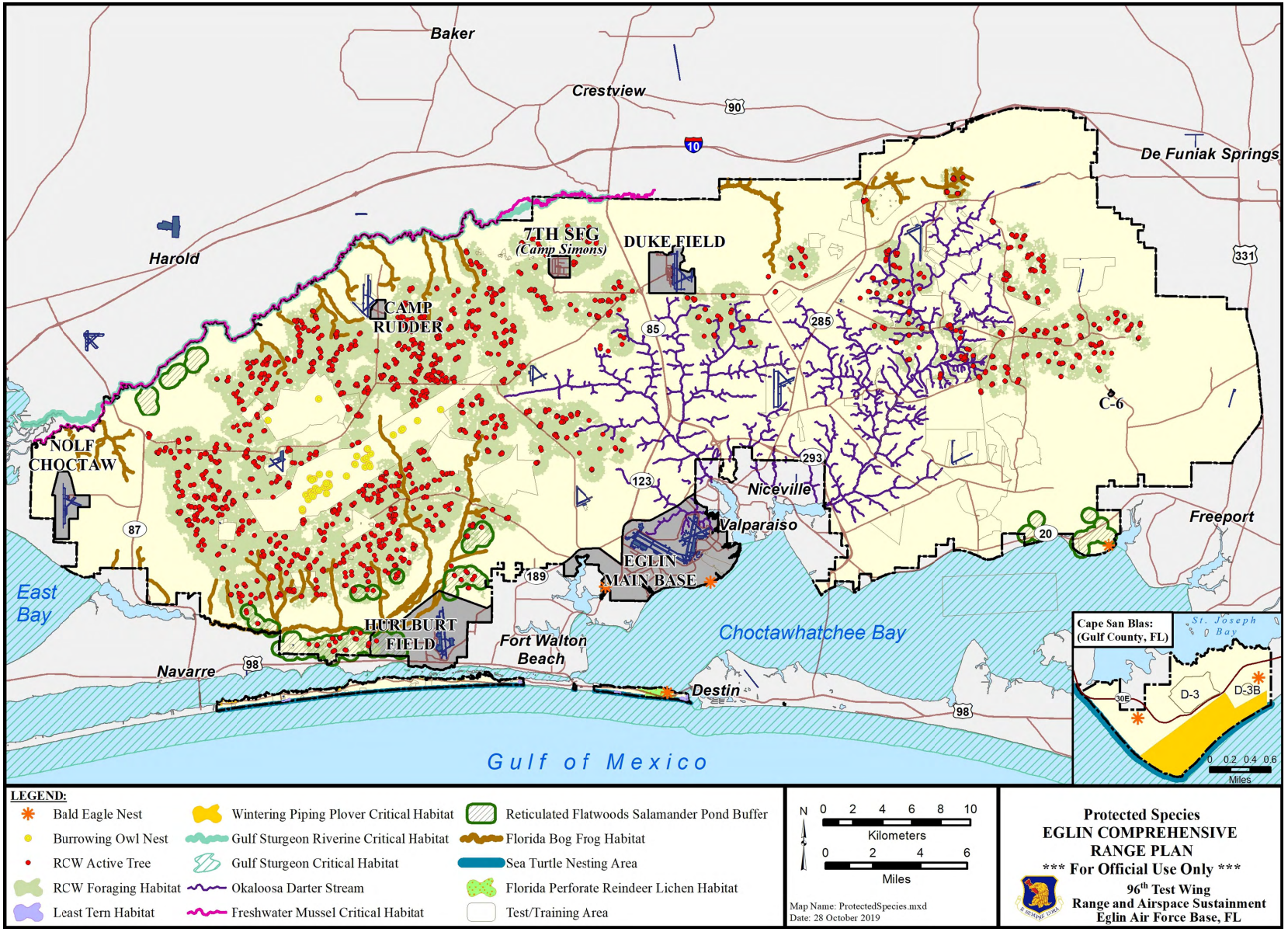
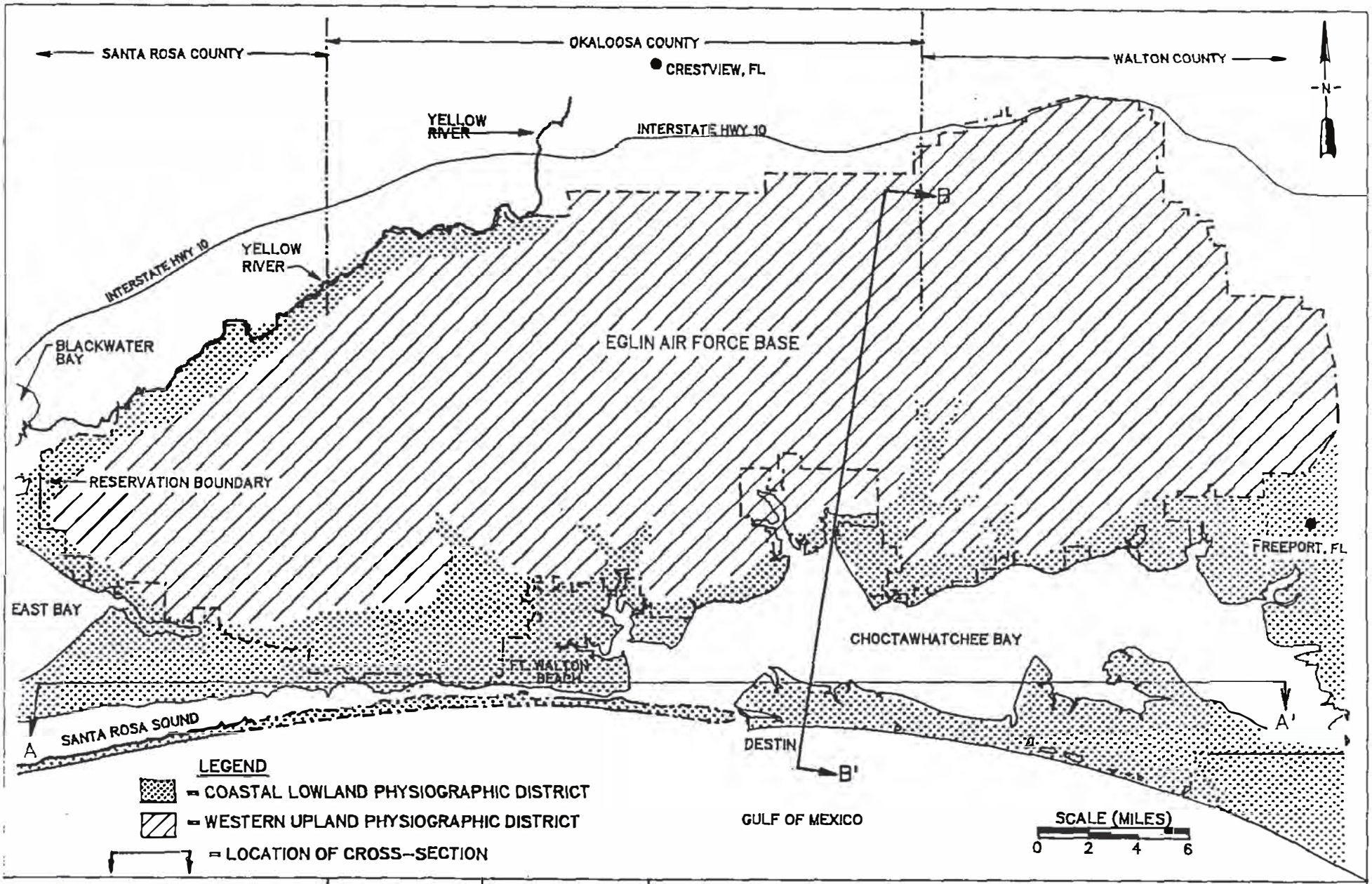
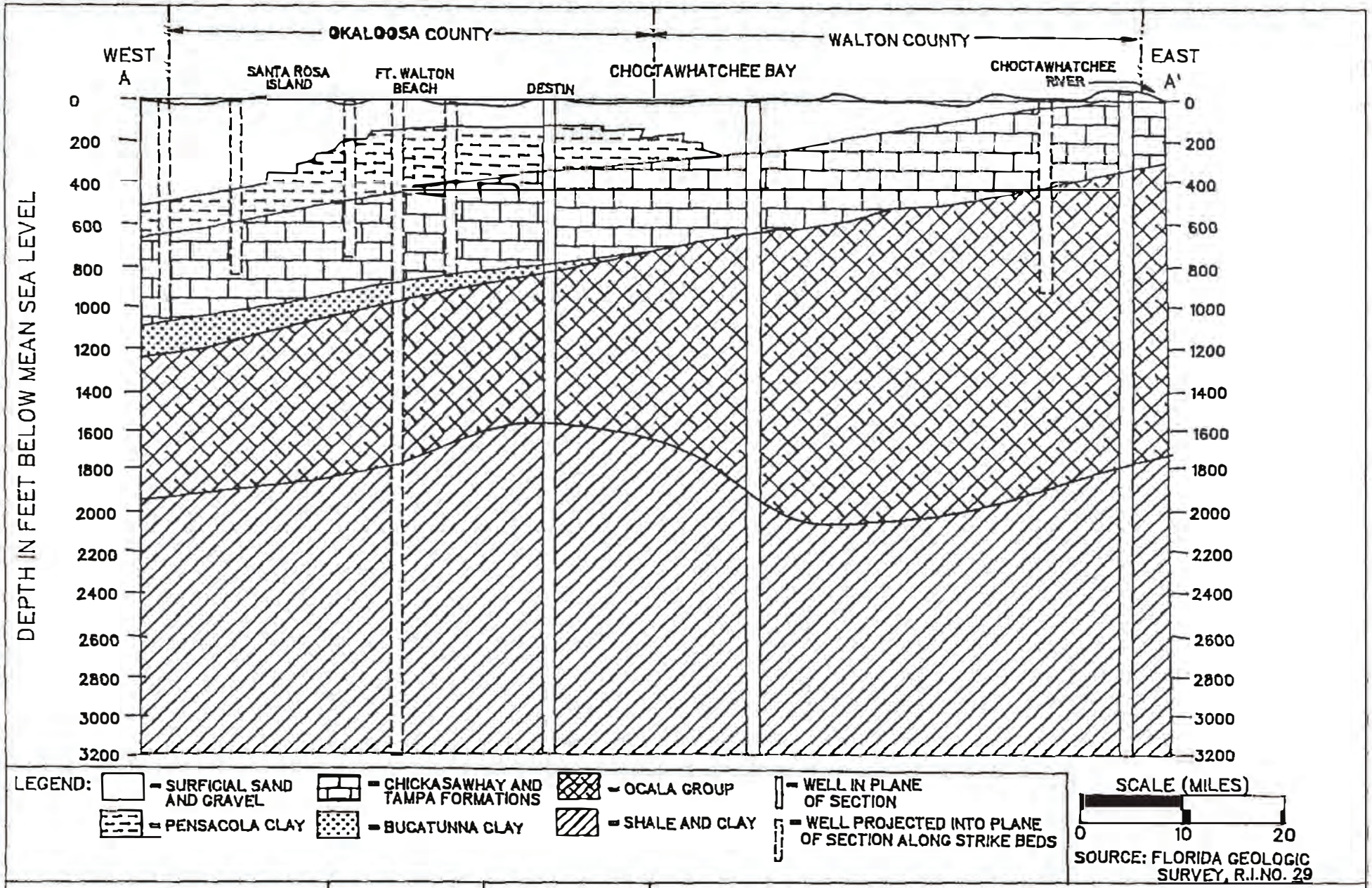


Figure 10. Protected Species on the ETTC



EA ENGINEERING, SCIENCE, AND TECHNOLOGY, INC.	DATE: JUNE 1992	PROJECT-TASK #: 11206.25-0403
	REVISED:	FILE: EGLIN3

Figure 11 Physiographic Provinces Showing Locations of Cross-sections. Eglin Air Force Base, Valparaiso, Florida.

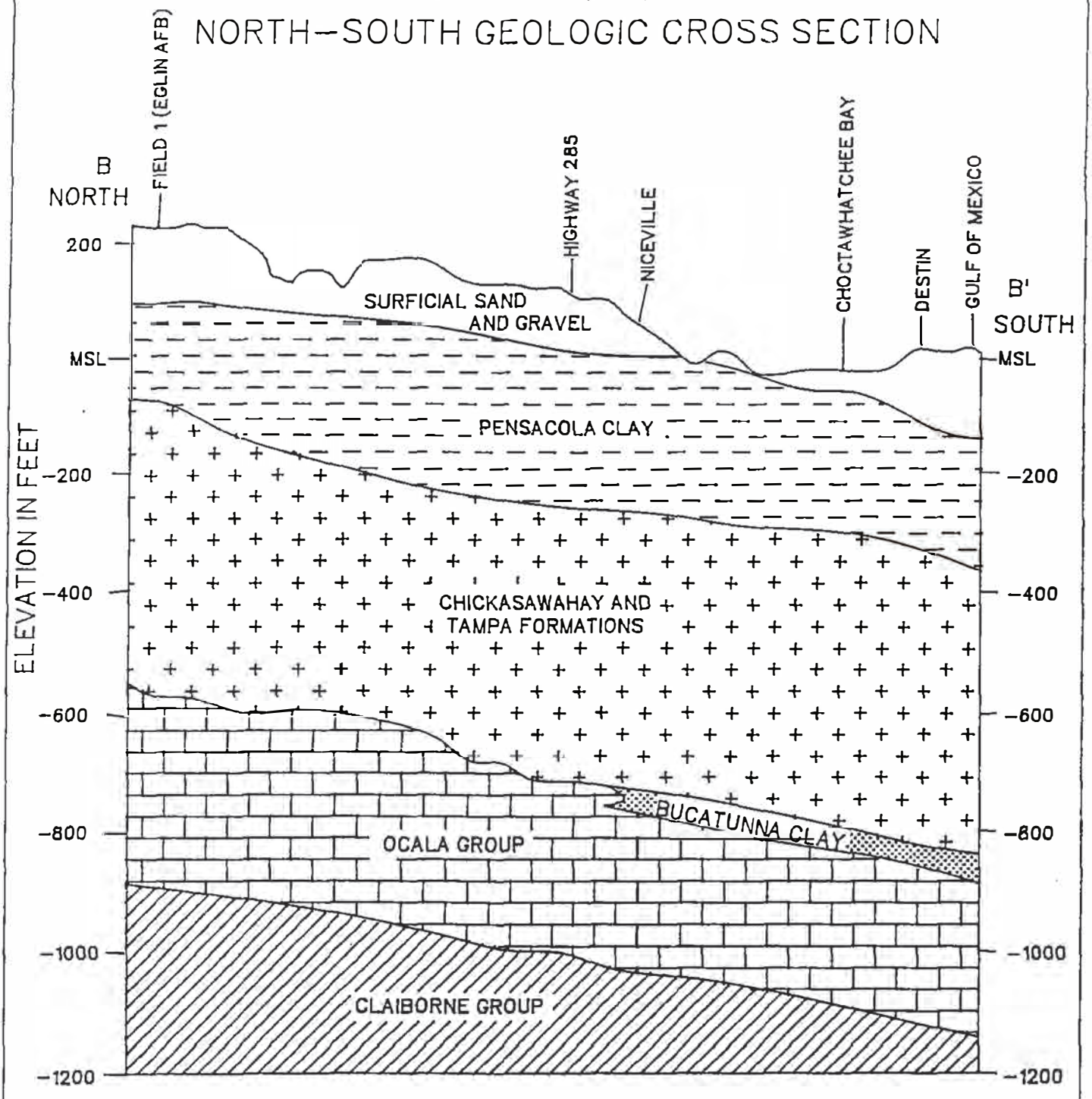


EA ENGINEERING, SCIENCE, AND TECHNOLOGY, INC.	FILE: XSECTA	DATE: 8 JUNE 92
	LAYERS USED: 1,20	PROJECT #: 11206.25

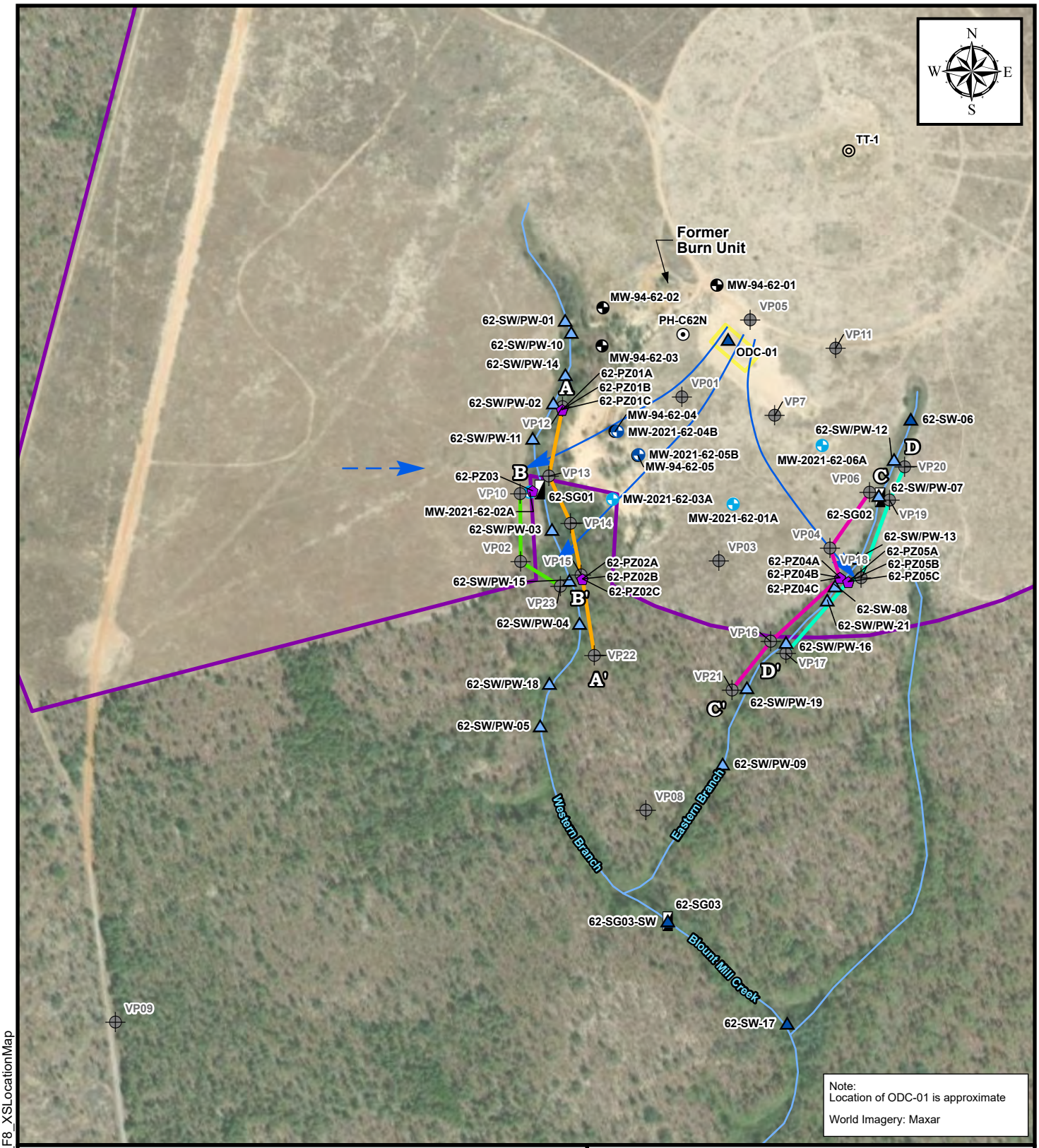
Figure 12 Regional Geologic Cross-section A-A'. Eglin Air Force Base, Valparaiso, Florida.

EGLIN AIR FORCE BASE

NORTH–SOUTH GEOLOGIC CROSS SECTION



EA ENGINEERING, SCIENCE, AND TECHNOLOGY, INC.	FILE: XSECTB	LAYERS: 1,20	**Figure 13 Regional Geologic Cross-section B-B'. Eglin Air Force Base, Valparaiso, Florida.**
	DATE: 2 JUNE 92	PROJECT #: 11206.25	



Legend

- Vertical Profile Location
- Deep Wells Installed by KGS
- Shallow Wells Installed by KGS
- Monitoring Well Installed by Others
- Newly Installed PZs May 2024
- Pilot Hole
- Newly Installed Staff Gauges
- Surface Water / Porewater Location
- Surface Water Location
- Bombing Target
- Groundwater Flow Paths
- Inferred Groundwater Flow Direction
- Open Detonation Unit (ODU)
- Range C-62 Boundary

Cross Section

- A - A'
- B - B'
- C - C'
- D - D'

Cross Section Plan View
Range C-62

Open Detonation Unit
Eglin AFB, Florida

KOMAN Government Solutions, LLC
293 Boston Post Road West, Suite 100, Marlborough, MA 01752

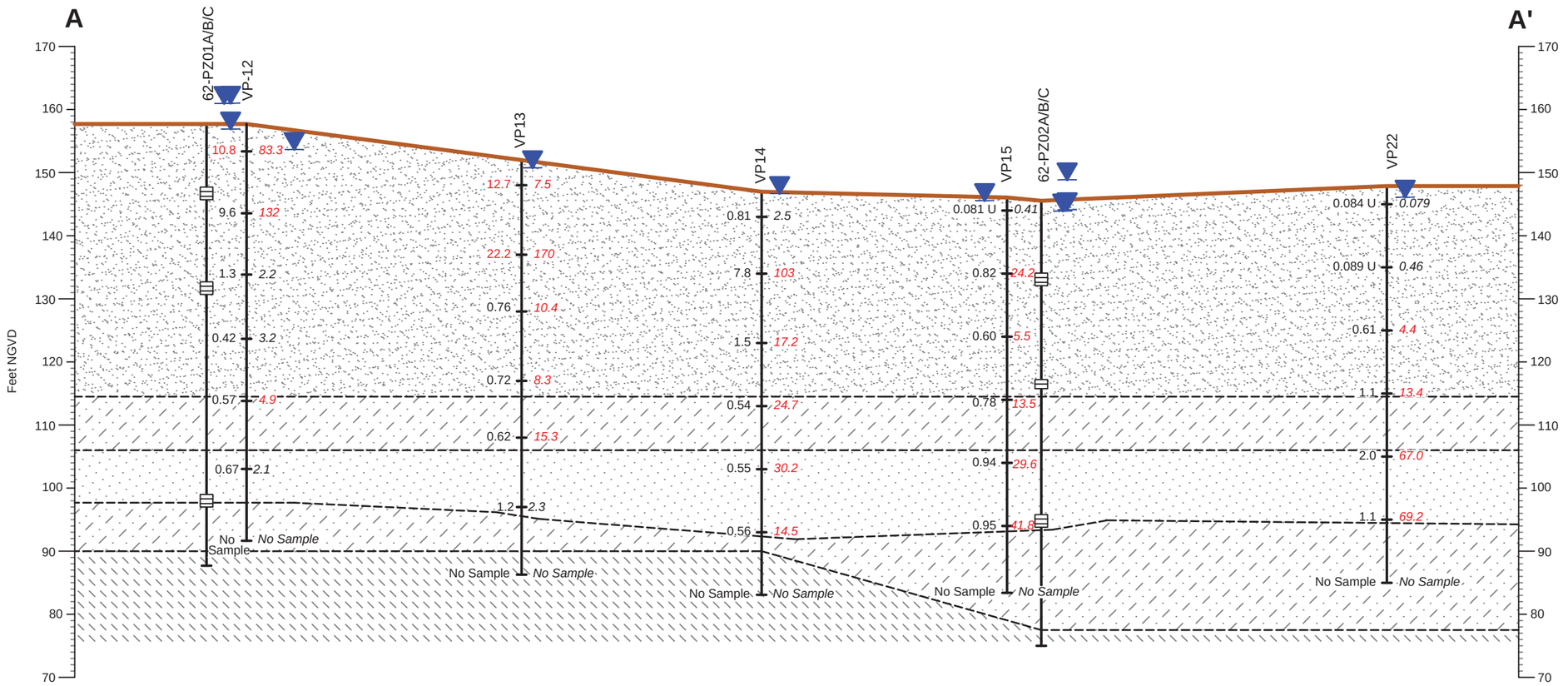
0 300 600
Feet

Date: 11/20/2024

Figure 14

KGS

File: 0524_Eglin.aprx Layout: 0924_F8_XSLocationMap



Legend

Monitoring Well or Piezometer

Screened Interval

Vertical Profile

RDX- 1.6 Concentration

Sample Interval

2.2 - Perchlorate Concentration

RED Value exceeds Groundwater Protection Standard (GWPS)

Ground Surface

Water Table (Dashed where Inferred)

Contact (Dashed where Inferred)

Fine Sand

Fine to Medium Sand

Medium to Coarse Sand

Silt

Pensacola Clay Formation

Clay

Note:
1. Duplicate Results not shown.
2. U = not detected. Value preceeding U is the detection limit.

VERTICAL SCALE IN FEET: 20

HORIZONTAL SCALE IN FEET: 120

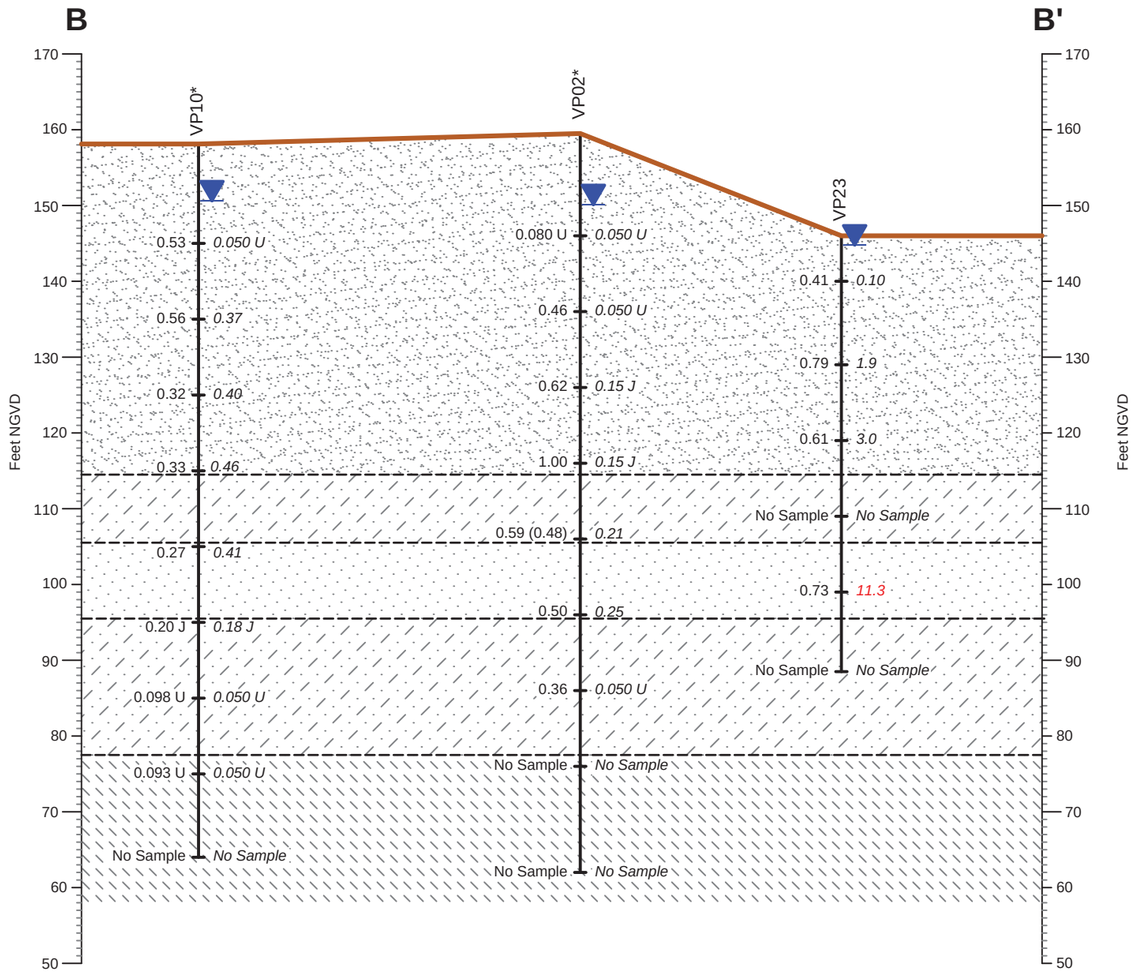
Cross Section A-A'
Range C-62

Open Detonation Unit
Eglin AFB, Florida

KOMAN Government Solutions, LLC
293 Boston Post Road West, Suite 100, Marlborough, MA 01752

Scale as Shown	Date: 11/12/2024	Figure 15	KGS

File: X:\HS_Environmental\Florida\Eglin_AFB\Drawings\2024\Sept2024_Xs\0924_Eglin_XSections.dwg F9_AA Date: 11/12/2024



Legend

Monitoring Well or Piezometer

Screened Interval

Vertical Profile

RDX- 1.6 Concentration — 2.2 - Perchlorate Concentration — Sample Interval

RED Value exceeds Groundwater Protection Standard (GWPS)

Ground Surface

Water Table (Dashed where Inferred)

Contact (Dashed where Inferred)

Fine Sand

Fine to Medium Sand

Medium to Coarse Sand

Silt

Pensacola Clay Formation

Clay

Notes:
1. Duplicate Results not shown.
2. U = not detected. Value preceeding U is the detection limit.
3. * VP results previously reported (EAS, 2023)

VERTICAL SCALE IN FEET: 20

HORIZONTAL SCALE IN FEET: 120

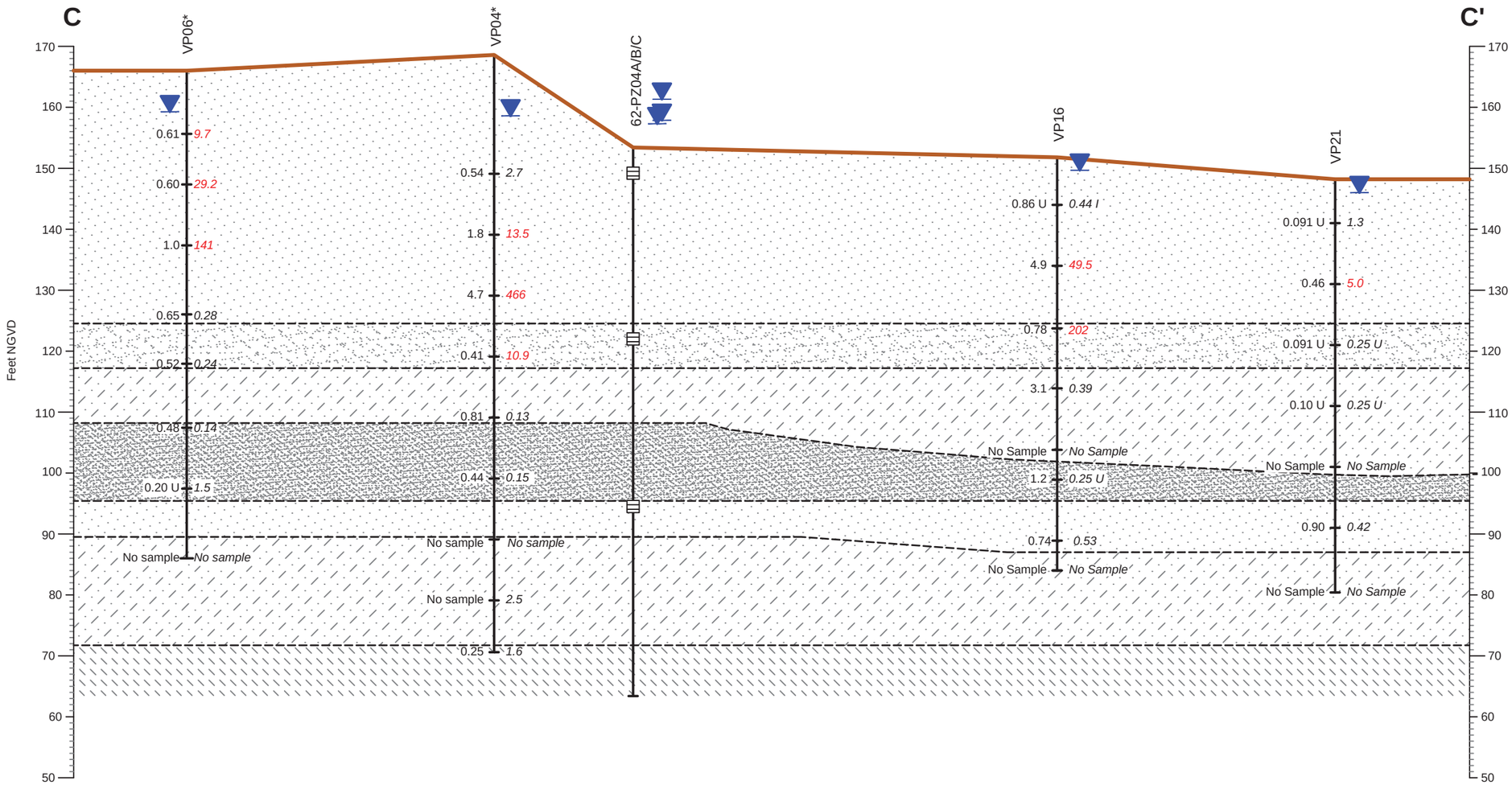
Cross Section B-B'
Range C-62

Open Detonation Unit
Eglin AFB, Florida

KOMAN Government Solutions, LLC
293 Boston Post Road West, Suite 100, Marlborough, MA 01752

Scale as Shown	Date: 11/12/2024	Figure 16	KGS

File: X:\HS_Environmental\Florida\Eglin_AFB\Drawings\2024\Sept2024_Xs\0924_Eglin_XSections.dwg F10_BB Date: 11/12/2024



Legend

Monitoring Well or Piezometer

Screened Interval

Vertical Profile

RDX- 1.6 Concentration

2.2 - Perchlorate Concentration

Sample Interval

RED Value exceeds Groundwater Protection Standard (GWPS)

Ground Surface

Water Table (Dashed where Inferred)

Contact (Dashed where Inferred)

Fine Sand

Fine to Medium Sand

Medium to Coarse Sand

Silt

Pensacola Clay Formation

Clay

Notes:

1. Duplicate Results not shown.
2. U = not detected. Value preceeding U is the detection limit.
3. * VP results previously reported (EAS, 2023)

VERTICAL SCALE IN FEET: 20

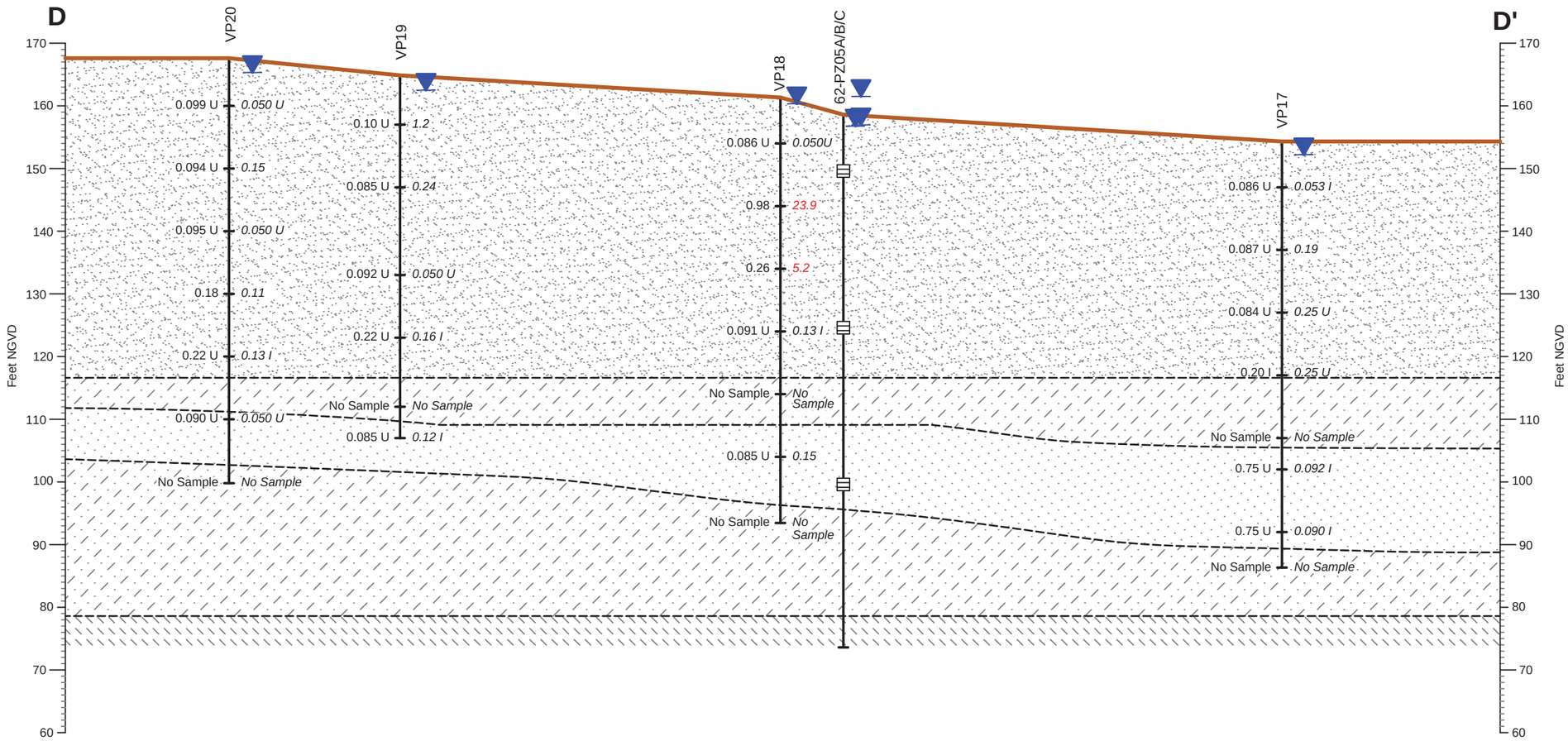
HORIZONTAL SCALE IN FEET: 120

Cross Section C-C'
Range C-62

Open Detonation Unit
Eglin AFB, Florida

KOMAN Government Solutions, LLC
293 Boston Post Road West, Suite 100, Marlborough, MA 01752

Scale as Shown	Date: 11/12/2024	Figure 17	KGS



Legend

Monitoring Well or Piezometer

Screened Interval

Vertical Profile

RDX- 1.6 Concentration

Sample Interval

2.2 - Perchlorate Concentration

RED Value exceeds Groundwater Protection Standard (GWPS)

Ground Surface

Water Table (Dashed where Inferred)

Contact (Dashed where Inferred)

Fine Sand

Fine to Medium Sand

Medium to Coarse Sand

Silt

Pensacola Clay Formation

Clay

Note:

1. Duplicate Results not shown.
2. U = not detected. Value preceeding U is the detection limit.

VERTICAL SCALE IN FEET: 20

HORIZONTAL SCALE IN FEET: 120

Cross Section D-D'
Range C-62

Open Detonation Unit
Eglin AFB, Florida

KOMAN Government Solutions, LLC
293 Boston Post Road West, Suite 100, Marlborough, MA 01752

Scale as Shown	Date: 11/12/2024	Figure 18	KGS

File: X:\HS_Environmental\Florida\Eglin_AFB\Drawings\2024\Sept2024_Xs\0924_Eglin_XSections.dwg F12_DD Date: 11/12/2024

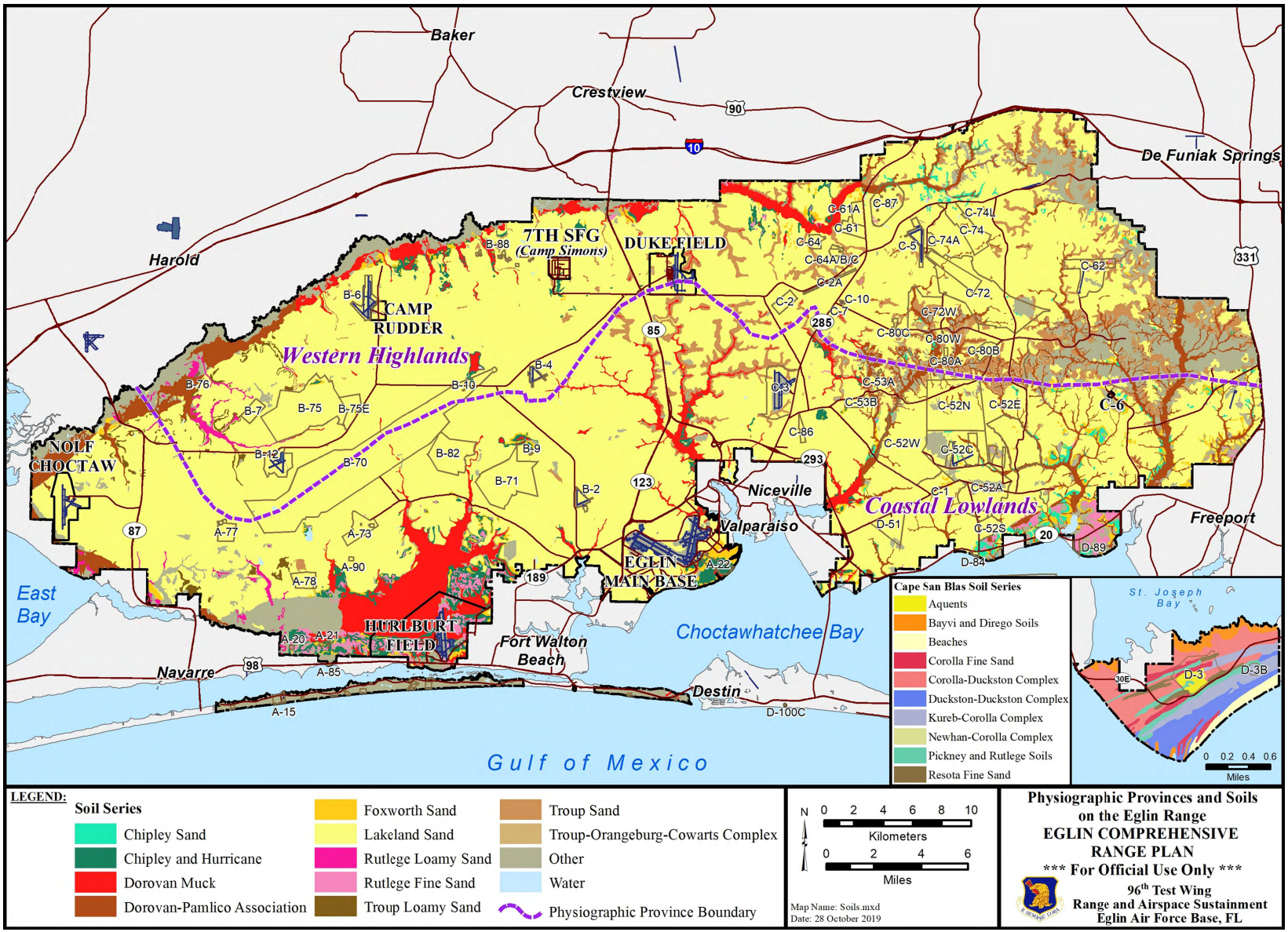
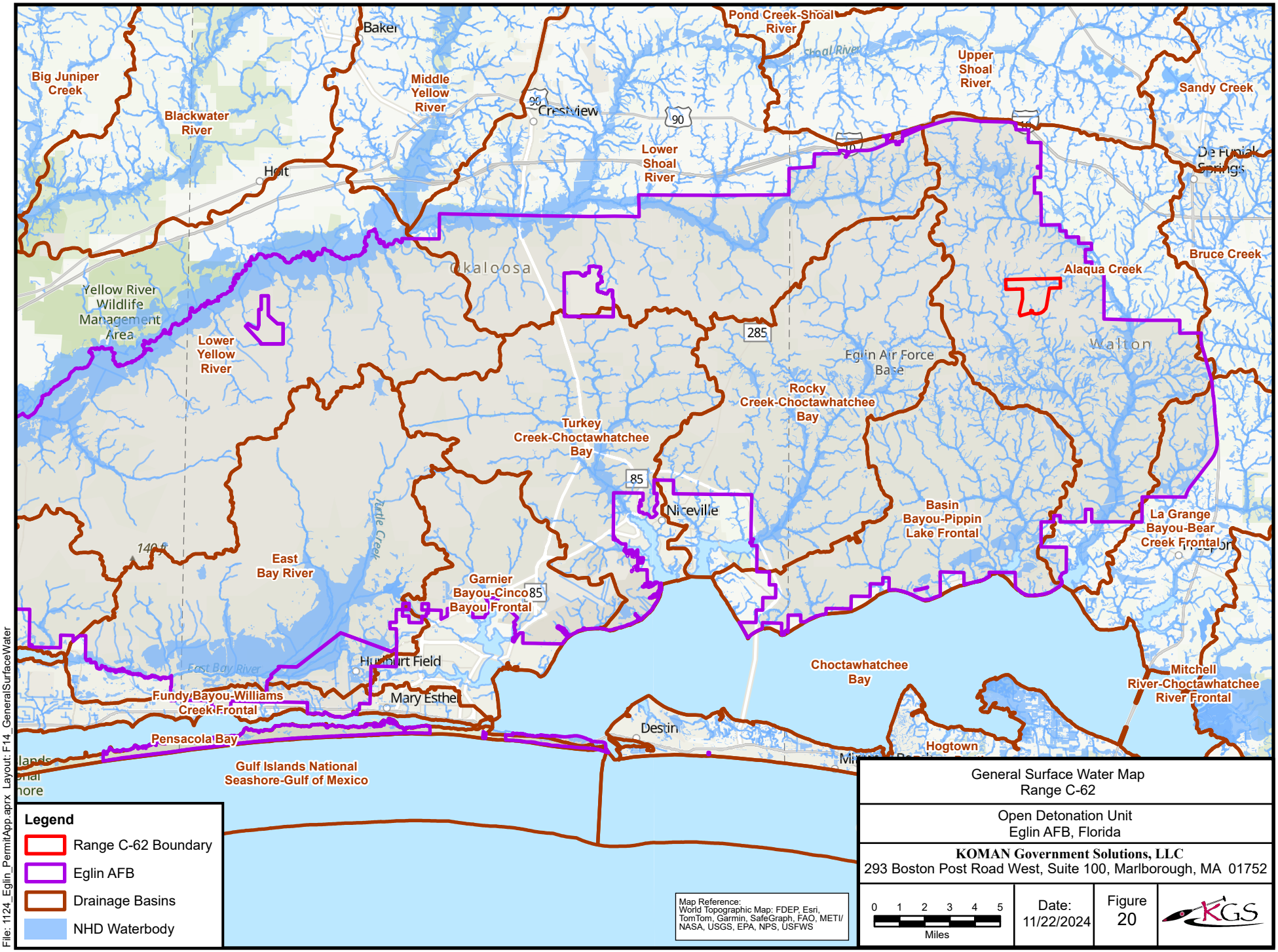


Figure 19. Soil Series on the Eglin Range

FOR OFFICIAL USE ONLY



General Surface Water Map
Range C-62

Open Detonation Unit
Eglin AFB, Florida

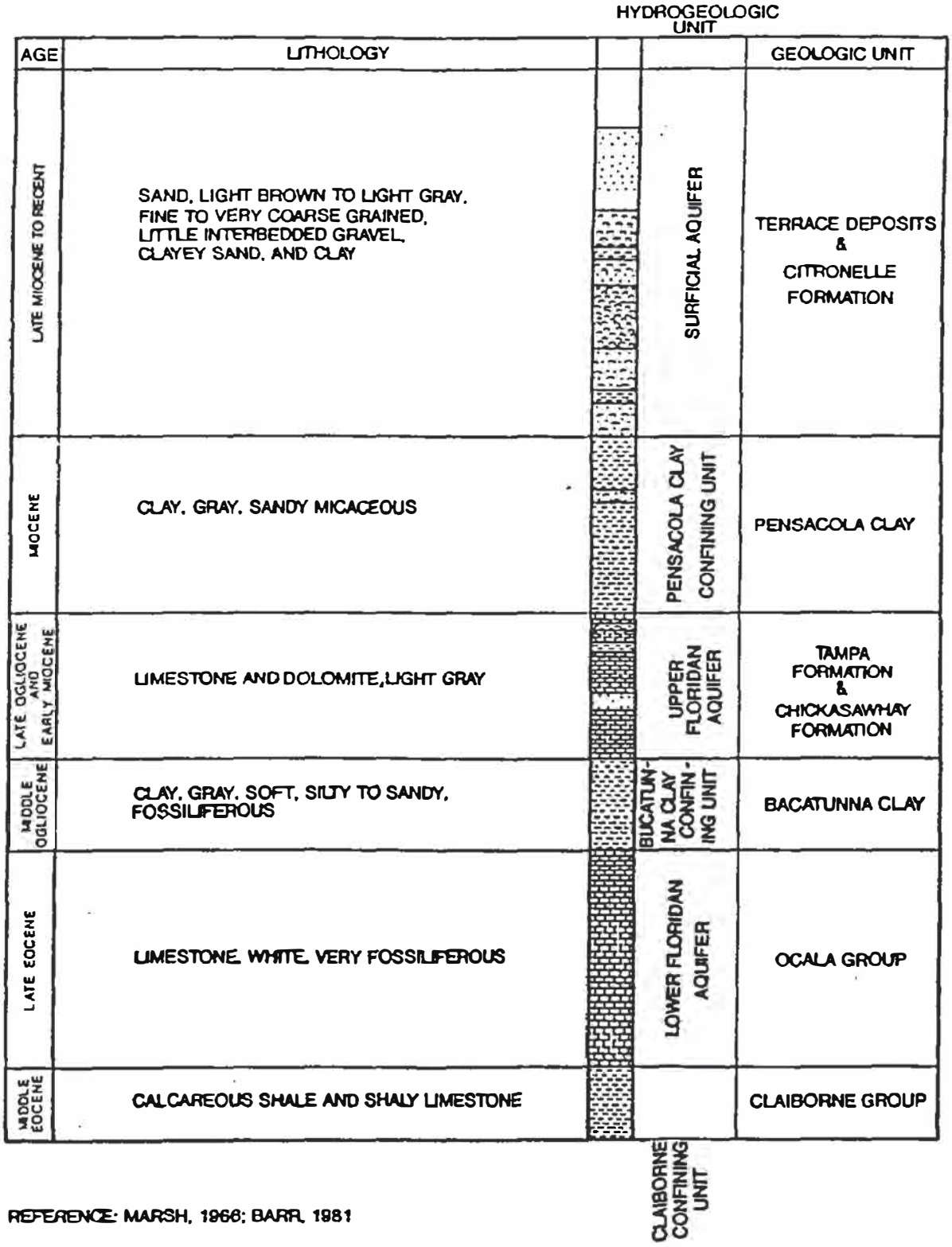
KOMAN Government Solutions, LLC
293 Boston Post Road West, Suite 100, Marlborough, MA 01752

Date: 11/22/2024

Figure 20

File: 1124_Eglin_PermitApp.aprx Layout: F14_GeneralSurfaceWater

GENERALIZED STRATIGRAPHIC COLUMN



REFERENCE: MARSH, 1966; BARR, 1981

EA ENGINEERING, SCIENCE, AND TECHNOLOGY, INC.	FILE NAME:	DATE: 10-7-92	**Figure 21 Regional Stratigraphic Column.**
	LAYERS USED:	PROJECT #: 11206.25	

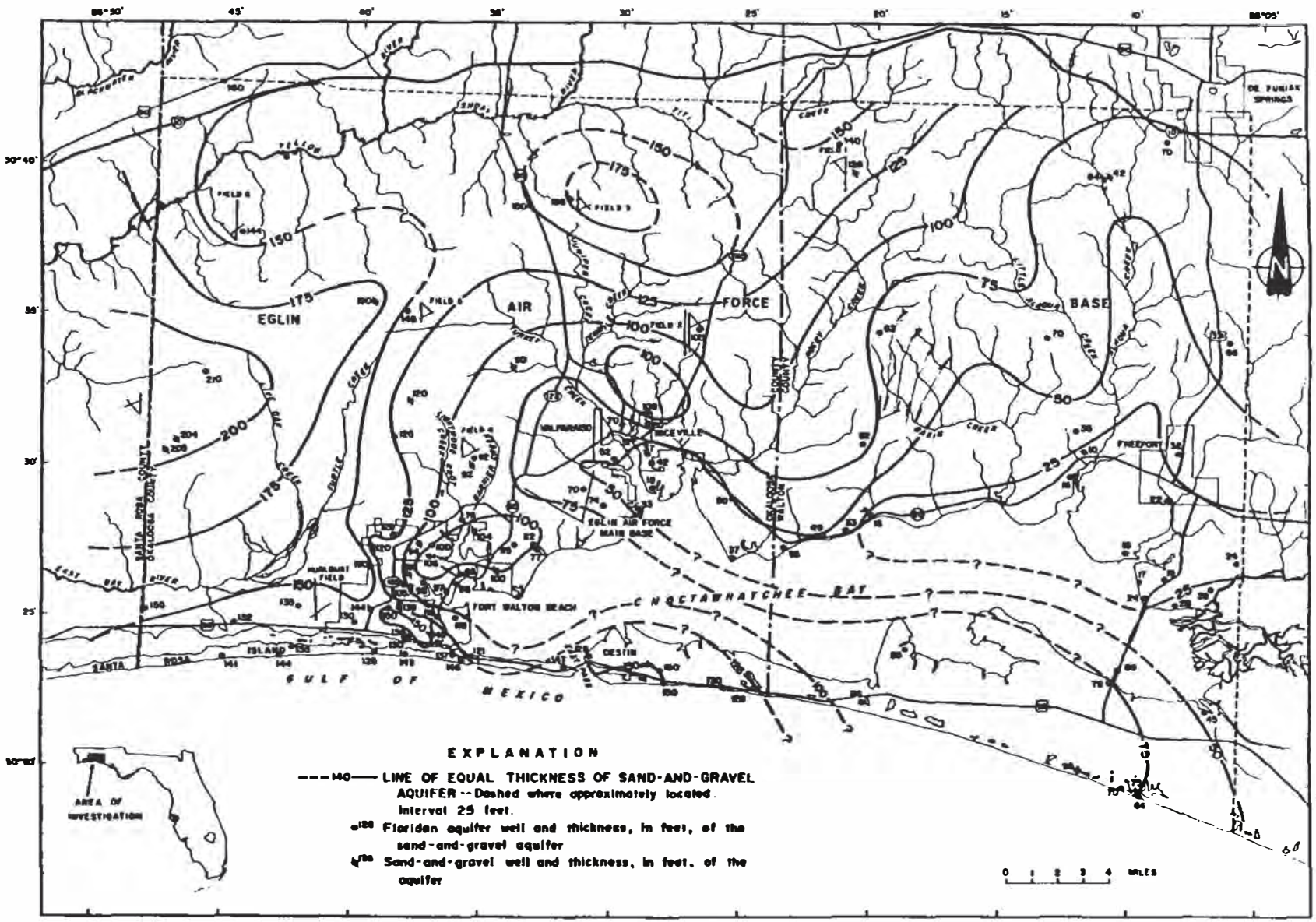


Figure 22 Thickness of the sand and gravel aquifer (Hayes and Barr, 1983). Eglin Air Force Base Valparaiso, Florida.

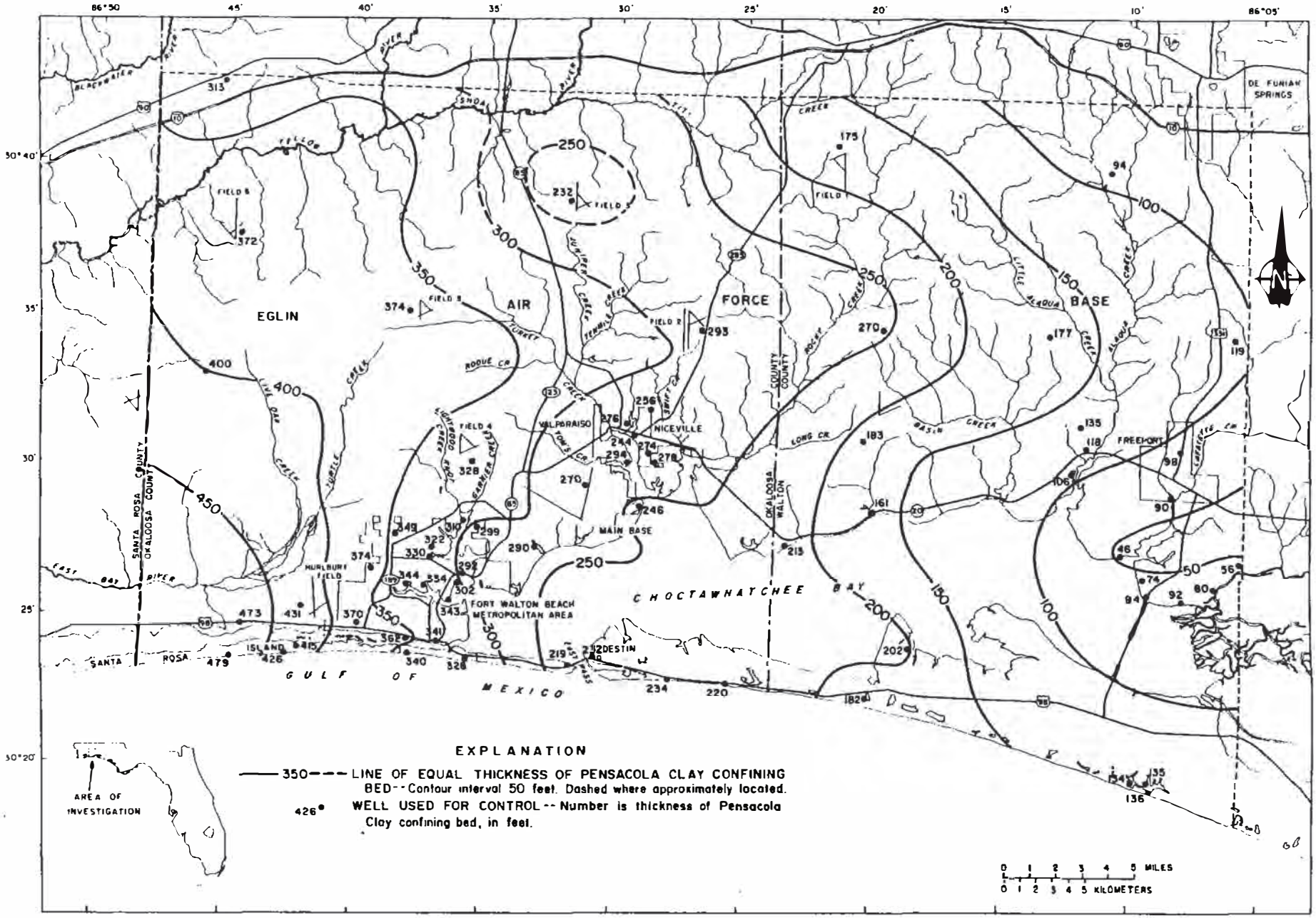


Figure 23 Thickness of the Pensacola Clay confining bed (Barr and others, 1981). Eglin Air Force Base Valparaiso, Florida.

Figure 24 - Frequency of Wind Speed and Direction at Eglin AFB in January

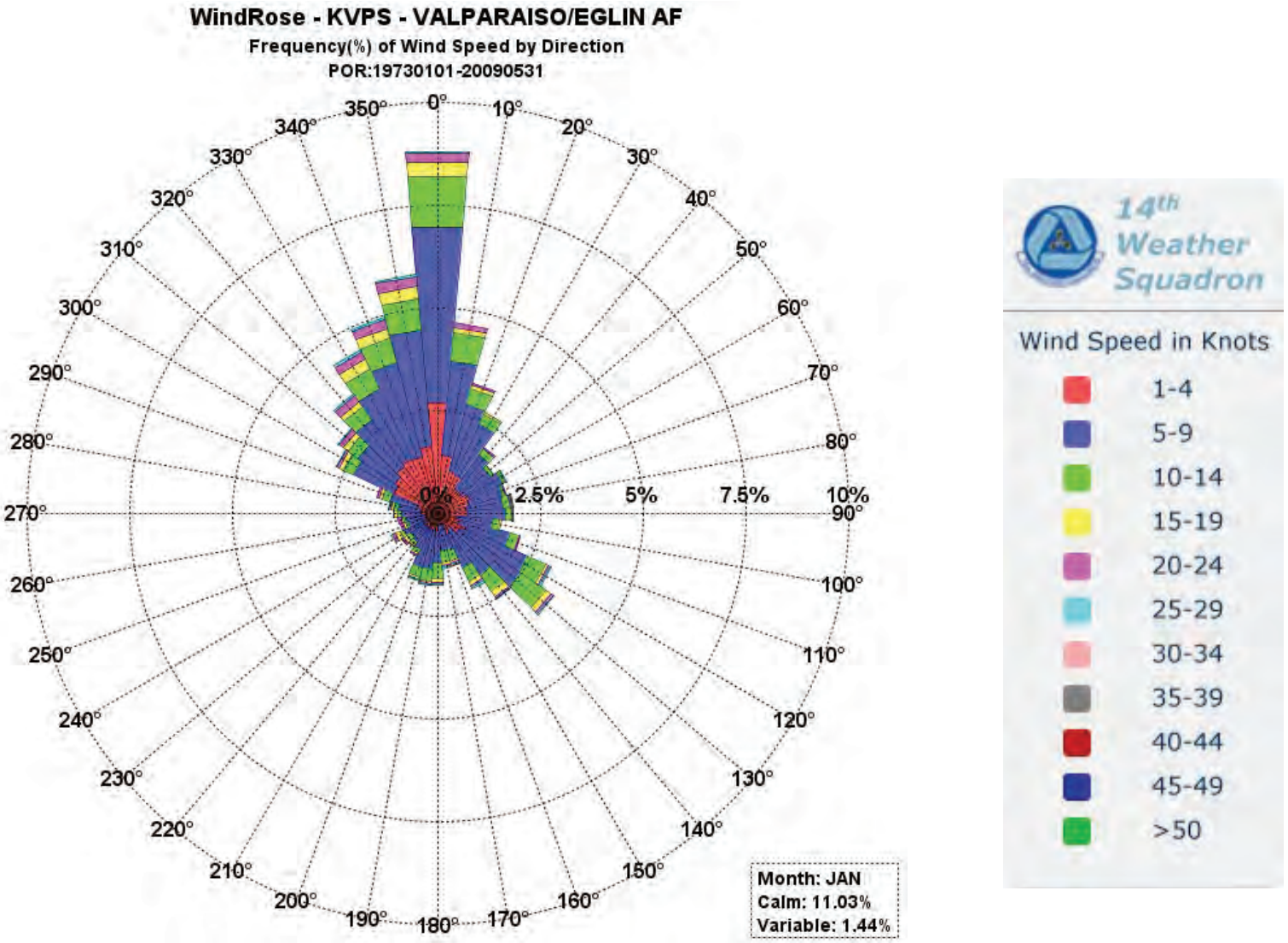


Figure 24 - Frequency of Wind Speed and Direction at Eglin AFB in February

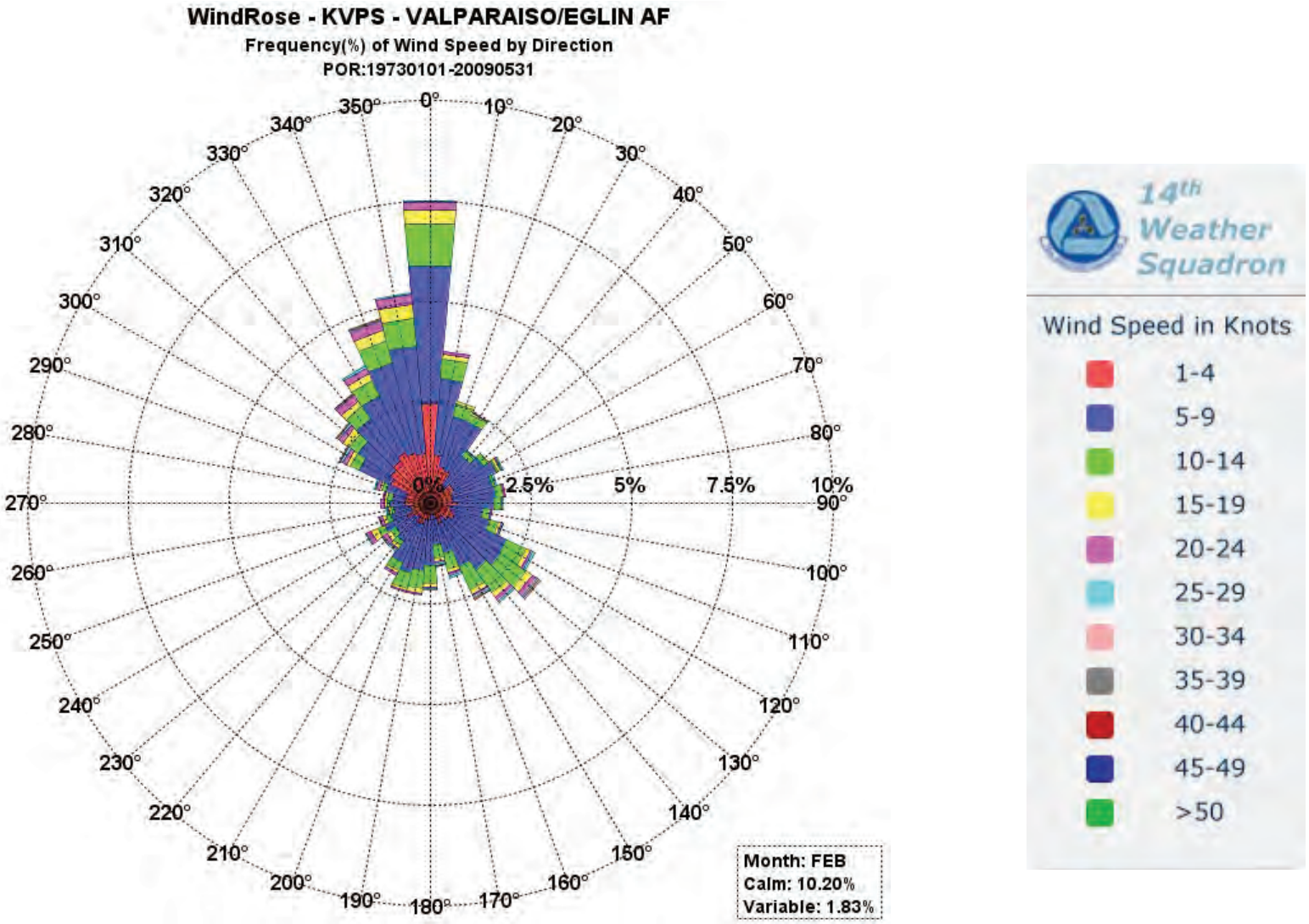


Figure 24 - Frequency of Wind Speed and Direction at Eglin AFB in March

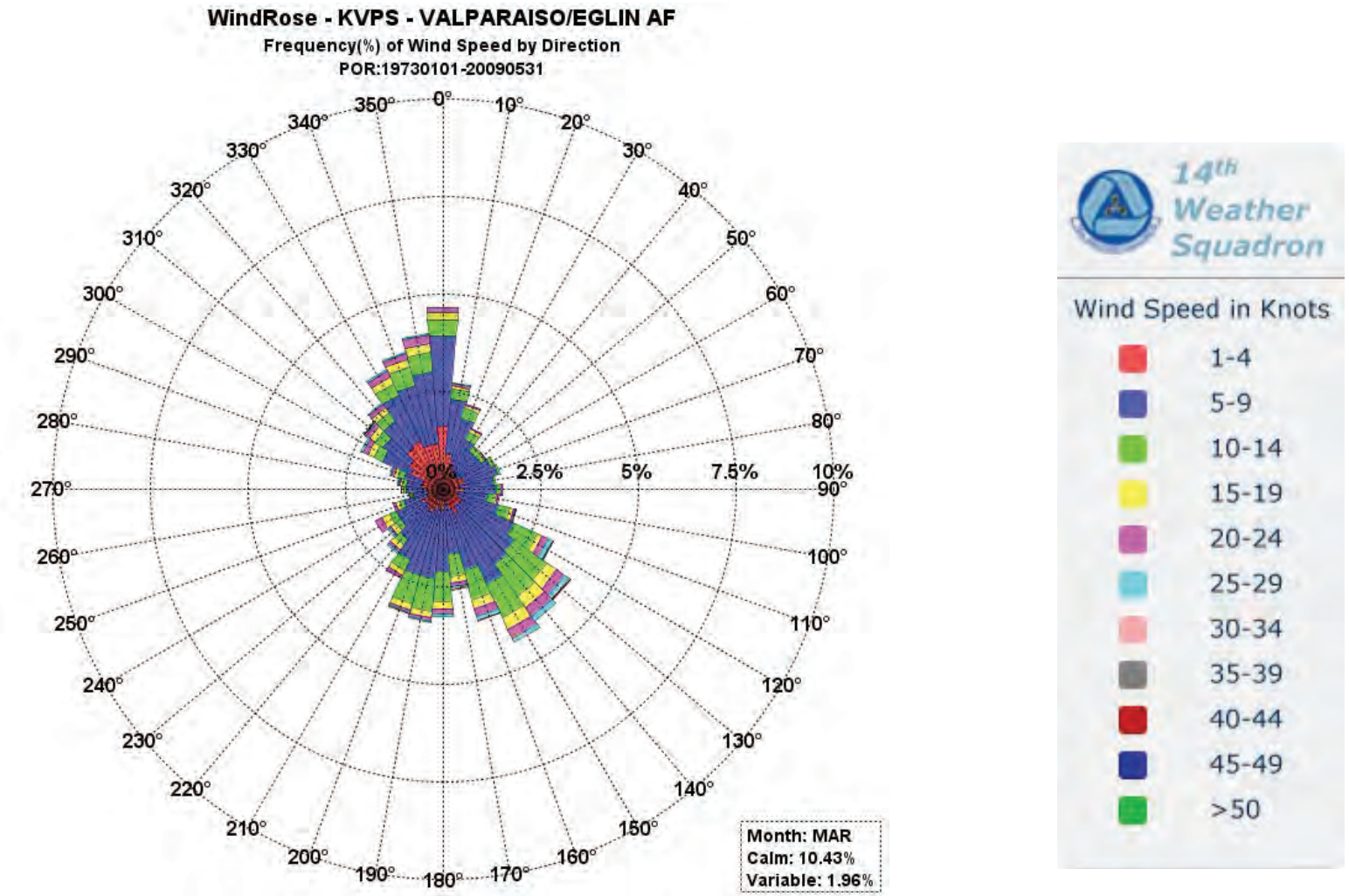


Figure 24 - Frequency of Wind Speed and Direction at Eglin AFB in April

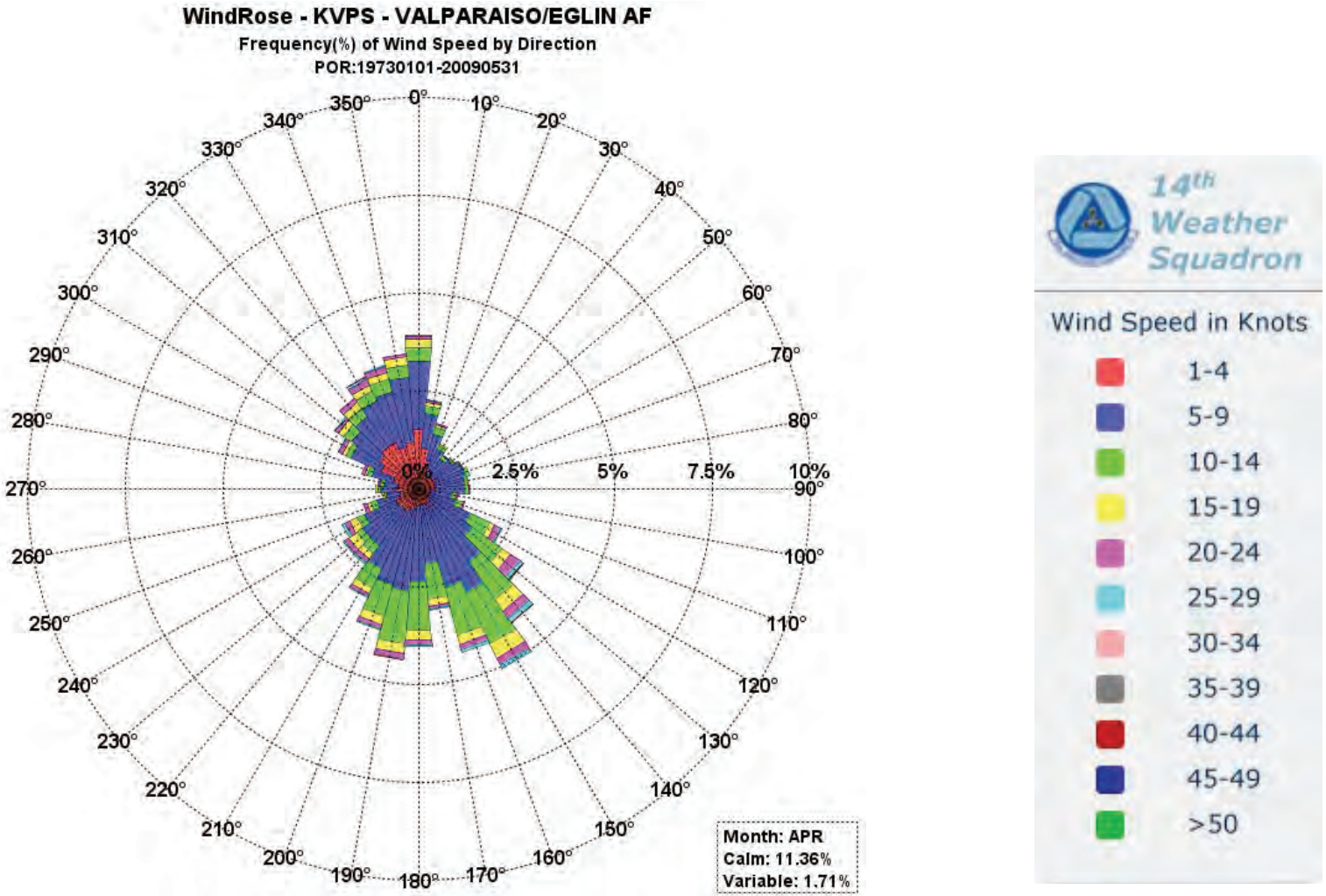


Figure 24 - Frequency of Wind Speed and Direction at Eglin AFB in May

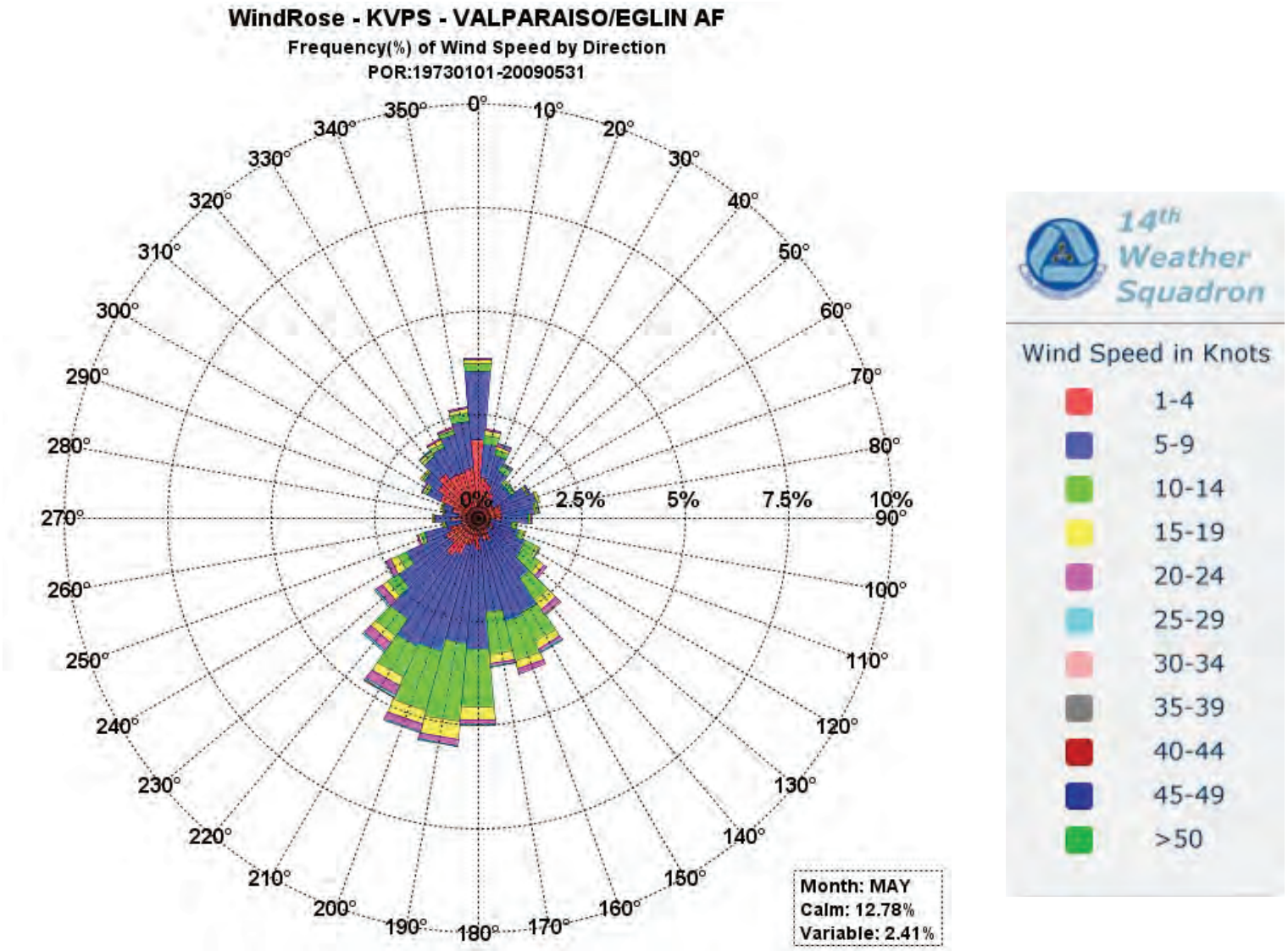


Figure 24 - Frequency of Wind Speed and Direction at Eglin AFB in June

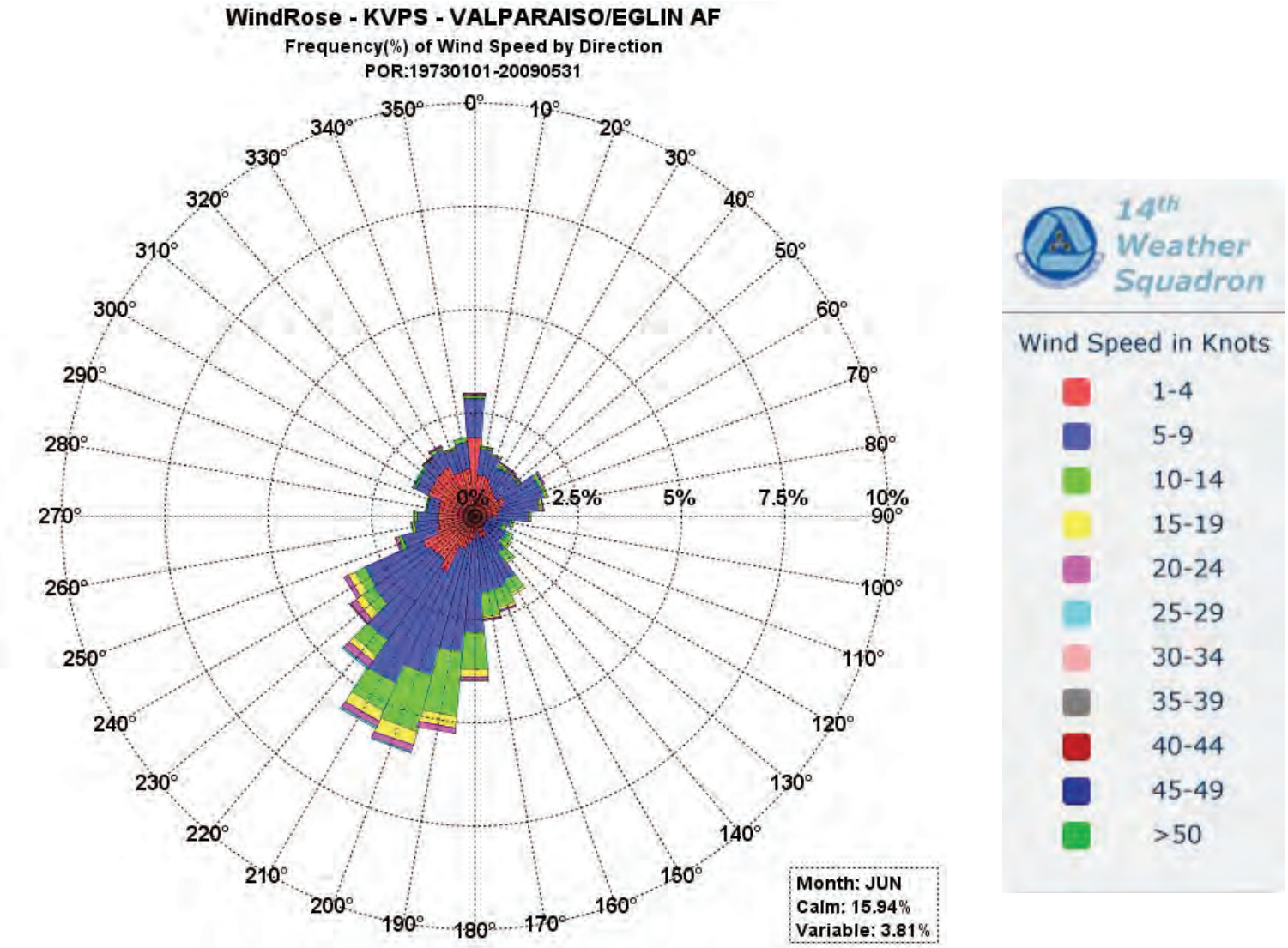


Figure 24 - Frequency of Wind Speed and Direction at Eglin AFB in July

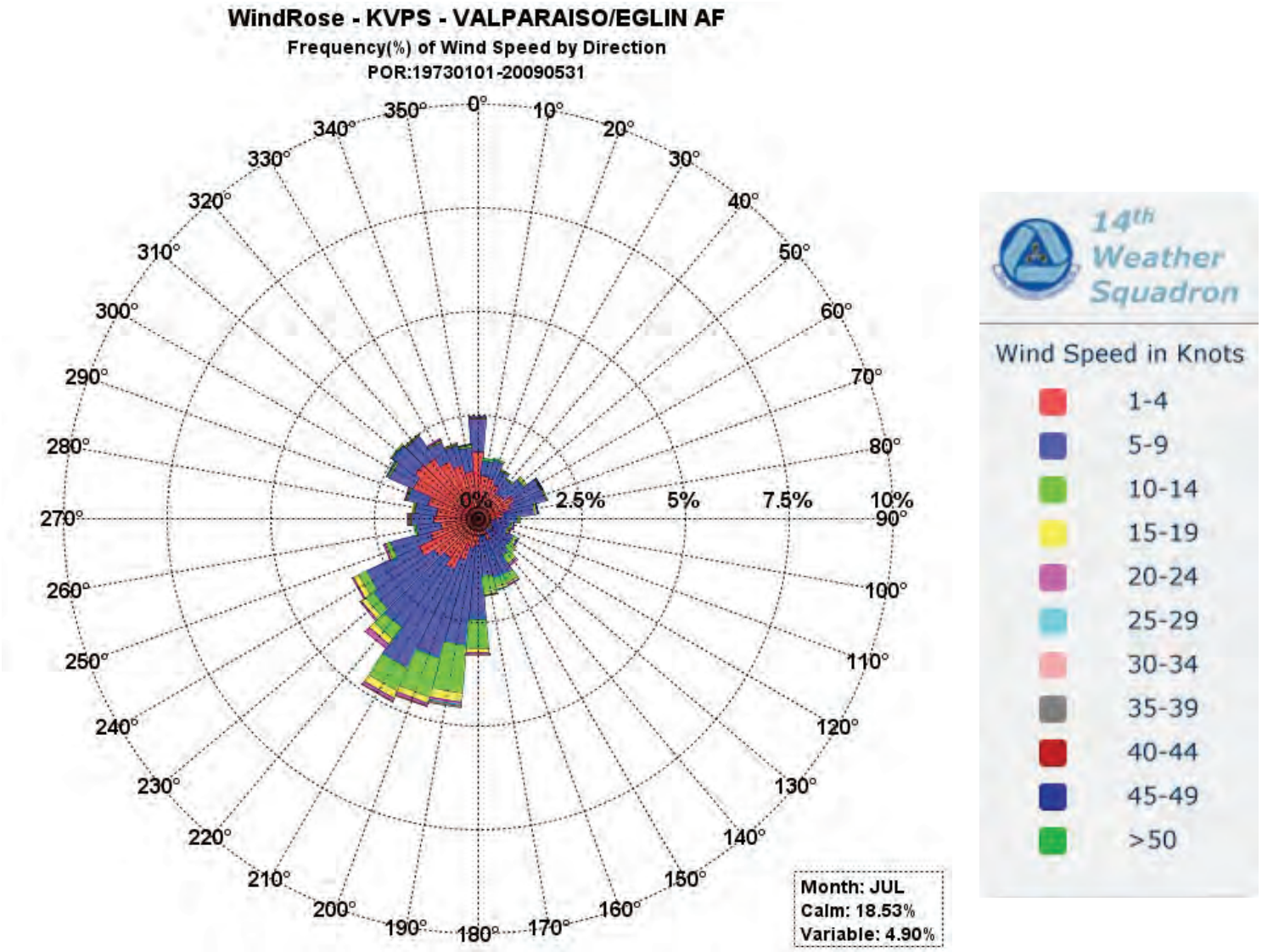


Figure 24- Frequency of Wind Speed and Direction at Eglin AFB in August

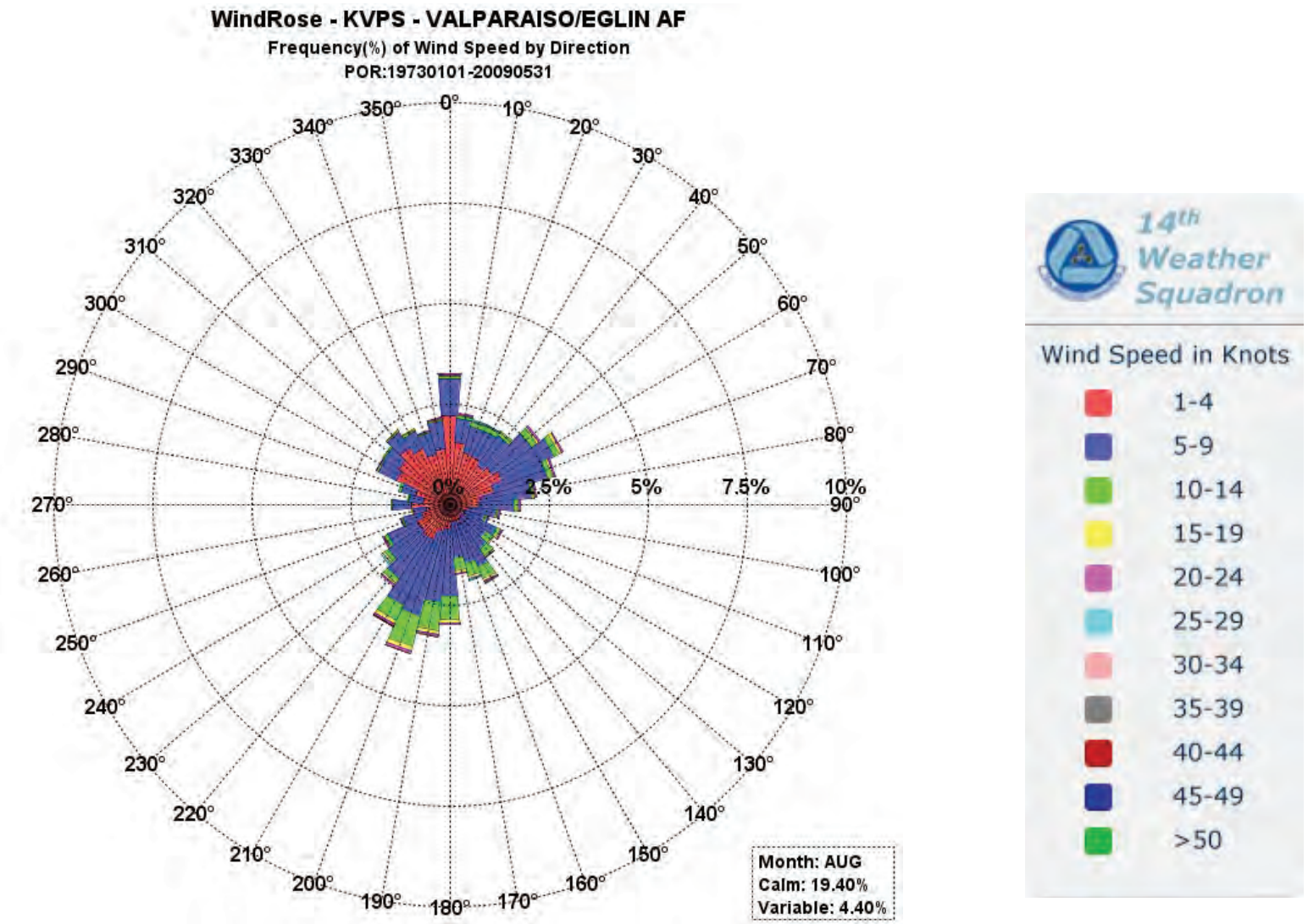


Figure 24- Frequency of Wind Speed and Direction at Eglin AFB in September

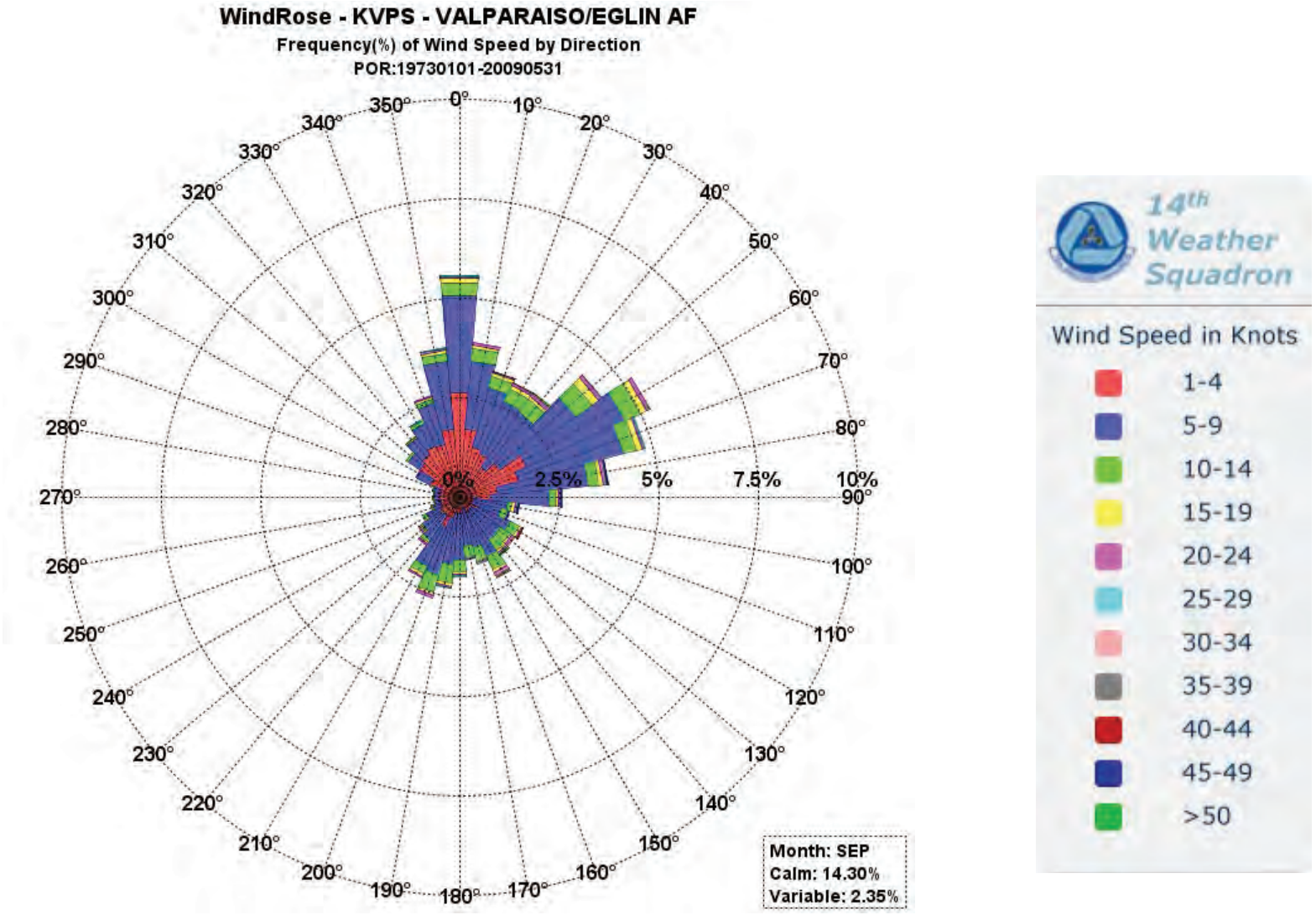


Figure 24 - Frequency of Wind Speed and Direction at Eglin AFB in October

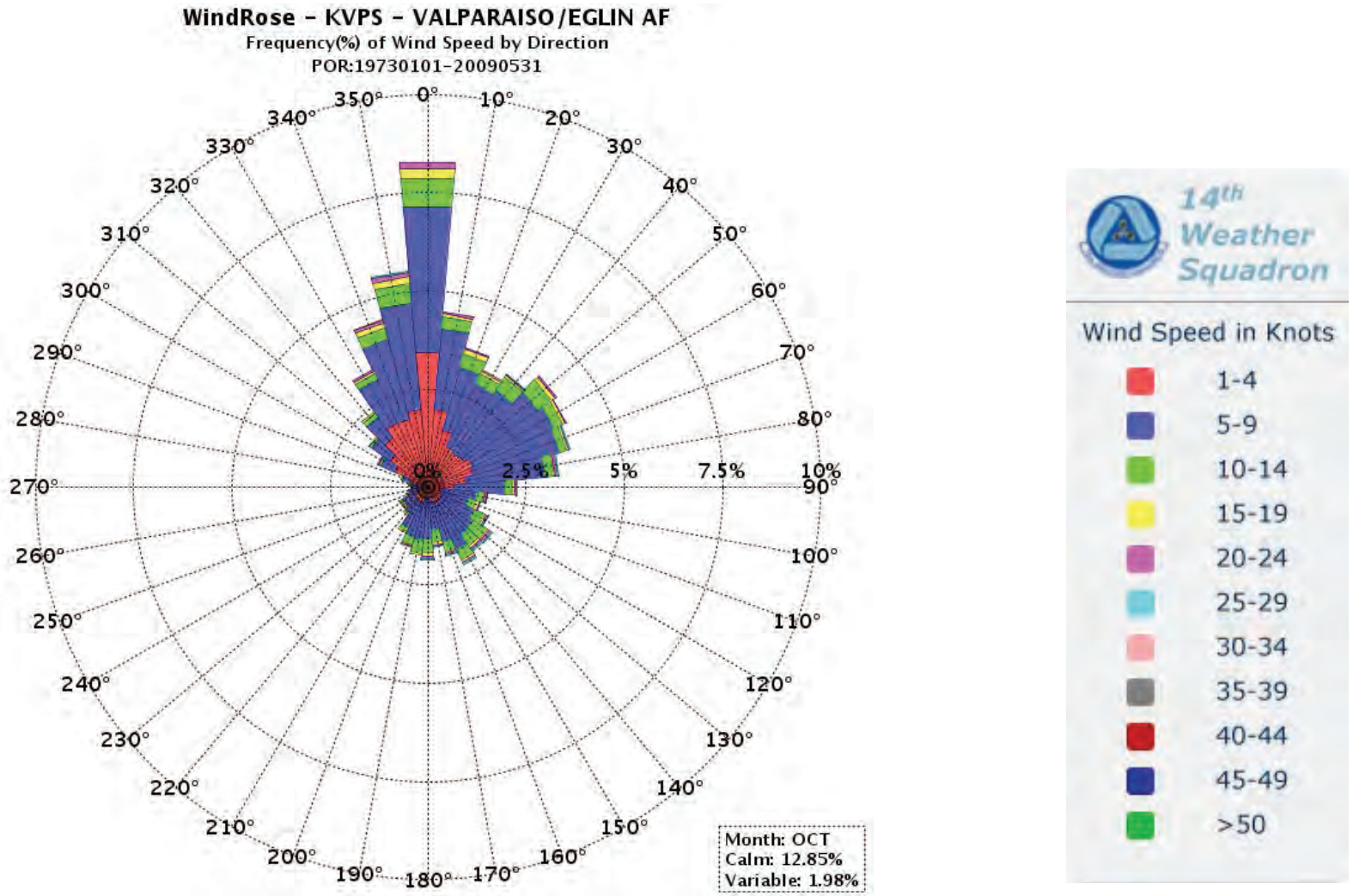


Figure 24 - Frequency of Wind Speed and Direction at Eglin AFB in November

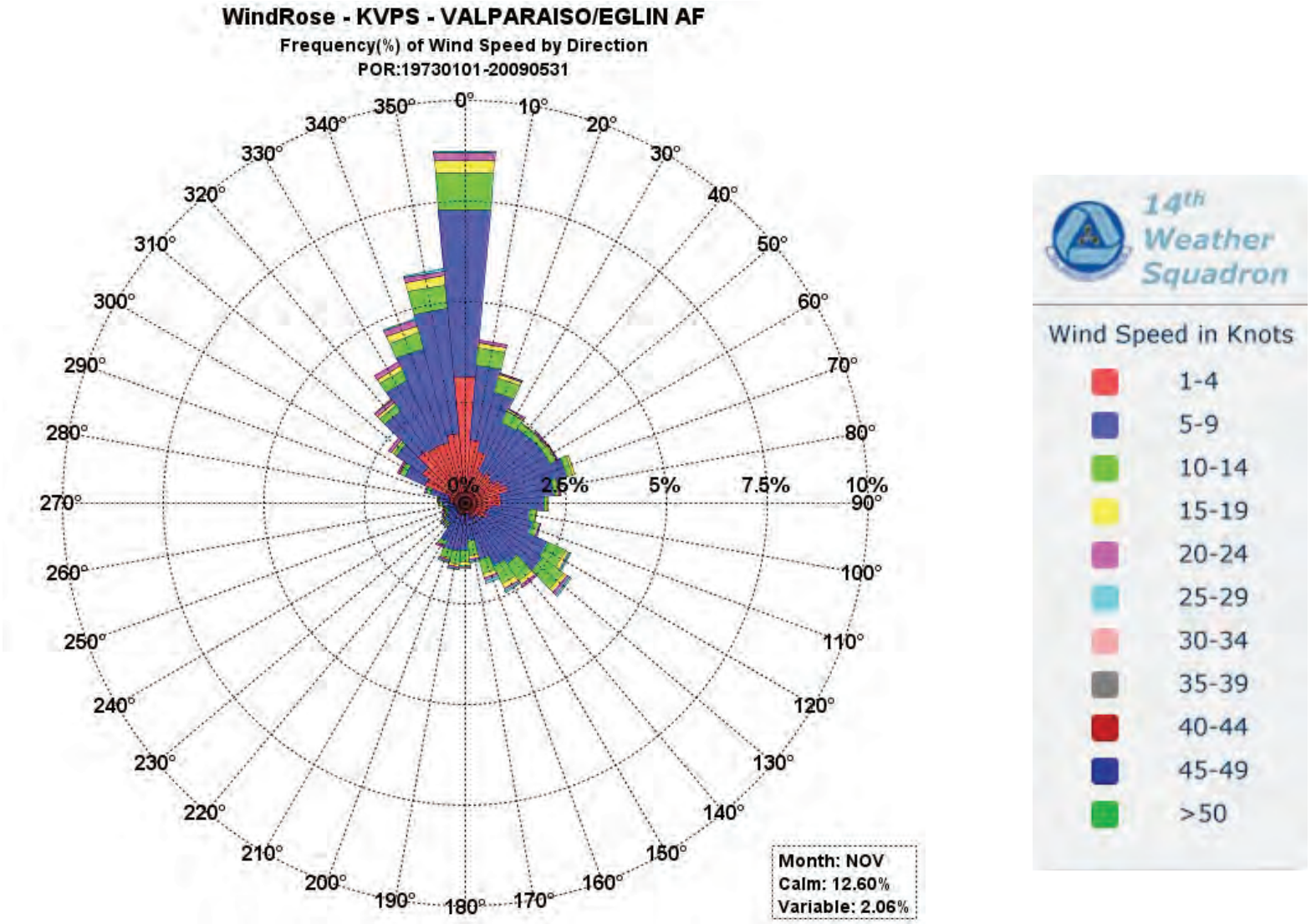
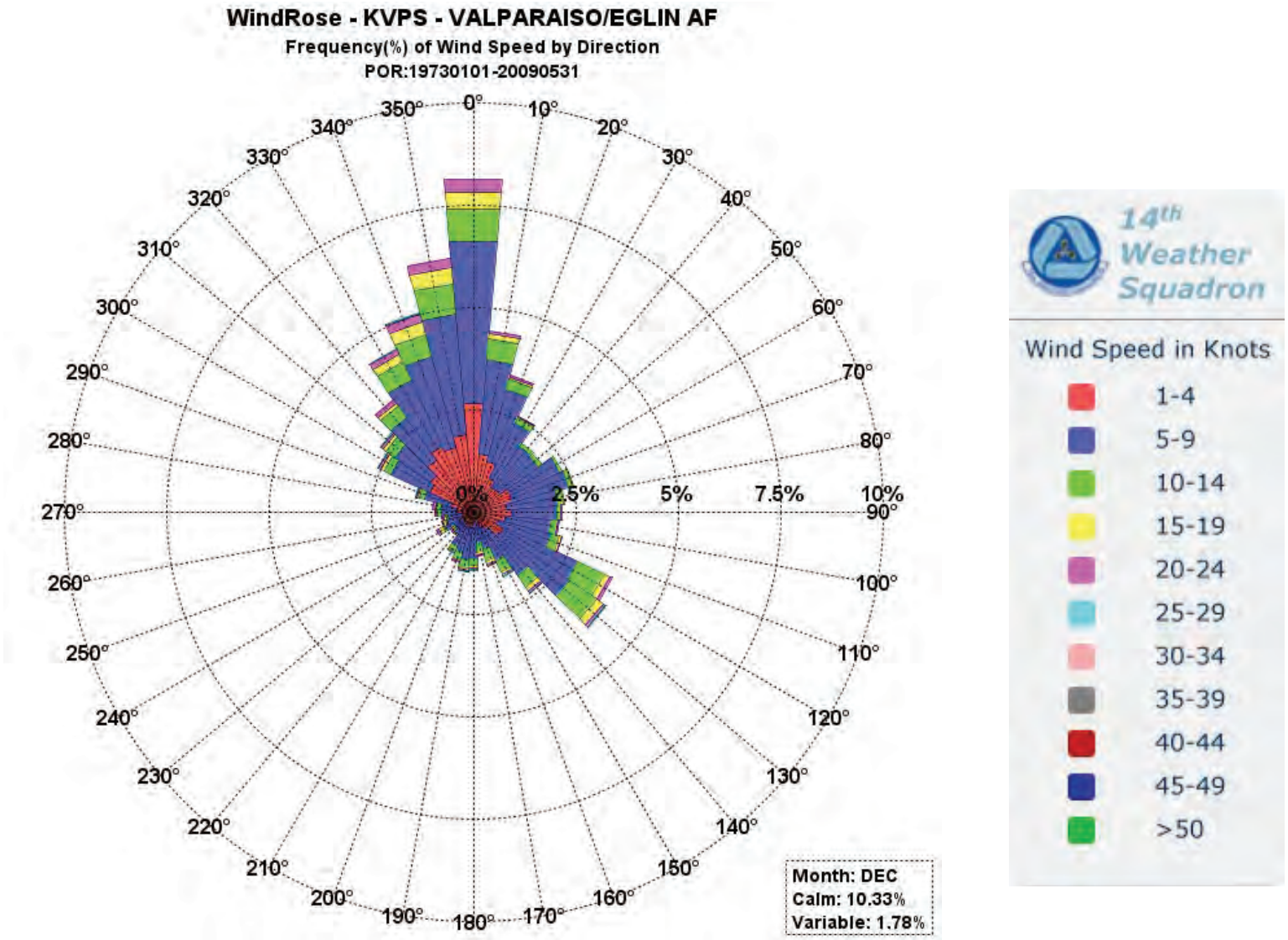
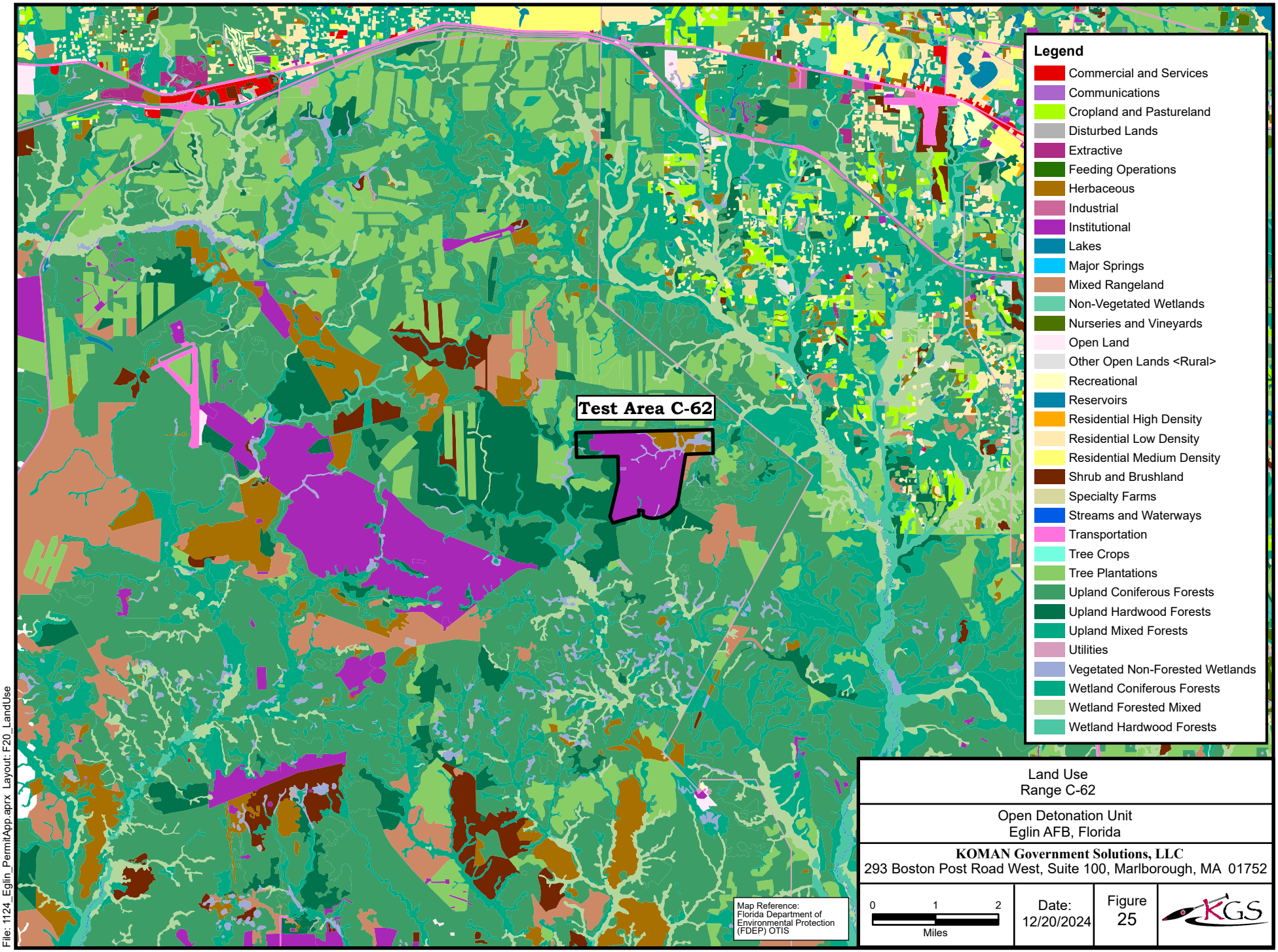


Figure 24 - Frequency of Wind Speed and Direction at Eglin AFB in December





Land Use
Range C-62

Open Detonation Unit
Eglin AFB, Florida

KOMAN Government Solutions, LLC
293 Boston Post Road West, Suite 100, Marlborough, MA 01752

Date: 12/20/2024

Figure 25

KGS

File: 1124_Eglin_PermitApp.aprx Layout: F20_LandUse

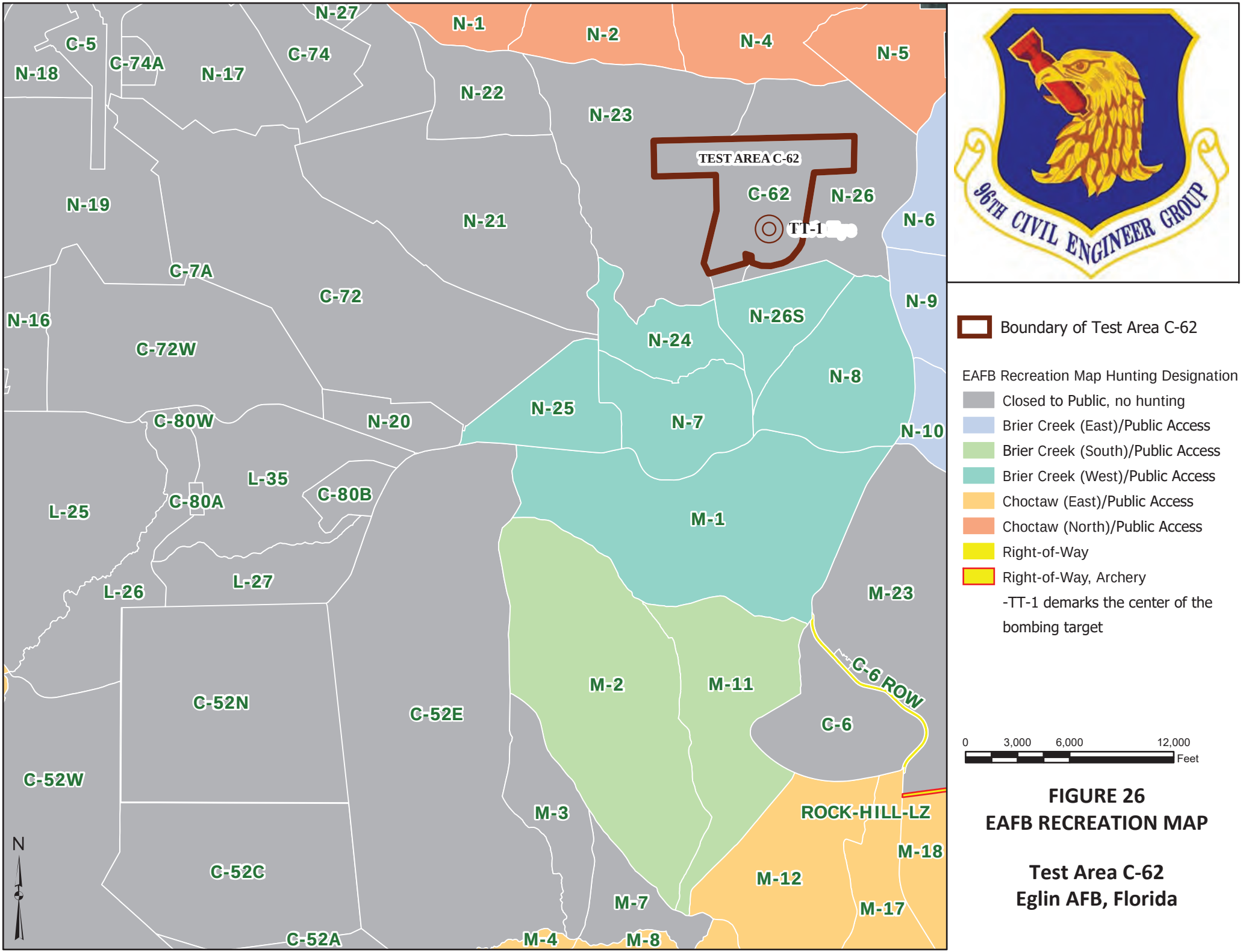
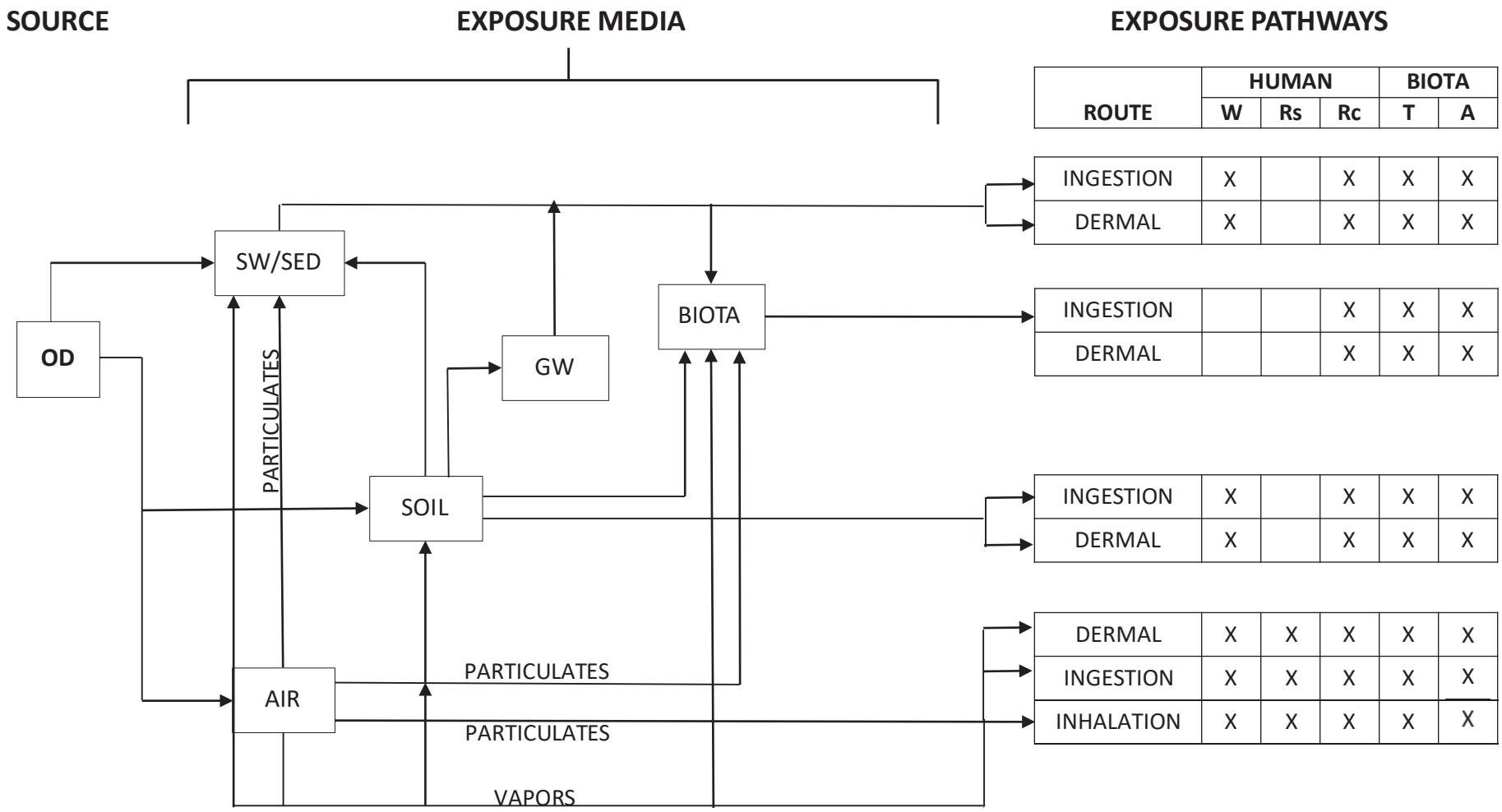


FIGURE 26
EAFB RECREATION MAP

Test Area C-62
Eglin AFB, Florida



KEY:

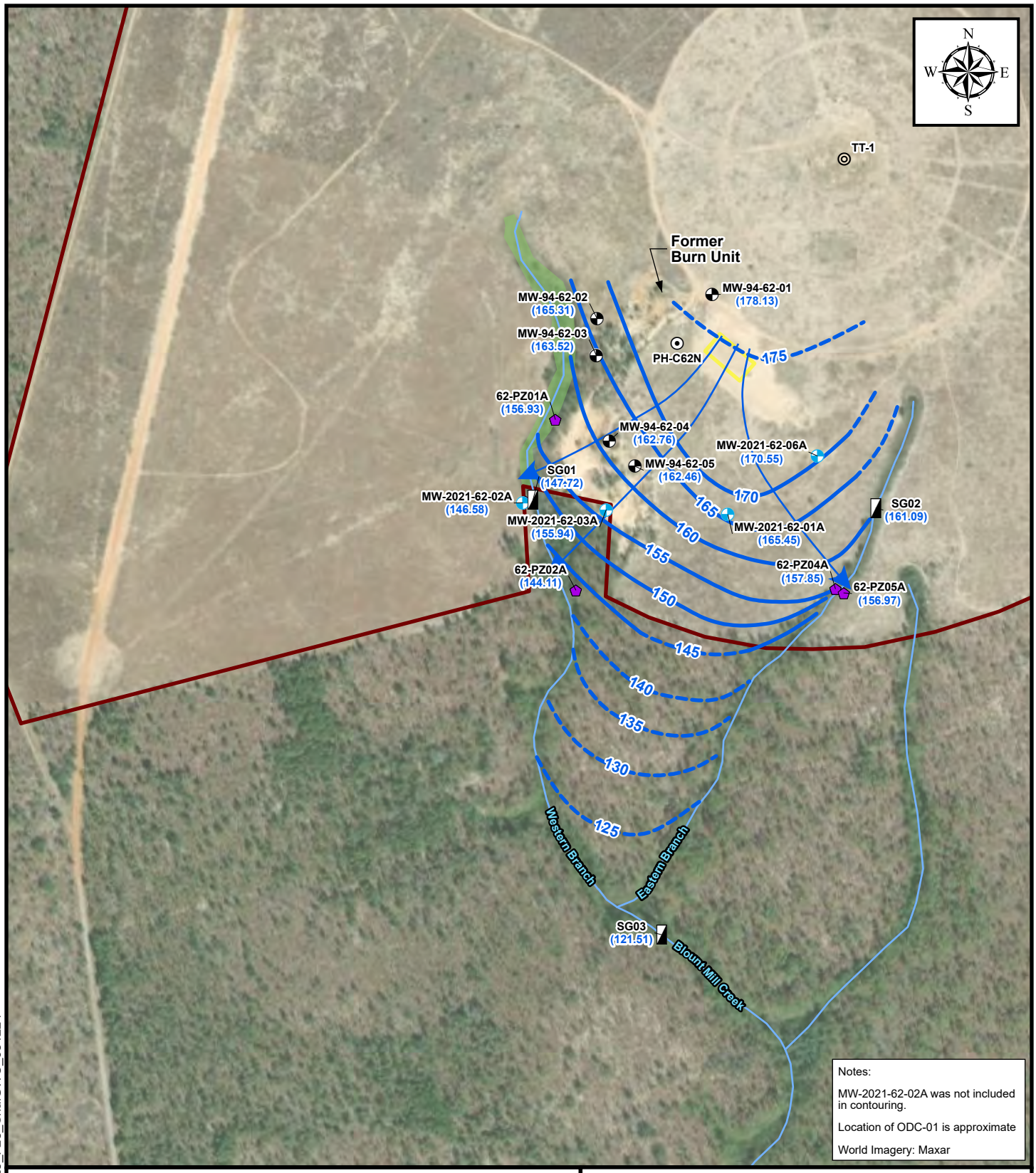
OD – Open Detonation

SW – Surface Water
SED – Sediment
GW – Groundwater

W – Water
Rs – Residential
Rc – Recreational

T – Terrestrial
A – Aquatic (marine)

Figure 27. Conceptual Site Model for Exposure Associated with ODU,Range C-62, Eglin AFB, FL



Legend

- Shallow Wells Installed by KGS
- Monitoring Well Installed by Others
- Newly Installed PZs - May 2024
- Newly Installed Staff Gauges
- Pilot Hole
- Bombing Target
- Seepage Bog
- Open Detonation Unit (ODU)
- Range C-62 Boundary
- Groundwater Elevation Contour (ft NAVD 88) (Contour Interval = 5 ft)
- Groundwater Flow Direction
- (178.13) Groundwater Elevation (ft NAVD88)

Shallow Groundwater Elevation Contour Map
August 12, 2024
Range C-62

Open Detonation Unit
Eglin AFB, Florida

KOMAN Government Solutions, LLC
293 Boston Post Road West, Suite 100, Marlborough, MA 01752

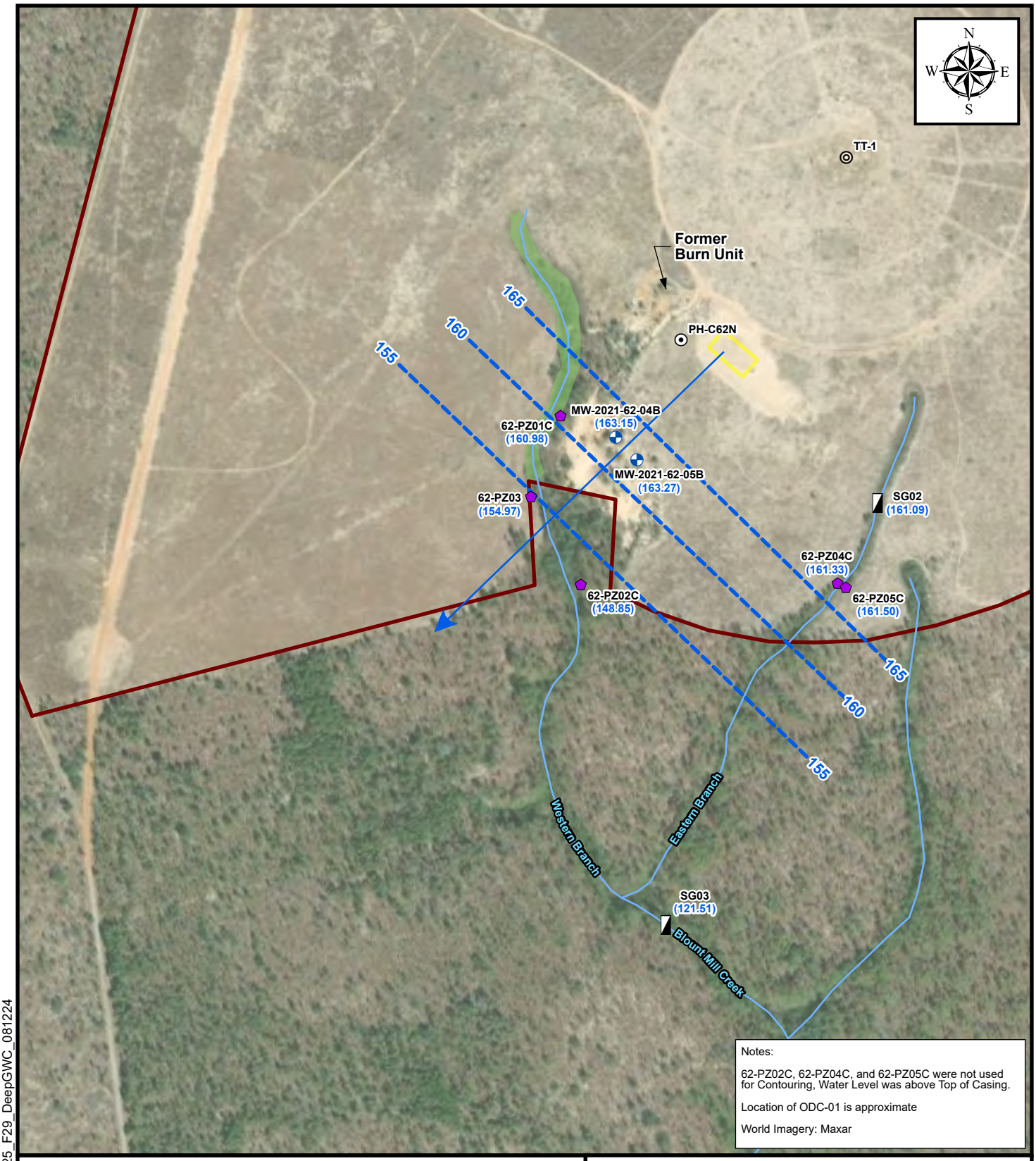
0 300 600
Feet

Date: 02/06/2025

Figure 28

EAS Environmental Assessment Services
Wholly Owned Subsidiary of Natives of Kodiak

File: 0225_Eglin.aprx Layout: 0225_F28_ShalGWC_081224



Legend

- Deep Wells Installed by KGS
- Newly Installed PZs - May 2024
- Newly Installed Staff Gauges
- Pilot Hole
- Bombing Target
- Seepage Bog
- Open Detonation Unit (ODU)
- Range C-62 Boundary
- Groundwater Elevation Contour (ft NAVD 88) (Contour Interval = 5 ft)
- Groundwater Flow Direction
- (163.15) Groundwater Elevation (ft NAVD88)

Deep Groundwater Elevation Contour Map
August 12, 2024
Range C-62

Open Detonation Unit
Eglin AFB, Florida

KOMAN Government Solutions, LLC
293 Boston Post Road West, Suite 100, Marlborough, MA 01752

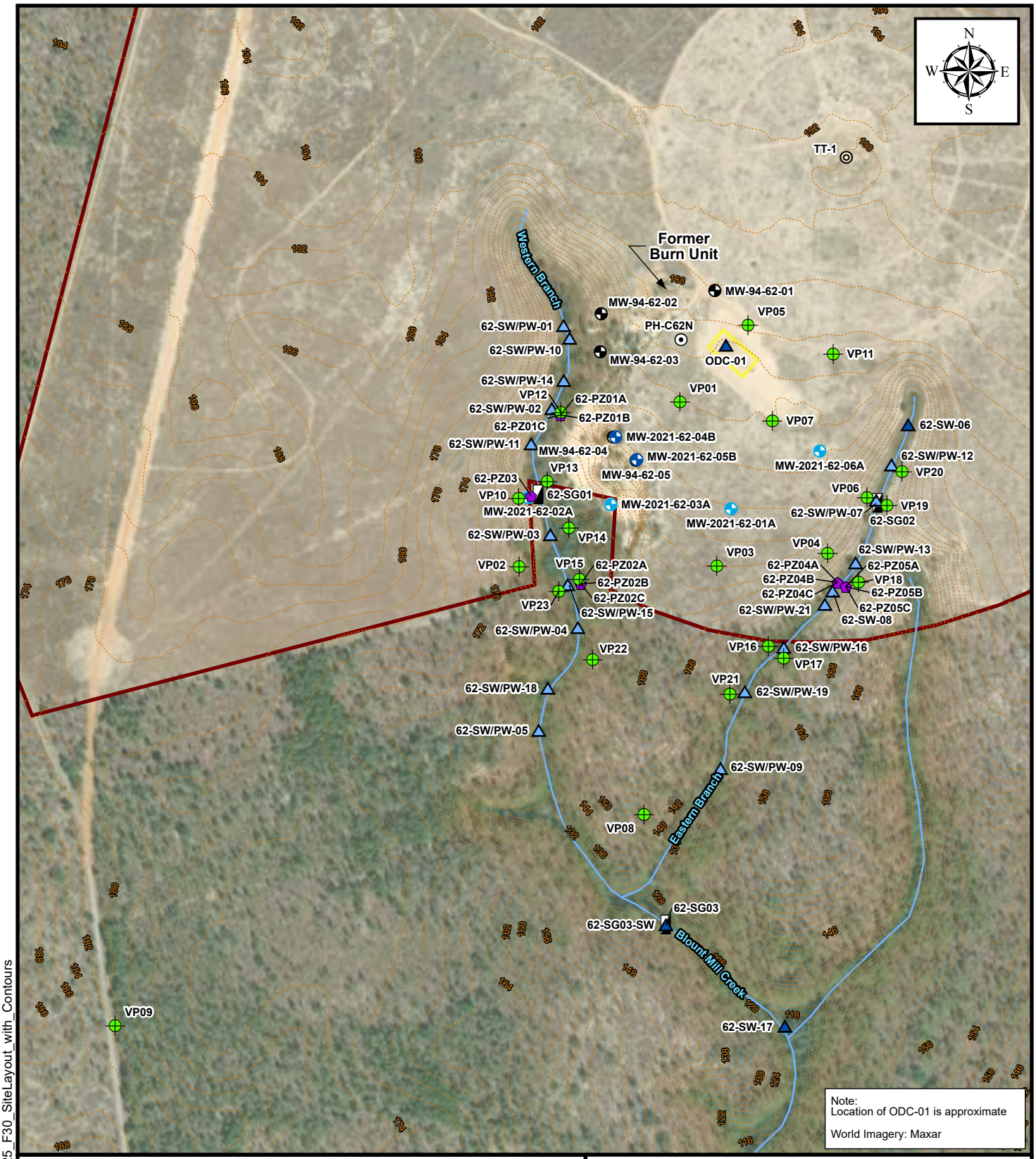
0 300 600
Feet

Date: 02/06/2025

Figure 29

EAS ENVIRONMENTAL ASSESSMENT SERVICES
Wholly Owned Subsidiary of Natives of Kodiak

File: 0225_Eglin.aprx Layout: 0225_F29_DeepGWC_081224



Legend

- Newly Installed Deep Wells
- Newly Installed Shallow Wells
- Existing Monitoring Well
- Pilot Hole
- Newly Installed Staff Gauges
- Newly Installed PZs - May 2024
- Vertical Profile Location
- Surfacewater Porewater Location
- Surfacewater Location
- Bombing Target
- Open Detonation Unit (ODU)
- Range C-62 Boundary
- LIDAR Contour North Central (Walton County, Florida) Contour Interval = 2 feet

Detailed Well Locations/Topographic Contours
Range C-62

Open Detonation Unit
Eglin AFB, Florida

KOMAN Government Solutions, LLC
293 Boston Post Road West, Suite 100, Marlborough, MA 01752

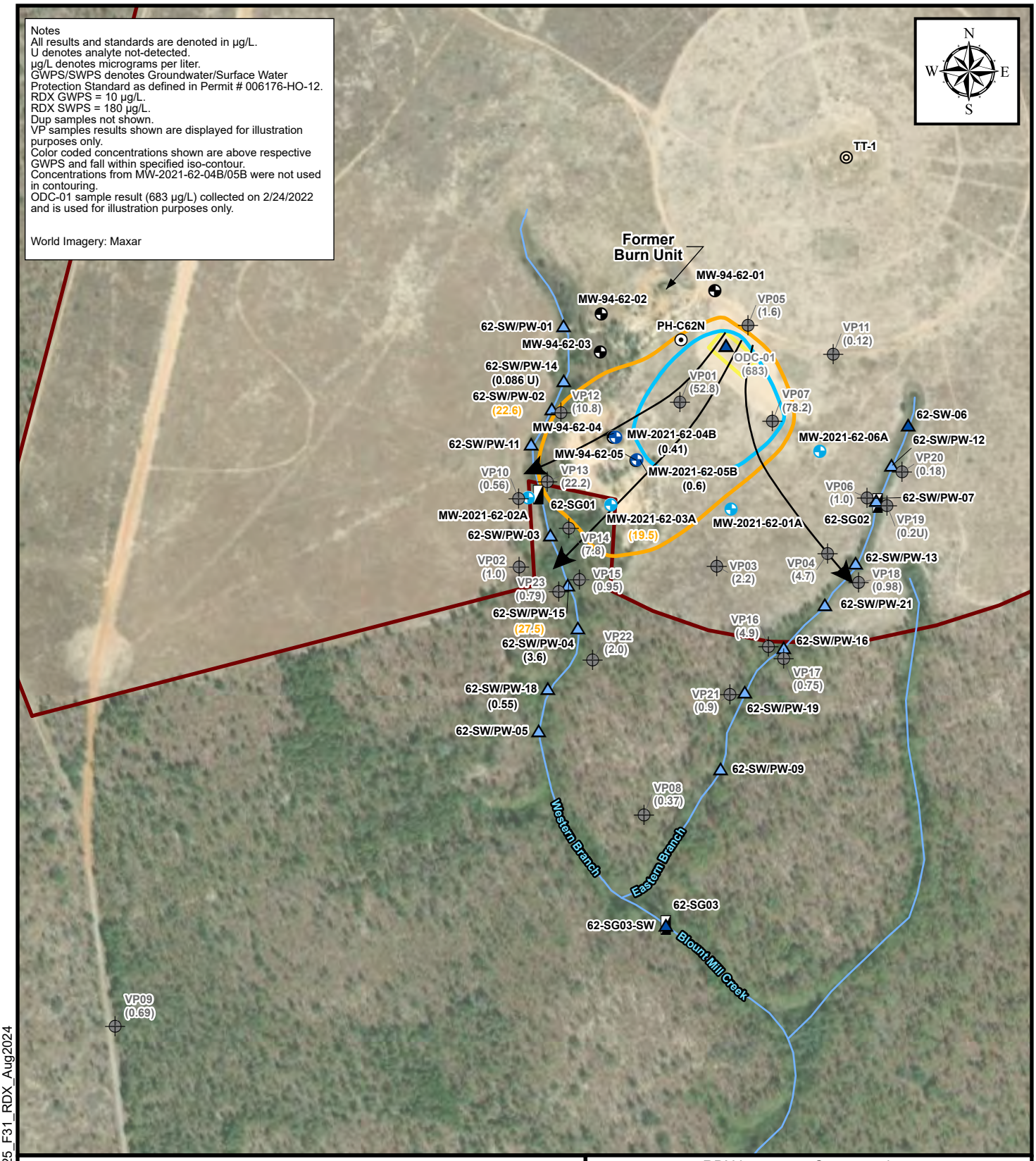
0 300 600
Feet

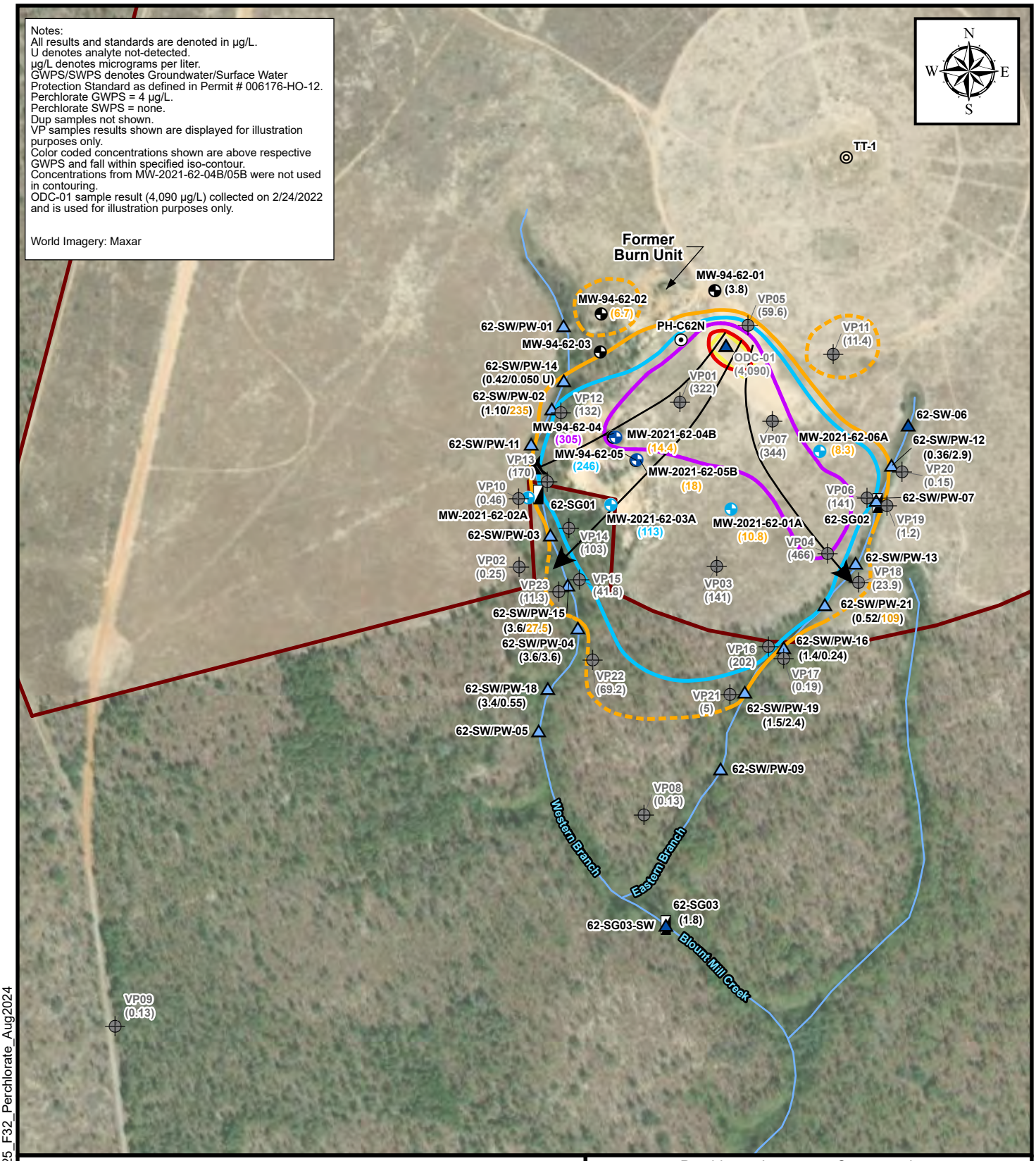
Date: 02/06/2025

Figure 30

EAS ENVIRONMENTAL ASSESSMENT SERVICES
Wholly Owned Subsidiary of Natives of Kodiak

File: 0225_Eglin.aprx Layout: 0225_F30_SiteLayout_with_Contours


Notes
All results and standards are denoted in µg/L.
U denotes analyte not-detected.
µg/L denotes micrograms per liter.
GWPS/SWPS denotes Groundwater/Surface Water Protection Standard as defined in Permit # 006176-HO-12.
RDX GWPS = 10 µg/L.
RDX SWPS = 180 µg/L.
Dup samples not shown.
VP samples results shown are displayed for illustration purposes only.
Color coded concentrations shown are above respective GWPS and fall within specified iso-contour.
Concentrations from MW-2021-62-04B/05B were not used in contouring.
ODC-01 sample result (683 µg/L) collected on 2/24/2022 and is used for illustration purposes only.
World Imagery: Maxar
N
W
E
S
TT-1
Former Burn Unit
MW-94-62-01
MW-94-62-02
VP05 (1.6)
62-SW/PW-01
PH-C62N
VP11 (0.12)
MW-94-62-03
ODC-01 (683)
62-SW/PW-14 (0.086 U)
VP01 (52.8)
62-SW/PW-02 (22.6)
VP12 (10.8)
VP07 (78.2)
62-SW-06
MW-94-62-04
MW-2021-62-04B (0.41)
MW-2021-62-06A
62-SW/PW-12
62-SW/PW-11
MW-94-62-05
VP20 (0.18)
VP10 (0.56)
VP13 (22.2)
MW-2021-62-05B (0.6)
VP06 (1.0)
62-SW/PW-07
62-SG01
MW-2021-62-02A
MW-2021-62-03A (19.5)
MW-2021-62-01A
62-SG02
VP19 (0.2U)
62-SW/PW-03
VP14 (7.8)
VP02 (1.0)
VP03 (2.2)
VP04 (4.7)
62-SW/PW-13
VP15 (0.95)
VP18 (0.98)
VP23 (0.79)
62-SW/PW-21
62-SW/PW-15 (27.5)
VP16 (4.9)
62-SW/PW-04 (3.6)
VP22 (2.0)
62-SW/PW-16
VP17 (0.75)
62-SW/PW-18 (0.55)
VP21 (0.9)
62-SW/PW-19
62-SW/PW-05
62-SW/PW-09
VP08 (0.37)
Western Branch
Eastern Branch
62-SG03
62-SG03-SW
Blount Mill Creek
VP09 (0.69)
Legend
Newly Installed Deep Wells
Newly Installed Shallow Wells
Existing Monitoring Well
Pilot Hole
Newly Installed Staff Gauges
Surface Water / Porewater Location
Surface Water Location
Vertical Profile Location
Range C-62 Boundary
Open Detonation Unit (ODU)
Groundwater Flow Direction
Bombing Target
Isocontour Concentration
50 µg/L
10 µg/L
(0.37) RDX Concentration
RDX Isocontour Concentrations in Groundwater and Porewater
August 2024
Range C-62
Open Detonation Unit
Eglin AFB, Florida
KOMAN Government Solutions, LLC
293 Boston Post Road West, Suite 100, Marlborough, MA 01752
0 300 600
Feet
Date: 02/06/2025
Figure 31
KGS TRINITY
File: 0225_Eglin.aprx Layout: 0225_F31_RDX_Aug2024


Notes:
All results and standards are denoted in µg/L.
U denotes analyte not-detected.
µg/L denotes micrograms per liter.
GWPS/SWPS denotes Groundwater/Surface Water Protection Standard as defined in Permit # 006176-HO-12.
Perchlorate GWPS = 4 µg/L.
Perchlorate SWPS = none.
Dup samples not shown.
VP samples results shown are displayed for illustration purposes only.
Color coded concentrations shown are above respective GWPS and fall within specified iso-contour.
Concentrations from MW-2021-62-04B/05B were not used in contouring.
ODC-01 sample result (4,090 µg/L) collected on 2/24/2022 and is used for illustration purposes only.
World Imagery: Maxar
N
W
E
S
TT-1
Former Burn Unit
MW-94-62-01 (3.8)
MW-94-62-02 (6.7)
VP05 (59.6)
62-SW/PW-01
PH-C62N
VP11 (11.4)
MW-94-62-03
ODC-01 (4,090)
62-SW/PW-14 (0.42/0.050 U)
VP01 (322)
62-SW/PW-02 (1.10/235)
VP12 (132)
62-SW-06
MW-94-62-04 (305)
MW-2021-62-04B (14.4)
VP07 (344)
MW-2021-62-06A (8.3)
62-SW/PW-12 (0.36/2.9)
62-SW/PW-11
MW-94-62-05 (246)
VP13 (170)
MW-2021-62-05B (18)
VP20 (0.15)
VP10 (0.46)
62-SG01
VP06 (141)
62-SW/PW-07
MW-2021-62-02A
MW-2021-62-03A (113)
MW-2021-62-01A (10.8)
62-SG02
VP19 (1.2)
62-SW/PW-03
VP14 (103)
VP04 (466)
62-SW/PW-13
VP02 (0.25)
VP03 (141)
VP18 (23.9)
VP15 (41.8)
VP23 (11.3)
62-SW/PW-21 (0.52/109)
62-SW/PW-15 (3.6/27.5)
62-SW/PW-04 (3.6/3.6)
VP16 (202)
62-SW/PW-16 (1.4/0.24)
VP22 (69.2)
VP17 (0.19)
62-SW/PW-18 (3.4/0.55)
VP21 (5)
62-SW/PW-19 (1.5/2.4)
62-SW/PW-05
62-SW/PW-09
VP08 (0.13)
Western Branch
Eastern Branch
62-SG03 (1.8)
62-SG03-SW
Blount Mill Creek
VP09 (0.13)
Legend
Newly Installed Deep Wells
Newly Installed Shallow Wells
Existing Monitoring Well
Pilot Hole
Newly Installed Staff Gauges
Surface Water / Porewater Location
Surface Water Location
Vertical Profile Location
Open Detonation Unit (ODU)
Range C-62 Boundary
Groundwater Flow Direction
Bombing Target
Isocontour Concentration
3,000 µg/L
300 µg/L
100 µg/L
4 µg/L
Dashed where Inferred
(0.13) Perchlorate Concentration
Perchlorate Isocontour Concentrations in Groundwater and Porewater
August 2024
Range C-62
Open Detonation Unit
Eglin AFB, Florida
KOMAN Government Solutions, LLC
293 Boston Post Road West, Suite 100, Marlborough, MA 01752
0 300 600
Feet
Date: 02/06/2025
Figure 32
KGS TRINITY
File: 0225_Eglin.aprx Layout: 0225_F32_Perchlorate_Aug2024

This page intentionally left blank.

Tables

Table 1 EOD Personnel Responsibilities and Job Experience

Personnel	Responsibilities/Job Experience
EOD Branch Chief **Chief Master Sergeant (CMSgt)** Air Force Enlisted Classification 3E800 **Skill Level 9** **Senior Master Sergeant (SMSgt)** Air Force Enlisted Classification 3E891	Manages the EOD program at Eglin AFB. Responsible to the installation commander for the resourcing, training, and operation of the EOD Branch. Is the technical authority on all EOD matters at Eglin AFB. 1. Plans and organizes explosive ordnance treatment activities. 2. Directs explosive ordnance activities to include checking methods and techniques employed in detecting, identifying, recovering, and destroying explosive ordnance. 3. Ensures compliance with safety regulations and practices. 4. Inspects and evaluates explosive ordnance activities. Experience: Qualifications mandatory as an EOD Technician and in directing functions such as detecting, identifying, rendering safe, recovering, and destroying explosives, incendiary, or nuclear ordnance.
EOD Team Chief **EOD Technician*** **Skill Level 7 (minimum)**	Supervises EOD Team and directly responsible to the Branch Chief for planning and execution of EOD operations by the EOD Team. 1. Organizes and conducts explosive ordnance treatment activities. 2. Performs explosive ordnance treatment functions. 3. Disposes of unserviceable explosive ordnance by detonation. 4. Performs as a specialized member of disaster preparedness teams. 5. Provide the required in-house Contingency Plan training to all employees and maintains training record. Experience: Qualifications mandatory as an EOD Specialist and in performing or supervising functions such as rendering safe, removing, or destroying dangerous or unserviceable explosive ordnance.
EOD Team Member, Leader, Shift Supervisor, or Task Trainer **EOD Journeyman*** **Skill Level 5**	1. Performs explosive ordnance treatment functions to include detecting and identifying UXO. 2. Determines safe distances to evacuate personnel and material. 3. Perform/render safe procedures, remove safe explosive ordnance. 4. Dispose of explosive ordnance rendered exceptionally hazardous by damage or deterioration. 5. Disposes of unserviceable explosive ordnance by detonation. 6. Fabricates and uses explosive charges 7. Performs as a specialized member of disaster preparedness teams. Experience: Completion of Phase I & II, NAVSCOLEOD. Experience is mandatory in performing functions such as rendering safe, removing, or destroying hazardous or unserviceable U.S. explosive ordnance.

Personnel	Responsibilities/Job Experience
EOD Team Member **EOD Apprentice*** **Skill Level 3**	1. EOD trainee will work with a trainer to enhance their knowledge and skills to progress to the 5-level. 2. Performs explosive ordnance treatment functions to include detecting and identifying UXO. 3. Determines safe distances to evacuate personnel and material. 4. Perform/render safe procedures, remove safe explosive ordnance. 5. Dispose of explosive ordnance rendered exceptionally hazardous by damage or deterioration. 6. Disposes of unserviceable explosive ordnance by detonation. 7. Fabricates and uses explosive charges 8. Performs as a specialized member of disaster preparedness teams. Experience: Completion of Phase I & II, NAVSCOLEOD. Experience is mandatory in performing functions such as rendering safe, removing, or destroying hazardous or unserviceable U.S. explosive ordnance.

*Job title, description, and experience are established by *Air Force Enlisted Classification Directory* (AFECD) (30 April 2019) and the *Career Field Education and Training Plan* (CFETP) 3E8X1 (1 JAN 2020).

Table 2 EOD Personnel Training Requirements

Training Requirements
EOD School, Phase I and II Conducted by NAVSCOLEOD Duration: 6 months
Installation Hazardous Waste Training Conducted by Office of Environmental Management, Eglin AFB. Topics include: a. Procedures for using, inspecting, repairing, and replacing facility emergency and monitoring equipment b. Key parameters for automatic waste feed cut-off systems c. Communications or alarm systems d. Response to fires or explosions e. Response to ground-water contamination incidents f. Shutdown of operations Training must be completed within 6 months of facility assignment or to new position at the facility (40 CFR Part 264.16(b)) Duration: 8 hours
Hazardous Waste Operations and Emergency Response (HAZWOPER) Conducted by Office of Environmental Management, Eglin AFB or outside vendor when applicable Duration: 40 hours
RCRA Explosive Ordnance Disposal Hazardous Waste Storage and Disposal Conducted by EOD Branch, 96th Equipment Maintenance Squadron, Eglin AFB Duration: 20 hours, followed by a post test
Radiation and Laser Safety Conducted by EOD Branch, 96th Equipment Maintenance Squadron, Eglin AFB
RCRA Training for Safe Transportation of Hazardous Materials Conducted by EOD Branch, 96th Equipment Maintenance Squadron, Eglin AFB Duration: 2 hours
Conducted by Office of Environmental Management, Eglin AFB
On-the-job training for all Skill Level 3 personnel Standardized self-pace career development course Duration: 18 months, and required to pass Skill Level 5
Periodic Training
Annual: a. Installation Hazardous Waste Refresher training (4 hours) b. RCRA refresher training on EOD Hazardous Waste Storage and Disposal (2 hours) c. RCRA refresher training on Training for Safe Transportation of Hazardous Materials (2 hours) d. Refresher training on explosive ordnance maintained or employed at Eglin AFB (216 hours) e. Refresher training on explosive ordnance found during range clearing at Eglin AFB (40 hours) f. Refresher training on aircraft support at Eglin AFB (30 hours) g. Refresher training on implementation of Contingency Plan (8 hours) h. Refresher training on Hazardous Waste Operations and Emergency Response (HAZWOPER) (8 hours) i. Refresher training on radiation and laser safety j. Preparedness and Prevention Training k. Cardiopulmonary Resuscitation (CPR) and First Aid

Periodic Training (cont'd)
Semiannual: Classroom or practical exercises on maintenance and use of assigned specialized EOD tool sets, photographic equipment, radiological and chemical protective clothing (30 hours)
Monthly: Refresher training on application of EOD procedures and techniques and review of new technical data and updated procedures. (6 hours) This is required by Department of the Air Force to maintain EOD certification.

Training records on current personnel must be kept until closure of the facility; training records on former employees must be kept for at least three years from the date the employee last worked at the facility. Personnel training records may accompany personnel transferred within the same company.

Table 3: Basic Compositions of Standard and HERD Explosives

INGREDIENT NAME	CAS No.	MAXIMUM WEIGHT %
2,2'-Methylene(4-methyl-6-tert-butylphenol)	119-47-1	<0.1
4,4'-methylenebis(2,6-ditertbutylphenol)	118-82-1	<0.1
Acetylene Black (fine graphite)	1333-86-4	<0.1
AIBN	78-67-1	<0.1
Aluminum	7429-90-5	<40
Ammonium Perchlorate	7790-98-9	<40
Ammonium Dinitramide	140456-78-6	
AO 2246	119-47-1	<0.1
Barium Nitrate	10022-31-8	
BDNPA/F (original entry: BDNPFUM)	80456-53-7	
3,3'-[(2,3-Dihydroxypropyl)imino]bispropiononitrile	4220-30-8	
Calight RPO	64742-52-5	<10
Carnauba (SP-8) Wax	8015-86-9	<25
Cobalt acetylacetonate	14024-48-7	
Cupric Sulfate (Anhydrous) (CuSO_{4})	7758-98-7	<0.1
DC-200 (L-45)	63148-62-9	<0.001
Desmodur N-100	28182-81-2	<1.5
Desmodur N-3200	28182-81-2	<1.5
Desmodur N-3400	28182-81-2	<3
DHE	26850-24-8	<0.3
Dibutyltin dilaurate (DBTDL)	77-58-7	<0.1
Diphenyl amine	122-39-4	
Dioctyl Phthalate	117-84-0	
DADNE	145250-81-3	
DATB	26616-30-8	
DNAN	97-02-9	
DOA	103-23-1	<10
EDDN	20829-66-7	<15
Emcol 14	9007-48-1	<0.1
Ethyl 702	118-82-1	<0.1
Ethyl Centralite	85-98-3	<1
FEFO	17003-79-1	<15
Ganex V-216	63231-81-2	<0.5
Ganex WP-660	136445-69-7	<0.5
Graphite	7782-42-5	<3
FeAA	14024-18-1	<0.01
HDI	822-06-0	<0.25
High bulk density nitroguanidine	556-88-7	<20
HMX	2691-41-0	<80
HNS	20062-22-0	
HTPB (R-20 LM)	69102-90-5	<10
HTPB (R-45 HT)	69102-90-5	<10
HTPB (R-45 HTLO)	69102-90-5	<10
HTPB (R-45M)	69102-90-5	<10
Hydromethylsiloxane curative	68037-59-2	<1

Table 3: Basic Compositions of Standard and HERD Explosives

Indramic 800 Wax (I-800)	63231-60-7	<1
Iron acetylacetonate	14024-18-1	
Isodecyl Pelargonate	109-32-0	<10
Isophorone Diisocyanate	4098-71-9	<2
Kel-F 800	9002-83-9	<5
Lead Nitrate (200-400 µm)	10099-74-8	<12
Liquid Lecithin	8002-43-5	<4
Maleic Anhydride	108-31-6	<0.1
1,2,4-Butanetriol trinitrate (BTTN)	6659-60-5	
Nitrocellulose	9004-70-0	
Nitroglycerin	55-63-0	
Nitroguanidine	556-88-7	<95
n-Lauryl Methacrylate	142-90-5	<7
N-methyl-4-nitroaniline	100-15-2	<1
Dinitrogen tetroxide	10544-72-6	
NTO	932-64-9	<40
Ozokerite (SP-1410) Wax	8021-55-4	<20
PAPI-901	9016-87-9	<2
PBNA	135-88-6	<1
PDMS/PDPS copolymer	68951-96-2	<12
PETN	78-11-5	<03
Poly(glycidyl 2,2-dinitro-2-fluoroethanoxide) (P-GDNFE)	Google returned two p	<8
platinum carbonyl cyclotetravinyltetrasiloxane	27342-69-4; 73018-55	<0.1
Polyisobutylene	9003-27-4	
Potassium Nitrate	7757-79-1	
Poly(propylene glycol) (PPG)	25322-69-4	<11
PYX	38082-89-2	<95
RDX	121-82-4	<90
Soy Oil	8001-22-7	
Sodium Nitrate	7631-99-4	
Stearic Acid	57-11-4	
Sulfur (S)	7704-34-9	<0.1
Sunthene 420 (Naphthenic oil)	64742-52-5	<10
Sylgard 184 Curative	68037-59-2; 68083-19	<2
Sylgard 184 Resin	68083-19-2; 68988-89	<20
Tantalum	7440-25-7	<65
TATB	3058-38-6	
TEGDMA	1019-16-0	<1
TEGDN	111-22-8	<3
TEPANOL	110445-33-5	<0.1
Tetryl	479-45-8	
TMETN	3032-55-1	<20
TNAZ	97645-24-4	
TNB	99-35-4	
TNT	118-96-7	80
Toluene Diisocyanate	584-84-9	<1
TPM	10201-29-3	95

Table 3: Basic Compositions of Standard and HERD Explosives

Triphenyl Bismuth	603-33-8	<0.1
Tungsten	7440-33-7	<90
Tween 21	9005-64-5	<0.1
Silicone Oil 10 cSt	63148-62-9	
Vinyl-terminated PDMS	68083-19-2	<1
Viton A	9011-17-0	<5
YBD-125	179005-03-9	<2
Zirconium	7440-67-7	<60

TABLE 4 PHYSICOCHEMICAL PROPERTIES OF THE POTENTIAL CHEMICALS OF CONCERN

CHEMICAL NAME LISTED IN COMPOSITION LISTS (CHEMCIAL FOR WHICH PROPERTIES ARE LISTED)	Physical State (S, L, G)	MW* *-Molecular Weight*	Water Solubility (mg/L)	K_{OC}	log K_{OW}	Boiling Point (deg C)	Melting Point (deg C)	Vapor Pressure (mm Hg at 30 deg C, unless shown)	Half Life (days) Air, Soil, Water	Hazardous Waste Characteristic
Acetylene	G	26	100961/100961 @ 18 C			-847 @ 760 mm	-80.8	40 @ 18.8 C		Reactive/Ignitable
Aluminum and Compounds (Aluminum)	S	27	INSOLUBLE			2327.2	660			Reactive/Toxic
Amino-4,6-dinitrotoluene, 2-	L	206	6.30E-03				173			Toxic
Ammonia	L, G	17	340,000 mg/L @ 20 C	3.1		-33.36	-77.7	10 @ 25 C		Reactive/Corrosive/Toxic
Ammonium chloride	S	54	28.3% (wt/wt) @ 26 C			520	336	1 @ 160.4 C		Toxic
Ammonium nitrate	S	80	871 g @ 100 C			210	169.6			Ignitable
Antimony and Compounds (Antimony)	S	122	INSOLUBLE			1635	630	1 @ 886 C		Toxic
Asphaltum (Asphalt)	S,L	Up to 100,000	INSOLUBLE			>700	43.3			Ignitable
Barium and Compounds (Barium)	S	137				1640	726	10 @ 1049 C		Toxic/Reactive/Corrosive
Calcium and Compounds (Calcium Cyanide)	S	92	SOLUBLE				640			Reactive
Carbon Black (Carbon, Activated)	S	12	INSOLUBLE			4200				Reactive/Ignitable
Carbon Dioxide	G	44			83.0%	-78.2	-56.2			Toxic
Carbon Monoxide	G	28	33 mL/L @ 0 C			-191.5	-206	.>1 ATM @ 20 C		Toxic/Reactive/Ignitable
Carbon tetrachloride	L	153.24	1160 mg/L @ 25 C	110	2.62-2.83	76.54	-23	91.3	Air: >330, Water: EVAP: 2 min - 7	Toxic
Cellulose	S	342.3	INSOLUBLE IN				260.56	0 mm Hg		Ignitable
Charcoal	S	12	INSOLUBLE			4200	>3500			Ignitable
Copper and Compounds (Copper)	S	64	INSOLUBLE			2595	1083	1 @ 1628 C		Toxic
Diazodinitrophenol	S	210	INSOLUBLE				158			Reactive/Ignitable
Dibutyl phthalate (Di-n-butyl phthalate)	L	278	13 mg/L @ 25 C	170,000	4.9	340	-36	0.0097	Air: 18 hours, Soil: 66-98% degrad. In 28 weeks, Water: 33% degrad. Seawater in 14	Toxic
Dinitrobenzene, 1,3- (Dinitrobenzene, m-)	S	168	500 mg/L	1.39	1.49	300	89	5.13E-6 @ 25 C	Air: 14.15 hours	Toxic
Dinitrotoluene, 2,4-	L, S	182	300 mg/L @ 20 C	201 & 290	1.98	300	71	2.17E-4 @ 25 C	Air: 8 hours, Soil: 436 days, Water: 3.7 in pond water	Toxic
Dinitrotoluene, 2,6-	S	182		201 & 290	1.72	295	66	5.67E-4 @ 25 C	Air: 8 hours, Water: 12 min in sunlit river water	Toxic

TABLE 4 PHYSICOCHEMICAL PROPERTIES OF THE POTENTIAL CHEMICALS OF CONCERN

CHEMICAL NAME LISTED IN COMPOSITION LISTS (CHEMCIAL FOR WHICH PROPERTIES ARE LISTED)	Physical State (S, L, G)	MW* *-Molecular Weight*	Water Solubility (mg/L)	K_{OC}	log K_{OW}	Boiling Point (deg C)	Melting Point (deg C)	Vapor Pressure (mm Hg at 30 deg C, unless shown)	Half Life (days) Air, Soil, Water	Hazardous Waste Characteristic
Diphenylamine	S	169	57.6 mg/L	470	3.6	302	53	1 @ 108.3 C		Toxic
Ethyl centralite (Diethylcarbanide, N,N'-)	S	268.39	Insoluble			325.56	78.89			Ignitable/Toxic
Ethylene dimethacrylate	L	198.218				89	-40			Toxic
Ethylene oxide	G	44	SOLUBLE	16	-0.3	10.7	-112.5	1,095	Air: 1 week, Water: hours to 2	Reactive/Toxic/Ignitable
Graphite	S	12	Insoluble				3650	0 mm Hg		Ignitable/Toxic
Gum arabic (Acaola)	L, S	600,000	SOLUBLE							Toxic
HMX	L,S	296	0.00000015		0.16		277	3.30E-14		Toxic/Reactive
Hexachlorobenzene	S	295	0.035 mg/L	4-5	5.31	323-326	231	1.1e-5 @ 25 C	Air: 2 years, Soil: 1530 days	Toxic
Hydrochloric acid	L	36.46	561,000 mg/L in hot water			39.4	-84.5			Corrosive/Toxic
Hydrogen cyanide	G, L	27.03	SOLUBLE		1.07	25.6	-13.4	630	Air: 334	Ignitable/Toxic
Hydrogem sulfide	G	34	4.130 mg/L @ 20 C			-60.33	-95.49	1 @ -60.4		Toxic/Reactive/Ignitable
Iron and Compounds (Ferric oxide)	S	160	INSOLUBLE				1595			Ignitable
Lead and Compounds (Lead)	S	207	INSOLUBLE			1740	327.4	1.77 @ 1000 C		Toxic
Linseed Oil	L	890	Insoluble in water			>316	-18.89			Ignitable
Magnesium and Compounds (Magnesium)	S	24	Slightly Soluble in Hot Water			1100	651			Reactive
Methane	G	16.043	4.29e-2 mol/L		1.09	-163	-38.2	4.66e+5 mmHg		Reactive/Ignitable
Methyl centralite (Dimethylcarbanide, N, N'-)	L,S	240.306				350	122			Toxic
Methyl Nitrate	L	77.04				64.6	-82.3			Toxic/Reactive
Nitrate	S	62	1.47 mol/L		0.21	493	189			Ignitable/Reactive
Nitric oxide	G	30	C			-151.7	-163.6	26,000		Toxic/Ignitable/Corrosive/Reactive
Nitrobenzene	L, S	123.11	1,780 mg/L		1.85	210.8	5.7	1.5e-1 @ 25 C	Air: 125 days, Water: 3.8 days in pond water	Toxic
Nitrocellulose	L, S	504.3	1 g/L @ 21 C			33.89	161	1e5 @ 25 C		Ignitable
Nitrogen dioxide	G	46				21.15	-9.3	400 @ 80 C		Reactive/Corrosive/Toxic/Ignitable
Nitroglycerine	L, S	227	1800 mg/L @ 25 C		1.62	153	13	0.0025	Water: 3,000 days from volatilization	Reactive/Toxic
Nitroguanidine	S	104	Soluble in Hot Water		-0.89					Reactive/Toxic
Nitrostarch	S		INSOLUBLE							Reactive/Ignitable/Toxic
Ozone	G	48	49 cc/100 cc @ 0 C			-111.9	-192.7			Reactive/Toxic
PETN	S	316	43 mg/L @ 25 C			180 @ 50mm HG	140			Reactive
Phosphorus	S	31				280				Reactive/Toxic/Corrosive/Ignitable

TABLE 4 PHYSICOCHEMICAL PROPERTIES OF THE POTENTIAL CHEMICALS OF CONCERN

CHEMICAL NAME LISTED IN COMPOSITION LISTS (CHEMCIAL FOR WHICH PROPERTIES ARE LISTED)	Physical State (S, L, G)	MW* *-Molecular Weight*	Water Solubility (mg/L)	K_{OC}	log K_{OW}	Boiling Point (deg C)	Melting Point (deg C)	Vapor Pressure (mm Hg at 30 deg C, unless shown)	Half Life (days) Air, Soil, Water	Hazardous Waste Characteristic
Picric acid (Trinitrophenol,2,4,6-)	S	229	5.52e-2 mol/L		1.44	300	122	7.50E-07		Toxic/Ignitable
Polybutylene	S	112					135			Toxic
Polyvinyl chloride	S	60K-150K								Toxic
Potassium and compounds (potassium cyanide)	S	65	11.1 mol/L			1630	634			Corrosive/Toxic
Propane	G	44	62.4 mg/L @ 25 C	450-460	2.36	-42.1	-189.7	760 @ 25 C	Air: 8-13.4 days, Water: 2.3 days in model pond	Ignitable/Toxic
RDX (Cyclonite)	S	222	INSOLUBLE	42-536	0.87	205-206		4E-9 @ 25 C	Air: 1.5 hours, Water: 11.6% loss/hydrolysis/112 days/seawater	Toxic/Reactive/Ignitable
Red Phosphorus	S	31				290	590			Reactive/Toxic/Corrosive/Ignitable
Silver	S	108	INSOLUBLE			2000	980.5			Toxic
Sodium and compounds (sodium cyanide)	S	49	820 mg/L @ 35 C			1496	563.7	1 @ 817 C		Toxic/Corrosive
Strontium and compounds (strontium)	S	96				1366	757	10 @ 898 C		Reactive/Corrosive
Sulfate	S,L	96								Corrosive
Sulfur	S	32	INSOLUBLE			444.6	112.8-120	4E-6 @ 30.4 C		Ignitable
Sulfur dioxide	G	64	95,000 mg/L @ 25 C			-10	-72.7	3.2		Corrosive/Toxic
TNA (Tetranitroaniline, 2,3,4,6-	S	274		1600						Reactive/Toxic/Ignitable
TNPH (Trinitrophenethane)	S	229	12,820 mg/L @ 25 C				122-123	<1 Torr @ 20 C		Reactive/Toxic/Ignitable
Tetracene	S	228	4.85E-09		5.83		351	2.48E-09		Toxic
Tetryl	S	267	200 mg/L @ 20 C	406		187	130-132	5.7E-9 @ 25 C	Air: 11 days, Water: 33 days @ 25 C & pH 8.1 in seawater	Reactive/Toxic/Ignitable
Tin and Compounds (Tin)	S	119	INSOLUBLE			2507	231.9	1 @ 1,492 C		Toxic
Trinitrobenzene, 1,3,5-	S	213	350 mg/L	104 & 178	1.1	315	122.5	3E-6 @ 25 C	Air: 35 years	Reactive/Toxic/Ignitable
Trinitrotoluene, 2,4,6-	S	227.13	100 mg/L @ 25 C		1.6	240	80.1	5.5E-6 @ 25 C	Air: 110 days, Water: 119 days from model river	Reactive/Toxic/Ignitable
White Phosphorus	S	31								Reactive/Toxic/Corrosive/Ignitable
Zirconium and compounds (Zirconium)	S	91	INSOLUBLE			3577	1857			Reactive

Footnotes:
Kow is ratio of a chemical's concentration in the octanol phase to its concentration in the aqueous phase of a two-phase octanol/water system
Koc is the organic carbon-water pertition co-efficient

Table 5
OD Treatment, 2020 through 2024
ODU, Range C-62
Eglin AFB, FL

Year	Date	Shot Detonation 1 (lbs)	Shot Detonation 2 (lbs)	Shot Detonation 3 (lbs)	Total (lbs)	Average NEW	Notes
				2019 Total	**12,596.08**		
2020	17-Mar	2,626.00	2,161.00		4,787.00	2,393.50	2 Shots
	13-Jul	1,238.00	1,134.88		2,372.88	1,186.44	2 Shots
	18-Aug	1,865.71			1,865.71	1,865.71	1 Shot
	5-Oct	2,306.00			2,306.00	2,306.00	1 Shot
	26-Oct	2,500.00			2,500.00	2,500.00	1 Shot
				2020 Total	**13,831.59**	**2,050.33**	
2021	22-Feb	1,917.00			1,917.00	1,917.00	1 Shot
	29-Mar	2,008.00			2,008.00	2,008.00	1 Shot
	19-Jul	1,194.42			1,194.42	1,194.42	1 Shot
	26-Jul	1,774.55	2,089.84		3,864.39	1,932.20	2 Shots
	25-Oct	1,644.00	2,323.00		3,967.00	1,983.50	2 Shots
	1-Nov	2,105.62	2,222.89		4,328.51	2,164.26	2 Shots
	15-Nov	2,765.00	1,969.00		4,734.00	2,367.00	2 Shots
				2021 Total	**22,013.32**	**1,938.05**	
2022	22-Feb	1,169.00			1,169.00	1,169.00	1 Shot
	16-Mar	2,512.27	1,398.26		3,910.53	1,955.27	2 Shot
	16-Mar	2,855.40			2,855.40	2,855.40	1 Shot
	25-Apr	209.30			209.30	209.30	1 Shots
	31-May	1,704.88			1,704.88	1,704.88	1 Shots
	7-Nov	2,041.15	1,302.23		3,343.38	1,671.69	2 Shots
				2022 Total	**13,192.49**	**1,594.26**	
2023	13-Feb	2,675.00			2,675.00	2,675.00	1 Shot
	27-Feb	1,719.00			1,719.00	1,719.00	1 Shot
	15-May	2,605.00	2,701.00	1,000.25	6,306.25	2,102.08	3 Shot
	14-Aug	1,953.00	2,375.00		4,328.00	2,164.00	2 Shot
	6-Nov	1,978.70	1,830.30		3,809.00	1,904.50	2 Shot
				2023 Total	**18,837.25**	**2,112.92**	
2024	11-Mar	2,969.27	2,600.74		5,570.01	2,785.01	2 Shots
	18-Jun	2,764.00	2,577.00	1,307.00	6,648.00	2,216.00	3 Shots
	26-Aug	1,772.73			1,772.73	1,772.73	1 Shots
	18-Nov	2,360.10			2,360.10	2,360.10	1 Shots
				2024 Total	**16,350.84**	**2,283.46**	
				Event Average NEW	2,005.37		
				Annual Average NEW	16,845.10		

Notes:
denotes maximum NEW detonated in a given year.

Table 6 Monthly Average Temperature, Precipitation, and Relative Humidity at Eglin AFB, Florida

2024	AVERAGE TEMPERATURE (F°)			PRECIPITATION (in.)	RELATIVE HUMID	
MONTH	MAX.	MIN.	MEAN	SUM FOR MONTH	MAX.	MIN.
January	72	63	66.08	4.02	100	0.00
February	79	66	69.03	2.92	100	18
March	81	66	70.61	4.82	100	17
April	84	70	76.04	2.58	95	0.00
May	95	80	84.10	6.84	100	0.00
June	99	81	87.26	7.49	94	25
July	96	85	87.92	7.73	94	0.00
August	100	82	90.08	0.67	94	27
September	95	67	80.10	4.91	100	34
October	91	74	80.50	0.49	94	0.00
November	85	75	78.36	4.81	95	0.00
December	78	60	70.73	0.02	94	0.00
Annual Average	88	72	78	3.94	97	10

Source: Weather Underground at Destin-Fort Walton BeachAirport/Eglin AFB Station

Appendices

Appendix A General Facility Information/Photographic Log

General Facility Information

Department of
Environmental Protection

Jeb Bush
Governor

Northwest District
160 Governmental Center
Pensacola, Florida 32501-5794

David B. Struhs
Secretary

FILE COPY

October 13, 2000

Mr. Thomas M. Paris
Environmental Directorate
501 DeLeon Street, Suite 101
Eglin Air Force Base, Florida 32542-5133

Dear Mr. Paris:

This is in response to the letter dated October 6 from Mr. Daniel Freeman, which requested that your Operation Permit, HO 46-286388, be modified to remove the present open burn kettles for Range 62. The letter also stated that a major modification is forthcoming to include a new open burn procedure for Range 62.

We have reviewed the submittal and your request to remove the open-burn kettles is approved.

This letter shall be attached to permit HO46-286388 as Modification #3 and becomes part thereof. All other conditions of the permit remain in effect.

If you have any questions, please call Bill Kellenberger, Hazardous Waste Section Supervisor at (850) 595-8360, extension 1264.

Sincerely,

Charles F. Goddard
Program Administrator
Waste Management

CFG:bkl

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS AIR ARMAMENT CENTER (AFMC)
EGLIN AIR FORCE BASE, FLORIDA

31 AUG 2001

RECEIVED
RCRA
SEP 07 2001
Hazardous Waste Regulation

Thomas M. Paris
Chief, Environmental Compliance
501 DeLeon Street Suite 101
Eglin AFB FL 32542–5133

Mr. Satish Kastury
Hazardous Waste Section
Florida Department of Environmental Protection
2600 Blair Stone Road
Tallahassee FL 32399-2400

Dear Mr. Kastury

Eglin Air Force Base wishes to amend our Part B, RCRA Permit # HO46-286388 renewal. In Appendix C "Flight Operating Instruction 32-3004, *Explosive Ordnance Disposal Open Burn/Open Detonation Procedures*" page 9 OPEN BURN replace this section with the attached "General Operating Procedures".

If you have any questions, contact Mr. Ed O'Connell, AAC/EMCP, (850) 882-6282, ext 326.

Sincerely

Ed O'Connell
for THOMAS M. PARIS, GS-14
Chief, Environmental Compliance

Attachment:
General Operating Procedures

cc:
Mr. Doug McCurry
Mr. Bill Kellenberger

General Operating Procedures for Open Burn

1. Verify that generator is "ON" and there is power to the system and the fan is "ON".
2. Light burner pilots.
3. Using control pendant, raise door and retract carbottom.
4. Load material on carbottom to be processed.
5. Using operator pendant move carbottom back into furnace and lower door.
6. Using remote pendant, light burners and allow temperature to go to operating range.
7. With furnace at temperature, allow for a 30 minute heat soak to ensure 5X conditions. (This time will be verified during startup.)
8. After heat soak, turn off burners and allow system to cool to 600°F.
9. With operator pendant, raise door retract carbottom.
10. Remove "5x" treated materials from carbottom.
11. Repeat steps 4 to 10 for additional loads.
12. Prior to shutdown for the day, make sure carbottom is in the furnace and door is lowered.
13. Turn off power.

Photographic Log

8958 and 8758 C-62 Looking NNW

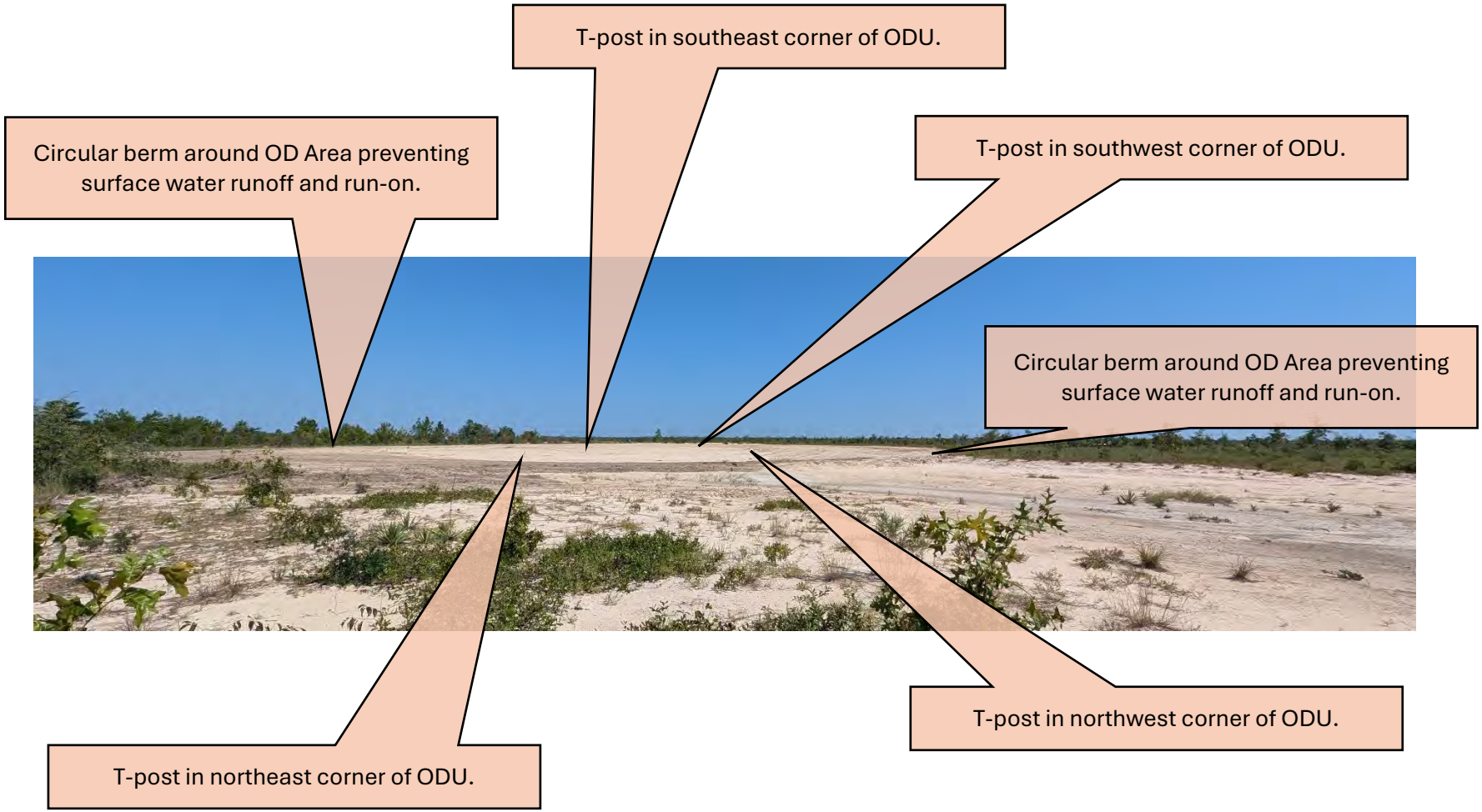
3-8958 Control Tower looking N

OD C-62 Looking SSE From Tower

8958 Gate to OD -62 looking S

C-62 NW Boundary looking SE

From NW Boundary Marker Looking NNW toward 8958 Control Tower



Photograph of OD Area, Range C62, Eglin AFB, August 12, 20204, View Toward the Southwest.

Phase I Soil Sampling in OD Unit, April 2024

Typical Soil Core

Typical Soil Core

Phase I Soil Sampling in OD Unit, April 2024

Placing soil samples into containers. View to southeast. Background features, from left to right: cement for borehole abandonment, water and hot water pressure washer for equipment decontamination, pickup truck, eastern portion of OD Unit.

Placing soil samples into containers. View to southwest. Background features, from left to right: western portion of OD Unit, skid steer, sonic drilling rig.

Piezometer Installation, May 2024

Drilling and installation of 62-PZ04C. View to south. Eastern Branch to the left (east) of the sonic drilling rig. Core barrel in rig mast, override casing in pipe racks between sonic rig and core. Core in foreground.

Piezometer Installation, May 2024

Setting up sonic rig to drill 62-PZ02C. View to southwest. Western Branch to the right (west) of the sonic drilling rig.

Piezometer Installation, May 2024

Core from 62-PZ01C. Shallow core at top of photo, deeper core at bottom.

Deepest core from 62-PZ01C. Silt (yellow-brown, left side of photo) overlying Pensacola Clay (gray, right side of photo). Green circular object (right side of photo) is a core retainer.

This page intentionally left blank.

Appendix B Contingency Plan

Appendix B
Contingency Plan for Open Detonation Activities
at Range C-62
EPA ID Number: FL8570024366
Eglin Air Force Base, Florida

Prepared for:

96th CEG/CEIEC
Environmental Compliance
700 Range Road, Building 592
Eglin Air Force Base, Florida 32542-5120

Under Contract to:

U.S. Army Corps of Engineers, Omaha District
1616 Capital Avenue
Omaha, Nebraska 68102-4901

Contract No. W9128F- 16- D-0037
Delivery Order No. W9128F20F0199

Prepared by:

TRINITY
1002 N. Eglin Parkway,
Shalimar, Florida 32579

January 2021

This page intentionally left blank.

Record of Review and Amendments

Name of Reviewer	Title/Organization	Date of Review	Changes Made

This page intentionally left blank.

TABLE OF CONTENTS

Record of Review and Amendments ..... **iii**
1.0 Introduction **1-1**
1.1 Scope of Work 1-1
1.2 Plan Organization 1-1
2.0 Preparedness and Prevention **2-1**
2.1 Weather Preventions 2-3
2.2 Preventing Hazards in Unloading Operations 2-3
2.3 Preventing Water Supply Contamination 2-3
2.4 Types and Quantity of Wastes 2-4
3.0 Response Actions **2-4**
3.1 Response Options for Fires 3-2
3.1.1 Response Actions for Fires during Explosive Operations 3-3
3.1.2 Response Actions for Fires Not Involving Explosives 3-5
3.2 Response Actions for an Unanticipated Detonation 3-7
3.3 Response Actions for Releases of Hazardous Materials and Hazardous Waste 3-9
3.3.1 Response Actions for Spills Greater than the Reportable Quantity 3-10
3.3.2 Response Actions for Spills Less than the Reportable Quantity 3-11
3.4 Response Actions for Spills of Petroleum, Oil and Lubricants 3-11
4.0 Coordination with Other Plans **4-1**
5.0 Cooperative Agreements **5-1**
6.0 Emergency Coordinators **6-1**
7.0 Emergency Equipment **7-1**
8.0 Evacuation Plan **8-1**
9.0 Location and Distribution of the Contingency Plan **9-1**
10.0 Review and Amendment of the Contingency Plan **10-1**

Figure

Figure 1 Site Locations and Explosive Transportation Route

List of Tables

Table 3-1 Levels of HAZMAT Response 3-11
Table 5-1 Local Emergency Response Resources 5-1
Table 6-1 Emergency Coordinators & Contacts 6-1
Table 7-1 Emergency Response Equipment Available at the OD Areas 7-1
Table 9-1 Locations of the Contingency Plan at EAFB 9-1

List of Attachments

Attachment 1 Defense Transportation Regulation 4500.9-R Part II – *Cargo Movement*
Attachment 2 EOD Flight Operating Instruction 32-3001, *Explosive Ordnance Disposal Program*
Attachment 3 Excerpt from Section 8G: Air Force Manual 91-201 *Explosive Safety Standards*

Abbreviations and Acronyms

AFMAN	Air Force Manual
CFR	Code of Federal Regulations
CPR	cardiopulmonary resuscitation
DRF	Disaster Response Force
DTR	Defense Transportation Regulation
EAFB	Eglin Air Force Base
EMS	Emergency Medical Services
EOD	Explosive Ordnance Disposal
EPA	Environmental Protection Agency
ERP	Environmental Restoration Program
F.A.C.	Florida Administrative Code
FDEP	Florida Department of Environmental Protection
FOI	Flight Operating Instruction
gpm	gallons per minute
HAZMAT	hazardous materials
IC	Incident Commander
IEMP 10-2	Installation Emergency Management Plan 10-2
IRF	Initial Response Force
JTOC	Joint Test and Training Operations Control Center
NRC	National Response Center
OD	Open Detonation
OSC	On-Scene Commander
POL	petroleum, oils, and lubricants
RCO	Range Control Officer
RQ	Reportable Quantity
RR	Range Road
SPCC	Spill Prevention, Control, and Countermeasures
SRT	Spill Response Team
TRINITY	Trinity Analysis & Development Corp.
TSDF	Treatment, Storage, and Disposal Facility

This page intentionally left blank.

1.0 Introduction

1.1 Scope of Work

According to 40 Code of Federal Regulations (CFR) §264.51, Purpose and Implementation of Contingency Plan:

- Each owner or operator of a hazardous waste treatment, storage, and disposal facility (TSDF) must have a Contingency Plan for his facility. The Contingency Plan must be designed to minimize hazards to human health or the environment from fires, explosions, or any unplanned sudden or non-sudden release of hazardous waste or hazardous waste constituents to air, soil, or surface water.
- The provisions of the Plan must be carried out immediately whenever there is a fire, explosion, or release of hazardous waste or hazardous waste constituents which could threaten human health or the environment.

This Contingency Plan is intended to meet the requirements of:

- 40 CFR §264.51, Purpose and Implementation of Contingency Plan
- 40 CFR §264.52, Content of Contingency Plan
- 40 CFR §264.53, Copies of Contingency Plan
- 40 CFR §264.54, Amendment of Contingency Plan
- 40 CFR §264.55, Emergency Coordinator
- 40 CFR §264.56, Emergency Procedures

This Contingency Plan is also intended to meet the requirements of:

- 40 CFR Part 264 Subpart C – Preparedness and Prevention

This Open Detonation (OD) Contingency Plan is specific only to the OD activities that occur only at and Range C-62 at Eglin Air Force Base (EAFB), Florida.

The Contingency Plan must be submitted to the Regional Administrator with Part B of the permit application under 40 CFR Part 270 and after modification or approval, will become a condition of any permit issued.

This work was performed under Contract by Trinity Analysis & Development Corp. (TRINITY), at the request of EAFB.

This Contingency Plan for Open Detonation Activities at Range C-62, EAFB, will be referred to throughout this document as the “OD Contingency Plan” or “Plan”. Any other plan referenced in this document will be clearly identified and referenced.

1.2 Plan Organization

The order of this Contingency Plan conforms to the order in which the requirements are presented in 40 CFR §264.30 through 264.37, and §264.52 through §264.56. Each subsequent Chapter in this plan is begun with the regulatory reference that requires the ensuing text. This is to expedite review by regulators and other auditors and to educate OD personnel as to the regulations and its effects on the Plan.

This page intentionally left blank.

2.0 Preparedness and Prevention

40 CFR §264.31: Facilities must be designed, constructed, maintained, and operated to minimize the possibility of a fire, explosion, or any unplanned sudden or non-sudden release of hazardous waste or hazardous waste constituents to air, soil, or surface water which could threaten human health or the environment.

40 CFR §264.32 Required equipment.

All facilities must be equipped with the following, unless it can be demonstrated to the Regional Administrator that none of the hazards posed by waste handled at the facility could require a particular kind of equipment specified below:

***(a)** An internal communications or alarm system capable of providing immediate emergency instruction (voice or signal) to facility personnel;*

***(b)** A device, such as a telephone (immediately available at the scene of operations) or a hand-held two-way radio, capable of summoning emergency assistance from local police departments, fire departments, or State or local emergency response teams;*

***(c)** Portable fire extinguishers, fire control equipment (including special extinguishing equipment, such as that using foam, inert gas, or dry chemicals), spill control equipment, and decontamination equipment; and*

***(d)** Water at adequate volume and pressure to supply water hose streams, or foam producing equipment, or automatic sprinklers, or water spray systems.*

40 CFR §264.33 Testing and Maintenance of equipment.

All facility communications or alarm systems, fire protection equipment, spill control equipment, and decontamination equipment, where required, must be tested and maintained as necessary to assure its proper operation in time of emergency.

40 CFR §264.34 Access to communications or alarm system.

(a) Whenever hazardous waste is being poured, mixed, spread, or otherwise handled, all personnel involved in the operation must have immediate access to an internal alarm or emergency communication device, either directly or through visual or voice contact with another employee, unless the Regional Administrator has ruled that such a device is not required under § 264.32.

(b) If there is ever just one employee on the premises while the facility is operating, he must have immediate access to a device, such as a telephone (immediately available at the scene of operation) or a hand-held two-way radio, capable of summoning external emergency assistance, unless the Regional Administrator has ruled that such a device is not required under § 264.32.

The OD facilities (**Figure 1**) are designed and operated to minimize the possibility of fire, explosion, or any unplanned release of hazardous waste which could threaten human health or the environment.

OD activities do not utilize any type of equipment or treatment units. Detonation occurs in existing craters on a cleared 100 x 200 feet area of land. Subsurface disposal of waste munitions are not buried or covered at OD site or within the crater. The existing craters, artifacts from previous detonations, vary in dimension from 6 x 6 x 3 feet deep to 20 x 50 x 6 feet deep, based on the number and size of ordnance items to be detonated (40 CFR 264.31). Use of subsurface detonations reduces the fragmentation hazard associated with the treatment of munition items, as well as minimizing noise.

Disposal detonations are only conducted on controlled Eglin ranges. All entry/exit gates are manned by military or government personnel and called "clear" via LMR radio before initiation of disposal. Visual clearance from all involved is obtained before initiation. There will always be at least two Explosive Ordnance Disposal (EOD) personnel present for any OD operation. Each individual present will be equipped with a hand-held radio for emergency communication. In addition, visual contact with other personnel will be maintained. Communications at the OD treatment areas are maintained by voice or hand-held two-way radio. Communication between EOD personnel and the Range Control Officer (RCO), Joint Test and Training Operations Control Center (JTOC), and EOD Operations are by hand-held two-way radio. Telephones are also available at the RCO and JTOC (40 CFR 264.34).

In the event of an emergency, portable two-way radios or the truck radio will be utilized to summon assistance from the on-base emergency response personnel. The radios will have sufficient range to easily contact the JTOC, who will always be available during OD operations. As stated in the Response Actions, the On-Scene Commander (OSC) will be responsible for contacting the RCO and the JTOC, who will notify the Command Post by radio or telephone. The OSC will have the authority to summon the required on-base assistance.

The fire control, spill, and decontamination equipment are available at the OD treatment areas and base-wide during OD operations. EOD vehicles containing fire extinguishers, absorbents, and other emergency equipment are located in proximity to the treatment area.

It is not necessary to maintain spill control equipment at the treatment area during OD activities because all materials to be treated are non-liquid and remain in their containers (bomb cases, shells, boxes) until actual burn/detonation.

In most scenarios, onsite fire extinguishers would be used for fire control. The fire extinguishers maintained on the range during the OD mission will be used to control the emergency until the on-base fire department arrives. No fire-fighting equipment maintained on the ranges contains or uses water; therefore, water of a substantial volume or pressure is not required. If EAFB Natural Resources Fire Response equipment is necessary, a 250-gallon initial attack truck capable of dispensing water or foam or a crawler tractor with a fire plow will be dispatched to the OD treatment area. There is a water supply well at Range C-62 with a discharge rate of 25 gallons per minute (gpm). Additional water supply well information is included in **Appendix E** of the Permit Renewal Application.

EAFB has cooperative agreements with local emergency response services. Arrangements with local police and fire departments, emergency response teams, and hospitals is addressed in Section 5.0 of this Contingency Plan. In that event local community emergency services are required, the OSC will notify the Command Post, which will authorize the Disaster Preparedness Division to contact the appropriate outside organizations, as required (40 CFR 264.37).

2.1 Weather Preventions

OD operations proceed following an acceptable weather report. No operations will take place if there is a forecast for a major storm or lightning within five (5) nautical miles. In case of bad weather, operations will be rescheduled. No preparations for OD sites are required for major storms or hurricanes. Since there is no equipment at the site, and all remnants are cleared following the previous operation, there is nothing to secure.

2.2 Preventing Hazards in Unloading Operations

Munitions loading, unloading, and transportation are common on EAFB. Defense Transportation Regulation (DTR) 4500.9-R Part II – *Cargo Movement* **(Attachment 1** [Table of Contents only]), which contains the general procedures that ensure safety for these operations. In addition, there are specific routes for transporting explosives on EAFB (**Figure 1**). All EOD personnel receive training in explosives handling and transportation. When using multiple vehicles on a mission, only one vehicle transports explosives unless a compatibility problem exists. The team plans the transportation route to ensure proper explosive routes and range roads are available and open, allowing for sufficient time to arrive at the range at least 15 minutes ahead of schedule.

Trucks containing munitions approach from either Range Road (RR) 200 from the south through Range Gate No. 62 or from RR 203 to the east. Once on the range, munitions are unloaded by a minimum of two personnel in the OD units (Flight Operating Instruction (FOI) 32-3001, *Explosive Ordnance Disposal Program* **Attachment 2**). Upon request to the EAFB range services, a 10K All-Terrain forklift is made available for on-site unloading if deemed necessary. The below listed EOD procedures are to be followed in accordance with Air Force Manual (AFMAN) 91-201 *Explosive Safety Standards*. An excerpt of this AFMAN, Section 8G- *Transportation and Movement of Explosives by Motor Vehicle and Material Handling Equipment*, is presented in **Attachment 3:**

- Chock explosives loaded vehicles during loading or unloading operations.
- To the maximum extent possible, position munitions cargo vehicles to permit loading and unloading from each side of the cargo bed. Munitions will be accessed from the side closest to the load unless access can only be obtained from one side.
- Except as required in the event of an electrical storm, do not leave explosives-laden vehicles unattended unless they are parked in a properly designated area, such as the weapons storage area, holding yard or flightline munitions holding area.
- Do not load or unload explosives from a motor vehicle while the engine is running, except under the following conditions:
    - Where the engine is required to provide power to vehicle mechanical handling equipment used in loading and unloading the vehicle.
    - Where necessary for emergency operations or timing for exercises simulating execution of emergency plans. In this case, small loads or packages of explosives

delivered to aircraft, requiring only momentary unloading time, may be removed from a vehicle while the motor is running.

  - Engines of diesel-powered vehicles may continue to run during loading or unloading of explosives except when exposed explosives or hazardous locations are involved.

- Do not leave vehicles at storage locations longer than needed to complete explosives loading or unloading. If a delay occurs, move the vehicle from location.
- When using multiple vehicles on a mission, only one vehicle transports explosives unless a compatibility problem exists.
- Refuel trucks before loading explosives.
- Upon OD mission completion, residue is inspected to ensure that treatment is complete before being transported for disposal.

2.3 Preventing Water Supply Contamination

The Sand & Gravel Aquifer is used as a regional water supply source for potable water, agricultural and industrial purposes. Range C-62 has water supply wells screened in the Sand & Gravel Aquifer that are used for non-potable purposes. The wells are located upgradient from OD activities.

Water supplied from the Floridan aquifer is not likely to be impacted due to the presence of the 160 to 250-ft-thick Pensacola clay confining layer, which effectively isolates the sand and gravel aquifer from the underlying Floridian aquifer. The Floridan aquifer averages 1,000 feet thick, and freshwater can extend to a depth of 2,000 feet below land surface. There are no surface water intakes within 15 miles of Range C-62.

2.4 Types and Quantity of Wastes

Wastes that are to be treated at the EAFB OD treatment units will generally be classified as hazardous by the reactivity characteristic of the explosive chemical constituents. Munitions treated by OD units include serviceable and unserviceable munitions. Serviceable munitions consist of munitions used in military training exercises and specialized weapons testing. These munitions include (but are not limited to) igniters, cartridges, rounds, flares, rockets, smoke canisters, bombs, propellants, and pyrotechnics. Wastes generated by the High Explosive Research & Development facility consist of (but are not limited to) research and development experimental explosives and traditional explosives.

The variety and variability of the energetic materials contained in military ordnance is extensive. It is not likely that exact quantities of various compounds can be predicted for those ordnance items that may require treatment in the future. For these reasons, a representative list of potentially treated ordnance items which may be detonated at the OD units at EAFB and their chemical composition is included with the renewal permit application.

EOD personnel are uniquely and specifically trained in the OD treatment of the potential chemical compositions. Each shipment to the OD facility may contain a wide variety and quantity of hazardous materials. The manifest identifies the type and quantity. The disposal experts are performing the treatment of these munitions. Therefore, local responders would comply with EAFB Command instructions when providing any emergency response or assistance. Response Actions

3.0 Response Actions

40 CFR §264.51 Purpose and implementation of contingency plan.

(a) Each owner or operator must have a contingency plan for his facility. The contingency plan must be designed to minimize hazards to human health or the environment from fires, explosions, or any unplanned sudden or non-sudden release of hazardous waste or hazardous waste constituents to air, soil, or surface water.

(b) The provisions of the plan must be carried out immediately whenever there is a fire, explosion, or release of hazardous waste or hazardous waste constituents which could threaten human health or the environment.

40 CFR §264.52(a): The contingency plan must describe the actions facility personnel must take to comply with §§ 264.51 and 264.56 in response to fires, explosions, or any unplanned sudden or non-sudden release of hazardous waste or hazardous waste constituents to air, soil, or surface water at the facility.

Sec. 264.56 Emergency procedures.

(a) Whenever there is an imminent or actual emergency situation, the emergency coordinator (or his designee when the emergency coordinator is on call) must immediately:

(1) Activate internal facility alarms or communication systems, where applicable, to notify all facility personnel; and
(2) Notify appropriate State or local agencies with designated response roles if their help is needed.

(b) Whenever there is a release, fire, or explosion, the emergency coordinator must immediately identify the character, exact source, amount, and areal extent of any released materials. He may do this by observation or review of facility records or manifests, and, if necessary, by chemical analysis.

(c) Concurrently, the emergency coordinator must assess possible hazards to human health or the environment that may result from the release, fire, or explosion. This assessment must consider both direct and indirect effects of the release, fire, or explosion (e.g., the effects of any toxic, irritating, or asphyxiating gases that are generated, or the effects of any hazardous surface water run-off from water or chemical agents used to control fire and heat-induced explosions).

(d) If the emergency coordinator determines that the facility has had a release, fire, or explosion which could threaten human health, or the environment, outside the facility, he must report his findings as follows:

(1) If his assessment indicates that evacuation of local areas may be advisable, he must immediately notify appropriate local authorities. He must be available to help appropriate officials decide whether local areas should be evacuated; and
(2) He must immediately notify either the government official designated as the on-scene coordinator for that geographical area, or the National Response Center (using their 24-hour toll free number 800/424-8802). The report must include:

(i) Name and telephone number of reporter;
(ii) Name and address of facility;
(iii) Time and type of incident (e.g., release, fire);
(iv) Name and quantity of material(s) involved, to the extent known;
(v) The extent of injuries, if any; and
(vi) The possible hazards to human health, or the environment, outside the facility.

(e) During an emergency, the emergency coordinator must take all reasonable measures necessary to ensure that fires, explosions, and releases do not occur, recur, or spread to other hazardous waste at the facility. These measures must include, where applicable, stopping processes and operations, collecting and containing release waste, and removing or isolating containers.

(f) If the facility stops operations in response to a fire, explosion, or release, the emergency coordinator must monitor for leaks, pressure buildup, gas generation, or ruptures in valves, pipes, or other equipment, wherever this is appropriate.

(g) Immediately after an emergency, the emergency coordinator must provide for treating, storing, or disposing of recovered waste, contaminated soil or surface water, or any other material that results from a release, fire, or explosion at the facility.

(h) The emergency coordinator must ensure that, in the affected area(s) of the facility:

(1) No waste that may be incompatible with the released material is treated, stored, or disposed of until cleanup procedures are completed; and
(2) All emergency equipment listed in the contingency plan is cleaned and fit for its intended use before operations are resumed.

(i) The owner or operator must note in the operating record the time, date, and details of any incident that requires implementing the contingency plan. Within 15 days after the incident, he must submit a written report on the incident to the Regional Administrator. The report must include:

(1) Name, address, and telephone number of the owner or operator;
(2) Name, address, and telephone number of the facility;
(3) Date, time, and type of incident (e.g., fire, explosion);
(4) Name and quantity of material(s) involved;
(5) The extent of injuries, if any;
(6) An assessment of actual or potential hazards to human health or the environment, where this is applicable; and
(7) Estimated quantity and disposition of recovered material that resulted from the incident.

3.1 Response Options for Fires

The sequences of actions to take in the event of a fire are detailed below. Section 3.1.1 details the actions to take during explosive operations and Section 3.1.2 details the actions to take during situations other than explosive operations. Given the nature of open detonation operations which occur at EAFB in the natural environment, on a remote active bombing range, response actions to fire are a normal part of operations designed to minimize hazards to human life, health, environment and property and are not an emergency incident when controlled and contained within

EAFB. These response actions do not constitute an implementation of the contingency plan but are included within to provide a complete picture of operations. EAFB routinely conducts prescribed burns to improve habitat and reduce fuel capacity of natural vegetation on the range. EAFB maintains a robust wildland fire fighting capability to conduct prescribed burns and respond to mission or nature-initiated fires.

3.1.1 Response Actions for Fires during Explosive Operations

In the event of a fire due to explosive operations, the EOD Team will not fight the fire. A fire of this nature could result in a high order detonation if residual explosives or munitions items are present.

Fires sometimes occur after a planned detonation and would not necessarily be an emergency, involve personal injury, or threaten the environment. In these cases, the EOD Team Chief will cancel all explosive operations for the remainder of the day, notify EOD Control, JTOC, and Jackson Guard Fire Management Section, which is the responsible office for wildland fire control. EOD Control will reschedule the explosive operations for another day and all remaining munitions will be taken back to the Weapons Storage Area.

EOD Unit Actions

The EOD Team Chief is responsible for implementing the response actions that can be performed by the EOD Team. He may delegate the responsibility for some of the actions. The following procedures will be followed by the EOD Unit for fires occurring down range due to explosive operations:

1. The person who discovers the fire will immediately sound a vocal and/or radio warning to any endangered personnel and notify the operations EOD Team Chief. (If the EOD Team Chief is injured then the next senior EOD Technician will become the EOD Team Chief.)
2. The EOD Team Chief will order all OD operations to cease.
3. The EOD Team Chief will instruct all personnel to stay up wind and to *not* fight the fire.
4. The EOD Team Chief will immediately evaluate the potential for endangerment to human health and/or the environment.
5. The EOD Team Chief will direct immediate first aid and buddy care procedures for any injured personnel, ***if safe to do so***. Emergency medical technicians are on site for each mission and will respond to injuries. In addition, first aid kits are located in each of the EOD truck tool kits.
6. EOD personnel will check for explosive hazards, hazardous materials (HAZMAT); hazardous waste; or petroleum, oils, and lubricants (POL) in the area and evacuate all unnecessary personnel to the previously determined range safe area.
7. Secure the site and any unused explosives for later investigation or storage.
8. The EOD Team Chief will immediately notify supporting agencies, including EOD Operations on the Primary EOD radio net, Range Control on the JTOC radio net or the appropriate range controller on the frequency in use at the location of the emergency where assistance is needed. Inform the agencies of the time of the fire, location of the fire, and size of the fire.
9. If appropriate, coordinate Life Flight evacuation of injured personnel through Range Control or EOD Operations.

10. Isolate containers or other equipment at risk ***only if safe to do so***.
11. Monitor for leaks, pressure buildup, gas generation, or ruptures in valves, pipes, or other equipment, as appropriate.
12. EOD Operations will provide additional EOD personnel for mission completion if personnel are injured, for communication with base agencies, or for site stabilization, as needed.
13. All operations scheduled for the day following the fire will be terminated and scheduled for another day.
14. Contact EOD Control and schedule a Z Clearance for the following day, preferably 12 hours after the fire was extinguished, to investigate the OD disposal area for explosive residue and munitions that may have been kicked out from the blast. A Z Clearance is a special designation/approval for personnel entering a closed range area for a specific range of time, for official business.
15. The EOD Team Chief will note in the operating record the time, date, and details of any emergency incident (injury to personnel, uncontrolled fire that goes beyond EAFB installation boundary or destroys occupied structures) that requires implementing this Contingency Plan. Within 15 days after the emergency incident, the EOD Team Chief must submit a written report on the incident to the Florida Department of Environmental Protection (FDEP) project manager, through environmental management. The report must include:
    - Name, address, e-mail and telephone number of the owner or operator
    - Name, address, e-mail and telephone number of the facility
    - Environmental Protection Agency (EPA) Identification Number: FL8570024366
    - Date, time, and type of incident (e.g., uncontrolled fire, unplanned explosion, injury to personnel)
    - Name, identification and quantity of material(s) involved
    - The extent of injuries, if any
    - An assessment of actual or potential hazards to human health or the environment, where this is applicable
    - Estimated quantity and disposition of recovered material that resulted from the incident
    - A description and cause of the noncompliance, if any
    - If not corrected, the expected time of correction, and the steps being taken to reduce, eliminate and prevent recurrence of the noncompliance, if any
16. The EOD Unit will perform a quality control inspection to ensure that, in the affected area(s) of the facility:
    - No waste that may be incompatible with the released material is treated, stored, or disposed of until cleanup procedures are completed; and
    - All emergency equipment listed in the contingency plan is cleaned and fit for its intended use before operations are resumed (see **Attachment 2** *Site Inspection Record* pages 55-56)

Contingency Plan Response Actions

The following emergency incident procedures will be taken by organizations other than the EOD Unit in accordance with the EAFB Installation Emergency Management Plan 10-2 (IEMP 10-2) if the fire is uncontrollable or involves injured personnel.

1. If evacuation of other on-base personnel is appropriate, the EAFB Command Post will notify affected personnel by radio, television, telephone, or giant voice. The giant voice is an audible mass notification system used across EAFB for emergency situations.

2. EAFB Command Post will dispatch the on-base Initial Response Force (IRF) with approval from the Wing Commander. The team will include the Fire Department, Security Police, Civil Engineering Representative, and/or Environmental Health Representative. Once the IRF arrives on scene, the EOD Team Chief will relinquish all Incident Commander (IC) responsibilities to the Senior Fire Department representative or the IRF Commander.
   - If the IRF is able to control the fire (including allowing the fire to burn itself out), the IC will continue to supervise the response and conditions and maintain contact with the JTOC.
   - If the IRF is not able to control the emergency, the EAFB Command Post will implement the notification and response procedures of the IEMP 10-2 by recalling the Disaster Response Force (DRF) who will proceed to the site. The response may involve the entire DRF or portions thereof, depending upon the magnitude and severity of the fire. The DRF will determine what off-base assistance is required, if any, and contact these organizations. Local emergency response resources are detailed in Section 4 of this Plan.
   - The IC will determine when the DRF and other response teams may leave the site.
3. The Environmental Restoration Program (ERP) will provide for treating, storing, or disposing of recovered waste, contaminated soil or surface water, or any other material that results from a release, fire, or explosion at the facility.

3.1.2 Response Actions for Fires Not Involving Explosives

In the event of a fire not associated with explosive operations, the EOD Team will fight the fire in a limited capacity if safe to do so, and coordinate with the Jackson Guard Fire Management Section. A fire on the range complex could quickly get out of control and result in the immediate response of the Jackson Guard Fire Management Section which is responsible for control of wildland fires.

EOD Unit Actions

The EOD Team Chief is responsible for implementing the response actions that can be performed by the EOD Team. He may delegate the responsibility for some of the actions. The following procedures will be taken by the EOD Unit for fires occurring due to situations other than explosive operations:

1. The person who discovers the fire will immediately sound a vocal and/or radio warning to any endangered personnel and notify the operations EOD Team Chief. (If the EOD Team Chief is injured than the next senior EOD Technician will become the EOD Team Chief.)
2. The EOD Team Chief will order all OD operations to cease.
3. The EOD Team Chief will immediately evaluate the potential for endangerment to human health and/or the environment.
4. Evacuate all nonessential personnel to the previously determined range safe area. Account for everyone involved in the operation.
5. The EOD Team Chief will assign personnel who will fight the fire, if safe to do so, and note the time any munitions become engulfed in flames.

NOTE: Do not fight fires involving 1.1 munitions (i.e., any munitions that are considered High Explosives, Primary Explosives, etc.) engulfed in flames unless attempting a rescue.

6. The EOD Team Chief will direct immediate first aid and buddy care procedures for any injured personnel, ***if safe to do so***. Emergency medical technicians are on site for each mission and will respond to injuries. In addition, first aid kits are located in each of the EOD truck tool kits.
7. The EOD Team Chief will notify supporting agencies, including EOD Operations on the Primary EOD radio net, Range Control on the JTOC radio net or the appropriate range controller on the frequency in use at the location of the emergency where assistance is needed or the location of the fire and whether it is contained. Inform the agencies of the time of the fire, location of the fire, and size of the fire.
8. EOD personnel will check for explosive hazards, hazardous materials, hazardous waste, or POLs in the area.
9. The EOD Team Chief will assign personnel to secure the site of unused explosives.
10. If appropriate, coordinate Life Flight evacuation of injured personnel through Range Control or EOD Operations.
11. Isolate containers or other equipment at risk ***only if safe to do so***.
12. Monitor for leaks, pressure buildup, gas generation, or ruptures in valves, pipes, or other equipment, as appropriate.
13. EOD Operations will provide additional EOD personnel for mission completion if personnel are injured, for communication with base agencies, or for site stabilization, as needed.
14. The EOD Team Chief will assign someone to direct responding personnel to the scene.
15. If a contractor is involved in the fire, notify the Contracting Office at (850) 882-0193.
16. If the fire did not involve the immediate area where explosive operations take place and no personal injuries occurred, the remaining scheduled explosive operations may continue.
17. If the fire did involve the immediate area where explosive operations take place and/or personal injuries occurred, all remaining explosive operations will cease and be rescheduled for another day.
18. The EOD Team Chief will note in the operating record the time, date, and details of any emergency incident (injury to personnel, uncontrolled fire that goes beyond EAFB installation boundary or destroys occupied structures) that requires implementing this Contingency Plan. Within 15 days after the incident, he must submit a written report on the incident to the FDEP project manager, through Environmental Management. The report must include:
    - Name, address, e-mail and telephone number of the owner or operator
    - Name, address, e-mail and telephone number of the facility
    - EPA Identification Number: FL8570024366
    - Date, time, and type of incident (e.g., uncontrolled fire, unplanned explosion, injury to personnel)
    - Name, identification and quantity of material(s) involved
    - The extent of injuries, if any
    - An assessment of actual or potential hazards to human health or the environment, where this is applicable
    - Estimated quantity and disposition of recovered material that resulted from the incident
    - A description and cause of the noncompliance, if any
    - If not corrected, the expected time of correction, and the steps being taken to reduce, eliminate and prevent recurrence of the noncompliance, if any

19. The EOD Unit will perform a quality control inspection to ensure that, in the affected area(s) of the facility:
    - No waste that may be incompatible with the released material is treated, stored, or disposed of until cleanup procedures are completed; and
    - All emergency equipment listed in the contingency plan is cleaned and fit for its intended use before operations are resumed (see **Attachment 2** *Site Inspection Record* pages 55-56)

Contingency Plan Response Actions

The following emergency incident procedures will be taken by organizations other than the EOD Unit in accordance with the IEMP 10-2 if the fire is uncontrollable or involves injured personnel.

1. If evacuation of other on-base personnel is appropriate, the EAFB Command Post will notify affected personnel by radio, television, telephone, or giant voice.
2. EAFB Command Post will dispatch the IRF only if facilities are involved or personnel are injured, with approval from the Wing Commander. The team will include the Fire Department, Security Police, Civil Engineering Representative, and/or Environmental Health Representative. Once the IRF arrives on scene, the EOD Team Chief will relinquish all IC responsibilities to the Senior Fire Department representative or the IRF Commander.
    - If the IRF is able to control the emergency, the OSC will continue to supervise the response and conditions and maintain contact with the JTOC.
    - If the IRF is not able to control the fire, the EAFB Command Post will implement the notification and response procedures of the IEMP 10-2 by recalling the DRF who will proceed to the site. The response may involve the entire DRF or portions thereof, depending upon the magnitude and severity of the fire. The DRF will determine what off-base assistance is required and contact these organizations.
    - The IC will determine when the DRF and other response teams may leave the site.
3. The ERP will provide for treating, storing, or disposing of recovered waste, contaminated soil or surface water, or any other material that results from a release, fire, or explosion at the facility.

3.2 Response Actions for an Unanticipated Detonation

Unanticipated detonations are a very serious matter and could involve injury or death of on-site personnel, therefore, all EOD personnel will be cardiopulmonary resuscitation (CPR) and first aid trained and certified. Emergency Medical Technicians are also on-site for each OD event. During an unanticipated detonation, the key to saving lives is decisive, immediate response by all uninjured personnel. The following procedures will assist in the proper actions to take, although it should be known that each situation is unique and could require a different sequence of events.

Note: It is critical that the immediate area be surveyed for hazards that could injure other personnel on site. If the situation requires that all personnel evacuate immediately due to the high probability of another detonation, the EOD Team Chief must make the decision to care for immobilized injured personnel or evacuate immediately. If injured personnel can be moved and there are enough personnel on site to move them, then they should be moved quickly to a safe area.

EOD Unit Actions

The EOD Team Chief is responsible for implementing the response actions that can be performed by the EOD Team. He may delegate the responsibility for some of the actions. The following procedures will be followed by the EOD Unit for an unanticipated detonation:

1. The person who discovers the unanticipated detonation will immediately sound a vocal and/or radio warning to any endangered personnel and notify the operations EOD Team Chief. (If the EOD Team Chief is injured than the next senior EOD Technician will become the EOD Team Chief.)
2. The EOD Team Chief will order all OD operations to cease.
3. The EOD Team Chief will instruct all personnel to stay up wind of any fires that may have been initiated by the detonation.
4. The EOD Team Chief will immediately evaluate the potential for endangerment to human health and/or the environment.
5. The EOD Team Chief will direct immediate first aid and buddy care procedures for injured personnel, ***only if safe to do so***. Emergency Medical Technicians will administer aid. In addition, first aid kits are located in each of the EOD truck tool kits.
6. The EOD Team Chief will notify supporting agencies, including EOD Operations on the Primary EOD radio net, JTOC radio net, or the appropriate range controller on the frequency in use at the location of the emergency where assistance is needed. Inform the agencies of the time of the unanticipated detonation and of any injured personnel, fire location if any and size of the fire.
7. EOD personnel will check for explosive hazards, hazardous materials, hazardous waste, or POLs in the area and evacuate all unnecessary personnel to the previously determined range safe area.
8. Secure the site and any unused explosives for later investigation or storage.
9. If appropriate, coordinate Life Flight evacuation of injured personnel through Range Control or EOD Operations.
10. Isolate containers or other equipment at risk ***only if safe to do so***.
11. Monitor for leaks, pressure buildup, gas generation, or ruptures in valves, pipes, or other equipment, as appropriate.
12. EOD Operations will provide additional EOD personnel for mission completion, communication with base agencies, or site stabilization, as needed.
13. An EOD Team from the EAFB EOD Unit will respond on site to eliminate all hazards associated with explosives or munitions.
14. The EOD Team Chief will note in the operating record the time, date, and details of any emergency incident that requires implementing this Contingency Plan. Within 15 days after the incident, he must submit a written report on the incident to the FDEP project manager, through Environmental Management. The report must include:
    - Name, address, e-mail and telephone number of the owner or operator
    - Name, address, e-mail and telephone number of the facility
    - EPA Identification Number: FL8570024366

- Date, time, and type of incident (e.g., uncontrolled fire, unplanned explosion, injury to personnel)
- Name, identification and quantity of material(s) involved
- The extent of injuries, if any
- An assessment of actual or potential hazards to human health or the environment, where this is applicable
- Estimated quantity and disposition of recovered material that resulted from the incident
- A description and cause of the noncompliance, if any
- If not corrected, the expected time of correction, and the steps being taken to reduce, eliminate and prevent recurrence of the noncompliance, if any

15. The EOD Unit will perform a quality control inspection to ensure that, in the affected area(s) of the facility:
    - No waste that may be incompatible with the released material is treated, stored, or disposed of until cleanup procedures are completed; and
    - All emergency equipment listed in the contingency plan is cleaned and fit for its intended use before operations are resumed (see **Attachment 2** *Site Inspection Record* pages 55-56)

Contingency Plan Response Actions

The following emergency incident procedures will be taken by organizations other than the EOD Unit in accordance with the IEMP 10-2 if the unanticipated detonation results in uncontrollable fire or involves injured personnel.

1. If evacuation of other on-base personnel is appropriate, the EAFB Command Post will notify affected personnel by radio, television, telephone, or giant voice.
2. EAFB Command Post will dispatch the IRF only if facilities are involved or personnel are injured, with approval from the Wing Commander. The team will include the Fire Department, Security Police, Civil Engineering Representative, and/or Environmental Health Representative. Once the IRF arrives on scene, the EOD Team Chief will relinquish all IC responsibilities to the Senior Fire Department representative or the IRF Commander.
    - If the IRF is able to control the emergency, the OSC will continue to supervise the response and conditions and maintain contact with the JTOC.
    - If the IRF is not able to control the fire, the EAFB Command Post will implement the notification and response procedures of the IEMP 10-2 by recalling the DRF who will proceed to the site. The response may involve the entire DRF or portions thereof, depending upon the magnitude and severity of the incident. The DRF will determine what off-base assistance is required and contact these organizations.
    - The IC will determine when the DRF and other response teams may leave the site.
3. The ERP will provide for treating, storing, or disposing of recovered waste, contaminated soil or surface water, or any other material that results from a release, fire, or explosion at the facility.

3.3 Response Actions for Releases of Hazardous Materials and Hazardous Waste

Florida Administrative Code (F.A.C.) 62-150.300 requires any owner or operator who has knowledge of any release of a hazardous substance from a facility in a quantity equal to or exceeding the

Reportable Quantity (RQ) in any 24-hour period to notify FDEP by calling the State Warning Point number, (800) 320-0519 or (850) 413-9911, within 1 business day of discovery of the release.

The National Response Center (NRC) must also be notified at (800) 424-8802 when a hazardous substance is released to the environment in an amount that equals or exceeds its RQ. Information reported to the NRC should include the following:

- Your name, location, organization, and telephone number
- Name and address of the party responsible for the incident; or name of the carrier or vessel, the railcar/truck number, or other identifying information
- Date and time of the incident
- Location of the incident
- Source and cause of the release or spill
- Types of material(s) released or spilled
- Quantity of materials released or spilled
- Medium (e.g. land, water) affected by release or spill
- Danger or threat posed by the release or spill
- Number and types of injuries or fatalities (if any)
- Weather conditions at the incident location
- Whether an evacuation has occurred
- Other agencies notified or about to be notified
- Any other information that may help emergency personnel respond to the incident

The RQ of waste for hazardous materials varies dependent upon the material released. A listing of RQ's is located in 49 CFR §172.101, Appendix A - List of Hazardous Substances and Reportable Quantities.

The Environmental Compliance Office will make all local, state and federal regulatory agency notifications.

3.3.1 Response Actions for Spills Greater than the Reportable Quantity

The EOD Unit will take the following actions immediately upon discovery of a release of more than the reportable quantity (RQ) of hazardous materials or hazardous waste:

1. As soon as a discharge or spill of a hazardous material or hazardous waste is discovered or suspected in a quantity greater than the RQ, report it to EAFB Command Post by dialing (**850**) **882-4020**. Information reported should include the following:
   - Name, address and telephone number of person making report
   - Exact location of spill
   - Time spill occurred
   - Number of injured personnel and nature of injuries
   - Name of material spilled or released
   - Estimated quantity spilled or released
   - Rate of discharge, if applicable

- Source of spilled material
- Cause of release, if known
- Containment/clean-up actions

2. After the spill has been reported, attempt to stop the spill at its source, only if it is safe to do so.
3. Wait for the appropriate response organizations to respond. The level of response will depend on the nature of the emergency (**Table 3-1**). Further responses to spills of more than the RQ of hazardous materials or hazardous wastes will be directed by EAFB Plan 32-6, *Hazardous Material Emergency Planning and Response.*

Table 3-1. Levels of HAZMAT Response

Response Level	Description	Contact
I	An incident which can be controlled, cleaned up, and disposed of by the using organizations. The incident is confined to a small area. Only evacuation of the immediate area is required.	Fire Department Environmental Management
II	An incident beyond the using organization's capabilities involving a greater hazard or larger area which could be a potential threat to life or property, and which may require a limited evacuation of the area.	Fire Department Emergency Medical Service (EMS) Security Forces HAZMAT Team Spill Response Team (SRT) Bioenvironmental Engineering Environmental Management Disaster Preparedness
III	An incident involving a severe hazard or large area which poses an extreme threat to life and property and will probably require a large-scale evacuation; or an incident requiring the expertise or resources of county, state, federal, or private agencies.	All Level II agencies, plus: Disaster Response Force

3.3.2 Response Actions for Spills Less than the Reportable Quantity

Any minor release (less than the RQ) of hazardous materials or hazardous waste will be handled by the EOD Team on-site using the portable spill kit.

The EOD Team will stop the source and contain the spill, if safe to do so, then remove the spill residue and related waste.

All spills/releases and accidental discharges of POL/HAZMAT/HAZWASTE, regardless of the quantity, must be reported by the responsible organization using a Spill Discharge Report. These may be submitted either electronically, via fax (850) 882-7675 or hand delivered to Environmental Compliance, Building 592, within 4 duty hours of the spill occurrence.

3.4 Response Actions for Spills of Petroleum, Oil and Lubricants

Responses to all spills of POLs, including gasoline, oil, used oil, and diesel fuel, will be directed by the EAFB Spill Prevention, Control, and Countermeasures (SPCC) Plan or IEMP 10-2, as appropriate.

Since the Transportable Burn Kettle Processors are no long in use, nor on-site, the likelihood of a response action required by the SPCC or IEMP is substantially reduced. The only POL on-site during the OD operations is the gasoline or diesel fuel within the EOD vehicles.

4.0 Coordination with Other Plans

40 CFR §264.52(b) If the owner or operator has already prepared a Spill Prevention, Control, and Countermeasures (SPCC) Plan in accordance with part 112 of this chapter, or some other emergency or contingency plan, he need only amend that plan to incorporate hazardous waste management provisions that are sufficient to comply with the requirements of this part.

This OD Contingency Plan is specific to OD operations at Range C-62. The SPCC Plan for EAFB is referenced where appropriate in this document. However, the SPCC Plan does not specifically address the emergency actions that are required for OD operations. Therefore, this Contingency Plan has been created as a stand-alone document.

Other emergency response plans, spill prevention plans, etc., that are referenced in this document and may be needed in the event of an emergency include the following:

- EAFB Plan 32-6, Hazardous Material Emergency Planning and Response
- EAFB SPCC Plan Includes 49 CFR §172.101, Appendix A-List of Hazardous Substances and Reportable Quantities
- EAFB IEMP 10-2
- EOD FOI 32-3001 Explosive Ordnance Disposal Program

In the event of an emergency, the most recent plan applicable to the emergency should be used.

This page intentionally left blank.

5.0 Cooperative Agreements

40 CFR §264.52(c): The plan must describe arrangements agreed to by local police departments, fire departments, hospitals, contractors, and State and local emergency response teams to coordinate emergency services, pursuant to Sec. 264.37.

EAFB has cooperative agreements with local communities. At the direction of the EAFB Command Post, the DRF will contact the required community organizations in the event that emergency services are required from these communities, or if these communities need to be evacuated. Some of the resources available through these arrangements are listed in **Table 5-1**.

However, no specific arrangements are required in support of OD activity, as EAFB is best equipped to respond to any emergency at the sites of the OD activities, and is therefore the primary authority. EAFB capability includes explosive ordinance disposal, structural and wildland fire fighting, security forces and medical personnel to include a hospital, environmental management staff, air lift support, and command and control operations. In addition, the scope and remote, secured location of the OD activity occurs such that it does not threaten the distant surrounding community.

Table 5-1. Local Emergency Response Resources

Name	Type of Assistance Available
Fort Walton Beach Medical Centers	Emergency medical services (EMS)
Fort Walton Beach Fire Department	Firefighting, HAZMAT response, EMS
Destin Fire Department	Firefighting, HAZMAT response, EMS
Ocean City-Wright Fire Department	Firefighting, HAZMAT response, EMS
Valparaiso Fire Department	Firefighting, HAZMAT response, EMS
Shalimar Fire Department	Firefighting, HAZMAT response, EMS
Crestview Fire Department	Firefighting, HAZMAT response, EMS
Freeport Fire Department	Firefighting, HAZMAT response, EMS
DeFuniak Springs Fire Department	Firefighting, HAZMAT response, EMS
Okaloosa Island Fire Department	Firefighting, HAZMAT response, EMS
North Bay Fire Department	Firefighting, HAZMAT response, EMS
Niceville Fire Department	Firefighting, HAZMAT response, EMS
Mary Esther Fire Department	Firefighting, HAZMAT response, EMS
FDEP State Watch Office (1-800-320-0519)	Notification of wastewater spills

This page intentionally left blank.

6.0 Emergency Coordinators

40 CFR §264.52 (d): The plan must list names, addresses, and phone numbers (office and home) of all persons qualified to act as emergency coordinator (see § 264.55), and this list must be kept up to date. Where more than one person is listed, one must be named as primary emergency coordinator and others must be listed in the order in which they will assume responsibility as alternates. For new facilities, this information must be supplied to the Regional Administrator at the time of certification, rather than at the time of permit application.

40 CFR §264.55, Emergency coordinator: At all times, there must be at least one employee either on the facility premises or on call (i.e., available to respond to an emergency by reaching the facility within a short period of time) with the responsibility for coordinating all emergency response measures. This emergency coordinator must be thoroughly familiar with all aspects of the facility's contingency plan, all operations and activities at the facility, the location and characteristics of waste handled the location of all records within the facility, and the facility layout. In addition, this person must have the authority to commit the resources needed to carry out the contingency plan.

The IC is designated as the emergency coordinator for the purposes of 40 CFR §264.52(d). The IC will be the EOD Team Chief present at the range during OD activities. All EOD Team Chiefs coordinating OD activities are qualified to act as the emergency coordinator in the capacity of an IC until other emergency responders arrive.

During all OD operations, the EOD Team Chief will be at Range C-62 (wherever operations are taking place) with the responsibility for coordinating all emergency response measures. The EOD Team Chief is required to be thoroughly familiar with all aspects of this OD Contingency Plan, all operations and activities at the OD ranges, the location and characteristics of waste handled at the OD ranges, the location of all records associated with OD operations, and the range layouts. The EOD Team Chief has the authority to commit the resources needed to carry out this OD Contingency Plan.

Emergency Coordinators are identified by position equivalent to name because EOD OD operations are conducted by military personnel that are subject to frequent rotation due to frequent deployments in support of the worldwide military mission. These positions will be manned at any time EOD is conducting OD operations. When operations are not being conducted there is no material on-site and therefore no risk of fire, explosion, or injury from the permitted TSDF. Emergency Coordinators/contacts are identified in **Table 5-1**.

Table 6-1. Emergency Coordinators & Contacts

Date of Revision: February 2020

Name	Telephone Number	Address
EOD Operations (Primary)	**(850) 882-3225**	Building 1334, EAFB
EAFB Command Post (Alternate 1)	(850) 883-4020	Building 1, EAFB
JTOC (Alternate 2)	(850) 882-5800	Building 104, EAFB

This page intentionally left blank.

7.0 Emergency Equipment

40 CFR §264.52(e): The plan must include a list of all emergency equipment at the facility (such as fire extinguishing systems, spill control equipment, communications and alarm systems (internal and external), and decontamination equipment), where this equipment is required. This list must be kept up to date. In addition, the plan must include the location and a physical description of each item on the list, and a brief outline of its capabilities.

Emergency equipment is inspected prior to any operation commencing and following the completion of all operations. Immediate response equipment is brought to the OD areas during any operations. Larger response equipment is located at the base fire response centers.

Table 7-1 lists the emergency response equipment that is brought to the site of OD operations. *FOI 32-3001 Explosive Ordnance Disposal Program* (**Attachment 2**, pages 55-56) is a site inspection log for the OD sites. This log includes safety and emergency equipment. Additional emergency response equipment is available from other sources and can be obtained, as necessary.

Table 7-1. Emergency Response Equipment Available at the OD Areas

Material on Hand	Unit	Quantity	Location
Fire Extinguishers	EOD	2	EOD Vehicle
Emergency Portable Spill Kit	EOD	1	EOD Vehicle
Radios	EOD	2	EOD Team
Portable Eye Wash Station	EOD	1	EOD Vehicle
Large First Aid Kit or Combat Life-Saver bag (preferred)	EOD	1	EOD Vehicle

All EOD vehicles are equipped with general safety equipment, including but not limited to; portable radios, boots, gloves, face shields, first aid kits, fire extinguishers, tie down straps, wheel chocks, and extra safety glasses.

Fire extinguishers are rated 2A:10BC and are available for any non-munition, small fires. Portable spill kits may be used for minor spills or releases, most likely a spill of oil or fuel leak from a vehicle. Radios are used between all EOD team members before, during, and after the OD event. These radios are the main method of communication in an area where cellular coverage is not consistently available. The portable eye wash station is for the emergency rinse of the face and eyes due to contact with an irritant or chemical.

First aid kits contain basic medical supplies used to slow deterioration of a wound until medical professionals arrive. EOD personnel are trained in the use of life saving equipment. The Combat Life-Saver bag contains:

ATROPINE INJECTION AQUEOUS TYPE 0.7ML SYRINGE WITH NEEDLE

DIAZEPAM INJECTION USP 5MG/ML 2ML SYRINGE-NEEDLE UNIT AUTO INJ

ADAPTER CATHETER TO LUER SYRINGE SHORT LOCKING 5S

ADHESIVE TAPE SURGICAL POROUS WOVEN 3 INCHES BY 10 YARDS 4S

AIRWAY NASOPHARYNGEAL 9MM ID 12MM OD KINK RES SMOOTH RD EDGES10S

BANDAGE MUSLIN COMPRESSED OLIVE DRAB37X37X52" TRIANG W/SFTY PINS

BANDAGE ELASTIC FLESH ROLLED NONSTERILE 6"X 4.5 YDS 12S

BANDAGE GAUZE COTTON 6 PLY WHITE 4.5" WIDE 4.1 YDS LONG

BANDAGE KIT ELASTIC

BANDAGE ADH.75X3" FLESH/CLEAR STER DRESS AFFIXED TO PLAS ADH100S

CATHETER IV INTROCAN SAFETY 18GAX1-1/4"LG WINGED NDL TEFLON 200S

CATHETER-NDL UNIT IV 14GAX3.25" LUER HUB AND NDL GUARD RADPQ 50S

DRESSING FIRST AID FIELD CAMOUFLAGED 11.5-12"W 11.5-12"LG ABS EA

DRESSING OCCLUSIVE ADHESIVE CLEAR 4.75X4" 5S

GLOVE PATIENT EXAMINING & TREATMENT SZ 10LG PURPLE 4.3MIL 100S

HETASTARCH IN LACTATED ELECTROLYTE INJECTION, 500ML

ADMINISTRATION SET INFUSION PUMP VENTED/UNVENTED

LUBRICANT SURGICAL 5 GRAM 144S

ORAL REHYDRATION SALTS USP 27.9GM FOIL PACKET 125 PER PACKAGE

PAD ISOPROPYL ALCOHOL IMPREGNATED NONWVN COTTON/RAYON WHITE 200S

PAD POVIDONE-IODINE IMPRE STER COTTON/RAYON 2X1.375" BROWN 100S

SCISSORS BANDAGE 7.25" LG ANG TO HDL 1.50" CUT LG BLUNT PTS CRS

SPLINT UNIVERSAL ALUM 36"O/A LG 4.25"W GRAY & OLIVE DRAB REUSE

SYRINGE AND NEEDLE HYPODERMIC SAFETY 3ML 23GA STER DISP 25S

TOURNIQUET NONPNEUMATIC ADULT 14X1" BLD TAKING DSGN RUBBER O/A

TOURNIQUET COMBAT APPLICATION ONE-HANDED

TUBE DRAINAGE SURGICAL PENROSE 1"X18" RUBBER RADIOPAGUE STER 6S

8.0 Evacuation Plan

40 CFR §264.52 (f) The plan must include an evacuation plan for facility personnel where there is a possibility that evacuation could be necessary. This plan must describe signal(s) to be used to begin evacuation, evacuation routes, and alternate evacuation routes (in cases where the primary routes could be blocked by releases of hazardous waste or fires).

A limited number of personnel required to perform the daily operation are allowed on the OD ranges during OD activities. A minimum of two EOD technicians (one 7-skill level and one 5-skill level) will support range, demolition, and recovery missions. Limit the maximum number of participants to a number consistent with a safe and efficient operation. Minimum EOD technician to non-EOD technician (workers/test support personnel) ratio during range clearance operations is 1:5. In most emergency situations, the safest place for people is the control building on the range. This structure is a concrete block two story building which provides cover from explosive debris for detonations up to the range limit. At Range C-62, the control building is more than 5,000 feet from the site of OD operations. Therefore, evacuation beyond the limits of the control building would not be anticipated.

The person who discovers the emergency situation will immediately sound a vocal and/or radio warning to any endangered personnel and notify the operations EOD Team Chief. (If the EOD Team Chief is injured, then the next senior EOD Technician will become the EOD Team Chief.)

In the unlikely event that evacuation beyond the control building is required, personnel will evacuate using the EOD vehicle, or on foot, to pre-designated rally points identified prior to the start of each OD mission. Locations of rally points will be based on the safe distances specified in FOI 32-3001 *Explosive Ordnance Disposal Program* (**Attachment 2**).

If evacuation of other on-base personnel is appropriate, the EAFB Command Post will notify affected personnel by radio, television, telephone, or giant voice.

This page intentionally left blank.

9.0 Location and Distribution of the Contingency Plan

40 CFR §264.53 Copies of contingency plan. A copy of the contingency plan and all revisions to the plan must be:

(a) Maintained at the facility; and

(b) Submitted to all local police departments, fire departments, hospitals, and State and local emergency response teams that may be called upon to provide emergency services.

Copies of this Contingency Plan will be maintained at the locations identified in **Table 9-1**. Copies can be provided to other interested local agencies who are parties to cooperative agreements with EAFB. Since EAFB provides its own fire, emergency medical and disaster response force there are no plans to call upon local civil authorities for OD emergencies. If local civil authorities need to be engaged, it will be through the EAFB IEMP 10-2.

Table 9-1. Locations of the Contingency Plan at EAFB

Organization	Physical Location	Telephone Number
EOD Operations Center	*Building 1334*	850-882-3225
Environmental Management Office	*Building 592* *https://em.eglin.af.mil/emc/ems/library/*	850-882-7670
EAFB Command Post	*Building 1*	850-833-4020

This page intentionally left blank.

10.0 Review and Amendment of the Contingency Plan

40 CFR §264.54 Amendment of contingency plan. The contingency plan must be reviewed, and immediately amended, if necessary, whenever:

(a) The facility permit is revised;

(b) The plan fails in an emergency;

(c) The facility changes--in its design, construction, operation, maintenance, or other circumstances--in a way that materially increases the potential for fires, explosions, or releases of hazardous waste or hazardous waste constituents, or changes the response necessary in an emergency;

(d) The list of emergency coordinators changes; or

(e) The list of emergency equipment changes.

This Contingency Plan will be reviewed by the EOD Flight and Environmental Management as required by 40 CFR §264.54 (see requirement above) and amended as required. Revised copies will be provided to the appropriate organizations as identified in Section 8 of this Plan.

Records of reviews and amendments should be documented and maintained. A form for tracking the reviews is included in the beginning of this Plan.

This page intentionally left blank.

FIGURE

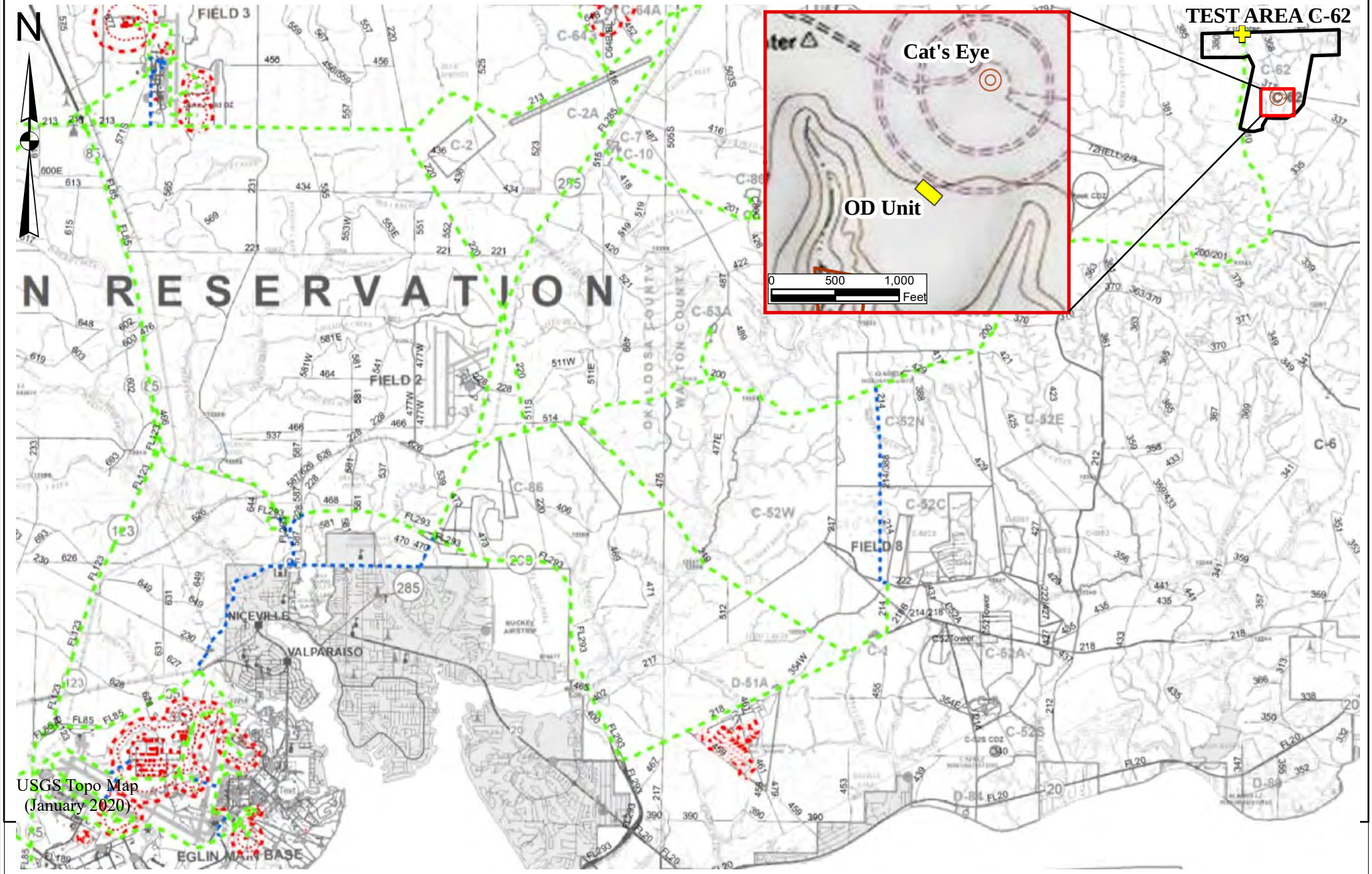


FIGURE 1
EXPLOSIVE
TRANSPORTATION ROUTE

Test Area C-62
Eglin AFB, Florida

Open Detonation (OD) Area

Range Tower

1 0.5 0 1 2 3
Miles

ATTACHMENT 1

Defense Transportation Regulation 4500.9-R Part II – *Cargo Movement*

https://www.ustranscom.mil/dtr/dtrp2.cfm

ATTACHMENT 2

Flight Operating Instructions 32-3001
Explosive Ordnance Disposal Program

BY ORDER OF THE COMMANDER, 96 CES

EOD FLIGHT OPERATING INSTRUCTION 32-3001

21 June 2021

Civil Engineering

EXPLOSIVE ORDNANCE DISPOSAL (EOD) PROGRAM

COMPLIANCE WITH THIS PUBLICATION IS MANDATORY

ACCESIBILITY: 96 CES/CED instructions are available for downloading at S:\Files\Admin\FOI's\FOI's

RELEASIBILITY: There are no releasability restrictions on this publication.

OPR: 96 CES/CEDO

Certified by: 96 CES/CED (Capt DeJulio)

Supersedes: EODFOI 32-3001, 15 May 2017

Pages: 54

This publication implements Air Force Policy Directive (AFPD) 32-30, *Explosive Ordnance Disposal*, Air Force Joint Instruction (AFJI) 32-3002, *Interservice Responsibility for Explosive Ordnance Disposal*, and Air Force Manual (AFMAN) 32-3001, *Explosive Ordnance Disposal Program*. It establishes policy and responsibility for the management of the Eglin Air Force Base, Florida, Explosive Ordnance Disposal (EOD) program and applies to all United States Air Force EOD personnel assigned or attached to the 96th Civil Engineer Squadron, Eglin Air Force Base, Florida. Refer recommended changes and questions about this publication to the Office of Primary Responsibility (OPR) using the AF Form 847, *Recommendation for Change of Publication*; route AF Forms 847 through the appropriate chain of command. Ensure that all records created as a result of processes prescribed in this publication are maintained IAW AFMAN 33-363, *Management of Records*, and disposed of IAW the Air Force Records Information Management System (AFRIMS) Records Disposition Schedule (RDS). This publication may not be supplemented or further implemented/extended. The use of the name or mark of any specific manufacturer, commercial product, commodity, or service in this publication does not imply endorsement by the Air Force.

SUMMARY OF CHANGES

This instruction is substantially revised and must be reviewed completely.

Chapter 1 – RESPONSIBILITIES **5**
1.1. Commander 5
1.2. Flight Management 5
1.3. Stand-By Team 6
1.4. EOD Personnel 7
1.5. Physical Fitness Training 8

Chapter 2 – SAFETY **9**
2.1. General 9
2.2. Transportation 9
2.3. Emergency Procedures 10
2.4. Lightning Protection 10

Chapter 3 - TEST DIRECTIVES & ROBOTICS **12**
3.1. Test Directives 12
3.2. Robotics 15

Chapter 4 – MUNITIONS STORAGE 17
4.1. Location 17
4.2. Personnel Limits 17
4.3. Explosive Limits 17
Table 4.1. Authorized Storage Quantities Bldg 1249, 1250, 1251, & 1252 17
Table 4.2. Authorized Storage Quantities Bldg 1334 18
4.4. Safety Precautions and General Information 18
4.5. Key Control 19

Chapter 5 – SECURITY **21**
5.1. Personnel 21
5.2. Facility 21
5.3. Combination and Lock Control 22
5.4. Classified Material 23
5.5. Weapons and Arming 23
5.6. Duress Procedures 24
5.7. Bomb Threat Procedures 24
5.8. Anti-Robbery Procedures 24

5.9. Force Protection Conditions 25
5.10 Intrusion Detection System 25

Chapter 6 – USE OF EOD TOOLS AT OFF-RANGE LOCATIONS 26
6.1. Personnel Limits 26
6.2. Explosive Limits 26
6.3. Authorized Tools 26
6.4. Location 27
6.5. Procedures 27

Chapter 7 – EGLIN AFB EOD PROFICIENCY RANGE **29**
7.1. Personnel Limits 29
7.2. Explosive Limits 29
7.3. Location 29
7.4. Required Equipment 29
7.5. Procedures 29

Chapter 8 – EGLIN TEST AND TRAINING COMPLEX RANGE OPERATIONS **31**
8.1. Personnel Limits 31
8.2. Explosive Limits 32
8.3. Location 32
8.4. Procedures 32
8.5. Disposal of Unexploded Munitions 33
8.6. CBU Clearance Operations 33
8.7. Recovery of Munitions from Ranges 33
8.8. Open Detonation. 34
8.9. Emergency Procedures 36
8.10. Guidance and Publications 36

Chapter 9 – RADIATION & LASER SAFETY **37**
9.1. General 37
9.2. Responsibilities 37
9.3. Procedures 38
9.4. Precautions 38

Attachment 1 – GLOSSSARY OF REFERENCES AND SUPPORTING INFO **39**

Attachment 2 – STANDARD PRE-OPERATION SAFETY BRIEFING 43

Attachment 3 – EXPLOSIVE OPERATIONS NOTIFICATION CHECKLIST 48

Attachment 4 – EXPLOSIVE CONTROL LOG 49

Attachment 5 – OPEN DETONATION SITE INSPECTION LOG 50

Attachment 6 – OPEN DETONATION FLOW OF EVENTS 52

Chapter 1

RESPONSIBILITIES

1.1. Commander. The Commander, 96th Civil Engineer Squadron (CES), will:

1.1.1. Provide routine and emergency EOD support to the installation, including tenant units, support bases, and special mission taskings. Agencies needing assistance will make routine support requests directly to the EOD Flight. The primary means for requesting emergency EOD support is through the Command Post (CP) or Emergency Operations Center. EOD will respond to other emergencies as requested by the Fire Alarm and Communications Center, Law Enforcement Desk or Central Security Control if routed from a certified Incident Commander. After hours requests for emergency support will be routed through the CP or Emergency Operations Center (EOC). Emergency support requirements for EOD response to an accident or incident are defined in AFI 32-3002-O and AFMAN 32-3001.

1.1.2. Provide the EOD Flight administrative and logistics support for administrative files, regulations, technical manuals, funding, facilities, and resources needed to perform the EOD mission.

1.1.3. Not assign EOD personnel to additional duties that negatively impact individual proficiency and/or team capabilities.

1.2. Flight Management. The EOD Flight Management will:

1.2.1. Ensure assigned EOD personnel are trained and qualified to provide routine and emergency EOD support as indicated in paragraph 1.1.1.

1.2.2. Ensure the EOD Operations Section publishes a stand-by roster with appropriately trained personnel.

1.2.3. Oversee compliance with this operating instruction and other applicable publications.

1.2.4. Ensure a comprehensive training program is in effect and training priorities are clearly defined. Wartime, as well as peacetime tasks must be continually taught, exercised, and evaluated to ensure the highest level of competency. EOD training will be prioritized above normal day-to-day work activities. Only EOD operations will receive a higher priority than training.

1.2.5. Notify the 96 CES Commander of any requests for assistance or response.

1.2.6. Ensure supervisors complete a post-deployment evaluation of members to ensure currency of training and document in members training record.

1.2.7. Oversee the EOD Quality Assurance program and designate a SNCO as the section Chief.

1.2.7.1. All qualified military EOD personnel will be evaluated in accordance with 3E8X1 Master Training Plan for the current year.

1.2.7.2. Evaluations may be combined as long as the intent of each is met. i.e., demolition operations evaluated in conjunction with RADBO.

1.2.7.3. Personnel will be evaluated according to the roles they are postured for and/or skill level.

1.2.7.4. Quality assurance evaluations will be conducted by a certified 7-level.

1.2.7.5. Training operations will not be counted as practical QA evaluations however QA evaluations may be counted as SORTS-reportable exercises IAW Air Force Instruction (AFI) 10-210, *Prime Base Engineer Emergency Force (Beef) Program*.

1.2.7.6. Only assigned Flight Chief, Flight Commander, the Quality Assurance evaluator(s), and the individual(s) being evaluated will be present for the evaluation.

1.2.7.7. Evaluation ratings and failure actions will be IAW Master Training Plan, Section 8.

1.2.7.8. Evaluations will be documented on MTP Attachment 4 QA Form, or locally produced equivalent, and filed in the flight's Quality Assurance folder.

1.3. Stand-By Team. The EOD Stand-By Team will:

1.3.1. The stand-by team will consist of a minimum of two qualified EOD personnel, one of which will be at a minimum a 7-skill level SSgt and one 5-skill level. **Exception:** a 3-skill level may be used in place of one 5-skill level as long the individual has met all AF IMT 797 stand-by requirements, has been approved by the supervisor, and is approved by Flight Chief and/or Flight Commander. A standard three person EOD Team will only be utilized when dictated by the accident/incident and Flight Chief and/or Flight Commander.

1.3.2. The stand-by team will adhere to the following response time parameters when responding to all emergency incidents requiring EOD support.

1.3.2.1. Normal duty hours: EOD teams will be en route to the incident site within 30 minutes of initial notification or within 30 minutes of approval from the Wing CC or designated representative for "immediate response authority" support to DSCA. Teams are considered en route when they leave Building 1334.

1.3.2.2. Off duty hours: EOD flights are not manned for continual 24/7 operations and therefore provide standby teams for off-duty immediate response, unless Force Protection condition requires otherwise. The goal for any incident off-duty is to respond in the most expeditious manner while taking safety, road conditions and other factors into account. Taking these factors into account the goal for off-duty EOD team response is to be responding to the scene within 60 minutes after initial notification or within 60 minutes of approval from the Wing Commander or designated representative for "immediate response authority" support to DSCA.

1.3.3. During periods of manning shortfalls, Flight Chief and/or Flight Commander may allow, on a temporary basis, the use of a 5-skill level NCO as Team Leader if all 7-skill level requirements have been met with the exception of 7-skill level school. **Note:** In this situation, the remaining team member may not be substituted with a 3-skill level as indicated in paragraph 1.3.1.

1.3.4. Be familiar with the contents of this operating instruction.

1.3.5. Perform stand-by duties, as assigned, from 0630 Friday through 0630 the following Friday. If Friday is a holiday or family day, the oncoming standby team will conduct stand-by checks the duty day prior to assuming response duty.

1.3.6. Upon assumption of stand-by duties, inventory all response munitions, inventory and function check all equipment, in the EOD Bomb Squad Emergency Response Vehicle (BSERV) and flightline response vehicle, and ensure response laptop is properly functioning. Document inventory/inspection in designated Equipment Section Tracker.

1.3.7. Ensure all equipment is cleaned, serviceable and returned to its proper place upon completion of stand-by duties.

1.3.8. Immediately notify EOD Flight Management of any requests for assistance or response. The need for an Incident Commander and/or Legal Representative will be determined by the 96 TW/CC.

1.3.9. Ensure that all trash is emptied from the common areas in the main EOD facility daily.

1.3.10. Perform end-of-day security checks and sign SF 701, *Activity Security Checklist.* Ensure SF 702, *Security Container Check Sheets*, are properly completed.

1.3.11. Perform daily pickup and delivery of official mail to the 96 CES, when necessary.

1.3.12. Carry personal issued ATAK device with them at all times. Carry a radio when away from the shop during duty hours.

1.3.13. Monitor the EOD Operations Section when operations personnel are not available or after normal duty hours, when required for test range support missions IAW Chapter 8.

1.3.14. Submit a properly formatted Explosive Ordnance Disposal Information Management System (EODIMS) report NLT 5 duty days from completion of an incident or mission on base and within 72hrs (duty & non-duty time) for support to Civil Authorities off base.

1.3.15. Ensure Defense Support to Civil Authorities (DSCA) information is passed along to the Command Post and annotate that in the narrative of your EODIMS report if incident or mission supports Civil Authorities off base. Notify IMSC at the earliest opportunity.

1.4. All EOD Personnel. All EOD personnel assigned to the EOD Flight will:

1.4.1. Conduct physical fitness training Monday thru Friday for a minimum of one hour or as otherwise dictated by EOD Flight Management. If PT is not conducted in the morning, report for duty NLT 0630.

1.4.2. Report for roll-call at 0830, Monday thru Friday, or as otherwise dictated by EOD Flight Management.

1.4.3. Adhere to normal duty hours 0630-1530 with a lunch period of no more than 90 minutes between 1100 and 1230.

1.4.4. Carry a cell phone, ATAK Device, and/or land mobile radio at all times when away from the EOD facility. If traveling in groups, only one EOD member is required to possess a means of communication.

1.4.5. Prepare training classes as assigned, by the morning of the scheduled date.

1.4.6. Notify EOD Flight Management of any requests for assistance or response.

1.4.7. Sign in and out utilizing the sign-out board in the EOD Operations Section. This applies to vehicles and radios, as well.

1.4.8. Carry a current recall roster with them at all times.

1.4.9. Respond to the EOD shop with required clothing and equipment immediately upon notification of a recall.

1.4.10. All arms, ammunition, explosives, and classified materials must be in positive control of assigned EOD personnel once removed from their designated storage area (i.e. the safe or vault in building 1334 or the munitions storage area).

1.5. Physical Fitness Training. Physical fitness training (PT) will be conducted five days a week to improve and maintain maximum individual strength, stamina, and aerobic activity, as well as, boost and maintain unit camaraderie. PT will be conducted through training teams and will be directed in a manner to improve flight members' abilities to complete physical requirements of EOD tasks. Squadron PT will be conducted as directed by the squadron commander.

Chapter 2

SAFETY

2.1. General.

2.1.1. The responding EOD team must positively identify and verify ordnance using EOD technical data prior to performing EOD procedures. If the Team Leader is the one who identifies the ordnance, a different EOD Team Member will verify the identification. If no technical data exists for the item in question, then other means will be used to identify the ordnance.

2.1.2. The Team Leader will ensure that all applicable safety precautions are adhered to unless those safety precautions will further endanger the EOD team or other resources.

2.1.3. EOD personnel do not require a waiver to deviate from 60-series EOD technical orders according to AF Technical Order 00-5-1, *Air Force Technical Order System*, 10.2.2.2. Team Leaders must ensure that all deviations are approved at the appropriate level, and all deviations must be reported to EOD Flight Management as soon as possible.

2.1.4. All explosive locations will have a minimum of two fire extinguishers rated 2A:10BC.

2.1.5. Restrict use of modern mobile emitters from within 10 feet of any exposed EED.

2.2. Transportation. The following procedures apply when transporting explosives.

2.2.1. There is no smoking allowed within 50 feet of explosive laden vehicles.

2.2.2. Do not load or unload explosives from a motor vehicle while the engine is running, except under emergency conditions. Diesel powered vehicles may continue to run during loading and unloading of explosives except when exposed explosives or hazardous locations are involved.

2.2.3. Blasting caps, demolition material and unserviceable (but not dangerously unserviceable) munitions may be transported by the same vehicle, provided they are segregated to the maximum extent possible.

2.2.4. Transport only the minimum amount of explosives that are available and required to perform the operation.

2.2.5. The following is the minimum equipment required to transport explosives.

2.2.5.1. One first aid kit, large. Combat Life-Saver (CLS) bag is preferred.

2.2.5.2. Two each fire extinguishers rated 2A:10BC will be serviceable and immediately available IAW DESR 6055.09 AFMAN 91-201.

2.2.5.3. ATAK mobile device and Motorola hand held radio.

2.2.5.4. Tie down straps.

2.2.5.5. Wheel chocks.

2.2.5.6. Explosive placards.

2.2.6. Prior to use, inspect all vehicles used to transport explosives utilizing the AF Form 1800. The DD Form 626, *Motor Vehicle Inspection,* and DD Form 836, *Dangerous Goods Shipping Paper and Emergency Response Information*, will be utilized when transporting explosive off the Eglin Test and Training Complex (ETTC) with the exception of an emergency response. Ensure all loads are secured prior to movement of vehicle.

2.2.7. An armed guard is required when transporting high-risk explosives off the ETTC.

2.2.8. Explosive laden vehicles will utilize the explosive movement routes to the greatest extent possible.

2.3. Emergency Procedures. In the event of an explosive mishap, cease all operations until the situation has been deemed safe to continue by the senior ranking individual.

2.3.1. Injury.

2.3.1.1. Render first aid, as applicable.

2.3.1.2. Notify the Emergency Communications Center (ECC) by the most expedient means available.

2.3.1.3. Notify EOD Flight Management, 96 CES/CC, 96 TW/SE and Unit Safety Representative (USR) as soon as possible.

2.3.1.4. Complete AF Form 978, *Supervisor's Mishap Report*, as soon as possible. Route completed from form through 96 CES to 96 TW/SEG.

2.3.2. Area/Vehicle Fire.

2.3.2.1. Use all available means to extinguish the fire unless explosives are directly involved.

2.3.2.2. Immediately evacuate all non-essential personnel from the area.

2.3.2.3. Notify the ECC by the most expedient means available.

2.3.2.4. Notify the EOD Flight Management, 96 CES/CC, 96 TW/SE and USR as soon as possible.

2.3.2.5. Schedule time at least 24 hours after the fire has been extinguished to check the disposal location/detonation point. Deviations are allowed at the TL discretion.

2.3.3. Ensure all first aid and/or firefighting equipment is reconstituted, as soon as possible.

2.3.4. In all emergencies, security of classified and protection of high-value resources is second only in priority to saving life, limb or eyesight.

2.4. Local Lightning Watch, Warning and Advisories. When operating on the ETTC, lightning monitoring and notification is primarily the responsibility of the Test Area Range Controller. When operating at other locations, on or off the ETTC, the EOD Team Leader is responsible for consulting the supporting weather unit and monitoring for

advisories, watches, and warnings. The EOD Operations Section and or the Joint Test and Training Operations Control Center (JTTOC) monitor and notify personnel of hazardous weather conditions. The 96 OSS Weather Flight or the 26th Operational Weather Squadron may be contacted for weather information. Refer to DESR6055.09_AFMAN91-201, *Explosive Safety Standards*, V2.E4.6 – *Procedures in the Event of Electrical Storms*, or Attachment 2 of this document for further information.

Chapter 3

TEST DIRECTIVES & ROBOTICS

3.1. Test Directives.

3.1.1. **General.** This section outlines and establishes procedures for personnel using and creating Safe Handling and Recovery Procedures (SHRP) for testing of weapons systems on Eglin Ranges.

3.1.1.1. The SHRP is the EOD technical information and is an integral component of the overall test directive.

3.1.1.2. The EOD Test Directives (TD) Section is responsible for all SHRP development.

3.1.1.3. The application of a SHRP is to provide EOD teams with approved 96TW EOD procedures and information similar to 60-series for developmental test items.

3.1.1.4. SHRPs are required to be on range with the team during operations.

3.1.2. **Responsibilities.**

3.1.2.1. The EOD Robotics and Test Directives Section Chief will be a SNCO.

3.1.2.2. EOD Robotics and Test Directives Section Chief or other SNCO appointed by EOD Flight Management will review and approve/disapprove all newly developed SHRPs.

3.1.2.3. Test Directives Section.

3.1.2.3.1. Assign SHRPs to an EOD member that has been assigned to the Test Directives section and is signed off on all Form 797 tasks.

3.1.2.3.2. Ensure SHRPs are updated when email notifications are received from Eglin Livelink (https://livelink2.eglin.af.mil).

3.1.2.3.3. Track all SHRPS and maintain a historical archive for use during future range missions and/or contractor projects on Eglin ranges through Livelink.

3.1.2.3.4. Coordinate with the EOD Operations Section to ensure appropriate representation at Safety Review Boards (SRB) or Electronic Safety Review Boards (ESRB) and kick-off meetings.

3.1.2.3.5. Establish, maintain and delete all EOD Livelink user accounts.

3.1.2.4. EOD Team Leaders will ensure they have all applicable information available on range while supporting a test mission.

3.1.3. **Test Directive Folder.** Test Directive SHRP folders are established in a uniform manner for accuracy and standardization, all folders are created and maintained

on Livelink (https://livelink2.eglin.af.mil/livelink/llisapi.dll?func=ll&objId=23896729&objAction=browse&viewType=1) and in the file cabinet located in the Robotics and Test Directive office. All SHRPs are digital and hardcopy. Teams will use hard copies located in the file cabinet or AEODPS laptops (where applicable) located in the vault.

3.1.3.1. Following is a list with a brief description of what should be included in each folder. Required templates are located at S:\Files\Robotics & Test Directives\SHRPs.

3.1.3.2. Safe Handling and Recovery Procedures and Approval Cover Letter. These are detailed procedures will be accomplished for all tests requiring EOD support; no generalized procedures will be included.

3.1.3.3. Test Directive Overview/SRB notes. These are locally generated forms highlighting information about the mission. Information is derived from a variety of sources including, the TD, appendices, notes from the SRB or ESRB, and conversations with the project engineers. This form should be completed and signed upon initial receipt by the member assigned to that project.

3.1.3.3.1. JON History. This is a locally generated form that is vital to the accuracy of the SHRP and continuity of the test. It will be annotated, signed, and dated after every meeting, action, or conversation involving the applicable test; including but not limited to project officers, test engineers, safety personnel and other stakeholders.

3.1.3.3.2. JON History during Tests. The JON History form will be used for entering detailed information about the events that occurred during missions supported by teams. As a minimum, include who was on the mission, what significant events took place during the mission, and number of misfires or clean-up shots that took place. Be as descriptive as possible, and include any changes that may take place in the future, e.g. future SRBs, mission cancellations, etc.

3.1.3.3.3. Test Directive parent folder link. Test Directives are documents used by the 96 TW/CC to direct and authorize the conduct of a test program. It contains the detailed method of test and necessary supporting appendices such as Safety Appendixes (SA), contractor data, etc.

3.1.3.3.4. All technical information provided by the contractor, any photographs, diagrams and schematics used in developing a SHRP are also included in this folder.

3.1.3.4. All Test Directive (SHRP) folders that are used will be signed out on an AF Form 614, *Charge Out Record*. After mission completion, all Test Directive (SHRP) folders will be returned to the appropriate location.

3.1.4. **Test Directive Development Procedures.**

3.1.4.1. An invite to Kickoff Meeting/SRB/ESRB is sent and reviewed for its application to EOD procedures or support. Once the need for EOD support has been determined, the TD element will create a TD folder at S:\Files\Robotics & Test Directives\SHRPs. All relevant documents, emails, etc. will be kept in this folder and transferred to Livelink once the SHRP is approved. The test is then assigned to an individual that will become the lead for any developments of the test.

3.1.4.2. The responsible individual will attend a kick off meeting, which will highlight the details of the test. During this meeting, all safety concerns should be addressed and any information that will be required from the contractor or Air Force personnel for the development of a SHRP should be requested. Request a source data package from the Test Engineer.

3.1.4.3. After receipt of the contractor data and before the SRB, the responsible individual will analyze the information to highlight any areas of EOD concern. Coordinate with contractor to receive this information as soon as possible.

3.1.4.4. The SRB is where principle members of the test come together to discuss resolutions to safety concerns of the test. The SRB must be attended by minimum 7-skill level SSgt or a member of the Test Directives Section.

Note: If an excavator is required it will be coordinated during the SRB. The flight will not supply equipment required, but will support excavation operations.

3.1.4.5. A draft SHRP must be completed no later than 5 duty days after SRB has concluded and all applicable information has been received.

3.1.4.6. After development of a SHRP, the TD Section, EOD Robotics and Test Directive Section Chief or other SNCO appointed by EOD Flight Management, and 96 TW Weapons Safety will review and sign via Livelink workflow process.

3.1.4.7. If the test is supported in AEODPS an MFR will be drafted in lieu of SHRP.

3.1.4.7.1. The MFR does not need to be routed but must be approved by EOD Robotics and Test Directive Section Chief or other SNCO appointed by EOD Flight Management.

3.1.5. **Use of Test Directives for Range Missions.**

3.1.5.1. No later than the day prior to an assigned mission, the team providing support to a JON will contact the project officer to get a schedule of events and compare that information to the information contained in the EOD JON and parent TD folders. JON information is located in the file cabinet

in the Robotics and Test Directive office. This is also the time to thoroughly review the SHRP, Method of Test (MOT), Safety Appendixes (SA), and misc. supporting documents and review any referenced 60-series TOs and OIs.

Note: Test Directive personnel will ensure that most relevant information is in the TD folder at least two days prior to an assigned mission.

3.1.5.2. If the SHRP requires the use of a 60-series TO to make the procedures complete, the Team Leader must ensure AEODPS is available while supporting the mission. This guarantees the latest revision of the applicable 60-series TO will be used on the next mission.

3.1.5.3. If a test mission utilizes non-modified production ordnance, an EOD JON folder will be created and contain a MFR directing AEODPS use.

3.1.5.4. Upon completion of the test the team will update the JON History.

3.2. ROBOTICS

3.2.1. **General.** The Robotics section is responsible for all remote recovery and remote disassembly operations developed and employed. The operation of DoD unique, locally developed, large platform robotics requires additional guidance to be set forth in this FOI. Safety standards have been created to address new hazards, and directives have been created to address new robotic capabilities. This chapter will be utilized in conjunction with applicable technical manuals and publications.

3.2.2. **Responsibilities.**

3.2.2.1. EOD Flight Management. Reviews and approves training standards for unique robotic platforms and tools.

3.2.2.2. Robotics Section. Perform all robotic platform remote recoveries and/or disassembly of test munition ordnance items to include pre- and post-operational checks of robotic platforms and oversee the outsourcing of required maintenance and/or repairs as required. Execute design, procurement, construction, maintenance, and troubleshooting of electronics packages and modifications. Manage Precision Measurement Equipment Laboratory (PMEL) account, bench stock, and Radio Frequency Authorization (RFA) accounts.

3.2.3. **Specialized Equipment.** In the event a SHRP requires the use of specialized equipment (Brokk, RFDS, Excavator, etc.) contact robotics or TDs personnel. These items require specific training and operation by untrained personnel can result in serious bodily injury or death.

3.2.4. **Remote Band saw.** Any Team Leader can operate the remote band saw IAW SHRPs. Robotics personnel will maintain the saw and train personnel as needed.

3.2.5. **Transportation**.

3.2.5.1. Members must be currently licensed on the respective vehicle and trailer prior to operation.

3.2.5.2. The Brokk may only be transported on a flatbed or trailer which is approved for the weight of the machine, see the type plate on the machine. The control unit must be well protected in the vehicle during transit.

3.2.5.3. When transporting the Predator arms, ensure the manipulator arms are stowed and secured with the mounting equipment (turnbuckles or straps may be used in an emergency, but do not over-tighten). Failure to do so may cause the arms to drift, collide with other objects, or swing outside the trailer. Using improper mounting equipment or techniques can damage the arms or its internal components.

Chapter 4

MUNITIONS STORAGE

4.1. Location. Explosive storage locations are Bldgs 1249, 1250, 1251, and 1252 in the Munitions Storage Area (MSA), and Bldg 1334.

4.2. Personnel limits. The explosive safety concept of minimum personnel on-site will be adhered to at all times.

4.2.1. Maximum. Limit entry in Bldgs 1249 Bays A, B and F, 1250, 1251 Bay A, and 1252 Bay B, to five personnel with at least one 5-Skill Level or higher or munitions account custodian. There are no maximum personnel limits in Bldg 1334.

4.2.2. Minimum. Two personnel, as prescribed in 4.2.1, are required for all explosive operations, to include inventories or movements of explosives.

4.2.3. The senior qualified EOD member will ensure compliance with all storage limitations.

4.2.4. Unescorted entry is limited to those listed on the entry authorization list (EAL).

4.3. Explosive Limits. Explosives are distributed between the munitions storage area and Bldg 1334. The BSERV can be used to store ready stocks of emergency response munitions with approved storage container.

4.3.1. Bldg 1249 (Bays A, B &F), 1250, 1251 and 1252. **Note:** Do not store HCD 1.1 in any bay in Bldg 1249 except Bay F due to compatibility issues.

Table 4.1. Authorized Storage Quantities Bldg 1249, 1250, 1251, & 1252.

NEW	1.1	1.2.1.	1.2.2.	1.2.3	1.3	1.4
1249	1800[1]	None	None	None	24,500	Capacity
1250	100,000	200,000	200,000	200,000	200,000	Capacity
1251	5,000	5,000	5,000	5,000	5,000	Capacity
1252[2]	5,000	5,000	5,000	5,000	5,000	Capacity

Note:

1 – HCD 1.1 will only be stored in Bldg 1249, Bay F, with coordination from Munitions Storage.

2 – Bldg 1252 is only used to store caliber .50 RAUFOSS rounds, HCD 1.2G at up to 5,000 lbs.

4.3.2. Bldg 1334. **Note:** Only HCD 1.4 is authorized to be stored in Bldg 1334. Do not store HCD 1.1, 1.2 or 1.3 in Bldg 1334.

Table 4.2. Authorized Storage Quantities Bldg 1334.

	Mk 274 [1]	Mk 275 [2]	Mk 276 [3]	Mk 277 [4]	Mk 279 [5]	Mk 280 [6]	Med. Velocity	Shock Tube	9mm Ball	Cal .50 Blank	9mm UTM	5.56mm UTM
Cat D	40	60	50	60	0	0	50	5,000’	0	24	90	360
Cat T	40	40	40	40	40	40	40	5,000’	60	24	0	0

Note:

1 – Ultra Velocity; 2 – AVON; 3 – Low Velocity; 4 – Enhanced; 5 – Steel; 6 – Aluminum

Cat D is Training Munitions.

Cat T is Operational Munitions.

4.4. Safety Precautions and General Information.

4.4.1. Do not mix mobility, operational or training stocks. Operational stocks will be solely used for real-world operations and Test Wing range missions

4.4.2. BSERV stocks will be replaced as soon as possible.

4.4.3. Refer to emergency procedures listed in paragraph 2.3., as needed.

4.4.4. Storage bays will be kept clean and orderly; free of excess dunnage and debris.

4.4.5. Properly package and mark containers, and separate lots when restoring after the completion of each mission. Record the changes on the Explosive Control Log (attachment 4).

4.4.6. Inform the Resources Section of any shortages so issue requests can be made through the Munitions Operations Element.

4.4.7. Provide at least two weeks notification to the EOD Resources Section for requests to utilize small quantities so that breakdown can be scheduled.

4.4.8. EOD Resources Section.

4.4.8.1. Ensure set-up boxes are stocked and ready for use. There will be at a minimum, three explosive set-up boxes; one for caps, one for igniters and one for time fuse.

4.4.8.2. Maintain an accurate count of all explosives on-hand, issued or expended; provide these figures to the Primary Munitions Custodian at the end of the week.

4.4.8.3. Ensure adequate levels of explosives are on hand to support normal operations.

4.4.8.4. Coordinate with Munitions Inspections and Munitions Storage the breakdown of larger quantities into ready-use quantities.

4.5. Key Control. EOD will be escorted to MSA facilities by Munitions personnel. Munitions personnel will sign out and maintain control of the keys. Provide a minimum of 30 minutes notification time to MSA personnel during duty hours to arrange escort into the MSA.

4.5.1. Individuals entering the MSA must have their personal issue Restricted Area Badge.

4.5.2. Daily Operations. Responsibility for withdrawing explosives falls on the teams.

4.5.3. **After-hours Operations**. Coordinate with Munitions Control for MSA access after-hours. Contact the standby Munitions Controller or have the Command Post contact them. Standby Munitions personnel have a two hour response time.

4.5.4. **Withdrawing Explosives.** A minimum of two flight members are required to sign for explosives. One individual must be at least a 3E851.

4.5.4.1. Once at the storage facility, perform the following steps.

4.5.4.1.1. Turn off engine and chock a rear tire. Park vehicles not being loaded with explosives a minimum of 25 feet from storage facility.

4.5.4.1.2. Gain access to the required bays.

4.5.4.1.3. Secure all explosives in the vehicle cargo compartment, cover explosives with tarp and placard vehicle.

4.5.4.1.4. Ensure all explosives withdrawn are entered in the Explosive Control Log and signed for by two personnel.

4.5.4.1.5. Return any unused explosives in the same manner outlined above.

4.5.4.1.6. Ensure all storage facilities are secured when complete with operation.

4.5.4.1.7. Report all explosives expended or returned to the Resources Section.

4.5.5. Munitions containers will not be opened for the purpose of issuing items from storage locations.

4.5.6. The following operations are authorized in explosives storage spaces.

4.5.6.1. Palletizing, removing and replacing shipping crates incidental to transportation.

4.5.6.2. Replacing unserviceable strapping on boxes.

4.5.6.3. Opening outer containers to remove inner packages. Complete any further processing of these items in an approved operating location.

4.5.6.4. Opening “lite” boxes for inventory purposes.

4.5.6.5. Opening containers of HD 1.4 explosives to allow inventory. Unpack, inspect, and repack in the storage location if building content is limited to HD 1.4 items.

Chapter 5

SECURITY

5.1. Personnel.

5.1.1. A primary and alternate(s) Controlled Area Monitor, Key and Lock Custodian, and Safe Custodian will be appointed in writing.

5.1.2. The Controlled Area Monitor will conduct annual self-inspections and forward to security forces.

5.1.3. All assigned personnel will receive initial security training within 30 days of being assigned to the work center. Annual security training is also required on challenging personnel to whom controlled area access is questionable, contacting Security Forces for assistance if the challenged personnel's access cannot be verified, and duress/bomb threat/anti-robbery/emergency egress procedures. Documentation will be maintained by the Resource Protection Monitor. Combinations will be changed upon reassignment/separation of assigned personnel.

5.2. Facility.

5.2.1. Entry Authorization.

5.2.1.1. Building 1334 uses cipher lock secured doors to control entry. Additionally, the secure storage area in Bldg 1334 is secured with cipher lock (separate from Bldg code). Inside the secure storage area is a firearms vault with a GSA Class 5-A Armory Door and monitored intrusion alarm panel.

5.2.1.2. At no time will temporary access be granted to the secure storage area, outside personnel will be escorted into the area.

5.2.1.3. Assigned personnel will not receive combinations until they have been properly trained on security measures, alarm systems, emergency procedures, and personal accountability. Training will be documented in the Resource Protection folder.

5.2.1.4. At a minimum, combinations will be changed when individuals no longer require access.

5.2.1.5. Assigned personnel will challenge any questionable person attempting to gain access to the secured storage area. If the questionable person(s) authorization to enter the secured storage area cannot be verified, inform EOD Operations and have an announcement made throughout the building that an unauthorized access attempt is in progress. Additionally, contact Security Forces Base Defense Operations Center (BDOC) so that they can respond and provide assistance.

5.2.2. Escorts. Escorts will verify that an official reason exists before allowing visitors actual entry into Bldg 1334 (as required by FPCON) and or the secured storage

area. Visitors to the secure storage area will be escorted at all times by personnel granted unescorted access to the secure storage area.

5.2.2.1. Visitors will be logged on an AF Form 1109, *Visitor Register Log*.

5.2.2.2. Escorts will brief visitors where the designated smoking area is.

5.2.2.3. Escorts will brief visitors on emergency evacuation procedures and actions.

5.2.2.4. Escorts will accompany visitors until they depart the facility.

5.2.3. Emergency Procedures. Verify all emergencies prior to allowing unrestricted access by non-assigned personnel. Once verified, emergency response personnel (e.g., security forces, medical technicians, fire protection, etc.) will be granted unimpeded access to controlled areas when responding to emergencies.

5.2.3.1. Personnel assigned to controlled areas will ensure all emergency response personnel and/or vehicles remain under constant surveillance except during evacuation.

5.2.3.2. Once the emergency situation has been terminated, the responding personnel will take a head count to ensure all personnel are accounted for prior to departing.

5.2.4. Evacuation. In the event of an evacuation from Bldg 1334, personnel will assemble at the evacuation location and the senior member present will account for all personnel. Notify EOD Flight Management as soon as practical.

5.3. Combination and Lock Control.

5.3.1. Access to munitions facilities is defined as any structure or room assigned to the flight designed for munitions storage or maintenance. Squadron Commander will appoint the Combination and Lock custodians within the Flight. The EOD Flight Commander authorizes personnel to issue and/or receive Combinations to munitions facilities within the EOD facility. A master key system will be used for weapons racks located inside the Bldg 1334 weapons vault.

5.3.2. A mandatory semiannual inventory of keys and locks will be maintained.

5.3.3. Keys to weapon racks in Bldg 1334 weapons vault must be maintained separately from other keys and accessible to only those individuals whose official duties require access to them. A current roster or letter of these individuals must be kept with the key custodian. The letter or roster will be protected from public view.

5.3.4. Keys to weapon racks in Bldg. 1334 weapons vault must not be left unsecured or unattended at any time.

5.3.5. When not in use, keys to weapon racks can be stored in Bldg. 1334, rm. 120 in a designated safe and equipped with a GSA-approved, changeable combination lock.

5.3.6. Key control registers must be maintained on AF Form 2432, *Key Issue Log*. Accountability records must contain the name and signature of the individual receiving the key, date and hour of issuance, serial number or other identifying information of the key, signature of individual issuing the key, keys return date and hour and name and signature of individual receiving returned keys.

5.3.7. Locks must be secured when the area container is opened to prevent theft, loss, or substitution of the lock.

5.3.8. In the event of lost, misplaced or stolen keys, the affected locks or cores must be replaced immediately. The facility must be inventoried and guarded by owner/user personnel until the area can be properly secured.

5.4. Classified Material.

5.4.1. Ensure all classified media/hardware is properly marked and secured when not in use.

5.4.2. Notes prepared for classified briefings and training classes will be properly marked as derivative information according to DoDM 5200.01, Vol 1, *DoD Information Security Program: Overview, Classification, and Declassification*. They will be properly classified according to DoDM 5200.01, Vol 2, *DoD Information Security Program: Marking of Classified Information.*

5.4.3. Prior to beginning classified processing, doors and windows will be secured to prevent unauthorized viewing and a classified processing sign will be posted on the door.

5.4.4. Users must remain EMSEC conscious at all times and maintain at least one meter of separation between classified and unclassified equipment and six inches between classified and unclassified power and transmit lines.

5.4.5. Only process classified information on an approved computer system.

5.4.6. Do not move or rearrange classified systems without approval of the Computer System Security Officer (CSSO).

5.4.7. Do not place telephones, communications equipment, or any other non-TEMPEST electronics equipment within one 1/2 meter of any portion of the system. This includes government or personal cellular and or radio frequency (RF), infrared (IR) wireless devices, and other devices such as cell phones and tablets, and devices that have photographic or audio recording capabilities. Report this activity as a security incident if discovered.

5.4.8. Do not attach any peripheral device not listed in your original request for Designated Approving Authority (DAA) approval.

5.4.9. Control classified in a means to prevent unauthorized personnel from viewing it.

5.4.10. Comply with the requirements in AFI 16-1404, *Air Force Information Security Program*.

5.5. Weapons and Arming.

5.5.1. Accountability.

5.5.1.1. A monthly serialized inventory will be accomplished and annotated using the AF IMT 1473, *Gun Equipment Room Inventory.*

5.5.1.2. Issued weapons will be signed out using an AF IMT 1297, *Temporary Issue Receipt.*

5.5.1.3. Weapons and ammunition will be inventoried each time the safe is opened.

5.5.2. Handling of weapons.

5.5.2.1. Arming will be performed IAW AFMAN 31-129, *USAF Small Arms and Light Weapons Handling Procedures* and EAFB Plan 31-101, *Integrated Defense Plan.*

5.5.3. Refer to emergency procedures listed in paragraph 2.3. and 2.4., as needed.

5.6. Duress Procedures.

5.6.1. Do not attempt to utilize the duress code unless you can do so without being detected. Make every effort to pass the wing duress code to munitions control, security forces, or any personnel available and capable of relaying your situation to BDOC.

5.6.2. When safe and practical to do so, dial 911 to alert security forces.

5.6.3. Involved personnel must follow the anti-robbery procedures contained in the emergency action checklist and this instruction.

5.7. Bomb Threat Procedures. In the event of bomb threat against the EOD facilities, perform the following minimum procedures.

5.7.1. Notification.

5.7.1.1. Complete the AF Form 440, *Bomb Threat Aid Card.*

5.7.1.2. Notify BDOC.

5.7.2. Evacuation.

5.7.2.1. Evacuate all personnel to the nearest facility not affected by the threat.

5.7.2.2. Evacuate surrounding facilities, as deemed necessary.

5.8. Anti-Robbery Procedures. In the event of robbery, or attempted robbery, against the EOD facilities perform the following minimum procedures.

5.8.1. Actions.

5.8.1.1. Fake compliance and activate the duress alarm if safe to do so.

5.8.1.2. Observe physical characteristics of the perpetrator and determine direction and mode of travel.

5.8.1.3. Cease all activities and stand-by until a Security Forces patrol responds.

5.8.1.4. Perform a complete inventory of the affected asset(s).

5.8.2. Notification.

5.8.2.1. Notify the BDOC.

5.8.2.2. Complete the AF Form 439, *Robbery Checklist.*

5.9. Force Protection Conditions (FPCON). The EOD Operations Section is the focal point during periods of increased security.

5.9.1. During increased security measures the EOD Operations Section will issue instructions on proper procedures to follow.

5.9.2. All sections will take implement designated measures.

5.9.3. Any person discovering a possible or confirmed security violation will report their findings to the EOD Operations Section.

5.10. Intrusion Detection System (IDS). Personnel whose duties require them to access alarmed facilities will be trained in alarm access procedures by their duty section prior to being authorized to access to these facilities. Procedures listed below will be used for both alarm testing and inadvertent alarms.

5.10.1. Contact BDOC and inform them of your name, rank, organization, alarm account number, state your intentions to test the alarm system and prepare to authenticate using the matrix.

5.10.2. Maintain constant contact with BDOC during the testing process.

5.10.3. In the event an alarm fails testing, implement appropriate security measures through Munitions Control and immediately notify Civil Engineering to request a work order to effect repairs.

5.10.4. If an alarm will not reset after three attempts, personnel will immediately notify Security Forces and EOD Operations or EOD Resources Section who will call alarm maintenance.

5.10.5. If an alarm is still inoperative at the completion of the duty day, arrangements must be made to relocate assets or post guards for the facility.

5.10.6. Testing will be performed by quarterly and documented using an AF IMT 2530, *Alarm System Test Record*. Maintain the test record in Resources Protection Folder.

Chapter 6

USE OF EOD TOOLS AT OFF-RANGE LOCATIONS

6.1. Personnel limits. The explosive safety concept of minimum personnel on-site will be adhered to at all times. Only two qualified EOD personnel will be present during capping-in procedures.

6.1.1. A minimum of two qualified EOD members are required to perform explosive operations. At least one member will possess a minimum 7-skill level.

6.1.2. The senior qualified EOD 7-level will be designated as the Range Safety Officer (RSO). At a minimum, RSOs will be a 7-level in AFS 3E8 and certified on all local IJQS tasks. If available, RSOs for high-profile events or any explosive operations involving multiple EOD teams should be an E-7 certified 7-level in AFS 3E8 and certified on all local IJQS tasks.

6.1.3. Casuals. Casuals are persons not normally part of an explosives operation but have duties that require their presence, such as quality assurance, medical, safety or inspection personnel. **Note**: When conducting live explosive operations, (e.g., EOD operations, range clearance, or other demolition and munitions destruction) emergency medical support must be available in accordance with AFMAN 32-3001.

6.1.4. Visitors. Visitors are non-essential personnel with limited access. Stop operations when visitors are present. Operations will not continue until all visitors are off the EOD range and outside the fragmenting AE hazard area of K328 minimum distance. Visitors will be determined by the Team Leader/RSO.

6.2. Explosive Limits. EOD personnel may use the explosive items listed below for off-range training, inspection and evaluation operations. Quantities shown are the maximums authorized for each inspection or evaluation scenario.

6.2.1. Two .50 caliber impulse cartridges.

6.2.2. Two .50 caliber ball, M2 cartridges (projectile extracted).

6.2.3. Two electric or non-electric blasting caps.

6.2.4. Two 10 foot lengths of standard detonating cord (DODIC M456).

6.2.5. Thirteen feet of safety fuse.

6.2.6. Three M60 or M81 fuse lighters.

6.2.7. Three AN-M14 thermite grenades.

6.2.8. Shock tube as required.

6.2.9. Igniters (Shock Tube Initiators, DODIC YY35), as required.

6.2.10. Five each, Percussion Actuated Neutralizer (PAN) cartridges.

6.3. Authorized Tools. EOD personnel may use the tools listed below for off-range training, inspection and evaluation operations.

6.3.1. Mk 1 Remote Wrench.

6.3.2. Mk 2 .50 Caliber Dearmer.

6.3.3. Field Fabricated Dearmer

6.3.4. Robotic Vehicles.

6.3.5. Stand-off Disrupters.

6.3.6. Stand-off De-Armors.

6.3.7. Percussion Actuated Neutralizer (PAN).

6.3.8. Carbon 10 Disrupters.

6.3.9. EOD personnel may use procedures with explosively propelled liquids, shots, gases, slugs, or heat against inert training munitions and soft targets at off-range locations on military installations in support of unit training, inspections, and evaluations.

6.4. Location. Off-range training procedures utilizing live explosives may be conducted at any location on the installation so long as it is outside of any explosive prohibited zone and in a location free of fire hazards. Take positive measures to prevent collateral damage when operating tools inside a building.

6.5. Procedures.

6.5.1. Agencies listed in Attachment 3 will be notified prior to commencing the operation.

6.5.2. The Team Leader for the operation will ensure a pre-task safety briefing is delivered to all personnel present utilizing Attachment 2 and any item specific publications. Step-by-step procedures for completing the operation will be briefed by the Team Leader.

6.5.3. Place a minimum of three filled sand bags in front and behind tools that project slugs, fluids or shot to limit directional force. Tools fired from robots only require three filled sand bags in front of the tool.

6.5.4. Use only slugs that will disintegrate on impact.

6.5.5. Ensure the safety procedures and emergency procedures in Chapter 2 are adhered to.

6.5.6. Do not initiate explosive tools during exercises until authorized by the EOD evaluator.

6.5.7. Use only inert training ordnance or IED concealment devices.

6.5.8. Evacuate personnel to the applicable withdrawal distances required for an actual situation.

6.5.9. Maintain radio contact with the EOD Operations Section during the entire operation.

6.5.10. Ensure all the applicable tech data is on site prior to and during all explosive operations.

6.5.11. Ensure a suitable first aid kit and all safety equipment is on site prior to and during all explosive operations.

6.5.12. Control, or delegate control, of all firing devices during explosive operations.

6.5.13. Ensure all personnel are located in the safe area prior to initiation of tools or explosives.

6.5.14. When operating tool sets inside a building, take positive measures to prevent secondary or collateral damage.

Chapter 7

EGLIN AFB EOD PROFICIENCY RANGE

7.1. Personnel limits. Refer to paragraph 6.1.

7.2. Explosive Limits. A maximum of 2.5 lbs. net explosive weight for quantity-distance (NEWQD) IAW DDESB-approved site plan AFMC-EGLIN-16-S032/S033/S034. Detonations in the scope of this chapter are only authorized in the predesignated destruction point, reasonably centered within the six foot high barricade. Holding areas approved for 10 pounds NEW each. Chapter 6 applies for operations conducted outside of the barricade.

7.3. Location. The Eglin AFB EOD Proficiency Range is located at approximately crash grid 6.5, F.5 in the area commonly referred to as the FARM, Base Tango, or the former Ground Combat Training Squadron Exercise Site. MGRS coordinates are 16REU 43357116.

7.4. Required Equipment. The following minimum equipment is required during all range operations.

7.4.1. EOD Range Book.

7.4.2. Two (2) each portable radios.

7.4.3. First aid kit.

7.4.4. Demolition gear/kit.

7.4.5. Two (2) each fire extinguishers rated 2A:10BC.

7.5. Procedures. Compliance with the following procedures will be ensured by the Team Leader.

7.5.1. Complete notifications as prescribed in Attachment 3 prior to conducting operations.

7.5.2. The Team Leader for the operation will ensure a pre-task safety briefing is delivered to all personnel present utilizing Attachment 2 and any item specific publications. Step-by-step procedures for completing the operation will be briefed by the Team Leader.

7.5.3. Munitions will be maintained in the designated holding areas until ready for use.

7.5.4. Ensure the range flag is flown for the duration of the operation.

7.5.5. Maintain radio contact with the EOD Operations Section during the entire operation.

7.5.6. Ensure the safety procedures and emergency procedures in Chapter 2 are adhered to.

7.5.7. Compensatory measures.

7.5.7.1. Ensure all entrances to the EOD range are closed or blocked prior to detonation.

7.5.7.2. Notify appropriate organizations IAW Attachment 3.

7.5.7.3. If available, post personnel along the running path at north end of training area and main vehicle entrance along Shoppette exit road to alert others of explosive operation and potential for loud noise.

7.5.7.4. Request that the Command Post sends out a base-wide notification.

7.5.8. Evacuate personnel to the applicable withdrawal distances required for explosives or tools used.

7.5.9. Do not initiate explosives or tools during exercises until authorized by the EOD evaluator.

7.5.10. Ensure all the applicable tech data is on site prior to and during all explosive operations.

7.5.11. Control, or delegate control, of all firing devices during explosive operations.

7.5.12. Ensure all personnel are located in the safe area prior to initiation of tools or explosives.

7.5.13. Ensure munitions expenditures are promptly reported to the EOD Resources Section.

Chapter 8

EGLIN TEST AND TRAINING COMPLEX RANGE OPERATIONS

8.1. Personnel limits. The explosive safety concept of minimum personnel on-site will be adhered to at all times when operating on the ETTC Range. Allow only essential personnel down range during munitions preparation operations. Only two qualified EOD personnel will be present during capping-in procedures per explosive shot. Only one EOD Technician will check the detonation location following a shot, with a second as a safety backup.

8.1.1. A minimum of two EOD technicians (one 7-skill level and one 5-skill level) will support scheduled tests. A 5-skill level SSgt may be used as a Team Leader if all 7-skill level requirements have been met with the exception of 7-skill level school and the individual is task qualified. Any 3-skill level, qualified on tasks pertaining to the mission, may be used in place of 5-skill levels, as long as a 7-skill level acts as Team Leader for the operation. For operations performed on static fire ranges, one EOD technician will act as the safety backup. During periods of low manning, two qualified 5-skill levels may support missions when approved by EOD Flight Management.

8.1.2. Range Clearance, Demolition and Recovery. EOD requirements are the same as listed in 8.1.1.

8.1.2.1. Limit maximum participants to a number consistent with a safe and efficient operation.

8.1.2.2. Minimum EOD technician to non-EOD technician (workers/test support personnel) ratio during range clearance operations is 1/5.

8.1.3. Escort Missions. A minimum of two EOD technicians (one 7-skill level and one 5-skill level or one 3-skill level qualified on tasks pertaining to mission) will support scheduled missions. Qualified 5-skill levels may Team Leader missions if approved through EOD Flight Management. **Note**: For escort missions not involving demolition operations, a 5-skill level qualified on tasks pertaining to mission may serve as Team Leader without explicit EOD Flight Management approval.

8.1.4. Operations Section. The EOD Operations Section will be monitored at all times when an EOD team is operating on the ETTC Range. Deviations for special circumstance will only be approved by EOD Flight Management.

8.1.5. The senior qualified EOD 7-level will be designated as the Range Safety Officer (RSO). At a minimum, RSOs will be a 7-level in AFS 3E8 and certified on all local IJQS tasks. If available, RSOs for high-profile events or any explosive operations involving multiple EOD teams should be an E-7 certified 7-level in AFS 3E8 and certified on all local IJQS tasks.

8.2. Explosive Limits.

8.2.1. ETTC.

8.2.1.1. Explosive limits are outlined in the method of test for each mission. Limits are also outlined in test site Standard Operating Procedures.

8.2.2. ADR.

8.2.2.1. A maximum of 3,000 lbs net explosive weight (NEW) of class/division 1.1 and 1.2.

8.3. Location.

8.3.1. General. The specific location and or target will be specified by range scheduling and through the daily operations order in the EOD Operations Section.

8.3.2. ADR. For ADR operations, conduct open detonations within the marked areas on ranges and C-62 only. For responses or other range missions, do not utilize the marked area.

8.4. Procedures.

8.4.1. A copy of the test directive and associated publications will be carried on all test support missions. Consult with the project officer and the EOD Operations Section to ensure mission requirements have not changed at least 24 hours prior to assigned mission.

8.4.2. The Team Leader for the operation will ensure a pre-task safety briefing is delivered to all personnel present utilizing Attachment 2 and any item specific publications. Step-by-step procedures for completing the operation will be briefed by the Team Leader.

8.4.3. Check in with range controller upon arrival.

8.4.4. The EOD Team Leader will ensure two-way radio communication is operational and available between the EOD Team, EOD Operations and Range Controller. A primary and a secondary means of communication are preferred.

8.4.5. Inform the range controller and the EOD Operations Section when complete. Upon return to the shop, fill out the JON history and mission slip. Return the SHRP to file, mission slip to operations, and brief operations on any unusual incidents. If the same project is scheduled for the next day, contact the appropriate team and brief on planned activities.

8.4.6. Explosive operations will not commence until 30 minutes after official sunrise. Explosive operations will cease 30 minutes prior to official sunset.

8.4.7. Obtain clearance from the JTTOC prior to initiating any shot. JTTOC can be reached via radio call sign "Wolfcall" or via the range controller. If range controller is unavailable, request a clearance directly from JTTOC or via EOD Operations. For unscheduled missions, request "Z" clearance. Notify JTTOC upon entering and exiting designated clearance area.

8.4.8. Observe withdrawal distances IAW 60-Series publications and TDA or approved SHRP.

8.4.9. Emergency Procedures.

8.4.9.1. Perform immediate care procedures for injured personnel. First Aid kits or Combat Life Saver bags will be located in each of the EOD trucks.

8.4.9.2. Check for other hazards in the area and evacuate to safe location, if necessary.

8.4.9.3. Notify supporting agencies, including the EOD Operations Section on the Primary EOD net, JTTOC (call-sign Wolfcall) on the WOLFCALL net or the appropriate range controller (e.g., 72 Control) on the frequency in use at the location of the emergency.

8.4.9.4. Secure the site and unused explosives for later investigation or storage.

8.4.9.5. If appropriate, coordinate Life Flight or ambulance evacuation of injured personnel through JTTOC or EOD Operations. EOD Operations maintains locations on the Eglin Range complex capable of handling helicopter

8.5. Disposal of Unexploded Munitions.

8.5.1. Make positive identification before moving any munitions item by hand.

8.5.2. Dispose of in place or clearly mark for later disposal dud munitions that cannot be safely moved.

8.5.3. Expose the munition fill at nose and tail of all inert bombs prior to removal from range or transportation to scrap yards. Exception: Not required for BDU-50s.

8.5.4. Probe BDU-33 and MK-106 practice bombs IAW TO. Segregate and detonate bombs containing live spotting charges prior to removal from range.

8.6. CBU Clearance Operations.

8.6.1. Maintain a minimum distance of 100 feet between sites used to prepare charges and the closest known dud.

8.6.2. Do not exceed a maximum of 25 individual shots per operation.

8.6.3. The maximum number of shots to be placed by any one individual is five.

8.6.4. Do not use trucks to transport primed charges.

8.7. Recovery of Munitions from Ranges.

8.7.1. Recovery.

8.7.1.1. Coordinate the use of heavy equipment for excavation on any Eglin testing area with 96 TW/SE. Do not attempt recovery of ordnance from below the surface in areas where live ordnance may exist except as specifically approved.

8.7.1.2. Subsurface Recovery.

8.7.1.2.1. If using heavy equipment (manually operated) to gain access to inert munitions suspected of containing live fuzing, dig to within 2 feet (no closer) of buried munitions.

8.7.1.2.2. The excavation should be 4 feet in diameter for every 1 foot of depth and be of a sufficient size to permit easy access by EOD personnel. Accomplish final excavation manually, conduct additional probing as required. **Note**: If in the opinion of the senior EOD technician present, hazards exist such that safe access to the munition/fuze cannot be performed, the item will not be recovered.

8.7.1.2.3. Perform recovery of inert munitions (identified by known mission or test with which the item is associated) with inert fuzing by manual or mechanical means.

8.7.1.2.4. Perform recovery and fuze removal of inert munitions with live fuzes and inert boosters (known by the mission) by manual means only if the fuze is hand-safe. Remotely perform recovery and fuze removal of inert munitions with live fuzes and inert boosters (not hand-safe) or with live fuzes and live boosters unless otherwise stated in TDs or approved by 96 TW/SEW.

8.7.1.2.5. Do not manually recover live bombs or other live munitions suspected of containing live fuzes and live boosters, especially fuzes containing delayed action or cocked striker. Accomplish recovery of such items with special equipment so EOD procedures can be completed remotely.

8.7.2. Assumption of liability for damages and replacement costs for robotics systems should be addressed at test planning meetings or Safety Review Boards prior to the commencing of operations. If assumption of liability has not been confirmed, ensure the project officer is aware that future support could be impeded in the event of robotics system damage.

8.7.3. Demilitarization. Accomplish demilitarization of munitions items that could possibly contain or disclose classified components or information.

8.8. Open Detonation. This paragraph outlines and establishes procedures for Open Detonation for ADR operations on the ETTC Range. These procedures are formulated to provide a safe and efficient method for conducting explosive disposal operations on ETTC ranges.

8.8.1. Munitions disposal operations are normally conducted for units assigned to Eglin AFB on a quarterly basis on Range C-62.

8.8.2. Special disposal operations may be scheduled to meet the needs of Eglin AFB generators. Any military organization outside Eglin AFB that wishes to use the Eglin munitions disposal facility must have a current support agreement. Special disposals will not be arranged for these outside agencies, but they will be given the opportunity to participate in disposals for Eglin AFB units.

8.8.3. Responsibilities.

8.8.3.1. EOD Management. With the guidance of the base environmental office, ensure that an authorized disposal facility is available for use on Eglin AFB.

Also ensure that personnel are sufficiently trained to conduct safe and legitimate disposal operations.

8.8.3.2. EOD Operations Section. Serve as focal point for all disposal operations. Coordinate and schedule with required outside agencies. Act as the focal point for all questions regarding which items may or may not be destroyed in accordance with the range permit.

8.8.3.3. EOD Team Leader for the ADR. Ensure that all safety and documentation requirements are met. Inventory all munitions designated for disposal by the generators.

8.8.3.4. Munitions Generators. Ensure that all required documentation is completed correctly prior to transporting munitions to the range for disposal. Transport or arrange for transport munitions to the disposal facility.

8.8.4. Documentation. The documents listed in paragraphs 8.8.4.1. through 8.8.4.4. are the generator's responsibility. If not properly prepared, the associated munitions will not be destroyed.

8.8.4.1. AF Form 191, Ammunition Disposition Request and DD Form 1348-1, DoD Single Line Item Release/Receipt Document. Military munitions items marked for disposal must have required supply documentation (AF Form 191 and DD Form 1348-1 or service equivalent).

8.8.4.2. High Explosive Research Division (HERD) Explosive Waste Manifest. Test munitions items from the Energetic Materials Branch of Wright Laboratory are normally listed on the HERD Explosive Waste Manifest with no accompanying supply documentation.

8.8.4.3. Environmental Protection Agency (EPA) Form 8700-22, Uniform Hazardous Waste Manifest and DRMS Form 1851, Restricted Waste Notification. If the waste explosive material is not a specific munitions item and use of DoD shipping controls is not appropriate, the required documentation is Environmental Protection Agency Form 8700-22 and DRMS Form 1851.

8.8.4.4. Other acceptable and commonly used form are the DD Form 1907, Signature and Tally Record, SF 1103, U.S. Government Bill of Lading, and SF 1109, U.S. Government Bill of Lading – Continuation Sheet.

8.8.4.5. Complete an EOD Report using the EODIMS database, for each disposal operation. Include an accurate list of items destroyed and a brief narrative describing the operation. Prepare and submit two copies of each of the following forms for base environmental and the Operations Section. Attach the forms electronically to the EODIMS report.

8.8.4.5.1. Cover sheet listing quantity treated provided by the Team Leader.

8.8.4.5.2. EPA Form(s) 8700-22.

8.8.4.5.3. DRMS Form(s) 1851.

8.8.4.5.4. AF IMT 3803, Surface Weather Observations.

8.8.4.5.5. Site Inspection Record (Attachment 5).

8.8.5. Sequence of Events. See Attachment 6.

8.9. Emergency Procedures. Refer to Chapter 2.

8.9.1. Perform immediate care procedures for injured personnel. First Aid kits are located in each of the EOD truck tool kits.

8.9.2. Check for other hazards in the area and evacuate to safe location, if necessary.

8.9.3. Notify supporting agencies, including the EOD Operations Section on the Primary EOD net, JTTOC (call-sign Wolfcall) on the WOLFCALL net or the appropriate range controller (e.g., 72 Control) on the frequency in use at the location of the emergency.

8.9.4. Secure the site and unused explosives for later investigation or storage.

8.9.5. If appropriate, coordinate Life Flight or ambulance evacuation of injured personnel through JTTOC or EOD Operations. EOD Operations maintains locations on the ETTC capable of handling helicopter extraction.

8.10. Guidance and Publications. The following publications and guidance provide details on EOD support to the ETTC RANGE. All assigned personnel will become familiar with the contents. They can be located at S:\Files\Operations\Pub & Guide Library\Range Documentation

8.10.1. AFI 13-212 V1, Range Planning and Operations.

8.10.2. EGLINAFBI 13-204, Eglin Range Mission Scheduling and Control.

8.10.3. EGLINAFBI 13-212, Range Planning and Operations.

8.10.4. Eglin Comprehensive Range Plan (CRP).

Chapter 9

RADIATION AND LASER SAFETY

9.1. General. This chapter provides guidance on the minimum requirements for ensuring radiation and laser safety. This chapter also establishes procedures for meeting the supervisor and employee responsibilities IAW AFI 48-109, Electromagnetic Field Radiation (EMFR) Occupational and Environmental Health program, AFI 48-139, Laser and Optical Radiation Protection Program, AFI 48-148, Ionizing Radiation Protection, and applicable Eglin AFB supplements.

9.2. Responsibilities.

9.2.1. Unit Radiation Safety Officer (RSO) and Laser Safety Officer (LSO).

9.2.1.1. The RSO and LSO will be appointed in writing by the unit commander. A copy of the appointment letter will be maintained in the Radiation Safety Program binder.

9.2.1.2. Receive and document training from the Bioenvironmental Engineering (BEE) Radiation Protection Element.

9.2.1.3. Review the contents of this chapter on an annual basis and update as operations change. Any and all changes must be forwarded to BEE.

9.2.1.4. Perform unit initial and annual training specific to the radiation, laser, and radiofrequency radiation (RFR) hazards that apply to the workers. Ensure training is documented in each individual's AF Form 55.

9.2.1.5. Inform BEE prior to using any new system or employing changes in existing operations. This includes, but is not limited to, changes in building layouts, exposure times, operating parameters, or any other requirements change that could alter the accuracy of hazard surveys.

9.2.1.6. Report any suspected or actual over-exposure to BEE immediately.

9.2.2. Supervisors.

9.2.2.1. Ensure all workers have been trained prior to authorizing them to use systems.

9.2.2.2. Inform unit RSO/LSO and BEE prior to operating a new system to ensure a risk assessment is completed.

9.2.2.3. Mark all radiation hazard areas adequately. Ensure hazards are clearly stated, and positive control is maintained over the hazard area at all times.

9.2.3. Workers.

9.2.3.1. Follow all established procedures, manufacturer data, technical orders, and applicable regulatory standards.

9.2.3.2. Ensure all safety precautions and required hazard areas are marked as required prior to operating systems. Never operate a system without prior training on operating procedures and hazards.

9.2.3.3. Report any hazardous conditions, suspected or actual over-exposures to supervisors, unit RSO/LSO and BEE immediately.

9.3. Procedures. The sources used by EOD personnel are used during emergency response, training for emergency response, and maintenance and calibration of response equipment activities. The following minimum procedures apply.

9.3.1. Source Specifics:

9.3.1.1. XRS-3, X-Ray Source. The XRS-3 is a small, lightweight, pulsed x-ray generator that operates using a removable battery. It creates pulses of very short duration (50 nanoseconds) at a relatively low dose rate with up to 270 Peak Kilo Volts of energy.

9.3.1.2. It is unlawful to use this equipment to intentionally expose humans or to use it for medical radiography.

9.3.1.3. Untrained and unauthorized personnel must not have access to this device.

9.3.1.4. The IdentiFINDER. The IdentiFINDER is a hand held gamma spectrometer used to locate, identify, measure dose/dose rate and verify neutron presence. It contains a Cs-137 cesium source and uses Ba-133 barium, Cd-109 cadmium, Co-57 & 60 cobalt, Eu-152 Europium, Mn-54 manganese, and Na-22 sodium for calibration.

9.3.1.5. ADM-300, Radiac Set. The ADM-300 is a hand held radiation detection and dose/dose rate measurement device for alpha, beta, gamma, and x-ray. The ADM-300 uses Cs-137 cesium and Th-232 thorium for calibration.

9.4. Precautions.

9.4.1. These sources must always be stored securely in a previously identified and approved area.

9.4.2. Use sources only as directed for calibration, and always return them to the storage area.

9.4.3. All personnel are required to wear nitrile gloves while handling button sources and will wash hands immediately after handling.

BRANDON G. GOEBEL, Maj, USAF
Commander, 96th Civil Engineer Squadron

Attachment 1

GLOSSSARY OF REFERENCES AND SUPPORTING INFORMATION

References

DoDM 5200.01, Vol 1, *DoD Information Security Program: Overview, Classification, and Declassification,* 24 February 2012

DoDM 5200.01, Vol 2, *DoD Information Security Program: Marking of Classified Information,* 24 February 2012

AFPD 32-30, *Explosive Ordnance Disposal*, 25 July 2018

AFI 32-3002-O, *Interservice Responsibilities for Explosive Ordnance Disposal*, 14 February 1992

AFI 10-210, *Prime Base Engineer Emergency Force (Beef) Program*, 21 January 2015

AFI 13-212 V1, *Range Planning and Operations,* 22 June 2018

AFI 16-1404, *Air Force Information Security Program,* 29 May 2015

AFMAN 32-3001, *Explosive Ordnance Disposal Program,* 26 April 2019

AFI 48-109, *Electromagnetic Field Radiation (EMFR) Occupational and Environmental Health program*, 1 August 2014

AFI 48-109 EGLIN_SUPP, *Electromagnetic Field Radiation (EMFR) Occupational and Environmental Health Program*, 13 March 2018

AFI 48-139, *Laser and Optical Radiation Protection Program*, 30 September 2014

AFI 48-139 EGLIN_SUPP, *Laser and Optical Radiation Protection Program*, 19 January 2018

AFI 48-148, *Ionizing Radiation Protection*, 20 July 2020

AFI 48-148 EGLINAFBSUP, *Ionizing Radiation Protection*, 20 September 2018

AFMAN 31-129, *USAF Small Arms and Light Weapons Handling Procedures,* 29 June 2016

AFMAN 17-1302-O, *Communications Security (COMSEC) Operations,* 3 February 2017

AFMAN 33-363, *Management of Records,* 1 March 2008

AFMAN 91-201, *Explosive Safety Standards,* 21 March 2017

EGLINAFBI 13-204, *Eglin Range Mission Scheduling and Control*, 14 January 2014

EGLINAFBI 13-212, *Range Planning and Operations,* 30 April 2015

EGLINAFBI 31-101, *Integrated Defense Plan,* 22 June 2018

TO 00-5-1, *Air Force Technical Order System,* 14 June 2016

Eglin Comprehensive Range Plan (CRP), 28 Oct 2014

Prescribed Forms

None

Adopted Forms

DD Form 626, *Motor Vehicle Inspection*

DD Form 836, *Dangerous Goods Shipping Paper and Emergency Response Information*

DD Form 1348-1, *DoD Single Line Item Release/Receipt Document*

DD Form 1907, *Signature and Tally Record*

AF IMT 68, *Munitions Authorization Record*

AF Form 191, *Ammunition Disposition Request*

AF Form 439, *Robbery Checklist*

AF Form 440, *Bomb Threat Aid Card*

AF Form 614, *Charge Out Record*

AF IMT 623a, *On-The-Job Training Record Continuation Sheet*

AF Form 847, *Recommendation for Change of Publication*

AF Form 978, *Supervisor's Mishap Report*

AF Form 1109, *Visitor Register Log*

AF IMT 1297, *Temporary Issue Receipt*

AF IMT 1473, *Gun Equipment Room Inventory*

AF Form 1800, *Operator's Inspection Guide and Trouble Report*

AF Form 2419, *Routing and Review of Quality Control Reports*

AF Form 2432, *Key Issue Log*

AF IMT 2530, *Alarm System Test Record*

AF IMT 3803, *Surface Weather Observations*

AF Form 4168, *COMSEC Responsible Officer and User Training Checklist*

AFCOMSEC Form 16, *COMSEC Physical Inventory*

SF 153, *COMSEC Material Report*

SF 701, *Activity Security Checklist*

SF 702, *Security Container Check Sheets*

SF 1103, *U.S. Government Bill of Lading*

SF 1109, *U.S. Government Bill of Lading – Continuation Sheet*

DRMS Form 1851, *Restricted Waste Notification*

EPA Form 8700-22, *Uniform Hazardous Waste Manifest*

Abbreviations and Acronyms

AAFES—Army Air Force Exchange Service

ADR—Ammunition Disposition Request

AFI—Air Force Instruction

AFMAN—Air Force Manual

AFPD—Air Force Policy Directive

AFRIMS—Air Force Records Information Management System

AGL—Above Ground Level

BDOC—Base Defense Operations Center

BEE—Bioenvironmental Engineering

BSERV—Bomb Squad Emergency Response Vehicle

CAM—COMSEC Account Manager

CAP—Cryptographic Access Program

CCI—Controlled Cryptographic Items

CDU—Capacitor Discharge Unit

CLS—Combat Life Saver

COMSEC—Communications Security

COTS—Commercial Off-the-Shelf

CRP—Comprehensive Range Plan

CSSO—Computer System Security Officer

DAA—Designated Approving Authority

DODIC—DoD Identification Code

EAL—Entry Authorization List

EAP—Emergency Action Plan

EBW—Exploding Bridge Wire

ECC—Enhanced Cryptographic Cards

EED—Electro Explosive Device

EMSEC—Emission Security

EOC—Emergency Operations Center

EOD—Explosive Ordnance Disposal

EODIMS—EOD Information Management System

ETTC—Eglin Test and Training Complex

FDSER—Fuse Disassembly System, EOD, Remote

FPCON—Force Protection Condition

HAZMAT—Hazardous Materials

HCD—Hazard Class Division

HERD—High Explosive Research Division

IDS—Intrusion Detection System

IED—Improvised Explosive Device

IR—Infrared

JON—Job Order Number

JTTOC—Joint Test and Training Operations Control Center

LSO—Laser Safety Officer

MSA—Munitions Storage Area

NEW—Net Explosive Weight

OD—Open Detonation

OPR—Office of Primary Responsibility

PAN—Percussion Actuated Neutralizer

PMEL—Precision Measurement Equipment Laboratory

PT—Physical Training

RDS—Records Disposition Schedule

RF—Radio Frequency

RFA—Radio Frequency Authorization

RFR—Radio Frequency Radiation

RM—Risk Management

RSO—Range Safety Officer

RSO—Radiation Safety Officer

SHRP—Safe Handling and Recovery Procedures

SRB—Safety Review Board

STE—Secure Terminal Equipment

TD—Test Directive

TL—Team Leader

TM—Team Member

TO—Technical Order

USR—Unit Safety Representative

Terms

EOD Flight Management—The Flight Chief and or Flight Commander.

Attachment 2

STANDARD PRE-OPERATION SAFETY BRIEFING

NOTE:

Prior to the start of all explosive operations on training, demolition, or bombing ranges the Team Leader (TL) or a Team Member (TM) will complete this form and brief all individuals present during the explosive operation.

If performing operations covered in the Safe Handling and Recovery Procedures this form does not need to be accomplished.

A2.1. Explosive and Personnel Limits.

A2.1.1. Operation(s) to be performed - **ADR / General Demo / Disposal**

A2.1.1.1. Munitions involved - **Conventional Munitions / Bulk HE / Explosive Waste**

A2.1.1.2. Number and NEWQD (w/TNT-equivalent) of Detonation(s) –

A2.1.1.3. Maximum Fragmentation Distance (per T.O. 60A-1-1-4, Protection of Property and Personnel,
TDA, and applicable T.O. 60 series publications) for each Detonation.

A2.1.1.3.1. Hazardous Fragmentation Range (HFR) -_____**FT**

A2.1.1.3.2. Maximum Fragmentation Range – Horizontal (MFR-H) -
_____FT

A2.1.1.3.3. Maximum Fragmentation Range – Vertical (MFR-V) -
_____FT

A2.1.1.3.4. Blast Overpressure Distance
K50 _____**FT** K328 _____**FT**

A2.1.1.4. Explosive Hazards (per applicable 60 series publications) - **Frag / Fire / Jet**

A2.1.1.5. Special Ordnance Considerations (orientation, heavy casing, etc.):_____

_____

A2.1.2. Location where operation is to be performed (detonation site) -

A2.1.3. Operating Location for Essential Personnel (For operating locations with aerospace vehicle traffic seek the appropriate Air Ground Level (AGL) clearance (based on calculated MFR-V) from local Air Traffic Controllers.) _____

A2.1.3.1. Distance from detonation site - _____**FT**

A2.1.3.1.1. If distance from detonation is less than Maximum Fragmentation Distance apply protective measures (AFMAN 91-201 para 12.74.4 and 12.74.8)

A2.1.3.1.2 Note all standing or approved ORM considerations IAW AFPAM 90-902 and overall assessments (i.e. Range OI, etc.) _____

A2.1.3.2. Commander approving ORM assessment based on being inside the maximum fragmentation distance (if applicable): _____

A2.1.4. Evacuation Assembly Point / Non-Essential Personnel area -_____

A2.1.5. Explosive Limits - _____ **LBS**

A2.1.6. Personnel Limit for the range is - _____

A2.1.6.1. A minimum of three EOD personnel, one who is a PAFSC 3E871 or higher, will be present during explosive operations.

A2.1.6.2. The parameter in 1.6.1 may be adjusted to a minimum of two EOD-qualified personnel, one of which is an E-5 that has been awarded a 5-skill level, when the mission is defined by EOD-coordinated instructions (local stand-by duties, exercise support, testing support, etc.), or when approved through Commander ORM determination during periods of critical manning or other unique circumstances to meet mission requirements. Document commander ORM data and maintain for inclusion in EODIMS report.

A2.1.7. Personnel/Duty assignments

Range Safety Officer (**RSO**) -_____

EOD Team Leader (**TL**) - _____

EOD Team Members (**TM**) - _____

Support Team / Medical (Casuals) - _____

Non-Essentials (Stop all operations when visitors are present) - _____

Non-Essential Escort - _____

A2.1.8. Conduct briefing to ensure personnel are familiar with all the hazards involved prior to commencing.

A2.2. Equipment Requirements.

A2.2.1. General Safety Equipment Requirements:

____ Water ____ Portable radios

____ Gloves ____ First Aid Kit

____ Sun-screen (as needed) ____ Fire Extinguishers
____ Safety glasses (explosive ops)

A2.2.2. Special personnel protective equipment (e.g., laser goggles, helmet, body armor) -
_____ _____
A2.2.3. Special operational equipment (e.g., Mk-series tools, robotics, etc.) -

A2.3. Pre-operational Safety Assessment.

WARNING

Ground yourself prior to handling initiating explosives; work on grounded surfaces if possible.

Personnel handling electrically initiated explosive devices will avoid wearing clothes made of material, which have high static generating characteristics.

Use available frontal/overhead protection during detonation – do not stand in view of the munitions to be detonated.

CAUTION

Expose the minimum amount of people to the minimum amount of explosives for the minimum amount of time.

A2.3.1. Visitors and casuals will be briefed on type of ordnance and associated hazards. Provide specific instructions on where to drive, park, and walk; and not to touch items they may encounter ("if you didn't drop it, don't pick it up"). Show visiting and casual personnel the specific frontal/overhead protected area in which to take cover.

A2.3.2. Non-Essential Personnel Escort: If visitors are on range, stop all operations and assign an escort to ensure safety rules are followed. Escort to visitor ratio will not exceed 1:5. The RSO may be the Escort.

NOTE

Any personnel wanting to proceed down range after commencement of the operation will do so only after obtaining approval from the TL. Personnel will then be briefed on all hazards present.

Any unsafe actions observed by EOD personnel will be immediately brought to the attention of the RSO and operations will cease until the condition is corrected.

If unable to resume safe operations, withdraw to a safe distance and inform EOD Operations and or Range Control that the EOD operation is terminated.

WARNING

(Do not transmit within 10-feet (3-meter) between transmitting antenna and any part of ordnance item. Per 60A-1-1-12)

A2.3.3. Remove rings and watches prior to starting any explosive operation.

A2.3.4. Do not handle munitions roughly (e.g., rolled, tumbled, dropped, dragged or thrown).

A2.3.5. If an abnormal condition occurs, stop the operation until the condition is corrected.

A2.3.6. Do not begin explosive operations on ranges until 30 minutes after sunrise; cease operations 30 minutes prior to official sunset.

A2.3.7. Observe wait times of 30 minutes for electrically primed misfires and 1 hour for non-electrically primed misfires.

A2.3.8. Cease all explosive operations when there is lightning within 5 nautical miles. Range control, operations or the RSO will monitor weather.

A2.3.9. Only one EOD technician will check the detonation point after a planned detonation with a second person acting as a safety backup. This rule also applies when checking items kicked out by a detonation. Deviation for the sake of training is not authorized.

A2.3.10. Do not proceed directly down range if the detonation results in a range fire. If it can be ascertained that the fire can be contained, immediately respond and try to control the fire while the FD is responding. If the decision is made not to fight the fire, the area should be evacuated and remain so until it has cooled for at least 24 hours. Inform range control or appropriate local authorities as to the extent of the fire so appropriate notifications can be made. Follow the safety measures outlined in 60A-1-1-31 and below prior to returning to the detonation site:

A2.3.10.1. Wait at least 24 hours after the fire has been extinguished to check the detonation point. Deviations are allowed at TL discretion.

A2.3.11. Make positive identification before taking any action on a munition item.

A2.3.12. Destroy in place or clearly mark for later destruction any dud munitions that cannot be safely moved.

A2.3.13. No smoking within 50 feet of explosives; TL or RSO will designate a smoking area.

A2.4. Emergency Procedures.

A2.4.1. In the event of an accident or fire, the RSO will notify the appropriate agency (e.g. fire department, ambulance, range controller or EOD Operations).

A2.4.1.1. Evacuate all nonessential personnel -_____**FT**

A2.4.1.2. The Evacuation Assembly Point is -_____

A2.4.2. Fire extinguishers/equipment are located – Each truck

A2.4.3. First Aid Kit is located – Each truck / Polaris

A2.4.4. _____ and _____ will fight the fire and note the time if any munitions become engulfed in flames.

WARNING

Do not fight fires involving 1.1 munitions engulfed in flames unless attempting a rescue.

A2.4.5. _____ will sound the alarm and go to the Evacuation Assembly Point and direct emergency responding personnel to the scene.

A2.4.6. _____ and _____ will secure the site of unused explosives for storage or later disposition.

A2.4.7. When evacuation is accomplished, RSO will account for everyone involved in the operation.

Attachment 3

EXPLOSIVE OPERATIONS NOTIFICATION CHECKLIST

A3.1. The below information will be utilized when making explosive use notifications IAW Chapters 7 and 8 of this instruction. Refer to Attachment 6 for Chapter 9 notifications.

A3.1.1. NAME OF PERSON MAKING RANGE CALLS: _____

A3.1.2. OPERATION START TIME: _____

A3.1.3. OPERATION END TIME: _____

A3.1.4. LOCATION OF OPERATION: _____

A3.1.5. # OF DETONATIONS: _____

A3.1.6. N.E.W.:_____

A3.1.7. TIME NOTIFICATIONS COMPLETE: _____

A3.2. Agencies listed below will be notified telephonically prior to conducting operations utilizing live explosives. **Note: When conducting operations IAW Chapter 7, *Use of EOD Tools at Off-Range Locations*, only notify agencies listed in A3.2.1. through A3.2.3.**

Agency	**Phone Number**	**Contacted Initials**
A3.2.1. BDOC	882-2000	_____
A3.2.2. Command Post	883-4020	_____
A3.2.3. Weapon Safety	882-8234/2540 x2	_____
A3.2.4. Fire Department	882-5856	_____
A3.2.5. Airfield Management Operations	882-5313/2614	_____
A3.2.6. Hospital	883-8227	_____
A3.2.7. Weather	882-4800/5730	_____
A3.2.8. Public Affairs	882-3931	_____
A3.2.9. West Gate Shoppette	850-651-6741	_____
A3.2.10. Eglin Elementary School	850-833-4320 x8	_____

A3.3. Additional weather information may be obtained from 26th Operational Weather Squadron (OWS), Barksdale Air Force Base, Louisiana. They may be contacted as follows:

A3.3.1. 26 OWS (DSN)	(312) 331-2651/2652	_____
A3.3.2. 26 OWS (Comm)	(318) 529-2651/2652	_____

Attachment 4

EXPLOSIVE CONTROL LOG

	Date:

Explosive Control Log			
Team Leader:		Can #:	
Mission #:	Issued	Returned	Used
C-4			
Lot #: Location:			
M7 Non-Electric Caps			
Lot #: Location:			
M60 Igniters			
Lot #: Location:			
M700 Time Fuse			
Lot #: Location:			
Det Cord			
Lot #: Location:			
.50 Cal Electric M174			
Lot #: Location:			
Item:			
Lot #: Location:			
Item:			
Lot #: Location:			

OUT/1022	**LOGGED**	**IN/1022**
	MSI DATE	

Attachment 5

OPEN DETONATION SITE INSPECTION LOG

AREA/LOCATION	**DATE/TIME**				**INSPECTOR NAME AND SIGNATURE**	**EOD NCOIC SIGNATURE**
SECURITY DEVICES (before/after each use)	**SAT**	**UNSAT**	**N/A**	**NOT INSP**	**PROBLEMS OBSERVED**	**DATE CORRECTIVE ACTION TAKEN/ DESCRIPTION OF ACTION**
Security of Gates						
Warning Signs						
Evidence of Tampering						
Evidence of Damage						
Other						
COMMUNICATION EQUIPMENT (as used)						
Radios						
Other						
SAFETY/EMERGENCY EQUIPMENT (before/after use)						
Fire Extinguishers						
Absorbents/Spill Kits						
First Aid Equipment/Supplies						
Portable Eye Wash Station						
Leather Gloves, Boots, Face Shields, Protective Glasses						

Vehicles and Other Mobile Equipment (Before Use)	**SAT**	**UNSAT**	**N/A**	**NOT INSP**	**PROBLEMS OBSERVED**	**DATE CORRECTIVE ACTION TAKEN/ DESCRIPTION OF ACTION**
Routine Maintenance						
Brakes						
Tires						
Hydraulics						
Emergency Lights						
Horns/Sirens						
On-Board Emergency Equipment						
Other						
OD AREAS (before/after each use)						
Detonation Pits						
Secondary Containment Devices [1]						
Deterioration of Roadway						
Gate Areas/Boundary markers						
Vegetation (Fire Potential)						
Other						

Note:

1- Inspect any secondary containment devices or structures (Berms, Erosion Control, etc.) in the event they are in place. If none are in place, mark as N/A.

I certify that all items were completed as per the checklist. No residual reactive/energetic material found post detonation.

Name (print/sign) _____Date _____

Attachment 6

OPEN DETONATION FLOW OF EVENTS CHECKLIST

NOTE

TL is ultimately responsible for ensuring all munitions are disposed of properly. Potential EPA fines may be levied upon individuals for failing to comply with the EPA Permit.

T.O. 11A-1-42 no longer states munitions disposition instructions specific by nomenclature. Disposition will be conducted in the most appropriate and safe manner.

A6.1. NLT 21 Days Out.

A6.1.1._____ Contact range scheduling at 882-2991 to schedule range time. A minimum of two days will be scheduled for detonation, one of which will be a post-operation cleanup day.

A6.1.2._____ Ensure range control schedules support from Jackson Guard, medical, weather, and heavy equipment, as needed.

A6.1.3._____ Advise the EOD Resources Section what explosives will be required and initiate a request for issue, as needed.

A6.1.4._____ Notify other generators and request list of pending ADR items. The generators must include explosive class/division and NEW on their list.

GENERATORS	PHONE #	PERSON NOTIFIED
96 MXS/MXMWMA	882-3979	_____
919 MXS/LGMVW	883-6321	_____
AFRL/MMNE	882-2079/5969	_____
1 SOMXG/MXMW	884-6706/6560	_____
780 TS/OGMTG/TAMS A-24	882-2086	_____
AFRL/MNMW	882-5705/8410	_____
Duke Field Ammo	883-7895	_____

A6.2.6. _____Notify the appropriate agencies.

AGENCY	PHONE #	PERSON NOTIFIED
96 CEG/CEV	2-7667/2-7668/ 699-9936/855-0869	_____
96 TW/SEW	3-1275/2-2540x2	_____

A6.2. NLT 2 to 3 Days Out.

A6.2.1._____ Ensure all parties are aware of date, time and place of operation. It is recommended that all participants meet at the incoming explosive cargo pad near the MSA before convoying to the range.

A6.2.2._____ Confirm with EOD Resources Section on the type and amount of explosives required.

A6.2.3._____ Confirm with the EOD Operations Section to ensure that all required support has been scheduled in CSE.

A6.2.4._____ Notify the appropriate agencies.

AGENCY	PHONE #	PERSON NOTIFIED
96 TW/PA	882-3933	_____
96 SFS/SFO/Range Patrol	882-2502/2000	_____
Okaloosa County Sheriffs (SR 85 roadblocks)	651-7410	_____
Range Complex C-6	883-7881/7882	_____
Jackson Guard	882-6233	_____

A6.3. Range Day.

A6.3.1._____ Load/Inspect all necessary equipment and explosives.

A6.3.2._____ At predetermined meeting place, verify that required documentation has been completed by all generators.

A6.3.3._____ Convoy to range using proper explosive movement routes.

A6.3.4._____ Establish contact with the appropriate range control. Ensure they have a radio with the EOD net and verify that access to the range has been restricted.

A6.3.5._____ Obtain initial weather report. Ensure weather parameters are within the EPA permit requirements: No forecast of major storms and no lightning within 5 nautical miles. Obtain a copy of the report for uploading into EODIMS.

A6.3.6._____ Give safety briefing to all personnel on site.

A6.3.7._____ Unpack and sort munitions for disposal. **Note:** Munitions personnel may be used during unloading/inventory operations if properly briefed and supervised. All empty containers and packing material will be removed from the range by munitions personnel/generators.

A6.3.8._____ Check container quantities with documentation. If quantities do not match, do not accept them for disposal.

A6.3.9._____ Prepare munitions for disposal IAW TO 60A-1-1-31 or specific item T.O. **Note:** A maximum of three detonation points may be set up at one time. Ensure each detonation will not disrupt subsequent detonations. Position munitions so the major fragment hazard is pointing hazard is pointing away from the safe area.

A6.3.10._____ Two personnel will verify all empty containers and packing material are empty and then report to the TL before returning to munitions personnel/generators.

This page intentionally left blank.

ATTACHMENT 3

Excerpt - Section 8G from: Air Force Manual 91-201 *Explosive Safety Standards*

Chapter 8

EXPLOSIVES TRANSPORTATION

Section 8A—Introduction

8.1. Introduction. This chapter gives safety requirements for transporting explosives and for operating vehicles and materials handling equipment in explosives locations. In-use ammunition items that must accompany security forces or other defense forces are not governed by transportation rules. QD criteria does not apply to munitions and explosives in the transportation mode. Take precautions to ensure minimum exposure of people and property during all phases of transportation. The time munitions and explosives are in the transportation mode must be limited to the absolute minimum necessary to complete the task.

Section 8B—Explosives Transportation Standards

8.2. Federal Regulation. Title 49 of the Code of Federal Regulation (CFR) regulates commercial shipment of hazardous material, including explosives, by rail, motor vehicle, cargo aircraft and ship within the United States (except maritime explosives). Rules in Title 49 CFR only apply on military installations when specifically prescribed. For transporting explosives and munitions on an Air Force installation use the criteria is this Manual. For transporting military explosives and munitions not on an Air Force installation, but in an Air Force conveyance, operated by Air Force personnel, the rules in Title 49 CFR must be applied to the extent they are prescribed in United States Air Force and Department of Defense directives. See **paragraph 8.3** for examples, but not an exhaustive list, of such publications.

8.3. DoD Directives. In addition to this Manual, the following directives apply to military shipments of hazardous materials within the defense transportation system: AFJI 11-204, *Operational Procedures for Aircraft Carrying Hazardous Material;* AFMAN 24-204, *Preparing Hazardous Materials for Military Air Shipment*; T.O. 11N-45-51 series, *Transportation of Nuclear Weapons, Materiel, General Shipping, and Limited Life Components (LLC) Data; Defense Transportation Regulation* **(**DTR) 4500.9R *Part 2* and AFJI 24-210, *Packaging of Hazardous Material;* AFI 24-203, *Preparation and Movement of Air Force Cargo;* AFI 24-301, *Transportation Vehicle Operations,* MILSTD 129, *Military Marking for Shipment and Storage.*

8.4. Local Laws Regulating Transportation of Explosives and Dangerous Articles. Each state and nearly all local and foreign governments have laws or ordinances regulating transportation of explosives and other dangerous articles within their jurisdiction. Obey local laws where state, local or host nation governments have jurisdiction. Where there is exclusive federal jurisdiction, local laws may not apply. Where there is a conflict, contact your MAJCOM for clarification.

Section 8C—Hazard Classification for Explosives Transportation

8.5. Hazard Classification Requirements for Transportation. Explosives, to be acceptable for transportation by any mode, must have an assigned hazard classification (HD; storage compatibility group; DOT class, markings, shipping name and label; and United Nations serial number), except as noted in paragraph 8.6. Developmental items, test articles, components, and

certain commercial items that contain explosives, but without a final classification must be assigned an interim hazard classification. See Chapter 3 for hazard classification procedures.

8.6. Commercial Explosives Hazard Classification Requirements for Transportation. Commercial explosive items purchased for official use must have a hazard classification assigned in accordance with T.O. 11A-1-47 before transportation and use, except as provided in this paragraph. Store, transport, or offer for transportation, commercial explosives that have not been examined, hazard classified, and approved by DoD in accordance with Title 49 CFR 173.56(b)(2) provided one of the following paragraphs is complied with:

8.6.1. The explosive has been designated, in writing, by the Associate Administrator for Hazardous Materials Safety (AAHMS), Research and Special Programs Administration, DOT, as "Not Regulated."

8.6.2. The explosive has been approved for transportation, in writing, by the AAHMS in a Classification of Explosives, Competent Authority Approval, or in a Confirmation of Acceptability of a foreign Competent Authority Approval, and the hazard classification of the explosive is HD 1.4S.

8.7. Compatibility of Explosives During Transportation. Part 177, Subpart C, Title 49 CFR provides guidance for separating and segregating hazardous materials, including different explosives, in the various modes of commercial transportation. Explosives transported on a public highway by Air Force motor vehicles, operated by Air Force personnel, will be separated and segregated using the rules in Title 49 CFR, except as otherwise provided in this Manual or other applicable military directives. When an item containing explosives is assigned to other than hazard class 1 because of the predominant hazard, a compatibility group is still assigned (see **paragraph 3.5.1.2**). For these items, compatibility for transportation, and temporary storage incident to transportation, must be based on rules for the assigned hazard class, not on the compatibility group. The compatibility group for these items applies only to long term storage. Cargo-configured items that may be shipped in the same Air Force aircraft are listed in AFMAN 24-204 and T.O. 11N-45-51 series. Procedures for submitting a compatibility waiver for air transportation of explosives is contained in AFMAN 24-204. The following exceptions to the above standards are permitted:

8.7.1. Development of new items for transportation by combining previously hazard classified components into an increased state of assembly to meet a valid military need. Use normal hazard classification procedures (T.O. 11A-1-47) to obtain the hazard classification approval for transportation applicable to the new configuration.

8.7.2. Movement of assembled or partially assembled explosive items between servicing explosives locations and aircraft loading points or other such locations on the same military installation, when the assembly has not been classed and approved as provided in T.O. 11A-1-47, but is necessary to meet valid operational requirements. If the operational requirement is expected to continue or can be anticipated, seek hazard classification approval.

8.7.3. Movement in a military vehicle of minimum quantities of explosive items necessary for demolition operations, to include proficiency training. Blasting caps, demolition explosives and unserviceable (but not dangerously unserviceable) munitions may be transported by the same vehicle, provided MAJCOM approves the mixing of all applicable

compatibility groups. See **paragraph 8.22** for restrictions concerning the carrying of explosives inside passenger compartments.

8.7.4. Transport dangerously unserviceable munitions in a separate military vehicle. If transport in a separate military vehicle is not possible, segregate and sandbag from other explosives being transported. Transport dangerously unserviceable munitions according to **paragraph 8.11** provided the munitions have been determined safe for transportation by qualified personnel as specified by the MAJCOM.

8.7.5. Movement by a DoD-owned vehicle, operated by DoD personnel, of mixed loads consisting of components (not otherwise compatible for transportation), in the numbers and of the types necessary to assemble a number of complete rounds of a single type, when essential to meet operational requirements, and when separate (unmixed) movement is not feasible. See DoD 4500.9R, *Defense Transportation Regulation,* for procedures where such exceptions to compatibility rules are required.

8.7.6. Movement by a DoD-owned vehicle, operated by DoD personnel, or a mixed load of small quantities of items (not to exceed 1,000 pounds total NEWQD) from compatibility groups B through J, N, and S. The NEWQD of HD 1.4S items need not be included.

8.7.7. Movement by Security Forces of mixed loads of ammunition in performance of their duties.

8.8. Compatibility of Explosives During Temporary Storage. Table 7.1, Title 49 CFR, or AFMAN 24-204 criteria may be used for temporary mixing of explosives while undergoing packing and unpacking operations or while in temporary storage awaiting shipment. Do not store other dangerous articles with these explosives. Shipping, receiving and storage facilities must comply with QD criteria of this Manual for the HD involved.

Section 8D—Packaging for Explosives Transportation

8.9. Packaging. Packaging of explosives offered for shipment must comply with T.O. 11A-1-10, Title 49 CFR, Part 173, or AFMAN 24-204 specifications, as appropriate. Follow these instructions:

8.9.1. Locally made packaging must meet the construction and marking requirements in Title 49 CFR, or must conform with a military Certification of Equivalency for the item being packed.

8.9.2. Mark each package to identify contents. The DOT marking consist of the Proper Shipping Name; United Nations Identification Number; and the EX-number, national stock number or other product code as specified in the hazard classification. See AFMAN 24-204, T.O. 11N-45-51, or the Joint Hazard Classification System (JHCS), as appropriate. For Transportation Protective Service Material, mark in accordance with Defense Transportation Regulations and MIL-STD-129.

8.9.3. If an item is not listed in above references, contact 505 CBSS/GBBA, Hill AFB UT 84056-5609 for the required data.

8.9.4. Do not open or repair a package in a railcar, motor vehicle, or aircraft unless it is essential for inflight safety or to safely unload a damaged package. Avoid re-nailing boxes because of the potential to strike the explosives with the nail.

8.9.5. If a package is damaged or defective, remove it from the transporting vehicle at the earliest opportunity for repair.

8.10. Shipment of Explosives Which Have Been Damaged or Failed To Function. If it is necessary to ship an explosive item that has been damaged, subjected to abnormal force or has failed to function, ask the responsible AFMC (prime ALC) element for shipping, packing, marking and safety instructions. For damaged or failed-to-function AE, EOD must determine that it is safe to ship prior to munitions requesting shipping instructions from ALC.

8.11. Transporting Dangerously Unserviceable Explosive Items for Disposal. Package and mark dangerously unserviceable items and explosive residue such as partially burned signals as specified in the item T.O. or EOD technical publications. Consult EOD before transporting dangerously unserviceable items and explosive residue other than as approved by DOT. DoD personnel who are properly trained in procedures to be followed and specific hazards of the material may routinely transport dangerously unserviceable items and explosive residue. Inspect vehicles using DD Form 626, Motor Vehicle Inspection (Transporting Hazardous Material).

Section 8E—Explosives Movement Routes on Base

8.12. Explosives Movement Routes on Base. Designate the safest possible primary and alternate explosives movement routes to cover all phases of movement. Identify routes and any limitations on explosives quantities by hazard class/division on base maps. Avoid built-up areas and key, mission-oriented facilities and equipment to the maximum extent possible. Movements of munitions within a munitions storage area, airfield or to and from licensed storage locations and transportation of explosives in support of the training of working dogs are not restricted to designated routes.

Section 8F—Incoming and In-transit Explosives Shipments

8.13. Incoming Explosives Shipments. Review guidance in the Transportation Facilities Guide maintained by Surface Deployment and Distribution Command (SDDC). Contact the base transportation officer for this guide. The base transportation officer is responsible for maintaining the base information current in the SDDC database. Clearly state in notification procedures the NEWQD (and MCE if applicable), by HD, that can be received at unloading facilities (i.e., railheads, ports, hot cargo pads, etc).

8.14. In-transit Explosives Shipments/Secure Holding. When the SDDC or carrier requests temporary storage for in-transit shipments of explosives, the responsible commander may authorize explosives laden carriers to temporarily store their cargo at a Secure Explosives Holding Area, or Secure Non-explosives Holding Area for HD 1.4S materials (see **paragraph 12.64**). Furthermore, DoD installations and activities shall provide a secure holding or safe haven for A&E shipments during emergency conditions (vehicle breakdowns, criminal/terrorist threat, etc.). Coordinate with the base transportation officer to ensure the Transportation Facilities Guide correctly reflects the NEWQD (and MCE if applicable), by HD, that can be held at the Secure Explosives Holding Area. See Defense Transportation Regulation (DTR), Part II, Chapter 205.Q, AFI 31-101, *Integrated Defense, integrated defense plans* and AFI 10-2501, *Air Force Emergency Management (EM) Program Planning and Operations,* for information. For guidance on SAFE HAVEN and SAFE parking, refer to AFMAN 32-4004, *Emergency Response Operations,* for information.

8.15. Inspection of Incoming Explosives Shipments. All incoming motor vehicles carrying hazard class 1 explosives and other hazard class items that carry an explosives compatibility group, to include HD 1.4 shipments more than 1,001 lbs (in accordance with 49 CFR 172.504), will be inspected at a designated inspection station by a representative of the Logistics Readiness Squadron (LRS) commander before further routing on base.

8.15.1. Inspection stations do not require explosives siting if they are limited to the activities described in paragraph 12.58. If the inspection station is also used as an explosives storage or suspect vehicle holding area, it must meet QD criteria per Chapter 12. Do not perform vehicle inspections at the station if it is in use as an explosives storage area or suspect vehicle holding area. The inspection station may be used as an interchange yard. Vehicles shall be removed promptly.

8.15.2. Inspections will be done using DD Form 626.

8.15.3. Once a vehicle has passed the initial inspection, a visual inspection of the external condition of the cargo may be done at any suitable location, including the unloading point.

8.15.4. Any vehicle found or suspected to be in a hazardous condition will be moved to a suspect vehicle holding area which is isolated from other locations by the proper QD criteria per paragraph 12.63, unless it is more hazardous to move the vehicle.

8.16. Inspection of Outgoing Explosives Shipments. This paragraph does not apply to the departure of in-transit explosives shipments. All vehicles to be used for off-base shipments of explosives will be inspected by shipping activities before and after loading for compliance with safety regulations.

8.16.1. Complete DD Form 626 according to DTR 4500.9R, Part 2, Chapter 204.

8.16.2. Maintain a record of the vehicle number, the type of explosive cargo, and the number of each seal applied to the vehicle.

8.16.3. Drivers must be qualified to operate the vehicle and knowledgeable of the explosives being transported and associated hazards. In addition, Air Force civilian drivers must have a Commercial Drivers License, with a hazardous materials endorsement, to transport explosives off a military installation. See AFI 24-301, *Vehicle Operations*.

8.16.4. DD Form 836, Dangerous Goods Shipping Paper/Declaration And Emergency Response Information for Hazardous Materials Transported By Government Vehicles, will be used to instruct drivers on the nature of their cargo, firefighting methods, and other specific precautions for the particular shipment. Information on the preparation and use of DD Form 836 is in DTR 4500.9R, Part 2.

8.16.5. Overseas units shall use bilingual instructions on the DD Forms 626 and 836 where needed.

8.16.6. Where special purpose vehicles are authorized to transport explosive loads, applicable technical data will be used.

8.16.7. Written procedures will be developed with the base Logistics Readiness Squadron to ensure procedures and requirements for military vehicles or drivers transporting explosives (assembled or partially assembled in a delivery mode) across or on public highways from one part of a base to another are compliant with the Defense Transportation Regulation 4500.9R,

Volume II, Chapters 204 and 205. Examples may include the transportation of munitions from a preparation area across the highway to the main base flightline, or on the highway to a nearby auxiliary field. If this is a daily operation, there shall be an agreement with local authorities on any local restrictions to be imposed. OCONUS locations must comply with Host Nation requirements, including any notice requirements contained in host nation law or applicable international agreements.

8.16.8. Commercial carriers used to move explosives over public highways from one area to another area of an installation will be externally inspected before entering the second area. Inspection is not required if the carrier was escorted or under surveillance en route.

8.17. Interchange Yards. This location will be used for the exchange of tractor-trailers between the common carrier and the base activity involved. Interchange yards do not require explosives siting if they are limited to the activities described in paragraph 12.59. If the inspection station is also used as an explosives storage or suspect vehicle holding area, it must meet QD criteria per Chapter 12. Do not perform vehicle interchange operations at the yard if it is in use as an explosives storage area or suspect vehicle holding area. The interchange yard may be used as an inspection station. Vehicles should be removed promptly.

8.18. Holding Yards. If the explosives-loaded vehicles cannot be dispatched to unloading points promptly, they must be moved to a holding yard. See **paragraph 12.60** for holding yard siting requirements. Holding yards may be used for interchange and inspection activities.

8.19. Classification Yards. Where the volume of vehicle traffic necessitates, establish a classification yard primarily for receiving, classifying, switching, and dispatching explosives-laden vehicles. Classification yards do not require explosives siting if they are limited to the activities described in paragraph 12.61. If the classification yard is also used as an explosives storage or suspect vehicle holding area, it must meet QD criteria per Chapter 12. The classification yard may be used as an interchange yard. Vehicles should be removed promptly.

8.20. AE Transportation Mode Change Locations. Transportation mode change locations require explosives siting as per paragraph 12.62.

Section 8G—Transportation and Movement of Explosives by Motor Vehicle and Material Handling Equipment

8.21. General. This section covers the transport and handling of explosives by DoD motor vehicle and material handling equipment. The requirements of this section also apply to DoD rental vehicles when used to transport DoD explosives on military installations. Do not transport DoD explosives in POVs under any circumstance.

8.21.1. Chock explosive loaded vehicles and material handling equipment (MHE) when parked and the driver is not behind the wheel. Chocking MHE is not required if the explosives load is lowered and completely resting on the ground.

8.21.2. Other forms of explosives loaded MHE (trailers, universal ammunition loading systems (UALS), etc.) will be chocked when parked and/or left unattended.

8.22. Transporting Explosives in Passenger Compartments. Do not transport explosives in a passenger compartment of a vehicle, except as authorized below.

8.22.1. Minimum essential personnel and limited quantities of HD 1.4, 1.3, and 1.2.2 explosives, as approved by the local OI, may be transported together in cargo portion of vehicles (including Metro type vans used on flightlines) or in vehicles used as runway supervisory units.

8.22.2. Egress system assembled components may be transported in the cargo compartment of Metro-type vehicles.

8.22.3. For emergency responses in vehicles without separate cargo compartments (e.g., robot vans, Metro-type vehicles, HMMWV, EOD Base Support Emergency Response Van (BSERV), Mine Resistant Ambush Protected (MRAP) family of vehicles), EOD units are authorized to transport minimum essential quantities of all HDs inside the vehicle. Separate incompatible explosives to the maximum extent possible.

8.22.4. Basic load munitions issued to emergency response personnel in the performance of their duties are exempt from these requirements. Basic loads can include HD 1.1 40mm grenades, LAW rockets, etc. However, transportation of re-supply stocks must comply with all the requirements of this paragraph.

8.22.5. When units responsible for demolition operations are issued vehicles without separate cargo compartments, such vehicles may be used to transport minimum quantities of explosives necessary to support demolition. Trailers will be used to the maximum extent possible.

8.23. Transporting Electro-Explosive Devices. When transporting items containing EEDs, fully consider EMR hazards discussed in Chapter 9. Vehicles with plastic bed liners may be used to transport EEDs that are in their original sealed outer package, box, or container. Metal ammo-type containers may be used to transport EEDs in vehicles with plastic bed liners if the containers provide the protection required by paragraph 7.9.2 and are bonded to the metal body of the vehicle.

8.24. Transporting Aircraft Seats and Survival Kits. Aircraft seats and survival kits with explosive devices installed must contain required safety pins and devices and be secured to prevent movement during transit.

8.25. Packaging. Transport explosives in their approved storage and shipping packaging. If less than a single shipping package must be transported, pack the explosives separately from other items in enclosed, clearly marked metal or wooden containers.

8.26. Placarding.

8.26.1. Use DOT placards as outlined in Subpart F of Title 49 CFR, Part 172. When transporting munitions off the installation in a foreign country comply with host nation requirements.

8.26.2. Commanders may omit placards on base where necessary to avoid attention of hostile forces. Instruct all personnel in proper emergency actions.

8.26.3. Where tow vehicle and trailer combinations are used on base, placard the lead vehicle on the front and the last vehicle on the rear. Placard loaded vehicles in between on each side. Placards may be omitted for transporting HD 1.4 material on base.

8.26.4. Placard materials handling equipment only when used in the same manner as a transport vehicle or trailer.

8.26.5. Compatibility group letters may be omitted from the placard if the vehicle remains on the installation.

8.26.6. Placards are not required when transporting nuclear weapons or on any explosives loaded vehicle in a nuclear weapons storage area.

8.26.7. Vehicles transporting Military Working Dog Explosives Search Training kits must be properly placarded.

8.27. Motor Vehicle Inspection. Prior to use, inspect motor vehicles used to transport explosives to determine that:

8.27.1. Fire extinguishers are available, filled, and in good working order (see **paragraph 10.23**).

8.27.2. Electric wiring is in good condition and properly attached.

8.27.3. Chassis, motor, pan, and underside of body is reasonably free of oil, grease, and fuel.

8.27.4. Fuel tank and feed lines are secure and not leaking.

8.27.5. Brakes, steering, lights, horn and windshield wipers are functioning properly.

8.27.6. Tires are properly inflated and serviceable IAW T.O. 36-1-191.

8.28. Load Protection and Stability.

8.28.1. Cover exposed ferrous metal in the cargo compartment before transporting explosives that are not packaged in DOT specified containers or equivalent.

8.28.2. Use only static resistant and noncombustible or flameproof tops or coverings.

8.28.3. Fasten safety chains between towing vehicles and trailers carrying explosives when lunette and pintle fastenings are used. Safety chains are not required when using specifically designed breakaway control safety features prescribed by the pertinent T.O.

8.28.4. Ensure lifting devices on vehicles or handling equipment have a serviceable mechanism designed to prevent sudden dropping of the load in the event of power failure.

8.28.5. Loads on the tines of a forklift must not extend more than one-third of the height of the top tier of containers above the backrest.

8.28.6. Ensure forklifts use skids or pallets to move containers of explosives, except when containers are designed with fully enclosed stirrups (360 degrees) for forklift tines.

8.28.7. Munitions may be carried on forklift tines when the weapon body is long enough to be firmly supported on both tines and strong enough to prevent damage.

8.28.8. Ensure munitions loads (AE and inert AE components) on all types of vehicles and handling equipment are stable and secure before movement. Load stability is required for all movements, to include rewarehousing or other activities conducted between one or more storage magazines, storage pads or other operating location. For on base movements, munitions loads (AE and inert AE components) must be restrained, blocked, braced, tied down or otherwise secured to the vehicle to prevent movement and must not damage

explosives or containers. "Secure" means the load is protected by an effective restraining system. Restraining devices may include chains and binders, cargo nets and tie-down straps, sideboards and tailgates, etc.

8.28.9. Consider vehicle and handling equipment type, type of load, and the prevailing weather and road conditions when determining if safe transport is feasible. This guidance pertains to munitions storage area as well as applicable flightline operations.

8.29. Loading and Unloading.

8.29.1. Chock explosives loaded vehicles and MHE (trailers, UALS, etc.) during loading or unloading operations.

8.29.2. To the maximum extent possible, position munitions cargo vehicles to permit loading and unloading from each side of the cargo bed. Munitions will be accessed from the side closest to the load unless access can only be obtained from one side.

8.29.3. Except as required in the event of an electrical storm (see Section 7H), do not leave explosives-laden vehicles unattended unless they are parked in a properly designated area, such as the weapons storage area, holding yard or flightline munitions holding area.

8.29.4. Do not load or unload explosives from a motor vehicle while the engine is running, except under the following conditions:

8.29.4.1. Where the engine is required to provide power to vehicle mechanical handling equipment used in loading and unloading the vehicle.

8.29.4.2. Where necessary for emergency operations or timing for exercises simulating execution of emergency plans. In this case, small loads or packages of explosives delivered to aircraft, requiring only momentary unloading time, may be removed from a vehicle while the motor is running.

8.29.4.3. Engines of diesel-powered vehicles may continue to run during loading or unloading of explosives except when exposed explosives or hazardous locations are involved.

8.29.4.4. Adequate ventilation is provided to prevent unnecessary build-up of exhaust gases.

8.29.5. Do not leave vehicles at aircraft or storage locations longer than needed to complete explosives loading or unloading. If a delay occurs, move the vehicle from location.

8.29.6. Refuel trucks before loading explosives.

8.30. Vehicle Refueling.

8.30.1. Refuel non-explosives loaded vehicles and equipment at least 100 feet from structures or sites containing explosives.

8.30.2. When refueling explosives-loaded vehicles, maintain a bonded path between the tank being filled and the tank being emptied. Ground the entire system. Refer to Section 7D for further guidance on static grounding.

8.30.2.1. When refueling is completed, remove refueling vehicle from the storage area.

8.30.2.2. Use the smallest available size of refueling unit.

This page intentionally left blank.

Appendix C Water Supply Well Information

Well Data

Installation: Eglin AFB, Fla.

Well No. 34

Elevation (Ft):

Location: Site 62 Bldg 8759

Date Constr Ended:

Well

Type: Submersible

Depth:

Diameter:

Pump Setting Depth:

Orig Static Water Level:

Draw Down:

Recovery Time:

Test Data

Well Capacity:

Pumping Level:

Air Line and Gauges

☐ Yes ☐ No

Length:

Specific Gravity (Gal per Ft.):

GPM / Draw Down =

Well Pumping Equipment

Pump

Type and Make: 22 SQ 15C-22 Grundfos Submersible

Capacity: 22 gpm

Suction (Ft): 189'

Size and Length: 1 1/4 9 sticks

Column:

Head: ab Grnd: be Grnd: Total:

Number of Bowls:

Size and Types:

No. Stages:

Motor

Serial No: Type: Make: HP: RPM: Frame: Phase: Cycles: Voltage:

Standby Power: Make: Size:

HP: 1 1/2 RPM: MP Description:

Casing and Well Screening Material Used	Setting Depth	Length each
model 96080248	189'	
Grundfos Pump and motor		
240 V 2 wire		
Chris: Lex Feb. 05		

WELL DATA

INSTALLATION	WELL NO.
EGLIN AFB, FL.	34

ELEVATION (FT)	LOCATION	DATE CONSTR ENDED
	FAC # 8759 C-62	1966

WELL

TYPE: DEEP ROCK

DEPTH	DIAMETER	PUMPSETTING DEPTH
620'	4"	

ORIG STATIC WATER LEVEL	DRAWDOWN	RECOVERY TIME
126'	10' AT 125 GPM	

TEST DATA

WELL CAPACITY	PUMPING LEVEL

AIR LINES AND GAGES

☐ YES ☐ NO — LENGTH:

SPECIFIC CAPACITY (GAL PER FT): GPM / DRAWDOWN =

WELL PUMPING EQUIPMENT

PUMP

TYPE AND MAKE: SUBMERSIBLE, JACUZZI (SANDHANDLER) — CAPACITY: 20 GPM

SUCTION (FT)	SIZE AND LENGTH	COLUMN
	1 1/4" DROP PIPE	

HEAD			NUMBER BOWLS	SIZE AND TYPE	NO. STAGES
ABOVE GRND	BELOW GRND	TOTAL			
MODEL					

MOTOR

~~SERIAL~~ NO.	TYPE	MAKE	HP	RPM	FRAME	PHASE	CYCLES	VOLTAGE
2343151618		FRANKLIN	2 HP	3450		3	60	230

STANDBY POWER	MAKE	SIZE

HP	RPM	DESCRIPTION

CASING AND WELL SCREENING MATERIAL USED	SETTING DEPTH	LENGTH EACH
4" STEEL CASING	354'	
INSTALLED NEW JACUZZI SANDHANDLER PUMP AND		
FRANKLIN MOTOR 6 FEB 95. AMP 6.7 SF MAX AMP	8.1	
3 WIRE MOTOR. SF 1.25		

Appendix D Career Field Education and Training Plan

DEPARTMENT OF THE AIR FORCE
Headquarter US Air Force
Washington DC 20330-5000

CFETP 3E8X1
Part I and II
1 JAN 2020

Air Force Specialty Code (AFSC) 3E8X1

EXPLOSIVE ORDNANCE DISPOSAL

CAREER FIELD EDUCATION AND TRAINING PLAN

ACCESSIBILITY: Publications and forms are available on the e-publishing website at www.e-publishing.af.mil for downloading or ordering.

RELEASABILITY: There are no releasability restrictions on this publication.

CAREER FIELD EDUCATION AND TRAINING PLAN
EXPLOSIVE ORDNANCE DISPOSAL (EOD) SPECIALTY
AFSC 3E8X1

TABLE OF CONTENTS

PREFACE.....5
ABBREVIATIONS/TERMS EXPLAINED.....7

PART I.....11

SECTION A - GENERAL INFORMATION.....11
A1. Purpose.....11
A2. Uses.....12
A3. Coordination and Approval.....12

SECTION B - CAREER FIELD PROGRESSION AND INFORMATION.....13
B1. Specialty Descriptions.....13
B2. Skill and Career Progression.....18
B3. Training Decisions.....21
B4. Community College of the Air Force (CCAF) Academic Programs.....23
B5. CCAF Degree Completion Requirements.....24
B6. Explosive Ordnance Disposal Enlisted Career Field Pyramid.....26
B7. Enlisted Training Path.....27
B8. EOD Mission Readiness Training.....28
B9. EOD and Civil Engineer (CE) Occupational Badges.....29

SECTION C - SKILL LEVEL TRAINING REQUIREMENTS.....33
C1. Purpose.....33
C2. Speciality Training Requirements.....33

SECTION D - RESOURCE CONSTRAINTS.....39
D1. Purpose.....39
D2. Apprentice (3-Level) Training.....39
D3. Journeyman (5-Level) Training.....39
D4. Craftsman (7-Level) Training.....39

SECTION E – TRANSITIONAL TRAINING GUIDE.....40

PART II.....41

SECTION A - SPECIALTY TRAINING STANDARD.....42
A1. Implementation. 42
A2. Purpose.....42
A3. Recommendations.....43

SECTION B - COURSE OBJECTIVE LIST (COL) 44
B1. Measurement 44
B2. Standard.....44
B3. Proficiency Level.. 44
B4. Course Objective List.....44

SECTION C - SUPPORT MATERIAL.....45
C1. Purpose.....45

SECTION D – EDUCATION AND TRAINING COURSE INDEX.....46
D1. Purpose.....46
D2. Air Force In-Residence Courses/Mobile Training Team (MTT) Courses.....46
D3. Air Force Career Development Academy (AFCDA). 47
D4. Multi-Media Training (MMT). 47
D5. Courses/CDCs Under Development/Revision 48
D6. Courses Rescinded 48
D7. Other EOD Mission Related Courses 49

SECTION E – MAJCOM UNIQUE REQUIREMENTS.....50
E1. Purpose 50
E2. MAJCOM Unique Training 50

SECTION F - HOME STATION TRAINING.....52
F1. Purpose 52
F2. Home Station Training (HST). 52

SECTION G – EOD STANDARD TRAINING PACKAGE 54
G1. Objective 54
G2. Group I Training Requirements (Monthly Qualification Training).....54
G3. Group II Training Requirements (Semiannual Qualification Training) 55
G4. Group III Training Requirements (Annual Qualification Training) 55
G5. Group IV Training Requirements 55
G6. Group V Training Requirements (Supplementary Training).....56

Attachments
Attachment 1 - Qualitative Requirements (Proficiency Code Key) 57
Attachment 2 – 3E8X1 Specialty Training Standard (STS) 58

THIS PAGE INTENTIONALLY LEFT BLANK

OPR: HAF/A4C
Certified by: CMSgt Douglas Moore (AF/A4CX)
Supersedes: CFETP 3E8X1, IC2, 1 FEB 2017

Pages: 82

PREFACE

This Career Field Education and Training Plan (CFETP) is a comprehensive education and training document that identifies life-cycle education/training requirements and training support resources for the Explosive Ordnance Disposal (EOD) specialty. The CFETP will provide our Airmen with a clear career path to success and instill consistency in all aspects of our career field training.

The CFETP consists of two parts used by the supervisor to plan, manage, and control training within the career field.

Part I provides information necessary for overall management of the specialty.

- Section A provides general information about how the CFETP will be used.
- Section B identifies career field progression information, duties and responsibilities, training strategies, and the career field path.
- Section C associates each skill-level with specialty qualifications (knowledge, education, and training).
- Section D indicates resource contraints.
- Section E identifies transition training guide requirements for SSgt through MSgt.

Part II includes the following:

- Section A identifies the Specialty Training Standard (STS) to include duties, tasks, and technical references to support Air Education and Training Command (AETC) conducted training, wartime course, and correspondence course requirements.
- Section B contains the course objective list and training standards supervisors will use to determine if an Airman has satisfied training requirements.
- Section C identifies available support materials.
- Section D identifies a training course index supervisors can use to determine resources available to support training. Included here are both mandatory and optional courses, and exportable courseware.
- Section E identifies MAJCOM-unique training requirements supervisors can use to determine additional training required for the associated qualification needs.
- Section F identifies home station training references and courses material required for this specialty in support of contingency/wartime training.
- Section G identifies the EOD Standard Training Package which prescribes the minimum monthly/semi-annual/annual training/exercise requirements for all active duty EOD personnel assigned below wing level.
- Section H advertises Advanced EOD Training Course Training Standards.

Note: At unit level, supervisors and trainers must use Part II to identify, plan, and conduct training commensurate with the overall goals of this guide.

Using guidance provided in the CFETP will ensure individuals in this specialty receive effective and efficient training at the appropriate point in their careers. This plan will enable supervisors and flight leaders to train today's work force for tomorrow's requirements.

ABBREVIATIONS/TERMS EXPLAINED

Advanced Distributive Learning (ADL). Anytime, anyplace learning within DoD consisting of instructional modules comprised of sharable content objectives in an Internet/Intranet environment.

Advanced Training (AT*).* A formal course training toward a technical or supervisor level Air Force Specialty (AFS). Training is for selected career Airmen in the advanced technology level of the AFS. Graduates are not awarded a new AFSC.

Air Force Career Field Manager (AFCFM). An individual on the Air Staff charged with the responsibility for overseeing all training and career field management aspects of an Air Force specialty or group of specialties.

Air Force Enlisted Classification Directory (AFECD) – The Official directory for all military enlisted classification descriptions, codes, and identifiers. The specialty descriptions and codes will be used to identify each Air Force job (valid requirements) and describes the minimum mandatory qualifications of personnel to fill these jobs. The updated AFECD is available at AF Personnel Center's web site located at http://ask.afpc.randolph.af.mil/ under the military classification menu.

Air Force Civil Engineer Center (AFCEC). Formerly, Air Force Civil Engineer Support Agency (AFCESA), the focal point for all Civil Engineer training development. All individual AFSC Force Development Managers (FDM) are located at AFCEC.

Air Force Credentialing Opportunities On-Line (AF COOL) Program. AF COOL replaced the CCAF Credentialing and Education Research Tool (CERT). The AF COOL Program can be accessed through the AF Virtual Education Center (AFVEC). The site provides a research tool designed to increase an Airman's awareness of national professional credentialing and CCAF education opportunities available for all Air Force occupational specialties.

Air Force Institute of Technology (AFIT). Provides vital, relevant, and connected education that enables Airmen to be ready engineers and great leaders who know how to build sustainable installations to last while leading the change for the Civil Engineer career field. Course list can be accessed at http://www.afit.edu/CE/.

Air Force Training Record (AFTR). Electronic training data base to document training and access is located at the Civil Engineer Virtual Learning Center (CE-VLC).

Air Force Job Qualification Standard/Command Job Qualification Standard (AFJQS/CJQS). A comprehensive task list that describes a particular job type or duty position. Used by supervisors to document task qualifications. The tasks on the AFJQS/CJQS are common to all persons serving in the described duty position.

Air Force Qualification Training Package (AFQTP). A required instructional package designed for use at the unit to qualify, or aid qualification, in a duty position or program, or on a

piece of equipment. AFQTPs identify the Air Force's standardized method for performing the task. The AFQTP may be printed (paper-based), computer-based, in other audiovisual media formats, or all three.

Career Field Education and Training Plan (CFETP). A comprehensive, multipurpose document encapsulating the entire spectrum of education and training for a career field. It outlines a logical growth plan that includes training resources and is designed to make career field training identifiable, to eliminate duplication, and to ensure this training is budget defensible.

Chief, Civil Engineer Force Development (CCEFD). Located at AFCEC, this individual is responsible for all force development education and training associated within the 3E0 to 3E6 AFSCs.

Civil Engineer Virtual Learning Center (CE-VLC). Anytime, anyplace learning within the Civil Engineer Community consisting of instructional modules and skill-level awarding course material specific to the AFSC.

Commercial Off The Shelf (COTS). Commercially-procured training products.

Computer-Based Training (CBT). A self-paced stand-alone computer product used to deliver interactive subject and task knowledge.

Core Tasks (*). Mandatory tasks which the AFCFM has identified as a minimum qualification requirement within an Air Force specialty or duty position. These tasks exemplify the essence of the career field.

Critical Tasks. Tasks that have been identified by the work center supervisor as having a detrimental effect on mission accomplishment if not performed correctly. Critical tasks may or may not be the same as core tasks but are mandatory if identified as 'critical' to the individual's position by the supervisor or work center.

Diamond Tasks (♦). Diamond tasks are extremely important to the career field. Diamond tasks are the same as core tasks with one exception--equipment shortfalls at most locations have created problems with the actual **hands-on** training/certification of these tasks. In instances where required equipment is not available for instruction, completion of the task's technical references is required for upgrade training. Hands-on certification will be accomplished at the first opportunity when equipment is available.

Distance Learning (DL). Includes Video Tele-seminar (VTS), Video Tele-training (VTT), and CBT. Formal courses that a training wing or a contractor develops for export to a field location (in place of resident training) for trainees to complete without the on-site support of the formal school instructor. For instance, courses are offered by Air Force Institute of Technology, Air University, and Training Detachment.

Duty Position Tasks. The tasks assigned to an individual for the position currently held. These include as a minimum all core tasks, diamond tasks, critical tasks and any other tasks assigned by the supervisor.

Enlisted Professional Military Education (EPME). Enlisted Professional Military Education (EPME) introduces Airmen to appropriate institutional competencies at specific milestones throughout their career. Resident EPME requirements include Airman Leadership School (ALS), NCOA, SNCOA and the Chief Leadership Course (CLC).

Expeditionary Combat Support-Training Certification Center (ECS-TCC). Total Force training center managed by the Air Force Reserve Command.

Force Development Manager (FDM). An individual assigned to the Air Force Civil Engineer Center (AFCEC) charged with the responsibility for overseeing all training and career field management aspects of a specific Air Force Civil Engineer specialty.

Initial Skills Training. AFS-specific training an individual receives upon entry into the Air Force or upon retraining into this specialty for award of the 3-skill level. Normally, this training is conducted by AETC at one of the technical training wings.

Just-in-Time (JIT) Training – Training required just prior to a selected deployment or tasking that delivers training necessary for mission accomplishment. It is typically predicated on hard-to-obtain contingency skills.

MAJCOM Functional Managers (MFMs). Senior leaders, designated by the appropriate functional authority (FA) who provide day-to-day management and responsibility over specific functional communities at the MAJCOM, FOA, DRU, or ARC level. While they should maintain an institutional focus in regards to resource deployment and distribution, FMs are responsible for ensuring their specialties are equipped, developed, and sustained to meet future needs of the total Air Force mission.

Occupational Analysis Report (OAR). A detailed report showing the results of an occupational survey of tasks performed within a particular AFS. The information collected from this survey is used to make changes to upgrade training and Weighted Airman Promotion Exams.

On-the-Job Training (OJT). Hands-on, over-the-shoulder training conducted to certify personnel in both upgrade (skill-level award) and job qualification (duty position certification) training.

Proficiency Training. Additional training, either in-residence, advanced/supplemental training courses, or on-the-job training provided to personnel to increase their skills and knowledge beyond the minimum required for upgrade.

Qualification Training (QT). Actual hands-on task performance training designed to qualify an individual in a specific duty position. This portion of the dual channel on-the-job training program

occurs both during and after the upgrade training process. It is designed to provide the performance skills required to do the job.

Regional Training Site (RTS). Total Force training centers managed by the Air National Guard.

Resource Constraints. Resource deficiencies, such as money, facilities, time, manpower, or equipment that precludes desired training from being delivered.

Specialty Training. A mix of formal training (technical school) and informal training (on-the-job) to qualify and upgrade airmen in the award of a skill level.

Specialty Training Standard (STS). Describes skills and knowledge that airmen in a particular AFS need on the job. It further serves as a contract between the Air Education and Training Command (AETC) and the user to show the overall training requirements for an AFS taught in the resident and nonresident courses.

Specialty Training Requirements Team (STRT) – Subject Matter Experts from each MAJCOM conduct research prior to Utilization and Training Workshop (U&TW), develops training, recommends delivery methods and determines if a full fledge U&TW is required. The team finalizes the CFETP, specialty description and develops a standard for all courses.

Subject Matter Expert (SME) – An individual with expertise in a particular subject matter, tasked to represent the subject matter to an individual or group for technical accuracy.

Supplemental Training. A formal course which provides individuals who are qualified in one or more positions of their Air Force Specialty (AFS) with additional skills/knowledge to enhance their expertise in the career field. Training is for selected career airmen at the advanced level of the AFS.

Total Force. All collective Air Force components (Active Duty, Reserve, Guard, and Civilian elements) of the United States Air Force.

Upgrade Training (UGT). Identifies the mandatory courses, task qualification requirements, and correspondence course completion requirements for award of the 5-, 7-, and 9-skill levels.

Utilization and Training Workshop (U&TW). An executive decision meeting to vote on funding for instructor authorizations, equipment and facilities needed to support any new or revised training coming from the STRT. They will also determine which organizations will furnish resources and establish commitment and delivery dates in writing, document equipment availability dates and any problems and establish training delivery dates.

PART I

SECTION A - GENERAL INFORMATION

A1. Purpose: This CFETP provides information necessary for Air Force Career Field Managers (AFCFMs), MAJCOM functional managers (MFMs), commanders, education and training managers, supervisors/trainers, and certifiers to plan, develop, manage, and conduct an effective career field training program. This plan outlines the training personnel in an AFS require to develop and progress throughout their careers. It identifies initial skills, upgrade, qualification, advanced, and proficiency training.

A1.1. **Initial Skills Training.** AFS-specific training an individual receives upon entry into the Air Force or upon retraining into this specialty for award of the 3-skill level. For our career field, this training is provided in a joint environment with Navy being the lead service. The training is conducted at Naval School EOD located at Eglin AFB, FL.

A1.2. **Upgrade Training.** Identifies the mandatory courses, task qualification requirements, and correspondence course completion requirements for award of the 5-, 7-, and 9-skill levels.

A1.3. **Qualification Training.** Actual hands- on task performance training designed to qualify an airman in a specific duty position. This training program occurs both during and after the upgrade training process. It is designed to provide the performance skills and knowledge required to do the job.

A1.4. **Advanced Training.** A formal course for training personnel towards a technical or supervisory level in an AFS. Training is for selected career Airmen in the advanced technology of the AFSs. Graduates are not awarded a new AFSC.

A1.5. **Proficiency Training.** Additional training either in-residence, exportable advanced training courses, or on-the-job training, provided to people to increase their skills and knowledge beyond the minimum required for upgrade.

A1.6. The CFETP has several purposes to include:

A1.6.1. Serves as a management tool to plan, manage, conduct, and evaluate a career field training program. It is used to help supervisors identify training at the appropriate point in an individual’s career.

A1.6.2. Identifies task and knowledge training requirements for each skill level in this specialty and recommends education/training throughout each phase of an individual's career.

A1.6.3. Lists training courses available in this specialty and identifies sources of training and the delivery methods.

A1.6.4. Identifies major resource constraints that impact full implementation of the desired career field training process.

PART I

A2. Uses. MFMs and supervisors will use the plan at all levels to ensure comprehensive and cohesive training programs are available for each individual in the specialty.

A2.1. AETC training personnel will develop/revise formal resident, non-resident, field, and exportable training based on requirements established by the users and documented in Part II of the CFETP. They will also work with the EOD AFCFM and Air Force Civil Engineer Center EOD Division (HQ AFCEC/CXD) to develop acquisition strategies for obtaining resources needed to provide the identified training.

A2.2. MFMs will ensure their training programs complement the CFETP mandatory initial, upgrade, qualification, and proficiency training requirements and identify requirements that can be satisfied by OJT, resident training, contract training, or exportable courses. MAJCOM-developed training to support this AFS must be identified for inclusion into the plan.

A2.3. Unit Education and Training managers and supervisors must ensure each individual completes the mandatory training requirements (including MAJCOM supplemental requirements) for the upgrade training specified in this plan.

A2.4. Each individual will complete mandatory training requirements specified in this plan. The list of courses in Part II of this CFETP will be used as a reference to support training.

A3. Coordination and Approval. The EOD AFCFM is the approval authority for the 3E8X1 EOD CFETP. MAJCOM representatives and AETC personnel will identify and coordinate on the career field training requirements. The AETC training manager for this specialty will initiate an annual review of this document by AETC and EOD AFCFM to ensure currency and accuracy. Using the list of courses in Part II, they will eliminate duplicate training.

PART I

SECTION B - CAREER FIELD PROGRESSION AND INFORMATION

B1. Specialty Descriptions. This information supplements what is presented in the *Air Force Enlisted Classification Directory*.

CEM Code 3E800, Civil Engineer EOD Manager	**AFSC 3E851, Journeyman**
AFSC 3E891, Superintendent	**AFSC 3E831, Apprentice**
AFSC 3E871, Craftsman	**AFSC 3E811, Helper**

B1.1. Specialty Summary. Performs EOD operations to protect personnel, resources, and the environment from the effects of hazardous explosive ordnance (EO), improvised explosive devices (IED) and weapons of mass destruction (WMD) which may include; incendiary, chemical, biological, radiological, and nuclear (CBRN) hazards. Employs specialized tools, techniques and personal protective equipment to detect/identify EOD objectives and to accomplish diagnostics, monitoring, evaluation, interrogation, mitigation, render safe, recovery, and disposal operations on ordnance/devices delivered, placed, or made dangerous by accident/incident or other circumstance. Utilizes and maintains advanced equipment, such as, robotics, x-ray, landmine and CBRN detection equipment. Transports demolition explosives and equipment to authorized disposal areas, fabricates explosive demolition charges, and disposes of hazardous devices, ordnance and explosives. EOD may be employed alone or as part of an Air Force, Joint, Interagency, or Coalition force, to support Combatant Commander and/or Air Force objectives. Provides rapid response capability and operates in five geographic disciplines: mountain, desert, arctic, urban and jungle, day or night, to include austere combat environments independent of an established airbase or its perimeter defenses in mounted, dismounted and limited airborne/aerial insertion operations. EOD at the 5-, 7-, and 9-level plan, organize, and direct EOD operations.

B1.2. Duties and Responsibilities.

B1.2.1. Plans, organizes, and directs EOD operations. Develops operational orders/plans, instructions, concepts of operation, and safety plans (ORM Assessments) concerning EOD employment. Translates commander's objectives/mission taskings into effective employment of EOD capability. Uses advanced technological and manual methods to perform long range/close-in reconnaissance, identification, assessment of ordnance/hazardous device conditions and filler materials, then advises commanders on recommended EOD actions and safe withdrawal distances. Prepares personnel and equipment for military operations.

B1.2.2. Supports U.S. and foreign aerospace systems/vehicles and conventional munitions operations; sortie generation and space launch operations by responding to airfield/launch complex explosive related ground/in-flight emergencies or crash situations; and research and development testing of weapons, aircraft, and space systems.

B1.2.3. Executes counter-IED (CIED) operations. Eliminates or mitigates explosive hazards and terrorist/criminal devices, to include missions outside the base boundary or Base Security Zone to enable freedom of maneuver for air or surface operations. Performs IED defeat actions to include (but not limited to) the following: recover/destroy weapon caches; perform immediate actions to defeat emplaced IEDs; conduct post-blast analysis of IED events; provides military authorities

with technical intelligence, analysis and exploitation; and provide key insights to enable development of CIED tactics, techniques and procedures (TTPs) to mitigate IED effectiveness.

B1.2.4. Executes counter-WMD operations. Peacetime EOD force WMD response efforts are limited in scope to provide initial threat confirmation, risk mitigation, situational awareness and site stabilization; however EOD forces may also provide additional technical support as required. During contingencies, EOD forces provide full-spectrum response capability to incidents involving CBRN, incendiary and explosive devices.

B1.2.5. Conducts nuclear weapon response. Provides immediate initial support to nuclear weapon accidents or incidents in order to evaluate nuclear weapon/delivery status, mitigate risk, provide site stabilization and situational awareness. Custodial units certified on specific weapon systems and aerospace platforms form the core of weapons recovery teams and must respond in conjunction with the Tactical Response Force to explosively overcome obstacles, conduct passive diagnostics and provide technical assessments through secure communications with National Render Safe assets while supporting the National Military Command Center and Response Task Force (RTF) incident/accident or recapture/recovery efforts.

B1.2.6. Performs unexploded explosive ordnance (UXO) recovery operations. Provides emergency response (on or off installation) to neutralize hazards posed by EO related incidents presenting a threat to operations, installations, personnel or materiel, including but not limited to, excavation and renders safe, evaluation of individual ordnance items, exploitation for technical intelligence value, support of developmental and operational ordnance/weapons system testing, and large-scale recovery of airbases, forward operating locations, landing zones, and drop zones denied by ordnance operations. Maintains capability to identify, stabilize and contain chemical/biological ordnance and provide disposition support to follow-on organizations. Transports demolition explosives and equipment to authorized disposal areas, fabricates explosive demolition charges, and disposes of hazardous devices, ordnance and explosives.

B1.2.7. Engaged in explosive range activities and operational range clearances. Establishes, operates, and maintains EOD explosive proficiency, training and disposal ranges. Evaluates extent of explosive contamination on Air Force property, and on bombing and gunnery, research and development, and munitions test ranges. Prepares clearance/logistical plans and cost estimates for operational range clearance operations. Performs surface-removal, or disposal, of unexploded ordnance, classified ordnance, inert ordnance debris, training projectile debris, and any other range material fired on, or upon a military range from the targets and surrounding areas.

B1.2.8. Combat enabler for irregular warfare (IW). Provide EOD support for General Purpose and Special Operations Forces in the execution of various IW missions to include security force assistance, counterinsurgency (COIN), stability operations, and building partnership capacity. Supports specialized Joint Service task force operations.

B1.2.9. Understands war fighter TTPs. Integrates EO, IED and WMD threat information into the decision-making process at all levels to mitigate and exploit the enemy's TTPs to maximize combat power. Performs tactical mission planning and preparation. Participates in Military

Decision Making Process. Briefs joint force commanders and staff on EO threats affecting operations.

B1.2.10. Supports Defense Support to Civil Authorities activities. Provides emergency or lifesaving EOD operational capability to the Federal, state, and local civil authorities requesting support to mitigate or eliminate hazards associated with explosives (IEDs, military munitions, etc.). Provides hazardous materials (HAZMAT) response capability for incidents involving explosive ordnance.

B1.2.11. Conducts Very Important Person/special protective activities. Supports U.S. Secret Service (USSS), Department of Homeland Security (DHS) and the Department of State (DoS) by providing counter explosive search teams in support of National Security Special Events, White House Complex and the protection of the President, Vice President, and other dignitaries.

B1.2.12. EOD Flight Sustainment Operations. Identifies requirements for and maintains tools, equipment, supplies, and technical data. Orders, inventories, stores, mobilizes, and maintains specialized tools, equipment, supplies, and EOD publications. Uses computers to support flight activities. Develops notional concepts, mission need statements, and operational requirements documents, and estimates for clearance operations.

B1.3. Skill Level Duties and Responsibilities.

B1.3.1. **EOD Apprentice and Journeyman**

B1.3.1.1. Performs EOD functions.

B1.3.1.2. Conducts area reconnaissance for detecting and identifying unexploded ordnance.

B1.3.1.3**.** Determines distances to which personnel and material must be evacuated.

B1.3.1.4. Photographs all unknown explosive ordnance for technical intelligence and reporting requirements.

B1.3.1.5. Removes earth and debris surrounding unexploded ordnance, using mechanical tools, hand tools, and appropriate equipment.

B1.3.1.6. Estimates depth of buried explosive ordnance by using probing techniques or detection equipment.

B1.3.1.7. Performs constructing, sinking, and timbering of shafts for access to buried explosive ordnance and to protect personnel during recovery operations.

B1.3.1.8. Performs necessary rendering safe procedures, using special tools and techniques, including remote controlled devices and shaped charges.

B1.3.1.9. Removes neutralized explosive ordnance by using winches, pulleys, cables, or cranes.

B1.3.1.10. Operates and interprets radiation and other detecting instruments in monitoring areas adjacent to unexploded ordnance suspected of containing toxic or radioactive contamination.

B1.3.1.11. Neutralizes, leak seals, packages, and disposes of chemical and biological munitions.

B1.3.1.12. Disposes of explosive ordnance rendered exceptionally hazardous by damage or deterioration.

B1.3.1.13. Disposes of unserviceable explosives by detonation or other methods.

B1.3.1.14. Notifies authorities when areas are free of danger.

B1.3.1.15. Secures explosive ordnance and equipment to vehicles and plans evacuation routes.

B1.3.1.16. Prepares reports concerning EOD activities.

B1.3.1.17. Fabricates and uses explosive charges.

B1.3.1.18. Neutralizes and disposes of improvised explosive devices.

B1.3.1.19. Performs as a specialized member of the Disaster Response Force.

B1.3.1.19.1. Provides guidance and advice to the Incident Commander in detecting, monitoring, evaluating, and decontaminating radioactive, chemical, or biological hazards.

B1.3.1.19.2. Safes, removes, and disposes of explosives, explosive devices, and explosive ordnance rendered hazardous due to accident or incident to include ejection and catapult devices, squibs, explosive bolts, warheads, bombs, rockets, guided missiles, guns, and gun ammunition.

B1.3.1.19.3. Conducts explosive ordnance ancillary training for base populace and other agencies.

B1.3.1.20. Performs related munitions and weapons functions**.**

B1.3.1.20.1. Performs functions relating to EOD munitions, weapons, or nuclear weapons activities as directed.

B1.3.1.20.2. Maintains explosive ordnance publications and administrative publication libraries pertaining to explosive ordnance functions.

B1.3.1.20.3. Inventories, stores, and maintains supplies, tools, and equipment relative to EOD.

B1.3.1.20.4. Complies with environmental and safety regulations while conducting EOD operations.

B1.3.2. EOD Craftsman (In addition to Apprentice/Journeyman Responsibilities).

B1.3.2.1. Advises on EOD related problems.

B1.3.2.1.1. Resolves EOD problems and provides other activities with advice and guidance on EOD matters.

B1.3.2.1.2. Organizes and conducts EOD operations.

B1.3.2.1.3. Determines procedures to be used in detecting, identifying, rendering safe, recovering, or destroying explosive, incendiary, and nuclear ordnance.

B1.3.2.2. Performs EOD Functions.

B1.3.2.2.1. Determines area from which personnel and materials must be evacuated, and ensures it is cleared before proceeding with disposal.

B1.3.2.2.2. Plans and conducts neutralizing and disposing of improvised explosive devices

B1.3.2.2.3. Plans and directs removing neutralized explosive ordnance, and ensures areas adjacent to unexploded ordnance suspected of containing toxic or radioactive contamination are properly monitored.

B1.3.2.2.4. Coordinates EOD activities and movements with other interested military and civilian agencies.

B1.3.2.3. Performs as a specialized member of the Disaster Response Force.

B1.3.2.3.1. Plans, organizes, directs, and assists in render-safe, removal, and disposal of explosives, explosive devices, and explosive ordnance rendered hazardous due to accident or incident to include ejection and catapult devices, squibs, explosive bolts, warheads, bombs, rockets, guided missiles, guns, and gun ammunition.

B1.3.2.3.2. Plans, establishes, and conducts explosive ordnance ancillary training programs for base populace and other agencies.

B1.3.2.4. Supervises related munitions and weapons functions.

B1.3.2.4.1. Ensures functions relating to EOD, weapons, and nuclear weapons activities are coordinated and performed as directed.

B1.3.2.4.2. Monitors and determines the proper procedures for turn-in or disposal of unserviceable supplies, tools, and equipment.

B1.3.2.4.3. Complies with environmental and safety regulations in performing EOD operations.

B1.3.3. EOD Superintendent/Civil Engineer EOD Manager.

B1.3.3.1. Plans and organizes EOD activities.

B1.3.3.1.1. Obtains and controls the resources necessary to conduct EOD operations.

B1.3.3.1.2. Coordinates with base, local, and federal agencies in matters concerning EOD operations.

B1.3.3.1.3. Coordinates deployment taskings through MAJCOM and unit deployment manager.

B1.3.3.2. Directs EOD activities.

B1.3.3.2.1. Checks methods and techniques employed in detecting, identifying, rendering safe, recovering, and destroying explosive ordnance.

B1.3.3.2.2. Supervises preparing, maintaining, and disposing of records concerning EOD activities.

B1.3.3.3. Inspects and evaluates EOD activities.

B1.3.3.3.1. Inspects EOD activities to ensure compliance with policies, regulations, and technical publications.

B1.3.3.3.2. Interprets inspection findings, implements corrective actions, and conducts follow-up inspections.

B1.3.3.4. Performs EOD functions.

B1.3.3.4.1. Interprets publications and resolves problems encountered, pertaining to detecting, identifying, rendering safe, recovering, transporting, and disposing of explosive, incendiary, chemical, biological, and nuclear ordnance.

B2. Skill and Career Progression. Adequate training and timely progression from the apprentice to the superintendent level play an important role in the Air Force's ability to accomplish its mission. It is essential that everyone involved in training must do their part to plan, manage, and conduct an effective training program. The guidance provided in this part of the CFETP will ensure each individual receives viable training at appropriate points in their career.

B2.1. **Apprentice (AFSC 3E831 / 3-Level).**

B2.1.1. On completion of initial skills training at the Naval School EOD, the EOD trainee will work with a trainer to enhance their knowledge and skills to progress to the 5-level.

B2.1.2. Utilize the Career Development Course (CDC), Air Force Qualification Training Packages (AFQTP), web-based courses, and other exportable courses for subject and task fundamentals in the career field.

B2.1.3. Once trained and task certified, a trainee may perform the task unsupervised.

B2.1.4. After all upgrade training requirements are completed, supervisors and Unit Training Managers (UTMs) coordinate upgrade procedures.

B2.1.5. Trainees awarded the primary AFSC receive automatic enrollment in the Community College of the Air Force (CCAF).

B2.2. **Journeyman (AFSC 3E851 / 5-Level).**

B2.2.1. A journeyman may be assigned job positions such as team member, team leader by exception, shift supervisor, and task trainer.

B2.2.2. Complete Civil Engineer (CE) 5-Level Common Core Concepts Course located on the CE-VLC prior to ordering CDCs.

B2.2.3. Completion of 5-level CDCs, 100% 5-level core and diamond tasks are basic prerequisites for five skill level award.

B2.2.4. Must complete, as a **minimum**, 12-months OJT before award of the 5-level (9-months for re-trainees that were awarded a five level in a previous AFSC).

B2.2.5. Active duty Air Force personnel must attend the Resident Airman Leadership School (ALS). Air Reserve Component (ARC) personnel may accomplish ALS by using distance learning (DL) and/or the resident or satellite program.

B2.2.6. Enter into continuation training to broaden technical experience base.

B2.2.7. Use CDCs and other reference material identified by the AFCFM to prepare for Weighted Airman Performance System (WAPS) testing.

B2.2.8. Continue pursuing a CCAF degree.

B2.2.9. After all upgrade training requirements are completed, supervisors and UTMs coordinate upgrade procedures.

B2.3. **Craftsman (AFSC 3E871 – 7-Level).**

B2.3.1. A craftsman can expect to fill various supervisory and management positions such as shift leader, team leader, supervisor, or task certifier.

B2.3.2. Completion of CE 7-Level Common Core Concepts Course located on the CE-VLC and 100% core/diamond tasks are basic prerequisites for 7-skill level award.

B2.3.3. Graduation from the 7-level in-resident EOD Team Leader Course is required.

PART I

B2.3.4. Must complete, as a **minimum**, 12-months OJT before award of the 7-level (6-months for re-trainees that were awarded a 7-level in a previous AFSC).

B2.3.5. Must complete NCO Academy.

B2.3.6. Should take continuation training courses to broaden technical knowledge or management of resources and personnel.

B2.3.7. Use CDCs and other reference material to prepare for WAPS testing.

B2.3.8. Continue academic education through CCAF and higher degree programs is encouraged.

B2.3.9. After all upgrade training requirements are completed, supervisors and UTMs coordinate upgrade procedures.

B2.3.10. Pursue career broadening opportunities that include, but are not limited to, special duty assignments such as an EOD Technical Training Instructor at Naval School EOD/EOD Preliminary Course or a Silver Flag Exercise Site EOD Instructor.

B2.4. **Superintendent. (AFSC 3E891 / 9-Level)**

B2.4.1. A superintendent can be expected to fill positions such as Flight Chief, Superintendent, and various staff positions.

B2.4.2. Completion of Civil Engineer Superintendent Course (AFIT WMGT 570) is mandatory for Active Duty Guard and Reserve SMSgt's. This course is highly encouraged for Air National Guard SMSgt's and mandatory to be promoted to CMSgt.
Note: This is not a skill level awarding course.

B2.4.3. Must complete Senior NCO Academy or sister-service equivalent.

B2.4.4. Should take continuation training course to increase knowledge of budget, manpower, resources, and personnel management.

B2.4.5. Continue academic development through higher education is recommended.

B2.4.6. Must be a SMSgt for award of the 9-skill level.

B2.5. **Civil Engineer EOD Manager (Chief Enlisted Manager (CEM) Code 3E800).**

B2.5.1. CEMs work in a variety of similar jobs and functional areas where general managerial and supervisory abilities can be most effectively used and challenged.

B2.5.2. Must be selected for CMSgt and possess qualifications as a 3E891.

PART I

B3. Training Decisions. The CFETP uses a building block approach (simple to complex) to encompass the entire spectrum of training requirements for the EOD career field. The spectrum includes a strategy for when, where, and how to meet the training requirements. The strategy must be apparent and affordable to reduce duplication of training and eliminate a disjointed approach to training. The training RECOMMENDATIONS were made by members of the 4-8 March 2019 Specialty Training Requirements Team (STRT) conducted at Sheppard AFB, training DECISIONS were accomplished by the 25 September 2019 Utilization and Training Workshop (U&TW) conducted via telecom.

B3.1. **Initials Skills Training.** The initial skill course was reviewed for content. No changes were recommended. Wartime training tasks were identified and validated.

B3.1.1. EOD Preliminary Course: Preliminary Course training requirements were reviewed with no recommended changes.

B3.1.2. Naval School EOD Course: The Specialty Training Standard (STS) was adjusted to represent current curriculum. Due to this being an Inter-Service school with the Navy being the executive manager, training decisions are made by the Technical Training Acceptance Board and the School's Commanding Officer. Recommendations can be made by the U&TW, however, it requires Joint EOD Program acceptance.

B3.2. **5-Level Upgrade Training Requirements.** Full training requirements review was conducted and change needs were identified for 5-Level upgrade requirements. The primary objectives of the STRT was to eliminate duties tracked elsewhere or not EOD-specific. This resulted in a net reduction of 399 line items from the STS. Many sections were deleted completely or merged into other sections.

B3.2.1. The STRT recommended additional 5-Level Core Tasks and the U&TW confirmed the addition. The additional 5-Level Core Tasks included the addition on HazMat Awareness and HazMat Operations. The sections on Nuclear Weapon Operations, Chemical/Biological Operations, and Airbase Recovery were all comprehensively rewritten, to include several core tasks.

B3.2.2. 3E8X1 EOD Journeyman CDC Program.

B3.2.2.1. The 3E8X1 EOD Journeyman CDC program is being evaluated for a shift to a more rapid publishing platform. Several options include a Blackboard-style delivery system or publishing the existing course to the CE-VLC.

B3.2.2.2. The 3E8X1 CDC writer is tasked to develop a delivery method that will allow for the Self-Test Questions, Unit Review Exercises and End of Course Test Questions to be changed with the same speed as source material updates.

B3.3. **7-Level Upgrade Training Requirements.** Full training requirements review was conducted and change needs were identified for 7-Level upgrade requirements.

B3.3.1. The STRT recommended additional 7-Level Core Tasks and the U&TW confirmed the addition. The additional 7-Level Core Tasks were the result of the comprehensive rewrite of the sections covering Nuclear Weapon Operations, Chemical/Biological Operations, and Airbase Recovery.

B3.3.2. 7-Level EOD Team Leader Course. No changes were recommended at this time. The curriculum was less than a year old at the time of the STRT. The curriculum will be reviewed on a regular basis to ensure currency.

B3.4. **Proficiency Training.** Any additional knowledge and skill requirements that were not taught through initial skills or upgrade training are assigned as continuation training. Purpose of continuation training is to provide training exceeding minimum upgrade training requirements with emphasis on present and future duty positions. MAJCOMs must develop a continuation-training program that ensures personnel in the EOD career field receive the necessary training at the appropriate point in their careers. The training program will identify both mandatory and optional training requirements.

B3.5. **Supplemental Training.** Subject Matter Experts (SMEs) and the Training Committee reviewed supplemental training courses for technical accuracy and validated the courses were deemed necessary to fully support AFSC career progression/operational capability.

B4. Community College of the Air Force (CCAF) Academic Programs. Airmen are automatically enrolled in CCAF upon completion of basic military training. CCAF is one of several federally chartered degree-granting institutions; however, it's the only 2-year institution exclusively serving military enlisted personnel. The college is regionally accredited through Air University by the Southern Association of Colleges and Schools Commission on Colleges (SACSCOC) to award Associate of Applied Science (AAS) degrees designed for specific Air Force occupational specialties and is the largest multi-campus community college in the world. Upon completion of basic military training and assignment to an Air Force career field, all enlisted personnel are registered in a CCAF degree program and are afforded the opportunity to obtain an AAS degree. In order to be awarded, degree requirements must be successfully completed before the Airman separates/retires from the Air Force or is commissioned as an officer. See the CCAF website: http://www.airuniversity.af.edu/Barnes/CCAF/ for details regarding the AAS degree programs. In addition to its degree program, CCAF offers the following professional certifications:

B4.1. **CCAF Instructor Certification (CIC) Program.** The CIC is a professional credential that recognizes the instructor's extensive faculty development training, education and qualification required to teach a CCAF course, and formally acknowledges the instructor's practical teaching experience. Qualified officer, enlisted, civilian and other service instructors are eligible for this certification. Complete details for the instructor certification program can be found at the CCAF website.

B4.2. **CCAF offers the Instructional Systems Development (ISD) Certification.** The ISD Certification is a professional credential that recognizes the writer's or manager's extensive training, education, qualifications and experience required to develop and manage CCAF courses. The certification also recognizes the individual's ISD qualifications and experience in

planning, developing, implementing and managing instructional systems. The program is designed to broaden faculty and professional development. Complete details can be found at the CCAF website.

B4.3. **Air Force Credentialing Opportunities On-Line (AF COOL) Program.** AF COOL replaced the CCAF Credentialing and Education Research Tool (CERT). The AF COOL Program can be accessed at https://afvec.langley.af.mil/afvec/Public/COOL/Default.aspx. The site provides a research tool designed to increase an Airman's awareness of national professional credentialing and CCAF education opportunities available for all Air Force occupational specialties. The AF COOL Program also provides information on specific occupational specialties, civilian occupational equivalencies, CCAF degree programs, and AFSC-related national professional credentials available to enlisted members through credentialing agencies and professional organizations. The AF COOL Program contains a variety of information about credentialing and licensing and can be used to:

B4.3.1. Get background information about civilian licensure and certification in general and specific information on individual credentials including eligibility requirements and resources to prepare for an examination.

B4.3.2. Identify licenses and certifications relevant to an AFSC.

B4.3.3. Learn how to fill gaps between Air Force training and experience and civilian credentialing requirements.

B4.3.4. Get information on Tuition Assistance and GI Bill eligible funding opportunities to pay for credentialing examinations and associated fees.

B4.3.5. Learn about resources available to you that can help gain civilian job credentials.

B4.4. **Trade Skill Certification.** When a CCAF student separates or retires, a trade skill certification is awarded for the primary occupational specialty. The College uses a competency-based assessment process for trade skill certification at one of three proficiency levels: Apprentice, Journeyman, and Craftsman/Supervisor. All are transcribed on the CCAF transcript.

B4.5. **Air University Associate to Baccalaureate Cooperative (AU-ABC).** AU-ABC directs Airmen with associate in applied science degrees from the CCAF to a collection of accredited “military friendly” colleges and universities to consider when completing a four-year degree. The program maximizes the application of military career education and training, and provides a multitude of online academic and support services for the enlisted member.

B5. CCAF Degree Completion Requirements (64 Semester Hours). The EOD Associates Degree (4VRC) applies to the 3E8X1 AFSC. Prior to completing a CCAF degree, the individual must be awarded a 5-level and the following requirements must be met:

PART I

Course	Semester Hours
Technical Education	**24**
Leadership, Management, and Military Studies	**6**
Physical Education	**4**
General Education	**15**
Program Elective	**15**
Technical Education; Leadership, Management, and Military Studies or General Education	
Total	**64**

B5.1. **Technical Education. (24 semester hours)** A minimum of 12 semester hours of technical core subjects or courses must be applied and the remaining semester hours applied from technical core or technical elective subjects or courses. Requests to substitute comparable courses or to exceed specified semester hour values in any subject or course must be approved in advance.

Technical Core Requirements	Semester Hours
Algebra-Based Physics	8
CCAF Specialty Internship	18
Electricity/Electronics	9
Explosive Ordnance Disposal	24
General Chemistry	8
Hazardous Materials	6

B5.2. **Technical Electives.**

Technical Electives	Semester Hours
Accident Prevention	3
Basic Photography (Camera/Video Operations)	3
Blueprint Reading/Schematic Diagrams	3
Computer Science	6
Emergency Medicine	3
Heavy Equipment Operation	3
Industrial Safety	3
Industrial X-Ray/Nondestructive Inspection	3
Inventory Management	3
Investigative Techniques	3
Map and Compass Reading	3
Nuclear Science	4
Principles of Marksmanship	3
Statistics	3
Technical Mathematics (College Algebra or Higher)	3
Technical Writing	3

PART I

B5.3. **Leadership, Management, and Military Studies (LMMS)** (6 Semester Hours): Professional military education, civilian management courses accepted in transfer and/or by testing credit.

B5.4. **Physical Education** (4 Semester Hours): This requirement is satisfied by completion of Basic Military Training.

B5.5. **General Education (15 Semester Hours):** Applicable courses must meet the criteria for application of courses to the general education requirements and be in agreement with the definitions of applicable general education subjects/courses as provided in the *CCAF General Catalog*.

General Education Subjects/Courses	Semester Hours
Communications	6
Written Communication English Composition (not duplicative)	6
OR	
Oral Communication Speech	3
Written Communication English Composition	3
Mathematics Intermediate algebra or a college-level mathematics course satisfying delivering institution's mathematics graduation requirement-if an acceptable mathematics course applies as technical or program elective, you may substitute a natural science course for mathematics.	3
Social Science Anthropology, archaeology, economics, geography, government, history, political science, psychology, and sociology.	3
Humanities Fine arts (criticism, appreciation, historical significance), foreign language, literature, philosophy, and religion.	3

B5.6. **Program Elective.** (15 semester hours) Courses applying to technical education, LMMS or general education requirements; natural science courses meeting general education requirement application criteria; foreign language credit earned at Defense Language Institute or through Defense Language Proficiency Test; maximum 9 semester hours of CCAF degree-applicable technical course credit otherwise not applicable to program of enrollment.

B5.7. Additional off-duty education is a personal choice that is encouraged for all. Individuals desiring to become an AETC Instructor should be actively pursuing an associate degree. A degreed faculty is necessary to maintain accreditation through the Southern Association of Colleges and Schools (SACS).

PART I

B6. Enlisted Career Field Pyramid. The EOD Pyramid illustrates the AFS 3E8X1 career field path.

PART I

B7. Enlisted Training Path.

ENLISTED CAREER PATH				
	GRADE REQUIREMENTS			
Education and Training Requirements	Rank	Average Sew-On	Earliest Sew-On	High Year Of Tenure (HYT) (Active Duty Only)
Basic Military Training School				
Upgrade To Apprentice (3-Skill Level) – Complete Technical School	Amn A1C	6 months 16 months		
Upgrade To Journeyman (5-Skill Level) – Complete all 5-level core/duty related tasks – Complete CE 5-Level Common Core Concept web-based course – Complete 5-level CDC – Specific AFQTPs for duties at assigned location – Supplemental Courses (MAJCOM Determined) – Minimum 12 months OJT (9 months OJT for retrainees)	SrA	3 years	28 months BTZ (22 Months)	10 years
Trainer – Must be qualified and certified to the perform tasks to be trained. – Attend AF Training Course – Recommended by the supervisor				
Upgrade To Craftsman (7-Skill Level) – Minimum rank of SSgt – Complete all core/duty related tasks – Complete CE 7-Level Common Core Concept web-based course – Complete EOD Craftsman Course (Team Leader Crs) – Supplemental Courses (MAJCOM Determined) – Minimum 12 months OJT (6 months OJT for retrainees)	SSgt	5 years	3 years	20 years
Certifier – SSgt with 5-skill level or civilian equivalent – Attend AF Training Course – Appointed by commander – Be a person other than the trainer (for core and critical tasks only)				
Upgrade To Superintendent (9-Skill Level) – Minimum rank of SMSgt – CE Superintendents Course (WMGT570) (AD/AFR Only, not skill level awarding)	SMSgt	20 years	11 years	26 years
EOD Manager – Chief Orientation Course (AFR Only) – CE Superintendents Course (WMGT 570) (ANG Only)	CMSgt	22 years	14 years	30 years

PART I

B8. AF EOD Mission Readiness Training.

B8.1.1 Joint Nuclear EOD Course (JNEODC), J5AZO3E871 00DA. Joint Nuclear Explosive Ordnance Disposal Course (JNEODC) is a 5-day training course that provides detailed sustainment training for EOD officers and enlisted personnel in nuclear EOD operations. The program focuses on nuclear weapons hazards, stockpile safety features and safeguards, weapons development, and response to a nuclear weapon accident/incident as part of the Initial Response Force (IRF) and Response Task Force (RTF). .

B8.1.1.1. Prerequisite: See the Education & Training Announcements (ETCA) website (https://app10-eis.aetc.af.mil/etca/SitePages/home.aspx#Home).

B8.1.1.2. This course is a one-time requirement for EOD personnel and attendance is mandatory for all personnel assigned to a custodial unit or an assignment supporting the nuclear enterprise. Seat allocations priority is given to personnel assigned to custodial units and attendance will be triggered once assigned. ARC EOD forces tasked to support nuclear weapons during contingencies will attend training.

B8.1.2. Advanced Improvised Explosive Device Disposal Course (AIEDDC), JBAZN3E871 00NA. This course is designed to provide advanced IED Tactics, Techniques and Procedures to EOD Technicians and personnel of other key Federal Agencies to diagnose, disable, contain and dispose of sophisticated IED's in varied environments; including battlefield operations, peacekeeping operations and homeland defense.

B8.1.2.1. Prerequisite: See the ETCA website (https://app10-eis.aetc.af.mil/etca/SitePages/home.aspx#Home). Completion of the EOD Basic Electronics CBT.

B8.1.2.2. This course is a one-time requirement for EOD personnel.

B8.1.3. Advanced Diagnostics Training I (ADT-1), J5AAD3E851 0A1A. This is a five-day unclassified course of instruction that focuses on WMD threat awareness, interagency policy, national response architecture, nuclear science, radiation detector theory, and crisis communications. This course meets interagency training standards for national crisis response. Course consists of lectures, facilitated discussions, individual technical hands-on classes, and group technical hands-on classes.

B8.1.3.1. Prerequisite: See the ETCA website (https://app10-eis.aetc.af.mil/etca/SitePages/home.aspx#Home).

B8.1.3.2. This course is a one-time requirement for EOD personnel and attendance is mandatory for all personnel assigned to a custodial unit or an assignment supporting the nuclear enterprise. Seat allocations priority is given to personnel assigned to custodial units and attendance will be triggered once assigned. All technical training graduates currently receive this level of training.

B8.1.4. Advanced Diagnostics Training 2 (ADT-2), J5AAD3E851 0A2A. This is a classified five-day course of instruction which focuses on steady-state operations threat assessment of Nuclear

Materials of Concern. This course also focuses on interagency policy, threat design concepts, nuclear science, tactics, techniques, procedures, and crisis communications. This course meets interagency training standards for national crisis response. The format of this course is lectures, facilitated discussions, individual technical hands-on classes, and group technical hands-on classes.

B8.1.4.1. Prerequisite: See the ETCA website (https://app10-eis.aetc.af.mil/etca/SitePages/home.aspx#Home). Completion of ADT-1.

B8.1.4.2. This course is a one-time requirement for EOD personnel and attendance is mandatory for all personnel assigned to a custodial unit or an assignment supporting the nuclear enterprise. Seat allocations priority is given to personnel assigned to custodial units and attendance will be triggered once assigned.

B8.2. **Prerequisite Waiver Authority.**

B8.2.1. Waiver Authority for course prerequisites rests with the EOD Career Field Manager or delegated representative. The current designated representative is the EOD Force Development Manager.

B8.2.2. For custodial units, JNEODC rank prerequisite waiver authority has been delegated to the owning MAJCOM EOD Functional Area Managers.

B9. EOD and Civil Engineer (CE) Occupational Badges. The Civil Engineer Badge is the occupational badge for all 3E AFSCs. The EOD badge is a joint service badge awarded at the completion of Tech School with the CE badge. The criteria for subsequent awards (senior and master) are based on qualifications and leadership in EOD tasks in order to more closely align with sister service award criteria and maintain joint service parity. Further information on the wearing of the badge can be located in AFI 36-2903, *Dress and Personal Appearance of Air Force Personnel.*

B9.1. **CE Occupational Badge.** The Civil Engineer badge reflects a great history and tradition. By wearing it, you will be recognized by your fellow airmen as having achieved an expected level of competence. The multitude of engineers before you established this expectation through excellent service in both peace and war. Eligibility criteria for award and wear of AF occupational badges can be found in AFI 36-2903, *Dress and Personal Appearance of Air Force Personnel*.

B9.1.1. **CE Badge Heraldry.** Historically, the gearwheel and compass represent the engineering profession in both the military and civilian sector. The gear represents the essence of engineering—applying scientific principles and technology to practical ends. To Air Force engineers, the gear symbolizes an element (representing the built environment) that complements other environments (weapon systems and trained personnel) to enable the Air Force to perform its mission. The compass is a precision tool used by engineers to design and construct facilities and equipment. Together, the gear and compass symbolize all the diverse specialties within Air Force Civil Engineer enterprise. The wings help to portray the fundamental linkage between the

engineering and aviation components—the built environment is the foundation supporting the Air Force mission and people.

PART I

B9.1.2. **CE Badge Wear Criteria.**

B9.1.2.1. **Basic Badge.** The basic badge is awarded upon successful completion of the apprentice course.

B9.1.2.2. **Senior Badge.** The senior badge adds a star to the top of the badge. Wear the senior badge after award of the 7-skill level.

B9.1.2.3. **Master Badge.** The master badge adds a wreath around the star. The Master Badge is awarded to Master Sergeant or above with 5 years in the specialty from award of the 7-skill level.

B9.2. **EOD Occupational Duty Badge.** The EOD badge reflects the achievements and laurels gained in eliminating or minimizing accident potentials of hazardous ordnance, through the ingenuity and devotion to duty of our fellow EOD professionals. It also serves as a living memorial of our fellow EOD professionals who gave their lives while performing EOD duties. Eligibility criteria for award and wear of AF occupational badges can be found in AFI 36-2903.

B9.2.1. **EOD Badge Heraldry.**

B9.2.1.1. Wreath. Symbolic of the achievements and laurels gained in minimizing accident potentials, through the ingenuity and devotion to duty of its members. It is in the memory of those EOD professionals who gave their lives while performing EOD duties.

B9.2.1.2. Bomb. Copied from the design of the World War II Bomb Disposal Badge, represents the historic and major objectives of the EOD attack, the unexploded bomb.

B9.2.1.3. Three Fins. Represent the major areas of nuclear, conventional and chemical/ biological interest.

B9.2.1.4. Lightning Bolts. Symbolize the potential destructive power of the bomb and the courage and professionalism of EOD personnel in their endeavors to reduce hazards as well as to render safe explosive ordnance.

B9.2.1.5. Shield. Represents the EOD mission-prevent a detonation and protect the surrounding area and property to the utmost.

B9.2.2. EOD Badge Wear Criteria. EOD Airmen will wear their specific duty badges in addition to the CE occupational badge. If filling an active EOD billet, the EOD badge takes precedence over the CE occupational badge. Use the following criteria for the award of the basic, senior and master EOD duty badges for enlisted and officer personnel.

B9.2.2.1. Award of basic EOD badge is achieved with successful graduation of EOD Technical School, Det 3, 366 TRS, Eglin Air Force Base, Florida.

B9.2.2.2. Award of the senior EOD badge is achieved four years from award of the basic EOD badge filling an active EOD billet, certified as a team leader in the CFETP and upon certification letter signed by EOD flight chief and approved by commander.

B9.2.2.3. Award of the master EOD badge is achieved after eight years from award of the basic EOD badge filling an active EOD billet, met all requirements for the senior EOD badge, and upon certification by EOD flight chief and approved by commander.

PART I

SECTION C - SKILL LEVEL TRAINING REQUIREMENTS

C1. Purpose. The various skill levels in the career field are defined in terms of tasks and knowledge requirements for the EOD career ladder. They are stated in broad, general terms and establish the standards of performance. An all-encompassing core task list has been developed for this specialty because of the diversity of the missions supported and the equipment installed to meet mission requirements. Core tasks, knowledge items, and skill requirements for this specialty are identified in the STS. Completion of the mandatory 3-level awarding course, the mandatory completion of CDCs, the mandatory completion of applicable AFQTPs, and the mandatory 7-level Craftsman course, comprise Air Force requirements.

C2. Skill Level Training Requirements.

C2.1. **Apprentice (3-Level) Training Requirements. (3E831).**

KNOWLEDGE	Completion of the EOD Preliminary course, J3AQR3E831 01AB at Sheppard AFB, TX and the NAVSCOLEOD Apprentice course, JBABN3E831 00NC at Elgin AFB, FL
EDUCATION	For entry into this specialty, completion of high school or general educational development (GED) equivalency is mandatory. Courses in physics, mechanics, and basic electronic theory are desirable.
TRAINING	Completion of the apprentice pipeline course (J3AQR3E831 01AB) and US Naval EOD School (JBABN3E831 00NC) course is mandatory for award of this skill level.
EXPERIENCE	None required.
OTHER	*For entry, award and retention of AFSC 3E8X: - No record of emotional instability - Passing color vision, as defined by correctly identifying at least 10 of 14 Ishihara Plates. - Must maintain local network access IAW AFI 17-130, *Cybersecurity Program Management* and AFMAN17-1301, *Computer Security.* - Specialty requires an adjudicated Secret (T3) security clearance, with an initiated Single Scope Background Investigation (T5) prior to attending Naval School Explosive Ordnance Disposal (NAVSCOLEOD). The T5 security clearance shall not be initiated until the T3 clearance is adjudicated. The T5 clearance is required due to training, assignments involving nuclear weapons, and United Stated Secret Service / Department of State Support. - Must maintain qualification for EOD IAW AFMAN 32-3001, EOD Program
IMPLEMENTATION	The 3-skill level is awarded upon graduating the apprentice pipeline course (J3AQR3E831 01AB), US Naval EOD School (JBABN3E831 00NC) course and submission by the Unit Training Manager at the member's unit of assignment.

*Refer to Air Force Enlisted Classification Directory (AFECD) Part I Section II and Attachment 4 for most current requirements.

PART I

C2.2. **Journeyman (5-Level) Training Qualifications. (3E851)**

KNOWLEDGE	EOD flight organization; applied principles of electronics, physics, chemistry and mechanics; peacetime-wartime accident/incident response procedures; operational principles for specialized EOD tools, equipment and personal protective equipment; explosive and demolition procedures; access and recovery operations; explosive ordnance reconnaissance and assessment; weapons technical intelligence; post blast analysis; protection of personnel and property; render safe techniques; dynamic charges and explosive entry tools; range clearance operations; proficiency, training and demolition range management; treatment of explosives and related hazardous materials; identification, safety precautions, render safe, and disposal fundamentals for U.S and foreign munitions/aerospace systems; identification, response planning, tactical considerations, render safe and disposal fundamentals for improvised explosive devices and homemade explosives; procedural fundamentals for weapons of mass destruction response; equipment and procedures for chemical/biological warfare and nuclear weapons; airbase recovery operations; deployment procedures; movement by aircraft; small arms and crew served weaponry; joint service and special force support requirements; combat operations.
EDUCATION	N/A
TRAINING	- Completion of 3E851 CDCs is mandatory - Completion of the CE 5-Level Common Core Concept web-based course located on the CE-VLC is mandatory for award of this skill level - Certification of all 5-skill level core tasks identified with an asterisk (*) in the 5-skill level column of the STS - Certification of all 5-skill level diamond tasks identified with a diamond (♦) in the 5-skill level core task column of the STS **if** the equipment is available - Certification of duty position requirements identified by the supervisor
EXPERIENCE	- Qualification in and possession of AFSC 3E831 - Experience operating EOD tools/equipment, executing aerospace system response, rendering safe munitions, removing and treating hazardous unexploded ordnance or decontaminating activities - Minimum 12 months OJT (9 months for retrainees) before award of 5-skill level

PART I

OTHER	*For entry, award and retention of AFSC 3E8X: - No record of emotional instability - Passing color vision, as defined by correctly identifying at least 10 of 14 Ishihara Plates. - Must maintain local network access IAW AFI 17-130, *Cybersecurity Program Management* and AFMAN17-1301, *Computer Security.* - Specialty requires an adjudicated Secret (T3) security clearance, with an initiated Single Scope Background Investigation (T5) prior to attending Naval School Explosive Ordnance Disposal (NAVSCOLEOD). The T5 security clearance shall not be initiated until the T3 clearance is adjudicated. The T5 clearance is required due to training, assignments involving nuclear weapons, and United Stated Secret Service / Department of State Support. Must maintain qualification for EOD IAW AFMAN 32-3001, EOD Program
IMPLEMENTATION	Entry into 5-level upgrade training is initiated after the individual has completed all 3-level requirements. Qualification training is initiated any time individuals are assigned duties they are not certified to perform. Use OJT, CDCs, and AFJQSs concurrently to obtain the necessary qualifications

*Refer to Air Force Enlisted Classification Directory (AFECD) Part I Section II and Attachment 4 for most current requirements.

C2.3. **Craftsman (7-Level) Training Requirements. (3E871)**

KNOWLEDGE	All 3- and 5-level knowledge requirements apply to 7-level
EDUCATION	- To assume the grade of SSgt, individuals must successfully complete Airman Leadership School (ALS) - To assume the grade of MSgt, individuals must successfully complete NCOA Academy. - Completion of the AFIT WMGT 433 EOD Flight Commanders/Chiefs Course is recommended for MSgt's - Possession of an Associate in Applied Sciences Degree in EOD is desirable
TRAINING	- Completion of in-residence 7-level Team Leader Course (J3ACR3E871 01AB) - Completion of the CE 7-Level Core Concept web-based course located on the CE-VLC is mandatory for award of this skill level - Certification of all 5-and 7- skill level core tasks identified by the 5 and 7 appropriately labeled column of the STS - Certification of duty position requirements identified by the supervisor
EXPERIENCE	- Qualification in and possession of AFSC 3E851 - Performing or supervising EOD functions and operations, such as, preparing operational orders/plans, training/organizing/equipping personnel, and conducting response activities - Must be SSgt with minimum 12 months OJT (6 months for retrainees)

PART I

OTHER	*For entry, award and retention of AFSC 3E8X: - No record of emotional instability - Passing color vision, as defined by correctly identifying at least 10 of 14 Ishihara Plates. - Must maintain local network access IAW AFI 17-130, *Cybersecurity Program Management* and AFMAN17-1301, *Computer Security.* - Specialty requires an adjudicated Secret (T3) security clearance, with an initiated Single Scope Background Investigation (T5) prior to attending Naval School Explosive Ordnance Disposal (NAVSCOLEOD). The T5 security clearance shall not be initiated until the T3 clearance is adjudicated. The T5 clearance is required due to training, assignments involving nuclear weapons, and United Stated Secret Service / Department of State Support. - Must maintain qualification for EOD IAW AFMAN 32-3001, EOD Program
IMPLEMENTATION	Entry into 7-level training is initiated when an individual is selected for SSgt and is fully qualified in the AFSC 5-skill level. Qualification training is initiated any time individuals are assigned duties they are not qualified to perform. Use OJT, CDCs, and AFJQSs concurrently to obtain the necessary qualifications.

*Refer to Air Force Enlisted Classification Directory (AFECD) Part I Section II and Attachment 4 for most current requirements.

C2.4. **Superintendent (9-Level) Training Requirements. (3E891)**

KNOWLEDGE	All 3-, 5-, and 7-level knowledge requirements apply to 9-level
EDUCATION	- Must complete Senior NCO Academy. - Completion of AFIT WMGT 570 Civil Engineer Superintendent Course is mandatory for Active Duty and Air Force Reserve SMSgts (not a skill level awarding course) - Completion of AFIT WMGT 570 Civil Engineer Superintendent Course is highly encouraged for Air National Guard SMSgts and mandatory to be promoted to CMSgt (not a skill level awarding course) - Completion of the AFIT WMGT 433 EOD Flight Commanders/Chiefs Course is highly encouraged - Possession of an Associate Degree is required. The Associate Degree in Applied Sciences Degree in EOD is desirable, and/or a bachelor's degree in any other related field
TRAINING	Completion of duty position training requirements and certification of all 5- and 7-skill level core tasks identified as 5- and 7 within the appropriately labeled columns of the STS is mandatory
EXPERIENCE	- Qualification in and possession of AFSC 3E871 - Managing EOD functions or operations, such as, evaluating, planning, organizing and leading EOD activities in the fulfillment of the broad scope of EOD duties and responsibilities

PART I

OTHER	*For entry, award and retention of AFSC 3E8X: - No record of emotional instability - Passing color vision, as defined by correctly identifying at least 10 of 14 Ishihara Plates. - Must maintain local network access IAW AFI 17-130, *Cybersecurity Program Management* and AFMAN17-1301, *Computer Security.* - Specialty requires an adjudicated Secret (T3) security clearance, with an initiated Single Scope Background Investigation (T5) prior to attending Naval School Explosive Ordnance Disposal (NAVSCOLEOD). The T5 security clearance shall not be initiated until the T3 clearance is adjudicated. The T5 clearance is required due to training, assignments involving nuclear weapons, and United Stated Secret Service / Department of State Support. - Must maintain qualification for EOD IAW AFMAN 32-3001, EOD Program
IMPLEMENTATION	Entry into 9-level training is initiated when an individual is selected for SMSgt and is a fully qualified 7-Level. Qualification training is initiated any time an individual is assigned duties they are not certified to perform.

*Refer to Air Force Enlisted Classification Directory (AFECD) Part I Section II and Attachment 4 for most current requirements.

C2.5. EOD Manager. (3E800)

KNOWLEDGE	All 3-, 5-, 7-, and 9-level knowledge requirements apply to 0-level
EDUCATION	Possession of an Associate Degree is required. The Associate Degree in Applied Sciences Degree in EOD is desirable, and/or a bachelor's degree in any other related field
TRAINING	N/A
EXPERIENCE	- Possess qualifications in feeder specialty (3E891) prior to award of Civil Engineer EOD Manger code 3E800 - Managerial ability to plan, direct, coordinate, implement, and control a wide range of work activity
OTHER	*For entry, award and retention of AFSC 3E8X: - No record of emotional instability - Passing color vision, as defined by correctly identifying at least 10 of 14 Ishihara Plates. - Must maintain local network access IAW AFI 17-130, *Cybersecurity Program Management* and AFMAN17-1301, *Computer Security.* - Specialty requires an adjudicated Secret (T3) security clearance, with an initiated Single Scope Background Investigation (T5) prior to attending Naval School Explosive Ordnance Disposal (NAVSCOLEOD). The T5 security clearance shall not be initiated until the T3 clearance is adjudicated. The T5 clearance is required due to training, assignments involving nuclear weapons, and United Stated Secret Service / Department of State Support. - Must maintain qualification for EOD IAW AFMAN 32-3001, EOD Program

PART I

IMPLEMENTATION	Entry into Civil Engineer Manager Code 3E800 is initiated when an individual is selected for CMSgt and possess qualifications in a feeder specialty 3E891.

*Refer to Air Force Enlisted Classification Directory (AFECD) Part I Section II and Attachment 4 for most current requirements.

PART I

SECTION D - RESOURCE CONSTRAINTS

D1. Purpose. This section identifies known resource constraints, which preclude optimal and desired training from being developed or conducted, including information such as cost and manpower. Narrative explanations of each resource constraint and an impact statement describing what effect each constraint has on training are included. Also included in this section are actions required, office of primary responsibility, and target completion dates. Resource constraints will be, as a minimum, reviewed and updated annually.

D2. Apprentice (3-Level) Training:

D2.1. Constraints. None.

D2.1.1 Impact. None.

D2.1.2. Resources Required. None.

D2.1.3. Action Required. None.

D2.2. OPR/Target Completion Date. None.

D3. Journeyman (5-Level) Training:

D3.1. Constraints. None.

D3.1.1. Impact. None.

D3.1.2. Resources Required. None.

D3.1.3. Action Required. None.

D3.2. OPR/Target Completion Date. None.

D4. Craftsman (7-Level) Training. None.

D4.1. Constraints. None.

D4.1.1. Impact. None.

D4.1.2. Resources Required. None

D4.1.3. Action Required. None.

D4.2. OPR/Target Completion Date. None.

PART I

SECTION E – TRANSITIONAL TRAINING GUIDE

“There are no transition training requirements at this time. This section is reserved.”

PART II

SECTION A - SPECIALTY TRAINING STANDARD

A1. Implementation. This STS will be used to identify technical training provided by AETC for the 3-level Naval School EOD Apprentice pipeline course and the 7-level Team Leader Course.

A2. **Purpose.** As prescribed in AFI 36-2651, *Air Force Training Program,* and in collaboration with the Civil Engineer, Air Force Career Field Manager (AFCFM), it is mandatory for all civil engineers, regardless of duty assignment, to use an automated training record. The automated training record currently being utilized to document upgrade and qualification training is the Air Force Training Record (AFTR) and the application is located on the CE-VLC.

A2.1. **Column 1 (*Tasks, Knowledge, and Technical References*).** Lists the most common tasks, knowledge, and supporting technical references (TR) necessary for Airmen to perform duties in the 3-, 5-, and 7-skill level.

A2.2. **Column 2 (*Core Tasks*)**. Identifies core tasks (specialty-wide training requirements) by 3, 5 or 7 in the appropriate column. **As a minimum, trainees must complete hands-on certification on all core, critical and diamond tasks for skill level upgrade.**

A2.2.1. **Wartime Tasks.** All tasks in the 3-level course column are considered wartime tasks. In response to a wartime scenario, these tasks will be taught in the 3-level course in a streamlined training environment.

A2.2.2. **Asterisk Tasks.** Tasks identified by an asterisk (*) are considered contingency/war task and are critical to the career field. Equipment shortfalls at most locations have created problems with actual hands-on certification of these tasks. In instances where required equipment is not available for hands-on training, reading the applicable EOD technical orders/manufacturer manuals as references until equipment becomes available is all that is required for upgrade training.

A2.3. **Column 3 (Certification for OJT)**. Used to record completion of tasks and knowledge training requirements. Use the automated training record application to document individual qualifications. **Task certification of core, critical and diamond tasks** require a training completion date and initials of the trainee, trainer, and certifier. All non-core tasks require training completion date and initials of the trainee and trainer only.

A2.4. **Column 4 (Proficiency Codes Used to Indicate Training/Information Provided).** Indicates formal training and correspondence course requirements. It shows the proficiency to be demonstrated on the job by the graduate as a result of training on the task, knowledge and the career knowledge provided by formal courses, CDC, distance learning (DL) and web-based training (WBT). See CADRE/AFSC/CDC listing maintained by the unit education and training manager for current CDC listings.

A2.5. **Qualitative Requirements.** Contains the proficiency code key used to indicate the level of training and knowledge provided by WBT, resident training and career development courses.

PART II

A2.6. **Job Qualification Standard (JQS).** The STS becomes the JQS for OJT when placed in automated training application and used according to AFI 36-2651. For OJT, the tasks in Column 1 are trained and qualified to the go/no go level. "Go" means the individual can perform the task without assistance and meets local requirements for accuracy, timeliness, and correct use of procedures. When used as a JQS, the following requirements apply:

A2.6.1. **Documentation.** Document and certify completion of training.

A2.6.1.1. **Duty position.** Duty position titles and task requirements will be developed and identified by the workcenter supervisor and loaded into the automated training application. Completion of core, critical and diamond tasks are mandatory for all duty positions. Ensure the correct duty position title is listed under Profile 1 section of the trainee's automated training record.

A2.6.1.2. **Duty position change.** To change a trainee duty position title select the Profile section under the trainee record and select the new duty position from the dropdown box, entry the date entered new duty position and save the update. Under the trainee JQS section you will see the new tasks associated with the selected duty position. The trainee and trainer/certifier will need to sign off the tasks associated with the new position.

A2.6.3. **Transcribing from previous versions to the new CFETP.** Most items should transcribe automatically during the update of the new CFETP. The UTM and supervisor must conduct a review of the new STS to identify any new core, diamond, or non-core tasks and add those tasks to their duty positions.

A2.6.3.1. **Previous training certification not listed** If previous training certification is not listed in the individual record, select the parent task to be transcribed, check the task title(s) block, and click on the transcribe button. Enter the date of the original certification and sign off the task(s). The trainee will then sign off the task(s) to finalize the transcription of previous training certification. The automated application will place an entry into the trainee 623a and must be acknowledged by the transcriber and trainee.

A2.6.3.2. **Transcribing external training certification.** If a trainee attended a formal training course and received appropriate accreditation, select the 623 III section of the user's automated training record and locate the course title in the master task list, then enter the completion date. If the course title is not listed, contact the UTM to have it loaded from the master catalog. If it is not listed in the master catalog contact the EOD FDM at AFCEC to have it loaded in the master catalog.

PART II

A2.6.4. **Documenting Career Knowledge.** When a CDC is not available, the supervisor identifies STS training references that the trainee requires for career knowledge IAW AFI 36-2651, *Air Force Training Program* and ensures, as a minimum, that trainees cover all mandatory items specified in AFI 36-2101, *Classifying Military Personnel (Officer and Enlisted).* For two-time CDC exam failures, the unit commander will take appropriate action IAW AFI 36-2651.
Note: Career knowledge must be documented prior to submitting a CDC waiver.

A2.6.5. **Decertification.** When an Airman is found to be unqualified on a task, the supervisor shall identify the task in the JQS and check the box next to the task title. The supervisor shall select the Decertify button on the screen menu and enter a 623a comment explaining why the task was decertified, and then enter the Airman into qualification training. The individual is recertified using the normal certification process.

A2.6.6. **Recertification.** When an Airman is required to be recertified on a previous task due to annual or bi-annual requirements. The supervisor shall identify the task in the JQS and check the box next to the task title and select the Recertify button on the screen and entry the dates the recertification was completed.

A2.6.7. **Training Standard.** Tasks are trained and certified to the "go" level. Go means the individual can perform the task without assistance and meets the local requirements for accuracy, timeliness, and correct use of procedures. This equates to a 3c in the proficiency code key.

A2.7. **Specialty Training Standard.** The STS is a guide for development of promotion tests used in the Weighted Airman Promotion System (WAPS). Specialty Knowledge Tests are developed at the USAF Airman Advancement Division by senior NCOs with extensive practical experience in their career fields. The tests sample knowledge of STS subject matter areas judged by test development team members as most appropriate for promotion to higher grades. Questions are based upon study references listed in the Enlisted Promotions References and Requirements Catalog. Individual responsibilities are in AFI 36-2605, *AF Military Testing System.* WAPS is not applicable to the Air National Guard or Air Reserve Forces.

A3. Recommendations. Comments and recommendations are invited concerning quality of training AETC graduates receive. Reference this STS and address your correspondence regarding changes to 782 TRG/TGE, 917 Missile Road, Rm 1A300, Sheppard AFB TX 76311-2368 or E-mail 782csil@us.af.mil. A Customer Service Information Line (CSIL) has been installed for the supervisor's convenience to identify graduates who may have received over or under training on tasks/knowledge items listed in this STS. For a quick response to problems, call the CSIL at DSN 736-2574 any time day or night.

PART II

SECTION B - COURSE OBJECTIVE LIST (COL)

B1. Measurement. Measurement of each objective is indicated as follows:

B1.1. Written Test (W) indicates task or subject knowledge that is measured using a written test.

B.1.2. Performance Test (P) indicates required task performance that is measured with a performance test.

B1.3. Progress Check (PC) indicates separate measurement of both knowledge and performance elements measured with a performance progress check.

B2. Standard.

B2.1. **EOD Preliminary Course (J3AQR3E831 01AB) Sheppard AFB TX.** The standard is 80% on written examinations. Standards for performance measurement are indicated in the objectives and delineated on the individual progress checklist. Instructor assistance is provided as needed during the progress check or performance test, and students may be required to repeat all or parts of the behavior until satisfactory performance is attained.

B2.2. **NAVSCOLEOD Apprentice Course (JBABN3E831 00NC) Eglin AFB, FL.** The minimum passing score is 85%. Standards for student measurements are indicated in the objectives. Students are normally afforded a retest if at least 85% is not attained. A Naval School EOD Joint Academic Review Board (ARB) is normally conducted for students that do not attain a passing score on retest. Training continuation is decided by the Commanding Officer, Naval School EOD, based on academic records, recommendations from ARB and 366 TRS Detachment 3 Commander.

B3. Proficiency Level. Most task performance is taught to the "2b" proficiency level, which means the student can do most parts of the task, but does need assistance on the hardest parts of the task (partially proficient). The student can also determine step-by-step procedures for doing the task.

B4. Course Objective List. These objectives are listed in the sequence taught by Blocks of Instruction, per AETCI 36-2641, *Technical and Basic Military Training Development*.

B4.1. Initial Skills Course. A detailed listing of the initial skills course objectives may be obtained by written request to 366 TRS/DO, 727 Missile Road, Sheppard AFB TX 76311- 2254.

B4.2. B4.2. 7-Skill Level Course. A detailed listing of the EOD Team Leader Course objectives may be obtained by written request to 366 TRS/DO, 727 Missile Road, Sheppard AFB TX 76311-2254.

PART II

SECTION C - SUPPORT MATERIAL

C1. Purpose. The following list of support materials is not all-inclusive; however, it covers the most frequently referenced areas.

C1.1. Computer-based and Web-based Air Force Qualification Training Packages (AFQTPs).

Specialized Training	Source
Large-scale Munitions Disposal Procedures	CE VLC
Explosive Entry Tools	CE VLC
EOD Homemade Explosives (HME)	CE VLC
EOD Basic Electronics	CE VLC
EOD Fieldcraft	CE VLC
CVRJ Operator Course	CE VLC
IED Electronics	CE VLC
Minehound Familiarization	CE VLC
EOD Explosive Entry Tools	CE VLC
EOD B-1B Aircraft Familiarization Course	CE VLC
EOD B-2 Aircraft Familiarization Course	CE VLC
EOD B-52H Aircraft Familiarization Course	CE VLC
EOD F-22A Aircraft Familiarization Course	CE VLC
Andros F6A Familiarization Course	CE VLC

C1.2. Pending Computer-based and Web-based Air Force Qualification Training Packages (AFQTPs).

AF JCREW I1B1 Administrator Course
AF JCREW I1B1 Dismounted Operator Course
AF JCREW I1B1 Mounted Operator Course
AF JCREW I1B1 Maintainer Course
EOD A-10 Aircraft Familiarization Course
EOD F-15 Aircraft Familiarization Course
EOD F-16 Aircraft Familiarization Course
EOD F-35 Aircraft Familiarization Course
EOD MQ-9 Aircraft Familiarization Course
EOD AC/MC-130 Aircraft Familiarization Course
Post Blast Analysis
Recovery of Airfields Denied by Ordnance (RADBO) Truck Familiarization

PART II

SECTION D – EDUCATION AND TRAINING COURSE INDEX

D1. Purpose. This section of the CFETP identifies training courses available for the Explosive Ordnance Disposal specialty. Refer to Education and Training Course Announcements (ETCA) web site for information on the Air Force in-residence courses. The web site address is https://app10-eis.aetc.af.mil/etca/SitePages/home.aspx#Home.

D2. Air Force In-Residence Courses/Mobile Training Team (MTT) Courses.

Course Number	Title	Source/Location	Requirement
J3AQR3E831 01AB	EOD Preliminary	366TRS, Sheppard AFB TX	Core (Mission Essential)
JBABN3E831 00NC	EOD Apprentice	NAVSCOLEOD, Eglin AFB FL	Core (Mission Essential)
J3ACR3E871 01AB	EOD Team Leader Course	366TRS, Sheppard AFB TX	Core (Mission Essential)
J5AAD3E851 0A1A	Advanced Diagnostics Training (ADT) 1	Defense Nuclear Weapons School, Kirtland AFB NM	Core (Mission Essential)
J5AAD3E851 0A2A	Advanced Diagnostics Training (ADT) 2	Defense Nuclear Weapons School, Kirtland AFB NM	Core (Mission Essential)
J5AZ03E871 00DA	Joint Nuclear EOD (JNEOD)	Defense Nuclear Weapons School, Kirtland AFB NM	Core (Mission Essential)
JBAZN3E871 00NA	Advanced Improvised Explosive Device (AIEDD) Defeat	NAVSCOLEOD, Eglin AFB FL	Core (Mission Essential)
J5AZD3E851 00LA	Joint EOD Military Homemade Explosive Course	Joint EOD Program/AF EOD CFM Endorsed; Los Alamos Labs, NM	Core (Mission Critical)
J5AZA3E851 00RA	Domestic Homemade Explosives Course	ATF Training Site; Redstone Arsenal, AL	Core (Mission Critical)
J5AZD3E851 00FA	FBI National Improvised Explosives Familiarization (NIEF)	Redstone Arsenal, Huntsville AL	Core (Mission Essential)
WMGT 433	EOD Flight Management	AFIT, Wright Patterson AFB OH	Core (Mission Essential)
WMGT 570	CE Superintendent	AFIT, Wright Patterson AFB OH	Core (Mission Essential)
S-V88-AL	Evasion, Conduct After Capture	AETC/A3TX, Lackland AFB TX	Core (Mission Essential)

PART II

D3. Air Force Career Development Academy (AFCDA).

Course Number	Title	Status
CDC 3E851 B	EOD Journeyman	Aug 97 (Deactivated date)
CDC 3E851 G	EOD Journeyman	Mar 04 (Deactivated date)
CDC 3E851 H	EOD Journeyman	Mar 04 (Deactivated date)
CDC 3E851	EOD Journeyman	Aug 03 – Edit Code 2
CDC 3E851 N	EOD Journeyman	May 07 – Edit Code 3 (Deactivated Feb 18)
CDC 3E851 A	EOD Journeyman	Edit Code 2 (Activated 2 Feb 18)
CDC 3E851B	EOD Journeyman	Edit Code 2 (Activated 2 Feb 18)

D4. Multi-Media Training (MMT).

Requirement	Course	Source
One Time	AF Emergency Management Program	Advanced Distributed Learning Service (ADLS) (https://golearn.adls.af.mil)
One Time	HazMat Awareness	Total Force Virtual Learning Center (TFVLC) (http://totalforcevlc.golearnportal.org)
One Time	HazMat Ops Certification	
One Time	Confined Space General Worker: Entrant, Attendant, and Supervisors	**Civil Engineer Virtual Learning Center (CE-VLC)** (https://afcec.adls.af.mil)
One Time	EOD Homemade Explosive's (HME)	
One Time	EOD Basic Electronics	
Annual	EOD Large-scale Munitions Disposal	
One Time	EOD Explosive Entry Tools	
As needed	EOD Andros F6A Familiarization	
As needed	Joint EOD Satellite Communications (SATCOM)	
As needed	Joint EOD CREW Vehicle Receiver/Jammer Operator's	
As needed	EOD B-1B Aircraft Familiarization	
As needed	EOD B-2 Aircraft Familiarization	
As needed	EOD B-52H Aircraft Familiarization	
As needed	EOD F-22A Aircraft Familiarization	

PART II

D5. Courses/CDCs Under Development/Revision.

Course Number	Title	Developer	Date Due
N/A	Global C-IED Threat Assessment	AFCEC	N/A
N/A	Mission Skills Tactics Training (MSTT)	AFCEC	N/A
CDC 3E851	EOD Journeyman	366 TRS/TRR	1 Oct 20
N/A	MRAP/MATV Driver Course	AFCEC	N/A
N/A	Range Skills Training	AFRC	N/A

D6. Courses Rescinded.

Course Number	Title	Developer	Conversion
L3AQR3E831 0E0A	EOD Preliminary	342 TRS, Lackland AFB, TX	J3AQR3E831 01AA
J3AQR3E831 01AA	EOD Preliminary	366TRS, Sheppard AFB TX	J3AQR3E831 01AB
JCABP3E831 00AA	EOD Air Force Unique Course	366 TRS, Eglin AFB FL	None
J5AZO3E871 00EA (DETS)	Air Force Nuclear Enhancement Course (AFNEC)	Sandia National Laboratories, Kirtland AFB NM	Joint EOD Level 3 Incident Response – Nuclear (L3IR(N)), J5OZD32 E3G 01DA
J5OZD32E3G 01DA	Joint EOD Improvised Nuclear and Radiological Dispersal Device Recognition Course (JEIRRC)	Sandia National Laboratories, Kirtland AFB NM	
J5OZD32E3G 01DA	Joint EOD Level 3 Incident Response – Nuclear (L3IR(N))	Defense Nuclear Weapons School, Kirtland AFB NM	Advanced Diagnostics Training (ADT) 1 & 2
J3ACR3E871 01AA	EOD 7-Level Craftsman	366 TRS, Eglin AFB, FL	J3ACR3E871 01AB

PART II

D7. Other EOD Mission Related Courses.

Course Number	Title	Source/Location	Requirement
Multi-Venue	Advanced Tactics Training	**AFCFM/MAJCOM Approved**	Sustainment
Multi-Venue	Post-Blast Analysis	* FBI Local SABT * ATF MTT/Redstone * MAJCOM/AF EOD **CFM Endorsed**	Core (Mission Critical)
Multi-Venue	Weapons Technical Intelligence	MAJCOM/AF EOD **CFM/FDM Approved**	Sustainment (Discretionary)
Multi-Venue	Combat Lifesaver/Tactical Combat Casualty Care	MAJCOM/AF EOD **CFM/FDM Approved**	Enhancement (Discretionary)
J5OZD32E3G 00DA	Nuclear Emergency Team Operations	Defense Nuclear Weapon School, Kirtland AFB NM	Enhancement (Discretionary)
JBOZD21A1A 00DA	Nuclear Weapons Orientation Course (NWOC)	Defense Nuclear Weapon School, Kirtland AFB NM	Enhancement (Discretionary)
JBOZD32E1D 00DA	Joint DoD/DoE Nuclear Surety Exec Course (JNSEC)	Defense Nuclear Weapon School, Kirtland AFB NM	Enhancement (Discretionary)
J5OZD13B4 04DA	Theater Nuclear Operation Course (TNOC)	Defense Nuclear Weapon School, Kirtland AFB NM	Enhancement (Discretionary)
SOED-DIT PDS code X9D	Dynamics of International Terrorism	Special Operations University, Hurlburt Field FL	Enhancement (Discretionary)
Multi-Venue	Helicopter Rope Suspension Techniques (HRST)	**MAJCOM/CFM/FDM Approved**	Enhancement (Discretionary)
2E-SI5P/SQI7/011-SQIP	Airborne School	1st Battalion, 507th Parachute Infantry Regiment, Fort Benning, GA	Enhancement (Discretionary)
419/420	Air Assault School	Fort Drum/Fort Hood	Enhancement (Discretionary)
M24M7A	USMC Basic Mountain Leader	Mountain Warfare Training Center, Bridgeport CA	Enhancement (Discretionary)
M24YAK	USMC Assault Climbers	Mountain Warfare Training Center, Bridgeport CA	Enhancement (Discretionary)
Multi-Venue	Foreign or Civilian IED or Bomb Disposal Schools	**MAJCOM/CFM/FDM Approved**	Enhancement (Discretionary)
N/A	Robot Maintenance	**MAJCOM/CFM/FDM Approved**	Enhancement (Discretionary)

PART II

PART II

SECTION E – MAJCOM UNIQUE REQUIREMENTS

E1. Purpose. This section of the CFETP identifies MAJCOM unique training requirements for EOD.

E2. MAJCOM Unique Training.

E2.1. Air Force Global Strike Command.

Course Number	Title	Source / Location
M02M729	Methods of Entry Course	Methods of Entry School (MOES), Weapons Training Battalion, Quantico, VA
Multi-Venue	Helicopter Rope Suspension Techniques (HRST) Operations	MAJCOM Approved

E2.2. Air Combat Command (820 COS Moody AFB).

Course Number	Title	Source / Location
2E-SI5P/SQI7/011-SQIP	Army Airborne	1st Battalion, 507th Parachute Infantry Regiment, Fort Benning, GA
419/420	Air Assault	Fort Drum/Fort Hood

E2.3. Air Force Special Operations Command.

Course Number	Title	Source / Location
2E-SI5P/SQIP/011-SQIP	Army Airborne	Fort Benning, GA
A-431-0135	Navy Parachute Static Line	Coronado, CA
419/420	Air Assault	Fort Drum/Fort Hood
Multi-Venue	Helicopter Rope Suspension Techniques (HRST) Operations	MAJCOM Approved
J4AMP2W1X1 M17A	AC-130 Hot-Gun Course	Hurlburt Field, FL

PART II

E2.4. US Air Force Europe.

Course Number	Title	Source / Location
M02M729	Methods of Entry Course	Methods of Entry School (MOES), Weapons Training Battalion, Quantico, VA

PART II

SECTION F - HOME STATION TRAINING

F1. Purpose. The purpose of this section is to identify the tasks, training references, and training sources available in support of contingency/wartime training. Civil Engineer forces will train to meet the full range of tasks expected in the contingency environment. Training ranges from knowledge-type training conducted in a classroom, to task-oriented hands-on training conducted in the field. These training requirements, frequencies, and sources are listed in AFI 10-209, *RED HORSE Program* and AFI 10-210, *Prime Base Emergency Engineer Force (BEEF) Program*.

F2. Home Station Training (HST). HST training is knowledge-based and hands-on training. The CE Commander ensures training is provided and documented and arranges for subject matter experts to conduct training as required. This includes training primarily accomplished during Prime BEEF training days. Units must make every effort to incorporate realism into their respective HST training programs. Field gear (to include primary weapons) must be used as the "norm" rather than the exception whenever training requirements such as security activities, convoy operations, defensive fighting positions, etc. are accomplished. Units will use demonstration performance packages, qualification training packages, other multimedia training packages, and AF CE standardized lesson plans to present the material. MAJCOMs and the ANG may develop and require other training materials to accomplish knowledge-based training.

F2.1. EOD (3E8X1) Specific Training. Exercises are to be accomplished, at a minimum, on an annual basis. EOD Flights are encouraged to increase the frequency in areas they feel are necessary.

F2.2. Aerospace System/Vehicles Exercise.

F2.3. Conventional Ordnance (One Peacetime/One Contingency) Exercise.

F2.4. Rapid Airfield Damage Recovery

F2.5. Counter-Improvised Explosive Device (IED) Exercise (One Peacetime/One Contingency).

F2.6. Weapon of Mass Destruction (WMD) Exercise.

F2.7. Nuclear Weapon Response - Broken Arrow (Non-Custodial=Annual / Custodial=Semi-Annual) Exercise. Traditional Guard/Reserve individuals may conduct the response exercise via table top.

F2.8. Chemical/Biological Exercise (Contingency – including disposal).

F2.9 Demolition Operation

F2.10 Sterile Bay Operation-Custodial units only (semi-annual on supported systems)

F2.11. Active Range Clearance War Skills. Complete Range Support Tasking within 48 months after graduating from EOD School. Complete one-time follow-on training within 60 months after

award of 7-skill level. See AFI 32-3001 and Range Clearance Operations AFTTP for performance expectations. These requirements are currently under review and will likely change. This will involve a name change to Range Operations Training but the requirements are in draft.

PART II

SECTION G – EOD STANDARD TRAINING PACKAGE

G1. Objective. Ensure we provide our customers with the best EOD capability in DoD. We accomplish this by producing highly qualified and technically proficient EOD Airmen capable of safely and efficiently performing the EOD peacetime and wartime missions.

G1.1. All active duty EOD personnel at flight level will participate in flight training per AFMAN 32-3001 *EOD Program*. If management duties prevent the senior officer and senior non-commissioned officer of the flight from full participation in training, the following training as a minimum will be completed: monthly proficiency, nuclear weapons training, and SORTS reportable training.

G1.2. EOD personnel assigned above wing level and those assigned special duty, i.e. instructor duty, Silver Flag Exercise Sites, or other authorized EOD billets, should accomplish Group I requirements as a minimum. Accomplishment of Group II through Group IV is not mandatory however; individuals are highly encouraged to complete additional training when possible.

G1.3. The training requirements in each group will be published annually by AFCEC/CXD as part of the EOD Master Training Plan.

G2. Group I Training Requirements (Monthly Qualification Training). Training or operations involving the use of cartridge-actuated tools, demolition explosives, or pyrotechnic devices used to perform render-safe procedures (RSP) or general demolition using live-explosives. Subjects listed in this section are taught as practical (hands on) training for all team members utilizing flight training explosive, tools and equipment inventories. List provides expectations for the minimum explosive training that will occur and does not require accomplishment in any specific order.

General Demolition Procedures
Non-Electric Firing System
Electric Firing System
Detonating Cord Firing Systems
Disposal Techniques
Shaped Charge Procedures
Cartridge Actuated Explosive Tools
Dynamic Charges, i.e. WBC, MLVD, Hydra-Jet, Bootbanger…
Unserviceable Munitions Disposal Practical
Thermite Burn Procedures
EXROD Procedures
Explosive Access Techniques

PART II

G3. Group II Training Requirements (Semiannual Training Requirements). Subjects in this section are taught in a classroom setting followed by practical (hands on) training for all team members. During the classroom training tools are assembled, unique features and safety precautions briefed, and equipment applications and limitations discussed. Classroom instruction on procedures should coincide with Group IV practical exercise schedule.

G4. Group III Training Requirements (Annual Training Requirements). Classroom and practical (when applicable) training on specific items.

G5. Group IV Training Requirements.

G5.1. Practical Training and Exercise Requirements. Team exercises allow members to apply knowledge learned in the classroom to formulate plans, select and use equipment, manage personnel, and direct operations to resolve incidents or accident situations involving explosive ordnance. Exercise will be conducted to enhance realism and incorporate all equipment and procedures associated with the scenario. Exercise participation, as an observer, instructor, evaluator, or participant will fulfill minimum training requirements.

G5.2. Practical Training and Exercise Physicality Expectations. Physical fitness is core of a combat warrior, ensures mission readiness, and supports the Airman Warrior ethos. Mission, equipment, and TTPs; EOD requirements are physically demanding which requires a high level of physical fitness. Practical training and exercises should test the physical capabilities relative to EOD mission and provide an avenue to evaluate EOD Airmen's physical performance.

G5.3. EOD practical training and exercises, specifically: Weapon of Mass Destruction; Nuclear Weapon Response; Chemical/Biological Weapon, utilizing SCBA and personal protective equipment fulfills intent of eight hour HAZMAT Operation Core w/PPE Annual Refresher Training.

PART II

G6. Group V Training Requirements (Supplementary Training). Ancillary or other specialized training required by directive to perform general or specific additional military duties. This section may also be used to record training conducted in excess of STP requirements.

BY ORDER OF THE SECRETARY OF THE AIR FORCE

OFFICIAL

JOHN J. ALLEN Jr., Brigadier General, USAF
DCS/Logistics, Installation and Mission Support

2 Attachments
1. Qualitative Requirements (Proficiency Code Key)
2. 3E8X1 Specialty Training Standard

Attachment 1

A1. Qualitative Requirements (Proficiency Code Key)

This Block Is For Identification Purposes Only.		
Name Of Trainee		
Printed Name (*Last, First, Middle Initial*)	**Initials (Written)**	**SSAN (Last four)**
Printed Name Of Trainer, Certifying Official And Written Initials		
N/I	*N/I*	
N/I	*N/I*	
N/I	*N/I*	

Note: Place a continuation sheet behind the CFETP when additional space is required.

Proficiency Code Key		
	Scale Value	**Definition: The individual:**
Task Performance Levels	1	Can do simple parts of the task. Needs to be told or shown how to do most of the task. (Extremely Limited)
	2	Can do most parts of the task. Needs only help on hardest parts. (Partially Proficient)
	3	Can do all parts of the task. Needs only a spot check of completed work. (Competent)
	4	Can do the complete task quickly and accurately. Can tell or show others how to do the task. (Highly Proficient)
*Task Knowledge Levels	a	Can name parts, tools, and simple facts about the task. (Nomenclature)
	b	Can determine step by step procedures for doing the task. (Procedures)
	c	Can identify why and when the task must be done and why each step is needed. (Operating Principles)
	d	Can predict, isolate, and resolve problems about the task. (Advanced Theory)
**Subject Knowledge Levels	A	Can identify basic facts and terms about the subject. (Facts)
	B	Can identify relationship of basic facts and state general principles about the subject. (Principles)
	C	Can analyze facts and principles and draw conclusions about the subject. (Analysis)
	D	Can evaluate conditions and make proper decisions about the subject. (Evaluation)

Explanations	
5	This symbol in the core task column indicates that it is a 5-level core task.
7	This symbol in the core task column indicates that it is a 7-level core task.
9	This symbol in the core task column indicates that it is a 9-level core task.
^	This symbol in the core task column indicates that 3rd party task certification is required.
*	This symbol in the deployment column indicates that the task is deployment task.
2b/b	This mark in the course columns is used to show that training is required but not given due to limitations in resources. Marking is an example.
(I)	This mark in the course columns is used to show that training is multi-service.
♦	A diamond in the task column indicates it is a core task, however due to equipment or funding constraint at some units, the completion of the AFQTP and/or web-based training course is all that is required for upgrade. Hands-on certification must be accomplished at the first opportunity when equipment or funding is available.
TQT	TQT in the task column indicates the task is a CBRN Qualification Task. IAW AFI 10-2501, these tasks will also be accomplished in MOPP 4 and annotated on the 623A or AF Form 797.
Specific tasks not identified with a symbol or proficiency code key indicates no training is provided in the course. Major commands and/or units may establish scale values and combat training as dictated by mission requirements.	
A task knowledge scale value may be used alone or with a task performance scale value to define a level of knowledge for a specific task.	
A subject knowledge scale value is used alone to define a level of knowledge for a subject not directly related to any specific task, or for a subject common to several tasks.	

Attachment 2
3E8X1 Specialty Training Standard

A2. 3E8X1 Specialty Training Standard.

A2.1. Identification. In the automated training record User Profile section the UTM will assign individuals to the correct workcenter upon in processing into the unit.

A2.1.1. For new trainee the UTM will assist them in creating a training record on the CE-VLC and placing them in the correct workcenter and specialty within their unit. Additional information will need to be entered into the following areas:

A2.1.1.1. **User Administrators:**

A2.1.1.1.1. Individual UTM

A2.1.1.1.2. Workcenter Supervisor

A2.1.1.1.3. Immediate Supervisor

A2.1.1.2. **User Training Information:**

A2.1.1.2..1 Duty Position

A2.1.1.2.2. Date Entered Duty Positions

A2.1.1.2.3. Training Status Code

A2.1.1.2.4. Date Entered Upgrade Training (UGT)

A2.1.2. For all other the UTM will need to place the individual into the correct workcenter and specialty. If the individual record is not available contact the losing unit to have the record transferred. If this fails, contact the AFCEC-VLC helpdesk for assistance. Additional information will need to be entered into the following areas:

A2.1.2.1. **User Administrators:**

A2.1.2.1.1. Individual UTM

A2.1.2.1.2. Workcenter Supervisor

A2.1.2.1.3. Immediate Supervisor

A2.1.2.2. **User Training Information:**

A2.1.2.2..1 Duty Position

A2.1.2.2.2. Date Entered Duty Positions

A2.1.2.2.3. Training Status Code

Attachment 2
3E8X1 Advanced EOD Course Training Standard

A2.2. Specialty Tasks. The following are tasks the workcenter supervisor will use to create the duty task list for each duty position created for their workcenter.

1. Tasks, Knowledge, And Technical References	2. Tasks		3. Certification for OJT					4. Proficiency Codes Used to Indicate Training Provided via CDC, DL or Course			
	Core/Cert ^	Deployment	A	B	C	D	E	3 Skill Level	5 Skill Level	7 Skill Level	9 Skill Level
			Tng Start Date	Tng Complete Date	Trainee Initials	Trainer Initials	Certifier Initials				
1. CIVIL ENGINEER (CE) COMMON CORE CONCEPTS COURSES TR: CE Virtual Learning Center (CE-VLC) Note: QTP required for UGT											
1.1. Accomplish CE 5-Level Core Concepts Course	5										
1.2. Accomplish CE 7-Level Core Concepts Course	7										
2. EOD FLIGHT MANAGEMENT TR: AFIs 10-201, 10-208, 10-210, 10-401, 10-402, 10-403, 10-404, 16-1404, 21-101, 32-3002-O, 38-101, 48-137, 65-601 Vol 1, 91-101, 91-204, 91-207; AFMAN 10-206, 21-209 Vol 1 & 2,24-204, 32-3001, 91-201; AFPD 32-30, 91-1, 91-2, 91-3; DoDD 5160.62, 5230.11; 3150.8M, 5200.1R, 5200.2R, 5200.8R, 6055.5M; 29 CFR 1910; TOs 00-5-1, 00-5-3, 00-5-18, 00-35D-54, 60A Series and 0-1 Series Indexes										
2.1. History, Duties and Responsibilities of EOD											
2.2. Air Force EOD Program											
2.2.1. Air Staff, Air Force Civil Engineering Center (AFCEC), and MAJCOM,											

Attachment 2
3E8X1 Advanced EOD Course Training Standard

AFIMSC and Detachment EOD Responsibilities											
2.2.2. EOD Mission Areas									B		
2.2.3. EOD Flight Organizational Structure											
2.2.4. Specialized EOD Unit/Command Responsibilities											
2.2.5. Duties of AFSCs 3E831/51/71											
2.3. Prepare Master Training Plan (MTP) / Master Task List (MTL)											
2.4. Manage Technical Order System								A			
3. EOD OPERATIONS TR: AFIs 10-404, 10-801, 10-2501, 32-3002-O, 48-151, 90-802; AFMAN 10-207, 10-2502, 32-3001; DoDD 3025.12, 3150.8, 3025.13, 5210.55, 5100.3, DoD 3025.1M; 49 CFR; TOs 60 Series and 11N Series; USSS DOD EOD and Canine Support Manual; JEOD Portal, EOD AFTTPs											
3.1. Incident Response											
3.1.1. Understand RM Principles during EOD operations	5^	*						B			
3.1.2. Apply Risk Management (RM) Principles to EOD Operations	7^	*						b			
3.1.3. Thermal Injury Prevention Program								B			
3.1.4. Select Incident Categories	7^	*									
3.1.5. Identify USAF EOD Responsibilities in Operations Involving Support to Federal, State, and Local Agencies	7^	*									
3.1.6. Use TOs When Performing Tasks	5^	*						2b			
3.1.7. EOD Mobile Field Kit (MFK)											
3.1.7.1. Use AEODPS								2b			
3.1.7.2. Use TDA								2b			
3.2. Perform Team Leader Operations											

Attachment 2
3E8X1 Advanced EOD Course Training Standard

3.2.1. Unexploded Ordnance (UXO) Recovery Operations Response	7^	*								2b	
3.2.2. Aerospace Platforms Response	7^	*								2b	
3.2.3. IED Response	7^	*								2b	
3.2.4. Chemical/Biological Response	7^	*									
3.2.5. Nuclear Weapon Accident/Incident Response	7^	*									
3.2.6. WMD/CBRN Response	7^	*									
3.3. VIP Support Procedures	5^	*							B		
3.4. Accomplish HAZMAT Awareness Certification	5	*									
3.5. Accomplish HAZMAT Operations Certification	5	*									
4. EOD SECURITY TR: AFMAN 16-1404, AFI 31-101, 10-701											
4.1. Control Procedures for Sensitive Items											
4.1.1. Classified								A			
4.1.2. Munitions								A			
4.1.3. Weapons											
4.2. Identify Vulnerabilities											
4.2.1. OPSEC											
4.2.2. COMSEC											
4.2.3. EMSEC											
5. EOD INFORMATION MANAGEMENT SYSTEM (EODIMS) TR: EOD AFTTP and User's Manual											
5.1. Use EODIMS	5^	*							b		
5.2. Use Range Scheduling Module											
5.3. Use VIPPSA Module											
5.4. Use Training Module											
5.5. Use Report Module											
5.6. Use Bulletin Board Module											
6. APPLIED PRINCIPLES OF											

Attachment 2
3E8X1 Advanced EOD Course Training Standard

PHYSICS AND CHEMISTRY											
6.1. Properties of Matter								B			
6.2. Laws of Motion								B			
6.3. Simple Machines								B			
6.4. Measurement Systems											
6.4.1. English System								B			
6.4.2. Metric System								B			
6.4.3. Convert Between Systems											
6.4.3.1. Mass								2b			
6.4.3.2. Volume								B			
6.4.3.3. Lengths								B			
6.4.3.4. Temperature								B			
6.5. Chemistry											
6.5.1. Elements								B			
6.5.2. Compounds								B			
6.5.3. Bonding								B			
7. TOOLS AND EQUIPMENT TR: 60A-2-1-3; 60A-2-1-3-2; 60A-2-1-42; 60A-2-1-46; 60A-2-1-58; 60A-2-1-74; 60A-2-1-76; 60A-2-1-77; 60A-2-1-90; 60A-2-1-114, Manufacturer's Manuals											
7.1. Mk 2 TR: 60A-2-1-3											
7.1.1. Operational Principles								B	B		
7.1.2. Inspect, Maintain and Use Properly	5^	*						2b	b		
7.2. Percussion Actuated Non-electric (PAN) Disrupter TR: 60A-2-1-77											
7.2.1. Operational Principles								B	B		
7.2.2. Inspect, Maintain and Use Properly	5^	*						2b	b		
7.3. Mk 1 TR: 60A-2-1-46											
7.3.1. Operational Principles								B	B		
7.3.2. Inspect, Maintain and Use Properly	5^	*						2b	b		
7.4. Field Fabricated Dearmer TR: 60A-2-1-3-2											
7.4.1. Operational Principles											

Attachment 2
3E8X1 Advanced EOD Course Training Standard

7.4.2. Inspect, Maintain and Use Properly											
7.5. Hook and Line Kits TR:Manufacturer's Manual											
7.5.1. Operational Principles								A			
7.5.2. Inspect, Maintain and Use Properly	5^	*						1a			
7.6. Robotics Systems											
7.6.1. Small Tactical Robot (MTGR) TR: Manufacturer's Manual											
7.6.1.1. Operational Principles								B	B		
7.6.1.2. Inspect, Maintain and Use Properly	5^	*						2b	b		
7.6.2. Medium Robot (AFMSR) TR: Manufacturer's Manual											
7.6.2.1. Operational Principles									B		
7.6.2.2. Inspect, Maintain and Use Properly	5^	*							b		
7.6.3. Large Robot (F6A) TR: Manufacturer's Manual											
7.6.3.1. Operational Principles									B		
7.6.3.2. Inspect, Maintain and Use Properly	5^	*							b		
7.7. Remote Firing Device (Mini-DRFD) TR: Manufacturer's Manual											
7.7.1. Operational Principles								B	B		
7.7.2. Inspect, Maintain and Use Properly	5^	*						2b	b		
7.8. Sub-Surface Hand Held Detector (CEIA) TR: Manufacturer's Manual											
7.8.1. Operational Principles								B	B		
7.8.2. Inspect, Maintain and Use Properly	5^	*						2b	b		
7.9. Ferrous Ordnance Locator TR: 60A-2-1-58											
7.9.1. Operational Principles								B	B		
7.9.2. Inspect, Maintain and Use Properly	5^	*						2b	b		

Attachment 2
3E8X1 Advanced EOD Course Training Standard

7.10. Ground Penetrating Radar Detector (Minehound) TR: Manufacturer's Manual											
7.10.1. Operational Principles									B		
7.10.2. Inspect, Maintain and Use Properly	5^	*							b		
7.11. Counter Radio Controlled Improvised Explosive Device (RCIED) Electronic Warfare (CREW) Equipment TR: System Publications/TTPs											
7.11.1. PLT-4											
7.11.1.1. Operational Principles								A	B		
7.11.1.2. Inspect, Maintain and Use Properly	5^	*							b		
7.11.2. PLT-5											
7.11.2.1. Operational Principles								A	B		
7.11.2.2. Inspect, Maintain and Use Properly	5^	*							b		
7.11.3. I1B1											
7.11.3.1. Operational Principles								A	B		
7.11.3.2. Inspect, Maintain and Use Properly	5^	*							b		
7.11.4. Universal Test Set											
7.11.4.1. Operational Principles								A	B		
7.11.4.2. Inspect, Maintain and Use Properly	5^	*							b		
7.11.5. Cryptographic Load Device (Simple Key Loader)											
7.11.5.1. Operational Principles								A	B		
7.11.5.2. Inspect, Maintain and Use Properly	5^	*							b		
7.12. Portable Radiograph (SCAN-X and MMX) TR: 60A-2-1-74/2-1-90											
7.12.1. Operational Principles								B	B		

Attachment 2
3E8X1 Advanced EOD Course Training Standard

7.12.2. Inspect, Maintain and Use Properly	5^	*						2b	b		
7.13. RADIACS											
7.13.1. RADIAC (ADM 300 Kit C and E) TR: Manufacturer's Manual											
7.13.1.1. Operational Principles								B	B		
7.13.1.2. Inspect, Maintain and Use Properly	5^	*						2b	b		
7.13.2. RADIAC **(**AN/PDX-2) Radiac Kit TR: 60A2-1-114											
7.13.2.1. Operational Principles								B	B		
7.13.2.2. Inspect, Maintain and Use Properly	5^	*						2b	b		
7.13.3. RADIAC, Tritium (T605) TR: T.O. 11N-74A-2											
7.13.3.1. Operational Principles											
7.13.3.2. Inspect, Maintain and Use Properly											
7.14. Joint Chemical Agent Detector, Ex. JCAD											
7.14.1. Operational Principles								B	B		
7.14.2. Inspect, Maintain and Use Properly	5^	*						2b	b		
7.15. Explosive/Chemical Identification Kit (FirstDefender/TruDefender)											
7.15.1. Operational Principles								B	B		
7.15.2. Inspect, Maintain and Use Properly	5^	*						2b	b		
7.16. Explosive (IED) Total Containment Vessel TR: Manufacturer’s Manual											
7.16.1. Operational Principles											
7.16.2. Inspect, Maintain and Use Properly	5^	*									
7.17. RADBO Vehicle											
7.17.1. Operational Principles											

Attachment 2
3E8X1 Advanced EOD Course Training Standard

7.17.2. Inspect, Maintain and Use Properly (♦)	5^	*									
7.18. Bomb Suit (EOD-10) TR: Manufacturer's Manual											
7.18.1. Operational Principles								B	B		
7.18.2. Inspect, Maintain and Use Properly	5^	*						2b	b		
8. DEMOLITION PROCEDURES TR: 60A-1-1-12/13/14/15, 60A-1-1-9, 60A-1-1-22, 60A1-1-31, 60A-2-1-33; AFMAN 91-201											
8.1. Grounding											
8.1.1. Principles of Grounding								B	b		
8.1.2. Perform Grounding Procedures	5^	*						2b	b		
8.2. Electromagnetic Radiation Precautions											
8.2.1. Principles of EMR								B	b		
8.2.2. Apply EOD Specific EMR precautions	5^	*						2b	b		
8.3. Prepare Firing Systems											
8.3.1. Electric Firing System Principles								B	b		
8.3.2. Demonstrate Electric Demolition Procedures	5^	*						2b	b		
8.3.3. Non-electric Firing System Principles								B	b		
8.3.4. Demonstrate Non-electric Demolition Procedures (Time fuze)	5^	*						2b	b		
8.3.4. Demonstrate Non-electric Demolition Procedures (Shock Tube)	5^	*						2b	b		
8.3.5. Use Det-Cord in Firing System	5^	*						2b	b		
8.4. Disposal Techniques											
8.4.1. Principles of disposal								B	B	B	
8.4.2. Perform Detonation Procedures **(TQT)**	5^	*						2b			
8.4.3. Perform Thermite Procedures	5^	*						2b			
8.4.4. Describe Burn Procedures	5^	*						2b	b		
8.4.5. Perform Shaped Charge Procedures	5^	*						b	b		

Attachment 2
3E8X1 Advanced EOD Course Training Standard

8.4.6. Describe Static Firing Procedures	5^	*						A	b		
8.4.7. Describe Insensitive Explosives Disposal Procedures	5^	*						A	B		
8.4.8. Demilitarization								A			
8.4.9. Describe Considerations for Large-Scale Munitions Disposal Procedures	5^	*						A			
9. ACCESS AND RECOVERY TR: 60A-1-1-5; 60A-1-1-4; TC 3-97.61; TC 21-24											
9.1. Soil Characteristics								A	B		
9.2. Identify terrain changes due to unexploded ordnance								a	b		
9.3. Locate UXOs											
9.3.1. Surface	5^	*						2b	B		
9.3.2. Sub-surface	5^	*						2b	B		
9.4. Ordnance Access Methods								A			
9.5. Tie Knots, Bends, and Hitches								1a			
9.6. Perform Field Rigging and Improvised Hoisting								1a			
10. EXPLOSIVE ORDNANCE RECONNAISSANCE AND ASSESSMENT TR: 60A-1-1-2/3/4; 60A-1-1-7; 60A-1-1-7-2; 60A-1-1- 22, WTI Lexicon, ATP 3-09.30											
10.1. Identify Munitions Hazards											
10.2. Reconnaissance Principles								B			
10.3. Reconnaissance Actions											
10.3.1. Perform Reconnaissance **(TQT)**	5^	*						2b			
10.3.2. Positively Identify Ordnance **(TQT)**	5^	*						2b			
10.4. Weapons Technical Intelligence (WTI)											
10.4.1. Perform Data Collection	5^	*						b	B		
10.4.2. Describe Reporting Requirements	5^	*							A		

Attachment 2
3E8X1 Advanced EOD Course Training Standard

10.4.3. Destructive Exploitation	7^	*						A			
10.4.4. Non-Destructive Exploitation	7^	*						A			
10.5. Post Blast Analysis											
10.5.1. Identify Secondary Hazards	5^	*						2b			
10.5.2. Sensitive Site Exploitation (SSE)											
10.5.2.1. Site Preservation	7^	*									
10.5.2.2. Identify Evidence	7^	*									
10.5.2.3. Collect Evidence	7^	*									
10.5.2.4. Determine IED Characteristics	7^	*									
10.6. Ordnance Post Blast Analysis											
10.6.1. Determine Ordnance Characteristics	7^	*									
10.6.2. Determine Fragmentation Characteristics	7^	*									
10.6.3. Determine Delivery Method	7^	*									
11. PROTECTION OF PERSONNEL AND PROPERTY TR: T.O.60A-1-1-4, AFMAN 91-201											
11.1. Determine Hazard Distances	5^	*						2b	B		
11.2. Determine Collateral Damage	5^	*						1a			
11.3. Determine Protective Works	5^	*						A	B		
12. RENDER SAFE TECHNIQUES TR: 60A-2-1 -51; 60A-2-1-60; 60A-2-1-91; 60A-2-1-73, 60A-2-1-73-2; 60A-2-1-81; 60A-2-1-82											
12.1. Immobilize Fuzes	5^	*						2b	B		
12.2. Remove Fuzes	5^	*						2b	B		
12.3. Disable Electrical Components	5^	*						2b	B		
12.4. Disrupt Firing Trains	5^	*						2b	B		
12.5. SMUD Techniques								A			
12.6. Describe RSP Development for First-found Ordnance Items	7^	*									

Attachment 2
3E8X1 Advanced EOD Course Training Standard

12.7. Dynamic Charges	5^	*									
13. RANGES TR: AFI 13-212; AFMAN 91-201, 32-3001; 11A-1-42; 11A-1-60; 11A-1-66; 60A-1-1-22; 40 CFR; 49 CFR; EOD Range AFTTP											
13.1. Develop Plans for Range Clearance Operations	7^	*									
13.2. Perform Active Range Clearance Operations								1a			
13.3. Range Management Principles									B		
13.4. Proficiency, Training, and Demolition Ranges											
13.4.1. Explosive Site Planning	7^	*									
13.4.2. Range Maintenance Standards									B		
13.4.3. Develop Range Operations Plan	7^	*									
14. ENVIRONMENTAL CONSDIERATIONS FOR EOD OPERATIONS TR: AFI 21-201; AFMAN 91-201;AFPD 32-70; 40 CFR Part 260-266, 270; 49 CFR Part 172; 11A-1-60; EO 12856; AFTTP 3-32.5V9 DSCA											
14.1. Identify Environmental Impacts Caused by EOD											
14.2. Military Munitions Response Program (FUDS, BRAC, Clean-up)											
14.3. Military Munitions Rule (Emergency Response and Operational Ranges)	5^	*							B		
14.4. Describe Levels of Emergency Response	5^	*									
14.5. Identify Requirements for EPA Permits	7^	*							B		

Attachment 2
3E8X1 Advanced EOD Course Training Standard

14.6. Identify Transportation Requirements								A			
14.7. Ammunitions Disposition Request (ADR) Operation											
14.7.1. Describe the difference between treatment and disposal											
14.7.2. Describe procedures for using a non-permitted range for disposal											
14.7.3. Plan											
14.7.4. Perform											
15. EXPLOSIVES TR: 60A-series											
15.1. Identification								A			
15.2. Explosive Effects	5^	*						B			
15.3. Apply Safety Precautions								B			
15.4. High Explosives											
15.4.1. Primary	5^	*						B	B		
15.4.2. Secondary	5^	*						B	B		
15.4.3. Main	5^	*						B	B		
15.5. Low Explosives	5^	*						B	B		
15.6. Insensitive High Explosives								B			
15.7. Homemade explosives											
15.7.1. Types								A			
15.7.2. Characteristics								A			
15.7.3. Precursors								A			
15.7.4. Identification techniques and field tests	5^	*									
15.7.5. Improvised Explosive Laboratory Hazards	5^	*									
15.7.6. Desensitization techniques	5^	*									
16. U.S. AND FOREIGN MUNITIONS TR: 60-series/60A-1-1-22											
16.1. U.S. AND FOREIGN DROPPED MUNITIONS TR: 60B-series; 60C-series											
16.1.1. Bombs and Bomb Fuzes TR: 60B-series											
16.1.1.1. Identify	5^	*						2b	B		

Attachment 2
3E8X1 Advanced EOD Course Training Standard

16.1.1.2. Observe Safety Precautions	5^	*						2b	B		
16.1.1.3. Render Safe	5^	*						2b	B		
16.1.1.4. Perform Disposal Procedures								2b			
16.1.2. Dispensers and Payloads TR: 60C- series											
16.1.2.1. Identify	5^	*						2b	B		
16.1.2.2. Observe Safety Precautions	5^	*						2b	B		
16.1.2.3. Render Safe	5^	*						2b	B		
16.1.2.4. Perform Disposal Procedures								2b			
16.1.3. U.S. AND FOREIGN PROJECTED MUNITIONS TR: 60D-series; 60E-series; 60F- series											
16.1.3.1. Projectiles and Projectile Fuzes TR: 60D-series											
16.1.3.1.1. Identify	5^	*						2b	B		
16.1.3.1.2. Observe Safety Precautions	5^	*						2b	B		
16.1.3.1.3. Render Safe	5^	*						2b	B		
16.1.3.1.4. Perform Disposal Procedures								2b			
16.1.3.2. Grenades and Grenade Fuzes TR: 60E-series											
16.1.3.2.1. Identify	5^	*						2b	B		
16.1.3.2.2. Observe Safety Precautions	5^	*						2b	B		
16.1.3.2.3. Render Safe	5^	*						2b	B		
16.1.3.2.4. Perform Disposal Procedures								2b			
16.1.3.3. Rockets and Rocket Fuzes TR: 60F-Series											
16.1.3.3.1. Identify	5^	*						2b	B		
16.1.3.3.2. Observe Safety Precautions	5^	*						2b	B		
16.1.3.3.3. Render Safe	5^	*						2b	B		
16.1.3.3.4. Perform Disposal Procedures								2b			
16.1.4. U.S. AND FOREIGN GUIDED MISSILES TR: 60G-series											
16.1.4.1. Identify	5^	*						2b	B		

Attachment 2
3E8X1 Advanced EOD Course Training Standard

16.1.4.2. Observe Safety Precautions	5^	*						2b	B		
16.1.4.3. Render Safe	5^	*						2b	B		
16.1.4.4. Perform Disposal Procedures								2b			
16.1.5. U.S. AND FOREIGN PLACED MUNITIONS TR: 60H-series, 60A-1-1-22, TM 3-34.85; ATP 3-90.8, ATP 3-34.20											
16.1.5.1. Minefield											
16.1.5.1.1. Concepts								A			
16.1.5.1.2. Minefield Breaching Charges								A			
16.1.5.2. Landmines and Landmine Fuzes											
16.1.5.2.1. Identify	5^	*						2b	B		
16.1.5.2.2. Observe Safety Precautions	5^	*						2b	B		
16.1.5.2.3. Render Safe	5^	*						2b			
16.1.5.2.4. Perform Disposal Procedures								2b			
16.1.5.3. Booby Traps and Booby Trap Fuzes											
16.1.5.3.1. Identify	5^	*						2b	B		
16.1.5.3.2. Observe Safety Precautions	5^	*						2b	B		
16.1.5.3.3. Render Safe	5^	*						2b			
16.1.5.3.4. Perform Disposal Procedures								2b			
16.1.6. U.S. AND FOREIGN PYROTECHNICS TR: 60K-series											
16.1.6.1. Identify	5^	*						2b	B		
16.1.6.2. Observe Safety Precautions	5^	*						2b	B		
16.1.6.3. Render Safe	5^	*						2b	B		
16.1.6.4. Perform Disposal Procedures								2b			
16.1.7. U.S. AND FOREIGN UNDERWATER ORDNANCE TR: 60Q-series; 60R-series; 60S- series											
16.1.7.1. Identify								1a			
16.1.7.2. Observe Safety Precautions								B			

Attachment 2
3E8X1 Advanced EOD Course Training Standard

16.1.7. U.S. AND FOREIGN LOITERING MUNITIONS TR: 60P-series											
16.1.7.1. Identify								1a			
16.1.7.2. Observe Safety Precautions								B			
17. AEROSPACE SYSTEMS TR: 00-105-E9; 60J-series; Aerospace Vehicle EOD AFTTP											
17.1. Egress Systems and System Components											
17.1.1. Principles								A			
17.1.2. Identify	5^	*						2b	B		
17.1.3. Observe Safety Precautions	5^	*						2b	B		
17.1.4. Render Safe	5^	*						2b	B		
17.1.5. Perform Disposal Procedures								2b			
17.2. Gun Systems											
17.2.1. Principles											
17.2.2. Identify	5^	*						2b	B		
17.2.3. Observe Safety Precautions	5^	*						2b	B		
17.2.4. Render Safe	5^	*						2b	B		
17.3. Munition Release and Launching Systems											
17.3.1. Principles								A			
17.3.2. Identify	5^	*						2b	B		
17.3.3. Observe Safety Precautions	5^	*						2b	B		
17.3.4. Render Safe	5^	*						2b	B		
17.4. Flare and Chaff Countermeasure Systems											
17.4.1. Identify	5^	*						2b	B		
17.4.2. Observe Safety Precautions	5^	*						2b	B		
17.4.3. Render Safe	5^	*						2b	B		
17.4.4. Disposal								2b			
17.5. ICBM/Space Launch Systems											
17.5.1. Identify											
17.5.2. Observe Safety Precautions											
17.5.3. RSP											
17.5.4. Disposal											
17.6. ICBM/Space Launch Facility Hazards											

Attachment 2
3E8X1 Advanced EOD Course Training Standard

17.6.1. Identify											
17.6.2. Observe Safety Precautions											
17.6.3. RSP											
17.6.4. Disposal											
18. NUCLEAR WEAPONS AND PROCEDURES TR: AFIs 21-203, 44-102, 44-110, 91 Series; AFMAN 13-501, AFPD 21-2; DoDD 3150.02, 3150.08; DoD 3150.2M, 3150.8M; DoDI 4540.05, 5210.42, 6055.08; DoDM 5210.41 volumes 1-3; TOs 11H Series, 11N Series, 14P Series, 60N Series, and Army FM 3-11.3; T.O. 11N-74A-2; Nuclear Response AFTTP											
18.1. Nuclear Weapon Characteristics											
18.1.1. Nuclear Physics								B			
18.1.2. Identify Hazards	5^	*						2b			
18.1.2.1. Explosives								B			
18.1.2.2. Toxic								B			
18.1.2.3. Radiological								B			
18.1.3. Identify Classified Components								2b			
18.1.4. Fuzing and Firing								B			
18.2 Recovery Operations											
18.2.1. IRF Responsibilities											
18.2.1.1. Identify Associated Weapon Hazards								2b			
18.2.1.2. Identify Safety Precautions/Warnings	5^	*						2b			
18.2.1.3. Determine Appropriate PPE	5^	*						2b			
18.2.2. Locate/Recon											
18.2.2.1. Observe Safety Precautions/Warnings	5^	*						2b			
18.2.2.2. Utilize Appropriate PPE	5^	*						2b			
18.2.2.3. Locate Classified Components								2b			

Attachment 2
3E8X1 Advanced EOD Course Training Standard

18.2.2.4. Verify Weapon Status/Condition	5^	*						2b			
18.2.2.5. Conduct Immediate Actions											
18.2.3. Reporting											
18.2.3.1. Conduct Initial IC Briefings								2b			
18.2.3.2. Conduct IRF/RTF Transition Brief											
18.3. Nuclear Surety Program								B			
18.4. Non-Permissive Weapons Recovery											
18.4.1. Brief Capabilities to IRT											
18.4.2. Identify Breaching Hazards											
18.4.2.1. Manual Breaching											
18.4.2.2. Mechanical Breaching											
18.4.2.3. Thermal Breaching											
18.4.2.4. Ballistic Breaching											
18.4.2.5. Explosive Breaching											
18.4.3. Decide Course of Action											
18.4.4. Execute Course of Action											
18.5. Nuclear Weapon Systems											
18.5.1. Bombs: B61-3, 4, 7, 10, 11, 12; B83-1											
18.5.1.1. Identify											
18.5.1.2. Conduct Render Safe Procedures											
18.5.1.3. Conduct Continuation Procedures											
18.5.2. Missiles: W80, W84											
18.5.2.1. Identify											
18.5.2.2. Conduct Render Safe Procedures											
18.5.2.3. Conduct Continuation Procedures											
18.5.3. Reentry Vehicles W62, W78, W87											
18.5.3.1. Identify											

Attachment 2
3E8X1 Advanced EOD Course Training Standard

18.5.3.2. Conduct Render Safe Procedures											
18.5.3.3. Conduct Continuation Procedures											
19. IMPROVISED EXPLOSIVE DEVICES TR: 60A-1-1-9; 60A-1-1-15; 60A-1-1-31; 60A-2-1-73- 2; 60A-2-1-81; 60A-2-1-82; 60A-2-1-83, 60L-series; NFPA 472; EOD IED AFTTP											
19.1. Types	5^	*						A	B		
19.2. IED Construction											
19.2.1. Switch	5^	*						A	B		
19.2.2. Initiators	5^	*						A	B		
19.2.3. Main Charge	5^	*						A	B		
19.2.4. Power Source	5^	*						A	B		
19.2.5. Container	5^	*						A	B		
19.2.6. Enhancements	5^	*						A	B		
19.3. Identify Hazards	5^	*						A	B		
19.4. Observe safety precautions	5^	*						2b	B		
19.5. Perform IED Threat Assessment	7^	*						2b			
19.6. Locate IED	5^	*						2b			
19.7. Interpret Radio Graphic Images	5^	*						2b			
19.8. Gain access	5^	*						2b	B		
19.9. Perform render safe techniques	5^	*						2b			
19.10. Perform disposal techniques								2b			
19.11. IED Tactical Approach											
19.11.1. Establish Site Security	7^	*						2b			
19.11.2. Perform Safe Area Search Procedures	5^	*						2b	B		
19.11.3. Perform Secondary Search Procedures	5^	*						2b	B		
19.11.4. Identify Ground Sign	5^	*						1b	B		
19.11.5. Isolate Threat	7^	*						2b			
19.11.6. Identify Enemy Targeting Principles	7^	*						1a			
20. WEAPONS OF MASS DESTRUCTION TR: 60A-1-1-9; 60A-1-1-15; 60A-1-1-31; 60A-2-											

Attachment 2
3E8X1 Advanced EOD Course Training Standard

1-73- 2; 60A-2-1-81; 60A-2-1-82; 60A-2-1-83, 60L-series; NFPA 472; EOD WMD AFTTP											
20.1. Types											
20.2. Detection Techniques	5^	*						2b	B		
20.3. Perform Passive Diagnostic Techniques	7^	*						2b			
20.4. Perform Triage Procedures	7^	*						1a			
21. CHEMICAL AND BIOLOGICAL WARFARE AGENTS, EQUIPMENT, AND PROCEDURES TR: AFIs 10-2501, 10-2503, 44 Series; TOs 11H Series, 14P4 Series, and 60 Series; TM 3-11.42, AFTTP 3-2.42, 3-2.44; Chemical and Biological AFTTP											
21.1. Chemical and Biological Agents TR: 60A-1-1-11; FM 3-11.3, 3-11.9, 3-11.21, 3-11											
21.1.1. Types								B			
21.1.2. Physical State								A	B		
21.1.3. Physiological Action								A	B		
21.1.4. Persistence								A	B		
21.2. Identify environments for expedient vs recovery operations **(TQT)**	7^	*									
21.3. Determine PPE Requirements **(TQT)**	7^	*						2b			
21.4. Determine Evacuation Distances **(TQT)**	7^	*						2b			
21.5. Conduct Contamination Control Procedures **(TQT)**	5^	*						2b			
21.6. Apply Decon **(TQT)**	5^	*						2b			
21.7. Perform Leak Seal procedures **(TQT)**	5^	*						2b			
21.8. Perform Packaging Procedures **(TQT)**	5^	*						2b			
21.9. Perform Marking Procedures **(TQT)**	5^	*						2b			

Attachment 2
3E8X1 Advanced EOD Course Training Standard

21.10. Determine Disposition **(TQT)**	7^	*						2b			
22. AIRBASE RECOVERY TR: AFI 10-210; AFH 10-222, vol 1; AFTTP 3-4, 3-32.11, 10-219 vol 4; 60A-2-1-39, EOD RADBO AFTTP											
22.1. Ordnance Order of Battle Concept											
22.2. Pre-attack											
22.2.1. Resource Dispersal Principles											
22.2.2. Coordinate Recon/ADAT Routes	5^	*									
22.2.3. Identify UXO Holding Areas	7^	*									
22.2.4. Bomb Removal Team											
22.2.5. Comm-out Procedures											
22.2.6. Brevity Codes											
22.3. Post-attack											
22.3.1. Conduct ADAT	5^	*									
22.3.2. Assist with MAOS Selection	7^	*									
22.3.3. Rapid Explosive Hazard Mitigation (REHM)											
23. AIRCRAFT (HELICOPTER) OPERATIONS TR: Local Helicopter Support											
23.1. General Safety Rules											
23.2. Perform Aircraft Emergency and Egress Procedures on Mission Aircraft											
23.3. Cargo Loading/Unloading and Utilization of Cargo Restraint Devices											
23.4. Operate Aircraft Intercom System											

Appendix E Biennial Report

Cycle	Site Name	Site ID
2023	EGLIN AIR FORCE BASE	FL8570024366

1. Reason for Submittal	
BR / AR with Notification. [Source B]	*BR Exempt* No

2. Site ID
FL8570024366

3. Site Name
EGLIN AIR FORCE BASE

4. Site Location		
Street Number	*Street 1* 501 DELEON ST SUITE 101	*Street 2*
Zip 32542-5105	*City, Town or Village* EGLIN AFB	*State* FLORIDA
Country UNITED STATES	*County* OKALOOSA	
Latitude 30.477003	*Longitude* -86.491313	*Use Lat/Long as Primary Address* No

5. Site Mailing Address		
Street Number	*Street 1* 501 DELEON ST STE 100	*Street 2*
Zip 32542-5133	*City, Town or Village* EGLIN AFB	*State* FLORIDA
Country UNITED STATES		

6. Site Land Type
Federal

7. North American Industry Classification System (NAICS)
Primary NAICS 92811 - NATIONAL SECURITY
Other NAICS

8. Site Contact Person		
First Name STEPHEN	*Middle Initial* M	*Last Name* KAUFFMAN
Title SITE CONTACT USAF	*Email* STEPHEN.KAUFFMAN@US.AF.MIL	*Language* ENGLISH
Phone Number 850-882-7665	*Extension*	*Fax*

8a. Site Contact Address		
Street Number	*Street 1* 700 RANGE RD	*Street 2*
Zip 32542-5120	*City, Town or Village* EGLIN AFB	*State* FLORIDA
Country UNITED STATES		

9a. Legal Owner #1		
Name UNITED STATES AIR FORCE	*Date* 10/27/1940	*Type* Federal
Street Number	*Street 1* 101 WEST D AVENUE SUITE 120	*Street 2*
Zip 32542-5495	*City, Town or Village* EGLIN AFB	*State* FLORIDA
Country UNITED STATES		
Email		
Phone Number 850-884-7923	*Extension*	*Fax*
Public Comments		

9b. Legal Operator #1

Name	*Date*	*Type*
COMMANDER 96 CEG	10/27/1940	Federal
Street Number	*Street 1*	*Street 2*
	501 DELEON ST SUITE 100	
Zip	*City, Town or Village*	*State*
32542-5133	EGLIN AFB	FLORIDA

Country
UNITED STATES

Email

Phone Number	*Extension*	*Fax*
850-884-7923		

Public Comments

10. Type of Federal Regulated Waste Activity

A. Hazardous Waste Activities

1. Generator of Hazardous Waste (Federal)	*3. Treater, Storer, or Disposer of Hazardous Waste*	*6. Exempt Boiler and / or Industrial Furnace*
1 - Large Quantity Generator	Yes	None selected
	4. Receives Hazardous Waste from Off-site	
	Yes	
2. Short Term Generator	*5. Recycler of Hazardous Waste*	
No	None selected	

B. Waste Codes for Federally Regulated Hazardous Wastes

Hazardous Waste Codes (Federal)

D002, D003, D004, D005, D006, D007, D001, D008, D009, D010, D011, D018, D022, D035, D038, D039, D040, F001, F002, F003, F004, F005, P001, P020, P031, P098, U003, U010, U035, U041, U044, U058, U080, U112, U122, U133, U134, U150, U154, U159, U188, U196, U211, U220, U223, U279

C. Waste Codes for State Regulated (non-Federal) Hazardous Wastes

Hazardous Waste Codes (State)

None selected

11. Additional Regulated Waste Activities

A. Other Waste Activities

1. Transporter of Hazardous Waste	*3. United States Importer of Hazardous Waste*	*5. Importer/Exporter of SLABs*
None selected	No	None selected
2. Underground Injection Control	*4. Recognized Trader*	
No	None selected	

B. Universal Waste Activities

1. Large Quantity Handler of Universal Waste

Accumulated/Managed:

- Batteries
- Lamps

Generated:
None selected

2. Destination Facility for Universal Waste

No

C. Used Oil Activities

1. Used Oil Transporter	*3. Off-Specification Used Oil Burner*
None selected	No
2. Used Oil Processor and / or Re-refiner	*4. Used Oil Fuel Marketer*
None selected	None selected

D. Pharmaceutical Activities

Operating under 40 CFR 266 Subpart P for the management of hazardous waste pharmaceuticals.

Withdrawing from operating under 40 CFR 266 Subpart P for the management of hazardous waste pharmaceuticals.

No

12. Eligible Academic Entities with Laboratories

1. Opting into or currently operating under 40 CFR Part 262 Subpart K for the management of hazardous wastes in laboratories.

None selected

2. Withdrawing from 40 CFR Part 262 Subpart K for the management of hazardous wastes in laboratories.

No

13. Episodic Generation

Are you an SQG or VSQG generating hazardous waste from a planned or unplanned episodic event, lasting no more than 60 days, that moves you to a higher generator category pursuant to 40 CFR Part 262 Subpart L? If "Yes", you must fill out the Addendum for Episodic Generator.

No

14. LQG Consolidation of VSQG Waste

Are you an LQG notifying of consolidating VSQG hazardous waste under the control of the same person pursuant to 40 CFR 262.17(f)?

No

15. Notification of LQG Site Closure for a Central Accumulation Area (CAA) (optional) and Entire Facility

LQG Site Closure of a Central Accumulation Area or Facility

No

16. Notification of Hazardous Secondary Material (HSM) Activity

Are you reporting HSM activities?

No

17. Electronic Manifest Broker

Are you notifying as a person, as defined in 40 CFR 260.10, electing to use the EPA electronic manifest system to obtain, complete, and transmit an electronic manifest under a contractual relationship with a hazardous waste generator?

No

18. Comments

Public Comments

Universe Correction 05/27/2011

19. Certification

Certifier #1

First Name	*Middle Initial*	*Last Name*
Albert		Pullen
Title	*Email*	*Date Signed*
Hazardous Waste Program Manager	albert.pullen.1@us.af.mil	03/13/2024

Appendix F Evaluation of Alternative Technologies to Open Detonation of Energetic Wastes

Evaluation of Alternative Technologies to Open Detonation of Energetic Wastes by Eglin Air Force Base
February 2025

Purpose. The purpose of this document is to identify, screen, and evaluate the initial feasibility of potential alternatives to open detonation (OD) for treatment of energetic waste streams generated from the research, development, test, and evaluation (RDT&E) mission activities at Eglin Air Force Base (AFB).

Approach. An evaluation was made of the feasibility and safety of technologies other than OB and OD for treating the energetic wastes generated by NSWCDD using the below six-step approach.

Step 1. Identify and describe the energetic waste stream.

Step 2. Identify safety issues.

Step 3. Identify and categorize alternative technologies to OD.

Step 4. Screen the technologies for general applicability to the energetic waste stream and technology maturity.

Step 5. Provide more information about the technologies that pass the initial screening.

Step 6. Evaluate the technologies for specific application to the waste stream and compare them with the current treatment methods.

The Department of Defense (DoD) has not identified viable alternative technologies for installations that utilize Open Burning (OB) and/or Open Detonation (OD). A 17 January 2025 guidance memo from the Assistant Secretary of Defense (Energy, Installations and Environment), established DoD's priority of evaluating alternative technologies for large scale demilitarization operations. DoD level evaluation of potential technologies for RDT&E facilities is not occurring at this time. Eglin AFB has been and will remain actively engaged with the DoD level working group regarding alternative technologies.

As per the EPA 3 January 2025 "Compendium of Potential Alternative Technologies to Open Burning and Open Detonation of Hazardous Waste Explosives", while a technology may have been implemented for a particular explosive hazardous waste stream at one facility, it may not be determined to be safe or available for use at another facility with a larger demilitarization or treatment requirement or a different or similar explosive hazardous waste stream. Additionally, technologies presented in the Compendium that were implemented at Department of Defense (DoD) facilities were approved only for use at the specific facility and for the specific explosive hazardous waste stream. The DoD Explosives Safety Board (DDESB) is required under federal law (10 U.S.C. § 172) to develop, implement, and oversee the DoD explosives safety program.

In addition to its oversight and approval authorities, the DDESB is the recognized explosives safety expert for all of DoD's munitions-related operations including treatment of hazardous waste explosives and munitions. As such, the DDESB must approve any alternative technology to OB or OD to be used by DoD for a specific explosive hazardous waste stream and at a specific location.

STEP 1. IDENTIFICATION AND DESCRIPTION OF NSWCDD'S ENERGETIC WASTE STREAM.

Background

Eglin AFB is neither a demilitarization facility nor an ammunition production plant. Instead, the Eglin Military Complex, located in the northwest Florida panhandle, is one of 23 component installations categorized as a DoD Major Range Test Facility Base (MRTFB). The primary mission of Eglin AFB is to develop and test conventional munitions and sensor tracking systems. It also provides support for individual and joint training of operational units, military schools, and various federal agencies. The Eglin Military Complex currently comprises four components, not including the cantonment or main base areas:

1. Test areas/sites

2. Interstitial areas (areas beyond and between the test areas)

3. Eglin Gulf Test Range

4. Airspace (over land and water)

Test Area (TA) C-62, where Eglin AFB's permitted OD unit (ODU) is located, makes up a portion of the Eglin Military Complex and supports a variety of test and training missions. TA C-62 is an air-to-ground tactical training area and static munitions testing area. There is a cleared area used as a training range for pilot qualifications in delivery of stores from high-performance aircraft and a cleared area for strafing. The continued DoD utilization of the Eglin Military Complex requires flexible and unencumbered access to land ranges and airspace, which support all of Eglin AFB's operations.

Sources of Explosive Wastes

As stated above, Eglin AFB is a MRTFB with an RDT&E mission to develop and test conventional munitions. In R&D, scientists and engineers synthesize experimental ingredients, formulate experimental propellants and explosives, and devise new concepts for motors, bombs, and warheads. In T&E, new and existing materials and concepts are tested and stressed in different environments. During the course of these RDT&E activities, Eglin AFB generates excess ordnance and other energetic materials which either have no further military use or have been stressed to a point where they are no longer safe for off-site transport. The primary sources of explosive waste at Eglin AFB are unserviceable munitions and Research, Development, Test

and Evaluation (RDT&E) reactive wastes from the Munition Support Squadron (MUNSS) and Air Force Research Laboratory (AFRL).

Waste Minimization

Eglin has implemented procedures aimed at minimizing the waste that requires treatment by OD. Eglin Waste Generating Organizations provide Eglin EOD with Ammunition Disposal Requests (ADR) prior to OD events who then perform waste classification reviews emphasizing waste minimization practices to the maximum degree possible. Items with low NEW such as small arms munitions and items with lower explosive class definitions such as 1.4 are often rejected to mitigate negative impacts to the environment by reducing the total quantity of reactive material treated by open detonation. Items with low NEW's require significant demolition explosive (C4) additions to ensure high order detonation of all items. Additionally, when designing optimal OD treatment events, larger NEW items are used as donor charges to reduce the overall amount of demolition explosives required to ensure high order detonation.

Eglin AFB continually evaluates waste minimization efforts to the greatest extent practicable with a goal that OD operations are used as a last resort for treating reactive hazardous waste. Eglin AFB waste treated by OD is done so because it is deemed unsuitable for reuse, storage and/or transport.

Categories of Explosive Hazardous Wastes

The Eglin AFB OD waste stream was divided into nine distinct munitions categories, using treatment data from 2020 through 2022 and documentation available from military databases, including the Explosive Ordnance Disposal (EOD) Information Management System (EODIMS). These categories were chosen based on Eglin AFB's mission and applicability for evaluating alternative technologies. Although there are a wide variety of items in each category, the general composition is expected to include the components of commonly used explosives and explosive mixtures, as listed below. Note, Eglin AFB has historically provided net explosive weight (NEW) totals for OD operations using the total NEWQD provided on ammunition disposition request (ADR) documentation. That documentation lists the NEWQD which is a net explosive weight that includes a safety factor per each explosive material. Data from EODIMS lists only the NEW for each material. Therefore, the category NEW and total presented are less than the total NEWQD historically provided in Eglin recordkeeping documents. Additionally, the EODIMS data listed does not include the explosive material, typically C-4, used to accomplish detonation. The intent of the table below is to categorize the waste stream treated for the evaluation of alternative technologies.

Table 1 lists the waste stream categories and NEW amount of waste treated by OD, across all munitions categories for the period from 2020 through 2022. As shown in Table 1, no single munitions category dominated Eglin AFB's waste stream during the time-period, as the RDT&E waste stream is never homogenous.

Table 1. Waste Characterization

	2020		2021		2022	
Waste Stream Category	**NEW lbs**	**% Waste Stream**	**NEW lbs**	**% Waste Stream**	**NEW lbs**	**% Waste Stream**
Bombs, Warheads	149	1%	10,663	68%	4,729	41%
Explosive Materials	8,299	79%	3,805	24%	1,191	10%
Grenades	394	4%	-	0%	9	0%
Missiles and Rocket Motors	1,086	10%	161	1%	1,828	16%
Flares	9	0%	29	0%	1,578	14%
Primers, Blasting Caps, Detonators	6	0%	15	0%	41	0%
Fuzes	-	0%	94	1%	0	0%
Ammunition	322	3%	844	5%	992	8%
Cartridges	197	2%	121	1%	635	5%
Misc	0	0%	-	0%	674	6%
Total	10,462	100%	15,731	100%	11,677	100%

When evaluating the applicability of alternative technologies, it is important to note that Eglin AFB's waste stream changes with time as munitions under development change to meet evolving DoD mission requirements, hence it is never homogenous. Therefore, while bombs and warheads comprised the largest fraction of waste in 2021 and 2022, explosive materials was the highest in 2020. It is also important to note that the yearly volume of Eglin AFB's waste stream is small with less than 25,000 lb NEW per year

Constituents of Explosive Hazardous Wastes

The composition of typical munition items for each waste category are provided in Table 3 of Eglin AFB's Hazardous Waste Permit Renewal Application for Permit # 006176-HO-12. Characterization of all materials in the Eglin AFB OD waste stream including explosives, chemicals, metals, polymers, etc. is based on waste treatment records from 2020 through 2022 and available documentation for items in military databases. Total breakdown of all materials in a category is complicated by the extreme variety of items in the category and further by developmental items that have no documented analysis available, including those that are classified in nature. Because of Eglin's RDT&E mission, future waste streams may not correlate well with past waste streams. Hence, a detailed breakdown of each item in the treatment records is not only impractical, but would not accurately predict wastes to be expected in the upcoming years.

STEP 2. IDENTIFICATION OF SAFETY ISSUES.

Safety issues present the most significant constraints when evaluating alternative treatment methods for energetic wastes. Once a propellant or explosive is initiated, the energy reactions are

extremely rapid and violent. Therefore, safety is of prime importance when working with propellants, explosives, and ordnance containing energetic materials. One of the fundamentals of safety is to minimize the exposure of people and equipment to energetics.

The safety situation is even more acute due to Eglin AFB's RDT&E mission. In R&D, scientists and engineers are synthesizing new experimental ingredients, formulating new experimental propellants and explosives, and devising new concepts for motors, bombs and warheads. Inherently, R&D pushes the existing knowledge base. Thus, the dangers of R&D items are less defined than with standard stock items. These R&D materials are treated in the safest manner possible to reduce the likelihood of serious injury or death to Eglin AFB workers or any impact to public health and safety.

In T&E, new and existing materials, components, munitions, weapons, weapon systems and concepts are tested and stressed in different environments. In the testing process the propellants and explosives may become damaged, which makes them much more sensitive to thermal and mechanical shock stimuli, including handling, movement and drops. Propellants that have been modestly damaged to 1% voids (a very small amount of damage that is almost impossible to detect via normal x-ray) can have their sensitivity to mechanical shock increased by an order of magnitude. Severely damaged propellants or propellant powders can easily and quickly transition from a burning reaction to a detonation.

Each T&E event is unique, involves a minimum number of needed test articles, and requires its own separate T&E safety document. The safety document may be specific to the test itself or even specific to the individual item under test, depending on safety concerns. Furthermore, storage and handling must be taken into account for these varied test articles, as the requirements are often unique, thus necessitating many magazines to accommodate compatibility issues.

The proximity of these T&E events to the ODU minimizes the handling, transportation and subsequent exposure of personnel and the public to potential explosive mishaps.

Department of Transportation (DOT) and DoD regulations prohibit many of the energetic wastes generated by Eglin AFB from being transported on public roadways, either because they are R&D materials that have not been fully classified for transportation, or because they have been damaged or otherwise altered through T&E activities causing them to have unpredictable stability and sensitivity.

All explosives safety procedures at Eglin AFB follow the DoD requirement set forth in DoD Directive 6055.9E, to "expose the minimum number of people for the minimum time to the minimum amount of explosives…". Operations are evaluated to be within acceptable risk limits, *provided excessive unpacking or manipulation of energetic wastes is avoided.* Each explosive operation is conducted to ensure the exposure time that personnel physically interact with explosives is minimized as much as possible to mitigate the likelihood of an explosive Accident or Incident (A/I).

Additionally, alternative treatment methods that involve pretreatment such as cutting, grinding, or other significant manipulation of the energetic material, would involve unacceptable risk because of the variety and unpredictable explosive hazards associated with Eglin AFB's waste stream. These pretreatment operations would also result in greatly increased manipulation requirements for the energetic wastes, increasing the exposure time of people to explosives and therefore increasing the probability of an accidental injury or death incident.

STEP 3. IDENTIFICATION AND CATEGORIZATION OF ALTERNATIVE TECHNOLOGIES

The Naval Surface Warfare Center, Dahlgren Division (NWSWCDD) Supplementary Information for OB/OD Alternative Treatment Methods was used to identify and obtain information about alternative technologies. Information sources within that document of special note are:

1. Evaluation of Alternative Technologies to Open Detonation for Treatment of Energetic Wastes at the Naval Air Weapons Station, China Lake, California, January 2004.
2. Status of Alternative Technologies to OB/OD Events, Naval Air Weapons Station, China Lake, California, July 2010.
3. Status of Alternative Technologies to OB/OD Events, Naval Air Weapons Station, China Lake, California, July 2012.
4. Status of Alternative Technologies to OB/OD Events, Naval Air Weapons Station, China Lake, California, July 2014.
5. OB/OD Alternatives Meeting. Joint Ordnance Commanders Group, Environmental Subgroup, February 2015
6. Review of International Technologies for Destruction of Recovered Chemical Warfare Materiel, National Academy of Sciences. 2006.
7. Human Health and Ecological Risk Assessment Report for the Open Burn/Open Detonation Unit, Naval Surface Warfare Center Dahlgren, April 2005.
8. Review and Evaluation of Alternative Technologies for Demilitarization of Assembled Chemical Weapons, National Academy of Sciences, 1999.
9. CDC (Centers for Disease Control and Prevention). 2006. M55 Rocket Fire/Explosion Concerns, March 1. Aberdeen Proving Ground, Md.: U.S. Army Chemical Materials Agency.
10. Investigation Report: Donaldson Enterprises Inc., Fireworks Disposal Explosion and Fire, US Chemical Safety and Hazard Investigation Board, April 8, 2011.
11. Pollutant Emission Factors for a Transportable Detonation System for Destroying UXO. UXO Countermine Forum, New Orleans, LA 2001.
12. Disposal Options for the Rocket Motors from Nerve Agent Rockets Stored at Blue Grass Army Depot, National Academies Press. 2012.

13. Santoleri, J.J., Theodore, L. and Reynolds, J. 2000. Introduction of Hazardous Waste Incineration, 2nd Edition. Wiley-Interscience, New York.

The technologies identified as potential alternatives to OD are grouped into two categories: destruction technologies, and recovery and reuse technologies. In addition, pretreatment technologies that facilitate either the removal of energetic material from the casing or the disassembly of munitions are listed (Figure 1). Table 2 is a comprehensive list of the technologies identified by category, with a brief description of each. All identified technologies are included in Table 2, regardless of their level of maturity or their applicability to NSWCDD's energetic waste stream.

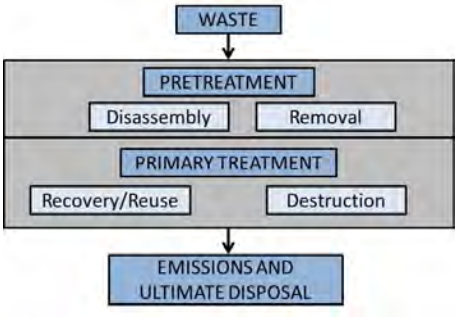


Figure 1. Technology Categories

Table 2. Identified Technologies With Description Summaries.

Technology	Description
Pretreatment: Disassembly	
Flexible Workcell/Robotic Disassembly	Robotics unpack, handle, repack, and help in the disassembly process.
Laser Cutting of Munitions	Ultra-short laser pulses ablate the energetic as an alternative to conventional explosive machining.
Pretreatment: Removal Technologies	
Washout, High-Pressure Waterjet	A high-pressure washout nozzle directs streams of water against the energetic. The energetic is eroded, removed and collected.
Washout, Steam	Steam removes TNT-based explosives
Washout, Carbon Dioxide	A carbon dioxide pellet blaster removes press-loaded explosives
Washout, Liquid Nitrogen	High-pressure liquid nitrogen erodes and thermally spalls propellant from a rotating rocket motor.
Meltout, Microwave	Microwaves melt out TNT-based explosives.
Dry Machining	Energetics are removed from their casings by machining.

Cryofracturing, Cryocycling	Liquid nitrogen freezes energetics or munitions and then fractures them for size reduction or to disassemble small cased munitions.
Ultrasonic Removal	Focused ultrasonic energy fragments the cast-loaded energetics and enables removal. Recovery/reuse would follow.
Primary Treatment: Destructive Technologies	
Open Burn	Described in permit (Most of which is similar to "Contained Burn #2" without treatment of combustion gases.)
Open Detonation	Described in permit
Contained Detonation	Energetics are detonated in a steel chamber, constructed to dampen the blast. After-burning reactions are suppressed to protect the integrity of the chamber. Particulates are filtered from the detonation gases.
Contained Burn #1, Solid Rocket Motors	Rocket motors are burned in a confined chamber. The combustion gases are contained, treated, and released.
Contained Burn #2, Confined Burn Facility	Energetic wastes are burned in a blast-reinforced chamber. The combustion gases are contained, treated, and released.
Incineration, Rotary Kiln	Enclosed incineration. Rotary kiln slowly moves waste from one end to the other. Waste detonates or combusts. Emissions are treated. Uniform waste streams are treated most efficiently. Small explosive items (< 40 grams energetics) with casings are acceptable in some units.
Incineration, Plasma Arc	Molten slag (soil with iron fluxing agent) destroys organic compounds and traps inorganic compounds. Emissions are treated. Enclosed alternative to incineration.
Incineration, Fluidized Bed	Waste is injected into a turbulent bed of hot sand, created by forced air. Emissions are treated. Limited to liquids, slurries and powders with low organic content. Enclosed incinerator.
Oxidation, Base Hydrolysis	Waste is heated to mild temperatures (90 to 150^{0}C) and usually elevated pressures (200 psig) with a strong base (pH >12). Energetic waste is converted to water-soluble, non-energetic products. Resulting solution is still hazardous and must be treated.
Oxidation, Supercritical Water (Hydrothermal Oxidation)	Organic waste, water, and an oxidant (e.g., air or oxygen are subjected to high temperature and pressure (>374^{0}C, >3,000 psig). Organics are decomposed. Very severe operating requirements and usually reserved for the more difficult to treat wastes

Oxidation, Molten Salt	Air and water are injected into a molten salt bed. The product gases are forced to pass through the molten salt before exiting, which results in good retention of metals and acidic gases. Operating temperatures are typically from 850 to 1,000^{0}C.
Oxidation, Electrochemical	An electrochemical cell is used to destroy organic waste. Organic liquids are oxidized either directly by metal ions, or by other oxidizing compounds produced from reaction involving the metal ions. This technology is being considered for primary explosives such as azides and styphnates, but has not been developed for this application yet.
Oxidation, Wet Air	Aqueous phase oxidation is used to treat organic and inorganic wastes at elevated temperatures (150 to 320^{0}C) and pressures (300 to 3,000 psig). Similar to supercritical water oxidation (SCWO), but with slightly lower temperatures and pressures. Limited to slurries and liquids.
Oxidation, Peroxydisulfate	An aqueous process that uses sodium or ammonium-peroxydisulfate to destroy organic liquids or solids.
Oxidation, Adams Sulfur	Organic wastes are reacted in an atmosphere of elemental sulfur vapor at low temperatures. Products are carbon-sulfur residue, hydrogen sulfide gas, and sulfides. Emission must be treated.
Molten Metal	A molten metal medium destroys energetic wastes.
Hypergolic Non-Detonative Neutralization	Bulk energetic wastes are reacted with a hypergolic chemical (the combination would instantly ignite), which neutralizes the energetic waste in a controlled exothermic reaction.
Charged Particle Beam	Energetic electron beams detect and detonate high explosives. Applicable for clearance of unexploded ordnance from military ranges.
Primary Treatment: Recovery and Reuse	
Liquid Ammonia Extraction	Propellant and explosive fuel and oxidizer ingredients are extracted, separated, and recovered using liquid ammonia.
Reuse Solid Propellant for Commercial Mining/Quarry Applications	Reformulation of reclaimed explosives and propellants into commercial blasting explosives for use in mining application.
Commercial Resale	Sale of obsolete U.S. munitions to foreign governments
Commercial Conversion	Chemical conversion of recovered explosives and propellants to form other products
Co-Firing in Boilers	Energetics are desensitized so that they can be co-fired with traditional fuels in commercial boilers for heat.

Actodemil Oxidation	Explosive waste slurry or granular solids are fed into the unit. Oxidation occurs at moderate temperatures (70°C to 90°C) and atmospheric pressure with a potassium hydroxide/humic acid reagent over a period of two to four hours. After hydrolysis, the waste stream is neutralized using hydrogen peroxide. (Actodemil is a patented process of Arctech Inc. based in Chantilly, Virginia.)

STEP 4. TECHNOLOGY SCREENS

Two initial screening criteria were applied to the identified technologies: 1) basic applicability of the technology to NSWCDD's waste stream, and 2) maturity of the technology.

Basic Applicability Screen

Most of the alternatives to OD identified are being developed to treat the growing stockpile of homogenous unusable munitions at production or demilitarization facilities. As a result, technology development is focused on treating a large volume of homogenous munitions. Addititonally, a 17 January 2025 guidance memorandum from the Assistant Secretary of Defense (Installations, Energy and Environment) notes that DoD will prioritize evaluation of alternative technologies at its facilities with a demilitarization mission as those are primarily larger quantity facilities. To support alternative technology implementation at the demilitarization facilities, a study of potential alternative technologies is being performed. Eglin AFB is a RDT&E facility, not a demilitarization facility nor an ammunition plant. Therefore, the Eglin AFB's energetic waste stream is completely mutable, and the opposite of a typical demilitarization facility or ammunition plant. Eglin AFB generates and treats a very low volume of a large variety of energetic wastes, while a typical demilitarization facility or ammunition plant treats a high volume of uniform energetic wastes.

Disassembly

Manual disassembly of the compromised munitions of Eglin AFB's waste stream poses an unacceptable risk to the workforce. Disassembly technologies typically involve assembly line operations, with preprogrammed machinery that can repeat the same task for multiple iterations. Programmable assembly line operations work well for large quantities of homogenous items which are in good to near pristine condition.

The energetic waste stream at Eglin AFB exhibits a complete lack of uniformity regarding geometry, explosive type, fuzing cavity spaces, degree of corrosion/degradation and country of origin. Reprogramming would be impractical if not impossible to adjust for the unique configurations of each item. No assembly line system exists for disassembling recovered munitions to separate the explosive from chemical agents. Similarly, Eglin AFB is unaware of assembly line systems for disassembling compromised munitions from conventional weapons.

Sandia National Labs is attempting to create a prototype system at McAlester Army Ammunition Plant in Oklahoma to disassemble 40mm fixed round munitions. Testing has found that although the munitions were thought to be identical, nose closure threads on the pitch of the projectile varied resulting in the inability of the disassembly machines to unscrew the nose closures. Thus even small differences in the configuration of unstressed munitions prove to be challenging to automated disassembly processes.

Removal

Technologies in the "removal" category are considered ancillary treatments. These technologies must be coupled with a primary treatment technology as a pretreatment of the wastes. Removal technologies are applicable to a wide variety of munitions and munitions components with minor changes to the procedure. Washout by water jet, steam, carbon dioxide, or liquid nitrogen can be done to different munitions by changes to cutting nozzles, pressures and locations of the cuts. However, these technologies would increase risks to ordnance workers since the munitions are unstable or misshapen after testing. Each individual item would have to be assessed on a case-by-case basis to determine, if possible, where to make efficient cuts and how much pressure is required to safely cut open the munition without causing a reaction. The unknown damage resulting from RDT&E coupled with additional handling and exposure required for each munition item poses unacceptable risks to the workforce. The other disadvantage to abrasive water jet cutting is that an additional waste stream is created because the water used in the cutting becomes contaminated with explosives, metal particles, and grit.

Likewise, dry machining evokes serious safety concerns. Dry machining involves the mechanical shearing, sawing or punching of test items to remove fuzes or detonators or to expose explosive fillers. Explosive hazards and safety concerns of an ordnance worker mutilating unstable munitions are the obvious risks. In addition, most of the equipment developed for this application is utilized for a specific munition or specific family of munitions and would not be appropriate for the diverse and evolving waste stream of Eglin AFB.

Microwave meltout involves a process that melts and erodes the explosive. Through unique fixturing, the condensate/explosive mixture is collected and processed by separating/melt kettles and the explosive cast into bricks or flaked. Insensitive munitions composed of polymer bonded explosives present a particularly difficult challenge because they cannot be removed from the munition by autoclave techniques. This method produces large quantities of pink water that would add a hazardous waste stream and require treatment prior to discharge. Additionally microwave meltout is labor intensive and hazardous to the health of operators.

Cryofracture involves the cooling of the munitions in a liquid nitrogen bath, followed by fracture of the embrittled item(s) in a hydraulic press and the subsequent thermal treatment of the fractured munition debris in order to destroy the explosives and decontaminate any residual metal parts (which may be recovered for scrap value). Cryofracture itself is not an alternative to OD, but is a component of a larger process to destroy munitions items which are then treated to

neutralize or drive off the energetic hazard. Cryofracture has been implemented at large demilitarization facilities such as Fort McAlester, Oklahoma. This technology requires a large infrastructure investment. Cryofracture has been demonstrated for industrial-scale, and very specific, applications. Cryofracture has not been demonstrated or tested on heterogeneous, small-scale waste streams resembling what Eglin AFB generates; furthermore, there are additional, safety concerns regarding the unintentional detonation of these munitions as they are crushed, if the liquid nitrogen has not completely inundated the explosive materials. This problem is significantly magnified when attempting to treat non-homogenous items that have undergone destructive testing and/or are experimental explosives developed through various R&D initiatives.

Recycle and Reuse

Propellant or explosive removal is the first step in implementing recycle and reuse processes for solid rocket motors and munitions. Subsequent steps include size reduction and preparation of the material for recycle and reuse. Once it is suitably prepared, the processed propellants and explosives can be introduced into the feed streams of the commercial explosives industry for direct reuse. Alternatively, the high value constituents of these materials can be chemically extracted for reuse.

Once the energetics have been recovered, they may be used as a supplemental fuel in boilers (co-firing) to provide energy or converted into other commercial products for resale such as explosives used in mining. Quarry and mining explosives are generally “ANFO like” materials (ammonium nitrate and fuel oil) and the use of a nonconventional blast explosive (e.g., an explosive removed from a waste munition) would need to be approved by the state’s Fire Marshall. Approval is only given in cases where there is a continuous source of a material, the product is ensured to be safe for the environment and there are industries willing to use the product. Eglin AFB does not process enough material for commercial interests and the waste is mixed and of unpredictable stability.

Two other technologies (liquid ammonia extraction and Actodemil oxidation) use explosives that have been removed from disassembled munitions as a feedstock for the production of propellants or, after neutralization, use as a fertilizer. A large portion of the items in the Eglin AFB waste stream consist of items that have undergone testing and/or experimental propellants and explosives developed through various R&D initiatives. The aging and/or degradation of the energetic material which occurs during these processes could cause it to have increased sensitivity to impact, shock, and thermal conditions and therefore prone to unintentional initiation, explosion, or reaction. Documented cases of fires that occurred during the cutting of rocket motors and the removal of black powder from fireworks have proven that the sensitivity of the explosives is often a significant safety issue for munition items that must undergo disassembly prior to any type of treatment. Due to these safety concerns, the technologies which

require disassembly or removal of the energetic prior to treatment are not appropriate for the Eglin AFB waste stream.

Maturity Screen
The alternative technologies listed in Table 2 are at varying stages of development – ranging from conceptual ideas to commercially available. Technologies in very early stages of development, including those that are in the conceptual idea, feasibility study, or bench-scale stage, have been eliminated from the current evaluation because their degree of success and the potential for implementation cannot be reasonably predicted. Additionally, unproven or immature technologies pose unacceptable safety risks. If any of the technologies eliminated exhibit promising results for development, they can be evaluated in the future.

The following technologies were found to be unproven or immature.

Electrochemical Oxidation
An electrochemical cell is used to destroy organic waste. Organic liquids are oxidized either directly be metal ions or by other oxidizing compounds produced from a reaction involving the metal ions. This process has been proposed as a possible alternative for treating chemical warfare agent but is not applicable to metal parts, energetics, or dunnage. A substantial research and development program for the application of this technology to energetic compounds would be required. No lab-scale or pilot plant demonstration data have been published or are available for evaluating applicability of this technology to the Eglin AFB waste stream. The application of this technology on Eglin AFB's explosive waste stream is currently unproven or immature and will not be further evaluated in this report.

Wet Air Oxidation
Organic materials in a dilute aqueous mixture are oxidized at elevated temperatures and pressures, detoxifying and converting residual organics to carbon dioxide. Despite long residence times, refractory organic compounds remain. Application of this process to the treatment of energetics will require additional research and pilot plant studies. The application of this technology on Eglin AFB's explosive waste stream is currently unproven or immature and will not be further evaluated in this report.

Peroxydisulfate Oxidation
Peroxydisulfate salts can be used to oxidize organic compounds to CO_2. This technology has been proposed as a potential treatment method for wastes generated during chemical agent detoxification. However, this process has not been shown to be applicable to contaminated metal parts or energetics and is not considered appropriate for the Eglin AFB waste stream. The application of this technology on Eglin AFB's explosive waste stream is currently unproven or immature and will not be further evaluated in this report.

Adams Sulfur Oxidation

This process used a patented method that relies on the reactivity of elemental sulfur vapor to destroy organic materials at temperatures of 500 to 600 °C. Liquid (chemical) agent and sulfur vapor are fed to a reactor that is maintained at a constant temperature. The gas leaving the reactor contains nitrogen and unreacted sulfur vapor along with products of the reaction such as carbon disulfide, hydrogen sulfide, carbonyl sulfide, disulfur dichloride, thiophosgene, and hydrochloric acid.

This process was identified as a possible treatment method for disposing of chemical agents (in bulk containers and in munitions) and energetics within the US stockpile. It has been evaluated for destruction of explosives. However, no lab-scale or pilot plant demonstration data have been published or are available for evaluating applicability of this technology to the Eglin AFB waste stream. The application of this technology on Eglin AFB's explosive waste stream is currently unproven or immature and will not be further evaluated in this report.

Molten Metal

Metals such as copper, iron, or cobalt are used at high temperatures (3,000°F) to thermally decompose organic compounds like chemical agent. Inorganics are dissolved to form a slag that is insoluble in the liquid metal and rises to the top of the vessel where it can be removed (skimmed off the top). Gasses from the furnace would be very dirty, containing soot from the metal pyrolysis and possible form slag particulate matter. A separate purifier unit would be needed to clean the gas before it is released. The molten metal furnace and catalytic extraction process are essentially developed technologies as they are very similar to those used in steel production. However, the use of these technologies in the destruction of munitions or propellants has not been tested or evaluated. The application of this technology on Eglin AFB's explosive waste stream is currently unproven or immature and will not be further evaluated in this report.

Hypergolic Non-Detonative Neutralization

Amine compounds are reacted with bulk TNT, RDX, and Comp B, leading to spontaneous burning of the explosive materials supposedly without detonation, deflagration, or uncontrolled cook-off. The high costs of degrading explosives by this method have discouraged further research and development of this technology. Eglin AFB is unaware of any pilot plant demonstration data that have been published or are available for evaluating applicability of this technology to the Eglin AFB waste stream. The application of this technology on Eglin's explosive waste stream is currently unproven or immature and will not be further evaluated in this report.

Charged Particle Beam

Energetically-charged (electron and proton) particle beams can penetrate significant distances into dense media and deposit significant fractions of their energy in the form of secondary electrons, gamma rays, x-rays, and neutrons. Such energy deposition can lead to heating,

melting, material dispersal and thermal shock of energetic materials. It has been shown experimentally that under proper conditions both sensitive and insensitive high explosives can be detonated by electronic beams. However, the technology to efficiently deliver electron beams of sufficient energy and current in the field has not been demonstrated. Research is ongoing at Lawrence Livermore National Laboratory (NAWCWD TP 8559). No lab-scale or pilot plant demonstration data have been published or are available for evaluating applicability of this technology to the Eglin AFB waste stream. The application of this technology on Eglin AFB's explosive waste stream is currently unproven or immature and will not be further evaluated in this report.

Base Hydrolysis Oxidation

Energetic wastes are mixed with a strong base and heated to 90-150°C, causing the waste to be decomposed into a water soluble product. Since all influent waste material must be separated from any non-energetic material, reduced in size so the energetic material can fit through a 1" x 1" mesh, and treated within a slurry, this technology is appropriate only for bulk high explosives and propellants. The base used for the reaction must be periodically replaced and the resulting secondary waste, which is highly toxic and corrosive, must be subjected to additional treatment and disposed of in a secure landfill.

This technology requires the energetic material to be removed from munitions and, due to the safety concerns outlined above, would not be applicable to cased munitions. However, this technology may be applicable to bulk high explosives and bulk propellants. The processes require further testing and development to ensure explosives safety of hydrolysis reaction (NAWCWD TP 8559). No lab-scale or pilot plant demonstration data have been published or are available for evaluating applicability of this technology to the Eglin AFB waste stream.

Tooele Army Depot currently uses base hydrolysis to demilitarize stocks of a very specific type of item, namely aluminum bodied cartridge actuated devices and propellant actuated devices (CADs and PADs).

PADs include such devices as catapults, rocket catapults and rocket motors which are used in military aircrew escape systems. In conjunction with various CADs and other life-support equipment, PADs power the ejection system utilized to eject aircrew members safely from disabled aircraft. Both CADs and PADs contain energetic material along with a mechanical or electronic actuating component. CADs and PADs come in a wide variety of odd shapes and sizes but normally contain only very small amounts of energetics (usually propellants).

The CAD/PAD demilitarization operation at Tooele Army Depot is not applicable at Eglin AFB for two main reasons. For one, this technology requires pre-treatment to neutralize the energetics and develop a slurry. For safety reasons, pretreatment is not appropriate for Eglin AFB's waste stream. Secondly, CADs and PADs are not a normal part of Eglin AFB's waste stream.

Molten Salt Oxidation

A bed of molten salt, usually sodium carbonate, oxidizes organic material at 900 – 1000°C. Volatile organic compounds in the waste feed material are broken up into their constituents; chlorine, sulfur, and phosphorous, are converted into inorganic salts and retained within the salt bed. Inorganic compounds and heavy metals sink into the melt and accumulate at the bottom where they remain in-situ. This accumulation allows for the possibility of recovering and recycling certain metals from the melt during melt disposal. This technology has not been fully developed for technology transition. The units were tested on small scale and met with explosives safety concerns with product limitations in waste preparation for treatment, reactive residue formation and runaway reactions and environmental concerns with the volumes of hazardous waste generated verses open burning an open detonation. Operational concerns include the need for expertise by users, a slow feed stream process, and significant handling of explosive waste prior to treatment. Eglin AFB is unaware of any applications of this technology on waste streams similar to Eglin AFB's. The application of this technology on Eglin AFB's explosive waste stream is currently unproven or immature and will not be further evaluated in this report.

Supercritical Water Oxidation

The waste feed stream is mixed with an oxidant (air, oxygen, or hydrogen peroxide) in water at pressures and temperatures above the critical points (374°C and 22.13MPa). At this point, the property of water as a polar solvent is diminished and its solubility behavior is reversed allowing for a single-phase reaction between an aqueous waste material and a dissolved oxidizer. The reactions are enclosed within a pressure vessel maintained at 400-650°C and occur relatively quickly from only a few seconds to several minutes. Solid feed waste must be pre-treated by either dissolving or atomizing into a water solution mixed with an oxidizer such as hydrogen peroxide. Salts within influent waste will precipitate within the oxidation reactor. The unit requires an off-gas treatment facility.

Supercritical water oxidation (SCWO) systems have been designed to treat secondary organic aqueous-based wastes at a few locations. For example, a SCWO system was evaluated for the Blue Grass Chemical Agent-Destruction Pilot Plant (BGCAPP) to process chemical warfare agents and energetic hydrolysates from chemical weapons stored at Blue Grass Army Depot; however, it was determined that SWCO has not yet been demonstrated functional in a production environment. A Korean SCWO facility, operated by Hanwha Chemical, was developed to treat secondary wastewater from a dinitrotoluene production plant. Treatment by SCWO requires preparation methods such as disassembly followed by grinding or alkaline hydrolysis to produce an aqueous waste stream. As outlined above, disassembly and processing of stressed and deformed munitions poses technical challenges and unacceptable safety risks, which would make SCWO inappropriate for Eglin AFB's waste stream. Eglin AFB is unaware of any applications of this technology on waste streams similar to Eglin AFB's. The application of this technology

on Eglin AFB's explosive waste stream is currently unproven or immature and will not be further evaluated in this report.

Fluidized Bed Incineration

A fluid bed is a dense, uniform suspension of solids (usually sand) maintained in a turbulent motion by upward moving air, behaving as a fluid. When fluidized, all particles are suspended and fully exposed to the gas stream, increasing the surface area available for reaction. Combustible solids are dispersed rapidly and are held for a long enough time to achieve high combustion efficiencies. Influent solid waste requires significant size reduction (shredding) and the removal of alkali metals. Solid waste feed particles in a bubbling fluidized bed combustor and a rotating fluidized bed combustor must be <10mm and <30mm respectively. Off-gases can be treated; however, effluent products can contain high amounts of mercury salts. The process requires a long start-up time to bring the bed to the required temperature and the bed material must be regularly replenished. This technology requires pretreatment processes which may cause accidental detonation of the feed stream, introducing safety hazards and risks to personnel or equipment. Eglin AFB is unaware of any applications of this technology on waste streams similar to Eglin AFB's. The application of this technology on Eglin AFB's explosive waste stream is currently unproven or immature and will not be further evaluated in this report.

Plasma Arc Incineration

Electric current heats gasses to 5,000 – 15,000^{o}C, dissociating waste into atomic elements which can re-combine into environmentally safe products. This concept has been proven for municipal waste where organic waste is heated and converted into a gas which is fed into a plasma arc for refining to be used for electricity generation. Remaining solid waste is fed into another plasma arc to be melted and cooled into an inert slag. This process has the potential to create volatile metals which must be sent to appropriate air scrubbers for off-gas treatment.

There were two plasma arc units tested by the Army, one at Hawthorne Army Depot and one at NSWC Crane. The Hawthorne unit was called the Plasma Ordnance Demilitarization System (PODS). MSE Technology Applications, Incorporated designed and constructed the PODS for Hawthorne Army Depot to treat small caliber, and hand-emplaced pyrotechnics, smokes, and flares, canisters removed from 155mm projectiles, and munition components containing small quantities of high explosives. The system at Hawthorne was unsuccessful and is currently inactive. NSWC Crane tested a Mobile Plasma Treatment System (MPTS). The MPTS was a smaller system that was designed to be moved from installation to installation. The MPTS was never proven out, nor was it ever used for production demilitarization operations. The MPTS at Crane has been dismantled. The application of this technology on Eglin AFB's explosive waste stream is currently unproven or immature and will not be further evaluated in this report.

Ultrasonic Fragmentation and Laser Cutting

Ultrasonic fragmentation and laser cutting are immature and unproven technologies and will not be explored further.

Table 3. Summary of the Results of the Applicability and Maturity Screens.

Technology	Determination
Pretreatment: Disassembly	
Flexible Workcell/Robotic Disassembly	Not appropriate for Eglin AFB
Laser Cutting of Munitions	Not appropriate for Eglin AFB; immature technology
Pretreatment: Removal Technologies	
Washout, High-Pressure Waterjet	Not appropriate for Eglin AFB
Washout, Steam	Not appropriate for Eglin AFB
Washout, Carbon Dioxide	Not appropriate for Eglin AFB
Washout, Liquid Nitrogen	Not appropriate for Eglin AFB
Meltout, Microwave	Not appropriate for Eglin AFB
Dry Machining	Not appropriate for Eglin AFB
Cryofracturing, Cryocycling	Not appropriate for Eglin AFB
Ultrasonic Removal	Not appropriate for Eglin AFB; immature technology
Primary Treatment: Recovery and Reuse	
Liquid Ammonia Extraction	Not appropriate for Eglin AFB
Reuse Solid Propellant for Commercial Mining/Quarry Applications	Not appropriate for Eglin AFB
Commercial Resale	Not appropriate for Eglin AFB
Commercial Conversion	Not appropriate for Eglin AFB
Co-Firing in Boilers	Not appropriate for Eglin AFB
Actodemil Oxidation	Not appropriate for Eglin AFB; and Immature technology
Primary Treatment: Destructive Technologies	
Oxidation, Electrochemical	Immature technology
Oxidation, Wet Air	Immature technology
Oxidation, Peroxydisulfate	Immature technology
Oxidation, Adams Sulfur	Immature technology
Molten Metal	Immature technology
Hypergolic Non-Detonative Neutralization	Immature technology
Charged Particle Beam	Immature technology
Oxidation, Base Hydrolysis	Immature technology
Oxidation, Molten Salt	Immature technology
Technology	Determination

Primary Treatment: Destructive Technologies Continued	
Oxidation, Molten Salt	Immature technology
Oxidation, Supercritical Water	Immature technology
Incineration, Fluidized Bed	Immature technology
Incineration, Plasma Arc	Immature technology
Contained Detonation	Candidate for evaluation
Contained Burn #1, Solid Rocket Motors	Candidate for evaluation
Contained Burn #2, Confined Burn Facility	Candidate for evaluation
Incineration, Rotary Kiln	Candidate for evaluation

STEP 5. REVIEW OF REMAINING ALTERNATIVE TECHNOLOGIES

This section provides information on current OD operations followed by the technologies listed in Table 3 that were found to be suitable candidates for further evaluation. The intent of these descriptions is to provide an overview of the technology, its developmental status, and a general understanding of how the technology fits into the treatment energetic wastes. Detailed qualitative and quantitative data are typically not provided because consistent data do not exist for the technologies. Available data vary significantly with the composition of the waste feed streams, throughput, operating conditions, and the use of scrubbing and filtration systems. Inclusion of these inconsistent data could mislead the reader into assuming that a qualitative and quantitative comparison of technologies exists, when in fact it does not. An in-depth analysis, evaluation, and comparison of existing data for specific technologies would be required before a final decision to implement an alternative technology.

Each technology description consists of the following outline:

Summary: Describes how the technology works

Current status: Describes current reported status of development or implementation of the technology

Applicability to Eglin AFB energetic wastes: Provides analysis of % by net explosive weight and gross weight of waste that could theoretically be treated by the technology if all considerations of space, costs, mission impacts, etc. could be successfully mitigated.

Impact to Eglin AFB's mission: Describes the considerations of locating another explosive operation or facility at Eglin AFB.

Environmental Releases: Describes environmental emissions and secondary waste streams.

Safety: Describes the safety risks posed to the Eglin AFB workforce.

OPEN DETONATION

Summary: The methods for conducting OD are described in depth within this permit application.

Current status: OD are mature technologies and are the current methods of treatment for Eglin AFB energetic wastes at Eglin AFB.

Applicability to Eglin AFB energetic wastes: 100% of EGLIN AFB's energetic waste stream is currently treated using typical OD. The ODU is collocated with mission RDT&E. OD requires minimal handling of altered, damaged, and/or experimental energetics.

Impact to EGLIN AFB's mission: OD treatment activity prevents concurrent RDT&E work if OD is also in progress. Routine OD operations are planned well in advance in an effort to mitigate scheduling conflicts to the RDT&E mission. Due to the close proximity of the OD units, minimal site preparation is required. The area is already secured with qualified and certified personnel on-hand so the handling, movement and overall exposure to explosive hazards are minimized to the greatest degree possible.

Environmental Releases: Environmental releases from Eglin AFB's open detonation activities were evaluated in the previously submitted Human Health and Ecological Risk Assessment (HHRA) Report for Open Detonation are being re-evaluated as part of an updated HHRA. The results of the previously submitted conservative risk assessment indicate that OD activities are not expected to pose risks to human health or ecological risk assessors. The conservative assumptions used in this analysis included worst-case emissions, and sensitive groups of human and ecological receptors. The Human Health and Ecological Risk Assessment is being updated to ensure continued protection to receptors.

Safety: Strict handling procedures are in place for OD activities in an effort to mitigate risks/hazards to acceptable levels to prevent a mishap from occurring. See Step 2 of this report for details pertaining to risk management.

CONTAINED DETONATION

Summary: Contained detonation of munitions can be performed in detonation chambers. The munition to be destroyed is bundled with donor charges and carried by hand into a detonation chamber where it is suspended by straps alongside suspended plastic bags filled with water. The detonation is initiated with electric blasting caps. The chamber is designed to withstand the detonation pressure and fragmentation. Expanding gasses are vented and cooled within an expansion tank before being filtered through an air pollution control unit for discharge to the atmosphere. Airborne particulates are collected on filters in the final stage. Filters create a secondary waste stream and must be removed as hazardous waste. The systems can be transportable or fixed.

Emissions generated during the detonation are vented to an expansion chamber to reduce pressure and then to a baghouse system to filter out particulates down to 0.5 µm. The remaining emissions are vented to the air. Noise, overpressure, particulates greater than 0.5 µm, and thermal and debris hazards are significantly reduced. The water quenches the after-burning, which leads to an increase in products of incomplete combustion that may not be captured by the particulate filters.

Current status: This technology is currently in use by some DoD organizations and was initially believed to represent a potential treatment alternative for some of the items Eglin AFB treats via OD. However, performance has been mixed. For example, NSWC Crane procured a D-200 model contained detonation chamber (CDC) over 10 years ago (2004). Crane conducted a stress test on the chamber prior to conducting treatment but, due to failures of the door and walls, the CDC has never been used for treatment at Crane. The structure is currently being utilized as an explosive staging site to support demolition operations as well has a holding cell for the temporary storage of material potentially presenting an explosive hazard (MPPEH).

NSWCDD evaluated a T-30 Donovan Chamber that is operated by the Edgewood Chemical Biological Center (ECBC) in Maryland for use on the NSWCDD treatment log items. Another CDC has been constructed at the Blue Grass Army Depot (BGAD), its specifications are very close to the ECBC unit although BGAD has found the CDC to be of limited value. The estimated NEW limits are 40 lbs for ECBC and 42 lbs for BGAD. The following observations were made:

- Restrictions on use of the chamber include:
    a. The upper explosive limit is 42 pounds NEW, including donor charges. Assuming a 1:1 munition item to donor charge ratio, only munition items less than 21 lb NEW could be treated in the unit;
    b. The unit would not be used for gun propellants which are generally considered inappropriate for detonation because donor charges required to detonate them exceed the weight of the waste propellant, often by a ratio of 3:1. Excessive amounts of donor charges would be counter to the waste minimization goals of RCRA. Gun propellants are most efficiently treated in a burn pan or propane burn unit depending on the quantity;
    c. Except when small items could readily be formed into a bundle, the unit would not be able to treat items less than 0.5 lbs NEW (which require more donor charge than waste) as efficiently as they are being treated in the propane burn unit;
    d. The unit would not be able to treat range residue since these items have unknown quantities (NEW) of energetic contamination and require a large donor charge to ensure that the suspect residue is completely eliminated in the OD reaction.

- During detonation operations pea gravel on the floor of the detonation chamber becomes pulverized by detonations and collects detritus from the detonated items. ECBC disposes of the pea gravel as hazardous waste at the time of breakdown. This increases the quantity of hazardous waste generated at the facility and is counter to the waste minimization goals of RCRA.
- The portable T-30 unit requires a week to 10 days each for system set-up and take-down. Suspending or terminating our mission to accommodate this lengthy schedule is untenable (see further discussion under the below mission impact section).
- Munitions that are large in size or contain a large amount of energetic material must be reduced in size and/or net explosive weight before loading into blast chamber. The munitions must also be stable enough for loading into the CDC. Explosive waste generated at Eglin AFB may not safely be cut or dismantled due to the need to minimize handling resulting from the increased risk of imperceptible damage to the items from previously conducted testing.
- Munitions with a significant amount of casing metal would fragment during detonation and accelerate wear and tear on replaceable armor plates that are suspended on the inside of the chamber. ECBC estimates a week long process to replace these plates.
- Due to the vulnerability of a portable CDC unit's components to the external impacts of adjacent explosive operations at Churchill Range, concurrent RDT&E operations at the EEA will be impacted by set-up and/or CDC unit removal. Likewise, a permanently located CDC unit would further constrain testing due to the unit's footprint encroachment as a it would be permanently exposed site to adjacent explosive RDT&E operations.

Applicability to Eglin AFB energetic wastes: The potential to treat approximately 10-79% of the annual NEW based upon 2020 to 2022 treatment data. However, the annual amounts are highly variable year to year both in amount and waste type

Specifications for an operational CDC at Blue Grass Army Depot (BGAD), Kentucky and similarly sized "Donovan Chamber" at ECBC were used for this analysis.

The BGAD CDC has an explosive limit of 42.5 pounds net explosive weight (NEW) including donor charges. Following items would not be able to be treated by this type of unit:

- NEW greater than 21 lbs—with donor charge these items would exceed the explosive capacity of the CDC;
- Gun propellant—these items are generally considered inappropriate for detonation because donor charges required to detonate them will exceed the weight of the waste propellant;;
- Small items less than 0.5 lb NEW—require more donor charge than waste;

- Range residue— these items can have unknown quantities (NEW) of energetic contamination and typically require a large donor charge to ensure that the suspect residue is completely eliminated in the OD reaction.

Review of the 2020-2023 waste stream categorization yields little potential to apply this technology.

Impact of a Transportable Confined Detonation Chamber to Eglin AFB's mission: ECBC estimates a week to 10 days is required for setup before their unit is ready for detonations. This includes rigging and moving the units into location at the EEA; receiving and installing a truckload of sand for use between inner and outer walls of the detonation chamber; receiving and installing pea gravel about 10 inches deep in the detonation chamber; setup; inspection and routine check-out and minor adjustments; and fueling. Typical OD operations at Eglin AFB are conducted quarterly over one day. Evaluation of range utilization indicates there are very few additional days available for portable treatment operations, and finding two consecutive days was improbable. It would be unlikely to rearrange the RDT&E schedule to accommodate the 7-21 consecutive days required to perform portable OD operations. Thus, from an RDT&E mission range schedule perspective, portable CDC units are infeasible for use at Eglin AFB.

Impact of a Permanently Sited Confined Detonation Chamber to Eglin AFB's mission: Siting of a permanent facility is not feasible. If a Donovan chamber similar to the ECBC unit or the BGAD facility were permanently sited, the facility could take years to construct, provided a Department of Defense Explosives Safety Board (DDESB) site approval were granted. Prior to construction, the area would have to be screened for UXO, in itself a slow and cumbersome process. Because concurrent ordnance and non-ordnance operations cannot be performed, either the construction time would have to be extended significantly to accommodate scheduled mission RDT&E or construction would have to be performed after-hours, raising security and safety issues. Either option would cause considerable operational delays. Suspending or terminating our mission to accommodate construction is infeasible.

Environmental Releases: Contained detonation chambers have the potential to reduce the emissions of metals and particulates. Emissions generated during the detonation are vented to an expansion chamber to reduce pressure and then to a baghouse system to filter out particulates down to 0.5 µm. The remaining emissions are vented to the air. Noise, overpressure, particulates greater than 0.5 µm, and thermal and debris hazards are significantly reduced. The water quenches the after-burning, which leads to an increase in products of incomplete combustion that may not be captured by the particulate filters. Additionally, the confines of the chamber also inhibit complete combustion.

Secondary waste streams include the filters, the pea gravel, and wastes from cleaning the inside of the detonation chamber or exhaust handling components.

Safety: Significantly more handling would be required to treat Eglin AFB's waste stream if contained detonation was adopted.. Increased handling and safety risks include factors such as:

- Additional transport of items pending treatment may be required pending the location of the portable or permanent contained detonation chamber. The limited capacity of contained detonation chambers requires multiple trips to the chamber from the magazine where items are stored and the magazine where donor charge is stored vs. one trip to each magazine for OD. This inherently increases risk to all involved.
- When considering operating a permanent or portable detonation chamber, existing technologies (e.g. Donovan Chamber) do not have the explosive capacity to meet or match the current 1,000lb limit at the Churchill OD site. The maximum NEW that existing detonation chambers are able to safely handle at one time is 40 to 42 lbs NEW. This is only 1.4% of the current limit for OD at Eglin AFB. The small capacity of a detonation chamber would require multiple detonation chamber operations to match a single OD explosive operation. For example, if ten (10) 155MM projectiles needed to be thermally treated in the Detonation Chamber, it would require ten separate detonations versus one at the current OD site. This translates to multiple explosive movements to the Detonation Chamber site, vice a single Blasting cap preparation and priming into the donor explosives of a treatment shot is the most dangerous aspect of a typical demolition, as it is the most likely time when an ordnance worker can become fatally injured. An OD site demolition operation involving ten 155MM projectiles would require just two blasting cap work-ups for this single OD event, whereas a Detonation Chamber demolition operation involving ten 155MM projectiles would require twenty blasting cap work-ups for ten separate detonation events. Couple this danger with that of items that have been put under stressful T&E, and it quickly becomes apparent that use of a detonation chamber poses an unacceptable increase in risk to human health for Eglin AFB workers and is a direct violation of DoD Directive 6055.9E.
- Certified ordnance workers would be required to load the post-test items into the chamber. In addition, a single entry door is utilized for accessing the chamber. This limited access point may present a handling challenge based on lifting and push/pull limits as identified in MIL-STD-1472G (Department of Defense Design Criteria Standard: Human Engineering). Limits are identified which show the maximum design weight limits for loads lifted, lowered, or carried while being grasped by two hands. The lifting and push/pull requirements may restrict handling operations for negotiating a single entry door.
- There is a greater risk for the generation of static electricity with the introduction of a metal enclosed chamber. Grounding systems would need to be implemented and tested prior to use.

- The contained detonation chamber limits on net explosive weight would require that contained detonations be conducted in smaller batches than current OD practices. An increased number of operations would increase the number of entries and exits from explosive storage magazines, travel and iterations for set-up, to include placement of detonators, initiators, squibs, blasting caps or other initiating devices. The placement of such detonators is inherently dangerous, significantly increasing the risk to human health and safety.
- Additional handling would be required during post treatment in the event of an incomplete detonation. Unconsumed waste will need to be collected in the contained chamber with limited lighting and equipment maneuverability which could make inspection challenging and increases safety risks to the workforce. The post treatment items may need to be removed from the chamber to adequately assess and perform inspection/verification procedures on the effectiveness of the treatment event. The chamber contains contaminated residuals including pea gravel which must be replaced as part of the overall treatment process.

CONTAINED BURN #1, SOLID ROCKET MOTORS

Summary: This technology involves burning rocket motors at very low pressures, without nozzles, in a confined chamber. Emissions are collected and then processed through a series of quenching and scrubbing chambers to remove particulates, acid gases, and organic contaminants.

Current status: Two facilities were developed and demonstrated at China Lake: the Modified Contained Burn Assessment Test facility for strategic rocket motors, and the Tactical Demilitarization Test facility for the lead-containing Shillelagh rocket motor and for composite propellant rocket motors. This capability was demonstrated on three types of rocket motors: a large rocket motor containing 17,450 pounds of Class 1.1 hazard classification propellant (mass detonating), a lead-containing rocket motor with 11 pounds of propellant, and an ammonium-perchlorate-containing rocket motor with 60 pounds of propellant. Two separate filtration systems were developed and demonstrated, one to separate out the heavy metals (lead) and one to neutralize the hydrochloric acid produced by the ammonium perchlorate.

Applicability to Eglin AFB energetic wastes: Rockets and missiles subjected to the types of testing routinely conducted are assumed to have cracked propellant castings and therefore unsafe for controlled burning or even nozzle removal or any disassembly operations. Therefore, this technology is not suitable for any (0%) of NSWCDD's typical rocket motor wastes.

Impact to Eglin AFB's mission: Siting of a permanent facility is infeasible at the relatively compact EEA, which is already fully populated with other explosive operating facilities and RDT&E activities, all requiring explosive safety quantity distance separation from other facilities and operations, plus maintenance of proximate foliage and land use.

Environmental Emissions: Gaseous and particulate emissions from the combustion process are stored in a holding tank for later processing before release into the environment. Handling is minimized, but gas storage capacity can be a limiting factor. Secondary hazardous wastes include filters and wastes from cleaning the inside of the chamber.

Safety: Not evaluated since this technology is not appropriate for any portion of Eglin AFB's waste stream.

CONTAINED BURN #2, CONFINED BURN FACILITY

Summary: This technology involves burning waste propellants and small explosive munitions in a chamber. The chamber is designed to contain an unintentional detonation. Emissions are contained, treated using conventional pollution control equipment, and released to the environment.

Current status: A pilot-scale contained burn facility unit was attempted at Naval Surface Warfare Center Indian Head Division on a 10-pound scale; however, the oxygen supply design for complete combustion and gas temperature control were never completed. Since small munitions are likely to detonate rather than burn, the design of the contained burn system must consider the chamber damage that could occur from the fragmentation of metal casings and high burn temperatures required for the smokeless powders/propellants. Research, development, and on-site demonstration of a full-scale treatment unit have not yet been completed. A contained burn facility will be used at Camp Minden, LA to treat over 15 million pounds of M6 propellant and approximately 320,000 pounds of Clean Burning Igniter that will test the concept of full-scale treatment of uniform waste streams.

Applicability to Eglin AFB energetic wastes: When and if this technology becomes available, it may be appropriate for a portion of Eglin AFB's energetic wastes, assuming this technology is appropriate for gun propellants and smokeless powder and that Eglin AFB has that waste stream or that it can adequately handle small munitions. Eglin AFB's small munitions ranged from 3%-8% of the waste stream from 2020 to 2022. As noted regarding explosive material potentially treated in contained detonation, the small munitions quantity is highly variable in both quantity and type year to year.

Impact to Eglin AFB's mission: Siting of a permanent facility is infeasible; refer to the siting requirements and constraints as detailed in the CDC evaluation.

The time required for post-combustion cleanup of the combustion chamber would decrease processing throughput. A portable facility would also impose the same mission impacts as described for the CDC.

Environmental Emissions: Gaseous and particulate emissions from the combustion process are stored in a holding tank for later processing before release into the environment. Handling is

minimized, but gas storage capacity can be a limiting factor. Secondary hazardous waste streams include the filters and wastes from cleaning the inside of the chamber.

Safety: Increased handling and safety risks would be similar to those for the CDC.

ROTARY KILN INCINERATION

Summary: The waste is fed into the rotary kiln through either a continuous or positive feed system. The kiln rotates, slowly moving the waste from one end to the other. The waste detonates or combusts, becomes part of the flue gas that leaves the kiln, and goes to the secondary combustion chamber. From the secondary combustion chamber, the flue gas is quenched, then scrubbed and filtered through a bag house before it is discharged. Another type of rotary kiln is the "Deact" furnace, a modified Ammunition Peculiar Equipment (APE) Model 1236 furnace designed to handle grenades, fuzes, and cut up hardware from pyrotechnics, white phosphorous, riot control devices, colored smoke munitions, and small explosive items. The APE 1236 can also be used to deactivate bulk energetics, small arms, rocket motors and other munitions which can be cut into pieces shorter than 10 inches to allow them to pass through the feed chute. The M1 version of the APE-1236 has been upgraded with a state-of-the-art bag house, afterburner, modern control circuitry, fugitive emission control, and an automatic feed system. Disadvantages include high capital and operating costs, highly trained personnel to ensure proper operation, frequent replacement of the refractory lining if very abrasive or corrosive conditions exist in the kiln, and the generation of fine particulates (which become entrained in the exhaust gases) due to the cascading action of the burning

Current Status: This technology is considered to be mature for small arms ammunition, small munitions, and bulk energetics. It is capable of processing up to ~40 grams of confined explosives per item. Several Army bases operate rotary kiln incinerators.

Applicability to Eglin AFB energetic wastes: Rotary kiln furnaces, such as the APE, are configured to specific munitions and configurations. The feedrate and other settings must be retooled for each munition type. This technology is appropriate for large volumes of homogeneous waste. Since none of Eglin AFB's waste stream is homogeneous or continuous, 0% of Eglin AFB's waste is appropriate for a rotary kiln incinerator.

Impact to Eglin AFB's mission: Siting of a permanent facility is infeasible; refer to the siting requirements and constraints as detailed in the CDC evaluation.

Environmental Emissions. Incinerator off-gas requires treatment by an air pollution-control system to remove particulates and neutralize and remove acid gases (HCl, NO_x, and SO_x). Baghouses, venturi scrubbers, and wet electrostatic precipitators remove particulates; packed-bed scrubbers and spray driers must be installed to remove acid gases. The furnace is equipped with conveyors and feed systems, and most are also equipped with air pollution control equipment to limit gaseous pollutant emissions by removing particulates and hazardous gaseous wastes such as

HCl, NOx and SOx. Rotary kiln designs incorporate high-temperature seals between the stationary end plates and rotating section. The seals are inherently prone to leaks, which creates the potential to release unburned wastes. The kilns are almost always operated at a negative pressure to circumvent this problem; however, difficulties often still arise when batches of waste are fed semi continuously. This phenomenon is known as puffing and poses a major problem if toxic or otherwise hazardous materials are being burned (Ref. 11). Few atmospheric filtration devices are capable of handling the extreme changes in pressure and flow rate that occur during a large detonation event. Also, unstable and inconsistent waste stream increases chances of "puffing." Secondary waste streams would include fly ash and filters.

Safety: Not evaluated since this technology is not appropriate for any portion of Eglin AFB's waste stream.

STEP 6. EVALUATION OF ALTERNATIVE TECHNOLOGIES.

OD is currently the only treatment methods that can safely and effectively treat all of Eglin AFB's energetic waste. Of the reviewed alternatives, only the contained detonation chamber and a confined burn facility have the potential to treat any portion of Eglin AFB's energetic wastes. It is important to note that while these technologies have the potential to treat a small portion of Eglin AFB's wastestream, the wastestream is variable and historical data may be a very poor predictor of the makeup the wastestream in future years based on the year-to-year variability of Eglin AFB's mission. Contained detonation chambers have a poor performance history and have the potential for capacity derating over time with use, and contained burn technology is still being developed for broader applications. Rotary kiln incinerator technology is not appropriate for any portion of Eglin AFB's waste stream. A summary table of the evaluated technologies is provided below.

Table 4. Summary of Evaluated Technologies

Technology	Maturity	Applicability to EGLIN AFB waste stream (% NEW)	Environmental releases	Safety
OD	Mature	100% per year	Contaminants of potential concern listed in Permit Application	Risk hazards mitigated
Contained Detonation	Limited use within DoD; performance has been mixed	10-79% per year; highly variable quantity and type year to year of	Contaminants of potential concern are the same as for open detonation; empirical emissions data not available	Increased safety and handling risks over OD
Contained Burn	Full-scale treatment for M6 propellant and clean burning igniter is being tested at Camp Minden	3-8% per year; highly variable quantity and type year to year	Contaminants of potential concern are the same as for open burning; empirical emissions data not available	Increased safety and handling risks over OD
Rotary Kiln Incinerator	Several Army bases operate rotary kiln incinerators for demilitarization	0%	Contaminants of potential concern are the same as for open burning or open detonation; empirical emissions data not available	Not evaluated since this technology is not appropriate for EGLIN AFB's waste stream

CONCLUSION

None of the identified alternative technologies are suited to address Eglin AFB's energetic waste stream. OD remains the safest, most flexible, simplest, and most effective method for treating Eglin AFB's energetic hazardous waste stream, and the only treatment method that does not negatively impact the mission. In addition, Eglin AFB is developing a formal risk assessment to evaluate human and environmental impacts from the ODU. All assumptions concerning treatment frequency, unit operation, and waste stream constituents will be defined and used to establish permit conditions which will ensure the unit is operated in accordance with the environmental performance standards established in 40 CFR Part 264.

FUTURE EFFORTS

Although this effort was unable to identify any feasible alternatives to the OD of energetic wastes at Eglin AFB, technology development is far from stagnant. Alternatives to OD are continuously being reviewed at the DoD level for applicability to the military's energetic waste streams. As appropriate alternatives are identified at the DoD level, Eglin AFB will evaluate

each for applicability to the Eglin AFB explosive waste stream and coordinate with the DDESB accordingly. The Eglin AFB energetic waste stream will continue to be monitored for changes to the energetic waste stream mix that could make alternatives more applicable.

Appendix G Human Health Risk Assessment (HHRA)

Human Health and Risk Assessment

Open Burn/Open Detonation Units
Range C-52 North and Range C-62
Eglin Air Force Base, Florida
Operational Permit No. 006176-HO-007

Prepared For:
Eglin Air Force Base
96 CEG/CEIEC
700 Range Road, Building 592
Eglin Air Force Base, Florida 32542

Prepared by:
LRS Federal, LLC
8221 Ritchie Highway, Suite 300
Pasadena, Maryland 21122
(410) 544-3570

Prepared Under Contract to:
Air Force Civil Engineer Center
Contract Number: FA8903-15-F-0006

February 2019

This page intentionally left blank.

TABLE OF CONTENTS

1.0 HAZARD IDENTIFICATION 1
1.1 Available Data 1
1.2 Selection of Chemicals of Potential Concern 2
1.3 Exposure Point Concentrations 3
1.4 Fate and Transport Modeling 3
2.0 EXPOSURE ASSESSMENT 4
2.1 Human Health Conceptual Site Model 4
2.1.1 Groundwater 4
2.1.2 Groundwater Discharge to Surface Water 5
2.2 Exposure Point Concentrations 5
2.2.1 Onsite Groundwater 5
2.2.2 Groundwater Discharge to Surface Water 6
2.3 Exposure Equations and Parameter Values 6
3.0 TOXICITY ASSESSMENT 7
3.1 Sources of Toxicity Values 7
3.1.1 Adverse, Non-cancer Health Effects 7
3.1.2 Carcinogenic Effects 8
4.0 RISK CHARACTERIZATION 10
4.1 Future Onsite Site Worker Non-Cancer Hazards and Cancer Risks 10
4.2 Future Hypothetical Onsite Resident Non-Cancer Hazards and Cancer Risks 10
4.3 Offsite Recreator Non-Cancer Hazards and Cancer Risks 11
4.4 Offsite Resident Non-Cancer Hazards and Cancer Risks 11
5.0 UNCERTAINTIES 12
5.1 Environmental Sampling and Analysis 12
5.2 Exposure Assessment 12
5.3 Toxicity Assessment 13
6.0 ALTERNATE CONCENTRATION LIMITS 14
6.1 Comparison of Site Data to ACLs 14
7.0 SUMMARY 16
8.0 REFERENCES 17

FIGURES

Figure 1 Site Location

Figure 2 Range C52N Potentiometric Contour Map – May 2018

Figure 3 Range C-62 Potentiometric Contour Map – May 2018

TABLES

Table 1 Occurrence, Distribution, and Selection of Chemicals of Potential Concern in the OB/OD Units

Table 2 Selection of Exposure Pathways

Table 3.1 Exposure Point Concentration Summary: Groundwater at C-52N

Table 3.2 Exposure Point Concentration Summary: Groundwater at C-62

Table 4 Values Used for Daily Exposure Calculations (Ingestion and Dermal Contact) - Reasonable Maximum Exposure

Table 4.1 Dermal Absorbed Dose (DAevent) Calculations

Table 5 Non-Cancer Toxicity Data – Oral/Dermal

Table 6 Cancer Toxicity Data - Oral/Dermal

Table 7.1.1 Calculation of Chemical Cancer Risks and Non-Cancer Hazards for a Current/Future Adult Onsite Worker Exposure to Groundwater at C-52N

Table 7.1.2 Calculation of Chemical Cancer Risks and Non-Cancer Hazards for a Current/Future Adult Onsite Worker Exposure to Groundwater at C-62

Table 7.2.1 Calculation of Chemical Cancer Risks and Non-Cancer Hazards for a Future Adult+Child (Cancer Risk), Child (Non-Cancer Hazard) Hypothetical Onsite Resident Exposure to Groundwater C-52N

Table 7.2.2 Calculation of Chemical Cancer Risks and Non-Cancer Hazards for a Future Adult+Child (Cancer Risk), Child (Non-Cancer Hazard) Hypothetical Onsite Resident Exposure to Groundwater at C-62

Table 7.3.1 Calculation of Chemical Cancer Risks and Non-Cancer Hazards for a Future Adult+Child (Cancer Risk), Child (Non-Cancer Hazard) Offsite Recreator Exposure to Groundwater C-52N

Table 7.3.2 Calculation of Chemical Cancer Risks and Non-Cancer Hazards for a Future Adult+Child (Cancer Risk), Child (Non-Cancer Hazard) Offsite Recreator Exposure to Groundwater at C-62

Table 7.4.1 Calculation of Chemical Cancer Risks and Non-Cancer Hazards for a Future Adult+Child (Cancer Risk), Child (Non-Cancer Hazard) Hypothetical Offsite Resident Exposure to Surface Water at C-52N

Table 7.4.2 Calculation of Chemical Cancer Risks and Non-Cancer Hazards for a Future Adult+Child (Cancer Risk), Child (Non-Cancer Hazard) Hypothetical Offsite Resident Exposure to Surface Water at C-62

Table 8 Summary of Groundwater Data and Modeled Concentrations at Points of Discharge

ATTACHMENTS

Attachment 1 ProUCL Output

Attachment 2 BIOSCREEN-AT Evaluation and Alternate Concentration Limits Ranges C-52N and C-62 Eglin Air Force Base, Florida

This page intentionally left blank.

LRS Federal LLC (LRS), in conjunction with Arcadis, conducted this human health and risk assessment (HHRA) for octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX) and hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX) detected in groundwater of the surficial aquifer at the Open Burn/Open Detonation (OB/OD) Units Range C-52 North (C-52N) and Range C-62 (location shown on **Figure 1**). The HHRA follows guidance outlined in the USEPA's Risk Assessment Guidance for Superfund (RAGS): Volume I, Human Health Evaluation Manual, Part A (USEPA, 1989), which is consistent with USACE guidance EM-200-1-15 (USACE, 2015), EM 200-1-4: Risk Assessment Handbook - Volume I: Human Health Evaluation (USACE, 1999), and other relevant USEPA guidance cited throughout the assessment. Accordingly, the HHRA is presented in a series of tables in RAGS Part D format (USEPA, 2001) and consists of the following four components:

1) Hazard Identification
2) Exposure Assessment
3) Toxicity Assessment, and
4) Risk Characterization.

In the Hazard Identification, relevant data are compiled and chemicals of potential concern (COPCs) are identified based on a comparison of maximum detected concentrations to human health risk-based screening levels. In the Exposure Assessment, actual or potential chemical release and transport mechanisms are identified; potentially exposed human populations and possible exposure pathways and routes are described; COPC concentrations at points of potential human contact are determined; and human exposures to the COPCs are estimated. In the Toxicity Assessment, quantitative and qualitative toxicity data used to characterize the potential for adverse health effects are identified. In the Risk Characterization, the likelihood and magnitude of adverse health effects are estimated for each applicable exposure scenario. Sources of uncertainty in the HHRA are then noted and discussed. Lastly, alternate concentration limits are derived to be protective of offsite receptors.

Supporting documentation for this HHRA are included in **Attachment 1**.

1.0 HAZARD IDENTIFICATION

This section identifies the COPCs in sampled environmental media based on a comparison of maximum detected concentrations to human health risk-based screening levels. The selected screening levels are protective of adverse health effects; therefore, chemicals present at concentrations below the corresponding screening levels are not anticipated to pose human health risks.

1.1 Available Data

Range C-52N and Range C-62 are currently used as active test and training ranges. Refer to **Figure 2** and **Figure 3** for the range features, including monitoring well locations, surface water drainage

locations, the target areas (historically referred to as the 'Cat's Eye'), open burn units (OBU), and open detonation units (ODU).

As described in previous site investigation reports (LRS 2018), three groundwater monitoring wells, including one upgradient background well (MW-94-52-01) and two point of compliance (POC) wells (MW-94-52-01 and MW-94-52-03) were installed at Range C-52N, and five monitoring wells, including one upgradient background well (MW-94-62-01) and four POC wells (MW-94-62-02 through MW-94-62-05 were installed at Range C-62. During quarterly, biannual, and annual sampling events between 1994 and 2018, groundwater data representing the area around the 'Cat's Eye' (the target area) open burn (OB) unit from the three monitoring wells at Range C-52N were collected. During the same time period, groundwater data representing the area surrounding the OB/OD units from the five monitoring wells at Range C-62 were also collected. Depending on timeframe, groundwater samples from both areas were analyzed for explosives, nitrate and nitrite, metals, and semi-volatile organic compounds (SVOCs). Samples at Range C-62 were also analyzed for benzene, toluene, ethylbenzene, and xylenes (BTEX). In addition to HMX and RDX, other explosive compounds detected at Ranges C-52N and/or C-62 include 2-amino-4, 6-Dinitrotoluene, and 4-amino-2, 6-Dinitrotoluene.

Currently, annual groundwater sampling for the OB/OD facilities is required in accordance with Part IV, Subpart A of Permit 006176-HO-007 issued by Florida Department of Environmental Protection (FDEP) on March 29, 2016. The Groundwater Cleanup Target Levels (GCTLs) are included in the updated 2016 Permit and the previous permit. In particular, the selected screening levels for HMX and RDX in groundwater are the FDEP GCTLs: 350 µg/L and 0.3 µg/L, respectively (FDEP, 2005). The GCTLs used are based on a target cancer risk of 1×10^{-6} (i.e., one-in-a-million excess lifetime cancer risk) or a non-cancer hazard quotient (HQ) of 1.

During the 2018 sampling event, BTEX compounds, nitrite, and nitrate were either not detected or did not exceed the GCTLs at Range C-52N or C-62. However, HMX and/or RDX was detected at both ranges. **Table 1** summarizes the available groundwater data from monitoring wells from Range C-52N and Range C-62. At Range C-52N, HMX was not detected in any of the 5 samples in the data set, with detection limits ranging from 0.078 µg/L to 0.13 µg/L. At the same range, RDX was detected in 4 of 5 samples in the data set from 0.72 µg/L to 1.5 µg/L. At Range C-62, both HMX and RDX were detected in all 10 samples included in the data set, ranging from 22.6 µg/L to 59 µg/L for HMX and 13.2 µg/L to 72 µg/L for RDX.

1.2 Selection of Chemicals of Potential Concern

As shown in **Table 1**, RDX is the only constituent detected at concentrations greater than the screening level and is selected as a COPC for both Range C-52N and Range C-62. HMX was also selected as a COPC for this HHRA. For the purposes of this HHRA, only the most recent RDX and HMX data from the sampling rounds from 2014 to 2018 were selected to provide the most representative data sets for evaluation.

1.3 Exposure Point Concentrations

Consistent with USEPA guidance on calculating exposure point concentrations (EPCs) for groundwater (USEPA, 2014a), monitoring wells representative of being within the 'core of the plume' were used to estimate EPCs for RDX in groundwater. The data for Range C-52N were limited to results from MW-94-52-01 because, as shown in Attachment 2, Table 1, RDX was not detected in the other two monitoring wells at Range C-52N (i.e., MW-94-52-02 and -03). The data for Range C-62 were limited to results from MW-94-62-04 and MW-94-62-05 because, as shown in Attachment 2, Table 1, RDX was detected in the other monitoring wells at Range C-62 (i.e., MW-94-62-01, MW-94-62-02, and MW-94-62-03) at concentrations approximately one order of magnitude or more lower than in MW-94-62-04 and MW-94-62-05. The following lists the monitoring wells and sample dates in the two data sets used for EPC calculations. The monitoring well locations are shown on **Figure 2** and **Figure 3**.

Range C-52 North	Range C-62
MW-94-52-01 (6/12/14)	MW-94-62-04 (5/23/14)
MW-94-52-01 (6/19/15)	MW-94-62-05 (5/23/14)
MW-94-52-01 (6/6/16)	MW-94-62-04 (5/19/15)
MW-94-52-01 (5/11/17)	MW-94-62-05 (5/19/15)
MW-94-52-01 (5/12/18)	MW-94-62-04 (6/6/16)
	MW-94-62-05 (6/6/16)
	MW-94-62-04 (5/11/17)
	MW-94-62-05 (5/11/17)
	MW-94-62-04 (5/12/18)
	MW-94-62-05 (5/12/18)

1.4 Fate and Transport Modeling

In order to estimate concentrations of COPCs in groundwater at the point of contact with downgradient surface water bodies, a BIOSCREEN-AT assessment was conducted using groundwater data collected at Range C-52N OB, Range C-62 OB, and Range C-62 OD. The BIOSCREEN-AT assessment is described in detail in the memorandum 'BIOSCREEN-AT Evaluation and Alternate Concentration Limits Ranges C-52N and C-62 Eglin Air Force Base, Florida', provided in **Attachment 2.**

2.0 EXPOSURE ASSESSMENT

The objective of the exposure assessment is to estimate the type and magnitude of human exposure to COPCs in groundwater within Range C-52N and Range C-62, as well as in offsite surface water bodies. This is accomplished by establishing assumptions about the potential for human exposure (e.g., exposed populations, exposure frequency) to groundwater within the two areas. For COPCs, representative EPCs are calculated and used to model potential human exposure in the form of daily chemical intakes and dermally absorbed doses (DAD). Since RDX is not volatile, inhalation is not a relevant route of exposure. These exposure estimates are combined in the Risk Characterization with chemical-specific toxicity values to calculate incremental lifetime cancer risks and non-cancer hazards.

Consistent with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (USEPA, 1990) and USEPA guidance (1989; 1995), estimates of COPC intake and exposure were developed to portray reasonable maximum exposure (RME) scenarios. The RME scenario considers the highest exposure that might reasonably be expected to occur, one that is well above the average case of exposure but within the range of possibility. Use of the RME individual to model human health risks is a conservative approach, in that it yields upper-bound cancer risk and non-cancer hazard estimates (USEPA, 1989).

2.1 Human Health Conceptual Site Model

Table 2 presents the human health conceptual site model (CSM) for the site. The human health CSM illustrates the current understanding of the potential for human exposure to the COPCs at the site. The CSM includes the exposure media of concern, potential human receptor populations, and the pathways through which human exposure may occur. In accordance with USEPA (1989) guidance, a complete exposure pathway includes: [1] a chemical source and release mechanism, [2] a transport or retention medium, [3] an exposure point where human contact with the contaminated medium may occur, and [4] an exposure route (i.e., ingestion, dermal absorption, or inhalation) at the contact point. If any one of these elements is missing, the pathway is considered incomplete.

2.1.1 Groundwater

The OB/OD units are located on both Range C-52N and C-62 (i.e., OD on C-52N and OB/OD on C-62), and site conditions on both ranges enable site-related munitions constituents to enter the groundwater system. However, groundwater in the surficial aquifer is currently not used as a potable water supply at Eglin AFB. Therefore, potentially complete exposure pathways at the site include hypothetical future onsite worker exposure to groundwater via future potable wells and hypothetical future onsite resident exposure to groundwater via future potable wells. Exposure to RDX in tap water includes ingestion and dermal contact.

2.1.2 Groundwater Discharge to Surface Water

Bay Head Branch Creek is located downgradient of the OB unit on Range C-52N, and Blount Mill Creek is located downgradient of the OB/OD unit plumes on Range C-62. Based on BIOSCREEN-AT modeling (refer to **Attachment 2**), RDX in surficial groundwater beneath the site has the potential for migration into downgradient surface water bodies. Therefore, additional exposure pathways associated with the site include future recreator exposure to groundwater discharged to downgradient surface water bodies and, although it is highly unlikely, offsite residential exposure to downgradient surface water used as a potable supply. These hypothetical exposure pathways are more conservative than base personnel occasional exposure during work or training. Exposure to RDX in both tap water and surface water includes ingestion and dermal contact.

2.2 Exposure Point Concentrations

2.2.1 Onsite Groundwater

EPCs used to model human exposure to onsite groundwater were calculated using the data sets as described above and are summarized in **Table 3.1** for Range C-52N and in **Table 3.2** for Range C-62. The USEPA (1992, 1989) recommends that the arithmetic average concentration of the data be used for evaluating long-term exposure and, because of the uncertainty associated with estimating the true average concentration at a site, the 95% upper confidence limit (UCL) on the arithmetic average be used as the EPC. The 95% UCL concentration provides reasonable confidence that the true average will not be under-estimated. The USEPA also indicates that where there is a question about the distribution of the data, a statistical test should be used to identify the best distributional assumption for the data set (USEPA, 1992). The USEPA (2014a) also recommends that in estimating EPCs for groundwater, recent data from the core of the plume are preferred.

Consistent with USEPA guidance on calculating EPCs for groundwater (USEPA, 2014a), monitoring wells identified within the ‘core of the plume’ were used to estimate EPCs for RDX in the two ranges. Groundwater samples collected from MW-94-52-01 were used in determining EPCs for Range C-52N, and MW-94-62-04 and MW-94-62-05 were used in determining EPCs for Range C-62.

The ProUCL® 5.1 (ProUCL) program developed by the USEPA’s Technology Support Center for Monitoring and Site Characterization was used to calculate 95% UCL concentrations for the data sets for each range. When entering data into ProUCL, if RDX was not detected in a sample, the sample reporting limit was entered as a proxy concentration and the sample result was coded as non-detect. ProUCL contains rigorous parametric and nonparametric statistical methods that can be used on full or uncensored data sets and on data sets with below detection limit observations (also called left-censored data sets). Depending on the distribution and 95% UCL estimation method, ProUCL will use only detected data or will incorporate detection limits (USEPA, 2015).

2.2.2 Groundwater Discharge to Surface Water

EPCs used to estimate human exposure to surface water conservatively assume that receptors will be exposed to the modeled concentrations expected in groundwater at the confluence with the surface water bodies downgradient of Range C-52N and Range C-62. The most conservative (i.e. highest) modeled RDX concentrations expected at the point of discharge was selected as the surface water EPC for each respective range.

The inputs, methods, and assumptions for the BIOSCREEN evaluation are described in detail in the memorandum 'BIOSCREEN-AT Evaluation and Alternate Concentration Limits Ranges C-52N and C-62 Eglin Air Force Base, Florida', provided in **Attachment 2**.

The EPCs for RDX in groundwater and surface water at Range C-52N and Range C-62 are presented in **Tables 3.1** and **3.2**, respectively. The ProUCL output sheet is provided **in Attachment 1**.

2.3 Exposure Equations and Parameter Values

The exposure equations and receptor-specific parameter values used to estimate COPC intakes and DADs are presented in **Table 4** for ingestion and dermal contact exposure. The exposure parameters used to estimate COPC intakes and DADs under the RME scenarios evaluated in this HHRA are based on USEPA (2014b, 2011, 2004, and 1989) guidance.

For future site workers, residents, and recreators, application of the exposure equations results in chronic daily intake for ingestion exposure or DAD for dermal contact exposure, expressed in milligrams per kilogram of body weight per day (mg/kg-day). The estimated daily intake is the amount of chemical at the exchange boundary (i.e., stomach for ingestion and skin for dermal absorption). A fundamental assumption in the estimate of the DAD is that absorption continues long after the exposure has ended (USEPA, 2004). As such, the final absorbed dose is estimated to be the total dose dissolved in the skin at the end of the exposure. Application of these equations requires a COPC concentration, or the average concentration contacted over the exposure period (e.g., mg/L water). These equations also require a contact rate (i.e., the amount of COPC contacted per unit time or event), body weight (i.e., the average body weight over the exposure period), and averaging time (i.e., the time over which exposure is averaged).

The averaging time depends on the type of toxic effect being assessed. When evaluating exposures for potential non-cancer health effects, intakes are calculated by averaging over the period of exposure. This is equivalent to the receptor-specific exposure duration multiplied by 365 days/year. When evaluating potential cancer risks, intakes are calculated by prorating the total cumulative intake over a lifetime (i.e., lifetime average daily intake). For calculation purposes, this is equal to 70 years multiplied by 365 days/year (i.e., 25,550 days). This distinction is consistent with the hypothesis that the mechanism of action for each of these health effects endpoints is different. The approach for carcinogens assumes that a high dose received over a short period of time is equivalent to a corresponding low dose spread over a lifetime.

3.0 TOXICITY ASSESSMENT

The toxicity assessment, also termed the dose-response assessment, characterizes the relationship between the magnitude of exposure and the potential that an adverse health effect will occur. Toxicity assessment involves determining whether exposure to a chemical can cause an increase in the incidence of a particular adverse health effect and characterizing the nature and strength of the evidence of causation. The toxicity information is then quantitatively evaluated, and the relationship between the dose of chemical received and the incidence of adverse health effects in the exposed population is evaluated.

3.1 Sources of Toxicity Values

The USEPA and other regulatory agencies have performed toxicity assessments for numerous chemicals, and their guidance was used in this HHRA. Toxicity values include reference doses (RfDs) and reference concentrations for the evaluation of non-cancer health effects from chronic and sub-chronic exposure to chemicals, and cancer slope factors and inhalation unit risks for evaluating incremental cancer risk from exposure to chemicals prorated over a lifetime (i.e., excess lifetime cancer risks).

Sources of toxicological information and toxicity values, in order of preference consistent with USEPA (2003) guidance, include:

- Tier 1 - Integrated Risk Information System (IRIS) (USEPA, 2018b). IRIS is an USEPA administered internet database that has received internal and external scientific review and contains current information on human health effects that may result from exposure to chemicals in the environment.
- Tier 2 - Provisional Peer-Reviewed Toxicity Values (PPRTV) (USEPA, 2018c). PPRTVs were developed by the USEPA Office of Research and Development/National Center for Environmental Assessment/Superfund Health Risk Technical Support Center, as presented in a series of chemical-specific issue papers.
- Tier 3 - Additional USEPA and non-USEPA sources of toxicity information, including but not limited to the California Environmental Protection Agency Office of Environmental Health Hazard Assessment's chronic reference exposure levels and cancer potency values, the Agency for Toxic Substances and Disease Registry (ATSDR) minimal risk levels (ATSDR, 2018), and toxicity values published in the Health Effects Assessment Summary Tables (USEPA, 2018d).

3.1.1 Adverse, Non-cancer Health Effects

The NCP (USEPA, 1990) indicates that acceptable exposure levels for chemicals with non-cancer health effects should represent concentration levels to which the human population, including sensitive subpopulations (e.g., the elderly, young children), may be exposed without adverse health effects during a lifetime or part of a lifetime, incorporating an adequate margin of safety. The

potential for non-cancer health effects associated with oral and dermal exposures is evaluated by comparing an estimated chemical intake or DAD over a specified time period with an RfD derived for a similar exposure period. The RfD is an estimate of a daily exposure level for the human population, including sensitive subpopulations, that is likely to be without an appreciable risk of deleterious effects during a lifetime. Therefore, the ratio of the intake or DAD to the RfD, termed the HQ, assumes there is a level of exposure (i.e., the RfD) below which it is unlikely for even sensitive subpopulations to experience adverse health effects. For child receptors, where exposure is assumed to occur over the six-year exposure duration, the subchronic RfD for RDX was used

Table 5 presents the non-cancer toxicity data for RDX, including the RfD, primary target organ(s), and uncertainty/modifying factors. Generally, order-of-magnitude uncertainty factors reflect the various types of toxicological data (e.g., a laboratory animal study extrapolated to the human condition) used to estimate the RfDs. Modifying factors, which can range from greater than zero to 10, reflect qualitative professional judgment regarding scientific uncertainties (e.g., the completeness of the overall database) not covered by the uncertainty factors. Application of the uncertainty and modifying factors is intended to result in RfDs that are protective of human health.

RfDs are not available to evaluate dermal exposure. In their absence, oral RfDs were used and adjusted following USEPA (2004) guidance to reflect absorbed dose. This allows for comparison between exposures estimated as absorbed doses and toxicity values expressed as absorbed doses.

3.1.2 Carcinogenic Effects

Regardless of the mechanism of effect, risk evaluation methods employed by the USEPA generally derive from the hypothesis that thresholds for cancer induction by carcinogens do not exist and that the dose-response relationship is linear at low doses. Based on this hypothesis, USEPA has derived estimates of incremental cancer risk from lifetime exposure to potential carcinogens. This is accomplished by establishing the carcinogenic potency of the chemical through critical evaluation of the various test data and fitting dose-response data to a low-dose extrapolation model. The slope factor, which describes the dose-response relationship at low doses, is expressed as a function of intake [i.e., $(mg/kg\text{-}day)^{-1}$].

Excess lifetime cancer risks were estimated by multiplying an estimated daily intake or DAD prorated over 70 years by the slope factor. The resulting risk estimate is expressed as a unitless probability (e.g., 2×10^{-5} or 2 in 100,000) of an individual developing cancer. The unitless probability represents the incremental (or increased) lifetime cancer risk associated with the estimated exposure above the background risk of developing cancer. This linear equation is valid only at low risk levels (i.e., below estimated risks of 0.01). According to the USEPA (1989), this approach does not necessarily give a realistic prediction of risk. The true value of the risk at trace ambient concentrations is unknown and may be as low as zero.

Table 6 presents the cancer toxicity data for RDX, including: the slope factor and weight-of-evidence classifications under USEPA's 2005 guidelines for carcinogen risk assessment (USEPA, 2005). As with RfDs, USEPA has not derived slope factors to evaluate dermal exposure. In their

absence, slope factors for oral exposure were used and adjusted per USEPA guidance to reflect absorbed dose. This allows for risk estimation based on exposures estimated as absorbed doses and slope factors expressed as absorbed doses.

4.0 RISK CHARACTERIZATION

Risk characterization involves combining exposure estimates with toxicity information to assess the potential for adverse health effects from exposure to groundwater by the receptor groups evaluated in the HHRA. In this section, the non-cancer hazards and cancer risks for each exposure scenario are presented and discussed.

As described in the Toxicity Assessment section, the potential for non-cancer health effects is evaluated by calculating the ratio of an estimated intake or DAD over a specified time period with a chemical-specific RfD derived for a similar exposure period. The RfD is an estimate of a daily exposure level for the human population, including sensitive subpopulations, that is likely to be without an appreciable risk of deleterious effects during a lifetime. The non-cancer HQ therefore assumes there is a level of exposure below which it is unlikely for even sensitive subpopulations to experience adverse health effects. The total individual HQs are summed for each route of exposure and exposure medium to yield hazard indices (HIs) representative of the potential for adverse, non-cancer health effects from cumulative exposure. For the non-cancer assessment, exposure scenarios with an HI greater than 1 are of potential concern.

Individual cancer risks are expressed as unitless probabilities of a person developing cancer. The cancer risks were summed for each exposure route to arrive at an estimate of the total receptor cancer risk. For known or suspected carcinogens, like RDX, the NCP established that acceptable exposure levels are generally concentration levels that represent an incremental upper-bound lifetime cancer risk in the range from 1×10^{-4} (i.e., 1 in 10,000) to 1×10^{-6} (i.e., 1 in 1,000,000) or less (USEPA, 1990). The cancer risks estimated for each exposure scenario are therefore compared to this risk range established by the NCP.

4.1 Future Onsite Site Worker Non-Cancer Hazards and Cancer Risks

Table 7.1.1 presents the cancer risk estimates and non-cancer HIs for the future onsite site worker at Range C-52N. As shown, the estimated cancer risk for future onsite site worker exposure to tap water via ingestion and dermal contact ($9x10^{-7}$) does not exceed the USEPA acceptable cancer risk range of $1x10^{-4}$ to $1x10^{-6}$. Additionally, the HI (0.008) is less than the USEPA acceptable noncancer HQ of 1. These results indicate adverse health effects are unlikely.

Table 7.1.2 presents the cancer risk estimates and non-cancer HIs for the future onsite site worker at Range C-62. As shown, the estimated cancer risk for future onsite site worker exposure to tap water via ingestion and dermal contact ($2x10^{-5}$) is within the USEPA acceptable cancer risk range of 1×10^{-4} to 1×10^{-6}. Additionally, the HI (0.2) is less than the USEPA acceptable noncancer HQ of 1. These results indicate adverse health effects are unlikely.

4.2 Future Hypothetical Onsite Resident Non-Cancer Hazards and Cancer Risks

Table 7.2.1 presents the cancer risk estimates and non-cancer HIs for the future hypothetical onsite resident at Range C-52N. As shown, the estimated cancer risk for future hypothetical onsite

resident child and adult exposure to tap water via ingestion and dermal contact ($1x10^{-6}$) does not exceed the USEPA acceptable cancer risk range of $1x10^{-4}$ to $1x10^{-6}$. Additionally, the HI (child exposure only of 0.0007) is less than the USEPA acceptable noncancer HQ of 1. These results indicate adverse health effects are unlikely.

Table 7.2.2 presents the cancer risk estimates and non-cancer HIs for the future hypothetical onsite resident at Range C-62. As shown, the estimated cancer risk for future hypothetical onsite resident child and adult exposure to tap water via ingestion and dermal contact ($4x10^{-5}$) is within the USEPA acceptable cancer risk range of 1×10^{-4} to 1×10^{-6}. Additionally, the HI (child exposure only of 0.02) is less than the USEPA acceptable noncancer HQ of 1. These results indicate adverse health effects are unlikely.

4.3 Offsite Recreator Non-Cancer Hazards and Cancer Risks

Table 7.3.1 presents the cancer risk estimates and non-cancer HIs for the future offsite recreator downgradient of Range C-52N. As shown, the estimated cancer risk for future child and adult offsite recreator exposure to surface water via ingestion and dermal contact ($9x10^{-9}$) is less than the USEPA acceptable cancer risk range of $1x10^{-4}$ to $1x10^{-6}$. Additionally, the HI (child exposure only of 0.00001) is less than the USEPA acceptable noncancer HQ of 1. These results indicate adverse health effects are unlikely.

Table 7.3.2 presents the cancer risk estimates and non-cancer HIs for the future offsite recreator downgradient of Range C-62. As shown, the estimated cancer risk for future child and adult recreator exposure to surface water via ingestion and dermal contact ($1x10^{-5}$) is within the USEPA acceptable cancer risk range of $1x10^{-4}$ to $1x10^{-6}$. Additionally, the HI (child exposure only of 0.001) is less than the USEPA acceptable noncancer HQ of 1. These results indicate adverse health effects are unlikely.

4.4 Offsite Resident Non-Cancer Hazards and Cancer Risks

Table 7.4.1 presents the cancer risk estimates and non-cancer HIs for the future hypothetical offsite resident at Range C-52N. As shown, the estimated cancer risk for future hypothetical offsite resident child and adult exposure to tap water via ingestion and dermal contact ($2x10^{-7}$) does not exceed the USEPA acceptable cancer risk range of $1x10^{-4}$ to $1x10^{-6}$. Additionally, the HI (child exposure only of 0.00008) is less than the USEPA acceptable noncancer HQ of 1. These results indicate adverse health effects are unlikely.

Table 7.4.2 presents the cancer risk estimates and non-cancer HIs for the future hypothetical offsite resident at Range C-62. As shown, the estimated cancer risk for future hypothetical offsite resident child and adult exposure to tap water via ingestion and dermal contact ($2x10^{-5}$) is within the USEPA acceptable cancer risk range of 1×10^{-4} to 1×10^{-6}. Additionally, the HI (child exposure only of 0.008) is less than the USEPA acceptable noncancer HQ of 1. These results indicate adverse health effects are unlikely.

5.0 UNCERTAINTIES

Risk assessment entails the integration of complex analyses of chemical concentrations in the environment, the fate and transport of chemicals in the environment, the potential for and extent of human exposure, and the chemical's toxicity. Some degree of uncertainty is associated with each component of the risk assessment process. Uncertainty can be quantitatively addressed by identifying specific sources of uncertainty and characterizing whether the potential for risk may be over-stated or under-stated. The intent of most risk assessments, including this HHRA, is to err on the side of conservatism, so the potential for risk is over-stated rather than under-stated. However, for this HHRA, major assumptions made and the potential impact on risk estimates are qualitatively discussed.

5.1 Environmental Sampling and Analysis

This HHRA is based on groundwater data for a limited number of monitoring wells at both Range C-52N and Range C-62. Data for soil at these sites were not reviewed for this HHRA. Based on the understanding that the areas around these sites are used for active testing missions, it may be that these activities also contribute as sources of explosives like RDX. RDX is consistently detected in the hydraulically upgradient well (MW-94-52-01) at Range C-52N at higher concentrations than at the two downgradient wells (MW-94-52-02 and MW-94-52-03). The RDX detections are likely due to the proximity of MW-94-52-01 to the 'Cat's Eye' target area and the presence of substantial debris/exploded ordinances in the vicinity of MW-94-52-01. However, as the HHRA assumed exposure was to concentrations in or migrating from that upgradient well it is not likely that EPCs for C-52N were underestimated. As indicated in the BIOSCREEN evaluation provided in **Attachment 2**, concentrations of RDX in groundwater of the surficial aquifer at C-52N are decreasing, while at C-62 increasing trends are observed in groundwater at monitoring wells MW-94-62-04 and MW-94-62-05. Therefore, if concentrations at C-62 continue to increase, EPCs were underestimated. Yet, the assumption that concentrations in surface water would be equal to those modeled at the point of groundwater discharge is highly conservative as mixing with surface water and photodegradation of RDX would occur. Therefore, EPCs were likely overestimated overall.

5.2 Exposure Assessment

The exposure assessment relies on a series of assumptions regarding the potential for human exposure, outlined in the CSM and approximated in the daily intake calculation by parameters such as the groundwater EPC and receptor-specific exposure duration, frequency, and time. This HHRA attempted to address some of the uncertainty in these assumptions by conservatively evaluating the potential for cancer risk and non-cancer hazard to individuals under RME conditions in the hypothetical future exposure scenarios. The surficial aquifer in the Citronelle Formation, referred to as the 'Sand and Gravel Aquifer,' the 'Miocene-Pliocene Aquifer,' or the 'Citronelle Aquifer', is the primary source of water for the population of Santa Rosa and Escambia Counties in the Florida Panhandle (United States Geologic Survey [USGS], 2016). However, groundwater

in the surficial aquifer is not currently used as a potable water supply at Eglin AFB, and no potable wells within the surficial aquifer will be allowed in the future at Eglin AFB. Both ranges are located well within the Eglin AFB boundary, with the closest off-base boundary being approximately 6 miles downgradient for C-52 and approximately 4 miles downgradient for C-62 (refer to **Figure 1**). In addition, surface water in the area is not used as a potable source. As described in **Attachment 2**, RDX in groundwater of the surficial aquifer is likely to degrade significantly within 1 mile downgradient of the units. Therefore, potable water scenarios are highly unlikely.

Eglin AFB is an active military facility engaged in testing and training activities and the primary mission in this portion of the Eglin Test and Training Complex (ETTC) or "Range" is expected to remain the same into the foreseeable future. In addition, wildlife and forest conservation activities are also conducted in this area of the Range. However, as the OB/OD units are within training ranges, the areas are closed to hunting, fishing and recreation, and all public access. Although base personnel may access these areas, the recreation user scenario with child exposure is highly unlikely. Therefore, this HHRA likely overestimates the potential for risk overall.

The HHRA primarily relied on the USEPA's standard default exposure assumptions which are used at Superfund sites across the country with appropriate modifications to reflect site-specific conditions. The intention is to over-estimate the potential for risk and hazards, so that actual risks are less than those predicted in this HHRA.

Uncertainties associated with the fate and transport modeling are discussed in **Attachment 2**. The HHRA did not include evaluation of RDX degradation products such as the nitroso derivatives including MNX, DNX, and TNX, as they were not analyzed for in groundwater samples and which form more readily under aerobic conditions and which undergo mineralization to hydrazines and methanol under anaerobic conditions. These compounds are not commonly analyzed constituents. Toxicity values (reference doses and cancer slope factors) are not available for MNX, DNX, and TNX. The cancer slope factor for hydrazine indicates it is 27 times more potent a carcinogen than RDX. However, based on groundwater sampling logs (from May 2018) aquifer conditions are likely aerobic. Therefore, while risks may be underestimated due to the lack of information on RDX degradation products, human exposure in this HHRA is probably still overestimated, overall.

5.3 Toxicity Assessment

The derivation of the toxicity values that form the basis of the risk characterization can result in over- or under-estimates of the potential for adverse health effects. As in most cases, the toxicity values for RDX are derived from extrapolation from laboratory animal data to humans. As indicated in **Table 4**, the oral RfD for RDX contains uncertainty factors totaling to 300.

Following USEPA guidance, the RfD and cancer slope factor for oral exposure were adjusted and used to assess risks from dermal absorption of RDX in water. However, the oral absorption was assumed to be 100 percent which may under-estimate dermal contact exposure for some chemicals. Consideration was not given to the absorption efficiency of the exposure vehicle used in the studies on which the factors are based. This may over-estimate or under-estimate dermal contact risks.

6.0 ALTERNATE CONCENTRATION LIMITS

Alternate concentration limits (ACLs) were developed for both HMX and RDX in groundwater that are protective of hypothetical future potable use of groundwater as it discharges to nearby streams. While hypothetical and highly unlikely, this scenario is conservative. The ACLs were derived considering migration from the source to the receptor (i.e., point of groundwater discharge for hypothetical future potable water users) as provided in **Attachment 2**. The ACLs derived are shown in the table below; for further details see the memorandum in **Attachment 2**.

Area	Chemical	Distance to Receptor (feet)	Alternate Concentration Limit (ug/L)	Notes
Range C-52 N				
Cat's Eye	RDX	310	0.32	distance from well MW-94-C52-02 to creek
Cat's Eye	HMX	310	580	distance from well MW-94-C52-02 to creek
Range C-62 OBU				
OBU	RDX	150	0.31	distance from well MW-94-C62-03 to creek
OBU	HMX	150	430	distance from well MW-94-C62-03 to creek
Range C-62 ODU				
ODU	RDX	380	0.87	distance from well MW-94-C62-04 to creek
ODU	HMX	380	21,000	distance from well MW-94-C62-04 to creek

Notes:
HMX = Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine
OBU = Open Burn Unit
ODU = Open Detonation Unit
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine
ug/L = micrograms per liter

6.1 Comparison of Site Data to ACLs

The ACLs were derived to be protective of potable use of groundwater in the surficial aquifer as it discharges to surface water downstream of C-52N and C-62. As shown in **Table 8**, the maximum detected concentrations and 95% UCLs of RDX at both C-52N and C-62, and the modeled RDX concentration at the point of surface water discharge for C-62 exceed the ACLs developed for protection of potable use. The modeled RDX concentration at the point of discharge to surface water for C-52N is below the ACL for protection of potable use.

The results of the BIOSCREEN-AT modeling suggest that:

- The groundwater RDX concentration at C-52N would drop below the FDEP GCTL by 1,800 feet downgradient from MW-94-52-01.

- The groundwater RDX concentration at C-62 is likely to attenuate significantly within one mile downgradient of the OB and OD Units, and is not expected to contribute to offsite groundwater exceedances of the FDEP GCTL for RDX further downgradient.
- It is likely that groundwater that daylights in the headwaters of Blount Mill Creek downgradient of C-62 would not pose a threat to potential receptors.

The recreator exposure scenario is also unlikely. Although instream concentrations were not modeled for this HHRA, comparing data to the FDEP Freshwater Surface Water Cleanup Target Levels (SWCTLs) (FDEP, 2005) can provide some perspective for protection of recreator exposure to surface water. As shown in **Table 8**, the maximum detected concentrations and 95% UCLs of both HMX and RDX, and the modeled concentrations of RDX at the point of discharge for both C-52N and C-62 are all less than the FDEP SWCTLs.

7.0 SUMMARY

The HHRA evaluated conservative hypothetical exposure scenarios to err on the side of conservatism and to over-state rather than under-state the potential for risk. Estimated cancer risks and noncancer HIs for all receptors were below or within the USEPA acceptable risk levels. RDX will not migrate offsite above the GCTL, with the possible exception of groundwater that daylights into the headwaters of Blount Mill Creek downgradient of the OD Unit at C-62. However, mixing with surface water and photodegradation of RDX are anticipated to limit any potential impacts to surface water from this source area. Additionally, since exposure to RDX in the surficial aquifer via a potable use scenario is highly unlikely, comparing modeled concentrations at the point of groundwater discharge (into the downgradient streams) to the FDEP SWCTLs (i.e., 180 µg/L for RDX and 1,300 µg/L for HMX (FDEP, 2005) provides useful information. Although exposure to surface water is also less likely than assumed in this HHRA, maximum detected concentrations of both RDX and HMX are less than the SWCTLs. Based on these considerations and the results of this HHRA, RDX and HMX in the surficial aquifer at C-52N and C-62 are unlikely to pose unacceptable risk to human receptors.

8.0 REFERENCES

ATSDR, 2018. Minimal Risk Levels for Hazardous Substances. (June 2018). Accessed online: https://www.atsdr.cdc.gov/mrls/mrllist.asp

Florida Department of Environmental Protection (FDEP). 2005. Technical Report: Development of Cleanup Target Levels (CTLs) for Chapter 62-777, F.A.C., Final. Prepared by Center for Environmental and Human Toxicology, University of Florida, Gainesville, FL. Prepared for the Division of Waste Management. February.

FDEP. 2016. Florida Surface Water Quality Criteria, Chapter 62-302.530, FAC. Effective 2/17/2016. Accessed at: https://www.flrules.org/gateway/ChapterHome.asp?Chapter=62-302

United States Army Corps of Engineers (USACE). 1999. EM 200-1-4: Risk Assessment Handbook - Volume I: Human Health Evaluation. 31 January 1999.

USACE. 2015. EM 200-1-15. Technical Guidance for Military Munitions Response Actions. 30 October 2015.

United States Environmental Protection Agency (USEPA). 1989. Risk Assessment Guidance for Superfund (RAGS): Volume 1, Human Health Evaluation Manual, Part A. EPA/5401-89/002. Office of Emergency and Remedial Response, Washington, DC. December.

USEPA. 1990. National Oil and Hazardous Substances Pollution Contingency Plan. Final Rule. 40 CFR Part 300. Federal Register 55(46): 8665-8866. March.

USEPA. 1992. Supplemental Guidance to RAGS: Calculating the Concentration Term. Publication 9285.7-08. Office of Solid Waste and Emergency Response, Washington, DC. May.

USEPA. 1995. Guidance for Risk Characterization. Science Policy Council, Washington, DC. February.

USEPA. 2001. Risk Assessment Guidance for Superfund: Volume 1- Human Health Evaluation Manual (Part D, Standardized Planning, Reporting, and Review of Superfund Risk Assessments), Final. 9285.7-01D. Office of Emergency and Remedial Response, Washington, D.C. December.

USEPA. 2004. Risk Assessment Guidance for Superfund. Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment). Final. EPA/540/R/99/005. Office of Superfund Remediation and Technology Innovation, Washington, DC. July.

USEPA. 2005. Guidelines for Carcinogen Risk Assessment. EPA/630/P-03/001F. Risk Assessment Forum, Washington, DC. May.

USEPA. 2011. Exposure Factors Handbook: 2011 Edition. EPA/600/R-90/05F. Office of Research and Development, Washington, DC. December.

USEPA. 2014a. Determining Groundwater Exposure Point Concentrations. OSWER Directive 9283.1-42. Office of Solid Waste and Emergency Response. Washington DC. February.

USEPA. 2014b. Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors. OSWER Directive 9200.1-120. Office of Solid Waste and Emergency Response, Washington, DC. February.

USEPA. 2015. ProUCL Version 5.1 User Guide. EPA/600/R-07/041. Office of Research and Development, Washington, DC. October.

USEPA. 2018a. Regional Screening Level Summary Table, May 2018. Accessed online: https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables.

USEPA. 2018b. Integrated Risk Information System. Accessed online: http://www.epa.gov/IRIS/

USEPA. 2018c. Provisional Peer Reviewed Toxicity Values (PPRTV) for Superfund, PPRTV Assessments Electronic Library. Accessed online: http://hhpprtv.ornl.gov/

USEPA. 2018d. Health Effects Assessment Summary Tables, HEAST On-line Repository (Current as of 2011). Accessed online: https://epa-heast.ornl.gov/.

USGS, 2016. Groundwater Atlas of the United States: Alabama, Florida, Georgia, and South Carolina HA 730-G, The Sand and Gravel Aquifer.

FIGURES

From Figure 1 in LRS (2018)

0 15 30 60 90 120
Miles

RANGES C-52N AND C-62
OPEN BURN/OPEN DETONATION UNIT
EGLIN AIR FORCE BASE, FLORIDA

SITE LOCATION MAP

ARCADIS Design & Consultancy for natural and built assets

FIGURE
1

12/10/2018 11:58:07 AM

From Figure 8 in LRS (2018)

0 250 500 1,000
Feet

Monitoring Well

Estimated Groundwater Flow Direction

120 Groundwater Elevation Contour (ft NGVD)

Modeled Plume Length

Modeled Domain Area

Modeled Source Width

Surface Water Drainage

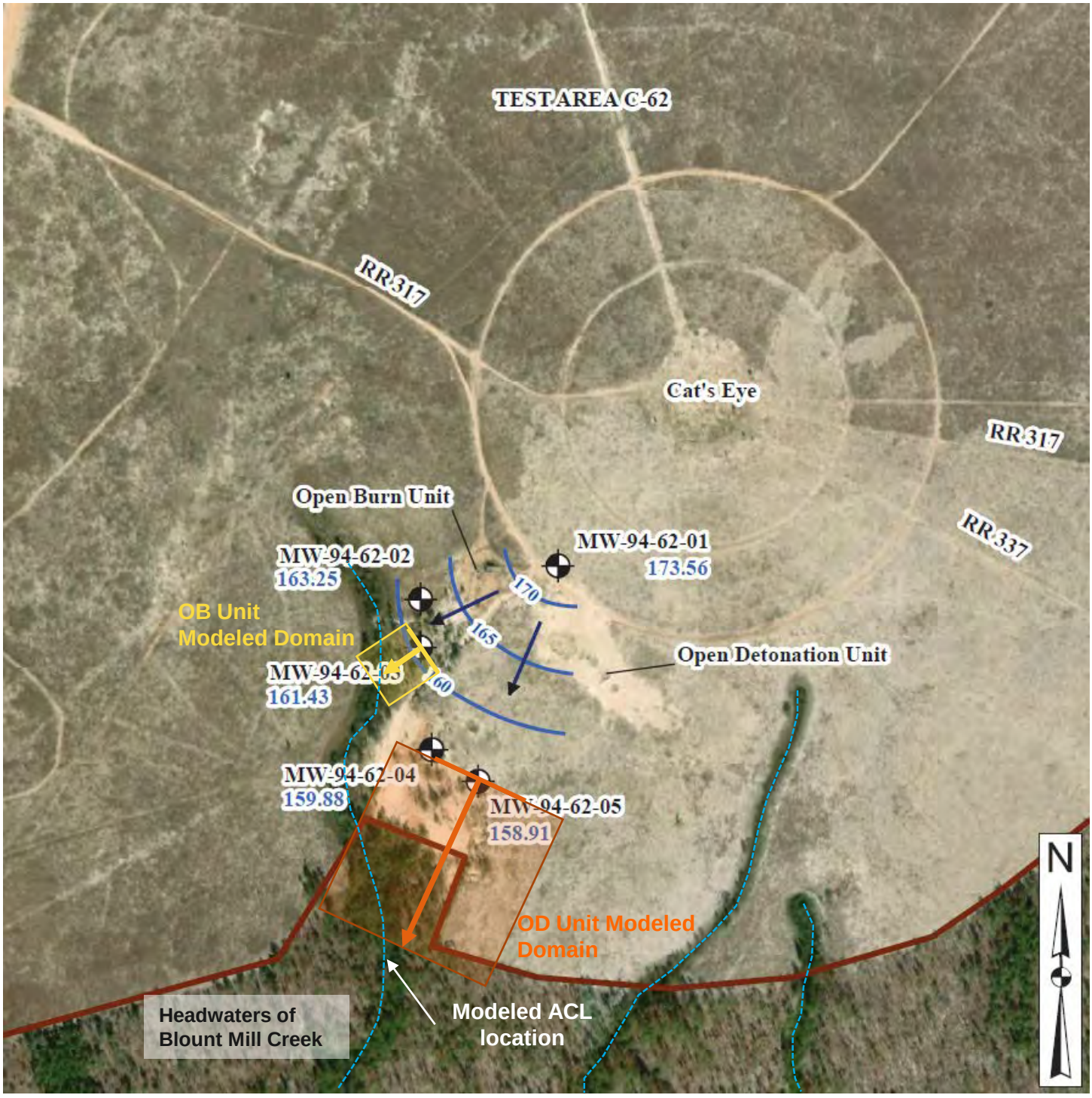
RANGES C-52N AND C-62
OPEN BURN/OPEN DETONATION UNIT
EGLIN AIR FORCE BASE, FLORIDA

RANGE C-52N
POTENTIOMETRIC CONTOUR MAP
MAY 2018

ARCADIS Design & Consultancy for natural and built assets

FIGURE
2

12/10/2018 11:58:07 AM



From Figure 9 in LRS (2018)

0 250 500 1,000 Feet

Legend:

- Monitoring Well
- 170 Groundwater Elevation Contour (ft NGVD)
- Estimated Groundwater Flow Direction
- Surface Water Drainage
- Modeled OB Unit Plume
- Modeled OD Unit Plume
- OB Unit Modeled Domain
- OD Unit Modeled Domain
- Modeled OB Unit Source Width
- Modeled OD Unit Source Width

RANGES C-52N AND C-62
OPEN BURN/OPEN DETONATION UNIT
EGLIN AIR FORCE BASE, FLORIDA

RANGE C-62
POTENTIOMETRIC CONTOUR MAP
MAY 2018

ARCADIS Design & Consultancy for natural and built assets

FIGURE
3

12/10/2018 11:58:07 AM

TABLES

Table 1
RAGS Part D Table 2
Occurrence, Distribution, and Selection of Chemicals of Potential Concern in the OB/OD Units
Human Health and Risk Assessment Memo - Open Burn/Open Detonation Units at Range C-52 North and Range C-62 Eglin Air Force Base
Florida

Scenario Timeframe:	Current/Future
Medium:	Groundwater
Exposure Medium:	Groundwater and Surface Water

Exposure Point	CASRN	Chemical	Minimum Concentration	Maximum Concentration	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (1)	Background Value	Screening Toxicity Value (2)		(3)	COPC Flag (Y/N)	Rationale for Selection or Deletion (4)
C-52 North	2691-41-0	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	ND	ND	µg/L	ND	0/5	0.078 - 0.13	ND	NA	350	nc	FDEP	N	BSC
	121-82-4	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	0.72	1.5	µg/L	MW-94-52-01(6/19/2015)	4/5	0.17 - 0.17	1.5	NA	0.3	c	FDEP	Y	ASC
C-62	2691-41-0	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	22.6	59	µg/L	MW-94-62-05(5/12/2018)	10/10	NA	59	NA	350	nc	FDEP	N	BSC
	121-82-4	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	13.2	72	µg/L	MW-94-62-05(5/12/2018)	10/10	NA	72	NA	0.3	c	FDEP	Y	ASC

Notes:

(1) Maximum concentration.
(2) The screening toxicity value is the lower of the United States Environmental Protection Agency (USEPA) Regional Screening Level (RSL) for Tapwater (USEPA, November 2018a) or the Florida DEP Groundwater Cleanup Target Level (2005)
(3) Codes used for Screening Toxicity Value Source
FDEP - Florida Department of Environmental Protection
(4) Codes used for the "Rationale for Selection or Deletion":
ASC - Above Screening Criterion
BSC - Below Screening Criterion

CASRN = Chemical Abstract Services Registry Number.
µg/L = microgram(s) per liter.
NA = not available.
N/A = not applicable.
ND = not detected.

Table 2
RAGS Part D Planning Table 1
Selection of Exposure Pathways
Human Health and Risk Assessment Memo - Open Burn/Open Detonation Units at Range C-52 North and Range C-62 Eglin Air Force Base
Florida

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Human Receptor Population	Receptor Age	Exposure Route	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Future	Groundwater	Tapwater	Range C-52N	Site Worker	Adult	Incidental Ingestion	Quantitative	Site worker exposure to tap water from future potable wells is a potentially complete exposure pathway.
						Dermal contact	Quantitative	
			Range C-62	Site Worker	Adult	Incidental Ingestion	Quantitative	Site worker exposure to tap water from future potable wells is a potentially complete exposure pathway.
						Dermal contact	Quantitative	
			Range C-52N	Resident	Adult	Incidental Ingestion	Quantitative	Residential exposure to tap water from future private potable wells is a potentially complete exposure pathway.
						Dermal contact	Quantitative	
					Child (0-6 years old)	Incidental Ingestion	Quantitative	
						Dermal contact	Quantitative	
			Range C-62	Resident	Adult	Incidental Ingestion	Quantitative	Residential exposure to tap water from future private potable wells is a potentially complete exposure pathway.
						Dermal contact	Quantitative	
					Child (0-6 years old)	Incidental Ingestion	Quantitative	
						Dermal contact	Quantitative	
	Surface Water	Surface Water	Points of C-52N Groundwater Discharge	Recreational Users	Adult	Incidental Ingestion	Quantitative	Recreator exposure to surface water is a potentially complete exposure pathway.
						Dermal contact	Quantitative	
					Child (0-6 years old)	Incidental Ingestion	Quantitative	
						Dermal contact	Quantitative	
			Points of C-62 Groundwater Discharge	Recreational Users	Adult	Incidental Ingestion	Quantitative	Recreator exposure to surface water is a potentially complete exposure pathway.
						Dermal contact	Quantitative	
					Child (0-6 years old)	Incidental Ingestion	Quantitative	
						Dermal contact	Quantitative	
		Tapwater	Points of C-52N Groundwater Discharge	Resident	Adult	Incidental Ingestion	Quantitative	Residential exposure to surface water as potable water is a potentially complete exposure pathway.
						Dermal contact	Quantitative	
					Child (0-6 years old)	Incidental Ingestion	Quantitative	
						Dermal contact	Quantitative	
			Points of C-62 Groundwater Discharge	Resident	Adult	Incidental Ingestion	Quantitative	Residential exposure to surface water as potable water is a potentially complete exposure pathway.
						Dermal contact	Quantitative	
					Child (0-6 years old)	Incidental Ingestion	Quantitative	
						Dermal contact	Quantitative	

Table 3.1
RAGS Part D Table 3
Exposure Point Concentration Summary: Groundwater at C-52N
Human Health and Risk Assessment Memo - Open Burn/Open Detonation Units at Range C-52 North and Range C-62 Eglin Air Force Base
Florida

Scenario Timeframe:	Current/Future
Medium:	Groundwater
Exposure Medium:	

Exposure Point	Receptor	Exposure Medium	CAS RN	Chemical of Potential Concern	Units	Arithmetic Mean [1]	95% UCL Concentration [2] (Distribution)		Maximum Concentration	Exposure Point Concentration			
										Value	Units	Statistic	Rationale
C-52 North	Worker	Tapwater	121-82-4	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	mg/L	0.000891	0.001447	KM (t) UCL	0.0015	0.001447	mg/L	95% UCL	ProUCL v5.1
	Resident	Tapwater	121-82-4	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	mg/L	0.000891	0.001447	KM (t) UCL	0.0015	0.001447	mg/L	95% UCL	ProUCL v5.1
	Recreator	Surface Water	121-82-4	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	mg/L	--	--	--	0.00015	0.00015	mg/L	Modeled	BIOSCREEN
	Offsite Resident	Surface Water	121-82-4	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	mg/L	--	--	--	0.00015	0.00015	mg/L	Modeled	BIOSCREEN

Notes
[1] For the arithmetic mean, where constituents were not detected half the detection limit was included in the calculation.
[2] The 95% Upper Confidence Level (UCL) on the arithmetic average concentration (*i.e.*, the 95% UCL concentration) was calculated using ProUCL version 5.1.

mg/L = milligram(s) per liter.

Data Distribution Codes:
G = Gamma
LN = Lognormal
N = Normal
NP = Nonparametric

Table 3.2
RAGS Part D Table 3
Exposure Point Concentration Summary: Groundwater at C-62
Human Health and Risk Assessment Memo - Open Burn/Open Detonation Units at Range C-52 North and Range C-62 Eglin Air Force Base
Florida

Scenario Timeframe:	Current/Future
Medium:	Groundwater
Exposure Medium:	

Exposure Point	Receptor	Exposure Medium	CAS RN	Chemical of Potential Concern	Units	Arithmetic Mean [1]	95% UCL Concentration [2] (Distribution)		Maximum Concentration	Exposure Point Concentration			
										Value	Units	Statistic	Rationale
C-62	Worker	Tapwater	121-82-4	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	mg/L	0.0279	0.04069	Adjusted G UCL	0.072	0.04069	mg/L	95% UCL	ProUCL v5.1
	Resident	Tapwater	121-82-4	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	mg/L	0.0279	0.04069	Adjusted G UCL	0.072	0.04069	mg/L	95% UCL	ProUCL v5.1
	Recreator	Surface Water	121-82-4	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	mg/L	--	--	--	0.015	0.015	mg/L	Modeled	BIOSCREEN
	Offsite Resident	Surface Water	121-82-4	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	mg/L	--	--	--	0.015	0.015	mg/L	Modeled	BIOSCREEN

Notes
[1] For the arithmetic mean, where constituents were not detected half the detection limit was included in the calculation.
[2] The 95% Upper Confidence Level (UCL) on the arithmetic average concentration (*i.e.,* the 95% UCL concentration) was calculated using ProUCL version 5.1.

mg/L = milligram(s) per liter.

Data Distribution Codes:
G = Gamma
LN = Lognormal
N = Normal
NP = Nonparametric

Table 4
RAGS Part D Table 4
Values Used for Daily Exposure Calculations (Ingestion and Dermal Contact) - Reasonable Maximum Exposure
Human Health and Risk Assessment Memo - Open Burn/Open Detonation Units at Range C-52 North and Range C-62 Eglin Air Force Base
Florida

Scenario Timeframe:
Medium: Groundwater
Exposure Medium:

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Notes	Intake Equation/ Model Name
Ingestion	Worker	Adult	Tapwater	C_W	RDX Concentration in Groundwater	--	mg/L	--	See Tables 3.1 and 3.2	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-W	Ingestion Rate	2.5	liters/day	USEPA, 2014		CW × IR-W × EF × ED × 1/BW × 1/AT
				EF	Exposure Frequency	250	days/year	USEPA, 2014		
				ED	Exposure Duration	25	years	USEPA, 2014		
				BW	Body Weight	80	kg	USEPA, 2014		
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989		
				AT-N	Averaging Time (Non-Cancer)	9,125	days	USEPA, 1989		
Dermal	Worker	Adult	Tapwater	Cw	RDX Concentration in Groundwater	--	mg/L	--	See Tables 3.1 and 3.2	Dermally Absorbed Dose (DAD) (mg/kg-day) =
				DA_{event}	Absorbed dose per event	calculated	mg/cm^2-event	USEPA, 2004	See Table 4.1	DA_{event} × EV × ED × EF × SA × 1/BW × 1/AT
				FA	Fraction Absorbed Water	1.0	unitless	USEPA, 2004		
				Kp	Permeability Coefficient	3.4E-04	cm/hour	USEPA, 2004		where for organic chemicals:
				SA	Skin Surface Area Available for Contact	3,527	cm^2	USEPA, 2014		Absorbed Dose per Event (DAevent) (mg/cm2-event) =
				t-event	Event Duration	0.0083	hours/event	Professional judgment		If t-event < t*, then: DAevent = 2FA x Kp x CW x CF x SQRT{(6 x tau-event x t-event)/pi}
				tau-event	Lag time per event	1.8	hours/event	USEPA, 2004		
				t*	Time to reach steady-state = 2.4 x tau-event	4.4	hours	USEPA, 2004		
				B	Ratio of permeability coefficient of a chemical thr	0.0019	unitless	USEPA, 2004		or
				EV	Event Frequency	4	events/day	USEPA, 2011; Professional judgment		If t-event > t*, then: DAevent = FA x Kp x CW x CF x {(t-event/(1 + B)) + 2 x tau-event x ((1 + (3 x B) + (3 x B x B))/(1 +
				EF	Exposure Frequency	250	days/year	USEPA, 2014		
				ED	Exposure Duration	25	years	USEPA, 2014		
				CF	Volumetric Conversion Factor for Water	1E-03	L/cm^3	--		
				BW	Body Weight	80	kg	USEPA, 2014		
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989		
				AT-N	Averaging Time (Non-Cancer)	9,125	days	USEPA, 1989		

Table 4
RAGS Part D Table 4
Values Used for Daily Exposure Calculations (Ingestion and Dermal Contact) - Reasonable Maximum Exposure
Human Health and Risk Assessment Memo - Open Burn/Open Detonation Units at Range C-52 North and Range C-62 Eglin Air Force Base
Florida

Scenario Timeframe:
Medium: Groundwater
Exposure Medium:

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Notes	Intake Equation/ Model Name
Ingestion	Resident	Adult	Tapwater	C_W	RDX Concentration in Groundwater	--	mg/L	--	See Tables 3.1 and 3.2	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-W	Ingestion Rate	2.5	liters/day	USEPA, 2014		CW × IR-W × EF × ED × 1/BW × 1/AT
				EF	Exposure Frequency	350	days/year	USEPA, 2014		
				ED	Exposure Duration	20	years	USEPA, 2014		
				BW	Body Weight	80	kg	USEPA, 2014		
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989		
				AT-N	Averaging Time (Non-Cancer)	7,300	days	USEPA, 1989		
		Child (0-6 years old)	Tapwater	C_W	RDX Concentration in Groundwater		mg/L	--	See Tables 3.1 and 3.2	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-W	Ingestion Rate	0.78	liters/day	USEPA, 2014		CW × IR-W × EF × ED × 1/BW × 1/AT
				EF	Exposure Frequency	350	days/year	USEPA, 2014		
				ED	Exposure Duration	6	years	USEPA, 2014		
				BW	Body Weight	15	kg	USEPA, 2014		
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989		
				AT-N	Averaging Time (Non-Cancer)	2,190	days	USEPA, 1989		
Dermal	Resident	Adult	Tapwater	Cw	RDX Concentration in Groundwater		mg/L	--	See Tables 3.1 and 3.2	Dermally Absorbed Dose (DAD) (mg/kg-day) =
				DA_{event}	Absorbed dose per event	calculated	mg/cm^2-event	USEPA, 2004	See Table 4.1	DA_{event} × EV × ED × EF × SA × 1/BW × 1/AT
				FA	Fraction Absorbed Water	1.0	unitless	USEPA, 2004		
				Kp	Permeability Coefficient	3.4E-04	cm/hour	USEPA, 2004		where for organic chemicals:
				SA	Skin Surface Area Available for Contact	20,900	cm^2	USEPA, 2014		Absorbed Dose per Event (DAevent) (mg/cm2-event) =
				t-event	Event Duration	0.71	hours/event	USEPA, 2014		If t-event < t*, then: DAevent = 2FA x Kp x CW x CF x SQRT{(6 x tau-event x t-event)/pi}
				tau-event	Lag time per event	1.8	hours/event	USEPA, 2004		
				t*	Time to reach steady-state = 2.4 x tau-event	4.4	hours	USEPA, 2004		
				B	Ratio of permeability coefficient of a chemical thr	0.0019	unitless	USEPA, 2004		or
				EV	Event Frequency	1	events/day	Professional judgment		
				EF	Exposure Frequency	350	days/year	USEPA, 2014		If t-event > t*, then: DAevent = FA x Kp x CW x CF x {(t-event/(1 + B)) + 2 x tau-event x ((1 + (3 x B) + (3 x B x B))/(1 + B)2)}
				ED	Exposure Duration	20	years	USEPA, 2014		
				CF	Volumetric Conversion Factor for Water	1E-03	L/cm^3	--		
				BW	Body Weight	80	kg	USEPA, 2014		
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989		
				AT-N	Averaging Time (Non-Cancer)	7,300	days	USEPA, 1989		
		Child (0-6 years old)	Tapwater	Cw	RDX Concentration in Groundwater		mg/L	--	See Tables 3.1 and 3.2	Dermally Absorbed Dose (DAD) (mg/kg-day) =
				DA_{event}	Absorbed dose per event	calculated	mg/cm^2-event	USEPA, 2004	See Table 4.1	DA_{event} × EV × ED × EF × SA × 1/BW × 1/AT
				FA	Fraction Absorbed Water	1.0	unitless	USEPA, 2004		
				Kp	Permeability Coefficient	3.4E-04	cm/hour	USEPA, 2004		where for organic chemicals:
				SA	Skin Surface Area Available for Contact	6,378	cm^2	USEPA, 2014		Absorbed Dose per Event (DAevent) (mg/cm2-event) =
				t-event	Event Duration	0.54	hours/event	USEPA, 2014		If t-event < t*, then: DAevent = 2FA x Kp x CW x CF x SQRT{(6 x tau-event x t-event)/pi}
				tau-event	Lag time per event	1.8	hours/event	USEPA, 2004		
				t*	Time to reach steady-state = 2.4 x tau-event	4.4	hours	USEPA, 2004		
				B	Ratio of permeability coefficient of a chemical thr	0.0019	unitless	USEPA, 2004		or
				EV	Event Frequency	1	events/day	Professional judgment		
				EF	Exposure Frequency	350	days/year	USUSEPA, 2014		If t-event > t*, then: DAevent = FA x Kp x CW x CF x {(t-event/(1 + B)) + 2 x tau-event x ((1 + (3 x B) + (3 x B x B))/(1 + B)2)}
				ED	Exposure Duration	6	years	USEPA, 2014		
				CF	Volumetric Conversion Factor for Water	1E-03	L/cm^3	--		
				BW	Body Weight	15	kg	USEPA, 2014		
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989		
				AT-N	Averaging Time (Non-Cancer)	2,190	days	USEPA, 1989		

Table 4
RAGS Part D Table 4
Values Used for Daily Exposure Calculations (Ingestion and Dermal Contact) - Reasonable Maximum Exposure
Human Health and Risk Assessment Memo - Open Burn/Open Detonation Units at Range C-52 North and Range
C-62 Eglin Air Force Base
Florida

Scenario Timeframe:
Medium: Groundwater
Exposure Medium:

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Notes	Intake Equation/ Model Name
Ingestion	Recreator	Adult	Surface Water	C_W	RDX Concentration in Surface Water		mg/L	--	See Tables 3.1 and 3.2	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-W	Ingestion Rate	0.43	liters/day	USEPA, 2014		CW × IR-W × EF × ED × 1/BW × 1/AT
				EF	Exposure Frequency	50	days/year	Professional judgment		
				ED	Exposure Duration	20	years	USEPA, 2014		
				BW	Body Weight	80	kg	USEPA, 2014		
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989		
				AT-N	Averaging Time (Non-Cancer)	7,300	days	USEPA, 1989		
		Child	Surface Water	C_W	RDX Concentration in Surface Water		mg/L	--	See Tables 3.1 and 3.2	
				IR-W	Ingestion Rate	0.72	liters/day	USEPA, 2014		
				EF	Exposure Frequency	50	days/year	Professional judgment		
				ED	Exposure Duration	6	years	USEPA, 2014		
				BW	Body Weight	15	kg	USEPA, 2014		
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989		
				AT-N	Averaging Time (Non-Cancer)	2,190	days	USEPA, 1989		
Dermal	Recreator	Adult	Surface Water	Cw	RDX Concentration in Surface Water		mg/L	--	See Tables 3.1 and 3.2	Dermally Absorbed Dose (DAD) (mg/kg-day) =
				DA_{event}	Absorbed dose per event	calculated	mg/cm^2-event	USEPA, 2004	See Table 4.1	DA_{event} × EV × ED × EF × SA × 1/BW × 1/AT
				FA	Fraction Absorbed Water	1.0	unitless	USEPA, 2004		
				Kp	Permeability Coefficient	3.4E-04	cm/hour	USEPA, 2004		where for organic chemicals:
				SA	Skin Surface Area Available for Contact	5,419	cm^2	Professional judgment		Absorbed Dose per Event (DAevent) (mg/cm2-event) =
				t-event	Event Duration	6	hours/event	Professional judgment		If t-event < t*, then: DAevent = 2FA x Kp x CW x CF x SQRT{(6 x tau-event x t-event)/pi}
				tau-event	Lag time per event	1.8	hours/event	USEPA, 2004		
				t*	Time to reach steady-state = 2.4 x tau-event	4.4	hours	USEPA, 2004		
				B	Ratio of permeability coefficient of a chemical thr	0.0019	unitless	USEPA, 2004		or
				EV	Event Frequency	1	events/day	Professional judgment		If t-event > t*, then: DAevent = FA x Kp x CW x CF x {(t-event/(1 + B)) + 2 x tau-event x ((1 + (3 x B) + (3 x B x B))/(1 + B)2)}
				EF	Exposure Frequency	50	days/year	Professional judgment		
				ED	Exposure Duration	20	years	USEPA 2014		
				CF	Volumetric Conversion Factor for Water	1E-03	L/cm^3	--		
				BW	Body Weight	80	kg	USEPA, 2014		
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989		
				AT-N	Averaging Time (Non-Cancer)	7,300	days	USEPA, 1989		
		Child	Surface Water	Cw	RDX Concentration in Surface Water		mg/L	--	See Tables 3.1 and 3.2	
				DAevent	Absorbed dose per event	calculated	mg/cm2-event	USEPA, 2004	See Table 4.1	
				FA	Fraction Absorbed Water	1.0	unitless	USEPA, 2004		
				Kp	Permeability Coefficient	3.4E-04	cm/hour	USEPA, 2004		
				SA	Skin Surface Area Available for Contact	2,058	cm2	Professional judgment		
				t-event	Event Duration	6	hours/event	Professional judgment		
				tau-event	Lag time per event	1.8	hours/event	USEPA, 2004		
				t*	Time to reach steady-state = 2.4 x tau-event	4.4	hours	USEPA, 2004		
				B	Ratio of permeability coefficient of a chemical thr	0.0019	unitless	USEPA, 2004		
				EV	Event Frequency	1	events/day	Professional judgment		
				EF	Exposure Frequency	50	days/year	Professional judgment		
				ED	Exposure Duration	6	years	USEPA, 2014		
				CF	Volumetric Conversion Factor for Water	1E-03	L/cm3	--		
				BW	Body Weight	15	kg	USEPA, 2014		
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989		
				AT-N	Averaging Time (Non-Cancer)	2,190	days	USEPA, 1989		

References:
USEPA. 2014. HumanHealth Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors. February.
USEPA. 1989. Risk Assessment Guidance for Superfund. Volume I: Human Health Evaluation Manual (Part A). Interim Final. USEPA/540/1-89/002. Office of Emergency and Remedial Response, Washington, DC. December.
USEPA. 2004. Risk Assessment Guidance for Superfund. Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment). Final. USEPA/540/R/99/005. Office of Superfund Remediation and Technology Innovation, Washington, DC. July.

Table 4.1
RAGS Part D Table 4.1
Values Used for Dermal Absorbed Dose (DAevent) Calculations
Human Health and Risk Assessment Memo - Open Burn/Open Detonation Units at Range C-52 North and Range C-62 Eglin Air Force Base
Florida

If t-event < t*

Chemical of Potential Concern	CAS RN	t*	FA	Kp	CF	tau-event
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	121-82-4	4.43	1	3.36E-04	0.001	1.84

Scenario	Event Duration	DAevent
Worker	0.00833	1.15E-07
Adult Resident	0.71	1.06E-06
Child Resident	0.54	9.27E-07

If t-event > t*

Chemical of Potential Concern	CAS RN	t*	FA	Kp	CF	B	tau-event
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	121-82-4	4.43	1	3.36E-04	0.001	1.93E-03	1.84

Scenario	Event Duration	DAevent
Recreator	6	3.25E-06

Note:
DAevent values shown here are multiplied by the EPC (Cw) for final DAD calculations.

Table 5
RAGS Part D Table 5.1
Non-Cancer Toxicity Data - Oral/Dermal
Human Health and Risk Assessment Memo - Open Burn/Open Detonation Units at Range C-52 North and Range C-62 Eglin Air Force Base
Florida

Chemical of Potential Concern	CASRN	Chronic/ Subchronic	Oral Reference Dose (RfD)		Oral Absorption Efficiency for Dermal	Absorbed RfD for Dermal		Primary Target Organ(s)	Combined Uncertainty/Modifying Factors	RfD	
			Value	Units		Value	Units			Source(s)	Date(s) (MM/DD/YYYY)
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	121-82-4	Chronic	4E-03	mg/kg-day	1	4E-03	mg/kg-day	Nervous System	300	IRIS	8/30/2018
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	121-82-4	Subchronic	1E-01	mg/kg-day	1	1E-01	mg/kg-day	Nervous System	30	ATSDR	1/1/2012

Notes:
NA = not available.

Hierarchy of Sources:
IRIS = Integrated Risk Information System (https://cfpub.epa.gov/ncea/iris2/atoz.cfm).
NCEA = National Center for Environmental Assessment, Provisional Peer-Reviewed Toxicity Value (http://hhpprtv.ornl.gov/).
CalEPA = California Environmental Protection Agency, Office of Environmental Health Hazard Assessment (https://oehha.ca.gov/chemicalsp).
ATSDR = Agency for Toxic Substances and Disease Registry, Minimal Risk Level (https://www.atsdr.cdc.gov/mrls/index.asp).
HEAST = Health Effects Assessment Summary Tables (https://epa-heast.ornl.gov/).

Table 6
RAGS Part D Table 6.1
Cancer Toxicity Data - Oral/Dermal
Human Health and Risk Assessment Memo - Open Burn/Open Detonation Units at Range C-52 North and Range C-62 Eglin Air Force Base
Florida

Chemical of Potential Concern	CASRN	Oral Cancer Slope Factor (CSF)		Oral Absorption Efficiency for Dermal	Absorbed CSF for Dermal		USEPA Weight of Evidence Classification / Cancer Guideline Description	Oral CSF	
		Value	Units		Value	Units		Source(s)	Date(s) (MM/DD/YYYY)
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	121-82-4	8E-02	(mg/kg-day)-1	1	8.0E-02	$(mg/kg\text{-}day)^{-1}$	Suggestive Evidence of Carcinogenic Potential	IRIS	8/30/2018

Notes:
NA = not available.

Hierarchy of Sources:
IRIS = Integrated Risk Information System (https://cfpub.epa.gov/ncea/iris2/atoz.cfm).
NCEA = National Center for Environmental Assessment, Provisional Peer-Reviewed Toxicity Value (http://hhpprtv.ornl.gov/).
CalEPA = California Environmental Protection Agency, Office of Environmental Health Hazard Assessment (https://oehha.ca.gov/chemicalsp).
ATSDR = Agency for Toxic Substances and Disease Registry, Minimal Risk Level (https://www.atsdr.cdc.gov/mrls/index.asp).
HEAST = Health Effects Assessment Summary Tables (https://epa-heast.ornl.gov/).

Table 7.1.1
RAGS Part D Table 7
Calculation of Chemical Cancer Risks and Non-Cancer Hazards for a Current/Future Adult Onsite Worker Exposure to Groundwater at C-52N
Human Health and Risk Assessment Memo - Open Burn/Open Detonation Units at Range C-52 North and Range C-62
Eglin Air Force Base
Florida

Scenario Timeframe:	Current/Future
Receptor Population:	Onsite Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake / Exposure Concentration		Cancer Slope Factor / Unit Risk		Cancer Risk	Intake / Exposure Concentration		Reference Dose / Reference Concentration		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Tapwater	C-52N	Ingestion	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	1.4E-03	mg/L	1.1E-05	mg/kg-day	8.0E-02	$(mg/kg\text{-}day)^{-1}$	9E-07	3.1E-05	mg/kg-day	4.0E-03	mg/kg-day	8E-03
			Exp. Route Total								9E-07					8E-03
			Dermal	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	1.4E-03	mg/L	7.2E-09	mg/kg-day	8.0E-02	$(mg/kg\text{-}day)^{-1}$	6E-10	2.0E-08	mg/kg-day	4.0E-03	mg/kg-day	5E-06
			Exp. Route Total								6E-10					5E-06
										Total of Receptor Risks Across All Media	9E-07				Total of Receptor Hazards Across All Media	8E-03

Notes:

-- = not applicable.
EPC = exposure point concentration.
mg/L = milligrams per liter.
mg/kg-day = milligrams per kilogram per day.
$(mg/kg\text{-}day)^{-1}$ = inverse milligrams per kilogram per day.
NA = not available.

Table 7.1.2
RAGS Part D Table 7
Calculation of Chemical Cancer Risks and Non-Cancer Hazards for a Current/Future Adult Onsite Worker Exposure to Groundwater at C-62
Human Health and Risk Assessment Memo - Open Burn/Open Detonation Units at Range C-52 North and Range C-62
Eglin Air Force Base
Florida

Scenario Timeframe:	Current/Future
Receptor Population:	Onsite Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake / Exposure Concentration		Cancer Slope Factor / Unit Risk		Cancer Risk	Intake / Exposure Concentration		Reference Dose / Reference Concentration		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Tapwater	C-62	Ingestion	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	4.1E-02	mg/L	3.1E-04	mg/kg-day	8.0E-02	$(mg/kg-day)^{-1}$	2E-05	8.7E-04	mg/kg-day	4.0E-03	mg/kg-day	2E-01
			Exp. Route Total								2E-05					2E-01
			Dermal	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	4.1E-02	mg/L	2.0E-07	mg/kg-day	8.0E-02	$(mg/kg-day)^{-1}$	2E-08	5.7E-07	mg/kg-day	4.0E-03	mg/kg-day	1E-04
			Exp. Route Total								2E-08					1E-04
										Total of Receptor Risks Across All Media	2E-05				Total of Receptor Hazards Across All Media	2E-01

Notes:
-- = not applicable.
EPC = exposure point concentration.
mg/L = milligrams per liter.
mg/kg-day = milligrams per kilogram per day.
$(mg/kg-day)^{-1}$ = inverse milligrams per kilogram per day.
NA = not available.

Table 7.2.1
RAGS Part D Table 7
Calculation of Chemical Cancer Risks and Non-Cancer Hazards for a Future Adult+Child (Cancer Risk), Child (Non-Cancer Hazard) Hypothetical Onsite Resident Exposure to Groundwater C-52N
Human Health and Risk Assessment Memo - Open Burn/Open Detonation Units at Range C-52 North and Range C-62
Eglin Air Force Base
Florida

Scenario Timeframe:	Future
Receptor Population:	Hypothetical Onsite Resident
Receptor Age:	Adult+Child (Cancer Risk), Child (Non-Cancer Hazard)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake / Exposure Concentration		Cancer Slope Factor / Unit Risk		Cancer Risk	Intake / Exposure Concentration		Reference Dose / Reference Concentration		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Tapwater	C-52N	Ingestion	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	1.4E-03	mg/L	1.9E-05	mg/kg-day	8.0E-02	$(mg/kg\text{-}day)^{-1}$	1E-06	7.2E-05	mg/kg-day	1.0E-01	mg/kg-day	7E-04
			Exp. Route Total								1E-06					7E-04
			Dermal	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	1.4E-03	mg/L	1.6E-07	mg/kg-day	8.0E-02	$(mg/kg\text{-}day)^{-1}$	1E-08	5.5E-07	mg/kg-day	1.0E-01	mg/kg-day	5E-06
			Exp. Route Total								1E-08					5E-06
										Total of Receptor Risks Across All Media	1E-06				Total of Receptor Hazards Across All Media	7E-04

Notes:

-- = not applicable.
EPC = exposure point concentration.
mg/L = milligrams per liter.
mg/kg-day = milligrams per kilogram per day.
$(mg/kg\text{-}day)^{-1}$ = inverse milligrams per kilogram per day.
NA = not available.

Table 7.2.2
RAGS Part D Table 7
Calculation of Chemical Cancer Risks and Non-Cancer Hazards for a Future Adult+Child (Cancer Risk), Child (Non-Cancer Hazard) Hypothetical Onsite Resident Exposure to Groundwater at C-62
Human Health and Risk Assessment Memo - Open Burn/Open Detonation Units at Range C-52 North and Range C-62
Eglin Air Force Base
Florida

Scenario Timeframe:	Future
Receptor Population:	Hypothetical Onsite Resident
Receptor Age:	Adult+Child (Cancer Risk), Child (Non-Cancer Hazard)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake / Exposure Concentration		Cancer Slope Factor / Unit Risk		Cancer Risk	Intake / Exposure Concentration		Reference Dose / Reference Concentration		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Tapwater	C-62	Ingestion	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	4.1E-02	mg/L	5.2E-04	mg/kg-day	8.0E-02	$(mg/kg-day)^{-1}$	4E-05	2.0E-03	mg/kg-day	1.0E-01	mg/kg-day	2E-02
			Exp. Route Total								4E-05					2E-02
			Dermal	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	4.1E-02	mg/L	4.4E-06	mg/kg-day	8.0E-02	$(mg/kg-day)^{-1}$	4E-07	1.5E-05	mg/kg-day	1.0E-01	mg/kg-day	2E-04
			Exp. Route Total								4E-07					2E-04
										Total of Receptor Risks Across All Media	4E-05				Total of Receptor Hazards Across All Media	2E-02

Notes:

-- = not applicable.
EPC = exposure point concentration.
mg/L = milligrams per liter.
mg/kg-day = milligrams per kilogram per day.
$(mg/kg-day)^{-1}$ = inverse milligrams per kilogram per day.
NA = not available.

Table 7.3.1
RAGS Part D Table 7
Calculation of Chemical Cancer Risks and Non-Cancer Hazards for a Future Adult+Child (Cancer Risk), Child (Non-Cancer Hazard) Offsite Recreator Exposure to Groundwater at C-52N
Human Health and Risk Assessment Memo - Open Burn/Open Detonation Units at Range C-52 North and Range C-62
Eglin Air Force Base
Florida

Scenario Timeframe:	Future
Receptor Population:	Offsite Recreator
Receptor Age:	Adult+Child (Cancer Risk), Child (Non-Cancer Hazard)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake / Exposure Concentration		Cancer Slope Factor / Unit Risk		Cancer Risk	Intake / Exposure Concentration		Reference Dose / Reference Concentration		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Surface Water	C-52N	Ingestion	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	1.5E-04	mg/L	1.2E-07	mg/kg-day	8.0E-02	$(mg/kg-day)^{-1}$	9E-09	9.9E-07	mg/kg-day	1.0E-01	mg/kg-day	1E-05
			Exp. Route Total								9E-09					1E-05
			Dermal	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	1.5E-04	mg/L	2.1E-09	mg/kg-day	8.0E-02	$(mg/kg-day)^{-1}$	2E-10	9.2E-09	mg/kg-day	1.0E-01	mg/kg-day	9E-08
			Exp. Route Total								2E-10					9E-08
										Total of Receptor Risks Across All Media	9E-09				Total of Receptor Hazards Across All Media	1E-05

Notes:

-- = not applicable.
EPC = exposure point concentration.
mg/L = milligrams per liter.
mg/kg-day = milligrams per kilogram per day.
$(mg/kg-day)^{-1}$ = inverse milligrams per kilogram per day.
NA = not available.

Table 7.3.2
RAGS Part D Table 7
Calculation of Chemical Cancer Risks and Non-Cancer Hazards for a Future Adult+Child (Cancer Risk), Child (Non-Cancer Hazard) Offsite Recreator Exposure to Groundwater at C-62
Human Health and Risk Assessment Memo - Open Burn/Open Detonation Units at Range C-52 North and Range C-62
Eglin Air Force Base
Florida

Scenario Timeframe:	Future
Receptor Population:	Offsite Recreator
Receptor Age:	Adult+Child (Cancer Risk), Child (Non-Cancer Hazard)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake / Exposure Concentration		Cancer Slope Factor / Unit Risk		Cancer Risk	Intake / Exposure Concentration		Reference Dose / Reference Concentration		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Surface Water	C-62	Ingestion	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	1.5E-02	mg/L	1.2E-05	mg/kg-day	8.0E-02	$(mg/kg\text{-}day)^{-1}$	9E-07	9.9E-05	mg/kg-day	1.0E-01	mg/kg-day	1E-03
			Exp. Route Total								9E-07					1E-03
			Dermal	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	1.5E-02	mg/L	2.1E-07	mg/kg-day	8.0E-02	$(mg/kg\text{-}day)^{-1}$	2E-08	9.2E-07	mg/kg-day	1.0E-01	mg/kg-day	9E-06
			Exp. Route Total								2E-08					9E-06
										Total of Receptor Risks Across All Media	9E-07				Total of Receptor Hazards Across All Media	1E-03

Notes:

-- = not applicable.
EPC = exposure point concentration.
mg/L = milligrams per liter.
mg/kg-day = milligrams per kilogram per day.
$(mg/kg\text{-}day)^{-1}$ = inverse milligrams per kilogram per day.
NA = not available.

Table 7.4.1
RAGS Part D Table 7
Calculation of Chemical Cancer Risks and Non-Cancer Hazards for a Future Adult+Child (Cancer Risk), Child (Non-Cancer Hazard) Hypothetical Offsite Resident Exposure to Surface Water at C-52N
Human Health and Risk Assessment Memo - Open Burn/Open Detonation Units at Range C-52 North and Range C-62
Eglin Air Force Base
Florida

Scenario Timeframe:	Future
Receptor Population:	Hypothetical Offsite Resident
Receptor Age:	Adult+Child (Cancer Risk), Child (Non-Cancer Hazard)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake / Exposure Concentration		Cancer Slope Factor / Unit Risk		Cancer Risk	Intake / Exposure Concentration		Reference Dose / Reference Concentration		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Water	Tapwater	C-52N	Ingestion	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	1.5E-04	mg/L	1.9E-06	mg/kg-day	8.0E-02	$(mg/kg-day)^{-1}$	2E-07	7.5E-06	mg/kg-day	1.0E-01	mg/kg-day	7E-05
			Exp. Route Total								2E-07					7E-05
			Dermal	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	1.5E-04	mg/L	1.6E-08	mg/kg-day	8.0E-02	$(mg/kg-day)^{-1}$	1E-09	5.7E-08	mg/kg-day	1.0E-01	mg/kg-day	6E-07
			Exp. Route Total								1E-09					6E-07
										Total of Receptor Risks Across All Media	2E-07				Total of Receptor Hazards Across All Media	8E-05

Notes:

-- = not applicable.
EPC = exposure point concentration.
mg/L = milligrams per liter.
mg/kg-day = milligrams per kilogram per day.
$(mg/kg-day)^{-1}$ = inverse milligrams per kilogram per day.
NA = not available.

Table 7.4.2
RAGS Part D Table 7
Calculation of Chemical Cancer Risks and Non-Cancer Hazards for a Future Adult+Child (Cancer Risk), Child (Non-Cancer Hazard) Hypothetical Offsite Resident Exposure to Surface Water at C-62 Human Health and Risk Assessment Memo - Open Burn/Open Detonation Units at Range C-52 North and Range C-62
Eglin Air Force Base
Florida

Scenario Timeframe:	Future
Receptor Population:	Hypothetical Offsite Resident
Receptor Age:	Adult+Child (Cancer Risk), Child (Non-Cancer Hazard)

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake / Exposure Concentration		Cancer Slope Factor / Unit Risk		Cancer Risk	Intake / Exposure Concentration		Reference Dose / Reference Concentration		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Water	Tapwater	C-62	Ingestion	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	1.5E-02	mg/L	1.9E-04	mg/kg-day	8.0E-02	$(mg/kg\text{-}day)^{-1}$	2E-05	7.5E-04	mg/kg-day	1.0E-01	mg/kg-day	7E-03
			Exp. Route Total								2E-05					7E-03
			Dermal	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	1.5E-02	mg/L	1.6E-06	mg/kg-day	8.0E-02	$(mg/kg\text{-}day)^{-1}$	1E-07	5.7E-06	mg/kg-day	1.0E-01	mg/kg-day	6E-05
			Exp. Route Total								1E-07					6E-05
										Total of Receptor Risks Across All Media	2E-05				Total of Receptor Hazards Across All Media	8E-03

Notes:

-- = not applicable.
EPC = exposure point concentration.
mg/L = milligrams per liter.
mg/kg-day = milligrams per kilogram per day.
$(mg/kg\text{-}day)^{-1}$ = inverse milligrams per kilogram per day.
NA = not available.

Table 8
Summary of Groundwater Data and Modeled Concentrations at Points of Discharge
Human Health and Risk Assessment Memo - Open Burn/Open Detonation Units at Range C-52 North and Range C-62 Eglin Air Force Base
Florida

Exposure Point	CASRN	Chemical	Units	Maximum Concentration	95 Upper Confidence Limit	Modeled Concentration at Point of Discharge into Surface Water (1)	Alternate Concentration Limit (2)	Surface Water Cleanup Target Level (3)
C-52 North	2691-41-0	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	µg/L	ND	NA	NA	580	1300
	121-82-4	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	µg/L	1.5	1.45	0.15	0.32	180
C-62	2691-41-0	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	µg/L	59	41.6	NA	430	1300
	121-82-4	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	µg/L	72	40.7	15	0.31	180

Notes:

(1) Most conservative modeled concentration at point of discharge location
C-52N: Bay Head Branch Creek
C-62: Blount Mill Creek

(2) Most conservative (lowest) ACL calculated for each range

(3) Surface Water Cleanup Target Level (SWCTL) from Florida DEP

CASRN = Chemical Abstract Services Registry Number.

µg/L = microgram(s) per liter.

NA = not available.

ND = not detected.

ATTACHMENTS

Attachment 1

ProUCL Output

Attachment 1
Table 1
ProUCL Output for MW-94-52-01
Eglin Air Force Base
Florida

Constituent	UCL Units	Distribution for UCL Selection	Total Sample Size	% ND	FOD%	SDp of In Detected - Skewness (p)	Gamma K star (bias corrected)	Selected UCL Method
HMX	µg/L	insufficient data	5	--	0%	NA	NA	insufficient data
RDX	µg/L	Nonparametric	5	20%	80%	0.340347984	2.399	95% KM (t) UCL

Notes:
When the RPD is <5% of multiple suggested/potential UCLs provided by ProUCL, the maximum value is shown in Column J
When the RPD is >5% of multiple suggested/potential UCLs provided by ProUCL, review of those UCLs is recommended.
FOD - frequency of detection
ND - non-detect
mg/kg - miligrams per kilogram
µg/kg - micrograms per kilogram
RPD = Relative Percent Difference = (MaxUCL - MinUCL) / ((MaxUCL + MinUCL) * 0.5)
UCL - upper confidence limit

Attachment 1
Table 1
ProUCL Output for MW-94-52-01
Eglin Air Force Base
Florida

Constituent	UCL Units	Sel UCL Value	# Detects	# NDs	Num Distinct Observations	Num Distinct Detects	Minimum Detected	Maximum Detected
HMX	µg/L	**NA**	0	5	5	0	--	--
RDX	µg/L	**1.447**	4	1	5	4	0.72	1.5

Attachment 1
Table 1
ProUCL Output for MW-94-52-01
Eglin Air Force Base
Florida

Constituent	UCL Units	Mean Detected	SD of In Detected - Skewness	KM Mean	KM SD	Minimum ND	Maximum ND	GOF Test Result
HMX	µg/L	--	NA	NA	NA	NA	NA	NA
RDX	µg/L	1.093	0.393	0.908	0.489	0.17	0.17	Detected Data appear Normal Distributed at 5% Significance Level

Attachment 1
Table 1
ProUCL Output for MW-94-52-01
Eglin Air Force Base
Florida

Constituent	UCL Units	# Pot. UCLs	Potential UCL(s) to Use	Pot UCL Val	UCL Flags - See Notes
HMX	µg/L	NA	NA	NA	NA
RDX	µg/L	1	95% KM (t) UCL	1.447	

Constituent	UCL Units	Warning
HMX	µg/L	Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!
RDX	µg/L	

Attachment 1
Table 1
ProUCL Output for MW-94-52-01
Eglin Air Force Base
Florida

Constituent	UCL Units	Selected 95% UCL to Use	Selected 95% UCL Method	Min Suggested UCL	Min Suggested UCL Method	Version
HMX	µg/L					ProUCL version 5.1
RDX	µg/L	1.447	95% KM (t) UCL	1.447	95% KM (t) UCL	ProUCL version 5.1

Attachment 1
Table 2
ProUCL Output for MW-94-62-04 and MW-94-62-05
Eglin Air Force Base
Florida

Constituent	UCL Units	Distribution for UCL Selection	Total Sample Size	% ND	FOD%	SDp of In Detected - Skewness (p)	Gamma K star (bias corrected)	Selected UCL Method
HMX	µg/L	Normal	10	0%	100%	0.292194456	8.089	95% Student's-t UCL
RDX	µg/L	Gamma	10	0%	100%	0.458214033	3.129	95% Adjusted Gamma UCL

Notes:
When the RPD is <5% of multiple suggested/potential UCLs provided by ProUCL, the maximum value is shown in Column J
When the RPD is >5% of multiple suggested/potential UCLs provided by ProUCL, review of those UCLs is recommended.
FOD - frequency of detection
ND - non-detect
mg/kg - miligrams per kilogram
µg/kg - micrograms per kilogram
RPD = Relative Percent Difference = (MaxUCL - MinUCL) / ((MaxUCL + MinUCL) * 0.5)
UCL - upper confidence limit

Attachment 1
Table 2
ProUCL Output for MW-94-62-04 and MW-94-62-05
Eglin Air Force Base
Florida

Constituent	UCL Units	Sel UCL Value	# Detects	# NDs	Num Distinct Observations	Num Distinct Detects	Minimum Detected	Maximum Detected
HMX	µg/L	**41.56**	10	0	10	10	22.6	59
RDX	µg/L	**40.69**	10	0	9	9	13.2	72

Attachment 1
Table 2
ProUCL Output for MW-94-62-04 and MW-94-62-05
Eglin Air Force Base
Florida

Constituent	UCL Units	Mean Detected	SD of In Detected - Skewness	KM Mean	KM SD	Minimum ND	Maximum ND	GOF Test Result
HMX	µg/L	34.94	0.308	NA	NA	NA	NA	Data appear to follow a Discernible Distribution at 5% Significance Level
RDX	µg/L	27.86	0.483	NA	NA	NA	NA	Data appear to follow a Discernible Distribution at 5% Significance Level

Attachment 1
Table 2
ProUCL Output for MW-94-62-04 and MW-94-62-05
Eglin Air Force Base
Florida

Constituent	UCL Units	# Pot. UCLs	Potential UCL(s) to Use	Pot UCL Val	UCL Flags - See Notes	Warning
HMX	µg/L	1	95% Student's-t UCL	41.56		
RDX	µg/L	1	95% Adjusted Gamma UCL	40.69		

Attachment 1
Table 2
ProUCL Output for MW-94-62-04 and MW-94-62-05
Eglin Air Force Base
Florida

Constituent	UCL Units	Selected 95% UCL to Use	Selected 95% UCL Method	Min Suggested UCL	Min Suggested UCL Method	Version
HMX	µg/L	41.56	95% Student's-t UCL	41.56	95% Student's-t UCL	ProUCL version 5.1
RDX	µg/L	40.69	95% Adjusted Gamma UCL	40.69	95% Adjusted Gamma UCL	ProUCL version 5.1

Attachment 1
Table 3
ProUCL Output for MW-94-62-05
Eglin Air Force Base
Florida

Constituent	UCL Units	Distribution for UCL Selection	Total Sample Size	% ND	FOD%	SDp of In Detected - Skewness (p)	Gamma K star (bias corrected)	Selected UCL Method
HMX	µg/L	Normal	5	0%	100%	0.341671187	3.726	95% Student's-t UCL
RDX	µg/L	Normal	5	0%	100%	0.626099034	1.129	95% Student's-t UCL

Notes:
When the RPD is <5% of multiple suggested/potential UCLs provided by ProUCL, the maximum value is shown in Column J
When the RPD is >5% of multiple suggested/potential UCLs provided by ProUCL, review of those UCLs is recommended.
FOD - frequency of detection
ND - non-detect
mg/kg - miligrams per kilogram
µg/kg - micrograms per kilogram
RPD = Relative Percent Difference = (MaxUCL - MinUCL) / ((MaxUCL + MinUCL) * 0.5)
UCL - upper confidence limit

Attachment 1
Table 3
ProUCL Output for MW-94-62-05
Eglin Air Force Base
Florida

Constituent	UCL Units	Sel UCL Value	# Detects	# NDs	Num Distinct Observations	Num Distinct Detects	Minimum Detected	Maximum Detected
HMX	µg/L	**53.12**	5	0	5	5	23	59
RDX	µg/L	**53.95**	5	0	5	5	13.2	72

Attachment 1
Table 3
ProUCL Output for MW-94-62-05
Eglin Air Force Base
Florida

Constituent	UCL Units	Mean Detected	SD of In Detected - Skewness	KM Mean	KM SD	Minimum ND	Maximum ND	GOF Test Result
HMX	µg/L	39.36	0.382	NA	NA	NA	NA	Data appear to follow a Discernible Distribution at 5% Significance Level
RDX	µg/L	30.66	0.7	NA	NA	NA	NA	Data appear to follow a Discernible Distribution at 5% Significance Level

Attachment 1
Table 3
ProUCL Output for MW-94-62-05
Eglin Air Force Base
Florida

Constituent	UCL Units	# Pot. UCLs	Potential UCL(s) to Use	Pot UCL Val	UCL Flags - See Notes	Warning
HMX	µg/L	1	95% Student's-t UCL	53.12		
RDX	µg/L	1	95% Student's-t UCL	53.95		

Attachment 1
Table 3
ProUCL Output for MW-94-62-05
Eglin Air Force Base
Florida

Constituent	UCL Units	Selected 95% UCL to Use	Selected 95% UCL Method	Min Suggested UCL	Min Suggested UCL Method	Version
HMX	µg/L	53.12	95% Student's-t UCL	53.12	95% Student's-t UCL	ProUCL version 5.1
RDX	µg/L	53.95	95% Student's-t UCL	53.95	95% Student's-t UCL	ProUCL version 5.1

Attachment 2

BIOSCREEN-AT Evaluation and Alternate Concentration Limits Ranges C-52N and C-62 Eglin Air Force Base, Florida

Attachment 2 – BIOSCREEN-AT Evaluation and Alternate Concentration Limits
Open Burn/Open Detonation Units
Range C-52 North and Range C-62
Eglin Air Force Base, Florida
Operational Permit No. 006176-HO-007

Prepared For:
Eglin Air Force Base
96 CEG/CEIEC
700 Range Road, Building 592
Eglin Air Force Base, Florida 32542

Prepared by:
LRS Federal, LLC
8221 Ritchie Highway, Suite 300
Pasadena, Maryland 21122
(410) 544-3570

Prepared Under Contract to:
Air Force Civil Engineer Center
Contract Number: FA8903-15-F-0006

February 2019

This page intentionally left blank.

TABLE OF CONTENTS

1.0 Site Background 1
1.1 Release and Monitoring History 1
1.2 Site Setting 2
1.3 Geology and Hydrogeology 2
1.3.1 Range C-52N 3
1.3.2 Range C-62 3
1.4 RDX and HMX in Groundwater 3
2.0 Fate and Transport of RDX 5
3.0 Review of Previous BIOSCREEN Model 6
4.0 Updated BIOSCREEN-AT Model 7
4.1 Input Parameters 8
4.1.1 Hydrogeology 8
4.1.2 Dispersion 9
4.1.3 Adsorption and Chemical Retardation 9
4.1.4 Biodegradation and Natural Attenuation Half-Life ($t_{1/2}$) 10
4.1.5 General (Modeled Domain) 10
4.1.6 Source Data 11
4.2 BIOSCREEN-AT Results 12
4.2.1 Range C-52N 12
4.2.2 Range C-62 12
4.3 Modeling Assumptions and Uncertainty 13
5.0 Alternative Concentration Limit Calculations 15
6.0 Conclusions 18
7.0 References 19

FIGURES

Figure 1 Site Location

Figure 2 Range C52N Potentiometric Contour Map – May 2018

Figure 3 Range C-62 Potentiometric Contour Map – May 2018

TABLES

Table 1 Historical Sampling Results – May 2003 through May 2018

Table 2A 2018 BIOSCREEN-AT Model Input Parameters

Table 2B 2002 BIOSCREEN Model Input Parameters

Table 3 BIOSCREEN-AT Results

Table 4 Alternate Concentration Limits for Downgradient Groundwater Monitoring Wells

ATTACHMENTS

Attachment 1 Linear Regression Analysis

Attachment 2 BIOSCREEN-AT Models

Attachment 3 Alternate Concentration Limits in Groundwater for the Protection of Surface Water Receptors

LRS Federal LLC (LRS) conducted this Draft BIOSCREEN-AT evaluation of the hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX) concentrations and alternate concentration limit (ACL) calculations for RDX and octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX) in groundwater at the C-52 North (C-52N) and C-62 ranges on the Eglin Air Force Base (AFB) in Florida (the Site). This memorandum summarizes Arcadis' review of the previous BIOSCREEN modeling conducted by CH2M Hill (CH2M Hill 2000, 2002a, and 2002b), summarizes an updated modeling scenario, and provides ACLs for RDX and HMX in groundwater.

1.0 SITE BACKGROUND

1.1 Release and Monitoring History

The Site is located in the northwest portion of the Florida Panhandle (Figure 1), occupying a large portion of Santa Rosa, Okaloosa, and Walton counties (LRS 2018). The Site is comprised of cantonments, ranges/live-fire areas, and undeveloped landscape. Bombing ranges at the Site have been operated since 1950. Ranges C-52N and C-62 are primarily used for testing and training of air-to-land bombing, gunnery, and rocketry training exercises. Range C-52N is located on an active mission target range, whereas Range C-62 is located on a practice mission target range. C-52N is located approximately 6 miles north of Niceville, Florida and 2.5 miles east of the Okaloosa-Walton County line. Range C-62 is situated approximately 6 miles southwest of Defuniak Springs, Florida in Walton County. The C-62 range is also secondarily used as open burn/open detonation (OB/OD) units for treatment of unserviceable and/or excess serviceable munitions, items, and/or waste explosives, as permitted by the Florida Department of Environmental Protection (FDEP; Permit No. HO46-286388). Range C-52N contains a 100-foot by 200-foot area known as the Cat's Eye target, which is also used for OD activities. The southern end of Range C-62 (a 100-yard by 200-yard area) contains an OD unit and two 20-foot by 9-foot covered burn kettles for OB operations. There are no current plans to change the land use at either of these ranges (CH2M Hill 2000, 2002a, and 2002b, LRS 2018).

Two constituents of potential concern from site operations include the explosive compounds RDX and HMX. In November 1994, three groundwater monitoring wells were installed at C-52N (MW-94-52-01 through MW-94-52-03), and five wells were installed at C-62 (MW-94-62-01 through MW-94-62-05). Three rounds of quarterly baseline sampling, including soil sampling, were conducted in November and December 1994 and March and May 1995. At Range C-52N, no explosive compounds were reported above detection limits for any of the six surface or subsurface soil samples. At Range C-62, explosive compounds were not detected at 19 of 20 surface soil samples, with only a trace amount of 1,3-dinitrobenzene (0.42 milligrams per kilogram [mg/kg]) was detected at concentrations below the United States Environmental Protection Agency Region III risk-based concentration of 0.78 mg/kg in one sample. In the subsurface soil samples collected from Range C-62, only nitrobenzene was detected at 0.26 mg/kg, below the United States Environmental Protection Agency Region III risk-based concentration of 3.9 mg/kg.

Twenty-two rounds of quarterly groundwater monitoring events were performed between September 1996 and January 2002 to establish baseline groundwater conditions at the site. Groundwater samples were analyzed for explosives (including RDX and HMX), nitrate, and nitrite. In addition to these parameters, groundwater samples collected from Range C-62 were analyzed for benzene, toluene, ethylbenzene, and total xylenes. Since 2002, groundwater monitoring at Range C-52N has consisted of one upgradient background well (MW-94-52-01) and two point of compliance (POC) wells (MW-94-52-01 and MW-94-52-03). Monitoring at Range C-62 has consisted of sampling one upgradient background well (MW-94-62-01) and four POC wells (MW-94-62-02 through MW-94-62-05; LRS 2018).

1.2 Site Setting

Topography at Range C-52N varies from elevations of near 170 feet above mean sea level (ft amsl) in the north to nearly 70 ft amsl at the southern end of the Range. Range Road 200 tracks a ridge dissecting the northern portion of the site with a bearing roughly southwest/northeast. Two drainages lie on the either side of the Cat's Eye (the target area): Bay Head Branch to the west and Coon Head Branch to the east. These drainages eventually flow south into the Basin Bayou via Basin Creek. Two downgradient monitoring wells at C-52N are located south of the Cat's Eye, at elevations of approximately 100 to 120 ft amsl (Figure 2)

A large open flatland dominates the central portion of the C-62 range. Drainages in the northern and southern extremes of the range drop off in elevation from near 200 ft amsl to 100 ft amsl. Downgradient monitoring wells at C-62 are located southwest of the Cat's Eye, upgradient of the headwaters of Blount Mill Creek (Figure 3). Both bombing ranges are deforested.

1.3 Geology and Hydrogeology

The Site is situated in the Gulf Coastal Plain and is underlain by deltaic deposits of the Plioceneage Citronelle Formation (Florida Geological Survey [FGS] 2001). This formation is characterized by very fine to very coarse, poorly sorted, clean to clayey sands. Clay, silt, and gravel frequently occur as variable and discontinuous lenses. The Citronelle Formation is 20 to 50 feet thick on the eastern half of the Site where the two ranges are located (FGS 2001). The surficial aquifer in the Citronelle Formation is referred to as the 'Sand and Gravel Aquifer,' the 'Miocene-Pliocene Aquifer', or the 'Citronelle Aquifer'. Specifically, this aquifer is approximately 60 feet thick at Range C-52N and 100 feet thick at Range C-62 (FDEP 2001). The Sand and Gravel Aquifer is comprised of fine to coarse sand, clay, silt, and gravel. While the aquifer is typically unconfined above with permeable material exposed at ground surface, lenses of less permeable material including fine sand, clay, and silt create discontinuous confined zones that result in localized 'leaky confined' conditions. Groundwater flow in the Sand and Gravel Aquifer is typically controlled by topography, with flow generally trending south towards the Gulf of Mexico. Flow patterns are locally influenced by streams and rivers which dissect the aquifer and serve as potential discharge boundaries (LRS 2018).

Underlying the Citronelle Formation on the eastern side of the base is the Miocene-age Alum Bluff Group. These sediments are characterized by clays, sands, and shell beds, with variable grain size (from very fine to very coarse). The Alum Bluff Group is approximately 180 feet thick below the eastern half of the Site (FGS 2001). The Pensacola Clay, which forms part of the Alum Bluff group, has low permeability and functions as a confining unit that separates the surficial Sand and Gravel Aquifer in the Citronelle Formation from the underlying Floridian aquifer (LRS 2018).

1.3.1 Range C-52N

Three monitoring wells were installed at Range C-52N (EA Engineering 1995). The monitoring wells were triangulated around the Cat's Eye and installed in the surficial aquifer of the Citronelle Formation. MW-94-52-01 was intended to be the upgradient "background" well, and monitoring wells MW-94-52-02 and MW-94-52-03 were intended to be downgradient POC wells (installed downgradient to the south). The lithology at C-52N consists of fine- to coarse-grained moderate- to well-sorted sands with minor amounts of silt. The sands appear to be continuous across the range, with occasional discontinuous peat lenses present near the top of the water table (EA Engineering 1995). Locally at Range C-52N, the groundwater flow direction appears to flow to the south away from the Cat's Eye (Figure 2).

1.3.2 Range C-62

Five monitoring wells were installed in the surficial aquifer of the Citronelle Formation at Range C-62 (EA Engineering 1995). The monitoring wells were set to surround the OB and OD units. MW-94-62-01 was intended to be the upgradient "background" well for both the OB and OD units. Monitoring wells MW-94-62-02 and MW-94-62-03 were installed downgradient of the OB unit (to the west-southwest) and upgradient of the headwaters of Blount Mill Creek. Monitoring wells MW-94-62-04 and MW-94-62-05 were installed downgradient of the OD Unit (to the south-southwest) and upgradient of the headwaters of Blount Mill Creek. The lithology of Range C-62 consists of continuous fine- to coarse-grained moderate- to well-sorted sands with minor amounts of silt. Locally at Range C-62, the groundwater flow direction appears to flow to the west-southwest from the OB Unit, while flowing more toward the southwest from the OD Unit toward the headwater of Blount Mill Creek (Figure 3).

1.4 RDX and HMX in Groundwater

Available historical sampling results (from May 2003 through May 2018; LRS 2018b) are presented in Table 1. The results from the last four years of monitoring data (May 2014 through May 2018) are summarized below.

Range C-52N

At Range C-52N, HMX has not been detected in the groundwater samples and are below the 350 µg/L FDEP Groundwater Cleanup Target Levels (GWCTL). RDX concentrations at Range C-52N

in the last four years ranged from nondetect to a maximum detected concentration of 1.5 µg/L in June 2015 at MW-94-52-01, which exceeds the FDEP GWCTL (0.3 µg/L). Concentrations of RDX in downgradient monitoring wells MW-94-52-02 and MW-94-52-03 have been nondetect below the FDEP GWCTL since May 2005, with the exception of one sampling qualified due to blank contamination (June 2016 at MW-94-52-03). The calculated 95 percent UCL (95 UCL) for RDX is 1.45 µg/L, with the arithmetic mean at 0.891 µg/L. The 95 UCL was not calculated for HMX, but the arithmetic mean was 0.0474 µg/L. Concentrations of HMX and RDX in groundwater appear to have stable to decreasing trends.

Range C-62

At Range C-62, in the past four years of monitoring data, concentrations of HMX have ranged from not detected (at MW-94-62-01) to a maximum detected HMX concentration at MW-94-62-05 of 59 µg/L in May 2018. RDX concentrations have ranged 0.19 µg/L (at MW-94-62-01 in May 2017) to a maximum detected concentration of 72 µg/L in May 2018 at MW-94-62-05. RDX concentrations have exceeded the FDEP GWCTL at MW-94-62-04 and MW-94-62-05 during each sampling event in the past four years. The calculated 95 UCL for RDX (at monitoring wells MW-94-62-02 through MW-94-62-05) is 32.3 µg/L, with the arithmetic mean at 15.6 µg/L. At MW-94-62-05 alone, the calculated 95 UCL was 0.054 µg/L. For HMX, The 95 UCL was not calculated for HMX, the calculated 95 UCL at monitoring wells MW-94-62-02 through MW-94-62-05 is 61.1 µg/L, with the arithmetic mean at 17.5 µg/L. Concentrations of HMX and RDX in groundwater appear to have potentially increasing trends at monitoring wells MW-94-62-04 and MW-94-62-05.

2.0 FATE AND TRANSPORT OF RDX

RDX is commonly deposited as discrete particles with strongly heterogeneous distributions, and soil concentrations can vary by more than an order of magnitude for samples collected less than a meter apart (USEPA 2014a; USACE 2002). Dissolution from explosives particles is often the controlling factor for fate and transport of RDX as it has a low water solubility (Furey et al. 2008; United States Environmental Protection Agency [USEPA] 2014a). Following dissolution, RDX is not strongly retained by soil and migrates in groundwater, with a low to moderate organic carbon sorption coefficient (Koc ranging from 42 to 167 liters per kilogram). Soils rich in organic carbon, clay, or iron increase sorption to soil and decrease mobility in groundwater (Furey et al. 2008; Sharma et al. 2013).

Photolysis of RDX by ultraviolet light is the primary mechanism that degrades aqueous RDX, and consequently, RDX does not persist in surface waters and sediments (USEPA 2014a). In soil and groundwater, however, photolysis is not significant. Nitroso derivatives, nitrate, nitrite, nitrogen-monoxide, ammonium, formaldehyde, formamide, and N-nitroso-methylenediamine have been identified as products of RDX photodegradation in surface water (Gorontzy et al. 1994).

Microbial biodegradation (i.e., mineralization) and transformation to organic derivatives are the primary attenuation processes for RDX in groundwater under typical subsurface conditions (Nishino et al. 2000). In laboratory experiments, RDX generally biodegrades most effectively under anaerobic conditions and mineralization is favored, yielding several nitroso and nitramine intermediates and, ultimately, hydrazines and methanol (Pennington et al. 1999; Hawari 2000). Under aerobic conditions, RDX undergoes biotransformation to mono-, di-, and tri-nitroso derivatives (hexahydro-1-nitroso-3,5- dinitro-1,3,5-triazine [MNX], hexahydro1,3-dinitroso-5-nitro-1,3,5-triazine [DNX], and hexahydro1,3,5-trinitroso-1,3,5-triazine [TNX]) (Pennington et al. 1999).

3.0 REVIEW OF PREVIOUS BIOSCREEN MODEL

In 2000 and 2002, CH2M Hill (2000, 2002a, and 2002b) used BIOSCREEN Natural Attenuation Decision Support System Version 1.4 (USEPA 1997) to estimate the potential risk posed to potential downgradient receptors from RDX in groundwater at Ranges C-52N and C-62 at the site. The input parameters for the updated BIOSCREEN-AT model is presented in Table 2A, and the previous BIOSCREEN model inputs (CH2M Hill 2002b) are summarized in Table 2b. CH2M Hill concluded that RDX would not migrate in groundwater more than 1,600 feet at Range C-52N and 2,500 feet at Range C-62 at concentrations greater than the 0.1 µg/L. (CH2M Hill 2000 and 2002a). However, as described above, recent groundwater monitoring data indicates that RDX concentrations at Ranges C-52N and C-62 have exceeded the current FDEP GWCTL and that concentrations appear to be increasing through time at Range C-62 downgradient from the OD Unit. Therefore, an updated, revised BIOSCREEN model is warranted. Arcadis, on behalf of LRS, reviewed the CH2M Hill BIOSCREEN model input parameters, assumptions and output and offers the following observations:

- BIOSCREEN Version 1.4 was updated in 2006 (BIOSCREEN Natural Attenuation Decision Support System AT Version 1.45 [BIOSCREEN-AT]) and offers a more exact solution (S.S. Papadopoulos, Inc. 2006). CH2M Hill's use of an earlier version of BIOSCREEN is expected to include a slightly higher degree of numerical error, but, may not be significant.
- CH2M Hill prepared three, independent, BIOSCREEN models to simulate the RDX concentrations: one for Range C-52N and two for Range C-62 (modeling the OB and OD unit plumes). The results from the two BIOSCREEN models at Range C-62 were then superimposed on each other.
- It is unclear how source area input parameters were derived. Available soil data (EA Engineering 1995) did not find RDX or HMX concentrations above the method detection limits, and cross-gradient groundwater data (to help delineate plume dimensions) are limited. CH2M Hill used the maximum detected concentration at the groundwater monitoring wells (through the 16th quarterly monitoring event) to estimate a source concentrations and estimated source widths from isopleth maps (which could not be independently verified). RDX concentrations have increased downgradient from the Range C-62 OD Unit. Since these models were constructed using lower HMX and RDX concentrations and concentrations appear to be increasing at Range C-62 and decreasing at range C-52N, a revised BIOSCREEN model is advisable.

4.0 UPDATED BIOSCREEN-AT MODEL

The most recent groundwater data that were available (from 2003 through 2018) at Ranges C-52N and C-62 were evaluated for an updated BIOSCREEN model using the BIOSCREEN-AT tool, Version 1.45 (S.S. Papadopoulos, Inc. 2014). RDX was the only constituent selected for a BIOSCREEN model, since HMX concentrations have not exceeded the FDEP GWCTL.

BIOSCREEN-AT assumes RDX concentrations in all wells (targets) downgradient from the source area are zero at time zero. Typically, historical and/or current analytical data from soil borings or groundwater monitoring wells in the center of the source area would be used to define the source area. However, at Ranges C-52N an C-62, RDX was not detected in the historical soil samples (EA Engineering 1995), and the existing monitoring wells with the highest RDX concentrations are installed either upgradient or downgradient of the source areas. Thus, the potential source area concentrations could not be defined for the ranges. Thus, the typical modeling approach of entering source area data and calibrating the model using downgradient monitoring well data could not be used. Instead, the updated BIOSCREEN-AT model established source concentrations as follows:

- Range C-52N – the source concentration was established at upgradient monitoring well MW-94-52-01, where the maximum RDX concentration was detected. The plume was then modeled downgradient to MW-94-52-02 to the potential confluence of the groundwater flow path with surface water in Bay Head Branch.
- Range C-62 – Given the two source areas at Range C-62 (i.e., the OB and OD units) have slightly different groundwater flow directions, two BIOSCREEN-AT models were developed for Range C-62: one for the OB unit and one for the OD unit. The source concentrations were established at the downgradient monitoring wells for the OB unit (at MW-94-62-03) and the OD Unit (at MW-94-62-05), where the maximum RDX concentrations were detected for each source area. The plume was then modeled downgradient from those monitoring wells to two potential receptors: the intersection of the groundwater flow path from OB or OD units with the headwaters of Blount Mill Creek (to assess potential impacts to surface water receptors) and approximately 5,000 feet downgradient from the OD Unit (to assess potential impacts to groundwater receptors).

This approach will provide a reasonable and conservative assessment of the likelihood of RDX to migrate to potential receptors under current conditions at the Site. However, using this approach, the BIOSCREEN-AT model will need to be periodically re-evaluated through time as new site data become available, particularly if RDX or HMX concentrations continue to display increasing trends. The input parameters for these BIOSCREEN-AT models are presented in Table 2A and described below. The previous input parameters for the 2002 BIOSCREEN evaluation (CH2M Hill 2002b) are included in Table 2B.

4.1 Input Parameters

4.1.1 Hydrogeology

The seepage velocity (v_x) was calculated by the BIOSCREEN-AT model using the horizontal hydraulic conductivity, (K), the hydraulic gradient (i), and the effective porosity (n_e) using the following equation in consistent units:

$$v_x = \frac{K \cdot i}{n_e}$$

Hydraulic Conductivity

For the updated BIOSCREEN-AT model, Arcadis calculated the average hydraulic conductivity values based on the slug test data collected in August 2001 (CH2M Hill 2002b). The average hydraulic conductivity for each range was calculated using the results from both the Bouwer and Rice and Hvorselv analytical solutions for the slug tests. At Range C-52N, the average hydraulic conductivity was $1.4X10^{-2}$ cm/sec (approximately 33 feet per day [ft/day]). This is slightly higher than that previously used by the BIOSCREEN model ($8.1X10^{-3}$ cm/sec; CH2M Hill 2002b). At Range C-62, hydraulic conductivities were calculated for both the OD Unit (MW-94-62-04 and MW-94-62-05) and the OB Unit (MW-94-62-02 and MW-94-62-03) The average hydraulic conductivity at the OD Unit was $6.32X10^{-04}$ cm/sec (1.8 ft/day), and at the OB Unit the average hydraulic conductivity was $7.68X10^{-03}$ cm/sec (22 ft/day). These hydraulic conductivities are higher (i.e., more conservative) than that previously used by the BIOSCREEN model ($5.3X10^{-4}$ cm/sec; CH2M Hill 2002b).

Hydraulic Gradient

Hydraulic gradients were calculated using the May 2018 potentiometric contour maps (LRS 2018a). For Range C-52N, the calculated hydraulic gradient between MW-94-52-01 and MW-94-52-02 was 0.01 ft/ft. For Range C-62, the calculated hydraulic gradients were 0.018 ft/ft for the OB Unit and 0.017 ft/ft for the OD Unit, based on the May 2018 groundwater water elevations between MW-94-62-01 and MW-94-62-03 (for the OB Unit) and between MW-94-62-01 and MW-94-62-05 (for the OD Unit; Figure 3; LRS 2018a). These values are comparable to the hydraulic gradients used in the previous BIOSCREEN models (approximately 0.017 ft/ft).

Effective Porosity

The previous BIOSCREEN model used an n_e of 30 percent as a default value. For the updated BIOSCREEN-AT model, the n_e was estimated at 20 percent based on the correlation between soil types (poorly graded sands at the Site) and n_e according to USEPA guidance (USEPA 1989). This results in a higher v_x.

Seepage Velocity

Based on these parameters, a v_x of 538 feet per year was used for Range C-52N, and a v_x of 55.6 feet per year (OD unit) and 715 feet per year was calculated and used for Range C-62. These v_x estimate are higher than those used in the previous BIOSCREEN model (279 ft/year and 23 ft/year, for Ranges C-52N and C-62, respectively; CH2M Hill 2002b) and thus is considered slightly more conservative (protective).

4.1.2 Dispersion

The longitudinal and transverse dispersivity values are calculated by BIOSCREEN-AT following the Xu and Eckstein (1995) and the Gelhar et al. (1992) relationships (USEPA 1996a), respectively, based on an approximated plume length. For Range C-52N, Arcadis estimated the plume length to be 2,650 feet, based on the distance from MW-94-52-01 to Bay Head Branch along the groundwater flow path. This results in longitudinal and transverse dispersivities of 35.8 feet and 3.58 feet, respectively. At Range C-62, Arcadis modeled the plume lengths for the OB and OD Units as the distances between the downgradient monitoring wells (MW-94-62-03 and MW-94-62-05, respectively) and the headwaters of the Blount Mill Creek (Figure 3). For the OD unit, the estimated plume length was approximately 500 feet, resulting in longitudinal and transverse dispersivities of 17.9 and 1.9 feet, respectively. For the OB Unit, the estimated plume length was 170 feet, resulting in longitudinal and transverse dispersivities of 10.0 and 1.0 feet, respectively.

Vertical dispersivities were estimated using the relationship in American Society of Testing and Materials (ASTM; 1995), where the vertical dispersivity is equal to 5 percent of the longitudinal dispersivity. This results in a vertical dispersivity of 1.79 feet for Range C-52N, and 0.90 ft and 0.50 feet for the OD and OB Units, respectively, at Range C-62.

4.1.3 Adsorption and Chemical Retardation

The BIOSCREEN-AT model uses the soil bulk density (ρ_b), total porosity (n), partitioning coefficient (K_{oc}), and fraction of organic carbon (f_{oc}) to determine the retardation factor (r_f):

$$r_f = 1 + \frac{\rho_b K_{oc} f_{oc}}{n}$$

The ρ_b was estimated to be 1.5 kg/L and the f_{oc} was estimated to be 0.002 grams per gram based on USEPA's Soil Screening Guidance default values for potential migration to groundwater assessments (USEPA 1996b). Total porosity was estimated at 35 percent based on literature values for sand (Freeze and Cherry 1979). The K_{oc} was determined using the USEPA chemical-specific parameters table for regional screening level assessments (USEPA 2018). For RDX, the K_{oc} is estimated to be 89.07 L/kg. Using the same n_e as before, this results in an estimated r_f value of 1.76 for the BIOSCREEN-AT models at both ranges. The retardation factor used is potentially biased low based on more recent studies that indicate the soil-water partitioning coefficient

($K_d=K_{oc}\cdot f_{oc}$) used is on the lower range of observed values. Recent literature values indicate the K_d is 0.37 and 1.5 (Yammamoto et al. 2004) for sorption and desorption processes, which would result in an r_f between 2.0 to 5.3.

4.1.4 Biodegradation and Natural Attenuation Half-Life ($t_{1/2}$)

BIOSCREEN-AT calculates a first order decay coefficient based on a user-supplied solute half-life. The half-lives of RDX in groundwater is a highly uncertain input, but the value is expected to be relatively high. RDX does not readily degrade in aerobic systems (Speitel et al. 2001 and Hawari 2000), and groundwater monitoring data from the Site indicate that the shallow aquifer system is aerobic (LRS 2018a). Half-lives of RDX on the order of years to over a hundred years have been reported in the literature for aerobic systems (Speitel et al. 2001 and Ronen et al. 2008). However, some *in-situ* studies have shown that the half-life of RDX can range between four and 13 years under aerobic conditions in shallow (less than 15 meters) portions of the aquifer (Bernstein et al. 2010).

The previous BIOSCREEN model estimated the first order decay coefficient during model calibration at 60 to 75 years (CH2M Hill 2000, 2002a, 2002b). However, site-specific estimates of constituent half-lives are preferable to estimates made through model calibration. To estimate the half-life of RDX using site-specific data, linear regression was performed on the analytical data from monitoring wells at the C-52N Site where source area concentrations appear to be more stable and/or declining. Monitoring wells at Range C-62 could not be utilized for this evaluation because they display increasing RDX concentrations through time. However, monitoring well MW-94-52-01 at Range C-52N display decreasing RDX concentrations through time. Monitoring wells MW-94-52-02 and MW-994-52-03 were not selected for linear regression analysis because of the high percentage of nondects. Linear regression was performed using the RDX concentrations observed from May 2003 to May 2018 at monitoring well MW-94-52-01 at Range C-52N to estimate the attenuation half-life ($t_{1/2}$) in years for RDX on a 1st order decay rate. The linear regression analysis is provided as Attachment 1. The calculated half-life was 8 years, which corresponds to a first order decay coefficient (k) of 0.087 year^{-1} based on the following relationship:

$$k = \frac{ln(2)}{t_{\frac{1}{2}}}$$

This half-life was used in the BIOSCREEN-AT models for both range and within reasonable, expected ranges.

4.1.5 General (Modeled Domain)

Modeled area lengths for both ranges were determined based on the distances from the modeled source areas to the nearest surface water receptor. Although there is no known evidence that groundwater is discharging to surface water at the Site (CH2M Hill 2000, LRS 2018a), the surface water drainages are the closest potential receptors to the source areas, and thus provided a conservative estimate of groundwater concentrations at potential receptors.

Range C-52N

The modeled area length was 3,000 feet ensure the modeled plume would be captured along the centerline extending from monitoring wells MW-94-52-01 and MW-94-52-02 to the intersection with the Bay Head Branch (Figure 2). Modeled area widths were set to 1,500 feet, slightly longer than the modeled source area width (described below). However, this value is arbitrary and has no significant effect on the results, as only the centerline concentration was used in this evaluation. The simulation time was set to 100 years to model steady-state conditions.

Range C-62

Modeled area lengths of 600 feet for the ODU and 200 feet for the OBU were used to ensure the modeled plume would be captured along the centerline extending from monitoring wells MW-94-62-05 and MW-94-62-03, respectively, to their intersection with the headwaters of Blount Mill Creek (Figure 3). Modeled area widths were set equal to the modeled area lengths for these scenarios. However, this value is arbitrary and has no effect on the results, as only the centerline concentration was used in this evaluation. The simulation time was set to 100 years to model steady-state conditions.

Two additional model runs were conducted for the OB and OD units where the modeled area length was set to 5,000 feet to simulate the potential for RDX to migrate to potential receptor wells (currently located approximately 3.6 and 4.4 miles potentially downgradient from the Site). The simulation time for these models was set to 500 years to simulate steady-state conditions.

4.1.6 Source Data

Source Thickness in Saturated Zone and Width

The source zone thickness at Range C-52N was set to 30 feet, and the source zone thickness at Range C-62 was set to 75 feet, based on the FDEP Comments (FDEP 2001) and revisions to the previous BIOSCREEN model (CH2M Hill 2002a and 2002b). The source zone widths used in the previous BIOSCREEN model could not be independently verified (1,400 feet at Range C-52 and 625 and 665 feet for both the OD and OB units at Range C-62). For Range C-52N, the revised BIOSCREEN-AT model used the same source zone width as the previous model. For Range C-62, the revised BIOSCREEN-AT model a source zone width of 300 feet and 170 feet for the OD unit and OB unit, respectively. These values were based on the visually-distinguishable widths of the OD and OB units on aerial images from May 2018 (Figure 3). However, the modeled source width has almost no impact on the results of the BIOSCREEN-AT models at this site; increasing the source width by an order of magnitude results in no change in the steady-state concentrations at the downgradient edge of the modeled area. Given the low horizontal and vertical dispersivity and the reliance on the centerline concentration output, these parameters do not have significant effects on the results.

Source Zone Concentrations

At Range C-52, the source zone concentration was set to 0.0015 mg/L, which is the maximum concentration detected at MW-84-52-01 in the past four years of monitoring. At range C-62, the source concentration at the OB unit was set to 0.0043 mg/L (the maximum detected concentration at MW-94-62-03). At the OD Unit, given the uncertainty in the source area concentrations, the models were run with two source concentrations to provide an estimated range of the expected groundwater concentrations along the plume centerline. The more conservative source concentration estimates used the maximum detected RDX concentrations at MW-94-62-05 (0.072 mg/L). A lower estimate of source area RDX concentrations was estimated using the 95 UCL at MW-94-62-05 (0.054 mg/L) in the OD Unit model.

4.2 BIOSCREEN-AT Results

The results of the BIOSCREEN-AT model are presented in Table 3 and Attachment 2 and are discussed below.

4.2.1 Range C-52N

The BIOSCREEN-AT model for Range C-52N was simulated over 100 years in 5-year time steps. The model indicates that steady-state conditions would be achieved within 15 years. The groundwater analytical results coupled with the chemical transport velocities (i.e., RDX should have reached the downgradient POC wells given the historical usage of this site) indicated that attenuation is occurring between MW-94-52-01 and the Bay Head Branch drainage. The predicted groundwater concentration at the point where the groundwater flow path potentially intersects Bay Head Branch is predicted to be 0.00015 mg/L, below the FDEP GWCTL of 0.0003 mg/L (0.3 micrograms per liter [ug/L]). The model predicts that the groundwater RDX concentration would drop below the FDEP GWCTL by 1,800 feet downgradient from MW-94-52-01.

4.2.2 Range C-62

Open Burn Unit Results

The BIOSCREEN-AT OB Unit model was simulated over 100 years in 5-year time steps. The model indicates steady-state conditions would be achieved within 5 years. The results indicate that minimal attenuation is occurring in the OB Unit plume between MW-94-62-03 and the headwaters of Blount Mill Creek. This is likely due to the short distance of the plume from MW-94-62-03 and the surface water drainage. However, the maximum predicted concentration with first order decay is 0.0041 mg/L, which is above the FDEP GWCTL (0.0003 mg/L). However, this BIOSCREEN-AT assessment is conservative because it does not take into account any potential mixing of groundwater with unimpacted surface water or potential photodegradation of RDX in surface water. When the model was simulated for 500 years with a model area length of 5,000 feet to simulate the potential impact on downgradient groundwater receptors, steady-state conditions

would be achieved in less than 25 years, with a predicted maximum RDX concentration at the downgradient edge of the modeled area (with first order decay) of 0.00064 mg/L, suggesting that RDX is likely to attenuate significantly within one mile downgradient of the OB Unit, and is not expected to contribute to exceedances of the FDEP GWCTL for RDX at downgradient receptors or offsite.

Open Detonation Unit Results

The BIOSCREEN-AT OD Unit model was simulated over 100 years in 5-year time steps, using two different source concentrations (maximum detected RDX concentration and the 95 UCL). The model indicates steady-state conditions would be achieved within 45 years. The results indicate that attenuation is occurring in the OD Unit plume between MW-94-62-05 and the headwaters of Blount Mill Creek, although the predicted groundwater concentration (with first order decay) is still above the FDEP GWCTL (between 0.011 and 0.015 mg/L). However, given that the model does not account for mixing of predicted groundwater concentrations with unimpacted surface water and that RDX readily photodegrades in surface waters, it is likely that groundwater that daylights in the headwaters of Blount Mill Creek would not pose a threat to potential receptors.

When the model was simulated for 500 years with a model area length of 5,000 feet, steady-state conditions would be achieved in less than 225 years, with a predicted RDX concentrations (with first order decay) dropping below the FDEP GWCTL in less than 2,000 feet downgradient of the OD Unit. These results indicated that RDX is likely to attenuate significantly within one mile downgradient of the OD Unit, and is not expected to contribute to of the FDEP GWCTL at downgradient receptors or offsite.

4.3 Modeling Assumptions and Uncertainty

The BIOSCREEN-AT model, like any model, requires the use of some simplifying assumptions regarding subsurface conditions, flow processes, and chemical processes that result in inherent limitations and uncertainty when compared to an actual flow system. In this case, uncertainty may be related to:

- assuming that the hydraulic conductivity of the aquifer is uniform; the actual hydraulic conductivity at the site may vary especially downgradient from the monitoring well, and heterogeneities are expected
- assuming monitoring well concentrations are representative of source area concentrations
- assuming an infinite source mass that may be increasing in the case of C-62 and decreasing in the case of C-52N
- uncertainties in the calculation of the RDX half-life

The model predictions are considered reasonable but may have a high bias considering the conservative assumptions used for some parameters. Thus, actual concentrations are expected to be less than or equal to the modeled concentrations.

5.0 ALTERNATIVE CONCENTRATION LIMIT CALCULATIONS

A series of industry standard chemical transport equations were used to calculate $ACLs$ for HMX and RDX in groundwater (ACL_{gw}) for point of compliance wells at each of the respective source areas as illustrated in Attachment 3 - Alternate Concentration Limits in Groundwater for the Protection of Surface Water Receptors. The assessment was similar to a BIOSCREEN-AT evaluation, however, instead of predicting what concentrations will be in the future the assessment back-calculated a groundwater concentration at a monitoring well or point of compliance that will not result in a groundwater quality concentration greater than the targeted groundwater concentration at a receptor. For purposes of this assessment the receptor was the closest stream and the monitoring well was the monitoring well (point of compliance well) closest to the stream. It was also assumed the streams could be used for drinking water purposes and the Florida GWCTL was used as the target concentration at the receptor (stream). Figures 2 and 3 illustrate the monitoring well used and the distance to the stream.

The calculations accounted for chemical retardation and degradation in groundwater and were based on USEPA guidance and *Contaminant Hydrogeology*[1]. Many of the equations are also summarized in the GA EPD's Guidance: Groundwater Contaminant Fate and Transport Modeling[2]. The equations were combined in a stepwise approach as follows to estimate the ACL_{gw} for downgradient monitoring wells for each of the respective areas and chemicals:

1. **Average seepage water velocity (V_s)** in ft/day. The transport rate (velocity) of groundwater was calculated using site-specific groundwater properties K, i, and θ_e; $V_s=[K*i]\div \theta_e$). V_s was used in step 3.

2. **Soil-water partition coefficient (K_d) and chemical-specific retardation factor (r_f)** in liters per kilogram (L/kg) and dimensionless, respectively. The K_d along with soil properties (ρ_b and n) were used to calculate r_f in groundwater ($r_f=1+K_d[\rho_b \div n]$).

3. **Chemical-specific transport rate in groundwater (v_c) and the time to reach the receptor (t_x)** in ft/day and days, respectively. The r_f (from step 2) in conjunction with the v_s (from step 1) were used to calculate the chemical transport velocity in groundwater ($v_c=v_s \div r_f$). Then, the time (in days) to reach the receptor was calculated using the distance (feet) from the monitoring well to the receptor and the v_c ($t_x=d_x \div v_c$).

4. **Chemical degradation rate constant (k) and allowable initial groundwater concentration ($C_{0\text{-}gw}$ or ACL_{gw})** in days^{-1} and micrograms per liter (ug/L), respectively. The respective chemical half-life (λ) from the BIOSCREEN-AT model, the resulting degradation constant (k), the target groundwater concentration (C) equal to the respective

[1] Fetter, C.W. 1999. Contaminant Hydrogeology. Second Edition. Waveland Press, Inc. Long Grove, IL.

[2] GA EPD. 2016. Guidance: Groundwater Contaminant Fate and Transport Modeling, Revision 1. October.

Florida GWCTL, and the time to reach the receptor (t_x) were used to estimate the initial chemical concentration at the monitoring well needed to equal C downgradient at the receptor ($C_{0\text{-}gw}=ACL_{gw}=C\div e\text{^}[k\cdot t_x]$).

The equations, inputs, calculations, and assumptions are included in Attachment 3 and follow the four primary steps outlined above. The ACL_{gw} results for each chemical and area are summarized in Table 4.

The equation inputs and parameters were based on site-specific data, default USEPA values, or on literature values that were considered representative of the site conditions (soil type, etc.). The assumptions used in simulating fate and transport of target analytes are detailed in Attachment 3 and the primary assumptions are summarized below:

- Infinite soil source mass*
- V_s was based on site-specific i and the average K for respective source areas[3]
- foc of 0.002* for K_{oc} based on USEPA default values[4,5]
- Groundwater transport calculations do not include dispersion, diffusion, or volatile losses*
- Chemical degradation rate (first order decay)* in groundwater based on literature values and site-specific rates as estimated in the Biodegradation and Natural Attenuation Half-Life ($t_{1/2}$) Section.
- Calculations estimate a centerline, peak concentration*. Thus, the average groundwater discharge concentration (and equivalent mass flux) would be lower than estimated herein.
- Mixing and degradation in the creeks* were not assessed but would significantly dilute and degrade the discharge concentration.

Assumptions with an asterisk (*) are considered conservative (i.e., more protective of human health and the environment).

Site-specific groundwater concentrations at the downgradient monitoring wells at the C-52N area as well as environmental studies indicate that RDX and HMX will attenuate in groundwater and that relative attenuation rates are greater (faster) than estimated since those concentrations have decreased and been less than the laboratory reporting limit for 8 years (see Updated BIOSCREEN-AT Model discussion).

The groundwater flow advection equations are linear in nature with the exception of the degradation equation ($C_{0\text{-}gw}$) which is exponential. Therefore, the parameters generally will have

[3] LRS. 2018. Annual Environmental Monitoring Report, Open Burn/Open Detonation Units, Range C-52 North and Range C-62, Eglin Air Force Base, Florida, Operational Permit No. 006176-H)-007. July.

[4] USEPA 1996b. Soil Screening Guidance: User's Guide. Second Edition. July.

[5] USEPA, 2018. Chemical Specific Parameters Table, May 2018: https://www.epa.gov/risk/regionalscreening-levels-rsls-generic-tables. Accessed December 2018.

an exponential effect on the ACL_{gw}. However, given the conservative approach, the predictions likely underestimate the ACL_{gw} concentration.

6.0 CONCLUSIONS

CH2M Hill's BIOSCREEN (2000, 2002a, 2002b) and Arcadis's BIOSCREEN-AT model indicate that the RDX is attenuating and that RDX will not migrate off-site or reach groundwater receptors above the FDEP GWCTL. However, some of the groundwater could daylight in the headwaters of Blount Mill Creek downgradient of the OD Unit at C-62 at concentrations above the FDEP GWCTL of 0.0003 mg/L (0.3 micrograms per liter) but below the FDEP surface water cleanup target levels of 0.180 mg/L (180 ug/L). However, mixing with surface water and photodegradation of RDX are anticipated to mitigate any potential impacts to surface water over the FDEP GWCTL a short distance downstream from this source area. Given the potentially increasing RDX concentration trends in C-62 groundwater, continued groundwater monitoring of this area is recommended. If concentrations increase significantly, an update to the BIOSCREEN-AT model or equivalent may be appropriate.

7.0 REFERENCES

Bernstein, Anat, Eilon Adar, Zeev Ronen, Harald Lowag, Willibald Stichler, and Rainer U. Meckenstock. 2010. Quantifying RDX biodegradation in groundwater using $\delta^{15}N$ isotope analysis. Journal of Contaminant Hydrology. 111:25-35.

CH2M Hill. 2000. Aquifer Quality Evaluation and Fate and Transport Models for OB/OD Units, Ranges C-52N and C-62, Egling AFB. Technical Memorandum. August 7.

CH2M Hill. 2002a. Eglin AFB Response to FDEP 1Feb01 comment letter on the Aquifer Quality Evaluation and Fate and Transport Models for OB/OD Units. March 11.

CH2M Hill, 2002b. Human Health Risk Assessment for Groundwater at C-52N and C-62, Eglin AFB, Florida.

EA Engineering, Science and Technology. 1995. Data Summary Report For Ranges C-52N and C-62, Open Burn/Open Detonation (OB/OD) Units, Eglin Air Force Base, Florida. March

FDEP, 2001. Review of the Technical Memorandum: Aquifer Quality Evaluation and Fate Transport Models for OB/OD Units, Ranges C-52N and C-62, Eglin AFB, August

FGS. 2001. Open File Report No. 80, Text to Accompany the Geologic Map of Florida.

Freeze, R. Allen and John A. Cherry. 1979. Groundwater. Prentice Hall Inc., Upper Saddle River, NJ. 604p.

Furey, J.S., Frederickson, H.L., Richmond, M, J., Michael, M. 2008. Effective elution of RDX and TNT from particles of Comp B in surface soil. Chemosphere, 70(7): 1175-1181.

Gorontzy, T., Drzyzga, O., Kahl, M.W., Bruns-Nagel, D., Breitung, J., von Loew, E., and

Blotevogel, K.H., 1994. Microbial Degradation of Explosives and Related Compounds. Critical Reviews in Microbiology, 20(4): 265-284.

Hawari, J. 2000. Biodegradation of RDX and HMX: From Basic Research to Field Application.

In Biodegradation of Nitroaromatic Compounds and Explosives, edited by J.C. Spain, J.B. Hughes, and H. Knackmuss.

LRS. 2018a. Annual Environmental Monitoring Report, Open Burn/Open Detonation Units, Range C-52 North and Range C-62, Eglin Air Force Base, Florida, Operational Permit No. 006176-H)-007. July.

Nishino, S.F., J.C. Spain, and Z. He, 2000. Strategies for Aerobic Degradation of Nitroaromatic Compounds by Bacteria: Process Discovery to Field Application. In Biodegradation of Nitroaromatic Compounds and Explosives, edited by J.C. Spain, J.B. Hughes, and H. Knackmuss.

Pennington, J.C., R. Bowen, Brannon, J.M., Zakikhani, J., Harrelson, D.W., Gunnison, D., Mahannah, J., Clarke, J., Jenkins, T.F., and S. Gnewuch. 1999. Draft Protocol for

Evaluating, Selecting, and Implementing Monitored Natural Attenuation at Explosives-Contaminated Sites. U.S. Army Corps of Engineers, Technical Report EL-99-10.

Sharma, P., Mayes, M.A., Tang, G. 2013. Role of soil organic carbon and colloids in sorption and transport of TNT, RDX and HMX in training range soils. Chemosphere, 92(8): 993-1000.

Speitel, Jr., G. E., T. L. Engels, D. C. McKinney. 2001. Biodegradation of RDX in unsaturated soil. Bioremediation Journal 5(1): 1-11.

S.S. Papadopulos & Associates, Inc. 2014. Software. BIOSCREEN-AT Documentation, Version 1.45. March 10.

USACE, 2002, Energy Research and Development Center, 2002. Distribution and Fate of Energetics on DoD Test and Training Ranges: Interim Report 2. Pennington et al. October 2002.

USEPA. 1996a. BIOSCREEN Natural Attenuation Decision Support System User's Manual Version 1.3, August 1996.

USEPA. 1996b. Soil Screening Guidance: User's Guide. Second Edition. July.

USEPA. 1997. BIOSCREEN Version 1.4, Natural Attenuation Decision Support System, July 1997.

USEPA. 2018. Chemical Specific Parameters Table, May 2018: https://www.epa.gov/risk/regionalscreening-levels-rsls-generic-tables.

USEPA. 2014a. Office of Solid Waste and Emergency Response, 2014. Technical Fact Sheet - Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX). EPA 505-F-14-008. January 2014a. https://www.epa.gov/sites/production/files/201403/documents/ffrrofactsheet_contaminant_rdx_january2014_final.pdf

USGS. 2016. Groundwater Atlas of the United States: Alabama, Florida, Georgia, and South Carolina HA 730-G, The Sand and Gravel Aquifer.

Yammamoto, H., M.C. Morely, G. E. Speitel Jr., and J. Clausen. 2004. Fate and Transport of High Explosives in a Sandy Soil: Adsorption and Desorption. Soil and Sediment Contamination. 13:361-379.

FIGURES

From Figure 1 in LRS (2018)

0 15 30 60 90 120
Miles

RANGES C-52N AND C-62
OPEN BURN/OPEN DETONATION UNIT
EGLIN AIR FORCE BASE, FLORIDA

SITE LOCATION MAP

ARCADIS Design & Consultancy for natural and built assets

FIGURE
1

12/10/2018 11:58:07 AM

From Figure 8 in LRS (2018)

0 250 500 1,000
Feet

Monitoring Well

Estimated Groundwater Flow Direction

120 Groundwater Elevation Contour (ft NGVD)

Modeled Plume Length

Modeled Domain Area

Modeled Source Width

Surface Water Drainage

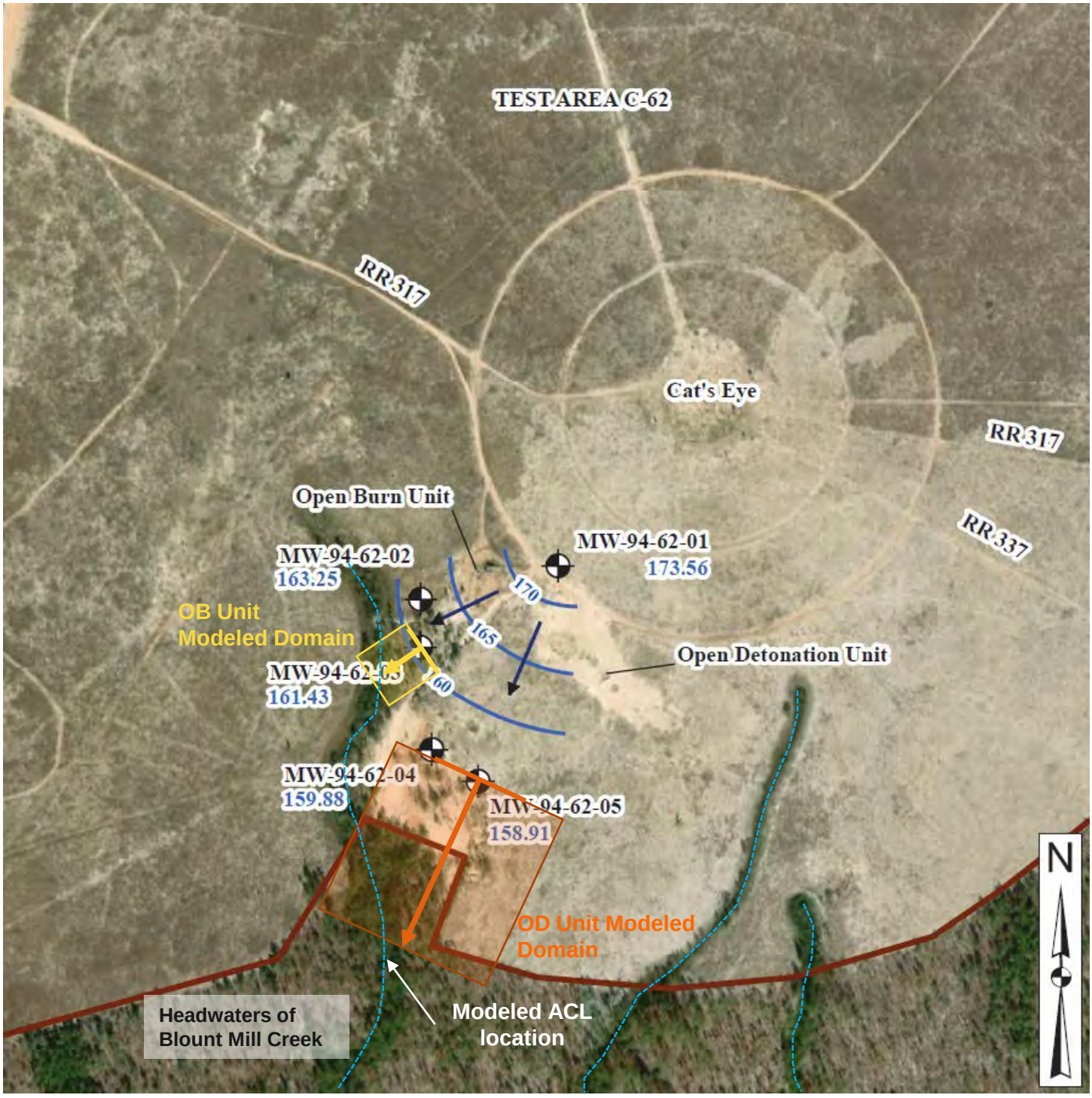
RANGES C-52N AND C-62
OPEN BURN/OPEN DETONATION UNIT
EGLIN AIR FORCE BASE, FLORIDA

RANGE C-52N
POTENTIOMETRIC CONTOUR MAP
MAY 2018

ARCADIS Design & Consultancy for natural and built assets

FIGURE
2

12/10/2018 11:58:07 AM



From Figure 9 in LRS (2018)

0 250 500 1,000 Feet

Legend:

- Monitoring Well
- 170 Groundwater Elevation Contour (ft NGVD)
- Estimated Groundwater Flow Direction
- Surface Water Drainage
- Modeled OB Unit Plume
- Modeled OD Unit Plume
- OB Unit Modeled Domain
- OD Unit Modeled Domain
- Modeled OB Unit Source Width
- Modeled OD Unit Source Width

RANGES C-52N AND C-62
OPEN BURN/OPEN DETONATION UNIT
EGLIN AIR FORCE BASE, FLORIDA

RANGE C-62
POTENTIOMETRIC CONTOUR MAP
MAY 2018

ARCADIS Design & Consultancy for natural and built assets

FIGURE
3

12/10/2018 11:58:07 AM

TABLES

Table 1
Historical Sampling Results - May 2003 through May 2018
Ranges C-52N and C-62
Open Burn / Open Detonation (OB/OD) Units
Eglin Air Force Base, Florida

Sampling Date	Range C-52 North										Range C-52 North				
	MW-94-52-01					MW-94-52-02					MW-94-52-03				
	HMX (µg/L)	Q	RDX (µg/L)	Q	GWE ft NGVD	HMX (µg/L)	Q	RDX (µg/L)	Q	GWE ft NGVD	HMX (µg/L)	Q	RDX (µg/L)	Q	GWE ft NGVD
5/23/2003	0.40		4.6		126.74	0.20	U	0.20	U	104.41	0.20	U	0.22		109.53
11/13/2003	0.33		2.1		126.24	0.20	U	0.20	U	103.96	0.21	U	0.26		109.05
5/14/2004	0.18		1.1		121.94	0.17		1.1		101.86	0.21	U	0.21	U	106.03
11/22/2004															
5/16/2005	0.27		1.8		129.98	0.20	U	0.20	U	106.31	0.21	U	0.21	U	112.32
12/2/2005	0.11	J	0.79		122.18	0.19	U	0.19	U	101.81	0.20	U	0.20	U	105.78
5/24/2006	0.06	U	0.34		118.68	0.067	U	0.083	U	100.64	0.067	U	0.084	U	104.33
11/16/2006	0.27		3.9		120.43	0.057	U	0.071	U	100.36	0.058	U	0.072	U	104.02
5/21/2007	0.057	U	0.61		118.42	0.057	U	0.071	U	99.73	0.057	U	0.071	U	103.38
6/17/2008	0.11	U	1.3		122.24	0.11	U	0.074	U	102.24	0.11	U	0.27		106.01
5/12/2009	0.19	U	1.5		123.75	0.10	U	0.071	U	102.75	0.11	U	0.073	U	107.16
6/1/2010	0.035	U	0.99		124.98	0.035	U	0.695		103.74	0.035	U	0.067	U	108.4
6/10/2011	0.036	U	0.068	U	118.79	0.035	U	0.067	U	99.83	0.035	U	0.067	U	103.5
5/18/2012	0.214	U	0.191	U	120.99	0.214	U	0.191	U	101.01	0.223	U	0.199	U	104.87
5/3/2013	0.212	U	0.189	U	123.63	0.212	U	0.189	U	103.04	0.212	U	0.189	U	112.71
6/12/2014	0.13	U	0.17	U	129.48	0.13	U	0.17	U	105.95	0.13	U	0.17	U	111.91
6/19/2015	0.078	U	1.5		122.46	0.076	U	0.076	U	101.24	0.076	U	0.076	U	105.18
6/6/2016	0.085	U	1.4		125.97	0.086	U	0.052	U	103.61	0.085	U	0.21	B	108.43
5/11/2017	0.097	U	0.75		120.94	0.087	U	0.052	U	101.39	0.088	U	0.052	U	105.35
5/12/2018	0.084	U	0.72		121.93	0.084	U	0.05	U	101.66	0.084	U	0.05	U	105.89

Notes:
GCTL for HMX = 350 µg/L
GCTL for RDX = 10 µg/L
µg/L= micrograms per liter
B = Analyte detected in the method blank
ft NGVD = feet National Geodetic Vertical Datum
GCTL = groundwater concentraiton threshold limit
GWE = groundwater elevation
I = Reported value is between lab method detection limit and the laboratory practical quantitation limit.
J = Estimated Value
Q = qualifier
U = Compound was analyzed for but not detected
Shaded = detected concentration exceeds the screening level

Table 1
Historical Sampling Results - May 2003 through May 2018
Ranges C-52N and C-62
Open Burn / Open Detonation (OB/OD) Units
Eglin Air Force Base, Florida

Sampling Date	Range C-62														
	MW-94-62-01					MW-94-62-02					MW-94-62-03				
	HMX (µg/L)	Q	RDX (µg/L)	Q	GWE ft NGVD	HMX (µg/L)	Q	RDX (µg/L)	Q	GWE ft NGVD	HMX (µg/L)	Q	RDX (µg/L)	Q	GWE ft NGVD
5/14/2003			0.53		175.37	0.20	U	1.9		163.85	0.21	U	1.5		161.95
11/6/2003	0.21	U	0.33		174.93	0.21	U	1.8		163.62	0.21	U	1.5		161.67
5/26/2004	0.20	U	0.52		171.51	0.20	U	1.9		162.11	0.20	U	2.0		160.34
11/22/2004	0.20	U	0.18			0.087		2.3			0.20	U	2.2		
5/23/2005	0.19	U	0.87		180.17	0.20	U	2.1		165.53	0.20	U	2.6		164.29
11/21/2005	0.19	U	0.34		173.71	0.20	U	2.1		163.23	0.20	U	1.96		161.26
5/17/2006	0.075	U	0.34		170.86	0.077	U	2.4		162.36	0.079	U	2.3		160.64
11/10/2006	0.057	U	0.54	J	170.1	0.083		2.0	J	161.75	0.057	U	1.9	J	160.35
6/8/2007	0.057	U	0.6		167.15	0.057	U	2.6		159.97	0.057	U	2.3		158.52
6/20/2008	0.11	U	0.33		173.73	0.11	U	2.7		162.76	0.1	U	2.9		160.91
5/14/2009	0.10	U	0.43		175.5	0.10	U	2.3		163.77	0.11	U	2.1		162.1
5/20/2010	0.035	U	0.918		178.4	0.058	I	3.53		164.68	0.061	I	3.8		162.58
5/9/2011	0.036	U	0.068	U	171.03	0.036	U	0.067	U	161.94	0.035	U	1.63		160.18
5/1/2012	0.149	U	0.095	U	172.78	0.152	U	0.097	U	162.08	0.146	U	0.093	U	160.71
5/23/2013	0.212	U	0.189	U	173.5	0.212	U	0.189	U	162.71	0.212	U	0.189	U	161.07
5/23/2014	0.13	U	0.864	I	181.23	0.13	U	2.56		165.75	0.44	I	2.31		163.68
5/19/2015	0.075	U	0.28		175.59	0.19	U	3.4		164.01	0.19	U	4		162.1
6/6/2016	0.092	U	0.42	I	176.43	0.14	I	3.6		164.3	0.19	I	3.9		162.22
5/11/2017	0.085	U	0.19		173.52	0.11	I	3.1		163.22	0.18	I	4.3		161.36
5/12/2018	0.084	U	0.30		173.56	0.13	I	3.1		163.25	0.13	I	3.8		161.43

Notes:
GCTL for HMX = 350 µg/L
GCTL for RDX = 10 µg/L
µg/L= micrograms per liter
B = Analyte detected in the method blank
ft NGVD = feet National Geodetic Vertical Datum
GCTL = groundwater concentraiton threshold limit
GWE = groundwater elevation
I = Reported value is between lab method detection limit and the laboratory practical quantitation limit.
J = Estimated Value
Q = qualifier
U = Compound was analyzed for but not detected
Shaded = detected concentration exceeds the screening level

Table 1
Historical Sampling Results - May 2003 through May 2018
Ranges C-52N and C-62
Open Burn / Open Detonation (OB/OD) Units
Eglin Air Force Base, Florida

Sampling Date	Range C-62									
	MW-94-62-04					MW-94-62-05				
	HMX (µg/L)	Q	RDX (µg/L)	Q	GWE ft NGVD	HMX (µg/L)	Q	RDX (µg/L)	Q	GWE ft NGVD
5/14/2003	1.4		5.1		160.71	1.8		2.8		159.81
11/6/2003	1.6		5.1		159.99	1.2		2.4		158.8
5/26/2004	1.5		4.6		158.45	1.1		3.2		157.28
11/22/2004	2.1		6.2			0.82		3.6		
5/23/2005	1.9		5.8		162.99	0.86		3.9		162.72
11/21/2005	1.8		5.4		158.99	0.77		4.7		157.73
5/17/2006	1.9		9.3		158.53	0.71		7.1		156.31
11/10/2006	2.3		12.9	J	158.38	1.2		17.5	J	157.12
6/8/2007	2.3		14		156.55	2.0		26.2		154.19
6/20/2008	2.3		16.1		159.24	4.3		30.2		158.06
5/14/2009	3.0		23.2		161.14	2.3		16.8		160.48
5/20/2010	3.07		19.6		161.35	2.38		14		160.64
5/9/2011	0.039	U	0.073	U	158.38	0.036	U	0.068	U	155.86
5/1/2012	0.151	U	0.096	U	159.17	0.149	U	0.095	U	158.1
5/23/2013	0.212	U	0.189	U	159.58	0.212	U	0.189	U	158.61
5/23/2014	22.6		17.9		163.47	23		13.2		163.34
5/19/2015	28		26.4		160.97	27.8		14.1		160.19
6/6/2016	31		26.0		161.08	41		21.0		159.42
5/11/2017	32		26.0		159.89	46		33.0		158.83
5/12/2018	39		29.0		159.88	59		72.0		158.91

Notes:
GCTL for HMX = 350 µg/L
GCTL for RDX = 10 µg/L
µg/L= micrograms per liter
B = Analyte detected in the method blank
ft NGVD = feet National Geodetic Vertical Datum
GCTL = groundwater concentraiton threshold limit
GWE = groundwater elevation
I = Reported value is between lab method detection limit and the laboratory practical quantitation limit.
J = Estimated Value
Q = qualifier
U = Compound was analyzed for but not detected
Shaded = detected concentration exceeds the screening level

Table 2A
2018 BIOSCREEN-AT Model Input Parameters
Ranges C-52N and C-62
Open Burn / Open Detonation (OB/OD) Units
Eglin Air Force Base, Florida

	2018 C-52N BIOSCREEN-AT ASSESSMENT		
Parameter	**Value**	**Units**	**Notes/ Data Sources**
Hydrogeology			
Seepage velocity	538	ft/year	Calculated by model
Effective Porosity	0.20	--	Estimated using soil types on boring logs (EPA 1989)
Hydraulic Conductivity	1.04E-02	cm/sec	Average of slug test results at MW-94-52-01 , MW-94-52-02, and MW-94-52-03 as reported in the 2002 Human Health Risk Assessment (CH2M Hill 2002b)
Hydraulic Gradient	0.010	ft/ft	May 2018 Groundwater Elevations (calculated between MW-94-52-01 and MW-94-52-02)
Dispersion			
Longitudinal dispersivity	35.8	ft	Calculated by model
Transverse dispersivity	3.58	ft	Calculated by model
Vertical transverse dispersivity	1.79	ft	Equal to 0.05 times longitudinal dispersivity (ASTM1995)
Estimated Plume Length	2650	ft	Distance from MW-94-52-01 to Bay Head Brach along May 2018 flow path
Adsorption			
Retardation Factor	1.76	--	Calculated same as model excep used total porosity (not effecitve porosity)
Soil Bulk density	1.5	kg/L	USEPA 1996a default value
Partitioning coefficient (Kd)	0.18	L/kg	Calculated (Koc*foc)
Total Porosity	0.35	--	Sands with fines. Freeze and Cherry (1979)
Soil-Water partitioning coefficient (Koc)	89.07	L/kg	May 2018 EPA Chemical Parameters Tables
Fraction Organic Carbon (foc)	0.002	g/g	Equation 10 (USEPA 1996a). Soil Screening Level Paritioning Equation for Migration to Groundwater default foc value
Biodegradation			
First-order Decay Coefficient	8.70E-02	$year^{-1}$	Calculated by model if half-life input
Solute half-life	8.00	year	Calculated using site-specific data from Range C-52N
General			
Modeled Area Length	3000	ft	
Modeled Area Width	1500	ft	
Simulation Time	100	year	Attempt to model steady-state

Table 2A
2018 BIOSCREEN-AT Model Input Parameters
Ranges C-52N and C-62
Open Burn / Open Detonation (OB/OD) Units
Eglin Air Force Base, Florida

	2018 C-52N BIOSCREEN-AT ASSESSMENT		
Parameter	**Value**	**Units**	**Notes/ Data Sources**
Source Data			
Source Thickness in Saturated Zone	30	ft	Used in previous model based on FDEP comments (FDEP 2001)
Source Half-Life	infinite	year	Based on current and planned site operations
Source Width	1400	ft	Previous modeled width (CH2M Hill 2002b)
Source Concentration - Maximum	0.0015	mg/L	Maximum concentration detected at MW-94-52-01 in the past four years of monitoring data (June 2015)
Source Concentration - 95 UCL	--	mg/L	

Notes:
ASTM = American Society for Testing and Materials
cm/sec = centimeters per second
ft = feet
ft/year = feet per year
kg = kilograms
L = liters
mg = milligrams
95 UCL = 95 percent upper confidence limit
$year^{-1}$ = per year

Table 2A
2018 BIOSCREEN-AT Model Input Parameters
Ranges C-52N and C-62
Open Burn / Open Detonation (OB/OD) Units
Eglin Air Force Base, Florida

Parameter	2018 C-62 BIOSCREEN-AT ASSESSMENT					
	Open Detonation Unit Model			Open Burn Unit Model		
	Value	Units	Notes/ Data Sources	Value	Units	Notes/ Data Sources
Hydrogeology						
Seepage velocity	55.6	ft/year	Calculated by model	715	ft/year	Calculated by model
Effective Porosity	0.20	--	Estimated using soil types on boring logs (EPA 1989)	0.20	--	Estimated using soil types on boring logs (EPA 1989)
Hydraulic Conductivity	6.32E-04	cm/sec	Average of slug test results at MW-94-62-04 and MW-94-62-05 as reported in the 2002 Human Health Risk Assessment (CH2M Hill 2002b)	7.68E-03	cm/sec	Average of slug test results at MW-94-62-01, MW-94-62-02, and MW-94-62-03 as reported in the 2002 Human Health Risk Assessment (CH2M Hill 2002b)
Hydraulic Gradient	0.017	ft/ft	May 2018 Groundwater Elevations (calculated between MW-94-62-01 and MW-94-62-05)	0.018	ft/ft	May 2018 Groundwater Elevations (calculated between MW-94-62-01 and MW-94-62-03)
Dispersion						
Longitudinal dispersivity	17.9	ft	Calculated by model	10.0	ft	Calculated by model
Transverse dispersivity	1.79	ft	Calculated by model	1.00	ft	Calculated by model
Vertical transverse dispersivity	0.90	ft	Equal to 0.05 times longitudinal dispersivity (ASTM1995)	0.50	ft	Equal to 0.05 times longitudinal dispersivity (ASTM1995)
Estimated Plume Length	500	ft	Distance from MW-94-62-05 to headwaters of Blount Mill Creek along May 2018 flow path	170	ft	Distance from MW-94-62-03 to headwaters of Blount Mill Creek along May 2018 flow path
Adsorption						
Retardation Factor	1.76	--	Calculated same as model excep used total porosity (not effecitve porosity)	1.76	--	Calculated same as model excep used total porosity (not effecitve porosity)
Soil Bulk density	1.5	kg/L	USEPA 1996a default value	1.5	kg/L	USEPA 1996a default value
Partitioning coefficient (Kd)	0.18	L/kg	Calculated (Koc*foc)	0.18	L/kg	Calculated (Koc*foc)
Total Porosity	0.35	--	Sands with fines. Freeze and Cherry (1979)	0.35	--	Sands with fines. Freeze and Cherry (1979)
Soil-Water partitioning coefficient (Koc)	89.07	L/kg	May 2018 EPA Chemical Parameters Tables	89.07	L/kg	May 2018 EPA Chemical Parameters Tables
Fraction Organic Carbon (foc)	0.002	g/g	Equation 10 (USEPA 1996a). Soil Screening Level Paritioning Equation for Migration to Groundwater default foc value	0.002	g/g	Equation 10 (USEPA 1996a). Soil Screening Level Paritioning Equation for Migration to Groundwater default foc value
Biodegradation						
First-order Decay Coefficient	8.70E-02	$year^{-1}$	Calculated by model if half-life input	8.70E-02	$year^{-1}$	Calculated by model if half-life input
Solute half-life	8.00	year	Calculated using site-specific data from Range C-52N	8.00	year	Calculated using site-specific data from Range C-52N
General						
Modeled Area Length	600	ft	Plume length or slightly longer	200	ft	Plume length or slightly longer
Modeled Area Width	600	ft	No effect on centerline calcs	200	ft	No effect on centerline calcs
Simulation Time	100	year	Attempt to model steady-state	100	year	Attempt to model steady-state

Table 2A
2018 BIOSCREEN-AT Model Input Parameters
Ranges C-52N and C-62
Open Burn / Open Detonation (OB/OD) Units
Eglin Air Force Base, Florida

Parameter	2018 C-62 BIOSCREEN-AT ASSESSMENT					
	Open Detonation Unit Model			Open Burn Unit Model		
	Value	Units	Notes/ Data Sources	Value	Units	Notes/ Data Sources
Source Data						
Source Thickness in Saturated Zone	75	ft	Used in previous model based on FDEP comments (FDEP 2001)	75	ft	Used in previous model based on FDEP comments (FDEP 2001)
Source Half-Life	infinite	year	Based on current and planned site operations	infinite	year	Based on current and planned site operations
Source Width	300	ft	Width of Open Detonation Unit on aerial image, perpendicular to groundwater flow	170	ft	Width of Open Burn Unit on aerial image, perpendicular to groundwater flow
Source Concentration - Maximum	0.072	mg/L	Maximum concentration detected at MW-94-62-05 (May 2018)	0.0043	mg/L	Maximum concentration detected at MW-94-62-03 (May 2017)
Source Concentration - 95 UCL	0.054	mg/L	95 UCL at MW-94-62-05	--	mg/L	Not calculated since maximum detected concentration below screening level

Notes:
ASTM = American Society for Testing a
cm/sec = centimeters per second
ft = feet
ft/year = feet per year
kg = kilograms
L = liters
mg = milligrams
95 UCL = 95 percent upper confidence
$year^{-1}$ = per year

Table 2B
2002 BIOSCREEN Model Input Parameters
Ranges C-52N and C-62
Open Burn / Open Detonation (OB/OD) Units
Eglin Air Force Base, Florida

Parameter	Range C-52N (2002 Human Health Risk Assessment; CH2M Hill 2002b)			Range C-62 (2002 Human Health Risk Assessment; CH2M Hill 2002b)				
				Open Detonation Unit Model		Open Burn Unit Model		
	Value	Units	Notes/ Data Sources	Value	Units	Value	Units	Notes/ Data Sources
Hydrogeology								
Seepage velocity	279	ft/year		23.0	ft/year	23.0	ft/year	Calculated by model
Effective Porosity	0.3	--		0.30	--	0.30	--	Literature Estimate
Hydraulic Conductivity	8.10E-03	cm/sec	Revised based on FDEP (2001) comments	5E-04	cm/sec	5E-04	cm/sec	Aquifer testing results
Hydraulic Gradient	0.01	ft/ft	Water Level measurements	0.013	ft/ft	0.013	ft/ft	Water Level measurements
Dispersion								
Longitudinal dispersivity	37.2	ft		24.7	ft	24.7	ft	Calculated by model
Transverse dispersivity	3.7	ft		2.5	ft	2.5	ft	Calculated by model
Vertical transverse dispersivity	0	ft		0	ft	0	ft	
Estimated Plume Length	2950	ft	Based on RDX concentrations	1020	ft	1020	ft	Based on RDX concentrations
Adsorption								
Retardation Factor	2.4	--		1.00	--	1.00	--	
Soil Bulk density	--	kg/L	Typical default	1.6	kg/L	1.6	kg/L	Typical default
Total Porosity	--	--		--	--	--	--	
Soil-Water partitioning coefficient (Koc)	--	L/kg	Selim and Iskandar 1994	0.07	L/kg	0.07	L/kg	Selim and Iskandar 1994
Fraction Organic Carbon (foc)	--	g/g		1.00E-03	g/g	1.00E-03	g/g	
Biodegradation								
First-order Decay Coefficient	1.20E-01	$year^{-1}$		1.2E-02	$year^{-1}$	1.2E-02	$year^{-1}$	
Solute half-life	6	year		60	year	60		

Table 2B
2002 BIOSCREEN Model Input Parameters
Ranges C-52N and C-62
Open Burn / Open Detonation (OB/OD) Units
Eglin Air Force Base, Florida

Parameter	Range C-52N (2002 Human Health Risk Assessment; CH2M Hill 2002b)			Range C-62 (2002 Human Health Risk Assessment; CH2M Hill 2002b)				
				Open Detonation Unit Model		Open Burn Unit Model		
	Value	Units	Notes/ Data Sources	Value	Units	Value	Units	Notes/ Data Sources
General								
Modeled Area Length	3100	ft		1000	ft	1000	ft	
Modeled Area Width	1500	ft		700	ft	700	ft	
Simulation Time	51	year	Site C-52N in operation since 1950	51	year	51	year	Site C62 in operation since 1950
Source Data								
Source Thickness in Saturated Zone	30	ft		75	ft	75	ft	
Source Half-Life	infinite	year		infinite	year	infinite	year	
Source Width	1400	ft		625	ft	665	ft	
Source Concentration	0.0035	mg/L	Groundwater Monitoring results	0.0028	mg/L	0.00128	mg/L	Groundwater Monitoring results

Notes:
cm/sec = centimeters per second
ft = feet
ft/year = feet per year
kg = kilograms
L = liters
mg = milligrams
$year^{-1}$ = per year

References:
Selim, H.M and I.K. Iskandar. 1994. Sorption-desorption and transport of TNT and RDX in soils. CRREL Report 94-7. U.S. Army Corp of Engineers. May

Table 3
BIOSCREEN-AT Results
Ranges C-52N and C-62
Open Burn / Open Detonation (OB/OD) Units
Eglin Air Force Base, Florida

Model	Source Concentration (mg/L)	Modeled Area Length (feet)	RDX Concentration with First-order Decay (mg/L)	Time to Reach Steady-State (years)
Range C-52 N				
OB/OD Unit	0.0015	3,000	0.000150	15
Range C-62				
OB Unit	0.0043	200	0.0041	< 5
	0.0043	5,000	0.00064	< 25
OD Unit	0.072	600	0.015	45
	0.054	600	0.011	45
	0.072	5,000	< 0.00001	225

Notes:
OB = Open Burn
OD = Open Detonation
mg/L = milligrams per liter

ARCADIS Design & Consultancy for natural and built assets

Table 4
Alternate Concentration Limits for Downgradient Groundwater Monitoring Wells
Ranges C-52N and C-62
Eglin Air Force Base, Florida

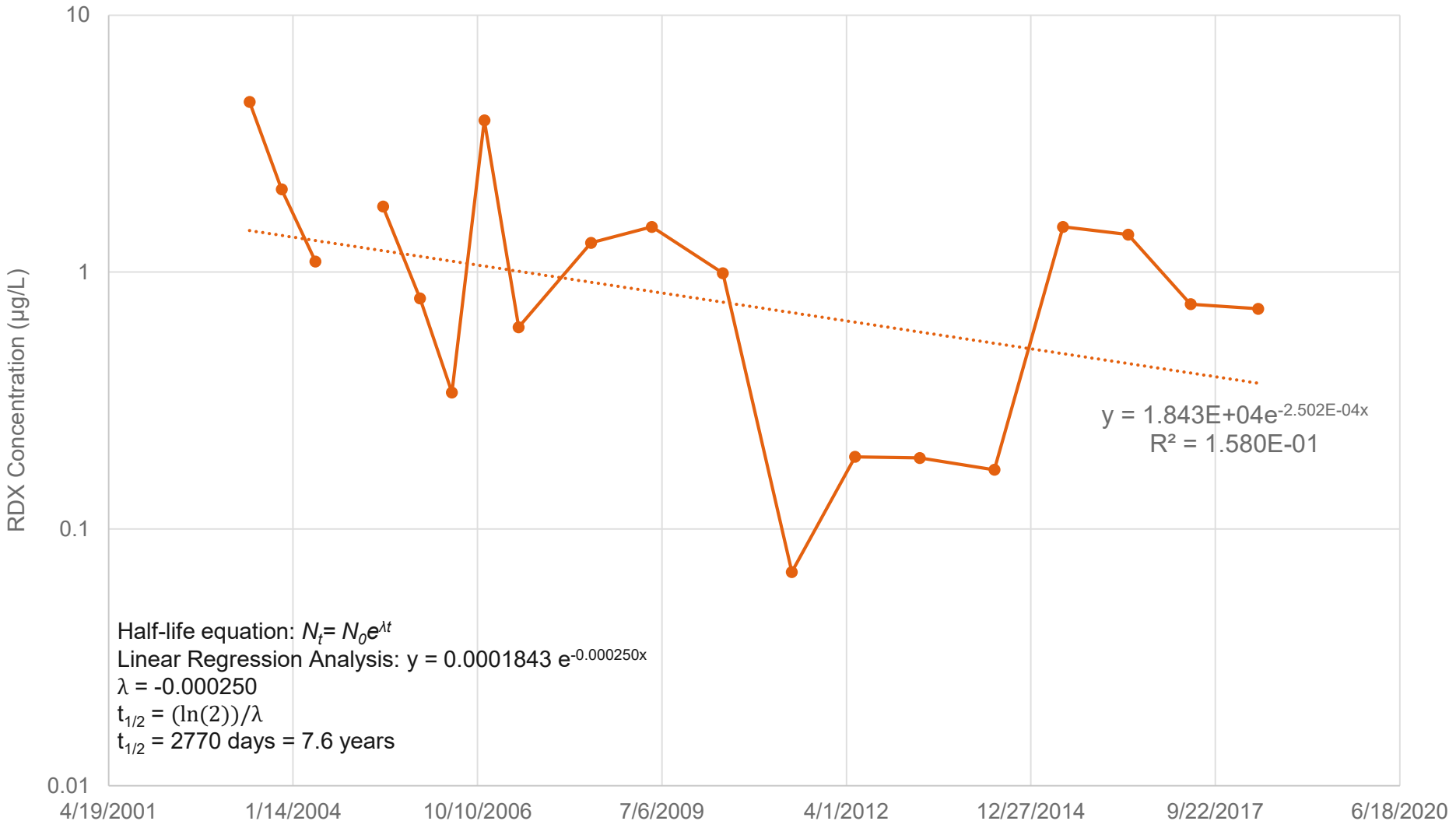
Area	Chemical	Distance to Receptor (feet)	Alternate Concentration Limit (ug/L)	Notes
Range C-52 N				
Cat's Eye	RDX	310	0.32	distance from well MW-94-C52-02 to creek
Cat's Eye	HMX	310	580	distance from well MW-94-C52-02 to creek
Range C-62 OBU				
OBU	RDX	150	0.31	distance from well MW-94-C62-03 to creek
OBU	HMX	150	430	distance from well MW-94-C62-03 to creek
Range C-62 ODU				
ODU	RDX	380	0.87	distance from well MW-94-C62-04 to creek
ODU	HMX	380	21,000	distance from well MW-94-C62-04 to creek

Notes:
HMX = Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine
OBU = Open Burn Unit
ODU = Open Detonation Unit
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine
ug/L = micrograms per liter

ATTACHMENTS

Attachment 1

Linear Regression Analysis



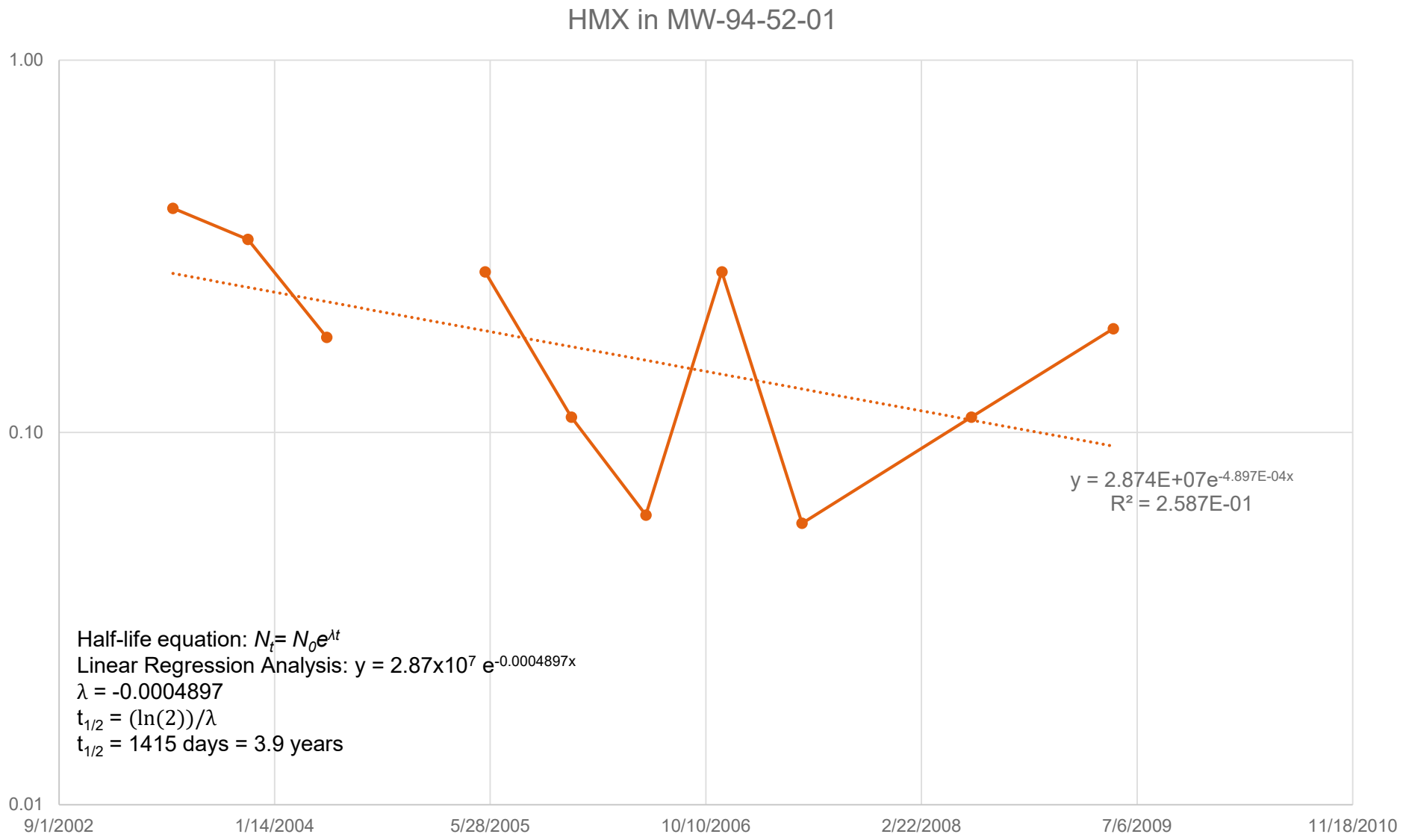
Notes:
µg/L = micrograms per liter
RDX = hexahydro-1,3,5-trinitro-1,3,5-triazine

RANGES C-52N AND C-62
OPEN BURN/OPEN DETONATION UNIT
EGLIN AIR FORCE BASE, FLORIDA

LINEAR REGRESSION ANALYSIS
MW-94-52-01

ARCADIS Design & Consultancy for natural and built assets

FIGURE
A1-1



Notes:
µg/L = micrograms per liter
HMX = octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine

RANGES C-52N AND C-62
OPEN BURN/OPEN DETONATION UNIT
EGLIN AIR FORCE BASE, FLORIDA

LINEAR REGRESSION ANALYSIS
MW-94-52-01

ARCADIS Design & Consultancy for natural and built assets

FIGURE
A1-2

Attachment 2

BIOSCREEN-AT Models

Attachment 2
BIOSCREEN-AT Models
Range C-52N
MW-94-52-01 to Bay Head Branch

BIOSCREEN-AT Natural Attenuation Decision Support System

S.S. Papadopulos & Associates, Inc.

Version 1.45

C52 - Bay Head Branch

Data Input Instructions:

115 → 1. Enter value directly....or
or
0.02 → 2. Calculate by filling in grey cells below. (To restore formulas, hit button below).

Variable* → Data used directly in model.
20 → Value calculated by model. (Don't enter any data).

1. HYDROGEOLOGY

Seepage Velocity*	Vs	538	(ft/yr)
or		or	
Hydraulic Conductivity	K	1.0E-02	(cm/sec)
Hydraulic Gradient	i	0.01	(ft/ft)
Porosity	n	0.2	(-)

2. DISPERSION

Longitudinal Dispersivity*	alpha x	35.8	(ft)
Transverse Dispersivity*	alpha y	3.58	(ft)
Vertical Dispersivity*	alpha z	1.79	(ft)
or		or	
Estimated Plume Length	Lp	2650	(ft)

3. ADSORPTION

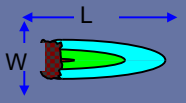
Retardation Factor*	R	1.76	(-)
or		or	
Soil Bulk Density	rho	1.5	(kg/l)
Partition Coefficient	Koc	89.07	(L/kg)
FractionOrganicCarbon	foc	2.0E-3	(-)

4. BIODEGRADATION

1st Order Decay Coeff*	lambda	8.7E-2	(per yr)
or		or	
Solute Half-Life	t-half	8.00	(year)
or Instantaneous Reaction Model			
Delta Oxygen*	DO		(mg/L)
Delta Nitrate*	NO3		(mg/L)
Observed Ferrous Iron*	Fe2+		(mg/L)
Delta Sulfate*	SO4		(mg/L)
Observed Methane*	CH4		(mg/L)

5. GENERAL

Modeled Area Length*	3000	(ft)
Modeled Area Width*	1500	(ft)
Simulation Time*	100.00	(yr)

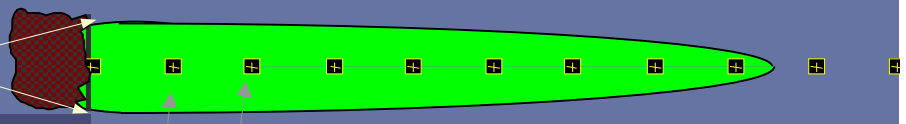


6. SOURCE DATA

Source Thickness	30	(ft)

Source	
Width (ft)	Conc.(mg/L)
1400	0.0015

☐ Exponentialy Decaying Conc.



View of Plume Looking Down

Observed Centerline Concentrations at Monitoring Wells
If No Data Leave Blank or Enter "0"

7. FIELD DATA FOR COMPARISON

Concentration (mg/L)	.0015						.0				
Dist. from Source (ft)	0	300	600	900	1200	1500	1800	2100	2400	2700	3000

8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN **RUN**

View Centerline **View Plume**

View BIOSCREEN

Recalculate This Sheet

Paste Example Dataset

Paste Dataset from BIOSCREEN

Restore Formulas for Vs,

DISSOLVED HYDROCARBON CONCENTRATIONS IN PLUME (mg/L at Z=0)

Distance from Source (ft)

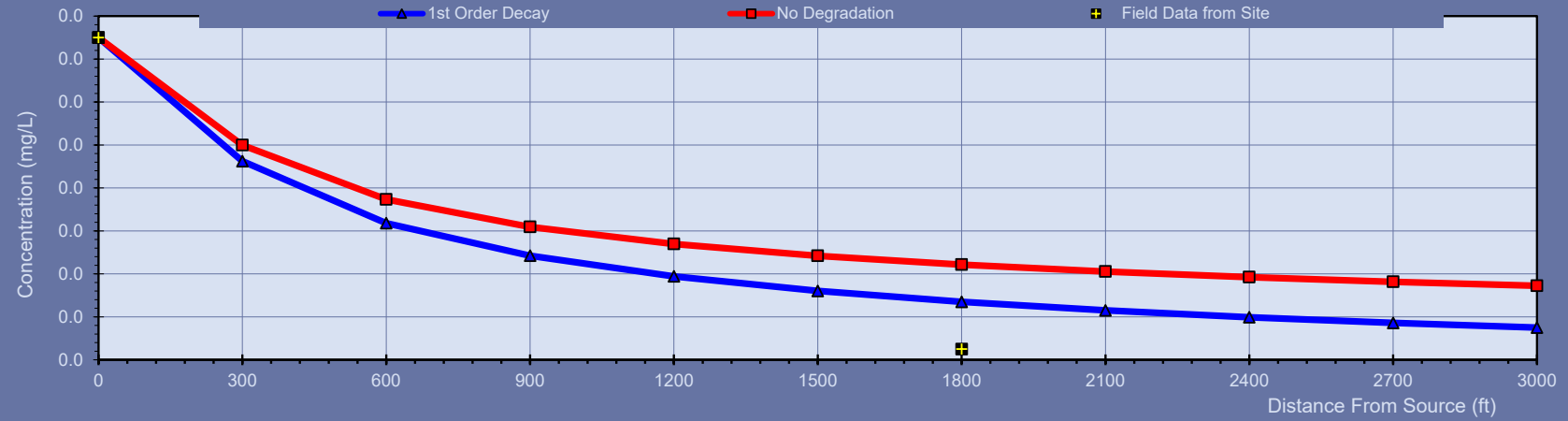
	0	300	600	900	1200	1500	1800	2100	2400	2700	3000
No Degradation	0.00150	0.00100	0.00075	0.00062	0.00054	0.00048	0.00044	0.00041	0.00038	0.00036	0.00034
1st Order Decay	0.00150	0.00092	0.00064	0.00048	0.00039	0.00032	0.00027	0.00023	0.00020	0.000172	0.000150
Field Data from Site	0.00150						0.00005				

# of TimeSteps: 20

Displayed Time=100 years

Return to Input

View Plume Output



Attachment 2
BIOSCREEN-AT Models
Range C-62
OBU to Blount Mill Creek

BIOSCREEN-AT Natural Attenuation Decision Support System

S.S. Papadopulos & Associates, Inc.

Version 1.45

OBU to Blount Mill Creek

Data Input Instructions:

115 → 1. Enter value directly....or

or

0.02 → 2. Calculate by filling in grey cells below. (To restore formulas, hit button below).

Variable* → Data used directly in model.

20 → Value calculated by model. (Don't enter any data).

1. HYDROGEOLOGY

Seepage Velocity*	Vs	715.1	(ft/yr)
or		or	
Hydraulic Conductivity	K	7.7E-03	(cm/sec)
Hydraulic Gradient	i	0.018	(ft/ft)
Porosity	n	0.2	(-)

2. DISPERSION

Longitudinal Dispersivity*	alpha x	10.0	(ft)
Transverse Dispersivity*	alpha y	1.00	(ft)
Vertical Dispersivity*	alpha z	0.50	(ft)
or		or	
Estimated Plume Length	Lp	170	(ft)

3. ADSORPTION

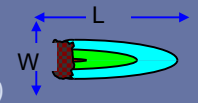
Retardation Factor*	R	1.76	(-)
or		or	
Soil Bulk Density	rho	1.5	(kg/l)
Partition Coefficient	Koc	89.07	(L/kg)
FractionOrganicCarbon	foc	2.0E-3	(-)

4. BIODEGRADATION

1st Order Decay Coeff*	lambda	8.7E-2	(per yr)
or		or	
Solute Half-Life	t-half	8.00	(year)
or Instantaneous Reaction Model			
Delta Oxygen*	DO		(mg/L)
Delta Nitrate*	NO3		(mg/L)
Observed Ferrous Iron*	Fe2+		(mg/L)
Delta Sulfate*	SO4		(mg/L)
Observed Methane*	CH4		(mg/L)

5. GENERAL

Modeled Area Length*	200	(ft)
Modeled Area Width*	200	(ft)
Simulation Time*	100.00	(yr)

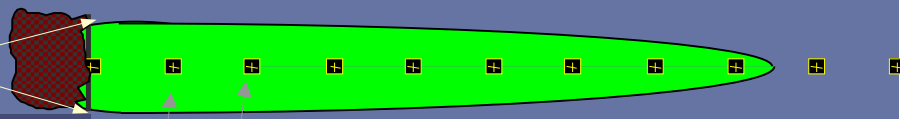


6. SOURCE DATA

Source Thickness	75	(ft)

Source	
Width (ft)	Conc.(mg/L)
170	0.0043

☐ Exponentialy Decaying Conc.



View of Plume Looking Down

Observed Centerline Concentrations at Monitoring Wells
If No Data Leave Blank or Enter "0"

7. FIELD DATA FOR COMPARISON

Dist. from Source (ft)	0	20	40	60	80	100	120	140	160	180	200
Concentration (mg/L)											

8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN | **RUN**

View Centerline | **View Plume**

View BIOSCREEN

Recalculate This Sheet

Paste Example Dataset

Paste Dataset from BIOSCREEN

Restore Formulas for Vs,

DISSOLVED HYDROCARBON CONCENTRATIONS IN PLUME (mg/L at Z=0)

Distance from Source (ft)

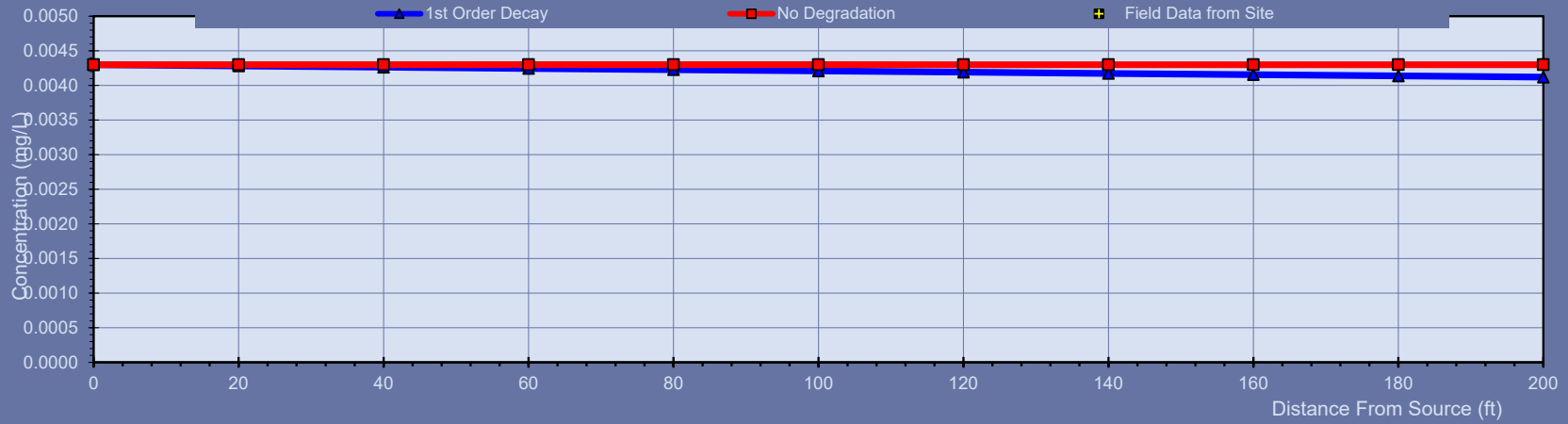
	0	20	40	60	80	100	120	140	160	180	200
No Degradation	0.00430	0.00430	0.00430	0.00430	0.00430	0.00430	0.00430	0.00430	0.00430	0.00430	0.00430
1st Order Decay	0.00430	0.00428	0.00426	0.00425	0.00423	0.00421	0.00419	0.00417	0.00416	0.00414	0.00412
Field Data from Site											

# of TimeSteps: 20

Displayed Time=100 years

Return to Input

View Plume Output



Attachment 2
BIOSCREEN-AT Models
Range C-62
OBU - 5000 feet

BIOSCREEN-AT Natural Attenuation Decision Support System

S.S. Papadopulos & Associates, Inc.

Version 1.45

OBU - 5000 ft model

Data Input Instructions:

115 → 1. Enter value directly....or
or
0.02 → 2. Calculate by filling in grey cells below. (To restore formulas, hit button below).

Variable* → Data used directly in model.
20 → Value calculated by model. (Don't enter any data).

1. HYDROGEOLOGY

Seepage Velocity*	Vs	715.1	(ft/yr)
or		or	
Hydraulic Conductivity	K	7.7E-03	(cm/sec)
Hydraulic Gradient	i	0.018	(ft/ft)
Porosity	n	0.2	(-)

2. DISPERSION

Longitudinal Dispersivity*	alpha x	10.0	(ft)
Transverse Dispersivity*	alpha y	1.00	(ft)
Vertical Dispersivity*	alpha z	0.50	(ft)
or		or	
Estimated Plume Length	Lp	170	(ft)

3. ADSORPTION

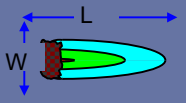
Retardation Factor*	R	1.76	(-)
or		or	
Soil Bulk Density	rho	1.5	(kg/l)
Partition Coefficient	Koc	89.07	(L/kg)
FractionOrganicCarbon	foc	2.0E-3	(-)

4. BIODEGRADATION

1st Order Decay Coeff*	lambda	8.7E-2	(per yr)
or		or	
Solute Half-Life	t-half	8.00	(year)
or Instantaneous Reaction Model			
Delta Oxygen*	DO		(mg/L)
Delta Nitrate*	NO3		(mg/L)
Observed Ferrous Iron*	Fe2+		(mg/L)
Delta Sulfate*	SO4		(mg/L)
Observed Methane*	CH4		(mg/L)

5. GENERAL

Modeled Area Length*	5000	(ft)
Modeled Area Width*	200	(ft)
Simulation Time*	500.00	(yr)

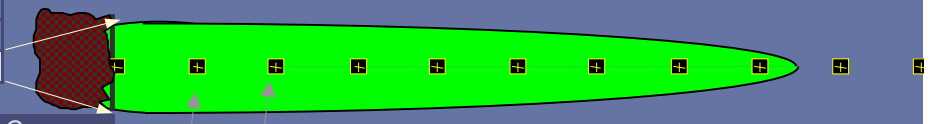


6. SOURCE DATA

Source Thickness	75	(ft)

Source	
Width (ft)	Conc.(mg/L)
170	0.0043

☐ Exponentialy Decaying Conc.



View of Plume Looking Down

Observed Centerline Concentrations at Monitoring Wells
If No Data Leave Blank or Enter "0"

7. FIELD DATA FOR COMPARISON

Dist. from Source (ft)	0	500	1000	1500	2000	2500	3000	3500	4000	4500	5000
Concentration (mg/L)											

8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN **RUN**

View Centerline **View Plume**

View BIOSCREEN

Recalculate This Sheet

Paste Example Dataset

Paste Dataset from BIOSCREEN

Restore Formulas for Vs,

DISSOLVED HYDROCARBON CONCENTRATIONS IN PLUME (mg/L at Z=0)

Distance from Source (ft)

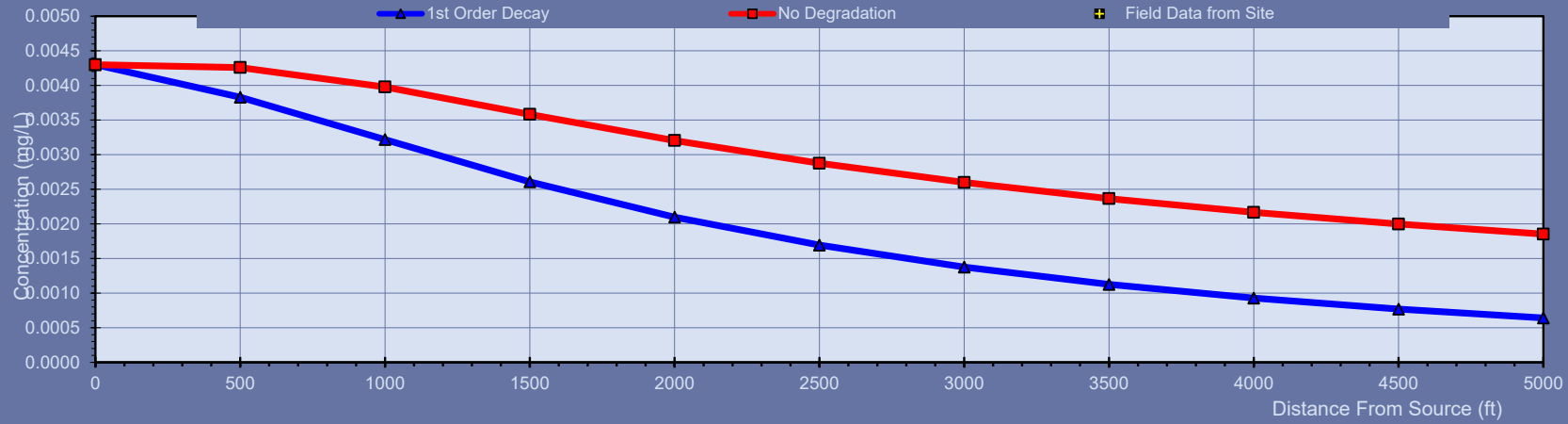
	0	500	1000	1500	2000	2500	3000	3500	4000	4500	5000
No Degradation	0.00430	0.00426	0.00398	0.00358	0.00320	0.00288	0.00260	0.00236	0.00217	0.00200	0.00185
1st Order Decay	0.00430	0.00383	0.00322	0.00261	0.00210	0.00169	0.00138	0.00113	0.00093	0.00077	0.00064
Field Data from Site											

# of TimeSteps: 20

Displayed Time=500 years

Return to Input

View Plume Output



Attachment 2
BIOSCREEN-AT Models
Range C-62
ODU to Blount Mill Creek

BIOSCREEN-AT Natural Attenuation Decision Support System

S.S. Papadopulos & Associates, Inc.

Version 1.45

ODU - Blount Mill Creek

Data Input Instructions:

115 → *1. Enter value directly....or*

or

0.02 → *2. Calculate by filling in grey cells below. (To restore formulas, hit button below).*

Variable* → *Data used directly in model.*

20 → *Value calculated by model. (Don't enter any data).*

1. HYDROGEOLOGY

Seepage Velocity*	*Vs*	55.6	*(ft/yr)*
or		*or*	
Hydraulic Conductivity	*K*	6.3E-04	*(cm/sec)*
Hydraulic Gradient	*i*	0.017	*(ft/ft)*
Porosity	*n*	0.2	*(-)*

2. DISPERSION

Longitudinal Dispersivity*	*alpha x*	17.9	*(ft)*
Transverse Dispersivity*	*alpha y*	1.79	*(ft)*
Vertical Dispersivity*	*alpha z*	0.90	*(ft)*
or		*or*	
Estimated Plume Length	*Lp*	500	*(ft)*

3. ADSORPTION

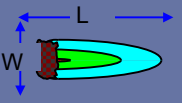
Retardation Factor*	*R*	1.76	*(-)*
or		*or*	
Soil Bulk Density	*rho*	1.5	*(kg/l)*
Partition Coefficient	*Koc*	89.07	*(L/kg)*
FractionOrganicCarbon	*foc*	2.0E-3	*(-)*

4. BIODEGRADATION

1st Order Decay Coeff*	*lambda*	8.70E-2	*(per yr)*
or		*or*	
Solute Half-Life	*t-half*	8.00	*(year)*
or Instantaneous Reaction Model			
Delta Oxygen*	*DO*		*(mg/L)*
Delta Nitrate*	*NO3*		*(mg/L)*
Observed Ferrous Iron*	*Fe2+*		*(mg/L)*
Delta Sulfate*	*SO4*		*(mg/L)*
Observed Methane*	*CH4*		*(mg/L)*

5. GENERAL

Modeled Area Length*	600	*(ft)*
Modeled Area Width*	600	*(ft)*
Simulation Time*	100.00	*(yr)*

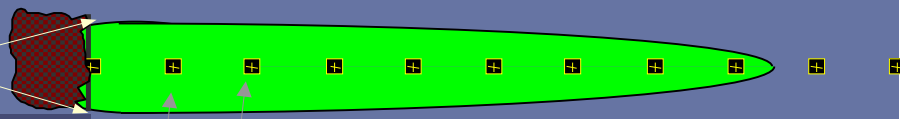


6. SOURCE DATA

Source Thickness: 75 *(ft)*

Source	
Width (ft)	Conc.(mg/L)
300	0.072

☐ Exponentialy Decaying Conc.



View of Plume Looking Down

Observed Centerline Concentrations at Monitoring Wells
If No Data Leave Blank or Enter "0"

7. FIELD DATA FOR COMPARISON

Dist. from Source (ft)	0	60	120	180	240	300	360	420	480	540	600
Concentration (mg/L)											

8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN **RUN**

View Centerline **View Plume**

View BIOSCREEN

Recalculate This Sheet

Paste Example Dataset

Paste Dataset from BIOSCREEN

Restore Formulas for Vs,

DISSOLVED HYDROCARBON CONCENTRATIONS IN PLUME (mg/L at Z=0)

Distance from Source (ft)

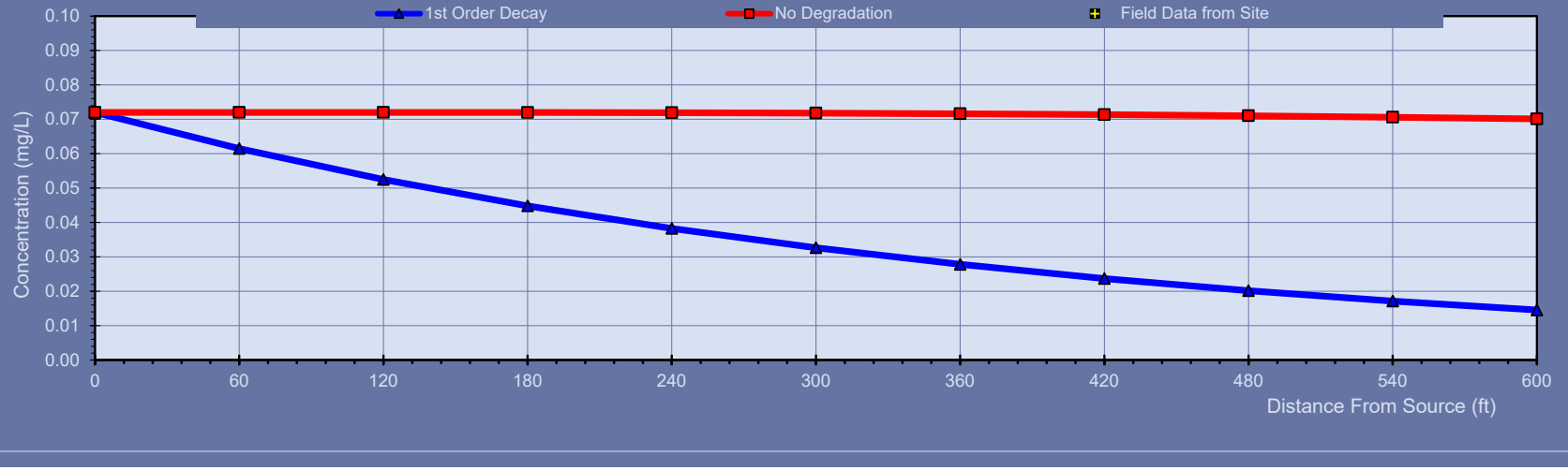
	0	60	120	180	240	300	360	420	480	540	600
No Degradation	0.0720	0.0720	0.0720	0.0720	0.0719	0.0718	0.0716	0.0714	0.0710	0.0706	0.0701
1st Order Decay	0.0720	0.0615	0.0525	0.0448	0.0383	0.0326	0.0278	0.0237	0.0202	0.0171	0.0146
Field Data from Site											

# of TimeSteps: 20

Displayed Time=100 years

Return to Input

View Plume Output



Attachment 2
BIOSCREEN-AT Models
Range C-62
ODU to Blount Mill Creek
95 UCL

BIOSCREEN-AT Natural Attenuation Decision Support System

S.S. Papadopulos & Associates, Inc. — *Version 1.45*

ODU - BMC 95UCL

Data Input Instructions:

115 → 1. Enter value directly....or
or
0.02 → 2. Calculate by filling in grey cells below. (To restore formulas, hit button below).

Variable* → Data used directly in model.
20 → Value calculated by model. (Don't enter any data).

1. HYDROGEOLOGY

Seepage Velocity*	Vs	55.6	(ft/yr)
or		or	
Hydraulic Conductivity	K	6.3E-04	(cm/sec)
Hydraulic Gradient	i	0.017	(ft/ft)
Porosity	n	0.2	(-)

2. DISPERSION

Longitudinal Dispersivity*	alpha x	17.9	(ft)
Transverse Dispersivity*	alpha y	1.79	(ft)
Vertical Dispersivity*	alpha z	0.90	(ft)
or		or	
Estimated Plume Length	Lp	500	(ft)

3. ADSORPTION

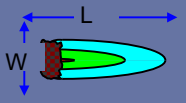
Retardation Factor*	R	1.8	(-)
or		or	
Soil Bulk Density	rho	1.5	(kg/l)
Partition Coefficient	Koc	89.07	(L/kg)
FractionOrganicCarbon	foc	2.0E-3	(-)

4. BIODEGRADATION

1st Order Decay Coeff*	lambda	8.7E-2	(per yr)
or		or	
Solute Half-Life	t-half	8.00	(year)
or Instantaneous Reaction Model			
Delta Oxygen*	DO		(mg/L)
Delta Nitrate*	NO3		(mg/L)
Observed Ferrous Iron*	Fe2+		(mg/L)
Delta Sulfate*	SO4		(mg/L)
Observed Methane*	CH4		(mg/L)

5. GENERAL

Modeled Area Length*	600	(ft)
Modeled Area Width*	600	(ft)
Simulation Time*	100.00	(yr)

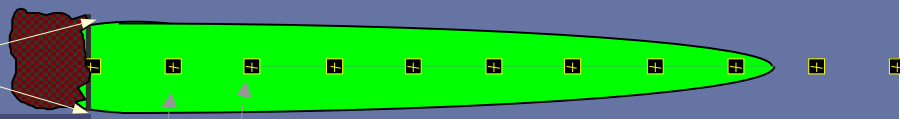


6. SOURCE DATA

Source Thickness	75	(ft)

Source	
Width (ft)	Conc.(mg/L)
300	0.054

☐ Exponentialy Decaying Conc.



View of Plume Looking Down

Observed Centerline Concentrations at Monitoring Wells
If No Data Leave Blank or Enter "0"

7. FIELD DATA FOR COMPARISON

Dist. from Source (ft)	0	60	120	180	240	300	360	420	480	540	600
Concentration (mg/L)											

8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN **RUN**

View Centerline **View Plume**

View BIOSCREEN

Recalculate This Sheet

Paste Example Dataset

Paste Dataset from BIOSCREEN

Restore Formulas for Vs,

DISSOLVED HYDROCARBON CONCENTRATIONS IN PLUME (mg/L at Z=0)

Distance from Source (ft)

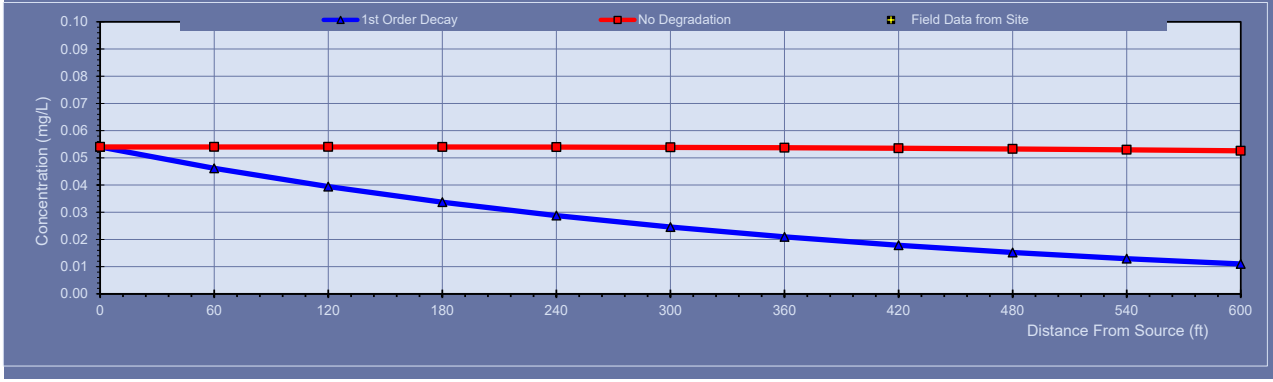
	0	60	120	180	240	300	360	420	480	540	600
No Degradation	0.0540	0.0540	0.0540	0.0540	0.0539	0.0538	0.0537	0.0535	0.0533	0.0530	0.0526
1st Order Decay	0.0540	0.0461	0.0394	0.0337	0.0288	0.0246	0.0210	0.0179	0.0152	0.0129	0.0110
Field Data from Site											

# of TimeSteps: 20

Displayed Time=100 years

Return to Input

View Plume Output



Attachment 2
BIOSCREEN-AT Models
Range C-62
ODU - 5000 feet

BIOSCREEN-AT Natural Attenuation Decision Support System

S.S. Papadopulos & Associates, Inc.

Version 1.45

ODU - 5000 ft plume

Data Input Instructions:

115 → *1. Enter value directly....or*

or

0.02 → *2. Calculate by filling in grey cells below. (To restore formulas, hit button below).*

Variable* → *Data used directly in model.*

20 → *Value calculated by model. (Don't enter any data).*

1. HYDROGEOLOGY

Seepage Velocity*	*Vs*	55.6	*(ft/yr)*
or		*or*	
Hydraulic Conductivity	*K*	6.3E-04	*(cm/sec)*
Hydraulic Gradient	*i*	0.017	*(ft/ft)*
Porosity	*n*	0.2	*(-)*

2. DISPERSION

Longitudinal Dispersivity*	*alpha x*	17.9	*(ft)*
Transverse Dispersivity*	*alpha y*	1.79	*(ft)*
Vertical Dispersivity*	*alpha z*	0.90	*(ft)*
or		*or*	
Estimated Plume Length	*Lp*	500	*(ft)*

3. ADSORPTION

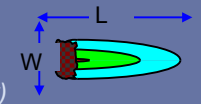
Retardation Factor*	*R*	1.76	*(-)*
or		*or*	
Soil Bulk Density	*rho*	1.5	*(kg/l)*
Partition Coefficient	*Koc*	89.07	*(L/kg)*
FractionOrganicCarbon	*foc*	2.0E-3	*(-)*

4. BIODEGRADATION

1st Order Decay Coeff*	*lambda*	8.7E-2	*(per yr)*
or		*or*	
Solute Half-Life	*t-half*	8.00	*(year)*
or Instantaneous Reaction Model			
Delta Oxygen*	*DO*		*(mg/L)*
Delta Nitrate*	*NO3*		*(mg/L)*
Observed Ferrous Iron*	*Fe2+*		*(mg/L)*
Delta Sulfate*	*SO4*		*(mg/L)*
Observed Methane*	*CH4*		*(mg/L)*

5. GENERAL

Modeled Area Length*	5000	*(ft)*
Modeled Area Width*	600	*(ft)*
Simulation Time*	500.00	*(yr)*

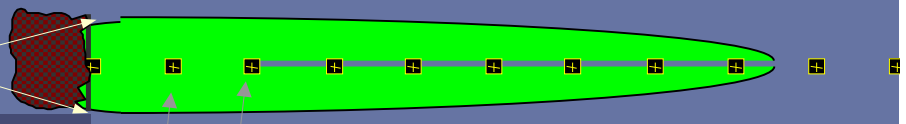


6. SOURCE DATA

Source Thickness	75	*(ft)*

Source	
Width (ft)	Conc.(mg/L)
300	0.072

☐ Exponentialy Decaying Conc.



View of Plume Looking Down

Observed Centerline Concentrations at Monitoring Wells
If No Data Leave Blank or Enter "0"

7. FIELD DATA FOR COMPARISON

Dist. from Source (ft)	0	500	1000	1500	2000	2500	3000	3500	4000	4500	5000
Concentration (mg/L)											

8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN **RUN**

View Centerline **View Plume**

View BIOSCREEN

Recalculate This Sheet

Paste Example Dataset

Paste Dataset from BIOSCREEN

Restore Formulas for Vs,

DISSOLVED HYDROCARBON CONCENTRATIONS IN PLUME (mg/L at Z=0)

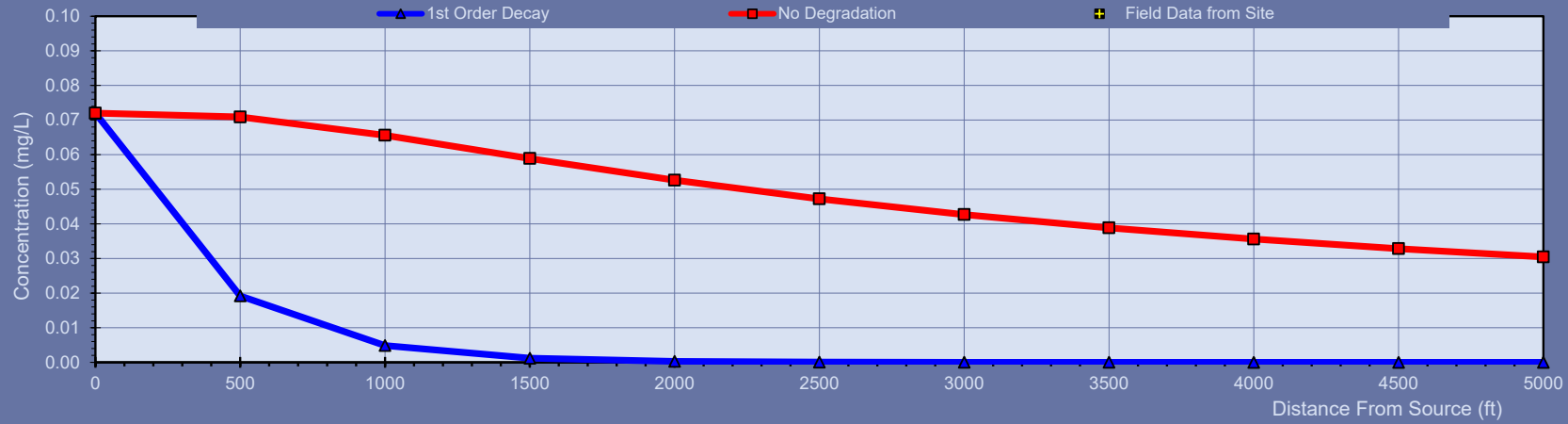
Distance from Source (ft)

	0	500	1000	1500	2000	2500	3000	3500	4000	4500	5000
No Degradation	0.0720	0.0709	0.0656	0.0589	0.0526	0.0472	0.0427	0.0389	0.0356	0.0328	0.0305
1st Order Decay	0.0720	0.0192	0.0049	0.0012	0.0003	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000
Field Data from Site											

# of TimeSteps: 20

Displayed Time=500 years

Return to Input | View Plume Output



Attachment 3

Alternate Concentration Limits in Groundwater for the Protection of Surface Water Receptors

Attachment 3

Alternate Concentration Limits in Groundwater for the Protection of Surface Water Receptors

Site:	Eglin Air Force Base - C-52 North	Calculated By:	Chris Shepherd
Location:	Florida	Checked By:	Ashley Nagle
Chemical(s):	See below	Date:	12/10/2018

Parameters:	RDX	HMX	Units	Source
1) Average Groundwater Linear Velocity: $V_s = \frac{K \cdot i}{\theta_e}$				
Aquifer hydraulic conductivity K	33	33	ft/day	a
Groundwater gradient i	0.010	0.010	ft/ft	b
Effective porosity θ_e	0.2	0.2	dimensionless	c
Seepage velocity V_s	**1.65**	**1.65**	**ft/day**	
2) Soil-Water Partition Coefficient and Retardation Factor $K_d = K_{oc} \cdot f_{oc}$ $r_f = 1 + K_d \frac{\rho_b}{n}$				
organic carbon coefficient K_{oc}	89.07	532	dimensionless	d
fraction of organic carbon f_{oc}	0.002	0.002	g/g	e
soil-water partition coefficient K_d	1.78E-01	1.06E+00	L/kg	
bulk density ρ_b	1.5	1.5	kg/L	e
soil porosity (total) n	0.35	0.35	dimensionless	f
Retardation factor (saturated) r_f	**1.76E+00**	**5.56E+00**	**dimensionless**	
3) Chemical Transport Rate, Distance, and Time $V_c = \frac{V_s}{r_f}$ $t_x = \frac{d_x}{v_c}$				
Seepage velocity v_s	1.65	1.65	ft/day	
Chemical velocity (retarded) v_c	**9.4E-01**	**3.0E-01**	**ft/day**	
Chemical velocity (retarded) v_c	342	109	ft/year	
Distance to receptor d_x	**310**	**310**	ft	g
Transport time to reach receptor t_x	**331**	**1,045**	**days**	
Transport time to reach receptor t_x	1	3	years	
4) Degradation Rate and Allowable Initial Concentration $k = \frac{ln(2)}{\lambda}$ $C_{0-GW} = \frac{C}{e^{-(k \cdot t_x)}}$				
Half-life λ	2,920	1,415	days	h
Target concentration (GCTL) C	0.3	350	ug/L	i
Chemical degradation constant k	**2.37E-04**	**4.90E-04**	**days^{-1}**	
Initial groundwater concentration $C_{0\text{-}GW}$	3.25E-01	5.84E+02	ug/L	j
Alternate concentration limit in groundwater ACL_{gw}	**0.32**	**580**	**ug/L**	
Maximum groundwater concentration in last 4 years C_{tmax}	< 0.21	< 0.088	ug/L	k
Maximum site exceedance factor EF	n/a	n/a	dimensionless	

Attachment 3
Alternate Concentration Limits in Groundwater for the Protection of Surface Water Receptors

Site:	Eglin Air Force Base - C-52 North	Calculated By:	Chris Shepherd
Location:	Florida	Checked By:	Ashley Nagle
Chemical(s):	See below	Date:	12/10/2018

Parameters:	RDX	HMX	Units	Source

Notes:
Calculations conservatively assumes an infinite source, no dispersion, and no diffusion
a = Source area average shallow groundwater hydraulic conductivity (CH2MHILL 2002)
b = Source area shallow groundwater gradient in May 2018 (LRS 2018)
c = based on sands with fines (USEPA 1989)
d = USEPA 2018
e = USEPA 1996 default value
f = based on representative soil, sands with fines (Fetter 1994, Freeze and Cherry 1979)
g = distance from monitoring well downgradient of the source area to the nearest stream (parallel to groundwater flow)
h = site-specific, calculated half-lives (see BIOSCREEN model)
j = calculated initial groundwater concentration at source area that would result in a concentration at or below the target receptor point concentration
k = maximum concentration or detection limit observed in the last four years at the downgradient monitoring well(s)

Acronyms
ft = feet
g = grams
GCTL = groundwater concentration target limit
FDEP = Florida Department of Environmental Protection
kg = kilograms
L = liters
mg = milligrams
ug = micrograms
USEPA = United States Environmental Protection Agency

References:
CH2M Hill. 2002. Human Health Risk Assessment for Groundwater at C-52N and C-62, Eglin AFB, Florida.
Fetter, C.W. 1993. Contaminant Hydrogeology. Macmillan Publishing, New York.
Freeze, R. Allen and John A. Cherry. 1979. Groundwater. Prentice Hall Inc., Upper Saddle River, NJ. 604p.
LRS. 2018. Annual Environmental Monitoring Report, Open Burn/Open Detonation Units, Range C-52 North and Range C-62, Eglin Air Force Base, Florida, Operational
USEPA 1996. Soil Screening Guidance: Technical Background Document. July.
USEPA 1998. Chemical Fate Half-Lives for Toxics Release Inventory (TRI) Chemicals. July
USEPA. May 2018 Chemical Parameters Tables. Website: https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables . Accessed December 2018.

Attachment 3
Alternate Concentration Limits in Groundwater for the Protection of Surface Water Receptors

Site: Eglin Air Force Base - C62 OBU
Location: Florida
Chemical(s): See below

Calculated By: Chris Shepherd
Checked By: Ashley Nagle
Date: 12/10/2018

Parameters:	**RDX**	**HMX**	**Units**	**Source**
1) Average Groundwater Linear Velocity: $V_s = \frac{K \cdot i}{\theta_e}$				
Aquifer hydraulic conductivity K	22	22	ft/day	a
Groundwater gradient i	0.018	0.018	ft/ft	b
Effective porosity θ_e	0.2	0.2	dimensionless	c
Seepage velocity V_s	**1.98**	**1.98**	**ft/day**	
2) Soil-Water Partition Coefficient and Retardation Factor $K_d = K_{oc} \cdot f_{oc}$ $r_f = 1 + K_d \frac{\rho_b}{n}$				
organic carbon coefficient K_{oc}	89.07	532	dimensionless	d
fraction of organic carbon f_{oc}	0.002	0.002	g/g	e
soil-water partition coefficient K_d	1.78E-01	1.06E+00	L/kg	
bulk density ρ_b	1.5	1.5	kg/L	e
soil porosity (total) n	0.35	0.35	dimensionless	f
Retardation factor (saturated) r_f	**1.76E+00**	**5.56E+00**	**dimensionless**	
3) Chemical Transport Rate, Distance, and Time $V_c = \frac{V_s}{r_f}$ $t_x = \frac{d_x}{v_c}$				
Seepage velocity v_s	1.98	1.98	ft/day	
Chemical velocity (retarded) v_c	1.1E+00	3.6E-01	ft/day	g
Chemical velocity (retarded) v_c	**410**	**130**	**ft/year**	
Distance to receptor d_x	150	150	ft	
Transport time to reach receptor t_x	**134**	**421**	**days**	
Transport time to reach receptor t_x	0.4	1.2	years	
4) Degradation Rate and Allowable Initial Concentration $k = \frac{ln(2)}{\lambda}$ $C_{0-GW} = \frac{C}{e^{-(k \cdot t_x)}} = ACL_{gw}$				
Half-life λ	2,920	1,415	days	h
Target concentration (GCTL) C	0.3	350	ug/L	i
Chemical degradation constant k	**2.37E-04**	**4.90E-04**	**days^{-1}**	
Initial groundwater concentration $C_{0\text{-}GW}$	3.10E-01	4.30E+02	ug/L	j
Alternate concentration limit in groundwater ACL_{gw}	**0.31**	**430**	**ug/L**	
Maximum groundwater concentration in last 4 years C_{tmax}	3.6	0.14	ug/L	k
Maximum site exceedance factor EF	12	0.00	dimensionless	l

Attachment 3
Alternate Concentration Limits in Groundwater for the Protection of Surface Water Receptors

Site:	Eglin Air Force Base - C62 OBU	Calculated By:	Chris Shepherd
Location:	Florida	Checked By:	Ashley Nagle
Chemical(s):	See below	Date:	12/10/2018

Parameters:	RDX	HMX	Units	Source

Notes:
Calculations conservatively assumes an infinite source, no dispersion, and no diffusion
a = Source area average shallow groundwater hydraulic conductivity (CH2MHILL 2002)
b = Source area shallow groundwater gradient in May 2018 (LRS 2018)
c = based on sands with fines (USEPA 1989)
d = USEPA 2018
e = USEPA 1996 default value
f = based on representative soil, sands with fines (Fetter 1994, Freeze and Cherry 1979)
g = distance from monitoring well downgradient of the source area to the nearest stream (parallel to groundwater flow)
h = site-specific, calculated half-lives (see BIOSCREEN model)
j = calculated initial groundwater concentration at source area that would result in a concentration at or below the target receptor point concentration
k = maximum concentration or detection limit observed in the last four years at the downgradient monitoring well(s)

Acronyms
ft = feet
g = grams
GCTL = groundwater concentration target limit
FDEP = Florida Department of Environmental Protection
kg = kilograms
L = liters
mg = milligrams
OBU = open burn unit
ug = micrograms
USEPA = United States Environmental Protection Agency

References:
CH2M Hill. 2002. Human Health Risk Assessment for Groundwater at C-52N and C-62, Eglin AFB, Florida.
Fetter, C.W. 1993. Contaminant Hydrogeology. Macmillan Publishing, New York.
Freeze, R. Allen and John A. Cherry. 1979. Groundwater. Prentice Hall Inc., Upper Saddle River, NJ. 604p.
LRS. 2018. Annual Environmental Monitoring Report, Open Burn/Open Detonation Units, Range C-52 North and Range C-62, Eglin Air Force Base, Florida, Operational
USEPA 1996. Soil Screening Guidance: Technical Background Document. July.
USEPA 1998. Chemical Fate Half-Lives for Toxics Release Inventory (TRI) Chemicals. July

Attachment 3

Alternate Concentration Limits in Groundwater for the Protection of Surface Water Receptors

Site:	Eglin Air Force Base - C62 ODU	Calculated By:	Chris Shepherd
Location:	Florida	Checked By:	Ashley Nagle
Chemical(s):	See below	Date:	12/10/2018

Parameters:	RDX	HMX	Units	Source
1) Average Groundwater Linear Velocity: $V_s = \frac{K \cdot i}{\theta_e}$				
Aquifer hydraulic conductivity K	1.8	1.8	ft/day	a
Groundwater gradient i	0.017	0.017	ft/ft	b
Effective porosity θ_e	0.2	0.2	dimensionless	c
Seepage velocity V_s	**0.15**	**0.15**	**ft/day**	
2) Soil-Water Partition Coefficient and Retardation Factor $K_d = K_{oc} \cdot f_{oc}$ $r_f = 1 + K_d \frac{\rho_b}{n}$				
organic carbon coefficient K_{oc}	89.07	266	dimensionless	d
fraction of organic carbon f_{oc}	0.002	0.002	g/g	e
soil-water partition coefficient K_d	1.78E-01	5.32E-01	L/kg	
bulk density ρ_b	1.5	1.5	kg/L	e
soil porosity (total) n	0.35	0.35	dimensionless	f
Retardation factor (saturated) r_f	**1.76E+00**	**3.28E+00**	**dimensionless**	
3) Chemical Transport Rate, Distance, and Time $V_c = \frac{V_s}{r_f}$ $t_x = \frac{d_x}{v_c}$				
Chemical velocity v_c	8.5E-02	4.6E-02	ft/day	
Distance to receptor d_x	380	380	ft	g
Transport time to reach receptor t_x	**4,467**	**8,309**	**days**	
Transport time to reach receptor t_x	12	23	years	
4) Degradation Rate and Allowable Initial Concentration $k = \frac{ln(2)}{\lambda}$ $C_{0-GW} = \frac{C}{e^{-(k \cdot t_x)}} = ACL_{gw}$				
Half-life λ	2,920	1,415	days	h
Target concentration (GCTL) C	0.3	350	ug/L	i
Chemical degradation constant k	**2.37E-04**	**4.90E-04**	**days^{-1}**	
Initial groundwater concentration C_{0-GW}	8.7E-01	2.1E+04	ug/L	j
Alternate concentration limit in groundwater ACL_{gw}	**0.87**	**21,000**	**ug/L**	
laximum groundwater concentration in last 4 years C_{tmax}	72	59	ug/L	k
Maximum site exceedance factor EF	83	0.00	dimensionless	

Attachment 3
Alternate Concentration Limits in Groundwater for the Protection of Surface Water Receptors

Site:	Eglin Air Force Base - C62 ODU	Calculated By:	Chris Shepherd
Location:	Florida	Checked By:	Ashley Nagle
Chemical(s):	See below	Date:	12/10/2018

Parameters:	RDX	HMX	Units	Source

Notes:
Calculations conservatively assumes an infinite source, no dispersion, and no diffusion
a = Source area average shallow groundwater hydraulic conductivity (CH2MHILL 2002)
b = Source area shallow groundwater gradient in May 2018 (LRS 2018)
c = based on sands with fines (USEPA 1989)
d = USEPA 2018
e = USEPA 1996 default value
f = based on representative soil, sands with fines (Fetter 1994, Freeze and Cherry 1979)
g = distance from monitoring well downgradient of the source area to the nearest stream (parallel to groundwater flow)
h = site-specific, calculated half-lives (see BIOSCREEN model)
j = calculated initial groundwater concentration at source area that would result in a concentration at or below the target receptor point concentration
k = maximum concentration or detection limit observed in the last four years at the downgradient monitoring well(s)

Acronyms
ft = feet
g = grams
GCTL = groundwater concentration target limit
FDEP = Florida Department of Environmental Protection
kg = kilograms
L = liters
ODU = open detonation unit
ug = micrograms
USEPA = United States Environmental Protection Agency

References:

CH2M Hill. 2002. Human Health Risk Assessment for Groundwater at C-52N and C-62, Eglin AFB, Florida.

Fetter, C.W. 1993. Contaminant Hydrogeology. Macmillan Publishing, New York.

Freeze, R. Allen and John A. Cherry. 1979. Groundwater. Prentice Hall Inc., Upper Saddle River, NJ. 604p.

LRS. 2018. Annual Environmental Monitoring Report, Open Burn/Open Detonation Units, Range C-52 North and Range C-62, Eglin Air Force Base, Florida, Operational Permit No. 006176-H)-007. July.

USEPA 1996. Soil Screening Guidance: Technical Background Document. July.

USEPA 1998. Chemical Fate Half-Lives for Toxics Release Inventory (TRI) Chemicals. July

Appendix H 1992 / 1994 Soil Sample Results

APPENDIX F

TCLP ANALYTICAL RESULTS

BULK MATERIAL SAMPLING DATA

(Use this space for mechanical entries)

WORKPLACE OR SITE IDENTIFIER: 0058 [redacted] X X X X [redacted] X X X Y

BASE: Eglin AFB

ORGANIZATION:

WORKPLACE OR SITE: C-62

DATE COLLECTED (YYMMDD): 921032 7 [redacted]

BLDG NO/LOCATION:

ROOM/AREA:

MAIL REPORTS TO (circle if change)

ORIGINAL: 0058

COPY 1:

COPY 2:

AFSC Regional Hospital/SGPB
Eglin AFB, FL 32542-5300

SAMPLE COLLECTED BY (Name, Grade, AFSC): Tamara J. McDevitt, Capt, 92G

SIGNATURE: [redacted]

AUTOVON: 872-5787

REASON FOR SUBMISSION: R

A-ACCIDENT, INCIDENT C-COMPLAINT F-FOLLOWUP/CLEANUP
R-ROUTINE BACKGROUND/PERIODIC SURVEY O-OTHER

SOURCE BEING SAMPLED: Prior to detonation site C-62 ADR

EXISTING CONTROLS (Personal protective equipment, Engineering, Administrative):

SAMPLE COLLECTION DATA

OEHL SAMPLE NO		[redacted]	[redacted]
BASE SAMPLE NO		65923132	65923133
A	CHECK FOR	☐ MAJOR COMPONENTS	☐ MAJOR COMPONENTS
B	NAME	Full TCLP *	Full TCLP *
	NIOSH NO.		
C	NAME		
	NIOSH NO.		
D	NAME		
	NIOSH NO.		
E	CHECK FOR	☐ HAZARDOUS/TOXIC WASTE	☐ HAZARDOUS/TOXIC WASTE
MATERIAL NAME		Soil (Surface)	Soil (IA)
LOT NUMBER			
NSN (FSN)			
SPECIFICATION (MIL or FED)			
MANUFACTURER'S NAME			
DESCRIPTION OF MATERIAL USAGE (Mixed, brushed, sprayed, etc.)			
SUPPORTING SAMPLES	OEHL SAMPLE NO.	[redacted]	[redacted]
	BASE SAMPLE NO		
	SAMPLE TYPE		

COMMENTS: * Except Pesticides
Background Soil prior to detonation.

AF FORM JAN 81 2751

AIR FORCE
OCCUPATIONAL AND ENVIRONMENTAL HEALTH DIRECTORATE
BROOKS AFB, TEXAS, 78235-5000

REPORT OF ANALYSIS

BASE SAMPLE NO: GS923133 OEHL SAMPLE NO: 92019500

SAMPLE TYPE: WASTE, HAZARDOUS/TOXIC/DISPOSAL

SITE IDENTIFIER: XXXXXXXX DATE RECEIVED: 920407

DATE COLLECTED: 920327 DATE REPORTED: 920526

RESULTS

Test	Results	Units	Method
Benzene	QNS		
Carbon tetrachloride	QNS		
Chlorobenzene	QNS		
Chloroform	QNS		
m-Cresol	<0.02	mg/L	EPA 8270
2-Methylphenol	<0.02	mg/L	EPA 8270
4-Methylphenol	<0.02	mg/L	EPA 8270
1,4-Dichlorobenzene	<0.02	mg/L	EPA 8270
1,2-Dichloroethene	QNS		
1,1-Dichloroethene	QNS		
2,4-Dinitrotoluene	<0.02	mg/L	EPA 8270
Hexachlorobenzene	<0.02	mg/L	EPA 8270
Hexachlorobutadiene	<0.02	mg/L	EPA 8270
Hexachloroethane	<0.02	mg/L	EPA 8270
Methyl ethyl ketone	QNS		
Nitrobenzene	<0.02	mg/L	EPA 8270
Pentachlorphenol	<0.02	mg/L	EPA 8270
Vinyl chloride	QNS		
Pyridine	<0.02	mg/L	EPA 8270
Trichloroethylene	QNS		
Tetrachloroethylene	QNS		
2,4,5-Trichlorophenol	<0.02	mg/L	EPA 8270
2,4,6-Trichlorophenol	<0.02	mg/L	EPA 8270
Arsenic	<0.5	mg/L	3010/6010
Barium	<10	mg/L	3010/6010
Cadmium	<0.1	mg/L	3010/6010
Chromium	<0.5	mg/L	3010/6010
Lead	<0.5	mg/L	3010/6010

TO:

AFSC REGIONAL HOSPITAL/SGPB
EGLIN AFB, FL 32542-5300

AIR FORCE
OCCUPATIONAL AND ENVIRONMENTAL HEALTH DIRECTORATE
BROOKS AFB, TEXAS, 78235-5000

REPORT OF ANALYSIS

BASE SAMPLE NO: GS923133 OEHL SAMPLE NO: 92019500

SAMPLE TYPE: WASTE, HAZARDOUS/TOXIC/DISPOSAL

SITE IDENTIFIER: XXXXXXXX DATE RECEIVED: 920407

DATE COLLECTED: 920327 DATE REPORTED: 920526

RESULTS

Test	Results	Units	Method
Mercury	<0.02	mg/L	EPA 7470
Selenium	<0.1	mg/L	3010/6010
Silver	<0.5	mg/L	3010/6010
Major Components	See comment.		

QNS : Quantity not sufficient for analysis.

Comments:

SAMPLE IS SOIL.
< - Signifies none detected and the detection limits.

Analyzed by: Biospherics, Inc.

Reviewed by:

Michael J. Wantland, MSgt, USAF
NCOIC Technical Operations Branch

AIR FORCE
OCCUPATIONAL AND ENVIRONMENTAL HEALTH DIRECTORATE
BROOKS AFB, TEXAS, 78235-5000

REPORT OF ANALYSIS

BASE SAMPLE NO: GS923132 OEHL SAMPLE NO: 92019499

SAMPLE TYPE: WASTE, HAZARDOUS/TOXIC/DISPOSAL

SITE IDENTIFIER: XXXXXXXX DATE RECEIVED: 920407

DATE COLLECTED: 920327 DATE REPORTED: 920527

RESULTS

Test	Results	Units	Method
Barium	<10	mg/L	3010/6010
Benzene	<0.005	mg/L	EPA 8240
Carbon tetrachloride	<0.005	mg/L	EPA 8240
Chlorobenzene	<0.005	mg/L	EPA 8240
Chloroform	<0.005	mg/L	EPA 8240
m-Cresol	<0.02	mg/L	EPA 8270
2-Methylphenol	<0.02	mg/L	EPA 8270
4-Methylphenol	<0.02	mg/L	EPA 8270
1,4-Dichlorobenzene	<0.02	mg/L	EPA 8270
1,2-Dichloroethane	<0.005	mg/L	EPA 8240
1,1-Dichloroethene	<0.005	mg/L	EPA 8240
2,4-Dinitrotoluene	<0.02	mg/L	EPA 8270
Hexachlorobenzene	<0.02	mg/L	EPA 8270
Hexachlorobutadiene	<0.02	mg/L	EPA 8270
Hexachloroethane	<0.02	mg/L	EPA 8270
Methyl ethyl ketone	<0.1	mg/L	EPA 8240
Nitrobenzene	<0.02	mg/L	EPA 8270
Pentachlorphenol	<0.02	mg/L	EPA 8270
Pyridine	<0.02	mg/L	EPA 8270
Vinyl chloride	<0.01	mg/L	EPA 8240
Trichloroethylene	<0.005	mg/L	EPA 8240
Tetrachloroethylene	<0.005	mg/L	EPA 8240
2,4,5-Trichlorophenol	<0.02	mg/L	EPA 8270
2,4,6-Trichlorophenol	<0.02	mg/L	EPA 8270
Major Components	See comment.		
Arsenic	<0.5	mg/L	3010/6010
Cadmium	<0.1	mg/L	3010/6010
Chromium	<0.5	mg/L	3010/6010

TO:

AFSC REGIONAL HOSPITAL/SGPB
EGLIN AFB, FL 32542-5300

AIR FORCE
OCCUPATIONAL AND ENVIRONMENTAL HEALTH DIRECTORATE
BROOKS AFB, TEXAS, 78235-5000

REPORT OF ANALYSIS

BASE SAMPLE NO: GS923132 OEHL SAMPLE NO: 92019499

SAMPLE TYPE: WASTE, HAZARDOUS/TOXIC/DISPOSAL

SITE IDENTIFIER: XXXXXXXX DATE RECEIVED: 920407

DATE COLLECTED: 920327 DATE REPORTED: 920527

RESULTS

Test	Results	Units	Method
Selenium	<0.1	mg/L	3010/6010
Silver	<0.5	mg/L	3010/6010
Lead	<0.5	mg/L	3010/6010
Mercury	<0.02	mg/L	EPA 7470

Comments:

SAMPLE IS SOIL.
< - Signifies none detected and the detection limits.

Analyzed by: Biospherics, Inc.

Reviewed by:

Michael J. Wantland, MSgt, USAF
NCOIC Technical Operations Branch

AIR FORCE
OCCUPATIONAL AND ENVIRONMENTAL HEALTH DIRECTORATE
BROOKS AFB, TEXAS, 78235-5000

REPORT OF ANALYSIS

BASE SAMPLE NO: GS923135 OEHL SAMPLE NO: 92019502

SAMPLE TYPE: WASTE, HAZARDOUS/TOXIC/DISPOSAL

SITE IDENTIFIER: XXXXXXXX DATE RECEIVED: 920407

DATE COLLECTED: 920327 DATE REPORTED: 920526

RESULTS

Test	Results	Units	Method
Tetrachloroethylene	<0.005	mg/L	EPA 8240
2,4,5-Trichlorophenol	<0.02	mg/L	EPA 8270
2,4,6-Trichlorophenol	<0.02	mg/L	EPA 8270
Major Components	See comment.		

Comments:

SAMPLE IS SOIL.
< - Signifies none detected and the detection limits.

Analyzed by: Biospherics, Inc.

Reviewed by: _____

Michael J. Wentland, MSgt, USAF
NCOIC Technical Operations Branch

BULK MATERIAL SAMPLING DATA

(Use this space for mechanical imprint)

WORKPLACE OR SITE IDENTIFIER: 0058 XXXX XXXX

BASE: Eglin AFB

ORGANIZATION:

WORKPLACE OR SITE:

DATE COLLECTED (YYMMDD): 17,2,0,3,1,2,7

BLDG NO/LOCATION:

ROOM/AREA:

MAIL REPORTS TO (circle if change)
ORIGINAL 0058
COPY 1
COPY 2

AFSC Regional Hospital/SGPB
Eglin AFB, FL 32542-5300

SAMPLE COLLECTED BY (Name, Grade, SSN): James F McLevit Capt 926

SIGNATURE: James F McLevit

ALD/OSN: 872587

REASON FOR SUBMISSION: X
A-ACCIDENT, INCIDENT C-COMPLAINT F-FOLLOWUP/CLEARANCE
R-ROUTINE BACKGROUND/PERIODIC SURVEY O-OTHER

OEHL PO:

SOURCE BEING SAMPLED: Post Detonation site C-62 ADR

EXISTING CONTROLS (Personal protective equipment, Engineering, Administrative)

SAMPLE COLLECTION DATA

OEHL SAMPLE NO				
BASE SAMPLE NO			G S 9 2 3 1 3 4	G S 9 2 3 1 3 5
	A	CHECK FOR	☐ MAJOR COMPONENTS	☐ MAJOR COMPONENTS
	B	NAME	Full TCLP *	Full TCLP *
		NIOSH NO.		
	C	NAME		
		NIOSH NO		
	D	NAME		
		NIOSH NO.		
	E	CHECK FOR	☐ HAZARDOUS/TOXIC WASTE	☐ HAZARDOUS/TOXIC WASTE
MATERIAL NAME			Soil	Soil
LOT NUMBER				
NSN (FSN)				
SPECIFICATION (MIL or FED)				
MANUFACTURER'S NAME				
DESCRIPTION OF MATERIAL USAGE (Poured, brushed, sprayed, etc.)				
SUPPORTING SAMPLES		OEHL SAMPLE NO.		
		BASE SAMPLE NO.		
		SAMPLE TYPE		

COMMENTS: * Except pesticides

AF FORM JAN 91 2761

AIR FORCE
OCCUPATIONAL AND ENVIRONMENTAL HEALTH DIRECTORATE
BROOKS AFB, TEXAS, 78235-5000

REPORT OF ANALYSIS

BASE SAMPLE NO: GS923134 OEHL SAMPLE NO: 92019501

SAMPLE TYPE: WASTE; HAZARDOUS/TOXIC/DISPOSAL

SITE IDENTIFIER: XXXXXXXX DATE RECEIVED: 920407

DATE COLLECTED: 920327 DATE REPORTED: 920526

RESULTS

Test	Results	Units	Method
Arsenic	<0.5	mg/L	3010/6010
Barium	<10	mg/L	3010/6010
Cadmium	<0.1	mg/L	3010/6010
Chromium	<0.5	mg/L	3010/6010
Lead	<0.5	mg/L	3010/6010
Mercury	<0.02	mg/L	EPA 7470
Selenium	<0.1	mg/L	3010/6010
Silver	<0.5	mg/L	3010/6010
Benzene	<0.005	mg/L	EPA 8240
Carbon tetrachloride	<0.005	mg/L	EPA 8240
Chlorobenzene	<0.005	mg/L	EPA 8240
Chloroform	<0.005	mg/L	EPA 8240
m-Cresol	<0.02	mg/L	EPA 8270
2-Methylphenol	<0.02	mg/L	EPA 8270
4-Methylphenol	<0.02	mg/L	EPA 8270
1,4-Dichlorobenzene	<0.02	mg/L	EPA 8270
1,2-Dichloroethene	<0.005	mg/L	EPA 8240
1,1-Dichloroethene	<0.005	mg/L	EPA 8240
2,4-Dinitrotoluene	<0.02	mg/L	EPA 8270
Hexachlorobenzene	<0.02	mg/L	EPA 8270
Hexachlorobutadiene	<0.02	mg/L	EPA 8270
Hexachloroethene	<0.02	mg/L	EPA 8270
Methyl ethyl ketone	<0.1	mg/L	EPA 8240
Nitrobenzene	<0.02	mg/L	EPA 8270
Pentachlorphenol	<0.02	mg/L	EPA 8270
Pyridine	<0.02	mg/L	EPA 8270
Vinyl chloride	<0.01	mg/L	EPA 8240
Trichloroethylene	<0.005	mg/L	EPA 8240

TO:

AFSC REGIONAL HOSPITAL/SGPB
EGLIN AFB, FL 32542-5300

AIR FORCE
OCCUPATIONAL AND ENVIRONMENTAL HEALTH DIRECTORATE
BROOKS AFB, TEXAS, 78235-5000

REPORT OF ANALYSIS

BASE SAMPLE NO: GS923134 OEHL SAMPLE NO: 92019501

SAMPLE TYPE: WASTE, HAZARDOUS/TOXIC/DISPOSAL

SITE IDENTIFIER: XXXXXXXX DATE RECEIVED: 920407

DATE COLLECTED: 920327 DATE REPORTED: 920526

RESULTS

Test	Results	Units	Method
Tetrechloroethylene	<0.005	mg/L	EPA 8240
2,4,5-Trichlorophenol	<0.02	mg/L	EPA 8270
2;4,6-Trichlorophenol	<0.02	mg/L	EPA 8270
Major Components	See comment.		

Comments:

SAMPLE IS SOIL.
< - Signifies none detected and the detection limits.

Analyzed by: Biospherics, Inc.

Reviewed by: _____

Michael J. Wantland, MSgt, USAF
NCOIC Technical Operations Branch

AIR FORCE
OCCUPATIONAL AND ENVIRONMENTAL HEALTH DIRECTORATE
BROOKS AFB, TEXAS, 78235-5000

REPORT OF ANALYSIS

BASE SAMPLE NO: GS923135 OEHL SAMPLE NO: 92019502

SAMPLE TYPE: WASTE, HAZARDOUS/TOXIC/DISPOSAL

SITE IDENTIFIER: XXXXXXXX DATE RECEIVED: 920407

DATE COLLECTED: 920327 DATE REPORTED: 920526

RESULTS

Test	Results	Units	Method
Arsenic	<0.5	mg/L	3010/6010
Barium	<10	mg/L	3010/6010
Cadmium	<0.1	mg/L	3010/6010
Chromium	<0.5	mg/L	3010/6010
Lead	<0.5	mg/L	3010/6010
Mercury	<0.02	mg/L	EPA 7470
Selenium	<0.1	mg/L	3010/6010
Silver	<0.5	mg/L	3010/6010
Benzene	<0.005	mg/L	EPA 8240
Carbon tetrachloride	<0.005	mg/L	EPA 8240
Chlorobenzene	<0.005	mg/L	EPA 8240
Chloroform	<0.005	mg/L	EPA 8240
m-Cresol	<0.02	mg/L	EPA 8270
2-Methylphenol	<0.02	mg/L	EPA 8270
4-Methylphenol	<0.02	mg/L	EPA 8270
1,4-Dichlorobenzene	<0.02	mg/L	EPA 8270
1,2-Dichloroethane	<0.005	mg/L	EPA 8240
1,1-Dichloroethene	<0.005	mg/L	EPA 8240
2,4-Dinitrotoluene	<0.02	mg/L	EPA 8270
Hexachlorobenzene	<0.02	mg/L	EPA 8270
Hexachlorobutadiene	<0.02	mg/L	EPA 8270
Hexachloroethane	<0.02	mg/L	EPA 8270
Methyl ethyl ketone	<0.1	mg/L	EPA 8240
Nitrobenzene	<0.02	mg/L	EPA 8270
Pentachlorphenol	<0.02	mg/L	EPA 8270
Pyridine	<0.02	mg/L	EPA 8270
Vinyl chloride	<0.01	mg/L	EPA 8240
Trichloroethylene	<0.005	mg/L	EPA 8240

TO:

AFSC REGIONAL HOSPITAL/SGPB
EGLIN AFB, FL 32542-5300

TABLE 4-7 SUMMARY OF SEMIVOLATILE ORGANICS AND EXPLOSIVES DATA FOR SOIL BORING SAMPLES OBTAINED ON 15 AND 18 NOVEMBER 1994, RANGE C-62, EGLIN AIR FORCE BASE, FLORIDA

Compound	SS-94-62-01	SS-94-62-02	SS-94-62-03	SS-94-62-04	SS-94-62-05	SS-94-62-06
SEMIVOLATILE ORGANIC COMPOUNDS EPA METHOD 3540 (μg/kg)						
Di-n-butyl phthalate	350U	340U	340U	350U	330U	600
Butylbenzyl phthalate	350U	340U	340U	160J	330U	340U
bis(2-Ethylhexyl)phthalate	520B	290BJ	470B	1,700B	2,000B	140BJ
1,3-Dinitrobenzene(1)	0.26U	0.26U	0.26U	0.16U	0.25U	0.26U

NOTES:
(1) = Explosives analysis EPA Method 8330.
U = Compound on the target compound list (TCL) was analyzed for, but not found.
B = The analyte is found in the associated blank as well as in the sample.
J = An estimated value.

TABLE 4-7 (continued)

Compound	SS-94-62-07	SS-94-62-08	SS-94-62-09	SS-94-62-10	SS-94-62-D1
SEMIVOLATILE ORGANIC COMPOUNDS EPA METHOD 3540 (μg/kg)					
Di-n-butyl phthalate	340U	340U	250J	350U	560
Butylbenzyl phthalate	340U	340U	340U	350U	340U
bis(2-Ethylhexyl)phthalate	920B	3,200B	870B	490B	420B
1,3-Dinitrobenzene[1]	0.26U	0.25U	0.26U	0.42	0.26U

NOTES:
(1) = Explosives analysis EPA Method 8330.
U = Compound on the target compound list (TCL) was analyzed for, but not found.
B = The analyte is found in the associated blank as well as in the sample.

TABLE 4-7 (continued)

Compound	SS-94-62-11	SS-94-62-12	SS-94-62-13	SS-94-62-14	SS-94-62-15	SS-94-62-16
SEMIVOLATILE ORGANIC COMPOUNDS EPA METHOD 3540 (μg/kg)						
Di-n-butyl phthalate	340U	350U	330U	340U	330U	71J
Butylbenzyl phthalate	340U	350U	3,000	340U	330U	340U
bis(2-Ethylhexyl) phthalate	150BJ	3,200B	750B	230BJ	520B	2,000B
1,3-Dinitrobenzene[1]	0.26U	0.25U	0.25U	0.25U	0.25U	0.26U

NOTES:
(1) = Explosives analysis EPA Method 8330.
U = Compound on the target compound list (TCL) was analyzed for, but not found.
B = The analyte is found in the associated blank as well as in the sample.
J = An estimated value.

TABLE 4-7 (continued)

Compound	SS-94-62-17	SS-94-62-18	SS-94-62-19	SS-94-62-20	SS-94-62-D3
SEMIVOLATILE ORGANIC COMPOUNDS EPA METHOD 3540 (μg/kg)					
Di-n-butyl phthalate	340U	330U	330U	330U	330U
Butylbenzyl phthalate	340U	330U	330U	330U	330U
bis(2-Ethylhexyl) phthalate	110BJ	80BJ	1,100B	2,100B	2,400B
1,3 - Dinitrobenzene[1]	0.26U	0.25U	0.25U	0.25U	0.25U

NOTES:
(1) = Explosives analysis EPA Method 8330.
U = Compound on the target compound list (TCL) was analyzed for, but not found.
B = The analyte is found in the associated blank as well as in the sample.
J = An estimated value.

are "J" flagged, indicating estimated values in the low end of the instrument calibration curve, or "B" flagged, indicating that the analytes were also found in the associated blank.

4.2.3.2 Explosives

No explosives compounds were reported above detection limits for 19 of 20 samples. A trace concentration (0.42 mg/kg) of 1,3-dinitrobenzene was reported in sample SS-94-67-10. This concentration is only slightly elevated above the reporting limit of 0.26 mg/kg.

DNS IS 50 PPb (.050 PPM)

4.2.3.3 Metals

Metals data are presented in Table 4-8. All of the analytes, except for cadmium (in 9 of 20 samples), were within the range of trace chemical content of natural soils, as reported by EPA (1983). Eight of the nine samples which exhibited cadmium levels slightly above the EPA reported range of 0.01-0.7 mg/kg were from the OB area. One sample with a slightly elevated cadmium concentration was from the OD area. The elevated cadmium concentrations ranged from 0.86 to 2.1 mg/kg with a mean of 1.28 mg/kg for the OB area samples. The elevated sample at the OD area (SS-94-62-19) had a reported cadmium concentration of 0.83 mg/kg. The mean cadmium across the OD area was 0.53 mg/kg (where the reporting limit was 0.50 mg/kg).

NOT CONSISTANT W/ EPA RISKED BASE

4.2.3.4 Other Anions

General chemistry and ion chromatograhpy data are presented in Table 4-9. These data (most notably the total petroleum hydrocarbon [TPH] data) are not suggestive of environmental contamination.

4.2.4 Range C-62 Subsurface Soil Samples

Subsurface soil samples were collected from two depth intervals each from five soil borings at Range C-62. The five soil borings were subsequently completed as monitoring wells. A duplicate sample was taken of sample number SR-94-62-02-02. Subsurface soil samples were analyzed for TCL semivolatile organics, explosives, and metals. Tables 4-10 through 4-12 present data for the Range C-62 subsurface soil samples.

TABLE 4-8 (continued)

Compound	SS-94-62-07	SS-94-62-08	SS-94-62-09	SS-94-62-10	SS-94-62-D1
INORGANIC METAL COMPOUNDS BY EPA METHOD 6010 (mg/kg)					
Aluminum	24,300*	5,630*	3,720*	23,800*	22,900*
Barium	8.4B	7.9B	5.6B	4.2B	3.7B
Cadmium	1.7	0.53	0.86	1.9	1.8
Calcium	27.0B	25.0B	46.0B	42.0B	36.3B
Chromium	21.6	10.0	3.6	19.8	18.3
Copper	3.1	6.1	4.4	3.6	11.3
Iron	13,200*	2,800*	2,150*	13,200*	12,700*
Magnesium	53.7B	102B	94.0B	58.0B	57.7B
Mercury(1)	0.05U	0.05U	0.05B	0.05U	0.05U
Potassium	27.2B	51.8B	79.1B	33.8B	34.6B
Silver	0.20U	0.21B	0.75B	0.20U	0.22B
Strontium	0.86B	0.84B	1.2	1.3	1.3
Tin	2.0UN	2.0UN	2.7N	2.0UN	2.0BN

NOTES:
(1) = EPA Method 7471.
B = Reported value is less than Contract Required Detection Limit (CRDL), but greater than the Instrument Detection Limit (IDL).
U = Analyte analyzed for but not detected (concentration is less than IDL).
N = Spiked sample is not within control limits.
* = Duplicate analyses is not within control limits.

TABLE 4-8 (continued)

Compound	SS-94-62-11	SS-94-62-12	SS-94-62-13	SS-94-62-14	SS-94-62-15	SS-94-62-16
INORGANIC METAL COMPOUNDS BY EPA METHOD 6010 (mg/kg)						
Aluminum	2,810	3,410	3,300	2,530	2,810	3,170
Barium	4.5B	6.1B	4.4B	2.1B	5.1B	5.0B
Cadmium	0.50U	0.50U	0.48U	0.51	0.50U	0.49U
Calcium	28.3B	42.1B	48.0B	19.0B	26.2B	25.7B
Chromium	2.0	2.4	2.3	2.0	2.1	2.5
Copper	6.8N*	2.5N*	1.7N*	1.3BN*	2.6N*	3.2N*
Iron	1480	1,730	1,690	1,460	1,630	1,580
Magnesium	46.9B	69.9B	75.3B	50.7B	54.4B	61.8B
Mercury(1)	0.05U	0.04B	0.04U	0.04U	0.05B	0.05U
Potassium	30.1B	45.3B	46.4B	36.7B	40.1B	40.3B
Silver	0.20U	0.20U	0.19U	0.20U	0.20U	0.20U
Strontium	0.36B	0.48B	0.49B	0.27B	0.35B	0.40B
Tin	2.0U	2.0U	1.9U	2.0U	2.0U	2.0U

NOTES:
(1) = EPA Method 7471.
B = Reported value is less than Contract Required Detection Limit (CRDL), but greater than the Instrument Detection Limit (IDL).
U = Analyte analyzed for but not detected (concentration is less than IDL).
N = Spiked sample recovery is not within control limits.
* = Duplicate analyses is not within control limits.

TABLE 4-8 (continued)

Compound	SS-94-62-17	SS-94-62-18	SS-94-62-19	SS-94-62-20	SS-94-62-D3
INORGANIC METAL COMPOUNDS BY EPA METHOD 6010 (mg/kg)					
Aluminum	2,320	2,840	2,600	3,150	3,840
Barium	4.3B	4.0B	5.6B	3.5B	4.8B
Cadmium	0.49U	0.50U	0.83	0.51U	0.49U
Calcium	27.5B	43.1B	51.0B	25.3B	33.9B
Chromium	1.3	2.2	2.4	2.5	3.3
Copper	3.0N*	4.1N*	1.8BN*	2.1BN*	1.6BN*
Iron	1,240	1,640	1,640	2,030	1,960
Magnesium	39.9B	48.7B	68.4B	55.8B	81.8B
Mercury(1)	0.05U	0.05U	0.05B	0.08B	0.04B
Potassium	28.6B	41.8B	68.7B	37.0B	48.9B
Silver	0.20U	0.20U	0.58B	0.20U	0.20U
Strontium	0.30B	0.41B	0.38B	0.28B	0.44B
Tin	2.0U	2.0U	2.0U	2.0U	2.0U

NOTES:
(1) = EPA Method 7471.
B = Reported value is less than Contract Required Detection Limit (CRDL), but greater than the Instrument Detection Limit (IDL).
U = Analyte analyzed for but not detected (concentration is less than IDL).
N = Spiked sample recovery is not within control limits.
* = Duplicate analyses is not within control limits.

TABLE 4-9 SUMMARY OF OTHER ANALYTICAL DATA FOR SOIL BORING SAMPLES OBTAINED ON 15 AND 18 NOVEMBER 1994, RANGE C-62, EGLIN AIR FORCE BASE, FLORIDA

Compound	SS94-62-01	SS94-62-02	SS94-62-03	SS94-62-04	SS94-62-05	SS94-62-06
GENERAL CHEMISTRY (mg/kg)						
Ammonia	<2.6	<2.5	<2.6	<2.6	<2.4	4.8
Cyanide	0.23	<0.20	<0.21	<0.22	<0.20	<0.21
Reactivity	No	No	No	No	No	No
Sulfide	<25.5	<25.2	<22.9	<25.9	27.9	<23.3
Total Kjeldahl Nitrogen	<15	19.6	15.5	11.9	41.9	71.6
Total Petroleum Hydrocarbons	<26.1	<25.9	<25.8	<20	<24.9	35.9
Anions (mg/kg)						
Sulfate	20	26	26	16	13	33
Chloride	<2.1	4.9	8.9	3.4	5.1	9.1
Fluoride	<2.1	<1.9	2.6	<1.9	<1.9	<1.9
Nitrite	<2.1	<1.9	<1.8	<1.9	<1.9	<1.9
Bromide	<2.1	<1.9	<1.8	<1.9	<1.9	<1.9
Nitrate	<2.1	<1.9	<1.8	<1.9	<1.9	<1.9
Phosphate	<2.1	<1.9	<1.8	<1.9	<1.9	<1.9

TABLE 4-9 (continued)

Compound	SS94-62-07	SS94-62-08	SS94-62-09	SS94-62-10	SS94-62-D1
GENERAL CHEMISTRY (mg/kg)					
Ammonia	<2.6	<2.4	3.9	<2.6	<2.6
Cyanide	<0.21	0.26	<0.20	<0.20	<0.23
Reactivity	No	No	No	No	No
Sulfide	<25.2	<23.9	<22.3	<25.3	<25.5
Total Kjeldahl Nitrogen	38.6	162	186	44.4	<15
Total Petroleum Hydrocarbons	<25.9	<25.4	<25.5	<26	40
Anions (mg/kg)					
Sulfate	17	11	22	20	20
Chloride	<2	<2	11	<2.1	<2
Fluoride	<2	<2	<2	<2.1	<2
Nitrite	<2	<2	<2	<2.1	<2
Bromide	<2	<2	<2	<2.1	<2
Nitrate	<2	<2	<2	<2.1	<2
Phosphate	<2	<2	<2	<2.1	<2

TABLE 4-9 (continued)

Compound	SS94-62-11	SS94-62-12	SS94-62-13	SS94-62-14	SS94-62-15
GENERAL CHEMISTRY (mg/kg)					
Ammonia	3.3	3.4	3.2	3.8	11.5
Cyanide	<0.20	<0.21	<0.2	<0.2	<0.2
Reactivity	No	No	No	No	No
Sulfide	<21.9	<21.4	<22.4	<22.2	<21.1
Total Kjeldahl Nitrogen	49.9	240	78.9	184	80.7
Total Petroleum Hydrocarbons	<25.3	<24.9	<24.9	<25.1	<25.3
Anions (mg/kg)					
Sulfate	4.1	2.8	6.2	3.5	32
Chloride	2.2	<2	<2	<2	<2
Fluoride	<2	<2	<2	<2	<2
Nitrite	<2	<2	<2	<2	<2
Bromide	<2	<2	<2	<2	<2
Nitrate	<2	<2	<2	<2	<2
Phosphate	<2	<2	<2	<2	<2

TABLE 4-9 (continued)

Compound	SS94-62-0-16	SS94-62-17	SS94-62-18	SS94-62-19	SS94-62-20	SS94-62-D3
GENERAL CHEMISTRY (mg/kg)						
Ammonia	4.7	6.0	8.2	5.1	3.9	3.9
Cyanide	<0.21	<0.2	<0.2	<0.21	<0.21	<0.21
Reactivity	No	No	No	No	No	No
Sulfide	<18.4	<19.8	<21.2	<23.1	<21.1	24.1
Total Kjeldahl Nitrogen	77.4	112	228	242	228	125
Total Petroleum Hydrocarbons	<25.7	54.8	28.2	<25.0	<25.3	<24.8
Anions (mg/kg)						
Sulfate	2.8	3.4	6.3	3.9	7.5	7.5
Chloride	<2	<2	<2	<2	<2	<2
Fluoride	<2	<2	<2	<2	<2	<2
Nitrite	<2	<2	<2	<2	<2	<2
Bromide	<2	<2	<2	<2	<2	<2
Nitrate	<2	<2	<2	<2	<2	<2
Phosphate	<2	<2	<2	<2	<2	<2

TABLE 4-10 SUMMARY OF SEMIVOLATILE AND EXPLOSIVES DATA FOR SOIL BORING SAMPLES OBTAINED ON 17 NOVEMBER 1994, RANGE C-62, EGLIN AIR FORCE BASE, FLORIDA

Compound	SB-94-62-02-01	SB-94-62-02-02	SB-94-62-02-D2	SB-94-62-01-01	SB-94-62-01-02
SEMIVOLATILE ORGANIC COMPOUNDS EPA METHOD 8270 (µg/kg)					
2,4 -Dinitrotoluene , 2 DNS	340U	380U	340U	340U	380U
Di-n-butyl phthalate	340U	380U	160J	340U	380U
Butylbenzylphtalate	340U	380U	340U	130J	380U
bis(2-Ethylhexyl)phthalate	800B	160BJ	400B	2600B	150BJ
Nitrobenzene[1] 9.5 DNS	0.26U	0.29U	0.26U	0.26	0.29U

NOTES:
(1) = Explosives Analysis by EPA Method 8330.
E = Compounds those concentrations exceed the calibration range of the GC/MS instrument for that specific anaysis.
U = Compound on the target compound list (TCL) was analyzed for, but not found.
B = The analyte is found in the associated blank as well as in the sample.
J = An estimated value.

Below Detection Limits

TABLE 4-10 (continued)

Compound	SB-94-62-05-01	SB-94-62-05-02	SB-94-6204-01	SB-94-62-04-02	SB-94-62-03-01	SB-94-62-03-02
SEMIVOLATILE ORGANIC COMPOUNDS EPA METHOD 8270 (ug/kg)						
2,4 -Dinitrotoluene	5,900E	400U	460U	390U	400U	400U
Di-n-butyl phthalate	2,300	400U	460U	390U	400U	400U
Butylbenzylphthalate	340U	400U	460U	390U	400U	400U
bis(2-Ethylhexyl)phthalate	340U	400U	460U	770B	400U	400U
Nitrobenzene[1]	0.26U	0.28U	0.35U	0.29U	0.30U	0.30U

NOTES:
(1) = Explosives Analysis by EPA Method 8330.
E = Compounds whose concentrations exceed thecalibration range of the GC/MS instrument for that specific analysis.
U = Compound on target compound list (TCL) was analyzed for, but not detected.
B = The analyte is found in the associated blank as well as in the sample.

TABLE 4-11 SUMMARY OF METALS DATA FOR SOIL BORING SAMPLES OBTAINED ON 17 NOVEMBER 1994, RANGE C-62, EGLIN AIR FORCE BASE, FLORIDA

Compound	SB-94-62-05-01	SB-94-62-05-02	SB-94-62-04-01	SB-94-62-04-02	SB-94-62-03-01	SB-94-62-03-02
INORGANIC METAL COMPOUNDS BY EPA METHOD 6010 (mg/kg)						
Aluminum	2630	689	5230	1,960	16,400	2,800
Barium	3.7B	1.4U	7.9B	1.6B	2.2B	1.4U
Cadmium	0.52U	0.59U	0.69U	0.56U	1.2	0.60U
Calcium	27.3B	25.1B	30.1B	32.2B	33.5B	20.1B
Chromium	1.7	1.4	3.6	2.5	13.6	2.5
Copper	11.4	0.81B	2.1B	0.91B	2.2B	1.4B
Iron	1540	918	2,700	574	8,800	1,220
Magnesium	51.2B	5.7U	147B	8.3B	46.9B	20.7B
Mercury(1)	0.05U	0.05B	0.06U	0.09B	0.06B	0.05U
Potassium	24.6B	9.8U	61.2B	17.3B	35.3B	27.3B
Silver	0.21U	0.24U	0.28U	0.23U	0.23U	0.24U
Strontium	0.29B	0.12U	0.79B	0.21B	0.53B	0.25B
Tin	2.1U	3.6	2.8U	2.3U	2.3U	2.4U

NOTES:
(1) = EPA Method 7471.
B = Reported value is less than Contract Required Detection Limit (CRDL), but greater than the Instrument Detection Limit (IDL).
U = Analyte analyzed for but not detected (concentration is less than IDL).

TABLE 4-11 (continued)

Compound	SB-94-62-02-01	SB-94-62-02-02	SB-94-62-02-D2	SB-94-62-01-01	SB-94-62-01-02
INORGANIC METAL COMPOUNDS BY EPA METHOD 6010 (mg/kg)					
Aluminum	3,260	4,940	3,550	3,630	1,880
Barium	2.4B	3.0B	3.1B	5.0B	1.4B
Cadmium	0.47U	0.56U	0.51U	0.51U	0.55U
Calcium	20.7B	21.3B	21.9B	28.7B	12.7B
Chromium	3.0	4.6	3.5	2.6	1.1
Copper	2.1B	1.4B	2.2B	1.7B	1.6B
Iron	1,820	2,690	1,900	1,810	822
Magnesium	44.3B	58.4B	58.8B	73.5B	5.5B
Mercury(1)	0.04U	0.06B	0.05B	0.05B	0.05B
Potassium	24.6B	45.7B	29.1B	41.5B	9.1U
Silver	0.19U	0.22U	0.20U	0.20U	0.22U
Strontium	0.25B	0.48B	0.42B	0.41B	0.13B
Tin	1.9U	6.1	2.0U	2.0U	2.2U

NOTES:
(1) = EPA Method 7471.
B = Reported value is less than Contract Required Detection Limit (CRDL), but greater than the Instrument Detection Limit (IDL).
U = Analyte analyzed for but not detected (concentration is less than IDL).

TABLE 4-12 SUMMARY OF OTHER ANALYTICAL DATA FOR SOIL BORING SAMPLES OBTAINED ON 17 NOVEMBER 1994, RANGE C-62, EGLIN AIR FORCE BASE, FLORIDA

Compound	SB94-62-01-01	SB94-62-01-02	SB94-62-02-01	SB94-62-02-02	SB94-62-03-01	SB94-62-03-02
GENERAL CHEMISTRY (mg/kg)						
Ammonia	<2.5	<2.8	<2.6	<2.8	<2.9	<2.4
Cyanide	<0.21	<0.23	<0.20	<0.23	<0.25	<0.24
Reactivity	No	No	No	No	No	No
Sulfide	27.8	<27.7	<18.7	<24.2	<23	<26.7
Total Kjeldahl Nitrogen	64.7	<14.6	<12.9	<14.3	25.6	<15.5
Total Petroleum Hydrocarbons	<25.2	<29.1	<25.3	<28.1	<29.2	<30.1
Anions (mg/kg)						
Sulfate	11	10	6.3	15	21	14
Chloride	<2	5	3.6	<2.2	2.4	<2.4
Fluoride	<2	<2.3	<2	<2.2	<2.3	<2.4
Nitrite	<2	<2.3	<2	<2.2	<2.3	<2.4
Bromide	<2	<2.3	<2	<2.2	<2.3	<2.4
Nitrate	<2	<2.3	<2	<2.2	<2.3	<2.4
Phosphate	<2	<2.3	<2	<2.2	<2.3	<2.4

TABLE 4-12 (continued)

Compound	SB94-62-04-01	SB94-62-04-02	SB94-62-05-01	SB94-62-05-02	SB94-62-D2
GENERAL CHEMISTRY (mg/kg)					
Ammonia	<3.4	<2.9	<2.5	10.7	<2.4
Cyanide	<0.27	<0.24	<0.21	<2.4	<0.20
Reactivity	No	No	No	No	No
Sulfide	<27.8	<26.5	<19.6	<24.9	<23.1
Total Kjeldahl Nitrogen	<17.1	<13.2	144	<14.0	51
Total Petroleum Hydrocarbons	<34.7	<28.8	<25.9	<30.1	<25.7
Anions (mg/kg)					
Sulfate	<2.8	8.9	7.3	5.6	6.8
Chloride	<2.8	<2.3	<2	<2.4	2.1
Fluoride	<2.8	<2.3	<2	<2.4	<2
Nitrite	<2.8	<2.3	<2	<2.4	<2
Bromide	<2.8	<2.3	<2	<2.4	<2
Nitrate	<2.8	<2.3	<2	<2.4	<2
Phosphate		<2.3	<2	<2.4	<2

Appendix I Compliance Schedule

Compliance Schedule
RCRA Hazardous Waste Permit
Eglin Air Force Base, Florida

Task	Duration (days)	Start	Finish	Schedule Logic
Stormwater Runoff Assessment	217	**10/20/2024**	**5/25/2025**	**Dates Subject to Change. Actual dates will be dependent on approvals, review cycles, range availability, and subcontractor availability.**
Conduct soil sampling at 17 locations within Erosion Impact Area	1	10/20/2024	10/21/2024	
Receive Laboratory Results	11	10/21/2024	11/1/2024	
Submit Final SAR to FDEP	62	3/24/2025	5/25/2025	
Review FDEP comments	1	5/25/2025	5/25/2025	
Installation of Monitoring Wells for Plume Definition	***189***	***11/15/2024***	***5/23/2025***	
Submit Final WP to FDEP	120	11/15/2024	3/15/2025	
Review FDEP responses	10	3/17/2025	3/27/2025	
Stake and Obtain DigPermit	15	4/14/2025	4/29/2025	
Implement monitoring well installation & development	12	5/5/2025	5/17/2025	
Sample newly installed monitoring wells (baseline)	3	5/20/2025	5/23/2025	
Sediment Sampling for Ecological Risk Assessment	***189***	***11/15/2024***	***5/23/2025***	
Conduct Sediment Sampling	7	6/9/2025	6/16/2025	
Incorporate results in Ecological Risk Assessment	10	6/16/2025	6/26/2025	
Human Healt Risk Assessment	***209***	***8/30/2024***	***3/27/2025***	
Work Plan				
Submit Draft-Final WP to FDEP	152	8/30/2024	1/29/2025	
Submit Final WP with comment resolution table	56	1/30/2025	3/27/2025	
Report	***243***	***3/27/2025***	***11/25/2025***	
Prepare & Submit Internal Draft	120	3/27/2025	7/25/2025	
Air Force Review Internal Draft	21	7/25/2025	8/15/2025	
Resolve Internal Draft-Final RTCs	21	8/15/2025	9/5/2025	
Submit Final to FDEP	60	9/5/2025	11/4/2025	
Review FDEP comments	21	11/4/2025	11/25/2025	
Air Model	***209***	***8/30/2024***	***3/27/2025***	
Work Plan				
Submit Draft-Final WP to FDEP	152	8/30/2024	1/29/2025	
Submit Final WP with comment resolution table	56	1/30/2025	3/27/2025	
Report	***243***	***3/27/2025***	***11/25/2025***	
Prepare & Submit Internal Draft	120	3/27/2025	7/25/2025	
Air Force Review Internal Draft	21	7/25/2025	8/15/2025	
Resolve Internal Draft-Final RTCs	21	8/15/2025	9/5/2025	
Submit Final to FDEP	60	9/5/2025	11/4/2025	
Review FDEP comments	21	11/4/2025	11/25/2025	
Ecological Health Risk Assessment	***209***	***8/30/2024***	***3/27/2025***	
Work Plan				
Submit Draft-Final WP to FDEP	152	8/30/2024	1/29/2025	
Submit Final WP with comment resolution table	56	1/30/2025	3/27/2025	
Report	***263***	***3/27/2025***	***12/15/2025***	
Prepare & Submit Internal Draft	140	3/27/2025	8/14/2025	
Air Force Review Internal Draft	21	8/14/2025	9/4/2025	
Resolve Internal Draft-Final RTCs	21	9/4/2025	9/25/2025	
Submit Final to FDEP	60	9/25/2025	11/24/2025	
Review FDEP comments	21	11/24/2025	12/15/2025	

Appendix J Emissions Modeling

POLU13G Emissions Model

Background

The U.S. Navy (Baroody and Tominack 1993) has developed a numerical computer model (POLU13G) to simulate high-temperature chemical reactions and predict the air pollution products from OB/OD operations. The POLU13G model includes a file of thermodynamic data for numerous potential combustion products. The model selects the compounds to consider in the combustion calculations based on the elemental composition of the materials being burned or detonated. The total number of combustion products and products of incomplete combustion considered for each calculation is listed in the model output.

When used for open burning (OB), the POLU13G model calculates emissions based on the material first mixed with air and then burned from the combustion product. The necessary thermodynamic data for the material's ingredients and air, the weight ratio of material/air, and the two pressure values of 1,000 and 14.7 pounds per square inch (psi) are read into the model as input data. The flame temperature, models of gaseous combustion products, entropy, and other pertinent data are calculated for the material/air ratios at a pressure of 1,000 psi. The computer procedure goes through a similar routine as it did at 1,000 psi to recalculate the combustion products, flame temperature, and other variables that changed because of expansion. The products calculated at 14.7 psi are reported as the emission products in the model output.

When used for open detonation (OD), the POLU13G model calculates emissions based on the material first being detonated. The detonation products are then mixed with air and reacted to form the emission products. Identical input data are used for both the OB and OD operations.

Model Inputs

In order to run POLU13G, specific information regarding the composition of the explosive/munition (on a percent basis), number of ingredients, fuel/air ratios, chamber and exit pressures, and other particulars have to be entered into the program. In the instance of open burning of M97A2 20 mm cartridges/LUU-2 flares where 100 gallons of diesel fuel was used to initiate combustion, an overall waste composition must be developed for input to the program. On a mass basis, the 23,000 M97A2 20 mm cartridges (NEW of 0.1158 lbs for each cartridge) consist of 70.20 percent of the overall weight of the material burned,

while 20 LUU-2 flares (NEW of 20 lbs per flare) and 100 gallons of fuel oil (density of 7.31 lbs/gal) consisted of 10.54 and 19.26 percent, respectively. Total material burned was 3,794 lbs. These percentages were then multiplied by the percentages presented in Table III-9 to calculate the overall percent composition needed for the POLU13G program.

The procedure presented in the file READ13G.ME, found on Disk No. 1, was followed for entering all input data. In all instances, the model was run by batch method.
Example input for open burning of 20 mm M97A2 cartridges/LUU-2 flares is presented below:

Line 1/Output File Name:
M97A2LUU.OUT
Line 2/Title of Run:
OPEN BURNING - M97A2 20 MM CARTRIDGES/LUU-2 FLARES (RANGE C-62)
Line 3/Pressure Units:
1 (lb/square inch),
Round-off:
3 ($1x10^{-4}$),
Number of Ingredients:
10 (includes air),
Number of Uncoded Ing:
0,
Number of Runs:
10,
OD/OB: 1 (open burn),
Units of Output Data:
1 (grams products per 100 grams propellant)

Line 4/Fuel-Air Ratios:
0.,10.,20.,30.,40.,50.,60.,70.,80.,90.
Line 5/Ingred. Code Numbers:
628 (nitrocellulose), 643 (nitroglycerin), 305 (diphenylamine), 844 (tetryl), 516 (lead azide), 17 (aluminum), 798 (sodium nitrate), 1493 (magnesium), 1236 (diesel oil), 15 (air)
Line 6/Pressures, Ing. Weights:
1000. (chamber pressure), 14.7 (exhaust pressure), 39.33, 3.97, 0.39, 21.66, 0.34, 3.64, 4.22, 5.90, 19.27, 0. (ingredient weights)

The output from the POLU13G model using this data is presented in Appendix M. Using these numbers and Table III-10 (OB/OD Reaction Products Predicted by POLU13G), Table M-12 is compiled. The second column is developed by simply adding the reaction products listed under the 30/70 fuel/air ratio column. Column three was produced by multiplying this

column by the total weight burned in grams burned divided by 100 (3,794 x 454/100), divided by the total burn time (assumed to be 60 minutes or 3,600 seconds).
This third column was then multiplied by the dispersion model unit emission rates to produce the maximum 1-hr, 3-hr, 8-hr, 24-hr, and annual average air quality impacts presented in Tables M-59 through M-63.

AIR DISPERSION MODELING

Ambient air quality impacts at locations of potential human and ecological exposure were predicted by use of acceptable U.S. Environmental Protection Agency (EPA) and Florida Department of Environmental Protection (FDEP) screening mode modeling techniques. A worst case analysis was performed to ensure the acceptability of EOD Range Operations.

For dispersion modeling purposes, Open Burning (OB) can be characterized as a "continuous" type release because of the 4-8 hours duration of the event. Open Detonation (OD), in contrast, is best characterized as a semi-instantaneous "puff" type release. Therefore, two distinct dispersion models for continuous and semi-instantaneous emissions were used.

Impacts from OB operations were addressed with the EPA Industrial Source Complex Short Term model (ISCST2) in the screening mode. OD operations were addressed with the EPA INPUFF model version 2.2.

For OB, the source is considered to be an area source (per recommendation by Tom Rogers/FDEP) with minimal momentum and buoyancy plume rise contributions. To comply with the ISCST2 model requirements, all sides of an area source must have equal dimensions. Accordingly, the OB area was broken into four area sources with the emission rate of 1 g/sec equally proportioned (i.e., each of the four area sources had an emission rate of 0.25 g/sec). In contrast, the OD operation results in significant plume rise. The extreme temperatures encountered during the detonation lead to an extremely buoyant cloud rising from the detonation. Due to its size, the cloud is considered a volume source for modeling purposes.

The final effective height of the buoyant detonation cloud was determined by using the following equation derived from a high explosive field test conducted by the Defense Nuclear Agency (Gould and Tempo 1981):

$$h_e = 500W^{1/4}$$

where

h_e = Effective height of the cloud center (m)
W = Net explosive weight (NEW) in tons of TNT equivalent
= (Actual NEW) x (TNT equivalency factor)

The detonation diameter was determined using the following equation derived from the same field tests (Gould and Tempo 1981):

$$C_d = 355W^{1/4}$$

where

C_d = Cloud diameter (m)
W = Net explosive weight (NEW) in tons of TNT equivalent
= (Actual NEW) x (TNT equivalency factor)

TNT equivalency factors for ordnance disposed of at Eglin AFB typically range from about 0.5 to 1.5. For the purposes of modeling detonations, a median value of 1.0 was used. The value chosen has a minor effect on the plume rise and cloud size (i.e., ± 10 percent for the range of equivalency factors noted above). Table M-1 shows some typical TNT-equivalent weight factors for some of the explosives detonated.

The OB plume was characterized as a ground level source with minimal credit allowed for momentum or buoyancy induced plume rise. The OD plume was characterized as an elevated source with the plume elevation as a function of the quantity of the ordnance being detonated, was used to calculate the initial lateral and vertical dispersion coefficients as follows:

$$\sigma_{xo}=\sigma_{y,o}= C_d/4.3$$

$$\sigma_{zo}=C_d/2.15$$

Modeling was initially performed using a normalized emission rate of 1 g/sec for OB and OD. Pollutant specific impacts were derived by multiplying the normalized impacts by the worst case emission rate for each pollutant. Modeled results are representative of the 1-hour averaging period. Impacts for longer averaging periods were derived by using acceptable EPA conversion factors listed below:

Averaging Time	Multiplying Factor
3 hours	0.9
8 hours	0.7
24 hours	0.4
Annual	0.08

Meteorological conditions were derived from the "worst-case" meteorological data set recommended by EPA for screening modeling purposes, consistent with limitations specified for OB/OD operations (i.e., daylight hours, wind speeds $>$ 3 mph and $\leq$ 15 mph, and no inversion conditions). Since OB/OD operations are restricted to daytime hours, atmospheric stability was limited to unstable (i.e., stability classes A-C) and neutral (i.e., stability class D) conditions.

The "worst-case" meteorological conditions were input into the ISCST2 and INPUFF models to determine the worst-case impact. A listing of the wind speed/stability class combinations utilized in the modeling analysis is presented in Table M-2.

Wind direction was chosen to be an omni directional (i.e., blowing toward any of the chosen receptors) to simulate the worst-case impact. A typical daytime mixing height of 1200 meters was also input into the models.

Receptors were placed at downwind distances to identify maximum impacts at specific receptors where military personnel responsible for range activities are located and where the general public has access. Tables M-3 and M-4 summarizes receptors selected for OB/OD modeling for Ranges C-52N and C-62.

All source parameter inputs for OD and the source release height for OB was based on guidance from the "Draft OB/OD Dispersion Modeling Guidance Documents" (provided via telephone conversation with Jeff Kirkpatrick, U.S. Army Proving Grounds, Aberdeen).

For OD operations, release height, cloud diameter, and initial lateral and vertical dispersion coefficients were calculated based on formulas discussed earlier and summarized as follows:

NEW (# TNT Equivalent)	h_e (m)	c_d (m)	σ_y (m)	σ_z (m)
700	384.58	57.97	59.92	119.85
3000	553.34	370.74	86.22	172.44

The exit velocity for OD operations was set at 1.0 m/s. Release temperature was set to the annual average ambient temperature of 71°F and the diameter was selected to be 2.25 meters (i.e., median range chosen on guidance recommended values of 1.5-3.0 meters).

For OB operations, the release height was set at 0.5 meters (i.e., ground-level release).

Normalized 1-hour average air quality impacts for OD (Range C-52N, Range C-62), and OB (Range C-62) are presented in Tables M-7 through M-9. Based on these values, pollutant specific impacts were calculated for all averaging periods for all operating OB/OD scenarios. Emissions for all OB/OD operating scenarios were calculated by using the U.S. Navy POLU13G Emissions Model. The model results are presented in Tables M-10 through M-18. Dispersion modeling results are presented in Tables M-19 through M-63. Modeling results were compared to National/Florida Ambient Air Quality Standards and Florida No Threat levels. A summary of these regulatory ambient standards and No Threat levels are presented in Tables M-64 and M-65, respectively.

POLU 13 G MODEL OUTPUT

MATERIAL=OPEN BURNING - IMPULSE CARTRIDGE BBU-36/B

OPEN BURN--MATERIAL DOES NOT DETONATE BEFORE REACTING WITH AIR--

H C N O

DIESEL OIL 0.0220.0120.0000.0000.0000.0000.0000.0000.0000.0000.0000.000 95.290 -476. 0.0254
NITROCELLULOSE(12.6) 0.0080.0060.0020.0100.0000.0000.0000.0000.0000.0000.0000.000 2.920 -625. 0.0600
NITROGLYCERIN - NG 0.0050.0030.0030.0090.0000.0000.0000.0000.0000.0000.0000.000 1.790 -392. 0.0578
AIR -(G 0.0000.0000.0060.0010.0000.0000.0000.0000.0000.0000.0000.000 0.000 0. 0.0000
0GRAM ATOM AMOUNTS FOR MATERIAL WEIGHT OF 100.000 1.0000
0 (H) (C) (N) (O) (
12.725751 6.963641 0.049910 0.177064
WT. MATERIAL 100.000 90.000 80.000 70.000 60.000 50.000 40.000 30.000 20.000 10.000
WT. AIR 0.000 10.000 20.000 30.000 40.000 50.000 60.000 70.000 80.000 90.000

--COMBUSTION CONDITIONS: THE MATERIAL AND AIR ARE BURNED TOGETHER AT 1000.00 PSI--

FLAME TEMP. T(K) 652.834 730.633 804.740 876.117 945.372 1012.777 1078.676 1145.754 1222.089 1725.145
FLAME TEMP. T(F) 715.702 855.740 989.133 1117.610 1242.271 1363.599 1482.217 1602.956 1740.361 2645.862
ENTHALPY KCAL/GFW -47.885 -43.096 -38.308 -33.519 -28.731 -23.942 -19.154 -14.365 -9.577 -4.788

--COMBUSTION CONDITIONS: THE COMBUSTION PRODUCTS FROM MATERIAL AND AIR AFTER EXPANDING FROM 1000.00 PSI TO 14.70 PSI--

FLAME TEMP. T(K) 384.469 445.281 501.034 550.920 595.738 637.515 679.020 723.739 775.234 813.117
FLAME TEMP. T(F) 232.645 342.106 442.461 532.256 612.929 688.127 762.836 843.330 936.022 1004.211
ENTHALPY KCAL/GFW -62.208 -59.531 -56.852 -54.211 -51.639 -49.154 -46.754 -44.415 -42.101 -41.843
T.VOL.GASES--LITERS 160.862 171.475 185.248 203.633 228.567 263.027 312.286 387.187 517.263 852.601
(GASES AT STP)
COMBUSTION PRODUCTS ROUNDED OFF TO 1.00E-04

----GRAMS PRODUCTS/100 GRAMS (GS/G)MATERIAL BURNED-----

CH4	49.5947	48.3051	46.5128	43.9686	40.4261	35.6272	29.3037	21.3438	12.4719	5.4883
C$	46.5055	47.4518	48.7322	50.4803	52.7704	55.5416	58.3532	59.4857	52.5546	11.9336
H2O	3.1779	5.7668	8.8904	12.6748	17.2686	22.7905	29.1449	35.4931	39.4240	42.0394
N2	0.6970	9.4512	20.3950	34.4671	53.2326	79.5086	118.9281	184.6347	316.0557	710.3138
CO2	0.0135	0.0832	0.3076	0.8775	2.1803	5.0729	11.5928	26.8786	64.5011	180.9932
H2	0.0072	0.0401	0.1394	0.3535	0.7279	1.3145	2.1915	3.4813	5.2721	6.7364
NH3	0.0018	0.0101	0.0193	0.0293	0.0393	0.0481	0.0545	0.0562	0.0503	0.0373
N2O5	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0003	0.0004	0.0005	0.0011
N2O4	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0003	0.0005	0.0009
N2O4$	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0003	0.0005	0.0009
N2O4*	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0003	0.0005	0.0009
C4N2	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0004	0.0008
N2O3	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0004	0.0008
C3O2	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0007
NHO3	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0006
NO3	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0006
C5	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0006
C4H10	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003	0.0006
C4H8	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003	0.0006
C2N2	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003	0.0005
C4	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0005
O3	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0005
NHO2	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0005
NO2	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0005
C3H8	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
C2H4O	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
N2O	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
CNHO	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
C3H6	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
N3	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004

MATERIAL=OPEN BURNING - M55 20 MM CARTRIDGE

OPEN BURN—MATERIAL DOES NOT DETONATE BEFORE REACTING WITH AIR—

| | H | C | N | O | MG | CA | BA | | |

Mg$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0002
Mg*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0002
Mg$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0002
Mg*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0002
C2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0002
H3O	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
H2O*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
H2O*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
HO	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
HO	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
NH2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
O	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
CH3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
NH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
CH2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001
N	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001
CH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001
C	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001
C$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001

---LIST OF TOTAL COMBUSTION PRODUCTS CONSIDERED---

CO CO2 C$ N2 H2O Ba$ MgO$ H2 CH4 CaHO NH3 BaO$ Ba Ba$ Ba$
Ba* Ba* N2O5 Mg3N2$ N2O4 N2O4$ N2O4* Mg2C3$ MgCO3$ C4N2 N2O3 CNH C3O2 NHO3 NO3
C5 MgH2O2 MgH2O2 C4H10 CaHO C4H8 CaO CaO$ CaO$ C2N2 MgC2$ C4 O3 NHO2 NO2
C3H8 C2H4O N2O CNHO C3H6 N3 CNO MgHO MgHO CaH MgO MgO* Ca Ca Ca$
Ca$ Ca* CN2 CN2 C2O MgN C2N C3 H2O2 HO2 N2H4 N2H4* O2 NHO C2H6
N2H2 CH2O NO NO CHO CHO C2H4 MgH2$ C2H2 CN CN MgH C2H Mg Mg
Mg$ Mg* Mg$ Mg* C2 H3O H2O* H2O* HO HO NH2 O CH3 NH CH2
N CH C C$ H H

N3	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
CNO	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
CN2	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
CN2	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
C2O	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
C2N	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
C3	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
H2O2	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
HO2	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
N2H4	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
N2H4*	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
O2	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	6.8051	42.0590	147.8184
NHO	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
C2H6	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
N2H2	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
CH2O	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
NO	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0015	0.0002	0.0003
NO	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
CHO	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
CHO	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
C2H4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
CNH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
C2H2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
CN	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
CN	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
C2H	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
C2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0002
H3O	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
H2O*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
H2O*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
HO	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
HO	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
NH2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
O	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
CH3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
NH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
CH2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001
N	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001
CH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001
C	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001
C$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001

---LIST OF TOTAL COMBUSTION PRODUCTS CONSIDERED---

CO2 N2 CO H2O C$ H2 CH4 NH3 N2O5 N2O4 N2O4$ N2O4* C4N2 N2O3 C3O2
NHO3 NO3 C5 C4H10 C4H8 C2N2 C4 O3 NHO2 NO2 C3H8 C2H4O N2O CNHO C3H6
N3 CNO CN2 CN2 C2O C2N C3 H2O2 HO2 N2H4 N2H4* O2 NHO C2H6 N2H2
CH2O NO NO CHO CHO C2H4 CNH C2H2 CN CN C2H C2 H3O H2O* H2O*
HO HO NH2 O CH3 NH CH2 N CH C C$ H H

NHO3	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0006
NO3	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0006
C5	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0006
AlHO2	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003	0.0006
AlO2	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003	0.0006
C4H10	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003	0.0006
C4H8	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003	0.0006
C2N2	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003	0.0005
C4	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0005
O3	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0005
NHO2	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0005
NO2	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0005
C3H8	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
C2H4O	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
N2O	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
AlHO	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
CNHO	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
AlO	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
AlO	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
C3H6	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
N3	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
CNO	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
AlN	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
CN2	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
CN2	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
C2O	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
AlC	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
C2N	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
C3	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
H2O2	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
HO2	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
N2H4	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
N2H4*	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
O2	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	7.6359	113.4132
NHO	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
C2H6	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
N2H2	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
CH2O	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
NO	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0283	0.0003
NO	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
CHO	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
CHO	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
C2H4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
Al*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
Al$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
Al*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
CN	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
CN	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
C2H	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
C2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0002
H3O	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
H2O*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
H2O*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
HO	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0003	0.0002
HO	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
NH2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
O	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
NH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
CH2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001
N	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001
CH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001
C	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001
CS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001

MATERIAL=BULK OPEN DETONATION - AFX 453

DETONATION BURN—MATERIAL DETONATES BEFORE REACTING WITH AIR—

H C N O AL

NITROGUANIDINE 0.0040.0010.0040.0020.0000.0000.0000.0000.0000.0000.0000.000 73.000 -209. 0.0625
ALUMINUM --AL 0.0000.0000.0000.0000.0010.0000.0000.0000.0000.0000.0000.000 15.000 0. 0.0975
ALUMINUM NITRAT.9H2O 0.0180.0000.0030.0180.0010.0000.0000.0000.0000.0000.0000.000 12.000 -2392. 0.0361
AIR -(G 0.0000.0000.0060.0010.0000.0000.0000.0000.0000.0000.0000.000 0.000 0. 0.0000
0GRAM ATOM AMOUNTS FOR MATERIAL WEIGHT OF 100.000 1.0000
0 (H) (C) (N) (O) (AL) (
3.381442 0.701417 2.901631 1.978607 0.587955
WT. MATERIAL 100.000 90.000 80.000 70.000 60.000 50.000 40.000 30.000 20.000 10.000
WT. AIR 0.000 10.000 20.000 30.000 40.000 50.000 60.000 70.000 80.000 90.000

—COMBUSTION CONDITIONS: AIR IS MIXED WITH THE MATERIAL'S COMBUSTION PRODUCTS AFTER—
---THE MATERIAL HAS EXPLODED. (WT. MATERIAL/WT. AIR IS SHOWN ABOVE)—

FLAME TEMP. T(K) 1519.971 1631.010 1753.840 1885.198 2026.035 2179.127 2303.241 1935.116 1470.767 933.814
FLAME TEMP. T(F) 2276.547 2476.417 2697.512 2933.957 3187.462 3463.028 3686.433 3023.809 2187.981 1221.465
ENTHALPY KCAL/GFW -113.353 -102.018 -90.683 -79.347 -68.012 -56.677 -45.341 -34.006 -22.671 -11.335

---COMBUSTION CONDITIONS: THE COMBUSTION PRODUCTS BELOW ARE FROM THE MATERIAL/AIR—
---MIXTURES ABOVE AFTER EXPANDING FROM 1000.00 PSI TO 14.70 PSI—

FLAME TEMP. T(K) 880.459 878.849 881.824 894.227 935.975 999.543 1069.272 815.737 559.532 312.817
FLAME TEMP. T(F) 1125.426 1122.528 1127.884 1150.209 1225.355 1339.777 1465.290 1008.927 547.757 103.670
ENTHALPY KCAL/GFW -148.746 -138.378 -128.275 -118.417 -108.743 -99.168 -89.695 -70.154 -49.490 -27.780
T.VOL.GASES--LITERS 86.596 94.789 105.651 118.909 134.864 155.986 187.564 252.405 382.382 772.323
(GASES AT STP)
COMBUSTION PRODUCTS ROUNDED OFF TO 1.00E-04

-----GRAMS PRODUCTS/100 GRAMS (GS/G)MATERIAL BURNED-----

N2	40.6377	49.3986	60.3502	74.4318	93.2085	119.4940	158.9197	224.6273	356.0436	750.2911
Al2O3$	29.9725	29.9723	29.9721	29.9718	29.9715	29.9710	29.9702	29.9690	29.9665	29.9591
CO2	10.3042	12.2511	14.4951	17.1495	19.9557	23.7081	30.6968	30.8594	30.8540	30.8380
CO	8.2891	8.6975	8.5754	8.1176	6.9014	4.5538	0.1052	0.0001	0.0001	0.0003
H2O	5.9896	6.7791	8.3279	10.7017	14.8565	21.2323	30.2788	30.4570	30.4554	30.4508
CH4	2.2246	1.8044	1.0562	0.3506	0.0239	0.0003	0.0000	0.0001	0.0001	0.0002
H2	2.1774	2.1946	2.2094	2.1214	1.7392	1.0321	0.0200	0.0000	0.0000	0.0000
C$	0.3919	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001
NH3	0.0093	0.0095	0.0092	0.0077	0.0040	0.0011	0.0000	0.0001	0.0001	0.0002
Al4C3$	0.0001	0.0002	0.0002	0.0002	0.0002	0.0003	0.0004	0.0005	0.0007	0.0014
N2O5	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0003	0.0004	0.0005	0.0011
Al2O3$	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0003	0.0005	0.0010
Al2O3*	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0003	0.0005	0.0010
N2O4	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0003	0.0005	0.0009
N2O4$	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0003	0.0005	0.0009
N2O4*	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0003	0.0005	0.0009
Al2O2	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0004	0.0009
Al2O2	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0004	0.0009
C4N2	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0004	0.0008
N2O3	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0004	0.0008
Al2O	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0007
Al2O	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0007
C3O2	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0007
NHO3	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0006
NO3	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0006
C5	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0006
AlHO2	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003	0.0006
AlO2	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003	0.0006
C4H10	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003	0.0006

---LIST OF TOTAL COMBUSTION PRODUCTS CONSIDERED---

N2 Al2O3$ CO2 CO H2O CH4 H2 C$ NH3 Al4C3$ N2O5 Al2O3$ Al2O3* N2O4 N2O4$
N2O4* Al2O2 Al2O2 C4N2 N2O3 Al2O Al2O C3O2 NHO3 NO3 C5 AlHO2 AlO2 C4H10 C4H8
C2N2 C4 O3 NHO2 NO2 C3H8 C2H4O N2O AlHO CNHO AlO AlO C3H6 N3 CNO
AlN AlN$ CN2 CN2 C2O AlC C2N CNH C3 H2O2 HO2 C2H6 N2H4 N2H4* O2
NHO N2H2 CH2O NO NO CHO CHO C2H4 AlH Al Al* Al$ Al* C2H2 CN
CN C2H C2 H3O H2O* H2O* HO HO NH2 O CH3 NH CH2 N CH
C C$ H H

NHO3	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0006
NO3	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0006
C2H4	0.0001	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
C5	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0006
AlHO2	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003	0.0006
AlO2	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003	0.0006
C4H10	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003	0.0006
C4H8	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003	0.0006
C2N2	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003	0.0005
C4	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0005
O3	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0005
NHO2	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0005
NO2	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0005
C3H8	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
C2H4O	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
N2O	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
AlHO	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
CNHO	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
AlO	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
AlO	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
C3H6	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
N3	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
CNO	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
AlN	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
AlN$	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
CN2	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
CN2	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
C2O	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
AlC	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
C2N	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
C3	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
H2O2	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
HO2	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
N2H4	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
N2H4*	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
O2	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	7.5537	113.3245
NHO	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
C2H6	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
N2H2	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
CH2O	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
NO	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0166	0.0003
NO	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
CHO	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
CHO	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
AlH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
Al	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
Al*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
Al$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
Al*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
CN	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
CN	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
C2H	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
C2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0002
H3O	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
H2O*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
H2O*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
CH3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
HO	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0002	0.0002
HO	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
NH2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
O	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0 0001	0.0002
NH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
CH2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001
N	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001
CH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001

MATERIAL= OPEN BURNING - M97A2 20 MM CARTRIDGES/LUU-2 FLARES (RANGE C

OPEN BURN---MATERIAL DOES NOT DETONATE BEFORE REACTING WITH AIR---

	H	C	N	O	NA	MG	AL	PB			
NITROCELLULOSE(12.6)	0.008	0.006	0.002	0.010	0.000	0.000	0.000	0.000	39.330	-625.	0.0600
NITROGLYCERIN - NG	0.005	0.003	0.003	0.009	0.000	0.000	0.000	0.000	3.970	-392.	0.0578
DIPHENYLAMINE - DPA	0.011	0.012	0.001	0.000	0.000	0.000	0.000	0.000	0.390	178.	0.0419
TETRYL	0.005	0.007	0.005	0.008	0.000	0.000	0.000	0.000	21.660	28.	0.0625
LEAD AZIDE	0.000	0.000	0.006	0.000	0.000	0.000	0.001	0.000	0.340	398.	0.0668
ALUMINUM --AL	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	3.640	0.	0.0975
SODIUM NITRATE	0.000	0.000	0.001	0.003	0.001	0.000	0.000	0.000	4.220	-1323.	0.0723
MAGNESIUM (PURE CRYS	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	5.900	0.	0.0628
DIESEL OIL	0.022	0.012	0.000	0.000	0.000	0.000	0.000	0.000	19.270	-476.	0.0254
AIR -(G	0.000	0.000	0.006	0.001	0.000	0.000	0.000	0.000	0.000	0.	0.0000

OGRAM ATOM AMOUNTS FOR MATERIAL WEIGHT OF 98.720 1.0000

0 (H)	(C)	(N)	(O)	(NA)	(MG)	(AL)	(PB)	(			
4.129139	2.864848	0.842291	2.339125	0.049648	0.242599	0.134915	0.001167				
WT. MATERIAL		98.720	88.848	78.976	69.104	59.232	49.360	39.488	29.616	19.744	9.872
WT. AIR		0.000	10.000	20.000	30.000	40.000	50.000	60.000	70.000	80.000	90.000

---COMBUSTION CONDITIONS: THE MATERIAL AND AIR ARE BURNED TOGETHER AT 1000.00 PSI---

FLAME TEMP. T(K)	1938.682	1920.225	1900.812	1880.062	1857.631	1987.681	2177.190	2380.969	2541.810	1734.609
FLAME TEMP. T(F)	3030.227	2997.005	2962.062	2924.711	2884.335	3118.425	3459.543	3826.344	4115.857	2662.895
ENTHALPY KCAL/GFW	-40.075	-36.067	-32.060	-28.052	-24.045	-20.037	-16.030	-12.022	-8.015	-4.007

---COMBUSTION CONDITIONS: THE COMBUSTION PRODUCTS FROM MATERIAL AND AIR AFTER EXPANDING FROM 1000.00 PSI TO 14.70 PSI---

FLAME TEMP. T(K)	1069.458	1053.121	1036.945	1020.810	1004.559	986.635	955.380	1035.011	1157.443	667.323
FLAME TEMP. T(F)	1465.625	1436.218	1407.100	1378.057	1348.806	1316.543	1260.284	1403.619	1623.998	741.782
ENTHALPY KCAL/GFW	-91.510	-86.302	-81.074	-75.822	-70.543	-66.222	-63.154	-60.668	-58.289	-36.015
T.VOL.GASES--LITERS (GASES AT STP)	126.390	133.420	142.249	153.643	168.883	189.097	220.972	276.925	384.158	770.760

COMBUSTION PRODUCTS ROUNDED OFF TO 1.00E-04

-----GRAMS PRODUCTS/100 GRAMS (GS/G)MATERIAL BURNED-----

CO	44.9577	46.8577	49.0963	51.8259	55.3012	58.6912	59.4171	44.8956	11.2433	0.0003
C$	13.9461	12.7391	11.2604	9.3866	6.9100	3.7307	0.0240	0.0000	0.0001	0.0001
N2	11.9484	20.8223	31.9151	46.1775	65.1941	91.8176	131.7528	198.3163	331.4379	730.7966
MgO$	8.1653	8.1653	8.1653	8.1652	8.1651	7.1528	7.1527	7.6220	8.1456	7.1508
MgA1204$	6.1479	6.1473	6.1468	6.1465	6.1463	9.7174	9.7162	8.0574	6.2039	9.6978
CO2	4.1190	5.4808	7.3267	9.8763	13.4984	18.7348	31.0675	56.5569	110.0338	126.5808
NaA102$	4.1159	4.1163	4.1164	4.1163	4.1159	0.0002	0.0002	1.9093	4.0404	0.0008
H2	3.8412	3.7957	3.7459	3.6913	3.6312	3.5579	3.3803	2.5644	0.4906	0.0000
H20	1.8258	2.1691	2.5683	3.0329	3.5758	4.2450	5.7429	14.7373	33.2815	37.6664
CH4	0.6765	0.7040	0.7238	0.7337	0.7307	0.7239	0.7630	0.0069	0.0001	0.0002
Pb*	0.1860	0.1971	0.2057	0.2122	0.2170	0.2211	0.2274	0.1542	0.0010	0.0021
Pb	0.0564	0.0449	0.0359	0.0290	0.0235	0.0185	0.0108	0.0818	0.2304	0.0021
NH3	0.0027	0.0035	0.0042	0.0048	0.0054	0.0059	0.0067	0.0025	0.0001	0.0002
NaHO	0.0008	0.0006	0.0005	0.0004	0.0004	0.0003	0.0001	0.0019	0.0304	0.0004
Pb3O4$	0.0007	0.0008	0.0009	0.0010	0.0011	0.0014	0.0017	0.0023	0.0035	0.2425
CNH	0.0006	0.0006	0.0006	0.0006	0.0005	0.0005	0.0003	0.0001	0.0001	0.0003
Pb2	0.0004	0.0005	0.0005	0.0006	0.0007	0.0008	0.0010	0.0014	0.0021	0.0042
Na	0.0003	0.0002	0.0001	0.0001	0.0000	0.0000	0.0001	0.0001	0.0008	0.0002
NaCN	0.0002	0.0002	0.0002	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0005
NaCN	0.0002	0.0002	0.0002	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0005
Pb02$	0.0002	0.0003	0.0003	0.0003	0.0004	0.0005	0.0006	0.0008	0.0012	0.0024
PbO	0.0002	0.0002	0.0003	0.0003	0.0004	0.0004	0.0006	0.0008	0.0011	0.0023
PbO$	0.0002	0.0002	0.0003	0.0003	0.0004	0.0004	0.0006	0.0008	0.0011	0.0023
PbO$	0.0002	0.0002	0.0003	0.0003	0.0004	0.0004	0.0006	0.0008	0.0011	0.0023
PbO*	0.0002	0.0002	0.0003	0.0003	0.0004	0.0004	0.0006	0.0008	0.0011	0.0023
PbO*	0.0002	0.0002	0.0003	0.0003	0.0004	0.0004	0.0006	0.0008	0.0011	0.0023
PbH	0.0002	0.0002	0.0003	0.0003	0.0003	0.0004	0.0005	0.0007	0.0011	0.0021
Pb$	0.0002	0.0002	0.0003	0.0003	0.0003	0.0004	0.0005	0.0007	0.0010	0.0021
A14C3$	0.0001	0.0002	0.0002	0.0002	0.0002	0.0003	0.0004	0.0005	0.0007	0.0015
MgA1204*	0.0001	0.0002	0.0002	0.0002	0.0002	0.0003	0.0004	0.0005	0.0007	0.0014
N2O5	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0003	0.0004	0.0005	0.0011
Na2CO3$	0.0001	0.0001	0.0001	0.0002	0.0002	2.6606	2.6597	1.4212	0.0005	2.3193
Na2CO3$	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0003	0.0004	0.0005	0.3245
Na2CO3*	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0003	0.0004	0.0005	0.0011
Na2CO3*	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0003	0.0004	0.0005	0.0011
Na2CO3$	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0003	0.0004	0.0005	0.0011
Na2CO3*	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0003	0.0004	0.0005	0.0011
A1203$	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0003	0.0005	0.0010
A1203$	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0003	0.0005	0.0010
A1203*	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0003	0.0005	0.0010
Mg3N2$	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0003	0.0005	0.0010
Na2C2N2	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0003	0.0005	0.0010
N204	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0003	0.0005	0.0009
N204$	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0003	0.0005	0.0009
N204*	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0003	0.0005	0.0009
A1202	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0004	0.0009
A1202	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0004	0.0009
Mg2C3$	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0004	0.0009
MgCO3$	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0004	0.0009
Na2H202	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0004	0.0008
Na202$	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0004	0.0008
C4N2	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0004	0.0008
N203	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0004	0.0008
A120	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0004	0.0007
A120	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0004	0.0007
C302	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0007
NHO3	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0006
NO3	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0006
Na20$	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0006
Na20*	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0006
C5	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0006
A1HO2	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0006
A102	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003	0.0006
MgH2O2	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003	0.0006
MgH2O2$	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003	0.0006
C4H10	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003	0.0006
C4H8	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003	0.0006
Na02$	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003	0.0006

C2N2	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003	0.0005
NaCN$	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0005
NaCN*	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0005
NaCN*	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0005
NaCN$	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0005
NaCN*	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0005
MgC2$	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0005
C4	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0005
O3	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0005
NHO2	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0005
NO2	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0005
Na2	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0005
C3H8	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
C2H4O	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
N2O	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
A1HO	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
CNHO	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
A1O	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
A1O	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
C3H6	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
N3	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
CNO	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
MgHO	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
MgHO	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
A1N	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
A1N$	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
MgO	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
MgO*	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
CN2	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
CN2	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
C2O	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
NaHO$	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
NaHO$	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
NaHO$	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
NaHO*	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
A1C	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
NaO	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
MgN	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
C2N	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
C3	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
H2O2	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
HO2	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
N2H4	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
N2H4*	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
O2	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	96.7995
NHO	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
C2H6	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
N2H2	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
CH2O	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
NO	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
NO	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
CHO	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
CHO	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
C2H4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
A1H	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
A1	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
A1*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
A1$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
A1*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
MgH2$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
C2H2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
CN	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
CN	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
MgH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
C2H	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
Mg	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0002
Mg	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0002
Mg$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0002
Mg*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0002
Mg$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0002
Mg*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0002
C2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0002
NaH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0002
NaH$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0002
Na$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0002
Na*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0002
H3O	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
H2O*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
H2O*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
HO	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
HO	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
NH2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
O	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
CH3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
NH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
CH2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001
N	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001
CH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001
C	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001
C$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001

---LIST OF TOTAL COMBUSTION PRODUCTS CONSIDERED---

CO	C$	N2	MgO$	MgA12O	CO2	NaA102	H2	H2O	CH4	Pb*	Pb	NH3	NaHO	Pb3O4$
CNH	Pb2	Na	NaCN	NaCN	PbO2$	PbO	PbO$	PbO$	PbO*	PbO*	PbH	Pb$	A14C3$	MgA12O
N2O5	Na2CO3	Na2CO3	Na2CO3	Na2CO3	Na2CO3	Na2CO3	A1203$	A1203$	A1203*	Mg3N2$	Na2C2N	N2O4	N2O4$	N2O4*
A12O2	A12O2	Mg2C3$	MgCO3$	Na2H2O	Na2O2$	C4N2	N2O3	A12O	A12O	C3O2	NHO3	NO3	Na2O$	Na2O*
C5	A1HO2	A1O2	MgH2O2	MgH2O2	C4H10	C4H8	NaO2$	C2N2	NaCN$	NaCN*	NaCN*	NaCN$	NaCN*	MgC2$
C4	O3	NHO2	NO2	Na2	C3H8	C2H4O	N2O	A1HO	CNHO	A1O	A1O	C3H6	N3	CNO
MgHO	MgHO	A1N	A1N$	MgO	MgO*	CN2	CN2	C2O	NaHO$	NaHO$	NaHO$	NaHO*	A1C	NaO
MgN	C2N	C3	H2O2	HO2	N2H4	N2H4*	O2	NHO	C2H6	N2H2	CH2O	NO	NO	CHO
CHO	C2H4	A1H	A1	A1*	A1$	A1*	MgH2$	C2H2	CN	CN	MgH	C2H	Mg	Mg
Mg$	Mg*	Mg$	Mg*	C2	NaH	NaH$	Na$	Na*	H3O	H2O*	H2O*	HO	HO	NH2
O	CH3	NH	CH2	N	CH	C	C$	H	H					

MATERIAL= OPEN DETONATION - OCTOL (RANGE C-62)

DETONATION BURN---MATERIAL DETONATES BEFORE REACTING WITH AIR---

	H	C	N	O								
HMX	0.008	0.004	0.008	0.008	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	75.000	61.	0.0686
TRINITROTOLUENE	0.005	0.007	0.003	0.006	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	25.000	-78.	0.0597
AIR -(G	0.0000	0.0000	0.0060	0.0010	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.000	0.	0.0000
OGRAM ATOM AMOUNTS FOR MATERIAL WEIGHT OF 100.000												1.0000	
O (H) (C) (N) (O) (													
2.576169 1.783371 2.356041 2.686233													

WT. MATERIAL	100.000	90.000	80.000	70.000	60.000	50.000	40.000	30.000	20.000	10.000
WT. AIR	0.000	10.000	20.000	30.000	40.000	50.000	60.000	70.000	80.000	90.000

---COMBUSTION CONDITIONS: AIR IS MIXED WITH THE MATERIAL'S COMBUSTION PRODUCTS AFTER---
---THE MATERIAL HAS EXPLODED. (WT. MATERIAL/WT. AIR IS SHOWN ABOVE)---

FLAME TEMP. T(K)	1308.566	1428.207	1582.667	1748.955	1925.802	2114.197	2306.958	1996.903	1510.383	953.095
FLAME TEMP. T(F)	1896.019	2111.373	2389.401	2688.719	3007.043	3346.155	3693.125	3135.025	2259.290	1256.171
ENTHALPY KCAL/GFW	-69.912	-62.921	-55.930	-48.939	-41.947	-34.956	-27.965	-20.974	-13.982	-6.991

---COMBUSTION CONDITIONS: THE COMBUSTION PRODUCTS BELOW ARE FROM THE MATERIAL/AIR---
---MIXTURES ABOVE AFTER EXPANDING FROM 1000.00 PSI TO 14.70 PSI---

FLAME TEMP. T(K)	861.908	860.920	857.575	851.255	852.812	903.951	989.473	811.260	559.150	314.185
FLAME TEMP. T(F)	1092.034	1090.256	1084.235	1072.859	1075.662	1167.712	1321.651	1000.867	547.070	106.132
ENTHALPY KCAL/GFW	-104.640	-98.316	-92.422	-86.977	-81.973	-77.267	-72.659	-58.803	-41.761	-23.833
T.VOL.GASES--LITERS (GASES AT STP)	92.262	99.472	108.411	119.833	136.105	158.480	190.090	252.997	382.979	772.918

COMBUSTION PRODUCTS ROUNDED OFF TO 1.00E-04

-----GRAMS PRODUCTS/100 GRAMS (GS/G)MATERIAL BURNED-----

CO2	38.8372	41.3451	44.7229	49.3578	55.2556	62.2749	74.5145	78.4778	78.4728	78.4576
N2	32.9989	41.7598	52.7110	66.7911	85.5652	111.8509	151.2772	216.9850	348.4012	742.6488
CO	12.8563	13.7766	14.4556	14.7983	13.9402	10.2960	2.5242	0.0001	0.0001	0.0003
H2O	8.3291	8.3298	8.4352	8.6726	10.0659	14.6008	21.4857	23.2031	23.2016	23.1971
C$	4.4809	3.4534	2.2852	0.9120	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001
H2	1.3863	1.4035	1.4068	1.3932	1.3480	0.9597	0.1923	0.0000	0.0000	0.0000
CH4	1.1042	1.0351	0.9752	0.9234	0.4828	0.0110	0.0000	0.0001	0.0001	0.0002
NH3	0.0047	0.0049	0.0051	0.0053	0.0049	0.0019	0.0001	0.0001	0.0001	0.0002
N2O5	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0003	0.0004	0.0005	0.0011
N2O4	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0003	0.0005	0.0009
N2O4$	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0003	0.0005	0.0009
N2O4*	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0003	0.0005	0.0009
C4N2	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0004	0.0008
N2O3	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0004	0.0008
C3O2	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0007
NHO3	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0006
NO3	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0006
C5	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0006
C4H10	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003	0.0006
C4H8	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003	0.0006
C2N2	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003	0.0005
C4	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0005
O3	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0005
NHO2	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0005
NO2	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0005
C3H8	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
C2H4O	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
N2O	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
CNHO	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
C3H6	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
N3	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
CNO	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
CN2	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
CN2	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
C2O	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
C2N	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
C3	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
H2O2	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
HO2	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
N2H4	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
N2H4*	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
O2	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	14.6588	49.9121	155.6714
NHO	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
C2H6	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
N2H2	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
CH2O	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
NO	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0004	0.0002	0.0003
NO	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
CHO	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
CHO	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
C2H4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
CNH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
C2H2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
CN	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
CN	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
C2H	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
C2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0002
H3O	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
H2O*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
H2O*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
HO	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
HO	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
NH2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
O	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
CH3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
NH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
CH2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001
N	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001
CH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001
C	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001
C$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001

---LIST OF TOTAL COMBUSTION PRODUCTS CONSIDERED---

CO2	N2	CO	H2O	C$	H2	CH4	NH3	N2O5	N2O4	N2O4$	N2O4*	C4N2	N2O3	C3O2
NHO3	NO3	C5	C4H10	C4H8	C2N2	C4	O3	NHO2	NO2	C3H8	C2H4O	N2O	CNHO	C3H6
N3	CNO	CN2	CN2	C2O	C2N	C3	H2O2	HO2	N2H4	N2H4*	O2	NHO	C2H6	N2H2
CH2O	NO	NO	CHO	CHO	C2H4	CNH	C2H2	CN	CN	C2H	C2	H3O	H2O*	H2O*
HO	HO	NH2	O	CH3	NH	CH2	N	CH	C	C$	H	H		

MATERIAL= OPEN DETONATION - MK82 BOMBS/C-4 EXPLOSIVE (RANGE C-62)

DETONATION BURN---MATERIAL DETONATES BEFORE REACTING WITH AIR---

	H	C	N	O	AL								
TRINITROTOLUENE	0.0050	.0070	.0030	.0060	.0000	.0000	.0000	.0000	.0000	.0000	.0000	79.890	-78.	0.0597
ALUMINUM --AL	0.0000	.0000	.0000	.0000	.0010	.0000	.0000	.0000	.0000	.0000	.0000	19.970	0.	0.0975
RDX -(S)	0.0060	.0030	.0060	.0060	.0000	.0000	.0000	.0000	.0000	.0000	.0000	0.130	72.	0.0656
AIR -(G	0.0000	.0000	.0060	.0010	.0000	.0000	.0000	.0000	.0000	.0000	.0000	0.000	0.	0.0000
OGRAM ATOM AMOUNTS FOR MATERIAL WEIGHT OF 99.990													1.0000	

O (H)	(C)	(N)	(O)	(AL)	(
1.762111	2.463795	1.058671	2.113831	0.740178	

WT. MATERIAL	99.990	89.991	79.992	69.993	59.994	49.995	39.996	29.997	19.998	9.999
WT. AIR	0.000	10.000	20.000	30.000	40.000	50.000	60.000	70.000	80.000	90.000

---COMBUSTION CONDITIONS: AIR IS MIXED WITH THE MATERIAL'S COMBUSTION PRODUCTS AFTER---
---THE MATERIAL HAS EXPLODED. (WT. MATERIAL/WT. AIR IS SHOWN ABOVE)---

FLAME TEMP. T(K)	2483.059	2430.011	2389.035	2354.768	2324.723	2322.100	2432.452	2605.111	2556.437	1602.623
FLAME TEMP. T(F)	4010.106	3914.620	3840.863	3779.182	3725.102	3720.381	3919.014	4229.800	4142.186	2425.321
ENTHALPY KCAL/GFW	-68.089	-61.274	-54.466	-47.658	-40.849	-34.041	-27.233	-20.425	-13.616	-6.808

---COMBUSTION CONDITIONS: THE COMBUSTION PRODUCTS BELOW ARE FROM THE MATERIAL/AIR---
---MIXTURES ABOVE AFTER EXPANDING FROM 1000.00 PSI TO 14.70 PSI---

FLAME TEMP. T(K)	1910.661	1769.028	1601.875	1435.244	1274.355	1138.131	1134.663	1223.514	1206.353	606.735
FLAME TEMP. T(F)	2979.791	2724.851	2423.975	2124.040	1834.439	1589.236	1582.994	1742.925	1712.035	632.723
ENTHALPY KCAL/GFW	-114.277	-108.756	-102.728	-96.111	-88.865	-80.997	-74.803	-69.396	-61.224	-35.327
T.VOL.GASES--LITERS (GASES AT STP)	95.021	102.111	110.950	122.264	137.288	158.275	189.985	242.630	353.318	743.299

COMBUSTION PRODUCTS ROUNDED OFF TO 1.00E-04

-----GRAMS PRODUCTS/100 GRAMS (GS/G)MATERIAL BURNED-----

A1203$	37.1157	37.7364	37.7362	37.7359	37.7356	37.7351	37.7343	37.7331	37.7307	37.7233
CO	28.6215	32.2214	37.3534	43.9162	52.4219	62.6217	58.5337	37.2328	0.0001	0.0003
C$	17.1934	15.6941	13.5329	10.7321	7.0367	2.2623	0.0000	0.0000	0.0001	0.0001
N2	14.5247	23.5018	34.5005	48.6092	67.3967	93.6859	133.1161	198.8313	330.2474	724.5479
H2	1.7636	1.7679	1.7709	1.7704	1.7626	1.7312	1.4755	0.7885	0.0000	0.0000
A1N$	0.4980	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
CNH	0.2618	0.1750	0.0856	0.0333	0.0100	0.0027	0.0002	0.0001	0.0001	0.0003
C2H2	0.0108	0.0036	0.0007	0.0001	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
CH4	0.0026	0.0035	0.0056	0.0104	0.0222	0.0477	0.0021	0.0001	0.0001	0.0002
H	0.0013	0.0004	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
H2O	0.0011	0.0021	0.0053	0.0168	0.0679	0.2929	2.6805	8.8247	15.8699	15.8654
CO2	0.0008	0.0019	0.0066	0.0315	0.2133	1.6223	16.4627	49.9340	108.4288	108.4128
A1	0.0006	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
A1O	0.0002	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0007
CH3	0.0002	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
A14C3$	0.0001	0.0002	0.0002	0.0002	0.0002	0.0003	0.0004	0.0005	0.0007	0.0014
N2O5	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0003	0.0004	0.0005	0.0011
A1H	0.0001	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
A1203$	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0003	0.0005	0.0010
A1203*	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0003	0.0005	0.0010
NH3	0.0001	0.0001	0.0002	0.0003	0.0006	0.0010	0.0008	0.0002	0.0001	0.0002
N2O4	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0003	0.0005	0.0009
N2O4$	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0003	0.0005	0.0009
N2O4*	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0003	0.0005	0.0009
A12O2	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0004	0.0009
A12O2	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0004	0.0009
C4N2	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0004	0.0008
N2O3	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0004	0.0008
A12O	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0007
C3O2	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0007
NHO3	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0006
NO3	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0006
C5	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0006
A1HO2	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003	0.0006
A1O2	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003	0.0006
C4H10	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003	0.0006
C4H8	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003	0.0006
C2N2	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003	0.0005
C4	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0005
O3	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0005
NHO2	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0005
NO2	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0005
C3H8	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
C2H4O	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
N2O	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
A1HO	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
CNHO	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
A1O	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
A1O	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
C3H6	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
N3	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
CNO	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
A1N	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
CN2	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
CN2	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
C2O	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
A1C	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
C2N	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
C3	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
H2O2	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
HO2	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
N2H4	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
N2H4*	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
O2	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	7.7167	113.5045
NHO	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
C2H6	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
N2H2	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
CH2O	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
NO	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0282	0.0003
NO	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
CHO	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
CHO	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003

C2H4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
A1*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
A1$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
A1*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
CN	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
CN	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
C2H	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
C2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0002
H3O	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
H2O*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
H2O*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
HO	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0003	0.0002
HO	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
NH2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
O	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
NH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
CH2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001
N	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001
CH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001
C	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001
C$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001

---LIST OF TOTAL COMBUSTION PRODUCTS CONSIDERED---

A12O3$	CO	C$	N2	H2	A1N$	CNH	C2H2	CH4	H	H2O	CO2	A1	A12O	CH3
A14C3$	N2O5	A1H	A12O3$	A12O3*	NH3	N2O4	N2O4$	N2O4*	A12O2	A12O2	C4N2	N2O3	A12O	C3O2
NHO3	NO3	C5	A1HO2	A1O2	C4H10	C4H8	C2N2	C4	O3	NHO2	NO2	C3H8	C2H4O	N2O
A1HO	CNHO	A1O	A1O	C3H6	N3	CNO	A1N	CN2	CN2	C2O	A1C	C2N	C3	H2O2
HO2	N2H4	N2H4*	O2	NHO	C2H6	N2H2	CH2O	NO	NO	CHO	CHO	C2H4	A1*	A1$
A1*	CN	CN	C2H	C2	H3O	H2O*	H2O*	HO	HO	NH2	O	NH	CH2	N
CH	C	C$	H											

MATERIAL=OPEN BURN - M1 PROPELLANT

OPEN BURN---MATERIAL DOES NOT DETONATE BEFORE REACTING WITH AIR---

	H	C	N	O								
NITROCELLULOSE(12.6)	0.008	0.006	0.002	0.010	0.000	0.000	0.000	0.000	0.000	0.000	84.000	-625.	0.0600
DINITRO TOLUENE	0.006	0.007	0.002	0.004	0.000	0.000	0.000	0.000	0.000	0.000	10.000	-71.	0.0476
DIBUTYL PHTHALATE	0.022	0.016	0.000	0.004	0.000	0.000	0.000	0.000	0.000	0.000	5.000	-733.	0.0378
DIPHENYLAMINE - DPA	0.011	0.012	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	178.	0.0419
AIR -(G	0.000	0.000	0.006	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.	0.0000

OGRAM ATOM AMOUNTS FOR MATERIAL WEIGHT OF 100.000 1.0000

O (H)	(C)	(N)	(O)	(
3.117827	2.592881	0.871232	3.344370	

WT. MATERIAL	100.000	90.000	80.000	70.000	60.000	50.000	40.000	30.000	20.000	10.000
WT. AIR	0.000	10.000	20.000	30.000	40.000	50.000	60.000	70.000	80.000	90.000

---COMBUSTION CONDITIONS: THE MATERIAL AND AIR ARE BURNED TOGETHER AT 1000.00 PSI---

FLAME TEMP. T(K)	1827.491	1926.344	2031.215	2142.813	2262.212	2390.614	2527.250	2622.114	2125.333	1311.271
FLAME TEMP. T(F)	2830.083	3008.020	3196.787	3397.662	3612.582	3843.706	4089.650	4260.404	3366.199	1900.887
ENTHALPY KCAL/GFW	-56.684	-51.016	-45.347	-39.679	-34.010	-28.342	-22.674	-17.005	-11.337	-5.668

---COMBUSTION CONDITIONS: THE COMBUSTION PRODUCTS FROM MATERIAL AND AIR AFTER EXPANDING FROM 1000.00 PSI TO 14.70 PSI---

FLAME TEMP. T(K)	966.281	958.497	949.169	941.724	970.423	1028.443	1098.534	1180.402	869.247	462.253
FLAME TEMP. T(F)	1279.906	1265.895	1249.104	1235.703	1287.361	1391.797	1517.961	1665.323	1105.244	372.655
ENTHALPY KCAL/GFW	-104.547	-99.011	-93.664	-88.520	-83.526	-78.584	-73.661	-68.725	-51.443	-29.316
T.VOL.GASES--LITERS (GASES AT STP)	100.917	107.966	116.765	128.334	144.725	166.079	197.672	250.301	376.742	766.682

COMBUSTION PRODUCTS ROUNDED OFF TO 1.00E-04

-----GRAMS PRODUCTS/100 GRAMS (GS/G)MATERIAL BURNED-----

CO	45.0319	45.0825	44.8678	44.0494	40.5523	34.6554	24.8558	6.0098	0.0001	0.0003
CO2	31.4140	34.3174	38.1429	43.2635	50.0848	59.6435	75.0540	104.6629	114.1001	114.0849
N2	12.2015	20.9621	31.9130	45.9930	64.7674	91.0519	130.4775	196.1859	327.6011	721.8499
H2O	5.5689	5.8053	6.1188	6.7054	9.0400	12.9448	18.5378	26.2630	28.0809	28.0764
C$	2.7190	1.9135	0.9692	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001
H2	2.3376	2.3139	2.2813	2.2416	2.1021	1.6924	1.0680	0.2036	0.0000	0.0000
CH4	0.7221	0.7105	0.7002	0.5967	0.1129	0.0055	0.0001	0.0001	0.0001	0.0002
NH3	0.0024	0.0030	0.0036	0.0039	0.0031	0.0016	0.0005	0.0001	0.0001	0.0002
N2O5	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0003	0.0004	0.0005	0.0011
CNH	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0003
N2O4	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0003	0.0005	0.0009
N2O4$	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0003	0.0005	0.0009
N2O4*	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0003	0.0005	0.0009
C4N2	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0004	0.0008
N2O3	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0004	0.0008
C3O2	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0007
NHO3	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0006
NO3	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0006
C5	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0006
C4H10	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003	0.0006
C4H8	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003	0.0006
C2N2	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003	0.0005
C4	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0005
O3	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0005
NHO2	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0005
NO2	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0005
C3H8	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
C2H4O	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
N2O	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
CNHO	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
C3H6	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
N3	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
CNO	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
CN2	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
CN2	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
C2O	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
C2N	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
C3	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
H2O2	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
HO2	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
N2H4	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
N2H4*	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
O2	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	30.2039	135.9641
NHO	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
C2H6	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
N2H2	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
CH2O	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
NO	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0017	0.0003
NO	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
CHO	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
CHO	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
C2H4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
C2H2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
CN	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
CN	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
C2H	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
C2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0002
H3O	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
H2O*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
H2O*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
HO	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
HO	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
NH2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
O	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
CH3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
NH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
CH2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001
N	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001
CH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001
C	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001
C$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001

---LIST OF TOTAL COMBUSTION PRODUCTS CONSIDERED---

CO	CO2	N2	H2O	C$	H2	CH4	NH3	N2O5	CNH	N2O4	N2O4$	N2O4*	C4N2	N2O3
C3O2	NHO3	NO3	C5	C4H10	C4H8	C2N2	C4	O3	NHO2	NO2	C3H8	C2H4O	N2O	CNHO
C3H6	N3	CNO	CN2	CN2	C2O	C2N	C3	H2O2	HO2	N2H4	N2H4*	O2	NHO	C2H6
N2H2	CH2O	NO	NO	CHO	CHO	C2H4	C2H2	CN	CN	C2H	C2	H3O	H2O*	H2O*
HO	HO	NH2	O	CH3	NH	CH2	N	CH	C	C$	H	H		

MATERIAL=OPEN BURN - M8 PROPELLANT

OPEN BURN---MATERIAL DOES NOT DETONATE BEFORE REACTING WITH AIR---

	H	C	N	O	K								
NITROCELLULOSE(12.6)	0.008	0.006	0.002	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000	52.150	-625.	0.0600
NITROGLYCERIN - NG	0.005	0.003	0.003	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	43.000	-392.	0.0578
DIETHYL PHTHALATE	0.014	0.012	0.000	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.000	-810.	0.0406
ETHYL CENTRALITE-EC	0.020	0.017	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.600	-117.	0.0451
POTASSIUM NITRATE	0.000	0.000	0.001	0.003	0.001	0.000	0.000	0.000	0.000	0.000	0.000	1.250	-1165.	0.0762
AIR -(G	0.000	0.000	0.006	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.	0.0000

OGRAM ATOM AMOUNTS FOR MATERIAL WEIGHT OF 100.000 1.0000

O (H)	(C)	(N)	(O)	(K)	(
2.625871	1.916727	1.053924	3.692784	0.012363	

WT. MATERIAL	100.000	90.000	80.000	70.000	60.000	50.000	40.000	30.000	20.000	10.000
WT. AIR	0.000	10.000	20.000	30.000	40.000	50.000	60.000	70.000	80.000	90.000

---COMBUSTION CONDITIONS: THE MATERIAL AND AIR ARE BURNED TOGETHER AT 1000.00 PSI---

FLAME TEMP. T(K)	3017.750	3016.080	3010.263	2995.661	2961.077	2876.833	2667.340	2252.801	1704.211	1065.067
FLAME TEMP. T(F)	4972.551	4969.543	4959.074	4932.790	4870.539	4718.899	4341.812	3595.642	2608.180	1457.721
ENTHALPY KCAL/GFW	-53.411	-48.070	-42.729	-37.388	-32.047	-26.706	-21.365	-16.023	-10.682	-5.341

---COMBUSTION CONDITIONS: THE COMBUSTION PRODUCTS FROM MATERIAL AND AIR AFTER EXPANDING FROM 1000.00 PSI TO 14.70 PSI---

FLAME TEMP. T(K)	1456.059	1459.321	1463.229	1468.279	1475.859	1493.099	1259.723	958.797	653.809	358.605
FLAME TEMP. T(F)	2161.506	2167.378	2174.412	2183.501	2197.146	2228.177	1808.100	1266.435	717.456	186.089
ENTHALPY KCAL/GFW	-122.139	-115.215	-108.296	-101.376	-94.422	-87.220	-74.610	-59.031	-42.252	-24.252
T.VOL.GASES--LITERS (GASES AT STP)	84.462	91.478	100.247	111.524	126.557	147.600	185.037	249.897	379.873	769.815

COMBUSTION PRODUCTS ROUNDED OFF TO 1.00E-04

-----GRAMS PRODUCTS/100 GRAMS (GS/G)MATERIAL BURNED-----

CO2	38.9520	42.9881	48.2258	55.2397	65.0534	79.6149	84.3487	84.0761	84.0713	84.0575
CO	28.8962	26.3271	22.9933	18.5289	12.2824	3.0140	0.0001	0.0001	0.0001	0.0003
H2O	15.8722	16.8637	18.0241	19.4015	21.0483	23.0131	23.5403	23.6505	23.6490	23.6441
N2	14.7626	23.5237	34.4750	48.5553	67.3290	93.6122	133.0242	198.7430	330.1606	724.4080
H2	0.8606	0.7495	0.6194	0.4651	0.2804	0.0598	0.0000	0.0000	0.0000	0.0000
KHO	0.5591	0.5668	0.5766	0.5896	0.6086	0.6478	0.6684	0.0008	0.0003	0.0006
K	0.0914	0.0861	0.0792	0.0702	0.0569	0.0294	0.0001	0.0001	0.0002	0.0004
K2H2O2	0.0021	0.0019	0.0017	0.0015	0.0013	0.0010	0.0219	0.0004	0.0006	0.0011
K2CO3$	0.0001	0.0002	0.0002	0.0002	0.0002	0.0003	0.0003	0.8478	0.8457	0.8371
K2CO3*	0.0001	0.0002	0.0002	0.0002	0.0002	0.0003	0.0003	0.0005	0.0007	0.0014
K2C2N2	0.0001	0.0001	0.0002	0.0002	0.0002	0.0003	0.0003	0.0004	0.0007	0.0013
K2O2$	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0003	0.0004	0.0006	0.0011
N2O5	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0003	0.0004	0.0005	0.0011
K2O$	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0003	0.0005	0.0009
N2O4	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0003	0.0005	0.0009
N2O4$	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0003	0.0005	0.0009
N2O4*	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0003	0.0005	0.0009
K2	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0004	0.0008
C4N2	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0004	0.0008
N2O3	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0004	0.0008
KO2$	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0004	0.0007
C3O2	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0007
NH3	0.0001	0.0001	0.0001	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
KCN	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0007
KCN$	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0007
KCN*	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0007
NHO3	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0006
NO3	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0006
KH	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
C5	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0006
C4H10	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003	0.0006
C4H8	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003	0.0006
KHO$	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003	0.0006
KHO$	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003	0.0006
KHO*	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003	0.0006
KO	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003	0.0006
C2N2	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003	0.0005
C4	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0005
O3	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0005
NHO2	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0005
NO2	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0003	0.0002	0.0005
C3H8	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
C2H4O	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
N2O	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
CNHO	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
C3H6	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
N3	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
CNO	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
KH$	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
CN2	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
CN2	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
C2O	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
K*	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
C2N	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
C3	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
H2O2	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
HO2	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
N2H4	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
N2H4*	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
O2	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	8.3590	25.9985	61.2541	167.0145
NHO	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
C2H6	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
N2H2	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
CH2O	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
NO	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0274	0.0039	0.0002	0.0003
NO	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
CHO	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
CHO	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
C2H4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
CNH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
C2H2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
CN	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
CN	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
C2H	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003

C2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0002
H3O	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
H2O*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
H2O*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
HO	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0007	0.0001	0.0001	0.0002
HO	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
CH4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
NH2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
O	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
CH3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
NH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
CH2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001
N	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001
CH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001
C	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001
C$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001
C$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001

---LIST OF TOTAL COMBUSTION PRODUCTS CONSIDERED---

CO2	CO	H2O	N2	H2	KHO	K	K2H2O2	K2CO3$	K2CO3*	K2C2N2	K2O2$	N2O5	K2O$	N2O4
N2O4$	N2O4*	K2	C4N2	N2O3	KO2$	C3O2	NH3	KCN	KCN$	KCN*	NHO3	NO3	KH	C5
C4H10	C4H8	KHO$	KHO$	KHO*	KO	C2N2	C4	O3	NHO2	NO2	C3H8	C2H4O	N2O	CNHO
C3H6	N3	CNO	KH$	CN2	CN2	C2O	K*	C2N	C3	H2O2	HO2	N2H4	N2H4*	O2
NHO	C2H6	N2H2	CH2O	NO	NO	CHO	CHO	C2H4	CNH	C2H2	CN	CN	C2H	C2
H3O	H2O*	H2O*	HO	HO	CH4	NH2	O	CH3	NH	CH2	N	CH	H	C
C$	C$	H												

MATERIAL=OPEN BURN - M15 PROPELLANT

OPEN BURN---MATERIAL DOES NOT DETONATE BEFORE REACTING WITH AIR---

	H	C	N	O	F	NA	AL			
NITROCELLULOSE(12.6)	0.008	0.006	0.002	0.010	0.000	0.000	0.000	20.000	-625.	0.0600
NITROGLYCERIN - NG	0.005	0.003	0.003	0.009	0.000	0.000	0.000	19.000	-392.	0.0578
NITROGUANIDINE	0.004	0.001	0.004	0.002	0.000	0.000	0.000	54.700	-209.	0.0625
ETHYL CENTRALITE-EC	0.020	0.017	0.002	0.001	0.000	0.000	0.000	6.000	-117.	0.0451
CRYOLITE	0.000	0.000	0.000	0.012	0.003	0.003	0.000	0.300	-3549.	0.1084
AIR -(G	0.000	0.000	0.006	0.001	0.000	0.000	0.000	0.000	0.	0.0000

OGRAM ATOM AMOUNTS FOR MATERIAL WEIGHT OF 100.000 1.0000

O (H)	(C)	(N)	(O)	(F)	(NA)	(AL)	(
3.522149	1.597194	2.577925	2.553388	0.009526	0.002382	0.002382	

WT. MATERIAL	100.000	90.000	80.000	70.000	60.000	50.000	40.000	30.000	20.000	10.000
WT. AIR	0.000	10.000	20.000	30.000	40.000	50.000	60.000	70.000	80.000	90.000

---COMBUSTION CONDITIONS: THE MATERIAL AND AIR ARE BURNED TOGETHER AT 1000.00 PSI---

FLAME TEMP. T(K)	2016.250	2096.437	2182.027	2273.865	2372.540	2479.654	2580.529	2344.708	1784.385	1114.331
FLAME TEMP. T(F)	3169.849	3314.186	3468.248	3633.556	3811.171	4003.978	4185.553	3761.073	2752.492	1546.396
ENTHALPY KCAL/GFW	-33.147	-29.833	-26.518	-23.203	-19.888	-16.574	-13.259	-9.944	-6.629	-3.315

---COMBUSTION CONDITIONS: THE COMBUSTION PRODUCTS FROM MATERIAL AND AIR AFTER EXPANDING FROM 1000.00 PSI TO 14.70 PSI---

FLAME TEMP. T(K)	923.546	927.788	939.180	967.255	1012.529	1065.006	1124.685	990.114	682.188	376.316
FLAME TEMP. T(F)	1202.984	1210.619	1231.125	1281.658	1363.152	1457.611	1565.033	1322.806	768.539	217.968
ENTHALPY KCAL/GFW	-85.664	-82.269	-78.958	-75.710	-72.490	-69.292	-66.135	-56.362	-40.461	-23.374
T.VOL.GASES--LITERS (GASES AT STP)	101.138	109.395	119.334	131.339	146.521	167.585	199.162	259.469	389.357	779.250

COMBUSTION PRODUCTS ROUNDED OFF TO 1.00E-04

-----GRAMS PRODUCTS/100 GRAMS (GS/G)MATERIAL BURNED-----

N2	36.1058	44.8669	55.8187	69.9001	88.6751	114.9592	154.3841	220.0905	351.5073	745.7479
CO2	27.2941	29.8470	32.9271	36.5254	41.2665	48.5242	61.1189	70.2778	70.2700	70.2471
CO	25.3538	24.5024	23.2428	21.3833	18.4611	13.8491	5.8321	0.0001	0.0001	0.0003
H2O	7.3046	8.4080	9.9909	12.4856	16.1535	21.1022	27.8474	31.6614	31.6793	31.7095
H2	2.4376	2.4255	2.3479	2.1302	1.7339	1.1800	0.4246	0.0000	0.0000	0.0000
CH4	1.1516	0.7084	0.3069	0.0599	0.0049	0.0002	0.0000	0.0001	0.0001	0.0002
Na3AlF6$	0.1623	0.1619	0.0594	0.0003	0.0003	0.0004	0.0005	0.0007	0.1467	0.1283
HF	0.0950	0.0950	0.1240	0.1407	0.1406	0.1699	0.1835	0.1387	0.0949	0.0159
Al2O3$	0.0795	0.0794	0.1038	0.1178	0.1174	0.0416	0.0077	0.1138	0.0746	0.0010
NH3	0.0058	0.0057	0.0051	0.0037	0.0020	0.0008	0.0001	0.0001	0.0001	0.0002
NaAlF4	0.0007	0.0007	0.0010	0.0010	0.0006	0.0005	0.0003	0.0004	0.0006	0.0013
Na3AlF6*	0.0002	0.0002	0.0003	0.0003	0.0003	0.0004	0.0005	0.0007	0.0010	0.0021
Na3AlF6*	0.0002	0.0002	0.0003	0.0003	0.0003	0.0004	0.0005	0.0007	0.0010	0.0021
Al2F6	0.0002	0.0002	0.0002	0.0002	0.0003	0.0003	0.0004	0.0006	0.0008	0.0017
Al4C3$	0.0001	0.0002	0.0002	0.0002	0.0002	0.0003	0.0004	0.0005	0.0007	0.0014
C2F6	0.0001	0.0002	0.0002	0.0002	0.0002	0.0003	0.0003	0.0005	0.0007	0.0014
N2O5	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0003	0.0004	0.0005	0.0011
Na2CO3$	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0003	0.0004	0.0005	0.0011
Na2CO3$	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0003	0.0004	0.0005	0.0011
Na2CO3*	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0003	0.0004	0.0005	0.0011
Na2CO3*	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0003	0.0004	0.0005	0.0011
Na2CO3$	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0003	0.0004	0.0005	0.0011
Na2CO3*	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0003	0.0004	0.0005	0.0011
N2F4	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0003	0.0005	0.0002
COF4	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0003	0.0005	0.0002
Al2O3$	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0003	0.0005	0.0010
Al2O3*	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0003	0.0005	0.0010
C2F4	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0003	0.0005	0.0007
Na2C2N2	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0003	0.0005	0.0010
C2NF3	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0003	0.0005	0.0008
N2O4	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0003	0.0005	0.0009
N2O4$	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0003	0.0005	0.0009
N2O4*	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0003	0.0005	0.0009
CF4	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0004	0.0002
NOF3	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0004	0.0007
Al2O2	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0004	0.0006
Al2O2	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0001	0.0003	0.0004	0.0006
Na2F2	0.0001	0.0001	0.0001	0.0001	0.0001	0.0004	0.0004	0.0003	0.0004	0.0008
AlF3	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0004	0.0008
AlF3	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0001	0.0003	0.0004	0.0008
AlF3$	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0004	0.1148
AlF3$	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0004	0.0008
NaAlO2$	0.0001	0.0001	0.0001	0.0001	0.0001	0.1209	0.1751	0.0003	0.0004	0.0008
NO3F	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0004	0.0007
Na2H2O2	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0004	0.0008
CNH	0.0001	0.0001	0.0001	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
Na2O2$	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0004	0.0008
C4N2	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0004	0.0008
N2O3	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0004	0.0008
NF3	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0004	0.0006
CHF3	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0004	0.0006
Al2O	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0005
Al2O	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0005
CF3	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0006
C3O2	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0007
N2F2	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0007
N2F2	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0007
COF2	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0007
NO2F	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0005
AlF2	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003	0.0005
AlF2	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003	0.0005
NHO3	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0006
C2F2	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0006
NO3	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0006
Na2O$	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0006
Na2O*	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0006
AlOF	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003	0.0006
C5	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0006
AlHO2	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003	0.0005
AlO2	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003	0.0005
C4H10	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003	0.0006
C4H8	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003	0.0006
NaO2$	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003	0.0005
OF2	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003	0.0002

C2N2	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003	0.0005
CH2F2	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003	0.0005
NF2	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003	0.0002
O2F	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003	0.0004
CF2	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003	0.0005
CF2	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003	0.0005
NaCN	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0004
NaCN	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0004
NaCN$	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0005
NaCN*	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0005
NaCN*	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0005
NaCN$	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0005
NaCN*	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0005
NOF	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0004
C4	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0005
CHOF	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0004
O3	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0005
NHO2	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0005
NO2	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0005
Na2	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0000	0.0002	0.0002	0.0002
AlF	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0005
AlF	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0005
CNF	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0004
C3H8	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
C2H4O	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
C2HF	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
N2O	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
AlHO	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
CNHO	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
AlO	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
AlO	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
C3H6	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
N3	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
CNO	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
NaF	0.0000	0.0000	0.0001	0.0001	0.0002	0.0009	0.0022	0.0001	0.0002	0.0004
NaF$	0.0000	0.0000	0.0611	0.0962	0.0957	0.0316	0.0001	0.0917	0.0002	0.0004
NaF*	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
NaF*	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
AlN	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
AlN$	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
CN2	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
CN2	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
C2O	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
NaHO	0.0000	0.0000	0.0000	0.0001	0.0001	0.0005	0.0021	0.0001	0.0002	0.0003
NaHO$	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
NaHO$	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
NaHO$	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
NaHO*	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
AlC	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
NaO	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
C2N	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
F2	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
C3	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
HOF	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
OF	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
CH3F	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
H2O2	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
NF	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
HO2	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
N2H4	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
N2H4*	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
CHF	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
O2	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	10.9246	46.1813	151.9455
NHO	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
CF	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
C2H6	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
N2H2	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
CH2O	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
NO	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0038	0.0002	0.0003
NO	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
CHO	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
CHO	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
C2H4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
AlH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002
Al	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002
Al*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
Al$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
Al*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003

C2H2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
CN	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
CN	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
C2H	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
C2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0002
NaH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
NaH$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
Na	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
Na$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0002
Na*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0002
H3O	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
F	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
H2O*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
H2O*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
HO	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
HO	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
NH2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
O	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
CH3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
NH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
CH2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001
N	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001
CH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001
C	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001
C$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001
C$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001

---LIST OF TOTAL COMBUSTION PRODUCTS CONSIDERED---

N2	CO2	CO	H2O	H2	CH4	Na3AlF	HF	Al2O3$	NH3	NaAlF4	Na3AlF	Na3AlF	Al2F6	Al4C3$
C2F6	N2O5	Na2CO3	Na2CO3	Na2CO3	Na2CO3	Na2CO3	Na2CO3	N2F4	COF4	Al2O3$	Al2O3*	C2F4	Na2C2N	C2NF3
N2O4	N2O4$	N2O4*	CF4	NOF3	Al2O2	Al2O2	Na2F2	AlF3	AlF3	AlF3$	AlF3$	NaAlO2	NO3F	Na2H2O
CNH	Na2O2$	C4N2	N2O3	NF3	CHF3	Al2O	Al2O	CF3	C3O2	N2F2	N2F2	COF2	NO2F	AlF2
AlF2	NHO3	C2F2	NO3	Na2O$	Na2O*	AlOF	C5	AlHO2	AlO2	C4H10	C4H8	NaO2$	OF2	C2N2
CH2F2	NF2	O2F	CF2	CF2	NaCN	NaCN	NaCN$	NaCN*	NaCN*	NaCN$	NaCN*	NOF	C4	CHOF
O3	NHO2	NO2	Na2	AlF	AlF	CNF	C3H8	C2H4O	C2HF	N2O	AlHO	CNHO	AlO	AlO
C3H6	N3	CNO	NaF	NaF$	NaF*	NaF*	AlN	AlN$	CN2	CN2	C2O	NaHO	NaHO$	NaHO$
NaHO$	NaHO*	AlC	NaO	C2N	F2	C3	HOF	OF	CH3F	H2O2	NF	HO2	N2H4	N2H4*
CHF	O2	NHO	CF	C2H6	N2H2	CH2O	NO	NO	CHO	CHO	C2H4	AlH	Al	Al*
Al$	Al*	C2H2	CN	CN	C2H	C2	NaH	NaH$	Na	Na$	Na*	H3O	F	H2O*
H2O*	HO	HO	NH2	O	CH3	NH	CH2	N	CH	C	C$	C$	H	H

MATERIAL=OPEN DETONATION -- PENTOLITE

DETONATION BURN---MATERIAL DETONATES BEFORE REACTING WITH AIR---

	H	C	N	O									
PETN	0.008	0.005	0.004	0.012	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	50.000	-401.	0.0640
TNT	0.005	0.007	0.003	0.006	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	50.000	-48.	0.0597
AIR -(G	0.0000	0.0000	0.006	0.001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.000	0.	0.0000
OGRAM ATOM AMOUNTS FOR MATERIAL WEIGHT OF 100.000													1.0000	
0 (H)	(C)	(N)	(O)	(										
2.365856	2.331655	1.292992	3.218593											

WT. MATERIAL	100.000	90.000	80.000	70.000	60.000	50.000	40.000	30.000	20.000	10.000
WT. AIR	0.000	10.000	20.000	30.000	40.000	50.000	60.000	70.000	80.000	90.000

---COMBUSTION CONDITIONS: AIR IS MIXED WITH THE MATERIAL'S COMBUSTION PRODUCTS AFTER---
---THE MATERIAL HAS EXPLODED. (WT. MATERIAL/WT. AIR IS SHOWN ABOVE)---

FLAME TEMP. T(K)	1267.903	1356.705	1512.020	1688.656	1876.132	2074.710	2283.240	2227.235	1682.427	1050.052
FLAME TEMP. T(F)	1822.825	1982.669	2262.235	2580.181	2917.638	3275.077	3650.432	3549.624	2568.968	1430.694
ENTHALPY KCAL/GFW	-88.271	-79.444	-70.617	-61.789	-52.962	-44.135	-35.308	-26.481	-17.654	-8.827

---COMBUSTION CONDITIONS: THE COMBUSTION PRODUCTS BELOW ARE FROM THE MATERIAL/AIR---
---MIXTURES ABOVE AFTER EXPANDING FROM 1000.00 PSI TO 14.70 PSI---

FLAME TEMP. T(K)	893.438	891.674	887.969	881.418	871.255	901.500	990.149	952.050	648.043	354.473
FLAME TEMP. T(F)	1148.788	1145.613	1138.944	1127.152	1108.860	1163.300	1322.867	1254.289	707.078	178.650
ENTHALPY KCAL/GFW	-121.877	-113.586	-105.733	-98.415	-91.620	-85.284	-79.102	-68.402	-48.519	-27.399
T.VOL.GASES--LITERS (GASES AT STP)	91.273	98.417	107.304	118.680	133.801	156.358	188.105	245.863	375.844	765.784

COMBUSTION PRODUCTS ROUNDED OFF TO 1.00E-04

-----GRAMS PRODUCTS/100 GRAMS (GS/G)MATERIAL BURNED-----

CO2	45.6522	47.9853	51.2182	55.8082	62.4676	71.4409	85.9568	102.6084	102.6033	102.5881
CO	20.7913	21.9905	22.9541	23.4839	23.3372	19.7347	10.5995	0.0001	0.0001	0.0003
N2	18.1093	26.8700	37.8212	51.9012	70.6747	96.9591	136.3857	202.0932	333.5097	727.7579
H2O	7.2370	7.2014	7.2425	7.3962	7.7084	10.6169	16.5150	21.3086	21.3071	21.3026
C$	6.0694	4.9526	3.6879	2.2345	0.5018	0.0000	0.0000	0.0000	0.0001	0.0001
H2	1.3860	1.4014	1.4071	1.3987	1.3711	1.1811	0.5364	0.0000	0.0000	0.0000
CH4	0.7496	0.7038	0.6626	0.6271	0.5978	0.0599	0.0001	0.0001	0.0001	0.0002
NH3	0.0028	0.0032	0.0035	0.0037	0.0040	0.0025	0.0004	0.0001	0.0001	0.0002
N2O5	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0003	0.0004	0.0005	0.0011
N2O4	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0003	0.0005	0.0009
N2O4$	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0003	0.0005	0.0009
N2O4*	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0003	0.0005	0.0009
C4N2	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0004	0.0008
N2O3	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0004	0.0008
C3O2	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0007
NHO3	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0006
NO3	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0006
C5	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0006
C4H10	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003	0.0006
C4H8	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003	0.0006
C2N2	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003	0.0005
C4	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0005
O3	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0005
NHO2	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0005
NO2	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0005
C3H8	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
C2H4O	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
N2O	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
CNHO	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
C3H6	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
N3	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
CNO	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
CN2	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
CN2	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
C2O	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
C2N	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
C3	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
H2O2	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
HO2	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
N2H4	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
N2H4*	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
O2	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	7.3132	42.5673	148.3267
NHO	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
C2H6	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
N2H2	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
CH2O	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
NO	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0019	0.0002	0.0003
NO	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
CHO	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
CHO	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
C2H4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
CNH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
C2H2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
CN	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
CN	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
C2H	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
C2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0002
H3O	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
H2O*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
H2O*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
HO	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
HO	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
NH2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
O	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
CH3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
NH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
CH2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001
N	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001
CH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001
C	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001
C$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001

---LIST OF TOTAL COMBUSTION PRODUCTS CONSIDERED---

CO2	CO	N2	H2O	C$	H2	CH4	NH3	N2O5	N2O4	N2O4$	N2O4*	C4N2	N2O3	C3O2
NHO3	NO3	C5	C4H10	C4H8	C2N2	C4	O3	NHO2	NO2	C3H8	C2H4O	N2O	CNHO	C3H6
N3	CNO	CN2	CN2	C2O	C2N	C3	H2O2	HO2	N2H4	N2H4*	O2	NHO	C2H6	N2H2
CH2O	NO	NO	CHO	CHO	C2H4	CNH	C2H2	CN	CN	C2H	C2	H3O	H2O*	H2O*
HO	HO	NH2	O	CH3	NH	CH2	N	CH	C	C$	H	H		

MATERIAL=OPEN DETONATION - AFX931-M

DETONATION BURN---MATERIAL DETONATES BEFORE REACTING WITH AIR---

	H	C	N	O	AL	CL			
R-45 HTPB (UTC)	0.981	0.654	0.000	0.006	0.000	0.000	7.260	5.	0.0336
DIOCTYL ADIPATE (DO	0.042	0.022	0.000	0.004	0.000	0.000	7.260	-733.	0.0332
(DHE)N,N-B-2-HY-ET-M	0.007	0.004	0.001	0.002	0.000	0.000	0.260	-838.	0.0444
ALUMINUM --AL	0.000	0.000	0.000	0.000	0.001	0.000	15.000	0.	0.0975
RDX -(S)	0.006	0.003	0.006	0.006	0.000	0.000	32.000	72.	0.0656
ALUMINUM PERCHLORATE	0.000	0.000	0.000	0.012	0.001	0.003	37.000	-614.	0.0939
IPDI	0.018	0.012	0.002	0.002	0.000	0.000	1.120	-501.	0.0384
AIR -(G	0.000	0.000	0.006	0.001	0.000	0.000	0.000	0.	0.0000

OGRAM ATOM AMOUNTS FOR MATERIAL WEIGHT OF 99.900 1.0000

0 (H)	(C)	(N)	(O)	(AL)	(CL)	(
2.593414	1.465189	0.876721	2.327577	0.669691	0.341170	

WT. MATERIAL	99.900	89.910	79.920	69.930	59.940	49.950	39.960	29.970	19.980	9.990
WT. AIR	0.000	10.000	20.000	30.000	40.000	50.000	60.000	70.000	80.000	90.000

---COMBUSTION CONDITIONS: AIR IS MIXED WITH THE MATERIAL'S COMBUSTION PRODUCTS AFTER---
---THE MATERIAL HAS EXPLODED. (WT. MATERIAL/WT. AIR IS SHOWN ABOVE)---

FLAME TEMP. T(K)	2145.687	2280.959	2320.046	2321.956	2377.330	2488.145	2603.138	2504.862	1955.110	1203.193
FLAME TEMP. T(F)	3402.837	3646.326	3716.683	3720.120	3819.793	4019.261	4226.248	4049.351	3059.799	1706.348
ENTHALPY KCAL/GFW	-102.236	-91.920	-81.707	-71.494	-61.280	-51.067	-40.854	-30.640	-20.427	-10.213

---COMBUSTION CONDITIONS: THE COMBUSTION PRODUCTS BELOW ARE FROM THE MATERIAL/AIR---
---MIXTURES ABOVE AFTER EXPANDING FROM 1000.00 PSI TO 14.70 PSI---

FLAME TEMP. T(K)	1193.179	1131.335	1126.034	1165.512	1208.574	1252.079	1296.692	1223.545	811.930	430.660
FLAME TEMP. T(F)	1688.322	1577.003	1567.461	1638.522	1716.033	1794.342	1874.646	1742.981	1002.074	315.787
ENTHALPY KCAL/GFW	-147.545	-137.238	-127.635	-118.071	-108.500	-99.015	-89.682	-77.466	-55.528	-31.415
T.VOL.GASES--LITERS (GASES AT STP)	82.949	89.851	98.948	110.324	125.383	146.456	178.056	234.687	364.422	753.260

COMBUSTION PRODUCTS ROUNDED OFF TO 1.00E-04

-----GRAMS PRODUCTS/100 GRAMS (GS/G)MATERIAL BURNED-----

CO	36.1319	38.9250	38.1254	34.8871	30.6138	24.3875	13.9083	0.0001	0.0001	0.0003
Al2O3$	34.1730	34.1727	34.1724	34.1721	34.1716	34.1709	34.1699	34.1682	34.1648	34.1546
HCl	12.4506	12.4503	12.4500	12.4495	12.4489	12.4480	12.4467	12.3286	10.0759	0.4595
N2	12.2909	21.0608	32.0235	46.1183	64.9111	91.2208	130.6851	196.4492	328.0058	722.6488
H2	2.2212	2.1858	2.0889	1.8599	1.5337	1.0927	0.5130	0.0000	0.0000	0.0000
C$	1.9133	0.4742	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001
CO2	0.4803	1.2502	4.5547	9.7202	16.4411	26.2232	42.6863	64.5355	64.5288	64.5085
H2O	0.2268	0.4487	1.5683	3.6789	6.6006	10.5425	15.7231	20.3349	20.8892	23.2602
CH4	0.1020	0.1442	0.0314	0.0030	0.0003	0.0000	0.0000	0.0001	0.0001	0.0002
CNH	0.0021	0.0013	0.0004	0.0001	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
NH3	0.0008	0.0012	0.0013	0.0010	0.0006	0.0003	0.0001	0.0001	0.0001	0.0002
Al2Cl6	0.0003	0.0003	0.0003	0.0004	0.0004	0.0005	0.0007	0.0009	0.0013	0.0027
C2Cl6	0.0002	0.0003	0.0003	0.0003	0.0004	0.0005	0.0006	0.0008	0.0012	0.0024
C2Cl4	0.0002	0.0002	0.0002	0.0002	0.0003	0.0003	0.0004	0.0006	0.0008	0.0017
CCl4	0.0002	0.0002	0.0002	0.0002	0.0003	0.0003	0.0004	0.0005	0.0008	0.0015
AlCl3	0.0001	0.0001	0.0002	0.0002	0.0002	0.0003	0.0003	0.0004	0.0007	0.0013
Al4C3$	0.0001	0.0002	0.0002	0.0002	0.0002	0.0003	0.0004	0.0005	0.0007	0.0014
AlCl3*	0.0001	0.0001	0.0002	0.0002	0.0002	0.0003	0.0003	0.0004	0.0007	0.0013
AlCl3$	0.0001	0.0001	0.0002	0.0002	0.0002	0.0003	0.0003	0.0004	0.0007	0.0013
CHCl3	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0003	0.0004	0.0006	0.0012
CCl3	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0003	0.0004	0.0006	0.0012
NH4O4Cl$	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0003	0.0004	0.0006	0.0012
N2O5	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0003	0.0004	0.0005	0.0011
Al2O3$	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0003	0.0005	0.0010
Al2O3*	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0003	0.0005	0.0010
COCl2	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0003	0.0005	0.0010
AlCl2	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0003	0.0005	0.0010
AlCl2	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0003	0.0005	0.0010
C2Cl2	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0003	0.0005	0.0010
N2O4	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0003	0.0005	0.0009
N2O4$	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0003	0.0005	0.0009
N2O4*	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0003	0.0005	0.0009
OCl2	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0004	0.0009
Al2O2	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0004	0.0009
Al2O2	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0004	0.0009
CH2Cl2	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0004	0.0009
CCl2	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0004	0.0008
NO2Cl	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0004	0.0008
AlOCl	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0004	0.0008
AlOCl$	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0004	0.0008
C4N2	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0004	0.0008
N2O3	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0004	0.0008
Cl2	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0869	2.2955	11.6377
Al2O	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0004	0.0007
Al2O	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0004	0.0007
C3O2	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0007
O2Cl	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0007
NOCl	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0007
COCl	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0006
NHO3	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0006
AlCl	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0006
AlCl	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0006
NO3	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0006
CNCl	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0006
C2HCl	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0006
C5	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0006
AlHO2	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0006
AlO2	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003	0.0006
C4H10	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003	0.0006
C4H8	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003	0.0006
NH4Cl$	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003	0.0005
NH4Cl$	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003	0.0005
HOCl	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0031	0.0058	0.0005
C2N2	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003	0.0005
OCl	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003	0.0005
CH3Cl	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003	0.0005
CHCl	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0005
C4	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0005
O3	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0005
CCl	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0005
NHO2	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0005
NO2	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0005
C3H8	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
C2H4O	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004

N2O	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
AlHO	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
CNHO	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
AlO	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
AlO	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
C3H6	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
N3	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
CNO	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
AlN	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
AlN$	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
CN2	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
CN2	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
C2O	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
AlC	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
C2N	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
C3	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
Cl	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0243	0.0003	0.0004
Cl	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
H2O2	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
HO2	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
N2H4	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
N2H4*	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
O2	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	5.5920	40.3990	144.1624
NHO	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
C2H6	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
N2H2	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
CH2O	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
NO	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0210	0.0008	0.0003
NO	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0003
CHO	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
CHO	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
C2H4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
AlH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
Al	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
Al*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
Al$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
Al*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
C2H2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
CN	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
CN	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
C2H	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0003
C2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0002
H3O	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
H2O*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
H2O*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
HO	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0004	0.0001	0.0002
HO	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
NH2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
O	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
CH3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
NH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
CH2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001
N	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001
CH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001
C	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001
C$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001

---LIST OF TOTAL COMBUSTION PRODUCTS CONSIDERED---

CO	Al2O3$	HCl	N2	H2	C$	CO2	H2O	CH4	CNH	NH3	Al2Cl6	C2Cl6	C2Cl4	CCl4
AlCl3	Al4C3$	AlCl3*	AlCl3$	CHCl3	CCl3	NH4O4C	N2O5	Al2O3$	Al2O3*	COCl2	AlCl2	AlCl2	C2Cl2	N2O4
N2O4$	N2O4*	OCl2	Al2O2	Al2O2	CH2Cl2	CCl2	NO2Cl	AlOCl	AlOCl$	C4N2	N2O3	Cl2	Al2O	Al2O
C3O2	O2Cl	NOCl	COCl	NHO3	AlCl	AlCl	NO3	CNCl	C2HCl	C5	AlHO2	AlO2	C4H10	C4H8
NH4Cl$	NH4Cl$	HOCl	C2N2	OCl	CH3Cl	CHCl	C4	O3	CCl	NHO2	NO2	C3H8	C2H4O	N2O
AlHO	CNHO	AlO	AlO	C3H6	N3	CNO	AlN	AlN$	CN2	CN2	C2O	AlC	C2N	C3
Cl	Cl	H2O2	HO2	N2H4	N2H4*	O2	NHO	C2H6	N2H2	CH2O	NO	NO	CHO	CHO
C2H4	AlH	Al	Al*	Al$	Al*	C2H2	CN	CN	C2H	C2	H3O	H2O*	H2O*	HO
HO	NH2	O	CH3	NH	CH2	N	CH	C	C$	H	H			

INPUFF AND ISCST2 MODEL OUTPUT AND SUPPORTING DOCUMENTATION

Table M-1
TNT-Equivalent Weights of Explosives

Explosive Type	TNT Equivalent Weight Factor
TNT	1.00
Tritonal	1.07
Composition	1.11
HBX-1	1.17
HBX-3	1.14
TNETB	1.36
Composition C-4	1.37
H-6	1.38
Petolite	1.42
PETN	1.27
Nitroglycerine	1.23
RDX-Cyclonite	1.17
Nitromethane	1.00
Ammonium Nitrate	0.84
Black Powder	0.46

Table M-2
Worst Case Meteorological Conditions

Stability Class	10-m Wind Speed (m/s)
A	1.5,2.0,2.5,3.0
B	1.5,2.0,2.5,3.0,3.5,4.0,4.5,5.0
C	1.5,2.0,2.5,3.0,3.5,4.0,4.5,5.0,5.5,6.0,6.5
D	1.5,2.0,2.5,3.0,3.5,4.0,4.5,5.0,5.5,6.0,6.5

TABLE M-3 OD DISPERSION MODELING RECEPTORS RANGE C-52N

Receptor	Receptor Location	Distance from OD Unit (Meters)
1	Gate 1	2,042
2	Gate 3	2,438
3	Gate 6E	4,816
4	Gate 13	4,267
5	Gate 115	2,835
6	Gate 116	1,859
7	Control Tower Building	1,341
8	Closest Hunting/Fishing	4,506
9	Closest Residence	9,656

Table M-4
OB/OD Dispersion Modeling Receptors at Range C-62

Receptor #	Receptor Location	Distance from OB Unit (meters)	Distance from OD Unit (meters)
1	Route 208 (public access)	2045	1970
2	Route 203 (public access)	2758	2848
3	Route 381 (public access)	2727	2864
4	Route 385 (public access)	2727	2727
5	Route 62 (public access)	3485	3485
6	Route 62A (public access)	2818	2848
7	Route 62B (public access)	2667	2727
8	Support Building (military personnel)	1939	2061
9	Closest Hunting/Fishing Location	2253	2253
10	Closest Residence	4506	4506

Table M-5
ISCST2 Model Options

Option	Parameter
Level of Analysis	Screening
Receptor Orientation	Discrete
Calculations	1-hour Average Impacts
Dispersion Coefficients	Rural
Wind Speed Profile	Default (Rural)
Potential Temperature Gradient	Default
Plume Rise Calculation	Final
Building Effect Downwash	No
Meteorology	Simulated, covering the reasonable range of wind speed and stability classes
Calm Hours	Omitted from Calculations

Table M-6
INPUFF Model Options

Option	Parameter
Level of Analysis	Screening
Receptor Orientation	Discrete
Calculations	Maximum 1-Hour Impacts
Dispersion Coefficients	Pasquill Gifford
Meteorology	Simulated, covering the reasonable range of wind speed and stability classes

Table M-7
Normalized 1-Hour Average Air Quality Impacts for OD ($\mu g/m^3$)
Range C-52N

Receptor	Receptor Location	Maximum Concentration	Worst Case Meteorology
1	Gate 1	0.5447	B@ 1.5 m/s
2	Gate 3	0.4376	C@ 1.5 m/s
3	Gate 6E	0.1948	C@ 2.0 m/s
4	Gate 13	0.2360	C@ 2.0 m/s
5	Gate 115	0.3952	C@ 1.5 m/s
6	Gate 116	0.6021	B@ 1.5 m/s
7	Control Tower Building	0.7772	B@ 1.5 m/s
8	Closest Hunting/Fishing	0.2175	C@ 2.0 m/s
9	Closest Residence	0.0728	D@ 3.5 m/s

Table M-8
Normalized 1-Hour Average Air Quality Impacts for OD ($\mu g/m^3$)
Range C2

Receptor #	Receptor Location	Maximum Concentration ($\mu g/m^3$)	Worst Case Meteorology
1	Route 208	32.01	D @ 1.5 m/s
2	Route 203	20.13	D @ 1.5 m/s
3	Route 381	20.48	D @ 1.5 m/s
4	Route 385	20.48	D @ 1.5 m/s
5	Route 62	14.10	D @ 1.5 m/s
6	Route 62A	19.47	D @ 1.5 m/s
7	Route 62B	21.20	D @ 1.5 m/s
8	Support Building	34.76	D @ 1.5 m/s
9	Closet Hunting/Fishing	27.54	D @ 1.5 m/s
10	Closest Residence	9.57	D @ 1.5 m/s

Table M-9
Normalized 1-hr Avg Air Quality Impacts For OD (μ/m^3) Range C-62

Receptor	Receptor Location	Maximum Concentration (μg/m^3)	Worst Case Meteorology
1	Route 208	0.3424	B @ 1.5 m/g
2	Route 203	0.2333	B @ 1.5 m/s
3	Route 381	0.2314	B @ 1.5 m/s
4	Route 385	0.2479	B @ 1.5 m/s
5	Range Gate 62	0.1662	C @ 1.5 m/s
6	Range Gate 62A	0.2333	B @ 1.5 m/s
7	Range Gate 62B	0.2479	B @ 1.5 m/s
8	Support Building	0.3314	B @ 1.5 m/s
9	Closest Hunting/Fishing	0.3076	B @ 1.5 m/s
10	Closest Residence	0.1236	C @ 2.0 m/s

Table M-10

Open Burning (Impulse Cartridges)

Conditions:

- Performed at Range C-62
- 600 Impulse Cartridges/Burn (36.12 lbs combined NEW/burn)
- 100 gallons diesel fuel/burn
- Impulse Cartridges combined NEW is 0.0602 lbs
- One burn/day
- Burn complete in 1 hr

Compound	Emission Factor Gms Product/100 Gms Material Burned	Emission Rate (g/sec)
Carbon Monoxide	1.9517	1.8881
Butane	0.0002	0.0002
Cyanogen	0.0002	0.0002
Ozone	0.0002	0.0002
Nitrogen Dioxide	0.0001	0.0001
Propane	0.0001	0.0001
Acetaldehyde	0.0001	0.0001
Hydrogen Peroxide	0.0001	0.0001
Ammonia	0.0562	0.0544
Hydrazine	0.0002	0.0002
Formaldehyde	0.0001	0.0001
Hydrogen Cyanide	0.0001	0.0001
Cyanide	0.0002	0.0002

Table M-11

Open Burning (M55 20 mm Cartridge)

Conditions:

- Performed at Range C-62
- 40,000 20 mm Ctgs/Burn (3,172 lbs combined NEW/burn)
- 100 gallons diesel fuel/burn
- 20 mm Ctg NEW is 0.0793 lbs
- One burn/day
- Burn complete in 1 hr.

Compound	Emission Factor Gms Product/100 Gms Material Burned	Emission Rate (g/sec)
Barium	4.0712	20.0265
Ammonia	0.0052	0.0256
Nitric Acid	0.0002	0.0010
Butane	0.0002	0.0010
Calcium Oxide	0.0006	0.0030
Cyanogen	0.0002	0.0010
Ozone	0.0002	0.0010
Nitrogen Dioxide	0.0002	0.0010
Propane	0.0001	0.0005
Acetaldehyde	0.0001	0.0005
Hydrogen Peroxide	0.0001	0.0005
Hydrazine	0.0001	0.0010
Hydrogen Cyanide	0.0001	0.0005
Acetylene	0.0001	0.0005
Cyanide	0.0002	0.0010
Carbon Monoxide	34.0225	167.4621
Magnesium Oxide	3.5617	17.5310

TABLE M-12

Open Burning (M97A2 20 mm Cartridges and LUU-2 Flares)

Conditions:

- Performed at Range C-62
- 15,000 M97A2 20 mm Cartridges and 80 LUU-2 Flares (3,337 lbs combined NEW/burn)
- 100 gallons diesel fuel/burn
- LUU-2 Flare combined NEW is 20 lbs and M97A2 20 mm Cartridges combined NEW is 0.1158 lbs
- One burn/day
- Burn complete in 1 hr

Compound	Emission Factor Gms Product/ 100 Gms Material Burned	Emission Rate (g/sec)
Carbon Monoxide	44.8956	173.7460
Butane	0.0002	0.0008
Cyanogen	0.0002	0.0008
Ozone	0.0002	0.0008
Nitrogen Dioxide	0.0002	0.0008
Propane	0.0001	0.0004
Acetaldehyde	0.0001	0.0004
Hydrogen Peroxide	0.0001	0.0004
Ammonia	0.0025	0.0097
Hydrazine	0.0002	0.0008
Formaldehyde	0.0001	0.0004
Hydrogen Cyanide	0.0001	0.0004
Cyanide	0.0002	0.0008
Acetylene	0.0001	0.0004
Aluminum	0.0003	0.00116
Aluminum Oxide	0.0009	0.0035
Magnesium Oxide	7.6222	29.4979
Nitric Acid	0.0002	0.0008
Lead Compounds	0.2459	0.9516
Sodium Hydroxide	0.0004	0.0015

TABLE M-13

Open Burning (M1 Propellant)

Conditions:

- Performed at Range C-62
- 3,000 pounds combined NEW/burn
- One burn/day
- Burn complete in 1 hr.

Compound	Emission Factor Gms Product/100 Gms Material Burned	Emission Rate (g/sec)
Acetaldehyde	0.0001	0.0004
Acetylene	0.0001	0.0004
Ammonia	0.0001	0.0004
Butane	0.0002	0.0008
Carbon Monoxide	6.0098	22.777
Cyanide	0.0002	0.0008
Cyanogen	0.0002	0.0008
Formaldehyde	0.0001	0.0004
Hydrazine	0.0001	0.0004
Hydrogen Cyanide	0.0001	0.0004
Hydrogen Peroxide	0.0001	0.0004
Nitric Acid	0.0002	0.0008
Nitric Oxide	0.0002	0.0008
Nitrogen Dioxide	0.0002	0.0008
Ozone	0.0002	0.0008
Propane	0.0001	0.0004

TABLE M-14

Open Burning (M8 Propellant)

Conditions:

- Performed at Range C-62
- 3,000 pounds combined NEW/burn
- One burn/day
- Burn complete in 1 hr.

Compound	Emission Factor Gms Product/100 Gms Material Burned	Emission Rate (g/sec)
Acetaldehyde	0.0001	0.0004
Acetylene	0.0001	0.0004
Ammonia	0.0001	0.0004
Butane	0.0002	0.0008
Carbon Monoxide	0.0001	0.0004
Cyanide	0.0002	0.0008
Cyanogen	0.0002	0.0008
Formaldehyde	0.0001	0.0004
Hydrazine	0.0002	0.0008
Hydrogen Cyanide	0.0001	0.0004
Hydrogen Peroxide	0.0001	0.0004
Nitric Acid	0.0002	0.0008
Nitrogen Dioxide	0.0003	0.0011
Nitric Oxide	0.0040	0.0152
Ozone	0.0002	0.0008
Propane	0.0001	0.0004
Potassium Cyanide	0.0006	0.0023
Potassium Hydroxide	0.0014	0.0053

TABLE M-15

Open Burning (M15 Propellant)

Conditions:

- Performed at Range C-62
- 3,000 pounds combined NEW/burn
- One burn/day
- Burn complete in 1 hr.

Compound	Emission Factor Gms Product/100 Gms Material Burned	Emission Rate (g/sec)
Acetaldehyde	0.0001	0.0004
Acetylene	0.0001	0.0004
Aluminum	0.0004	0.0015
Aluminum Oxide	0.1144	0.4336
Ammonia	0.0001	0.0004
Butane	0.0002	0.0008
Carbon Monoxide	0.0001	0.0004
Carbonyl Fluoride	0.0002	0.0008
Cyanide	0.0002	0.0008
Cyanogen	0.0002	0.0008
Formaldehyde	0.0001	0.0004
Hydrazine	0.0002	0.0008
Hydrogen Cyanide	0.0001	0.0004
Hydrogen Fluoride	0.1387	0.5257
Hydrogen Peroxide	0.0001	0.0004
Nitric Acid	0.0002	0.0008
Nitric Oxide	0.0039	0.0148
Nitrogen Dioxide	0.0002	0.0008
Ozone	0.0002	0.0008
Propane	0.0001	0.0004
Sodium Hydroxide	0.0005	0.0019

TABLE M-16

Open Detonation (Comp B)

Conditions:

- Performed at Range C-62
- 3,000 pounds combined NEW/detonation
- One detonation/day
- Detonation complete in 1 hr.

Compound	Emission Factor Gms Product/100 Gms Material Detonated	Emission Rate (g/sec)
Carbon Monoxide	0.0001	0.0004
Ammonia	0.0001	0.0004
Nitric Acid	0.0002	0.0008
Butane	0.0002	0.0008
Cyanogen	0.0002	0.0008
Ozone	0.0002	0.0008
Nitrogen Dioxide	0.0002	0.0008
Propane	0.0001	0.0004
Acetaldehyde	0.0001	0.0004
Hydrogen Peroxide	0.0001	0.0004
Hydrazine	0.0002	0.0008
Hydrogen Cyanide	0.0001	0.0004
Acetylene	0.0001	0.0004
Cyanide	0.0002	0.0008
Particulate[1]	0.0	1,700.25

Note:

(1) A factor of 4.5 lbs of airborne particulates per pound of material burned was used (i.e., 4.5 x 3,000 lbs/event = 13,500 lbs/event).

TABLE M-17

Open Detonation (Tritonal)

Conditions (same as Comp B)

Compound	Emission Factor Gms Product/100 Gms Material Detonated)	Emission Rate (g/sec)
Aluminum Oxide	37.7866	142.9580
Carbon Monoxide	37.3449	141.2870
Hydrogen Cyanide	0.0001	0.0004
Acetylene	0.0001	0.0004
Aluminum	0.0004	0.0015
Ammonia	0.0002	0.0008
Butane	0.0002	0.0008
Cyanogen	0.0002	0.0008
Ozone	0.0002	0.0008
Nitrogen Dioxide	0.0002	0.0008
Propane	0.0001	0.0004
Acetaldehyde	0.0001	0.0004
Hydrogen Peroxide	0.0001	0.0004
Hydrazine	0.0002	0.0008
Cyanide	0.0002	0.0008
Particulate[1]	0.0	1,700.25

Note:

(1) A factor of 4.5 lbs of airborne particulates per pound of material burned was used (i.e., 4.5 x 3,000 lbs/event = 13,500 lbs/event).

TABLE M-18

Open Detonation (Octol)

Conditions:

- Performed at Range C-62
- 3,000 lbs combined NEW Octol/Detonation
- One Detonation/day
- Detonation complete in 1 hr.

Compound	Emission Factor Gms Product/100 Gms Material Burned	Emission Rate (g/sec)
Carbon Monoxide	0.0001	0.0004
Butane	0.0002	0.0008
Cyanogen	0.0002	0.0008
Ozone	0.0002	0.0008
Nitrogen Dioxide	0.0002	0.0008
Propane	0.0001	0.0004
Acetaldehyde	0.0001	0.0004
Ammonia	0.0001	0.0004
Hydrazine	0.0002	0.0008
Formaldehyde	0.0001	0.0004
Hydrogen Cyanide	0.0001	0.0004
Cyanide	0.0002	0.0008
Acetylene	0.0001	0.0004
Nitric Acid	0.0002	0.0008
Particulate[1]	0.00	1,700.25

Note:

(1) A factor of 4.5 lbs of airborne particulates per pound of material burned was used (i.e., 4.5 x 3,000 lbs/event = 13,500 lbs/event).

TABLE M-19

Open Detonation (MK 82 Bombs w/4 lbs of C-4)

Conditions:

- Performed at Range C-62
- 15 MK82 Bombs w/4 lbs C-4 explosive
- MK82 Bomb NEW is 192 lbs
- One detonation/day
- Detonation complete in 1 hr.

Compound	Emission Factor Gms Product/100 Gms Material Detonated	Emission Rate (g/sec)
Carbon Monoxide	37.2328	135.5274
Butane	0.0002	0.0007
Cyanogen	0.0002	0.0007
Ozone	0.0002	0.0007
Nitrogen Dioxide	0.0002	0.0007
Propane	0.0001	0.0004
Acetaldehyde	0.0001	0.0004
Hydrogen Peroxide	0.0001	0.0004
Ammonia	0.0002	0.0007
Hydrazine	0.0002	0.0007
Formaldehyde	0.0001	0.0004
Hydrogen Cyanide	0.0001	0.0004
Cyanide	0.0002	0.0007
Acetylene	0.0001	0.0004
Aluminum	0.0004	0.0015
Aluminum Oxide	37.7337	137.3507
Particulate[1]	0.00	1,632.24

Note: A factor of 4.5 lbs of airborne particulates per pound of material burned was used (i.e., 4.5 x 2,880 lbs/event = 12,960 lbs/event).

TABLE M-20

Open Detonation (Pentolite)

Conditions:

- Performed at Range C-62
- 3,000 pounds combined NEW/detonation
- One detonation/day
- Detonation complete in 1 hr.

Compound	Emission Factor Gms Product/100 Gms Material Detonated	Emission Rate (g/sec)
Acetaldehyde	0.0001	0.0004
Acetylene	0.0001	0.0004
Ammonia	0.0001	0.0004
Butane	0.0002	0.0008
Carbon Monoxide	0.0001	0.0004
Cyanide	0.0002	0.0008
Cyanogen	0.0002	0.0008
Formaldehyde	0.0001	0.0004
Hydrazine	0.0002	0.0008
Hydrogen Cyanide	0.0001	0.0004
Hydrogen Peroxide	0.0001	0.0004
Nitric Acid	0.0002	0.0008
Nitric Oxide	0.0020	0.0076
Nitrogen Dioxide	0.0002	0.0008
Ozone	0.0002	0.0008
Propane	0.0001	0.0004
Particulates[1]	0.00	1,700.25

Note:

(1) A factor of 4.5 lbs of airborne particulates per pound of material burned was used (i.e., 4.5 x 3,000 lbs/event = 13,500 lbs/event).

TABLE M-21

Open Detonation (AFX 453)

Conditions:

- Performed at Range C-52N only
- 700 pounds combined NEW/detonation
- One detonation/day
- Detonation complete in 1 hr.
- Six detonations/yr

Compound	Emission Factor Gms Product/100 Gms Material Detonated	Emission Rate (g/sec)
Aluminum Oxide	29.9696	26.4565
Ammonia	0.0001	0.0001
Butane	0.0002	0.0002
Cyanogen	0.0002	0.0002
Ozone	0.0002	0.0002
Carbon Monoxide	0.0001	0.0001
Nitrogen Dioxide	0.0002	0.0002
Propane	0.0001	0.0001
Acetaldehyde	0.0001	0.0001
Hydrogen Cyanide	0.0001	0.0001
Hydrogen Peroxide	0.0001	0.0001
Hydrazine	0.0002	0.0002
Formaldehyde	0.0001	0.0001
Aluminum	0.0004	0.0001
Acetylene	0.0001	0.0001
Cyanide	0.0002	0.0002
Nitric Acid	0.0002	0.0002
Particulate[1]	0.0	396.73

Note:

(1) A factor of 4.5 lbs of airborne particulates per pound of material burned was used (i.e., 4.5 x 700 lbs/event = 3,150 lbs/event).

TABLE M-22

Open Detonation (PBXN 109)

Conditions (same as AFX 453)

Compound	Emission Factor Gms Product/100 Gms Material Detonated	Emission Rate (g/sec)
Aluminum Oxide	37.7860	33.3566
Carbon Monoxide	26.2848	23.2036
Hydrogen Cyanide	0.0001	0.0001
Ammonia	0.0008	0.0007
Acetylene	0.0001	0.0001
Nitric Acid	0.0002	0.0002
Butane	0.0002	0.0002
Cyanogen	0.0002	0.0002
Ozone	0.0002	0.0002
Nitrogen Dioxide	0.0002	0.0002
Propane	0.0001	0.0001
Acetaldehyde	0.0001	0.0001
Hydrogen Peroxide	0.0001	0.0001
Hydrazine	0.0002	0.0002
Formaldehyde	0.0001	0.0001
Aluminum	0.0004	0.0004
Cyanide	0.0002	0.0002
Particulate[1]	0.0	396.73

Note:

(1) A factor of 4.5 lbs of airborne particulates per pound of material burned was used (i.e., 4.5 x 700 lbs/event = 3,150 lbs/event).

TABLE M-23

Open Detonation (AFX931-M)

Conditions:

- Performed at Range C-52N only
- 700 pounds combined NEW/detonation
- One detonation per day
- Detonation complete in 1 hr.
- Six detonations/yr.

Compound	Emission Factor Gms Product/100 Gms Material Burned	Emission Rate (g/sec)
Acetylene	0.0001	0.0001
Aluminum	0.0004	0.0004
Aluminum Oxide	34.1688	30.2052
Ammonia	0.0001	0.0001
Butane	0.0002	0.0002
Carbon Monoxide	0.0001	0.0001
Cyanide	0.0002	0.0002
Cyanogen	0.0002	0.0002
Formaldehyde	0.0001	0.0001
Hydrazine	0.0002	0.0002
Hydrochloric Acid	12.3286	6.8985
Hydrogen Cyanide	0.0001	0.0001
Hydrogen Peroxide	0.0001	0.0001
Nitrogen Dioxide	0.0002	0.0002
Ozone	0.0002	0.0002
Propane	0.0001	0.0001
Particulates[1]	0.00	396.73
Chloroform (trichloromethane)	0.0004	0.0004
Ammonium Chloride	0.0004	0.0004
Carbon Tetrachloride	0.0005	0.0004
Carbonyl Chloride	0.0003	0.0003
Chlorine Dioxide	0.0002	0.0002

Note:

(1) A factor of 4.5 lbs of airborne particulates per pound of material burned was used (i.e., 4.5 x 700 lbs/event = 3,150 lbs/event).

TABLE M-54. Maximum 1-Hr Average Air Quality Impacts for OD (ug/m^3): Range C-62 (Composition B)

Compound	Emission Rate	Receptor - 1 Hour 1	2	3	4	5	6	7	8	9	10
Acetaldehyde	0.0004	0.00014	0.00009	0.00009	0.00010	0.00007	0.00009	0.00010	0.00013	0.00012	0.00005
Acetylene	0.0004	0.00014	0.00009	0.00009	0.00010	0.00007	0.00009	0.00010	0.00013	0.00012	0.00005
Aluminum		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Aluminum Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Ammonia	0.0004	0.00014	0.00009	0.00009	0.00010	0.00007	0.00009	0.00010	0.00013	0.00012	0.00005
Barium		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Butane	0.0008	0.00027	0.00019	0.00019	0.00020	0.00013	0.00019	0.00020	0.00027	0.00025	0.00010
Calcium Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Carbon Monoxide	0.0004	0.00014	0.00009	0.00009	0.00010	0.00007	0.00009	0.00010	0.00013	0.00012	0.00005
Cyanide	0.0008	0.00027	0.00019	0.00019	0.00020	0.00013	0.00019	0.00020	0.00027	0.00025	0.00010
Cyanogen	0.0008	0.00027	0.00019	0.00019	0.00020	0.00013	0.00019	0.00020	0.00027	0.00025	0.00010
Formaldehyde		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Hydrazine	0.0008	0.00027	0.00019	0.00019	0.00020	0.00013	0.00019	0.00020	0.00027	0.00025	0.00010
Hydrogen Cyanide	0.0004	0.00014	0.00009	0.00009	0.00010	0.00007	0.00009	0.00010	0.00013	0.00012	0.00005
Hydrogen Peroxide	0.0004	0.00014	0.00009	0.00009	0.00010	0.00007	0.00009	0.00010	0.00013	0.00012	0.00005
Magnesium Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Nitric Acid	0.0008	0.00027	0.00019	0.00019	0.00020	0.00013	0.00019	0.00020	0.00027	0.00025	0.00010
Nitrogen Dioxide	0.0008	0.00027	0.00019	0.00019	0.00020	0.00013	0.00019	0.00020	0.00027	0.00025	0.00010
Ozone	0.0008	0.00027	0.00019	0.00019	0.00020	0.00013	0.00019	0.00020	0.00027	0.00025	0.00010
Particulate	1,700.25	582.16560	396.66833	393.43785	421.49198	282.58155	396.66833	421.49198	563.46285	522.99690	210.15090
Propane	0.0004	0.00014	0.00009	0.00009	0.00010	0.00007	0.00009	0.00010	0.00013	0.00012	0.00005
Sulfur Dioxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

TABLE M-55. Maximum 3-Hr Average Air Quality Impacts for OD (ug/m^3): Range C-62 (Composition B)

Compound	Emission Rate	Receptor - 3Hour 1	2	3	4	5	6	7	8	9	10
Acetaldehyde	0.0004	0.00012	0.00008	0.00008	0.00009	0.00006	0.00008	0.00009	0.00012	0.00011	0.00004
Acetylene	0.0004	0.00012	0.00008	0.00008	0.00009	0.00006	0.00008	0.00009	0.00012	0.00011	0.00004
Aluminum		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Aluminum Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Ammonia	0.0004	0.00012	0.00008	0.00008	0.00009	0.00006	0.00008	0.00009	0.00012	0.00011	0.00004
Barium		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Butane	0.0008	0.00025	0.00017	0.00017	0.00018	0.00012	0.00017	0.00018	0.00024	0.00022	0.00009
Calcium Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Carbon Monoxide	0.0004	0.00012	0.00008	0.00008	0.00009	0.00006	0.00008	0.00009	0.00012	0.00011	0.00004
Cyanide	0.0008	0.00025	0.00017	0.00017	0.00018	0.00012	0.00017	0.00018	0.00024	0.00022	0.00009
Cyanogen	0.0008	0.00025	0.00017	0.00017	0.00018	0.00012	0.00017	0.00018	0.00024	0.00022	0.00009
Formaldehyde		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Hydrazine	0.0008	0.00025	0.00017	0.00017	0.00018	0.00012	0.00017	0.00018	0.00024	0.00022	0.00009
Hydrogen Cyanide	0.0004	0.00012	0.00008	0.00008	0.00009	0.00006	0.00008	0.00009	0.00012	0.00011	0.00004
Hydrogen Peroxide	0.0004	0.00012	0.00008	0.00008	0.00009	0.00006	0.00008	0.00009	0.00012	0.00011	0.00004
Magnesium Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Nitric Acid	0.0008	0.00025	0.00017	0.00017	0.00018	0.00012	0.00017	0.00018	0.00024	0.00022	0.00009
Nitrogen Dioxide	0.0008	0.00025	0.00017	0.00017	0.00018	0.00012	0.00017	0.00018	0.00024	0.00022	0.00009
Ozone	0.0008	0.00025	0.00017	0.00017	0.00018	0.00012	0.00017	0.00018	0.00024	0.00022	0.00009
Particulate	1,700.25	523.94904	357.00149	354.09407	379.34278	254.32340	357.00149	379.34278	507.11657	470.69721	189.13581
Propane	0.0004	0.00012	0.00008	0.00008	0.00009	0.00006	0.00008	0.00009	0.00012	0.00011	0.00004
Sulfur Dioxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

TABLE M-56. Maximum 8-Hr Average Air Quality Impacts for OD (ug/m^3): Range C-62 (Composition B)

Compound	Emission Rate	Receptor - 8 Hour 1	2	3	4	5	6	7	8	9	10
Acetaldehyde	0.0004	0.00010	0.00007	0.00006	0.00007	0.00005	0.00007	0.00007	0.00009	0.00009	0.00003
Acetylene	0.0004	0.00010	0.00007	0.00006	0.00007	0.00005	0.00007	0.00007	0.00009	0.00009	0.00003
Aluminum		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Aluminum Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Ammonia	0.0004	0.00010	0.00007	0.00006	0.00007	0.00005	0.00007	0.00007	0.00009	0.00009	0.00003
Barium		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Butane	0.0008	0.00019	0.00013	0.00013	0.00014	0.00009	0.00013	0.00014	0.00019	0.00017	0.00007
Calcium Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Carbon Monoxide	0.0004	0.00010	0.00007	0.00006	0.00007	0.00005	0.00007	0.00007	0.00009	0.00009	0.00003
Cyanide	0.0008	0.00019	0.00013	0.00013	0.00014	0.00009	0.00013	0.00014	0.00019	0.00017	0.00007
Cyanogen	0.0008	0.00019	0.00013	0.00013	0.00014	0.00009	0.00013	0.00014	0.00019	0.00017	0.00007
Formaldehyde		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Hydrazine	0.0008	0.00019	0.00013	0.00013	0.00014	0.00009	0.00013	0.00014	0.00019	0.00017	0.00007
Hydrogen Cyanide	0.0004	0.00010	0.00007	0.00006	0.00007	0.00005	0.00007	0.00007	0.00009	0.00009	0.00003
Hydrogen Peroxide	0.0004	0.00010	0.00007	0.00006	0.00007	0.00005	0.00007	0.00007	0.00009	0.00009	0.00003
Magnesium Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Nitric Acid	0.0008	0.00019	0.00013	0.00013	0.00014	0.00009	0.00013	0.00014	0.00019	0.00017	0.00007
Nitrogen Dioxide	0.0008	0.00019	0.00013	0.00013	0.00014	0.00009	0.00013	0.00014	0.00019	0.00017	0.00007
Ozone	0.0008	0.00019	0.00013	0.00013	0.00014	0.00009	0.00013	0.00014	0.00019	0.00017	0.00007
Particulate	1,700.25	407.51592	277.66783	275.40650	295.04438	197.80709	277.66783	295.04438	394.42399	366.09783	147.10563
Propane	0.0004	0.00010	0.00007	0.00006	0.00007	0.00005	0.00007	0.00007	0.00009	0.00009	0.00003
Sulfur Dioxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

TABLE M-57. Maximum 24-Hr Average Air Quality Impacts for OD (ug/m^3): Range C-62 (Composition B)

Compound	Emission Rate	Receptor- 24 Hour 1	2	3	4	5	6	7	8	9	10
Acetaldehyde	0.0004	0.00005	0.00004	0.00004	0.00004	0.00003	0.00004	0.00004	0.00005	0.00005	0.00002
Acetylene	0.0004	0.00005	0.00004	0.00004	0.00004	0.00003	0.00004	0.00004	0.00005	0.00005	0.00002
Aluminum		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Aluminum Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Ammonia	0.0004	0.00005	0.00004	0.00004	0.00004	0.00003	0.00004	0.00004	0.00005	0.00005	0.00002
Barium		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Butane	0.0008	0.00011	0.00007	0.00007	0.00008	0.00005	0.00007	0.00008	0.00011	0.00010	0.00004
Calcium Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Carbon Monoxide	0.0004	0.00005	0.00004	0.00004	0.00004	0.00003	0.00004	0.00004	0.00005	0.00005	0.00002
Cyanide	0.0008	0.00011	0.00007	0.00007	0.00008	0.00005	0.00007	0.00008	0.00011	0.00010	0.00004
Cyanogen	0.0008	0.00011	0.00007	0.00007	0.00008	0.00005	0.00007	0.00008	0.00011	0.00010	0.00004
Formaldehyde		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Hydrazine	0.0008	0.00011	0.00007	0.00007	0.00008	0.00005	0.00007	0.00008	0.00011	0.00010	0.00004
Hydrogen Cyanide	0.0004	0.00005	0.00004	0.00004	0.00004	0.00003	0.00004	0.00004	0.00005	0.00005	0.00002
Hydrogen Peroxide	0.0004	0.00005	0.00004	0.00004	0.00004	0.00003	0.00004	0.00004	0.00005	0.00005	0.00002
Magnesium Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Nitric Acid	0.0008	0.00011	0.00007	0.00007	0.00008	0.00005	0.00007	0.00008	0.00011	0.00010	0.00004
Nitrogen Dioxide	0.0008	0.00011	0.00007	0.00007	0.00008	0.00005	0.00007	0.00008	0.00011	0.00010	0.00004
Ozone	0.0008	0.00011	0.00007	0.00007	0.00008	0.00005	0.00007	0.00008	0.00011	0.00010	0.00004
Particulate	1,700.25	232.86624	158.66733	157.37514	168.59679	113.03262	158.66733	168.59679	225.38514	209.19876	84.06036
Propane	0.0004	0.00005	0.00004	0.00004	0.00004	0.00003	0.00004	0.00004	0.00005	0.00005	0.00002
Sulfur Dioxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

TABLE M-58. Maximum Annual Average Air Quality Impacts for OD (ug/m^3): Range C-62 (Composition B)

Compound	Emission Rate	Receptor - Annual 1	2	3	4	5	6	7	8	9	10
Acetaldehyde	0.0004	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00000
Acetylene	0.0004	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00000
Aluminum		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Aluminum Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Ammonia	0.0004	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00000
Barium		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Butane	0.0008	0.00002	0.00001	0.00001	0.00002	0.00001	0.00001	0.00002	0.00002	0.00002	0.00001
Calcium Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Carbon Monoxide	0.0004	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00000
Cyanide	0.0008	0.00002	0.00001	0.00001	0.00002	0.00001	0.00001	0.00002	0.00002	0.00002	0.00001
Cyanogen	0.0008	0.00002	0.00001	0.00001	0.00002	0.00001	0.00001	0.00002	0.00002	0.00002	0.00001
Formaldehyde		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Hydrazine	0.0008	0.00002	0.00001	0.00001	0.00002	0.00001	0.00001	0.00002	0.00002	0.00002	0.00001
Hydrogen Cyanide	0.0004	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00000
Hydrogen Peroxide	0.0004	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00000
Magnesium Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Nitric Acid	0.0008	0.00002	0.00001	0.00001	0.00002	0.00001	0.00001	0.00002	0.00002	0.00002	0.00001
Nitrogen Dioxide	0.0008	0.00002	0.00001	0.00001	0.00002	0.00001	0.00001	0.00002	0.00002	0.00002	0.00001
Ozone	0.0008	0.00002	0.00001	0.00001	0.00002	0.00001	0.00001	0.00002	0.00002	0.00002	0.00001
Particulate	1,700.25	46.57325	31.73347	31.47503	33.71936	22.60652	31.73347	33.71936	45.07703	41.83975	16.81207
Propane	0.0004	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00000
Sulfur Dioxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

TABLE M-59. Maximum 1-Hr Average Air Quality Imapcts for OD (ug/m^3): Range C-62 (Tritonal)

Compound	Emission Rate	Receptor - 1 Hour 1	2	3	4	5	6	7	8	9	10
Acetaldehyde	0.0004	0.00014	0.00009	0.00009	0.00010	0.00006	0.00009	0.00010	0.00013	0.00012	0.00005
Acetylene	0.0004	0.00014	0.00009	0.00009	0.00010	0.00006	0.00009	0.00010	0.00013	0.00012	0.00005
Aluminum	0.0015	0.00051	0.00035	0.00035	0.00037	0.00024	0.00035	0.00037	0.00050	0.00046	0.00019
Aluminum Oxide	142.9580	48.94882	33.35210	33.08048	35.43929	23.18779	33.35210	35.43929	47.37628	43.97388	17.66961
Ammonia	0.0008	0.00027	0.00019	0.00019	0.00020	0.00013	0.00019	0.00020	0.00027	0.00025	0.00010
Barium		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Butane	0.0008	0.00027	0.00019	0.00019	0.00020	0.00013	0.00019	0.00020	0.00027	0.00025	0.00010
Calcium Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Carbon Monoxide	141.2870	48.37667	32.96226	32.69381	35.02505	22.91675	32.96226	35.02505	46.82251	43.45988	17.46307
Cyanide	0.0008	0.00027	0.00019	0.00019	0.00020	0.00013	0.00019	0.00020	0.00027	0.00025	0.00010
Cyanogen	0.0008	0.00027	0.00019	0.00019	0.00020	0.00013	0.00019	0.00020	0.00027	0.00025	0.00010
Formaldehyde		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Hydrazine	0.0008	0.00027	0.00019	0.00019	0.00020	0.00013	0.00019	0.00020	0.00027	0.00025	0.00010
Hydrogen Cyanide	0.0004	0.00014	0.00009	0.00009	0.00010	0.00006	0.00009	0.00010	0.00013	0.00012	0.00005
Hydrogen Peroxide	0.0004	0.00014	0.00009	0.00009	0.00010	0.00006	0.00009	0.00010	0.00013	0.00012	0.00005
Magnesium Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Nitric Acid		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Nitrogen Dioxide	0.0008	0.00027	0.00019	0.00019	0.00020	0.00013	0.00019	0.00020	0.00027	0.00025	0.00010
Ozone	0.0008	0.00027	0.00019	0.00019	0.00020	0.00013	0.00019	0.00020	0.00027	0.00025	0.00010
Particulate	1,700.2500	582.16560	396.66833	393.43785	421.49198	275.78055	396.66833	421.49198	563.46285	522.99690	210.15090
Propane	0.0004	0.00014	0.00009	0.00009	0.00010	0.00006	0.00009	0.00010	0.00013	0.00012	0.00005
Sulfur Dioxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

TABLE M-60. Maximum 3-Hr Average Air Quality Imapcts for OD (ug/m^3): Range C-62 (Tritonal)

Compound	Emission Rate	Receptor - 3 Hour 1	2	3	4	5	6	7	8	9	10
Acetaldehyde	0.0004	0.00012	0.00008	0.00008	0.00009	0.00006	0.00008	0.00009	0.00012	0.00011	0.00004
Acetylene	0.0004	0.00012	0.00008	0.00008	0.00009	0.00006	0.00008	0.00009	0.00012	0.00011	0.00004
Aluminum	0.0015	0.00046	0.00031	0.00031	0.00033	0.00022	0.00031	0.00033	0.00045	0.00042	0.00017
Aluminum Oxide	142.9580	44.05394	30.01689	29.77243	31.89536	20.86901	30.01689	31.89536	42.63865	39.57649	15.90265
Ammonia	0.0008	0.00025	0.00017	0.00017	0.00018	0.00012	0.00017	0.00018	0.00024	0.00022	0.00009
Barium		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Butane	0.0008	0.00025	0.00017	0.00017	0.00018	0.00012	0.00017	0.00018	0.00024	0.00022	0.00009
Calcium Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Carbon Monoxide	141.2870	43.53900	29.66603	29.42443	31.52254	20.62508	29.66603	31.52254	42.14026	39.11389	15.71677
Cyanide	0.0008	0.00025	0.00017	0.00017	0.00018	0.00012	0.00017	0.00018	0.00024	0.00022	0.00009
Cyanogen	0.0008	0.00025	0.00017	0.00017	0.00018	0.00012	0.00017	0.00018	0.00024	0.00022	0.00009
Formaldehyde		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Hydrazine	0.0008	0.00025	0.00017	0.00017	0.00018	0.00012	0.00017	0.00018	0.00024	0.00022	0.00009
Hydrogen Cyanide	0.0004	0.00012	0.00008	0.00008	0.00009	0.00006	0.00008	0.00009	0.00012	0.00011	0.00004
Hydrogen Peroxide	0.0004	0.00012	0.00008	0.00008	0.00009	0.00006	0.00008	0.00009	0.00012	0.00011	0.00004
Magnesium Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Nitric Acid		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Nitrogen Dioxide	0.0008	0.00025	0.00017	0.00017	0.00018	0.00012	0.00017	0.00018	0.00024	0.00022	0.00009
Ozone	0.0008	0.00025	0.00017	0.00017	0.00018	0.00012	0.00017	0.00018	0.00024	0.00022	0.00009
Particulate	1,700.2500	523.94904	357.00149	354.09407	379.34278	248.20250	357.00149	379.34278	507.11657	470.69721	189.13581
Propane	0.0004	0.00012	0.00008	0.00008	0.00009	0.00006	0.00008	0.00009	0.00012	0.00011	0.00004
Sulfur Dioxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

TABLE M-61. Maximum 8-Hr Average Air Quality Imapcts for OD (ug/m^3): Range C-62 (Tritonal)

Compound	Emission Rate	Receptor - 8 Hour 1	2	3	4	5	6	7	8	9	10
Acetaldehyde	0.0004	0.00010	0.00007	0.00006	0.00007	0.00005	0.00007	0.00007	0.00009	0.00009	0.00003
Acetylene	0.0004	0.00010	0.00007	0.00006	0.00007	0.00005	0.00007	0.00007	0.00009	0.00009	0.00003
Aluminum	0.0015	0.00036	0.00024	0.00024	0.00026	0.00017	0.00024	0.00026	0.00035	0.00032	0.00013
Aluminum Oxide	142.9580	34.26417	23.34647	23.15634	24.80750	16.23145	23.34647	24.80750	33.16340	30.78172	12.36873
Ammonia	0.0008	0.00019	0.00013	0.00013	0.00014	0.00009	0.00013	0.00014	0.00019	0.00017	0.00007
Barium		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Butane	0.0008	0.00019	0.00013	0.00013	0.00014	0.00009	0.00013	0.00014	0.00019	0.00017	0.00007
Calcium Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Carbon Monoxide	141.2870	33.86367	23.07358	22.88567	24.51753	16.04173	23.07358	24.51753	32.77576	30.42192	12.22415
Cyanide	0.0008	0.00019	0.00013	0.00013	0.00014	0.00009	0.00013	0.00014	0.00019	0.00017	0.00007
Cyanogen	0.0008	0.00019	0.00013	0.00013	0.00014	0.00009	0.00013	0.00014	0.00019	0.00017	0.00007
Formaldehyde		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Hydrazine	0.0008	0.00019	0.00013	0.00013	0.00014	0.00009	0.00013	0.00014	0.00019	0.00017	0.00007
Hydrogen Cyanide	0.0004	0.00010	0.00007	0.00006	0.00007	0.00005	0.00007	0.00007	0.00009	0.00009	0.00003
Hydrogen Peroxide	0.0004	0.00010	0.00007	0.00006	0.00007	0.00005	0.00007	0.00007	0.00009	0.00009	0.00003
Magnesium Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Nitric Acid		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Nitrogen Dioxide	0.0008	0.00019	0.00013	0.00013	0.00014	0.00009	0.00013	0.00014	0.00019	0.00017	0.00007
Ozone	0.0008	0.00019	0.00013	0.00013	0.00014	0.00009	0.00013	0.00014	0.00019	0.00017	0.00007
Particulate	1,700.2500	407.51592	277.66783	275.40650	295.04438	193.04639	277.66783	295.04438	394.42399	366.09783	147.10563
Propane	0.0004	0.00010	0.00007	0.00006	0.00007	0.00005	0.00007	0.00007	0.00009	0.00009	0.00003
Sulfur Dioxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

TABLE M-62. Maximum 24-Hr Average Air Quality Imapcts for OD (ug/m^3): Range C-62 (Tritonal)

Compound	Emission Rate	Receptor - 24 Hour 1	2	3	4	5	6	7	8	9	10
Acetaldehyde	0.0004	0.00005	0.00004	0.00004	0.00004	0.00003	0.00004	0.00004	0.00005	0.00005	0.00002
Acetylene	0.0004	0.00005	0.00004	0.00004	0.00004	0.00003	0.00004	0.00004	0.00005	0.00005	0.00002
Aluminum	0.0015	0.00021	0.00014	0.00014	0.00015	0.00010	0.00014	0.00015	0.00020	0.00018	0.00007
Aluminum Oxide	142.9580	19.57953	13.34084	13.23219	14.17572	9.27512	13.34084	14.17572	18.95051	17.58955	7.06784
Ammonia	0.0008	0.00011	0.00007	0.00007	0.00008	0.00005	0.00007	0.00008	0.00011	0.00010	0.00004
Barium		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Butane	0.0008	0.00011	0.00007	0.00007	0.00008	0.00005	0.00007	0.00008	0.00011	0.00010	0.00004
Calcium Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Carbon Monoxide	141.2870	19.35067	13.18490	13.07752	14.01002	9.16670	13.18490	14.01002	18.72900	17.38395	6.98523
Cyanide	0.0008	0.00011	0.00007	0.00007	0.00008	0.00005	0.00007	0.00008	0.00011	0.00010	0.00004
Cyanogen	0.0008	0.00011	0.00007	0.00007	0.00008	0.00005	0.00007	0.00008	0.00011	0.00010	0.00004
Formaldehyde		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Hydrazine	0.0008	0.00011	0.00007	0.00007	0.00008	0.00005	0.00007	0.00008	0.00011	0.00010	0.00004
Hydrogen Cyanide	0.0004	0.00005	0.00004	0.00004	0.00004	0.00003	0.00004	0.00004	0.00005	0.00005	0.00002
Hydrogen Peroxide	0.0004	0.00005	0.00004	0.00004	0.00004	0.00003	0.00004	0.00004	0.00005	0.00005	0.00002
Magnesium Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Nitric Acid		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Nitrogen Dioxide	0.0008	0.00011	0.00007	0.00007	0.00008	0.00005	0.00007	0.00008	0.00011	0.00010	0.00004
Ozone	0.0008	0.00011	0.00007	0.00007	0.00008	0.00005	0.00007	0.00008	0.00011	0.00010	0.00004
Particulate	1,700.2500	232.86624	158.66733	157.37514	168.59679	110.31222	158.66733	168.59679	225.38514	209.19876	84.06036
Propane	0.0004	0.00005	0.00004	0.00004	0.00004	0.00003	0.00004	0.00004	0.00005	0.00005	0.00002
Sulfur Dioxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

TABLE M-63. Maximum Annual Average Air Quality Imapcts for OD (ug/m^3): Range C-62 (Tritonal)

Compound	Emission Rate	Receptor - Annual 1	2	3	4	5	6	7	8	9	10
Acetaldehyde	0.0004	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00000
Acetylene	0.0004	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00000
Aluminum	0.0015	0.00004	0.00003	0.00003	0.00003	0.00002	0.00003	0.00003	0.00004	0.00004	0.00001
Aluminum Oxide	142.9580	3.91591	2.66817	2.64644	2.83514	1.85502	2.66817	2.83514	3.79010	3.51791	1.41357
Ammonia	0.0008	0.00002	0.00001	0.00001	0.00002	0.00001	0.00001	0.00002	0.00002	0.00002	0.00001
Barium		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Butane	0.0008	0.00002	0.00001	0.00001	0.00002	0.00001	0.00001	0.00002	0.00002	0.00002	0.00001
Calcium Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Carbon Monoxide	141.2870	3.87013	2.63698	2.61550	2.80200	1.83334	2.63698	2.80200	3.74580	3.47679	1.39705
Cyanide	0.0008	0.00002	0.00001	0.00001	0.00002	0.00001	0.00001	0.00002	0.00002	0.00002	0.00001
Cyanogen	0.0008	0.00002	0.00001	0.00001	0.00002	0.00001	0.00001	0.00002	0.00002	0.00002	0.00001
Formaldehyde		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Hydrazine	0.0008	0.00002	0.00001	0.00001	0.00002	0.00001	0.00001	0.00002	0.00002	0.00002	0.00001
Hydrogen Cyanide	0.0004	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00000
Hydrogen Peroxide	0.0004	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00000
Magnesium Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Nitric Acid		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Nitrogen Dioxide	0.0008	0.00002	0.00001	0.00001	0.00002	0.00001	0.00001	0.00002	0.00002	0.00002	0.00001
Ozone	0.0008	0.00002	0.00001	0.00001	0.00002	0.00001	0.00001	0.00002	0.00002	0.00002	0.00001
Particulate	1,700.2500	46.57325	31.73347	31.47503	33.71936	22.06244	31.73347	33.71936	45.07703	41.83975	16.81207
Propane	0.0004	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00000
Sulfur Dioxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

TABLE M-64. Maximum 1-Hr Average Air Quality Impacts for OD (ug/m^3): Range C-62 (Octol)

Compound	Emission Rate	Receptor - 1 Hour 1	2	3	4	5	6	7	8	9	10
Acetaldehyde	0.0004	0.00014	0.00009	0.00009	0.00010	0.00007	0.00009	0.00010	0.00013	0.00012	0.00005
Acetylene	0.0004	0.00014	0.00009	0.00009	0.00010	0.00007	0.00009	0.00010	0.00013	0.00012	0.00005
Aluminum		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Aluminum Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Ammonia	0.0004	0.00014	0.00009	0.00009	0.00010	0.00007	0.00009	0.00010	0.00013	0.00012	0.00005
Barium		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Butane	0.0008	0.00027	0.00019	0.00019	0.00020	0.00013	0.00019	0.00020	0.00027	0.00025	0.00010
Calcium Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Carbon Monoxide	0.0004	0.00014	0.00009	0.00009	0.00010	0.00007	0.00009	0.00010	0.00013	0.00012	0.00005
Cyanide	0.0008	0.00027	0.00019	0.00019	0.00020	0.00013	0.00019	0.00020	0.00027	0.00025	0.00010
Cyanogen	0.0008	0.00027	0.00019	0.00019	0.00020	0.00013	0.00019	0.00020	0.00027	0.00025	0.00010
Formaldehyde	0.0004	0.00014	0.00009	0.00009	0.00010	0.00007	0.00009	0.00010	0.00013	0.00012	0.00005
Hydrazine	0.0008	0.00027	0.00019	0.00019	0.00020	0.00013	0.00019	0.00020	0.00027	0.00025	0.00010
Hydrogen Cyanide	0.0004	0.00014	0.00009	0.00009	0.00010	0.00007	0.00009	0.00010	0.00013	0.00012	0.00005
Hydrogen Peroxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Magnesium Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Nitric Acid	0.0008	0.00027	0.00019	0.00019	0.00020	0.00013	0.00019	0.00020	0.00027	0.00025	0.00010
Nitrogen Dioxide	0.0008	0.00027	0.00019	0.00019	0.00020	0.00013	0.00019	0.00020	0.00027	0.00025	0.00010
Ozone	0.0008	0.00027	0.00019	0.00019	0.00020	0.00013	0.00019	0.00020	0.00027	0.00025	0.00010
Particulate	1,700.2500	582.16560	396.66833	393.43785	421.49198	282.58155	396.66833	421.49198	563.46285	522.99690	210.15090
Propane	0.0004	0.00014	0.00009	0.00009	0.00010	0.00007	0.00009	0.00010	0.00013	0.00012	0.00005
Sulfur Dioxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

TABLE M-65. Maximum 3-Hr Average Air Quality Impacts for OD (ug/m^3): Range C-62 (Octol)

Compound	Emission Rate	Receptor - 3 Hour 1	2	3	4	5	6	7	8	9	10
Acetaldehyde	0.0004	0.00012	0.00008	0.00008	0.00009	0.00006	0.00008	0.00009	0.00012	0.00011	0.00004
Acetylene	0.0004	0.00012	0.00008	0.00008	0.00009	0.00006	0.00008	0.00009	0.00012	0.00011	0.00004
Aluminum		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Aluminum Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Ammonia	0.0004	0.00012	0.00008	0.00008	0.00009	0.00006	0.00008	0.00009	0.00012	0.00011	0.00004
Barium		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Butane	0.0008	0.00025	0.00017	0.00017	0.00018	0.00012	0.00017	0.00018	0.00024	0.00022	0.00009
Calcium Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Carbon Monoxide	0.0004	0.00012	0.00008	0.00008	0.00009	0.00006	0.00008	0.00009	0.00012	0.00011	0.00004
Cyanide	0.0008	0.00025	0.00017	0.00017	0.00018	0.00012	0.00017	0.00018	0.00024	0.00022	0.00009
Cyanogen	0.0008	0.00025	0.00017	0.00017	0.00018	0.00012	0.00017	0.00018	0.00024	0.00022	0.00009
Formaldehyde	0.0004	0.00012	0.00008	0.00008	0.00009	0.00006	0.00008	0.00009	0.00012	0.00011	0.00004
Hydrazine	0.0008	0.00025	0.00017	0.00017	0.00018	0.00012	0.00017	0.00018	0.00024	0.00022	0.00009
Hydrogen Cyanide	0.0004	0.00012	0.00008	0.00008	0.00009	0.00006	0.00008	0.00009	0.00012	0.00011	0.00004
Hydrogen Peroxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Magnesium Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Nitric Acid	0.0008	0.00025	0.00017	0.00017	0.00018	0.00012	0.00017	0.00018	0.00024	0.00022	0.00009
Nitrogen Dioxide	0.0008	0.00025	0.00017	0.00017	0.00018	0.00012	0.00017	0.00018	0.00024	0.00022	0.00009
Ozone	0.0008	0.00025	0.00017	0.00017	0.00018	0.00012	0.00017	0.00018	0.00024	0.00022	0.00009
Particulate	1,700.2500	523.94904	357.00149	354.09407	379.34278	254.32340	357.00149	379.34278	507.11657	470.69721	189.13581
Propane	0.0004	0.00012	0.00008	0.00008	0.00009	0.00006	0.00008	0.00009	0.00012	0.00011	0.00004
Sulfur Dioxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

TABLE M-66. Maximum 8-Hr Average Air Quality Impacts for OD (ug/m^3): Range C-62 (Octol)

Compound	Emission Rate	Receptor- 8 Hour 1	2	3	4	5	6	7	8	9	10
Acetaldehyde	0.0004	0.00010	0.00007	0.00006	0.00007	0.00005	0.00007	0.00007	0.00009	0.00009	0.00003
Acetylene	0.0004	0.00010	0.00007	0.00006	0.00007	0.00005	0.00007	0.00007	0.00009	0.00009	0.00003
Aluminum		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Aluminum Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Ammonia	0.0004	0.00010	0.00007	0.00006	0.00007	0.00005	0.00007	0.00007	0.00009	0.00009	0.00003
Barium		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Butane	0.0008	0.00019	0.00013	0.00013	0.00014	0.00009	0.00013	0.00014	0.00019	0.00017	0.00007
Calcium Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Carbon Monoxide	0.0004	0.00010	0.00007	0.00006	0.00007	0.00005	0.00007	0.00007	0.00009	0.00009	0.00003
Cyanide	0.0008	0.00019	0.00013	0.00013	0.00014	0.00009	0.00013	0.00014	0.00019	0.00017	0.00007
Cyanogen	0.0008	0.00019	0.00013	0.00013	0.00014	0.00009	0.00013	0.00014	0.00019	0.00017	0.00007
Formaldehyde	0.0004	0.00010	0.00007	0.00006	0.00007	0.00005	0.00007	0.00007	0.00009	0.00009	0.00003
Hydrazine	0.0008	0.00019	0.00013	0.00013	0.00014	0.00009	0.00013	0.00014	0.00019	0.00017	0.00007
Hydrogen Cyanide	0.0004	0.00010	0.00007	0.00006	0.00007	0.00005	0.00007	0.00007	0.00009	0.00009	0.00003
Hydrogen Peroxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Magnesium Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Nitric Acid	0.0008	0.00019	0.00013	0.00013	0.00014	0.00009	0.00013	0.00014	0.00019	0.00017	0.00007
Nitrogen Dioxide	0.0008	0.00019	0.00013	0.00013	0.00014	0.00009	0.00013	0.00014	0.00019	0.00017	0.00007
Ozone	0.0008	0.00019	0.00013	0.00013	0.00014	0.00009	0.00013	0.00014	0.00019	0.00017	0.00007
Particulate	1,700.2500	407.51592	277.66783	275.40650	295.04438	197.80709	277.66783	295.04438	394.42399	366.09783	147.10563
Propane	0.0004	0.00010	0.00007	0.00006	0.00007	0.00005	0.00007	0.00007	0.00009	0.00009	0.00003
Sulfur Dioxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

TABLE M-67. Maximum 24-Hr Average Air Quality Impacts for OD (ug/m^3): Range C-62 (Octol)

Compound	Emission Rate	Receptor- 24 Hour 1	2	3	4	5	6	7	8	9	10
Acetaldehyde	0.0004	0.00005	0.00004	0.00004	0.00004	0.00003	0.00004	0.00004	0.00005	0.00005	0.00002
Acetylene	0.0004	0.00005	0.00004	0.00004	0.00004	0.00003	0.00004	0.00004	0.00005	0.00005	0.00002
Aluminum		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Aluminum Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Ammonia	0.0004	0.00005	0.00004	0.00004	0.00004	0.00003	0.00004	0.00004	0.00005	0.00005	0.00002
Barium		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Butane	0.0008	0.00011	0.00007	0.00007	0.00008	0.00005	0.00007	0.00008	0.00011	0.00010	0.00004
Calcium Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Carbon Monoxide	0.0004	0.00005	0.00004	0.00004	0.00004	0.00003	0.00004	0.00004	0.00005	0.00005	0.00002
Cyanide	0.0008	0.00011	0.00007	0.00007	0.00008	0.00005	0.00007	0.00008	0.00011	0.00010	0.00004
Cyanogen	0.0008	0.00011	0.00007	0.00007	0.00008	0.00005	0.00007	0.00008	0.00011	0.00010	0.00004
Formaldehyde	0.0004	0.00005	0.00004	0.00004	0.00004	0.00003	0.00004	0.00004	0.00005	0.00005	0.00002
Hydrazine	0.0008	0.00011	0.00007	0.00007	0.00008	0.00005	0.00007	0.00008	0.00011	0.00010	0.00004
Hydrogen Cyanide	0.0004	0.00005	0.00004	0.00004	0.00004	0.00003	0.00004	0.00004	0.00005	0.00005	0.00002
Hydrogen Peroxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Magnesium Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Nitric Acid	0.0008	0.00011	0.00007	0.00007	0.00008	0.00005	0.00007	0.00008	0.00011	0.00010	0.00004
Nitrogen Dioxide	0.0008	0.00011	0.00007	0.00007	0.00008	0.00005	0.00007	0.00008	0.00011	0.00010	0.00004
Ozone	0.0008	0.00011	0.00007	0.00007	0.00008	0.00005	0.00007	0.00008	0.00011	0.00010	0.00004
Particulate	1,700.2500	232.86624	158.66733	157.37514	168.59679	113.03262	158.66733	168.59679	225.38514	209.19876	84.06036
Propane	0.0004	0.00005	0.00004	0.00004	0.00004	0.00003	0.00004	0.00004	0.00005	0.00005	0.00002
Sulfur Dioxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

TABLE M-68. Maximum Annual Average Air Quality Impacts for OD (ug/m^3): Range C-62 (Octol)

Compound	Emission Rate	Receptor - Annual 1	2	3	4	5	6	7	8	9	10
Acetaldehyde	0.0004	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00000
Acetylene	0.0004	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00000
Aluminum		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Aluminum Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Ammonia	0.0004	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00000
Barium		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Butane	0.0008	0.00002	0.00001	0.00001	0.00002	0.00001	0.00001	0.00002	0.00002	0.00002	0.00001
Calcium Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Carbon Monoxide	0.0004	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00000
Cyanide	0.0008	0.00002	0.00001	0.00001	0.00002	0.00001	0.00001	0.00002	0.00002	0.00002	0.00001
Cyanogen	0.0008	0.00002	0.00001	0.00001	0.00002	0.00001	0.00001	0.00002	0.00002	0.00002	0.00001
Formaldehyde	0.0004	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00000
Hydrazine	0.0008	0.00002	0.00001	0.00001	0.00002	0.00001	0.00001	0.00002	0.00002	0.00002	0.00001
Hydrogen Cyanide	0.0004	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00000
Hydrogen Peroxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Magnesium Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Nitric Acid	0.0008	0.00002	0.00001	0.00001	0.00002	0.00001	0.00001	0.00002	0.00002	0.00002	0.00001
Nitrogen Dioxide	0.0008	0.00002	0.00001	0.00001	0.00002	0.00001	0.00001	0.00002	0.00002	0.00002	0.00001
Ozone	0.0008	0.00002	0.00001	0.00001	0.00002	0.00001	0.00001	0.00002	0.00002	0.00002	0.00001
Particulate	1,700.2500	46.57325	31.73347	31.47503	33.71936	22.60652	31.73347	33.71936	45.07703	41.83975	16.81207
Propane	0.0004	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00000
Sulfur Dioxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

TABLE M-69. Maximum 1-Hr Average Air Quality Impacts for OD (ug/m^3): Range C-62 (MK82B/C-4E)

Compound	Emission Rate	Receptor - 1 Hour 1	2	3	4	5	6	7	8	9	10
Acetaldehyde	0.0004	0.00014	0.00009	0.00009	0.00010	0.00007	0.00009	0.00010	0.00013	0.00012	0.00005
Acetylene	0.0004	0.00014	0.00009	0.00009	0.00010	0.00007	0.00009	0.00010	0.00013	0.00012	0.00005
Aluminum	0.0015	0.00051	0.00035	0.00035	0.00037	0.00025	0.00035	0.00037	0.00050	0.00046	0.00019
Aluminum Oxide	137.3507	47.02888	32.04392	31.78295	34.04924	22.82769	32.04392	34.04924	45.51802	42.24908	16.97655
Ammonia	0.0007	0.00024	0.00016	0.00016	0.00017	0.00012	0.00016	0.00017	0.00023	0.00022	0.00009
Barium		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Butane	0.0007	0.00024	0.00016	0.00016	0.00017	0.00012	0.00016	0.00017	0.00023	0.00022	0.00009
Calcium Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Carbon Monoxide	135.5274	46.40458	31.61854	31.36104	33.59724	22.52465	31.61854	33.59724	44.91378	41.68823	16.75119
Cyanide	0.0007	0.00024	0.00016	0.00016	0.00017	0.00012	0.00016	0.00017	0.00023	0.00022	0.00009
Cyanogen	0.0007	0.00024	0.00016	0.00016	0.00017	0.00012	0.00016	0.00017	0.00023	0.00022	0.00009
Formaldehyde	0.0004	0.00014	0.00009	0.00009	0.00010	0.00007	0.00009	0.00010	0.00013	0.00012	0.00005
Hydrazine	0.0007	0.00024	0.00016	0.00016	0.00017	0.00012	0.00016	0.00017	0.00023	0.00022	0.00009
Hydrogen Cyanide	0.0004	0.00014	0.00009	0.00009	0.00010	0.00007	0.00009	0.00010	0.00013	0.00012	0.00005
Hydrogen Peroxide	0.0004	0.00014	0.00009	0.00009	0.00010	0.00007	0.00009	0.00010	0.00013	0.00012	0.00005
Magnesium Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Nitric Acid		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Nitrogen Dioxide	0.0007	0.00024	0.00016	0.00016	0.00017	0.00012	0.00016	0.00017	0.00023	0.00022	0.00009
Ozone	0.0007	0.00024	0.00016	0.00016	0.00017	0.00012	0.00016	0.00017	0.00023	0.00022	0.00009
Particulate	1,632.2400	558.87898	380.80159	377.70034	404.63230	271.27829	380.80159	404.63230	540.92434	502.07702	201.74486
Propane	0.0004	0.00014	0.00009	0.00009	0.00010	0.00007	0.00009	0.00010	0.00013	0.00012	0.00005
Sulfur Dioxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

TABLE M-70. Maximum 3-Hr Average Air Quality Impacts for OD (ug/m^3): Range C-62 (MK82B/C-4E)

Compound	Emission Rate	Receptor - 3 Hour 1	2	3	4	5	6	7	8	9	10
Acetaldehyde	0.0004	0.00012	0.00008	0.00008	0.00009	0.00006	0.00008	0.00009	0.00012	0.00011	0.00004
Acetylene	0.0004	0.00012	0.00008	0.00008	0.00009	0.00006	0.00008	0.00009	0.00012	0.00011	0.00004
Aluminum	0.0015	0.00046	0.00031	0.00031	0.00033	0.00022	0.00031	0.00033	0.00045	0.00042	0.00017
Aluminum Oxide	137.3507	42.32599	28.83953	28.60466	30.64431	20.54492	28.83953	30.64431	40.96622	38.02417	15.27889
Ammonia	0.0007	0.00022	0.00015	0.00015	0.00016	0.00010	0.00015	0.00016	0.00021	0.00019	0.00008
Barium		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Butane	0.0007	0.00022	0.00015	0.00015	0.00016	0.00010	0.00015	0.00016	0.00021	0.00019	0.00008
Calcium Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Carbon Monoxide	135.5274	41.76412	28.45669	28.22494	30.23752	20.27219	28.45669	30.23752	40.42240	37.51941	15.07607
Cyanide	0.0007	0.00022	0.00015	0.00015	0.00016	0.00010	0.00015	0.00016	0.00021	0.00019	0.00008
Cyanogen	0.0007	0.00022	0.00015	0.00015	0.00016	0.00010	0.00015	0.00016	0.00021	0.00019	0.00008
Formaldehyde	0.0004	0.00012	0.00008	0.00008	0.00009	0.00006	0.00008	0.00009	0.00012	0.00011	0.00004
Hydrazine	0.0007	0.00022	0.00015	0.00015	0.00016	0.00010	0.00015	0.00016	0.00021	0.00019	0.00008
Hydrogen Cyanide	0.0004	0.00012	0.00008	0.00008	0.00009	0.00006	0.00008	0.00009	0.00012	0.00011	0.00004
Hydrogen Peroxide	0.0004	0.00012	0.00008	0.00008	0.00009	0.00006	0.00008	0.00009	0.00012	0.00011	0.00004
Magnesium Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Nitric Acid		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Nitrogen Dioxide	0.0007	0.00022	0.00015	0.00015	0.00016	0.00010	0.00015	0.00016	0.00021	0.00019	0.00008
Ozone	0.0007	0.00022	0.00015	0.00015	0.00016	0.00010	0.00015	0.00016	0.00021	0.00019	0.00008
Particulate	1,632.2400	502.99108	342.72143	339.93030	364.16907	244.15046	342.72143	364.16907	486.83190	451.86932	181.57038
Propane	0.0004	0.00012	0.00008	0.00008	0.00009	0.00006	0.00008	0.00009	0.00012	0.00011	0.00004
Sulfur Dioxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

TABLE M-71. Maximum 8-Hr Average Air Quality Impacts for OD (ug/m^3): Range C-62 (MK82B/C-4E)

Compound	Emission Rate	Receptor- 8 Hour 1	2	3	4	5	6	7	8	9	10
Acetaldehyde	0.0004	0.00010	0.00007	0.00006	0.00007	0.00005	0.00007	0.00007	0.00009	0.00009	0.00003
Acetylene	0.0004	0.00010	0.00007	0.00006	0.00007	0.00005	0.00007	0.00007	0.00009	0.00009	0.00003
Aluminum	0.0015	0.00036	0.00024	0.00024	0.00026	0.00017	0.00024	0.00026	0.00035	0.00032	0.00013
Aluminum Oxide	137.3507	32.92022	22.43074	22.24807	23.83447	15.97938	22.43074	23.83447	31.86262	29.57435	11.88358
Ammonia	0.0007	0.00017	0.00011	0.00011	0.00012	0.00008	0.00011	0.00012	0.00016	0.00015	0.00006
Barium		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Butane	0.0007	0.00017	0.00011	0.00011	0.00012	0.00008	0.00011	0.00012	0.00016	0.00015	0.00006
Calcium Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Carbon Monoxide	135.5274	32.48321	22.13298	21.95273	23.51807	15.76726	22.13298	23.51807	31.43965	29.18176	11.72583
Cyanide	0.0007	0.00017	0.00011	0.00011	0.00012	0.00008	0.00011	0.00012	0.00016	0.00015	0.00006
Cyanogen	0.0007	0.00017	0.00011	0.00011	0.00012	0.00008	0.00011	0.00012	0.00016	0.00015	0.00006
Formaldehyde	0.0004	0.00010	0.00007	0.00006	0.00007	0.00005	0.00007	0.00007	0.00009	0.00009	0.00003
Hydrazine	0.0007	0.00017	0.00011	0.00011	0.00012	0.00008	0.00011	0.00012	0.00016	0.00015	0.00006
Hydrogen Cyanide	0.0004	0.00010	0.00007	0.00006	0.00007	0.00005	0.00007	0.00007	0.00009	0.00009	0.00003
Hydrogen Peroxide	0.0004	0.00010	0.00007	0.00006	0.00007	0.00005	0.00007	0.00007	0.00009	0.00009	0.00003
Magnesium Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Nitric Acid		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Nitrogen Dioxide	0.0007	0.00017	0.00011	0.00011	0.00012	0.00008	0.00011	0.00012	0.00016	0.00015	0.00006
Ozone	0.0007	0.00017	0.00011	0.00011	0.00012	0.00008	0.00011	0.00012	0.00016	0.00015	0.00006
Particulate	1,632.2400	391.21528	266.56111	264.39024	283.24261	189.89480	266.56111	283.24261	378.64704	351.45392	141.22140
Propane	0.0004	0.00010	0.00007	0.00006	0.00007	0.00005	0.00007	0.00007	0.00009	0.00009	0.00003
Sulfur Dioxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

TABLE M-72. Maximum 24-Hr Average Air Quality Impacts for OD (ug/m^3): Range C-62 (MK82B/C-4E)

Compound	Emission Rate	Receptor- 24 Hour 1	2	3	4	5	6	7	8	9	10
Acetaldehyde	0.0004	0.00005	0.00004	0.00004	0.00004	0.00003	0.00004	0.00004	0.00005	0.00005	0.00002
Acetylene	0.0004	0.00005	0.00004	0.00004	0.00004	0.00003	0.00004	0.00004	0.00005	0.00005	0.00002
Aluminum	0.0015	0.00021	0.00014	0.00014	0.00015	0.00010	0.00014	0.00015	0.00020	0.00018	0.00007
Aluminum Oxide	137.3507	18.81155	12.81757	12.71318	13.61970	9.13107	12.81757	13.61970	18.20721	16.89963	6.79062
Ammonia	0.0007	0.00010	0.00007	0.00006	0.00007	0.00005	0.00007	0.00007	0.00009	0.00009	0.00003
Barium		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Butane	0.0007	0.00010	0.00007	0.00006	0.00007	0.00005	0.00007	0.00007	0.00009	0.00009	0.00003
Calcium Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Carbon Monoxide	135.5274	18.56183	12.64742	12.54442	13.43890	9.00986	12.64742	13.43890	17.96551	16.67529	6.70047
Cyanide	0.0007	0.00010	0.00007	0.00006	0.00007	0.00005	0.00007	0.00007	0.00009	0.00009	0.00003
Cyanogen	0.0007	0.00010	0.00007	0.00006	0.00007	0.00005	0.00007	0.00007	0.00009	0.00009	0.00003
Formaldehyde	0.0004	0.00005	0.00004	0.00004	0.00004	0.00003	0.00004	0.00004	0.00005	0.00005	0.00002
Hydrazine	0.0007	0.00010	0.00007	0.00006	0.00007	0.00005	0.00007	0.00007	0.00009	0.00009	0.00003
Hydrogen Cyanide	0.0004	0.00005	0.00004	0.00004	0.00004	0.00003	0.00004	0.00004	0.00005	0.00005	0.00002
Hydrogen Peroxide	0.0004	0.00005	0.00004	0.00004	0.00004	0.00003	0.00004	0.00004	0.00005	0.00005	0.00002
Magnesium Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Nitric Acid		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Nitrogen Dioxide	0.0007	0.00010	0.00007	0.00006	0.00007	0.00005	0.00007	0.00007	0.00009	0.00009	0.00003
Ozone	0.0007	0.00010	0.00007	0.00006	0.00007	0.00005	0.00007	0.00007	0.00009	0.00009	0.00003
Particulate	1,632.2400	223.55159	152.32064	151.08013	161.85292	108.51132	152.32064	161.85292	216.36973	200.83081	80.69795
Propane	0.0004	0.00005	0.00004	0.00004	0.00004	0.00003	0.00004	0.00004	0.00005	0.00005	0.00002
Sulfur Dioxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

TABLE M-73. Maximum Annual Average Air Quality Impacts for OD (ug/m^3): Range C-62 (MK82B/C-4E)

Compound	Emission Rate	Receptor - Annual 1	2	3	4	5	6	7	8	9	10
Acetaldehyde	0.0004	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00000
Acetylene	0.0004	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00000
Aluminum	0.0015	0.00004	0.00003	0.00003	0.00003	0.00002	0.00003	0.00003	0.00004	0.00004	0.00001
Aluminum Oxide	137.3507	3.76231	2.56351	2.54264	2.72394	1.82621	2.56351	2.72394	3.64144	3.37993	1.35812
Ammonia	0.0007	0.00002	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00002	0.00002	0.00001
Barium		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Butane	0.0007	0.00002	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00002	0.00002	0.00001
Calcium Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Carbon Monoxide	135.5274	3.71237	2.52948	2.50888	2.68778	1.80197	2.52948	2.68778	3.59310	3.33506	1.34009
Cyanide	0.0007	0.00002	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00002	0.00002	0.00001
Cyanogen	0.0007	0.00002	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00002	0.00002	0.00001
Formaldehyde	0.0004	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00000
Hydrazine	0.0007	0.00002	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00002	0.00002	0.00001
Hydrogen Cyanide	0.0004	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00000
Hydrogen Peroxide	0.0004	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00000
Magnesium Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Nitric Acid		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Nitrogen Dioxide	0.0007	0.00002	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00002	0.00002	0.00001
Ozone	0.0007	0.00002	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00002	0.00002	0.00001
Particulate	1,632.2400	44.71032	30.46413	30.21603	32.37058	21.70226	30.46413	32.37058	43.27395	40.16616	16.13959
Propane	0.0004	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00000
Sulfur Dioxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

TABLE M-74. Maximum 1-Hr Average Air Quality Impacts for OD (ug/m^3): Range C-62 (Pentolite)

Compound	Emission Rate	Receptor - 1 Hour 1	2	3	4	5	6	7	8	9	10
Acetaldehyde	0.0004	0.00014	0.00009	0.00009	0.00010	0.00007	0.00009	0.00010	0.00013	0.00012	0.00005
Acetylene	0.0004	0.00014	0.00009	0.00009	0.00010	0.00007	0.00009	0.00010	0.00013	0.00012	0.00005
Aluminum		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Aluminum Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Ammonia	0.0004	0.00014	0.00009	0.00009	0.00010	0.00007	0.00009	0.00010	0.00013	0.00012	0.00005
Barium		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Butane	0.0008	0.00027	0.00019	0.00019	0.00020	0.00013	0.00019	0.00020	0.00027	0.00025	0.00010
Calcium Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Carbon Monoxide	0.0004	0.00014	0.00009	0.00009	0.00010	0.00007	0.00009	0.00010	0.00013	0.00012	0.00005
Cyanide	0.0008	0.00027	0.00019	0.00019	0.00020	0.00013	0.00019	0.00020	0.00027	0.00025	0.00010
Cyanogen	0.0008	0.00027	0.00019	0.00019	0.00020	0.00013	0.00019	0.00020	0.00027	0.00025	0.00010
Formaldehyde	0.0004	0.00014	0.00009	0.00009	0.00010	0.00007	0.00009	0.00010	0.00013	0.00012	0.00005
Hydrazine	0.0008	0.00027	0.00019	0.00019	0.00020	0.00013	0.00019	0.00020	0.00027	0.00025	0.00010
Hydrogen Cyanide	0.0004	0.00014	0.00009	0.00009	0.00010	0.00007	0.00009	0.00010	0.00013	0.00012	0.00005
Hydrogen Peroxide	0.0004	0.00014	0.00009	0.00009	0.00010	0.00007	0.00009	0.00010	0.00013	0.00012	0.00005
Lead Compounds		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Magnesium Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Nitric Acid	0.0008	0.00027	0.00019	0.00019	0.00020	0.00013	0.00019	0.00020	0.00027	0.00025	0.00010
Nitrogen Dioxide	0.0008	0.00027	0.00019	0.00019	0.00020	0.00013	0.00019	0.00020	0.00027	0.00025	0.00010
Ozone	0.0008	0.00027	0.00019	0.00019	0.00020	0.00013	0.00019	0.00020	0.00027	0.00025	0.00010
Propane	0.0004	0.00014	0.00009	0.00009	0.00010	0.00007	0.00009	0.00010	0.00013	0.00012	0.00005
Particulate	1,700.2500	582.16560	396.66833	393.43785	421.49198	282.58155	396.66833	421.49198	563.46285	522.99690	210.15090
Sodium Hydroxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Sulfur Dioxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Nitric Oxide	0.0076	0.00260	0.00177	0.00176	0.00188	0.00126	0.00177	0.00188	0.00252	0.00234	0.00094

TABLE M-75. Maximum 3-Hr Average Air Quality Impacts for OD (ug/m^3): Range C-62 (Pentolite)

Compound	Emission Rate	Receptor - 3 Hour 1	2	3	4	5	6	7	8	9	10
Acetaldehyde	0.0004	0.00012	0.00008	0.00008	0.00009	0.00006	0.00008	0.00009	0.00012	0.00011	0.00004
Acetylene	0.0004	0.00012	0.00008	0.00008	0.00009	0.00006	0.00008	0.00009	0.00012	0.00011	0.00004
Aluminum		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Aluminum Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Ammonia	0.0004	0.00012	0.00008	0.00008	0.00009	0.00006	0.00008	0.00009	0.00012	0.00011	0.00004
Barium		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Butane	0.0008	0.00025	0.00017	0.00017	0.00018	0.00012	0.00017	0.00018	0.00024	0.00022	0.00009
Calcium Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Carbon Monoxide	0.0004	0.00012	0.00008	0.00008	0.00009	0.00006	0.00008	0.00009	0.00012	0.00011	0.00004
Cyanide	0.0008	0.00025	0.00017	0.00017	0.00018	0.00012	0.00017	0.00018	0.00024	0.00022	0.00009
Cyanogen	0.0008	0.00025	0.00017	0.00017	0.00018	0.00012	0.00017	0.00018	0.00024	0.00022	0.00009
Formaldehyde	0.0004	0.00012	0.00008	0.00008	0.00009	0.00006	0.00008	0.00009	0.00012	0.00011	0.00004
Hydrazine	0.0008	0.00025	0.00017	0.00017	0.00018	0.00012	0.00017	0.00018	0.00024	0.00022	0.00009
Hydrogen Cyanide	0.0004	0.00012	0.00008	0.00008	0.00009	0.00006	0.00008	0.00009	0.00012	0.00011	0.00004
Hydrogen Peroxide	0.0004	0.00012	0.00008	0.00008	0.00009	0.00006	0.00008	0.00009	0.00012	0.00011	0.00004
Lead Compounds		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Magnesium Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Nitric Acid	0.0008	0.00025	0.00017	0.00017	0.00018	0.00012	0.00017	0.00018	0.00024	0.00022	0.00009
Nitrogen Dioxide	0.0008	0.00025	0.00017	0.00017	0.00018	0.00012	0.00017	0.00018	0.00024	0.00022	0.00009
Ozone	0.0008	0.00025	0.00017	0.00017	0.00018	0.00012	0.00017	0.00018	0.00024	0.00022	0.00009
Propane	0.0004	0.00012	0.00008	0.00008	0.00009	0.00006	0.00008	0.00009	0.00012	0.00011	0.00004
Particulate	1,700.2500	523.94904	357.00149	354.09407	379.34278	254.32340	357.00149	379.34278	507.11657	470.69721	189.13581
Sodium Hydroxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Sulfur Dioxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Nitric Oxide	0.0076	0.00234	0.00160	0.00158	0.00170	0.00114	0.00160	0.00170	0.00227	0.00210	0.00085

TABLE M-76. Maximum 8-Hr Average Air Quality Impacts for OD (ug/m^3): Range C-62 (Pentolite)

Compound	Emission Rate	Receptor- 8 Hour 1	2	3	4	5	6	7	8	9	10
Acetaldehyde	0.0004	0.00010	0.00007	0.00006	0.00007	0.00005	0.00007	0.00007	0.00009	0.00009	0.00003
Acetylene	0.0004	0.00010	0.00007	0.00006	0.00007	0.00005	0.00007	0.00007	0.00009	0.00009	0.00003
Aluminum		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Aluminum Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Ammonia	0.0004	0.00010	0.00007	0.00006	0.00007	0.00005	0.00007	0.00007	0.00009	0.00009	0.00003
Barium		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Butane	0.0008	0.00019	0.00013	0.00013	0.00014	0.00009	0.00013	0.00014	0.00019	0.00017	0.00007
Calcium Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Carbon Monoxide	0.0004	0.00010	0.00007	0.00006	0.00007	0.00005	0.00007	0.00007	0.00009	0.00009	0.00003
Cyanide	0.0008	0.00019	0.00013	0.00013	0.00014	0.00009	0.00013	0.00014	0.00019	0.00017	0.00007
Cyanogen	0.0008	0.00019	0.00013	0.00013	0.00014	0.00009	0.00013	0.00014	0.00019	0.00017	0.00007
Formaldehyde	0.0004	0.00010	0.00007	0.00006	0.00007	0.00005	0.00007	0.00007	0.00009	0.00009	0.00003
Hydrazine	0.0008	0.00019	0.00013	0.00013	0.00014	0.00009	0.00013	0.00014	0.00019	0.00017	0.00007
Hydrogen Cyanide	0.0004	0.00010	0.00007	0.00006	0.00007	0.00005	0.00007	0.00007	0.00009	0.00009	0.00003
Hydrogen Peroxide	0.0004	0.00010	0.00007	0.00006	0.00007	0.00005	0.00007	0.00007	0.00009	0.00009	0.00003
Lead Compounds		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Magnesium Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Nitric Acid	0.0008	0.00019	0.00013	0.00013	0.00014	0.00009	0.00013	0.00014	0.00019	0.00017	0.00007
Nitrogen Dioxide	0.0008	0.00019	0.00013	0.00013	0.00014	0.00009	0.00013	0.00014	0.00019	0.00017	0.00007
Ozone	0.0008	0.00019	0.00013	0.00013	0.00014	0.00009	0.00013	0.00014	0.00019	0.00017	0.00007
Propane	0.0004	0.00010	0.00007	0.00006	0.00007	0.00005	0.00007	0.00007	0.00009	0.00009	0.00003
Particulate	1,700.2500	407.51592	277.66783	275.40650	295.04438	197.80709	277.66783	295.04438	394.42399	366.09783	147.10563
Sodium Hydroxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Sulfur Dioxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Nitric Oxide	0.0076	0.00182	0.00124	0.00123	0.00132	0.00088	0.00124	0.00132	0.00176	0.00164	0.00066

TABLE M-77. Maximum 24-Hr Average Air Quality Impacts for OD (ug/m^3): Range C-62 (Pentolite)

Compound	Emission Rate	Receptor- 24 Hour 1	2	3	4	5	6	7	8	9	10
Acetaldehyde	0.0004	0.00005	0.00004	0.00004	0.00004	0.00003	0.00004	0.00004	0.00005	0.00005	0.00002
Acetylene	0.0004	0.00005	0.00004	0.00004	0.00004	0.00003	0.00004	0.00004	0.00005	0.00005	0.00002
Aluminum		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Aluminum Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Ammonia	0.0004	0.00005	0.00004	0.00004	0.00004	0.00003	0.00004	0.00004	0.00005	0.00005	0.00002
Barium		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Butane	0.0008	0.00011	0.00007	0.00007	0.00008	0.00005	0.00007	0.00008	0.00011	0.00010	0.00004
Calcium Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Carbon Monoxide	0.0004	0.00005	0.00004	0.00004	0.00004	0.00003	0.00004	0.00004	0.00005	0.00005	0.00002
Cyanide	0.0008	0.00011	0.00007	0.00007	0.00008	0.00005	0.00007	0.00008	0.00011	0.00010	0.00004
Cyanogen	0.0008	0.00011	0.00007	0.00007	0.00008	0.00005	0.00007	0.00008	0.00011	0.00010	0.00004
Formaldehyde	0.0004	0.00005	0.00004	0.00004	0.00004	0.00003	0.00004	0.00004	0.00005	0.00005	0.00002
Hydrazine	0.0008	0.00011	0.00007	0.00007	0.00008	0.00005	0.00007	0.00008	0.00011	0.00010	0.00004
Hydrogen Cyanide	0.0004	0.00005	0.00004	0.00004	0.00004	0.00003	0.00004	0.00004	0.00005	0.00005	0.00002
Hydrogen Peroxide	0.0004	0.00005	0.00004	0.00004	0.00004	0.00003	0.00004	0.00004	0.00005	0.00005	0.00002
Lead Compounds		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Magnesium Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Nitric Acid	0.0008	0.00011	0.00007	0.00007	0.00008	0.00005	0.00007	0.00008	0.00011	0.00010	0.00004
Nitrogen Dioxide	0.0008	0.00011	0.00007	0.00007	0.00008	0.00005	0.00007	0.00008	0.00011	0.00010	0.00004
Ozone	0.0008	0.00011	0.00007	0.00007	0.00008	0.00005	0.00007	0.00008	0.00011	0.00010	0.00004
Propane	0.0004	0.00005	0.00004	0.00004	0.00004	0.00003	0.00004	0.00004	0.00005	0.00005	0.00002
Particulate	1,700.2500	232.86624	158.66733	157.37514	168.59679	113.03262	158.66733	168.59679	225.38514	209.19876	84.06036
Sodium Hydroxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Sulfur Dioxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Nitric Oxide	0.0076	0.00104	0.00071	0.00070	0.00075	0.00051	0.00071	0.00075	0.00101	0.00094	0.00038

TABLE M-78. Maximum Annual Average Air Quality Impacts for OD (ug/m^3): Range C-62 (Pentolite)

Compound	Emission Rate	Receptor - Annual 1	2	3	4	5	6	7	8	9	10
Acetaldehyde	0.0004	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00000
Acetylene	0.0004	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00000
Aluminum		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Aluminum Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Ammonia	0.0004	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00000
Barium		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Butane	0.0008	0.00002	0.00001	0.00001	0.00002	0.00001	0.00001	0.00002	0.00002	0.00002	0.00001
Calcium Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Carbon Monoxide	0.0004	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00000
Cyanide	0.0008	0.00002	0.00001	0.00001	0.00002	0.00001	0.00001	0.00002	0.00002	0.00002	0.00001
Cyanogen	0.0008	0.00002	0.00001	0.00001	0.00002	0.00001	0.00001	0.00002	0.00002	0.00002	0.00001
Formaldehyde	0.0004	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00000
Hydrazine	0.0008	0.00002	0.00001	0.00001	0.00002	0.00001	0.00001	0.00002	0.00002	0.00002	0.00001
Hydrogen Cyanide	0.0004	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00000
Hydrogen Peroxide	0.0004	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00000
Lead Compounds		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Magnesium Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Nitric Acid	0.0008	0.00002	0.00001	0.00001	0.00002	0.00001	0.00001	0.00002	0.00002	0.00002	0.00001
Nitrogen Dioxide	0.0008	0.00002	0.00001	0.00001	0.00002	0.00001	0.00001	0.00002	0.00002	0.00002	0.00001
Ozone	0.0008	0.00002	0.00001	0.00001	0.00002	0.00001	0.00001	0.00002	0.00002	0.00002	0.00001
Propane	0.0004	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00000
Particulate	1,700.2500	46.57325	31.73347	31.47503	33.71936	22.60652	31.73347	33.71936	45.07703	41.83975	16.81207
Sodium Hydroxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Sulfur Dioxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Nitric Oxide	0.0076	0.00021	0.00014	0.00014	0.00015	0.00010	0.00014	0.00015	0.00020	0.00019	0.00008

TABLE M-79. Maximum 1-Hr Average Air Quality Impacts for OD (ug/m^3): Range C-52N (AFX453)

Compound	Emission Rate	Receptor - 1 Hour 1	2	3	4	5	6	7	8	9
Acetaldehyde	0.0001	0.00005	0.00004	0.00002	0.00002	0.00004	0.00006	0.00008	0.00002	0.00001
Acetylene	0.0001	0.00005	0.00004	0.00002	0.00002	0.00004	0.00006	0.00008	0.00002	0.00001
Aluminum	0.0001	0.00005	0.00004	0.00002	0.00002	0.00004	0.00006	0.00008	0.00002	0.00001
Aluminum Oxide	26.4565	14.41086	11.57736	5.15373	6.24373	10.37095	15.92946	20.56199	5.75429	1.92603
Ammonia	0.0001	0.00005	0.00004	0.00002	0.00002	0.00004	0.00006	0.00008	0.00002	0.00001
Barium		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Butane	0.0002	0.00011	0.00009	0.00004	0.00005	0.00008	0.00012	0.00016	0.00004	0.00001
Calcium Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Carbon Monoxide	0.0001	0.00005	0.00004	0.00002	0.00002	0.00004	0.00006	0.00008	0.00002	0.00001
Cyanide	0.0002	0.00011	0.00009	0.00004	0.00005	0.00008	0.00012	0.00016	0.00004	0.00001
Cyanogen	0.0002	0.00011	0.00009	0.00004	0.00005	0.00008	0.00012	0.00016	0.00004	0.00001
Formaldehyde	0.0001	0.00005	0.00004	0.00002	0.00002	0.00004	0.00006	0.00008	0.00002	0.00001
Hydrazine	0.0002	0.00011	0.00009	0.00004	0.00005	0.00008	0.00012	0.00016	0.00004	0.00001
Hydrogen Cyanide	0.0001	0.00005	0.00004	0.00002	0.00002	0.00004	0.00006	0.00008	0.00002	0.00001
Hydrogen Peroxide	0.0001	0.00005	0.00004	0.00002	0.00002	0.00004	0.00006	0.00008	0.00002	0.00001
Magnesium Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Nitric Acid	0.0002	0.00011	0.00009	0.00004	0.00005	0.00008	0.00012	0.00016	0.00004	0.00001
Nitrogen Dioxide	0.0002	0.00011	0.00009	0.00004	0.00005	0.00008	0.00012	0.00016	0.00004	0.00001
Ozone	0.0002	0.00011	0.00009	0.00004	0.00005	0.00008	0.00012	0.00016	0.00004	0.00001
Particulate	396.7300	216.09883	173.60905	77.28300	93.62828	155.51816	238.87113	308.33856	86.28878	28.88194
Propane	0.0001	0.00005	0.00004	0.00002	0.00002	0.00004	0.00006	0.00008	0.00002	0.00001
Sulfur Dioxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

TABLE M-80. Maximum 3-Hr Average Air Quality Impacts for OD (ug/m^3): Range C-52N (AFX453)

Compound	Emission Rate	Receptor - 3 Hour 1	2	3	4	5	6	7	8	9
Acetaldehyde	0.0001	0.00005	0.00004	0.00002	0.00002	0.00004	0.00005	0.00007	0.00002	0.00001
Acetylene	0.0001	0.00005	0.00004	0.00002	0.00002	0.00004	0.00005	0.00007	0.00002	0.00001
Aluminum	0.0001	0.00005	0.00004	0.00002	0.00002	0.00004	0.00005	0.00007	0.00002	0.00001
Aluminum Oxide	26.4565	12.96977	10.41963	4.63835	5.61936	9.33385	14.33651	18.50579	5.17886	1.73343
Ammonia	0.0001	0.00005	0.00004	0.00002	0.00002	0.00004	0.00005	0.00007	0.00002	0.00001
Barium		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Butane	0.0002	0.00010	0.00008	0.00004	0.00004	0.00007	0.00011	0.00014	0.00004	0.00001
Calcium Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Carbon Monoxide	0.0001	0.00005	0.00004	0.00002	0.00002	0.00004	0.00005	0.00007	0.00002	0.00001
Cyanide	0.0002	0.00010	0.00008	0.00004	0.00004	0.00007	0.00011	0.00014	0.00004	0.00001
Cyanogen	0.0002	0.00010	0.00008	0.00004	0.00004	0.00007	0.00011	0.00014	0.00004	0.00001
Formaldehyde	0.0001	0.00005	0.00004	0.00002	0.00002	0.00004	0.00005	0.00007	0.00002	0.00001
Hydrazine	0.0002	0.00010	0.00008	0.00004	0.00004	0.00007	0.00011	0.00014	0.00004	0.00001
Hydrogen Cyanide	0.0001	0.00005	0.00004	0.00002	0.00002	0.00004	0.00005	0.00007	0.00002	0.00001
Hydrogen Peroxide	0.0001	0.00005	0.00004	0.00002	0.00002	0.00004	0.00005	0.00007	0.00002	0.00001
Magnesium Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Nitric Acid	0.0002	0.00010	0.00008	0.00004	0.00004	0.00007	0.00011	0.00014	0.00004	0.00001
Nitrogen Dioxide	0.0002	0.00010	0.00008	0.00004	0.00004	0.00007	0.00011	0.00014	0.00004	0.00001
Ozone	0.0002	0.00010	0.00008	0.00004	0.00004	0.00007	0.00011	0.00014	0.00004	0.00001
Particulate	396.7300	194.48895	156.24814	69.55470	84.26545	139.96634	214.98402	277.50470	77.65990	25.99375
Propane	0.0001	0.00005	0.00004	0.00002	0.00002	0.00004	0.00005	0.00007	0.00002	0.00001
Sulfur Dioxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

TABLE M-81. Maximum 8-Hr Average Air Quality Impacts for OD (ug/m^3): Range C-52N (AFX453)

Compound	Emission Rate	Receptor- 8 Hour 1	2	3	4	5	6	7	8	9
Acetaldehyde	0.0001	0.00004	0.00003	0.00001	0.00002	0.00003	0.00004	0.00005	0.00002	0.00001
Acetylene	0.0001	0.00004	0.00003	0.00001	0.00002	0.00003	0.00004	0.00005	0.00002	0.00001
Aluminum	0.0001	0.00004	0.00003	0.00001	0.00002	0.00003	0.00004	0.00005	0.00002	0.00001
Aluminum Oxide	26.4565	10.08760	8.10416	3.60761	4.37061	7.25966	11.15062	14.39339	4.02800	1.34822
Ammonia	0.0001	0.00004	0.00003	0.00001	0.00002	0.00003	0.00004	0.00005	0.00002	0.00001
Barium		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Butane	0.0002	0.00008	0.00006	0.00003	0.00003	0.00005	0.00008	0.00011	0.00003	0.00001
Calcium Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Carbon Monoxide	0.0001	0.00004	0.00003	0.00001	0.00002	0.00003	0.00004	0.00005	0.00002	0.00001
Cyanide	0.0002	0.00008	0.00006	0.00003	0.00003	0.00005	0.00008	0.00011	0.00003	0.00001
Cyanogen	0.0002	0.00008	0.00006	0.00003	0.00003	0.00005	0.00008	0.00011	0.00003	0.00001
Formaldehyde	0.0001	0.00004	0.00003	0.00001	0.00002	0.00003	0.00004	0.00005	0.00002	0.00001
Hydrazine	0.0002	0.00008	0.00006	0.00003	0.00003	0.00005	0.00008	0.00011	0.00003	0.00001
Hydrogen Cyanide	0.0001	0.00004	0.00003	0.00001	0.00002	0.00003	0.00004	0.00005	0.00002	0.00001
Hydrogen Peroxide	0.0001	0.00004	0.00003	0.00001	0.00002	0.00003	0.00004	0.00005	0.00002	0.00001
Magnesium Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Nitric Acid	0.0002	0.00008	0.00006	0.00003	0.00003	0.00005	0.00008	0.00011	0.00003	0.00001
Nitrogen Dioxide	0.0002	0.00008	0.00006	0.00003	0.00003	0.00005	0.00008	0.00011	0.00003	0.00001
Ozone	0.0002	0.00008	0.00006	0.00003	0.00003	0.00005	0.00008	0.00011	0.00003	0.00001
Particulate	396.7300	151.26918	121.52633	54.09810	65.53980	108.86271	167.20979	215.83699	60.40214	20.21736
Propane	0.0001	0.00004	0.00003	0.00001	0.00002	0.00003	0.00004	0.00005	0.00002	0.00001
Sulfur Dioxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

TABLE M-82. Maximum 24-Hr Average Air Quality Impacts for OD (ug/m^3): Range C-52N (AFX453)

Compound	Emission Rate	Receptor- 24 Hour 1	2	3	4	5	6	7	8	9
Acetaldehyde	0.0001	0.00002	0.00002	0.00001	0.00001	0.00002	0.00002	0.00003	0.00001	0.00000
Acetylene	0.0001	0.00002	0.00002	0.00001	0.00001	0.00002	0.00002	0.00003	0.00001	0.00000
Aluminum	0.0001	0.00002	0.00002	0.00001	0.00001	0.00002	0.00002	0.00003	0.00001	0.00000
Aluminum Oxide	26.4565	5.76434	4.63095	2.06149	2.49749	4.14838	6.37178	8.22480	2.30172	0.77041
Ammonia	0.0001	0.00002	0.00002	0.00001	0.00001	0.00002	0.00002	0.00003	0.00001	0.00000
Barium		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Butane	0.0002	0.00004	0.00004	0.00002	0.00002	0.00003	0.00005	0.00006	0.00002	0.00001
Calcium Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Carbon Monoxide	0.0001	0.00002	0.00002	0.00001	0.00001	0.00002	0.00002	0.00003	0.00001	0.00000
Cyanide	0.0002	0.00004	0.00004	0.00002	0.00002	0.00003	0.00005	0.00006	0.00002	0.00001
Cyanogen	0.0002	0.00004	0.00004	0.00002	0.00002	0.00003	0.00005	0.00006	0.00002	0.00001
Formaldehyde	0.0001	0.00002	0.00002	0.00001	0.00001	0.00002	0.00002	0.00003	0.00001	0.00000
Hydrazine	0.0002	0.00004	0.00004	0.00002	0.00002	0.00003	0.00005	0.00006	0.00002	0.00001
Hydrogen Cyanide	0.0001	0.00002	0.00002	0.00001	0.00001	0.00002	0.00002	0.00003	0.00001	0.00000
Hydrogen Peroxide	0.0001	0.00002	0.00002	0.00001	0.00001	0.00002	0.00002	0.00003	0.00001	0.00000
Magnesium Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Nitric Acid	0.0002	0.00004	0.00004	0.00002	0.00002	0.00003	0.00005	0.00006	0.00002	0.00001
Nitrogen Dioxide	0.0002	0.00004	0.00004	0.00002	0.00002	0.00003	0.00005	0.00006	0.00002	0.00001
Ozone	0.0002	0.00004	0.00004	0.00002	0.00002	0.00003	0.00005	0.00006	0.00002	0.00001
Particulate	396.7300	86.43953	69.44362	30.91320	37.45131	62.20726	95.54845	123.33542	34.51551	11.55278
Propane	0.0001	0.00002	0.00002	0.00001	0.00001	0.00002	0.00002	0.00003	0.00001	0.00000
Sulfur Dioxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

TABLE M-83. Maximum Annual Average Air Quality Impacts for OD (ug/m^3): Range C-52N (AFX453)

Compound	Emission Rate	Receptor - Annual 1	2	3	4	5	6	7	8	9
Acetaldehyde	0.0001	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00001	0.00000	0.00000
Acetylene	0.0001	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00001	0.00000	0.00000
Aluminum	0.0001	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00001	0.00000	0.00000
Aluminum Oxide	26.4565	1.15287	0.92619	0.41230	0.49950	0.82968	1.27436	1.64496	0.46034	0.15408
Ammonia	0.0001	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00001	0.00000	0.00000
Barium		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Butane	0.0002	0.00001	0.00001	0.00000	0.00000	0.00001	0.00001	0.00001	0.00000	0.00000
Calcium Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Carbon Monoxide	0.0001	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00001	0.00000	0.00000
Cyanide	0.0002	0.00001	0.00001	0.00000	0.00000	0.00001	0.00001	0.00001	0.00000	0.00000
Cyanogen	0.0002	0.00001	0.00001	0.00000	0.00000	0.00001	0.00001	0.00001	0.00000	0.00000
Formaldehyde	0.0001	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00001	0.00000	0.00000
Hydrazine	0.0002	0.00001	0.00001	0.00000	0.00000	0.00001	0.00001	0.00001	0.00000	0.00000
Hydrogen Cyanide	0.0001	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00001	0.00000	0.00000
Hydrogen Peroxide	0.0001	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00001	0.00000	0.00000
Magnesium Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Nitric Acid	0.0002	0.00001	0.00001	0.00000	0.00000	0.00001	0.00001	0.00001	0.00000	0.00000
Nitrogen Dioxide	0.0002	0.00001	0.00001	0.00000	0.00000	0.00001	0.00001	0.00001	0.00000	0.00000
Ozone	0.0002	0.00001	0.00001	0.00000	0.00000	0.00001	0.00001	0.00001	0.00000	0.00000
Particulate	396.7300	17.28791	13.88872	6.18264	7.49026	12.44145	19.10969	24.66708	6.90310	2.31056
Propane	0.0001	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00001	0.00000	0.00000
Sulfur Dioxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

TABLE M-84. Maximum 1-Hr Average Air Quality Impacts for OD (ug/m^3): Range C-52N (PBXN 109)

Compound	Emission Rate	Receptor - 1 Hour 1	2	3	4	5	6	7	8	9
Acetaldehyde	0.0001	0.00005	0.00004	0.00002	0.00002	0.00004	0.00006	0.00008	0.00002	0.00001
Acetylene	0.0001	0.00005	0.00004	0.00002	0.00002	0.00004	0.00006	0.00008	0.00002	0.00001
Aluminum	0.0004	0.00022	0.00018	0.00008	0.00009	0.00016	0.00024	0.00031	0.00009	0.00003
Aluminum Oxide	33.3566	18.16934	14.59685	6.49787	7.87216	13.18253	20.08401	25.92475	7.25506	2.42836
Ammonia	0.0007	0.00038	0.00031	0.00014	0.00017	0.00028	0.00042	0.00054	0.00015	0.00005
Barium		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Butane	0.0002	0.00011	0.00009	0.00004	0.00005	0.00008	0.00012	0.00016	0.00004	0.00001
Calcium Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Carbon Monoxide	23.2036	12.63900	10.15390	4.52006	5.47605	9.17006	13.97089	18.03384	5.04678	1.68922
Cyanide	0.0002	0.00011	0.00009	0.00004	0.00005	0.00008	0.00012	0.00016	0.00004	0.00001
Cyanogen	0.0002	0.00011	0.00009	0.00004	0.00005	0.00008	0.00012	0.00016	0.00004	0.00001
Formaldehyde	0.0001	0.00005	0.00004	0.00002	0.00002	0.00004	0.00006	0.00008	0.00002	0.00001
Hydrazine	0.0002	0.00011	0.00009	0.00004	0.00005	0.00008	0.00012	0.00016	0.00004	0.00001
Hydrogen Cyanide	0.0001	0.00005	0.00004	0.00002	0.00002	0.00004	0.00006	0.00008	0.00002	0.00001
Hydrogen Peroxide	0.0001	0.00005	0.00004	0.00002	0.00002	0.00004	0.00006	0.00008	0.00002	0.00001
Magnesium Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Nitric Acid	0.0002	0.00011	0.00009	0.00004	0.00005	0.00008	0.00012	0.00016	0.00004	0.00001
Nitrogen Dioxide	0.0002	0.00011	0.00009	0.00004	0.00005	0.00008	0.00012	0.00016	0.00004	0.00001
Ozone	0.0002	0.00011	0.00009	0.00004	0.00005	0.00008	0.00012	0.00016	0.00004	0.00001
Particulate	396.7300	216.09883	173.60905	77.28300	93.62828	156.78770	238.87113	308.33856	86.28878	28.88194
Propane	0.0001	0.00005	0.00004	0.00002	0.00002	0.00004	0.00006	0.00008	0.00002	0.00001
Sulfur Dioxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

TABLE M-85. Maximum 3-Hr Average Air Quality Impacts for OD (ug/m^3): Range C-52N (PBXN 109)

Compound	Emission Rate	Receptor - 3 Hour 1	2	3	4	5	6	7	8	9
Acetaldehyde	0.0001	0.00005	0.00004	0.00002	0.00002	0.00004	0.00005	0.00007	0.00002	0.00001
Acetylene	0.0001	0.00005	0.00004	0.00002	0.00002	0.00004	0.00005	0.00007	0.00002	0.00001
Aluminum	0.0004	0.00020	0.00016	0.00007	0.00008	0.00014	0.00022	0.00028	0.00008	0.00003
Aluminum Oxide	33.3566	16.35241	13.13716	5.84808	7.08494	11.86428	18.07561	23.33227	6.52955	2.18552
Ammonia	0.0007	0.00034	0.00028	0.00012	0.00015	0.00025	0.00038	0.00049	0.00014	0.00005
Barium		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Butane	0.0002	0.00010	0.00008	0.00004	0.00004	0.00007	0.00011	0.00014	0.00004	0.00001
Calcium Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Carbon Monoxide	23.2036	11.37510	9.13851	4.06806	4.92844	8.25306	12.57380	16.23045	4.54210	1.52030
Cyanide	0.0002	0.00010	0.00008	0.00004	0.00004	0.00007	0.00011	0.00014	0.00004	0.00001
Cyanogen	0.0002	0.00010	0.00008	0.00004	0.00004	0.00007	0.00011	0.00014	0.00004	0.00001
Formaldehyde	0.0001	0.00005	0.00004	0.00002	0.00002	0.00004	0.00005	0.00007	0.00002	0.00001
Hydrazine	0.0002	0.00010	0.00008	0.00004	0.00004	0.00007	0.00011	0.00014	0.00004	0.00001
Hydrogen Cyanide	0.0001	0.00005	0.00004	0.00002	0.00002	0.00004	0.00005	0.00007	0.00002	0.00001
Hydrogen Peroxide	0.0001	0.00005	0.00004	0.00002	0.00002	0.00004	0.00005	0.00007	0.00002	0.00001
Magnesium Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Nitric Acid	0.0002	0.00010	0.00008	0.00004	0.00004	0.00007	0.00011	0.00014	0.00004	0.00001
Nitrogen Dioxide	0.0002	0.00010	0.00008	0.00004	0.00004	0.00007	0.00011	0.00014	0.00004	0.00001
Ozone	0.0002	0.00010	0.00008	0.00004	0.00004	0.00007	0.00011	0.00014	0.00004	0.00001
Particulate	396.7300	194.48895	156.24814	69.55470	84.26545	141.10893	214.98402	277.50470	77.65990	25.99375
Propane	0.0001	0.00005	0.00004	0.00002	0.00002	0.00004	0.00005	0.00007	0.00002	0.00001
Sulfur Dioxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

TABLE M-86. Maximum 8-Hr Average Air Quality Impacts for OD (ug/m^3): Range C-52N (PBXN 109)

Compound	Emission Rate	Receptor- 8 Hour 1	2	3	4	5	6	7	8	9
Acetaldehyde	0.0001	0.00004	0.00003	0.00001	0.00002	0.00003	0.00004	0.00005	0.00002	0.00001
Acetylene	0.0001	0.00004	0.00003	0.00001	0.00002	0.00003	0.00004	0.00005	0.00002	0.00001
Aluminum	0.0004	0.00015	0.00012	0.00005	0.00007	0.00011	0.00017	0.00022	0.00006	0.00002
Aluminum Oxide	33.3566	12.71854	10.21779	4.54851	5.51051	9.22777	14.05881	18.14732	5.07854	1.69985
Ammonia	0.0007	0.00027	0.00021	0.00010	0.00012	0.00019	0.00030	0.00038	0.00011	0.00004
Barium		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Butane	0.0002	0.00008	0.00006	0.00003	0.00003	0.00006	0.00008	0.00011	0.00003	0.00001
Calcium Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Carbon Monoxide	23.2036	8.84730	7.10773	3.16404	3.83323	6.41904	9.77962	12.62369	3.53275	1.18246
Cyanide	0.0002	0.00008	0.00006	0.00003	0.00003	0.00006	0.00008	0.00011	0.00003	0.00001
Cyanogen	0.0002	0.00008	0.00006	0.00003	0.00003	0.00006	0.00008	0.00011	0.00003	0.00001
Formaldehyde	0.0001	0.00004	0.00003	0.00001	0.00002	0.00003	0.00004	0.00005	0.00002	0.00001
Hydrazine	0.0002	0.00008	0.00006	0.00003	0.00003	0.00006	0.00008	0.00011	0.00003	0.00001
Hydrogen Cyanide	0.0001	0.00004	0.00003	0.00001	0.00002	0.00003	0.00004	0.00005	0.00002	0.00001
Hydrogen Peroxide	0.0001	0.00004	0.00003	0.00001	0.00002	0.00003	0.00004	0.00005	0.00002	0.00001
Magnesium Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Nitric Acid	0.0002	0.00008	0.00006	0.00003	0.00003	0.00006	0.00008	0.00011	0.00003	0.00001
Nitrogen Dioxide	0.0002	0.00008	0.00006	0.00003	0.00003	0.00006	0.00008	0.00011	0.00003	0.00001
Ozone	0.0002	0.00008	0.00006	0.00003	0.00003	0.00006	0.00008	0.00011	0.00003	0.00001
Particulate	396.7300	151.26918	121.52633	54.09810	65.53980	109.75139	167.20979	215.83699	60.40214	20.21736
Propane	0.0001	0.00004	0.00003	0.00001	0.00002	0.00003	0.00004	0.00005	0.00002	0.00001
Sulfur Dioxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

TABLE M-87. Maximum 24-Hr Average Air Quality Impacts for OD (ug/m^3): Range C-52N (PBXN 109)

Compound	Emission Rate	Receptor - 24 Hour 1	2	3	4	5	6	7	8	9
Acetaldehyde	0.0001	0.00002	0.00002	0.00001	0.00001	0.00002	0.00002	0.00003	0.00001	0.00000
Acetylene	0.0001	0.00002	0.00002	0.00001	0.00001	0.00002	0.00002	0.00003	0.00001	0.00000
Aluminum	0.0004	0.00009	0.00007	0.00003	0.00004	0.00006	0.00010	0.00012	0.00003	0.00001
Aluminum Oxide	33.3566	7.26774	5.83874	2.59915	3.14886	5.27301	8.03360	10.36990	2.90202	0.97134
Ammonia	0.0007	0.00015	0.00012	0.00005	0.00007	0.00011	0.00017	0.00022	0.00006	0.00002
Barium		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Butane	0.0002	0.00004	0.00004	0.00002	0.00002	0.00003	0.00005	0.00006	0.00002	0.00001
Calcium Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Carbon Monoxide	23.2036	5.05560	4.06156	1.80802	2.19042	3.66803	5.58836	7.21354	2.01871	0.67569
Cyanide	0.0002	0.00004	0.00004	0.00002	0.00002	0.00003	0.00005	0.00006	0.00002	0.00001
Cyanogen	0.0002	0.00004	0.00004	0.00002	0.00002	0.00003	0.00005	0.00006	0.00002	0.00001
Formaldehyde	0.0001	0.00002	0.00002	0.00001	0.00001	0.00002	0.00002	0.00003	0.00001	0.00000
Hydrazine	0.0002	0.00004	0.00004	0.00002	0.00002	0.00003	0.00005	0.00006	0.00002	0.00001
Hydrogen Cyanide	0.0001	0.00002	0.00002	0.00001	0.00001	0.00002	0.00002	0.00003	0.00001	0.00000
Hydrogen Peroxide	0.0001	0.00002	0.00002	0.00001	0.00001	0.00002	0.00002	0.00003	0.00001	0.00000
Magnesium Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Nitric Acid	0.0002	0.00004	0.00004	0.00002	0.00002	0.00003	0.00005	0.00006	0.00002	0.00001
Nitrogen Dioxide	0.0002	0.00004	0.00004	0.00002	0.00002	0.00003	0.00005	0.00006	0.00002	0.00001
Ozone	0.0002	0.00004	0.00004	0.00002	0.00002	0.00003	0.00005	0.00006	0.00002	0.00001
Particulate	396.7300	86.43953	69.44362	30.91320	37.45131	62.71508	95.54845	123.33542	34.51551	11.55278
Propane	0.0001	0.00002	0.00002	0.00001	0.00001	0.00002	0.00002	0.00003	0.00001	0.00000
Sulfur Dioxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

TABLE M-88. Maximum Annual Average Air Quality Impacts for OD (ug/m^3): Range C-52N (PBXN 109)

Compound	Emission Rate	Receptor - Annual 1	2	3	4	5	6	7	8	9
Acetaldehyde	0.0001	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00001	0.00000	0.00000
Acetylene	0.0001	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00001	0.00000	0.00000
Aluminum	0.0004	0.00002	0.00001	0.00001	0.00001	0.00001	0.00002	0.00002	0.00001	0.00000
Aluminum Oxide	33.3566	1.45355	1.16775	0.51983	0.62977	1.05460	1.60672	2.07398	0.58040	0.19427
Ammonia	0.0007	0.00003	0.00002	0.00001	0.00001	0.00002	0.00003	0.00004	0.00001	0.00000
Barium		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Butane	0.0002	0.00001	0.00001	0.00000	0.00000	0.00001	0.00001	0.00001	0.00000	0.00000
Calcium Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Carbon Monoxide	23.2036	1.01112	0.81231	0.36160	0.43808	0.73361	1.11767	1.44271	0.40374	0.13514
Cyanide	0.0002	0.00001	0.00001	0.00000	0.00000	0.00001	0.00001	0.00001	0.00000	0.00000
Cyanogen	0.0002	0.00001	0.00001	0.00000	0.00000	0.00001	0.00001	0.00001	0.00000	0.00000
Formaldehyde	0.0001	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00001	0.00000	0.00000
Hydrazine	0.0002	0.00001	0.00001	0.00000	0.00000	0.00001	0.00001	0.00001	0.00000	0.00000
Hydrogen Cyanide	0.0001	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00001	0.00000	0.00000
Hydrogen Peroxide	0.0001	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00001	0.00000	0.00000
Magnesium Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Nitric Acid	0.0002	0.00001	0.00001	0.00000	0.00000	0.00001	0.00001	0.00001	0.00000	0.00000
Nitrogen Dioxide	0.0002	0.00001	0.00001	0.00000	0.00000	0.00001	0.00001	0.00001	0.00000	0.00000
Ozone	0.0002	0.00001	0.00001	0.00000	0.00000	0.00001	0.00001	0.00001	0.00000	0.00000
Particulate	396.7300	17.28791	13.88872	6.18264	7.49026	12.54302	19.10969	24.66708	6.90310	2.31056
Propane	0.0001	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00001	0.00000	0.00000
Sulfur Dioxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

TABLE M-89. Maximum 1-Hr Average Air Quality Impacts for OD (ug/m^3): Range C-52N (AFX931-M)

Compound	Emission Rate	Receptor - 1 Hour 1	2	3	4	5	6	7	8	9
Acetaldehyde		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Acetylene	0.0001	0.00005	0.00004	0.00002	0.00002	0.00004	0.00006	0.00008	0.00002	0.00001
Aluminum	0.0004	0.00022	0.00018	0.00008	0.00009	0.00016	0.00024	0.00031	0.00009	0.00003
Aluminum Oxide	30.2052	16.45277	13.21780	5.88397	7.12843	11.93710	18.18655	23.47548	6.56963	2.19894
Ammonia	0.0001	0.00005	0.00004	0.00002	0.00002	0.00004	0.00006	0.00008	0.00002	0.00001
Barium		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Butane	0.0002	0.00011	0.00009	0.00004	0.00005	0.00008	0.00012	0.00016	0.00004	0.00001
Calcium Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Carbon Monoxide	0.0001	0.00005	0.00004	0.00002	0.00002	0.00004	0.00006	0.00008	0.00002	0.00001
Cyanide	0.0002	0.00011	0.00009	0.00004	0.00005	0.00008	0.00012	0.00016	0.00004	0.00001
Cyanogen	0.0002	0.00011	0.00009	0.00004	0.00005	0.00008	0.00012	0.00016	0.00004	0.00001
Formaldehyde	0.0001	0.00005	0.00004	0.00002	0.00002	0.00004	0.00006	0.00008	0.00002	0.00001
Hydrazine	0.0002	0.00011	0.00009	0.00004	0.00005	0.00008	0.00012	0.00016	0.00004	0.00001
Hydrogen Cyanide	0.0001	0.00005	0.00004	0.00002	0.00002	0.00004	0.00006	0.00008	0.00002	0.00001
Hydrogen Peroxide	0.0001	0.00005	0.00004	0.00002	0.00002	0.00004	0.00006	0.00008	0.00002	0.00001
Lead Compounds		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Magnesium Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Nitric Acid		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Nitrogen Dioxide	0.0002	0.00011	0.00009	0.00004	0.00005	0.00008	0.00012	0.00016	0.00004	0.00001
Ozone	0.0002	0.00011	0.00009	0.00004	0.00005	0.00008	0.00012	0.00016	0.00004	0.00001
Propane	0.0001	0.00005	0.00004	0.00002	0.00002	0.00004	0.00006	0.00008	0.00002	0.00001
Particulate	396.7300	216.09883	173.60905	77.28300	93.62828	156.78770	238.87113	308.33856	86.28878	28.88194
Sodium Hydroxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Sulfur Dioxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Hydrochloric Acid	10.8985	5.93641	4.76918	2.12303	2.57205	4.30709	6.56199	8.47031	2.37042	0.79341
Trichloromethane	0.0004	0.00022	0.00018	0.00008	0.00009	0.00016	0.00024	0.00031	0.00009	0.00003
Ammonium Chloride	0.0004	0.00022	0.00018	0.00008	0.00009	0.00016	0.00024	0.00031	0.00009	0.00003
Carbon Tetrachloride	0.0004	0.00022	0.00018	0.00008	0.00009	0.00016	0.00024	0.00031	0.00009	0.00003
Carbonyl Chloride	0.0003	0.00016	0.00013	0.00006	0.00007	0.00012	0.00018	0.00023	0.00007	0.00002
Chlorine Dioxide	0.0002	0.00011	0.00009	0.00004	0.00005	0.00008	0.00012	0.00016	0.00004	0.00001

TABLE M-90. Maximum 3-Hr Average Air Quality Impacts for OD (ug/m^3): Range C-52N (AFX931-M)

Compound	Emission Rate	Receptor - 3 Hour 1	2	3	4	5	6	7	8	9
Acetaldehyde		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Acetylene	0.0001	0.00005	0.00004	0.00002	0.00002	0.00004	0.00005	0.00007	0.00002	0.00001
Aluminum	0.0004	0.00020	0.00016	0.00007	0.00008	0.00014	0.00022	0.00028	0.00008	0.00003
Aluminum Oxide	30.2052	14.80750	11.89602	5.29558	6.41558	10.74339	16.36790	21.12793	5.91267	1.97904
Ammonia	0.0001	0.00005	0.00004	0.00002	0.00002	0.00004	0.00005	0.00007	0.00002	0.00001
Barium		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Butane	0.0002	0.00010	0.00008	0.00004	0.00004	0.00007	0.00011	0.00014	0.00004	0.00001
Calcium Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Carbon Monoxide	0.0001	0.00005	0.00004	0.00002	0.00002	0.00004	0.00005	0.00007	0.00002	0.00001
Cyanide	0.0002	0.00010	0.00008	0.00004	0.00004	0.00007	0.00011	0.00014	0.00004	0.00001
Cyanogen	0.0002	0.00010	0.00008	0.00004	0.00004	0.00007	0.00011	0.00014	0.00004	0.00001
Formaldehyde	0.0001	0.00005	0.00004	0.00002	0.00002	0.00004	0.00005	0.00007	0.00002	0.00001
Hydrazine	0.0002	0.00010	0.00008	0.00004	0.00004	0.00007	0.00011	0.00014	0.00004	0.00001
Hydrogen Cyanide	0.0001	0.00005	0.00004	0.00002	0.00002	0.00004	0.00005	0.00007	0.00002	0.00001
Hydrogen Peroxide	0.0001	0.00005	0.00004	0.00002	0.00002	0.00004	0.00005	0.00007	0.00002	0.00001
Lead Compounds		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Magnesium Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Nitric Acid		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Nitrogen Dioxide	0.0002	0.00010	0.00008	0.00004	0.00004	0.00007	0.00011	0.00014	0.00004	0.00001
Ozone	0.0002	0.00010	0.00008	0.00004	0.00004	0.00007	0.00011	0.00014	0.00004	0.00001
Propane	0.0001	0.00005	0.00004	0.00002	0.00002	0.00004	0.00005	0.00007	0.00002	0.00001
Particulate	396.7300	194.48895	156.24814	69.55470	84.26545	141.10893	214.98402	277.50470	77.65990	25.99375
Sodium Hydroxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Sulfur Dioxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Hydrochloric Acid	10.8985	5.34277	4.29227	1.91073	2.31484	3.87638	5.90579	7.62328	2.13338	0.71407
Trichloromethane	0.0004	0.00020	0.00016	0.00007	0.00008	0.00014	0.00022	0.00028	0.00008	0.00003
Ammonium Chloride	0.0004	0.00020	0.00016	0.00007	0.00008	0.00014	0.00022	0.00028	0.00008	0.00003
Carbon Tetrachloride	0.0004	0.00020	0.00016	0.00007	0.00008	0.00014	0.00022	0.00028	0.00008	0.00003
Carbonyl Chloride	0.0003	0.00015	0.00012	0.00005	0.00006	0.00011	0.00016	0.00021	0.00006	0.00002
Chlorine Dioxide	0.0002	0.00010	0.00008	0.00004	0.00004	0.00007	0.00011	0.00014	0.00004	0.00001

TABLE M-91. Maximum 8-Hr Average Air Quality Impacts for OD (ug/m^3): Range C-52N (AFX931-M)

Compound	Emission Rate	Receptor- 8 Hour 1	2	3	4	5	6	7	8	9
Acetaldehyde		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Acetylene	0.0001	0.00004	0.00003	0.00001	0.00002	0.00003	0.00004	0.00005	0.00002	0.00001
Aluminum	0.0004	0.00015	0.00012	0.00005	0.00007	0.00011	0.00017	0.00022	0.00006	0.00002
Aluminum Oxide	30.2052	11.51694	9.25246	4.11878	4.98990	8.35597	12.73059	16.43284	4.59874	1.53926
Ammonia	0.0001	0.00004	0.00003	0.00001	0.00002	0.00003	0.00004	0.00005	0.00002	0.00001
Barium		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Butane	0.0002	0.00008	0.00006	0.00003	0.00003	0.00006	0.00008	0.00011	0.00003	0.00001
Calcium Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Carbon Monoxide	0.0001	0.00004	0.00003	0.00001	0.00002	0.00003	0.00004	0.00005	0.00002	0.00001
Cyanide	0.0002	0.00008	0.00006	0.00003	0.00003	0.00006	0.00008	0.00011	0.00003	0.00001
Cyanogen	0.0002	0.00008	0.00006	0.00003	0.00003	0.00006	0.00008	0.00011	0.00003	0.00001
Formaldehyde	0.0001	0.00004	0.00003	0.00001	0.00002	0.00003	0.00004	0.00005	0.00002	0.00001
Hydrazine	0.0002	0.00008	0.00006	0.00003	0.00003	0.00006	0.00008	0.00011	0.00003	0.00001
Hydrogen Cyanide	0.0001	0.00004	0.00003	0.00001	0.00002	0.00003	0.00004	0.00005	0.00002	0.00001
Hydrogen Peroxide	0.0001	0.00004	0.00003	0.00001	0.00002	0.00003	0.00004	0.00005	0.00002	0.00001
Lead Compounds		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Magnesium Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Nitric Acid		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Nitrogen Dioxide	0.0002	0.00008	0.00006	0.00003	0.00003	0.00006	0.00008	0.00011	0.00003	0.00001
Ozone	0.0002	0.00008	0.00006	0.00003	0.00003	0.00006	0.00008	0.00011	0.00003	0.00001
Propane	0.0001	0.00004	0.00003	0.00001	0.00002	0.00003	0.00004	0.00005	0.00002	0.00001
Particulate	396.7300	151.26918	121.52633	54.09810	65.53980	109.75139	167.20979	215.83699	60.40214	20.21736
Sodium Hydroxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Sulfur Dioxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Hydrochloric Acid	10.8985	4.15549	3.33843	1.48612	1.80043	3.01496	4.59339	5.92922	1.65930	0.55539
Trichloromethane	0.0004	0.00015	0.00012	0.00005	0.00007	0.00011	0.00017	0.00022	0.00006	0.00002
Ammonium Chloride	0.0004	0.00015	0.00012	0.00005	0.00007	0.00011	0.00017	0.00022	0.00006	0.00002
Carbon Tetrachloride	0.0004	0.00015	0.00012	0.00005	0.00007	0.00011	0.00017	0.00022	0.00006	0.00002
Carbonyl Chloride	0.0003	0.00011	0.00009	0.00004	0.00005	0.00008	0.00013	0.00016	0.00005	0.00002
Chlorine Dioxide	0.0002	0.00008	0.00006	0.00003	0.00003	0.00006	0.00008	0.00011	0.00003	0.00001

TABLE M-92. Maximum 24-Hr Average Air Quality Impacts for OD (ug/m^3): Range C-52N (AFX931-M)

Compound	Emission Rate	Receptor- 24 Hour 1	2	3	4	5	6	7	8	9
Acetaldehyde		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Acetylene	0.0001	0.00002	0.00002	0.00001	0.00001	0.00002	0.00002	0.00003	0.00001	0.00000
Aluminum	0.0004	0.00009	0.00007	0.00003	0.00004	0.00006	0.00010	0.00012	0.00003	0.00001
Aluminum Oxide	30.2052	6.58111	5.28712	2.35359	2.85137	4.77484	7.27462	9.39019	2.62785	0.87958
Ammonia	0.0001	0.00002	0.00002	0.00001	0.00001	0.00002	0.00002	0.00003	0.00001	0.00000
Barium		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Butane	0.0002	0.00004	0.00004	0.00002	0.00002	0.00003	0.00005	0.00006	0.00002	0.00001
Calcium Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Carbon Monoxide	0.0001	0.00002	0.00002	0.00001	0.00001	0.00002	0.00002	0.00003	0.00001	0.00000
Cyanide	0.0002	0.00004	0.00004	0.00002	0.00002	0.00003	0.00005	0.00006	0.00002	0.00001
Cyanogen	0.0002	0.00004	0.00004	0.00002	0.00002	0.00003	0.00005	0.00006	0.00002	0.00001
Formaldehyde	0.0001	0.00002	0.00002	0.00001	0.00001	0.00002	0.00002	0.00003	0.00001	0.00000
Hydrazine	0.0002	0.00004	0.00004	0.00002	0.00002	0.00003	0.00005	0.00006	0.00002	0.00001
Hydrogen Cyanide	0.0001	0.00002	0.00002	0.00001	0.00001	0.00002	0.00002	0.00003	0.00001	0.00000
Hydrogen Peroxide	0.0001	0.00002	0.00002	0.00001	0.00001	0.00002	0.00002	0.00003	0.00001	0.00000
Lead Compounds		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Magnesium Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Nitric Acid		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Nitrogen Dioxide	0.0002	0.00004	0.00004	0.00002	0.00002	0.00003	0.00005	0.00006	0.00002	0.00001
Ozone	0.0002	0.00004	0.00004	0.00002	0.00002	0.00003	0.00005	0.00006	0.00002	0.00001
Propane	0.0001	0.00002	0.00002	0.00001	0.00001	0.00002	0.00002	0.00003	0.00001	0.00000
Particulate	396.7300	86.43953	69.44362	30.91320	37.45131	62.71508	95.54845	123.33542	34.51551	11.55278
Sodium Hydroxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Sulfur Dioxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Hydrochloric Acid	10.8985	2.37457	1.90767	0.84921	1.02882	1.72283	2.62479	3.38813	0.94817	0.31736
Trichloromethane	0.0004	0.00009	0.00007	0.00003	0.00004	0.00006	0.00010	0.00012	0.00003	0.00001
Ammonium Chloride	0.0004	0.00009	0.00007	0.00003	0.00004	0.00006	0.00010	0.00012	0.00003	0.00001
Carbon Tetrachloride	0.0004	0.00009	0.00007	0.00003	0.00004	0.00006	0.00010	0.00012	0.00003	0.00001
Carbonyl Chloride	0.0003	0.00007	0.00005	0.00002	0.00003	0.00005	0.00007	0.00009	0.00003	0.00001
Chlorine Dioxide	0.0002	0.00004	0.00004	0.00002	0.00002	0.00003	0.00005	0.00006	0.00002	0.00001

TABLE M-93. Maximum Annual Average Air Quality Impacts for OD (ug/m^3): Range C-52N (AFX931-M)

Compound	Emission Rate	Receptor - Annual 1	2	3	4	5	6	7	8	9
Acetaldehyde		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Acetylene	0.0001	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00001	0.00000	0.00000
Aluminum	0.0004	0.00002	0.00001	0.00001	0.00001	0.00001	0.00002	0.00002	0.00001	0.00000
Aluminum Oxide	30.2052	1.31622	1.05742	0.47072	0.57027	0.95497	1.45492	1.87804	0.52557	0.17592
Ammonia	0.0001	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00001	0.00000	0.00000
Barium		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Butane	0.0002	0.00001	0.00001	0.00000	0.00000	0.00001	0.00001	0.00001	0.00000	0.00000
Calcium Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Carbon Monoxide	0.0001	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00001	0.00000	0.00000
Cyanide	0.0002	0.00001	0.00001	0.00000	0.00000	0.00001	0.00001	0.00001	0.00000	0.00000
Cyanogen	0.0002	0.00001	0.00001	0.00000	0.00000	0.00001	0.00001	0.00001	0.00000	0.00000
Formaldehyde	0.0001	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00001	0.00000	0.00000
Hydrazine	0.0002	0.00001	0.00001	0.00000	0.00000	0.00001	0.00001	0.00001	0.00000	0.00000
Hydrogen Cyanide	0.0001	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00001	0.00000	0.00000
Hydrogen Peroxide	0.0001	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00001	0.00000	0.00000
Lead Compounds		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Magnesium Oxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Nitric Acid		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Nitrogen Dioxide	0.0002	0.00001	0.00001	0.00000	0.00000	0.00001	0.00001	0.00001	0.00000	0.00000
Ozone	0.0002	0.00001	0.00001	0.00000	0.00000	0.00001	0.00001	0.00001	0.00000	0.00000
Propane	0.0001	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00001	0.00000	0.00000
Particulate	396.7300	17.28791	13.88872	6.18264	7.49026	12.54302	19.10969	24.66708	6.90310	2.31056
Sodium Hydroxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Sulfur Dioxide		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Hydrochloric Acid	10.8985	0.47491	0.38153	0.16984	0.20576	0.34457	0.52496	0.67763	0.18963	0.06347
Trichloromethane	0.0004	0.00002	0.00001	0.00001	0.00001	0.00001	0.00002	0.00002	0.00001	0.00000
Ammonium Chloride	0.0004	0.00002	0.00001	0.00001	0.00001	0.00001	0.00002	0.00002	0.00001	0.00000
Carbon Tetrachloride	0.0004	0.00002	0.00001	0.00001	0.00001	0.00001	0.00002	0.00002	0.00001	0.00000
Carbonyl Chloride	0.0003	0.00001	0.00001	0.00000	0.00001	0.00001	0.00001	0.00002	0.00001	0.00000
Chlorine Dioxide	0.0002	0.00001	0.00001	0.00000	0.00000	0.00001	0.00001	0.00001	0.00000	0.00000

Table M-94
National/Florida Ambient Air Quality Standards[a]

Compound	NAAQS/FAAQS ($\mu g/m^3$)				
	1-hr	3-hr	8-hr	24-hr	Annual
PM_{10}				150	50
SO_2		1,300		260	60
NO_2					100
CO	10,000		40,000		
O_3	235				
Pb[b]					

(a) Florida 24-hour and annual SO_2 standards are more restrictive than the NAAQS.
(b) Lead has a quarterly arithmetric mean standard of 1.5 $\mu g/m^3$.

Table M-95
Forida No Threat Levels

Compound	Ambient Concentrations ($\mu g/m^3$)		
	8-hr	24-hr	Annual
Acetylene	--	--	--
Acetaldehyde	1,800	432	0.45
Aluminum Dust	100	24	--
Aluminum Oxide	100	24	--
Ammonia	170	40.8	100
Ammonium Chloride	100	24	--
Barium, Soluble Compounds	5	1.2	50
Butane	38,000	9,120	--
Calcium Oxide	20	4.8	--
Carbon Monoxide	--	--	--
Carbon Tetrachloride	310	74.4	0.067
Carbonyl Chloride	4	0.96	--
Carbonyl Fluoride	54	12.96	--
Chlorine Dioxide	2.8	0.672	0.02
Cyanides (as Cn)	50	12	20
Cyanogen	210	50.4	30
Formaldehyde	12	2.88	0.077
Hydrazine	1.3	0.312	0.0002
Hydrochloric Acid	75	18	7
Hydrogen Cyanide	110	26.4	--
Hydrogen Fluoride	26	6.24	--
Hydrogen Peroxide	14	3.36	--
Lead Compounds	0.5	0.12	0.09
Magnesium Oxide, fume	100	24	--

Table M-95 (continued)

Compound	Ambient Concentrations ($\mu g/m^3$)		
	8-hr	24-hr	Annual
Nitric Acid	52	12.48	--
Nitric Oxide	--	--	--
Nitrogen Dioxide	56	13.44	--
Ozone	--	--	--
Particulate	--	--	--
Potassium Cyanide	--	--	50
Potassium Hydroxide	20	4.8	--
Propane	--	--	--
Sodium Hydroxide	--	--	--
Sulfur Dioxide	--	--	--
Trichloromethane	490	117.6	0.043

Appendix K Historical Water Quality

This page intentionally left blank.

Historical Groundwater Quality

TABLE 4-16 SUMMARY OF SEMIVOLATILE ORGANICS AND EXPLOSIVES DATA (μg/L) FOR WATER SAMPLES OBTAINED ON 6 AND 7 DECEMBER 1994, RANGE C-62, EGLIN AIR FORCE BASE, FLORIDA

Compound	94-62-01	94-62-02	94-62-03	92-62-04	94-62-05	DUPLICATE
bis(2-ethylhexyl)phthalate	4J	10U	8J	8J	25	18
HMX PQL	0.5OU	0.5OU	0.5OU	0.24J	0.88	0.5OU
RDX 10 ppb DWS	0.64	0.91	1.4	1.1	1.6	1.4

NOTES:
Semivolatile organic analysis EPA Method 8270.
J = Estimated value.
U = A compound on the target compound list (TCL) was analyzed for, but not detected.

TABLE 4-17 SUMMARY OF METALS DATA (μg/L) FOR WATER SAMPLES OBTAINED ON 6 AND 7 DECEMBER 1994, RANGE C-62, EGLIN AIR FORCE BASE, FLORIDA

Compound	94-62-01	94-62-02	94-62-03	94-62-04	94-62-05	DUPLICATE
Aluminum[1] 200	13,800	121,000	1,170	2,120	3,870	993
Arsenic[2] 50	1.3B	3.5B	1.3B	1.0U	1.0U	1.3B
Barium[1] 2000	12.0U	41.5B	12.0U	19.2B	14.5B	12.0U
Calcium[1]	1,510B	3,160B	1,540B	5,070	10,600	1,470B
Chromium[1] 100	11.0	75.5	5.0U	5.0U	8.5B	5.0U
Copper[1] 1000	5.6B	19.6B	4.0U	4.0U	9.3B	4.0U
Iron[1] 300	4,110	25,000	334	887	1,260	293
Magnesium[1]	472B	1,220B	388B	547B	380B	377B
Mercury[3] 2	0.16B	0.52	0.17B	0.18B	0.15B	0.17B
Potassium[1]	1770B	7,390	737B	1,820B	3,940B	731B
Selenium[4] 50	2.2BW	1.0UW	1.2B	1.0UW	1.0U	1.0U
Strontium[1] 41200	19.4	40.1	15.8	31.4	112	16.2

NOTES:
(1) = EPA Method 6010.
(2) = EPA Method 7060.
(3) = EPA Method 7470.
(4) = EPA Method 7740.
U = Analyte analyzed for, but not detected (concentration is less than IDL).
B = Reported value is less than the Contract Required Detection Limit (CRDL), but greater than the Instrument Detection Limit (IDL).
W = Postdigestion spike for furance AAS analysis is out of control limits (85% - 115%) and sample absorbance is less than 50% of spike absorbance.

TABLE 4-18 SUMMARY OF OTHER ANALYTICAL DATA (μg/L) FOR WATER SAMPLES OBTAINED ON 6 AND 7 DECEMBER 1994, RANGE C-62, EGLIN AIR FORCE BASE, FLORIDA

Compound	MW94-62-01	MW94-62-02	MW94-62-03	MW94-62-04	MW94-62-05	MW94-62-D1
GENERAL CHEMISTRY (mg/kg)						
Ammonia	<0.1	<0.1	0.11	0.13	<0.10	<0.10
Cyanide	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Sulfide	<1	<1	<1	<1	<1	<1
Total Dissolved Solids	18	89	<10	12	29	31
Total Kjeldahl Nitrogen	0.74	<0.25	<0.25	<0.25	<0.25	<0.25
Total Petroleum Hydrocarbons	1.1	<1.0	4.5	2.2	1.9	6.8
Total Suspended Solids	113	1,420	14.0	36	56	18
Anions (mg/kg)						
Sulfate	0.59	5.4	0.63	6.5	3.4	0.63
Chloride	1.1	2.1	1.7	2.0	1.2	1.7
Fluoride	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Nitrite	0.24	<0.1	<.2	0.2	0.2	0.21
Bromide	<0.1	<0.1	0.15	<0.1	<0.1	<0.1
Nitrate	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Phosphate	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

Water Quality Summary - May 2015
Range C-62
Eglin Air Force Base, Florida

	FDEP Permit # 006176-006-HO					MW-94-62-01	MW-94-62-02	MW-94-62-03	MW-94-62-04	MW-94-62-05	MW-94-62-05-a (dup)
LAB INFO					Lab Sample No.	FA24511-2	FA24511-3	FA24511-5	FA24511-6	FA24511-7	FA24511-7
					Sample Date	5/19/15	5/19/15	5/19/15	5/19/15	5/19/15	5/19/15
					Sample Time	09:35	11:10	10:56	10:55	11:55	11:55
	Parameter	**Method**	**Unit**	**MDL**	**GCTL**						
WELL INFORMATION	Permit Designation					Background	POC	POC	POC	POC	POC
	Top of Casing (TOC)	---	ft NGVD	0.01	---	188.22	173.55	172.36	178.50	177.81	177.81
	Water level (At time of sampling)	EPASOP	ft BTOC	0.01	---	12.63	9.54	10.26	17.53	17.62	17.62
	Water elevation	calc.	ft NGVD	0.01	---	175.59	164.01	162.10	160.97	160.19	160.19
	Well condition	obs.	---	---	---	OK	OK	OK	OK	OK	OK
	Well ID.	---	inches	---	---	4	4	4	4	4	4
	Well depth	---	ft btoc	---	---	34.30	38.67	39.60	39.00	39.20	39.20
FIELD PARAMETERS	Color	obs	---	---	---	clear	clear	clear	clear	clear	clear
	odor	obs	---	---	---	none	none	none	none	none	none
	pH	150.1	std units	---	6.5-8.5	4.50	4.85	4.23	5.84	4.21	4.21
	Specific Conductance (field)	120.1	mS/cm	---	---	0.010	0.012	0.031	0.029	0.017	0.017
	Temperature	170.1	˚C	---	---	23.70	22.86	22.34	23.84	24.24	24.24
	Dissolved oxygen	360.1	mg/L	---	---	7.86	6.81	8.19	6.68	7.42	7.42
	Turbidity	180.1	NTU	---	---	8.43	7.25	2.09	1.31	1.10	1.10
	Oxidation-reduction potential	2580B	mV	---	---	145.2	167.2	242.3	314.1	383.5	383.5
	Purging rate	---	gpm	---	---	0.19	0.10	0.19	0.10	0.14	0.14
GENERAL PARAMETERS	Nitrogen, Nitrate	EPA353.2	mg/L	0.05	10	0.05	0.19	0.16	0.86	0.67	0.67
	Nitrogen, Nitrite	EPA353.2	mg/L	0.05	1	0.05	0.05	0.05	0.05	0.05	0.05
EXPLOSIVES PARAMETERS	1,3,5 Trinitrobenzene	SW846 8330	µg/L	0.075 - 0.078	210	0.075	0.075	0.077	0.075	0.078	0.077
	1,3-Dinitrobenzene	SW846 8330	µg/L	0.075 - 0.078	0.7	0.075	0.075	0.077	0.075	0.078	0.077
	2,4,6 Trinitrotoluene	SW846 8330	µg/L	0.075 - 0.078	10	0.075	0.075	0.077	0.075	0.078	0.077
	2,4-Dinitrotoluene	SW846 8330	µg/L	0.075 - 0.078	0.6	0.075	0.075	0.077	0.075	0.078	0.077
	2,6-Dinitrotoluene	SW846 8330	µg/L	0.075 - 0.078	0.2	0.075	0.075	0.077	0.075	0.078	0.077
	2-amino-4, 6-Dinitrotoluene	SW846 8330	µg/L	0.075 - 0.078	4.0	0.075	0.55	0.25	0.075	0.078	0.077
	o-Nitrotoluene (2-nitrotoluene)	SW846 8330	µg/L	0.075 - 0.078	70	0.075	0.075	0.077	0.075	0.078	0.077
	m-Nitrotoluene (3-nitrotoluene)	SW846 8330	µg/L	0.075 - 0.078	140	0.075	0.075	0.077	0.075	0.078	0.077
	4-amino-2, 6-Dinitrotoluene	SW846 8330	µg/L	0.075 - 0.078	4.0	0.075	0.46	0.21	0.075	0.078	0.077
	p-Nitrotoluene (4-nitrotoluene)	SW846 8330	µg/L	0.075 - 0.078	70	0.075	0.075	0.077	0.075	0.078	0.077
	HMX	SW846 8330	µg/L	0.075 - 0.15	350	0.075	0.19	0.19	28.0	27.8	28.1
	RDX	SW846 8330	µg/L	0.15 - 0.078	10	0.28	3.4	4.0	**26.4**	**14.1**	**14.5**
BTEX	Benzene	SW846 8260B	µg/L	0.2	1	0.2	0.2	0.2	0.2	0.2	0.2
	Ethylbenzene	SW846 8260B	µg/L	0.2	30	0.2	0.2	0.2	0.2	0.2	0.2
	Toluene	SW846 8260B	µg/L	0.4	40	0.4	0.4	0.4	0.4	0.4	0.4
	Total Xylenes	SW846 8260B	µg/L	0.51	20	0.51	0.51	0.51	0.51	0.51	0.51

Notes:
Grayscale indicates value less than MDL
Italics indicate result between MDL and RL
Redscale indicates an exceedance of GCTL
GCTLs are from current FDEP Permit # 0006176-006-HO
Laboratory: Test America, Orlando, FL

Water Quality Summary - June 2016
Range C-62
Eglin Air Force Base, Florida

	FDEP Permit # 006176-006-HO				MW-94-62-01	MW-94-62-02	MW-94-62-03	MW-94-62-04	MW-94-62-05	MW-94-62-05-FD
		Method	Unit	GCTL						
WELL INFORMATION	Permit Designation				Background	POC	POC	POC	POC	POC
	Top of Casing (TOC)	---	ft NGVD	---	188.22	173.55	172.36	178.50	177.81	177.81
	Water level (At time of sampling)	EPASOP	ft BTOC	---	11.79	9.25	10.14	17.42	18.39	18.39
	Water elevation	calc.	ft NGVD	---	176.43	164.30	162.22	161.08	159.42	159.42
	Well condition	obs.	---	---	OK	OK	OK	OK	OK	OK
	Well ID.	---	inches	---	4	4	4	4	4	4
	Well depth	---	ft btoc	---	34.22	38.90	39.50	38.92	39.35	39.35
FIELD PARAMETERS	Color	obs	---	---	clear	clear	clear	clear	clear	clear
	odor	obs	---	---	none	none	none	none	none	none
	pH	150.1	std units	6.5-8.5	4.68	3.83	4.39	5.58	4.31	4.31
	Specific Conductance (field)	120.1	mS/cm	---	0.011	0.013	0.018	0.024	0.020	0.020
	Temperature	170.1	˚C	---	21.48	22.30	22.09	21.58	21.90	21.90
	Dissolved oxygen	360.1	mg/L	---	8.32	7.89	8.51	8.07	8.31	8.31
	Turbidity	180.1	NTU	---	4.21	0.94	0.81	4.25	1.81	1.81
	Oxidation-reduction potential	2580B	mV	---	203.8	138.3	189.6	210.5	249.5	249.5
	Purging rate	---	gpm	---	0.20	0.20	0.20	0.20	0.20	0.20
GENERAL PARAMETERS	Nitrogen, Nitrate	EPA353.2	mg/L	10	*0.044*	0.26	0.20	0.88	0.69	0.89
	Nitrogen, Nitrite	EPA353.2	mg/L	1	0.021	0.021	0.021	0.021	0.021	0.021
EXPLOSIVES PARAMETERS	1,3,5 Trinitrobenzene	SW846 8330	µg/L	210	0.21	0.20	0.21	0.22	0.20	0.22
	1,3-Dinitrobenzene	SW846 8330	µg/L	0.7	0.093	0.091	0.091	0.098	0.088	0.098
	2,4,6 Trinitrotoluene	SW846 8330	µg/L	10	0.076	0.074	0.075	0.080	0.072	0.08
	2,4-Dinitrotoluene	SW846 8330	µg/L	0.6	0.088	0.086	0.086	0.093	0.083	0.093
	2,6-Dinitrotoluene	SW846 8330	µg/L	0.2	0.067	0.066	0.066	0.072	0.064	0.071
	2-amino-4, 6-Dinitrotoluene	SW846 8330	µg/L	4.0	0.053	0.42	*0.16*	0.056	0.050	0.056
	o-Nitrotoluene (2-nitrotoluene)	SW846 8330	µg/L	70	0.089	0.087	0.088	0.095	0.085	0.095
	m-Nitrotoluene (3-nitrotoluene)	SW846 8330	µg/L	140	0.087	0.085	0.086	0.093	0.083	0.092
	4-amino-2, 6-Dinitrotoluene	SW846 8330	µg/L	4.0	0.06	0.41	*0.18*	0.064	0.057	0.064
	p-Nitrotoluene (4-nitrotoluene)	SW846 8330	µg/L	70	0.21	0.20	0.21	0.22	0.20	0.22
	HMX	SW846 8330	µg/L	350	0.092	*0.14*	*0.19*	31	41	31
	RDX	SW846 8330	µg/L	10	*0.42*	3.6	3.9	**26**	**21**	**27**
BTEX	Benzene	SW846 8260B	µg/L	1	0.16	0.16	0.16	0.16	0.16	0.16
	Ethylbenzene	SW846 8260B	µg/L	30	0.16	0.16	0.16	0.16	0.16	0.16
	Toluene	SW846 8260B	µg/L	40	0.17	0.17	0.17	0.17	0.17	0.17
	Total Xylenes	SW846 8260B	µg/L	20	0.19	0.19	0.19	0.19	0.19	0.19

Notes:
Grayscale indicates value less than MDL
Italics indicate result between MDL and RL
Italics and underscore indicates analyte detected in the method blank
Redscale indicates an exceedance of GCTL
GCTLs are from current FDEP Permit # 0006176-006-HO
Laboratory: Test America, Orlando, FL

Water Quality Summary - May 2017
Range C-62
Eglin Air Force Base, Florida

	FDEP Permit # 006176-007-HO				MW-94-62-01	MW-94-62-02	MW-94-62-03	MW-94-62-04	MW-94-62-05	MW-94-62-05-FD
		Method	Unit	GCTL						
WELL INFORMATION	Permit Designation				Background	POC	POC	POC	POC	POC
	Top of Casing	---	feet NGVD	---	188.22	173.55	172.36	178.50	177.81	177.81
	Water level (At time of sampling)	EPA SOP	feet BTOC	---	14.70	10.33	11.00	18.61	18.98	18.98
	Water elevation	calculation	feet NGVD	---	173.52	163.22	161.36	159.89	158.83	158.83
	Well condition	observation	---	---	Okay	Okay	Okay	Okay	Okay	Okay
	Well Identification	---	inches	---	4	4	4	4	4	4
	Well depth	---	feet BTOC	---	34.24	38.07	40.53	38.76	39.39	39.39
FIELD PARAMETERS	Color	observation	---	---	clear	clear	clear	clear	clear	clear
	odor	observation	---	---	none	none	none	none	none	none
	pH	150.1	standard units	6.5-8.5	3.94	4.68	4.43	5.53	4.26	4.26
	Specific Conductance (field)	120.1	mS/cm	---	0.009	0.019	0.013	0.030	0.015	0.015
	Temperature	170.1	˚C	---	22.2	23.0	22.5	23.2	22.6	22.6
	Dissolved oxygen	360.1	mg/L	---	7.79	7.07	6.82	6.88	7.31	7.31
	Turbidity	180.1	NTU	---	1.07	4.78	2.11	1.45	2.19	2.19
	Oxidation-reduction potential	2580B	mV	---	250.2	263.5	169.8	193.4	160.9	160.9
	Purging rate	---	gpm	---	0.08	0.10	0.10	0.10	0.08	0.08
GENERAL PARAMETERS	Nitrogen, Nitrate	EPA353.2	mg/L	10	*0.036*	0.15	0.15	0.74	0.40	0.42
	Nitrogen, Nitrite	EPA353.2	mg/L	1	0.021	0.021	0.021	0.021	0.021	0.021
EXPLOSIVES PARAMETERS	1,3,5 Trinitrobenzene	SW846 8330	µg/L	210	0.19	0.21	0.22	2.1	2.1	2.2
	1,3-Dinitrobenzene	SW846 8330	µg/L	0.7	0.086	0.094	0.097	0.95	0.94	0.97
	2,4,6 Trinitrotoluene	SW846 8330	µg/L	10	0.070	0.077	0.079	0.780	0.77	0.79
	2,4-Dinitrotoluene	SW846 8330	µg/L	0.6	0.081	0.089	0.091	0.90	0.89	0.92
	2,6-Dinitrotoluene	SW846 8330	µg/L	0.2	0.063	0.068	0.070	0.69	0.68	0.71
	2-amino-4, 6-Dinitrotoluene	SW846 8330	µg/L	4.0	0.049	0.36	*0.17*	0.54	0.54	0.56
	o-Nitrotoluene (2-nitrotoluene)	SW846 8330	µg/L	70	0.083	0.091	0.093	0.92	0.90	0.94
	m-Nitrotoluene (3-nitrotoluene)	SW846 8330	µg/L	140	0.081	0.088	0.091	0.90	0.88	0.91
	4-amino-2, 6-Dinitrotoluene	SW846 8330	µg/L	4.0	0.056	0.31	*0.12*	0.62	0.61	0.63
	p-Nitrotoluene (4-nitrotoluene)	SW846 8330	µg/L	70	0.19	0.21	0.22	2.1	2.1	2.2
	HMX	SW846 8330	µg/L	350	0.085	*0.11*	*0.18*	32	46	48
	RDX	SW846 8330	µg/L	10	0.19	3.1	4.3	**26**	**33**	**36**
BTEX	Benzene	SW846 8260B	µg/L	1	0.38	0.38	0.38	0.38	0.38	0.38
	Ethylbenzene	SW846 8260B	µg/L	30	0.5	0.5	0.5	0.5	0.5	0.5
	Toluene	SW846 8260B	µg/L	40	0.7	0.7	0.7	0.7	0.7	0.7
	Total Xylenes	SW846 8260B	µg/L	20	1.6	1.6	1.6	1.6	1.6	1.6

Notes:
Grayscale indicates value less than method detection limit (MDL)
Italics indicate result between MDL and reporting limit (RL)
Underlined results are estimated low
Redscale indicates an exceedance of GCTL
GCTLs are from current FDEP Permit # 0006176-007-HO
Laboratory: Test America, Orlando, FL

POC: Point of Compliance
GCTL: Groundwater Cleanup Target Level
NGVD: National Geodetic Vertical Datum
EPA: Environmental Protection Agency
SOP: Standard Operation Procedure
mS/cm: millisiemens per centimeter
˚C: degree Celsius

mg/L: milligrams per liter
mV: millivolts
NTU: Nephelometric Turbidity Unit
gpm: gallons per minute
µg/L: micrograms per liter
BTEX: benzene, toluene, ethylbenzene, and total xylenes

TABLE 3-2
Water Quality Summary - May 2018
Range C-62
Eglin Air Force Base, Florida

	FDEP Permit # 006176-HO-007				MW-94-62-01	MW-94-62-02	MW-94-62-03	MW-94-62-04	MW-94-62-05	MW-94-62-02-DUP	C-62 EB	C-62 TD
		Method	Unit	GCTL								
WELL INFORMATION	Permit Designation				Background	POC	POC	POC	POC	POC	---	---
	Top of Casing	---	feet NGVD	---	188.22	173.55	172.36	178.50	177.81	173.55	---	---
	Water level (Day of Sampling)	EPA SOP	feet BTOC	---	14.66	10.30	10.93	18.62	18.90	10.30	---	---
	Water elevation	calculation	feet NGVD	---	173.56	163.25	161.43	159.88	158.91	163.25	---	---
	Well condition	observation	---	---	Okay	Okay	Okay	Okay	Okay	Okay	---	---
	Well Inside Diameter	---	inches	---	4	4	4	4	4	4	---	---
	Well depth	EPA SOP	feet BTOC	---	34.30	38.85	39.70	38.92	39.41	38.85	---	---
FIELD PARAMETERS	Color	observation	---	---	clear	clear	clear	clear	clear	clear	clear	clear
	odor	observation	---	---	none	none	none	none	none	none	none	none
	pH	150.1	standard units	6.5-8.5	4.58	5.05	3.03	4.80	2.59	5.05	---	---
	Specific Conductance (field)	120.1	mS/cm	---	0.009	0.013	0.012	0.025	0.016	0.013	---	---
	Temperature	170.1	˚C	---	22.61	22.59	22.42	22.46	22.43	22.59	---	---
	Dissolved oxygen	360.1	mg/L	---	7.56	7.46	7.91	7.81	7.83	7.46	---	---
	Turbidity	180.1	NTU	---	0.86	5.35	1.14	1.30	1.10	5.35	---	---
	Purging rate	---	gpm	---	0.10	0.10	0.10	0.10	0.10	0.10	---	---
GENERAL PARAMETERS	Nitrogen, Nitrate	EPA 300.0	mg/L	10	*0.044*	*0.19*	*0.12*	*0.74*	*0.43*	*0.18*	0.012	---
	Nitrogen, Nitrite	EPA 300.0	mg/L	1	0.021	0.021	0.021	0.021	0.021	0.021	0.021	---
EXPLOSIVES PARAMETERS	1,3,5 Trinitrobenzene	SW846 8330	µg/L	210	0.19	0.19	0.20	0.21	0.19	0.19	0.18	---
	1,3-Dinitrobenzene	SW846 8330	µg/L	0.70	0.085	0.086	0.089	0.091	0.084	0.084	0.082	---
	2,4,6 Trinitrotoluene	SW846 8330	µg/L	10	0.069	0.07	0.072	0.074	0.069	0.069	0.067	---
	2,4-Dinitrotoluene	SW846 8330	µg/L	0.60	0.080	0.081	0.084	0.086	0.08	0.08	0.077	---
	2,6-Dinitrotoluene	SW846 8330	µg/L	0.20	0.062	0.063	0.065	0.066	0.061	0.061	0.059	---
	2-amino-4, 6-Dinitrotoluene	SW846 8330	µg/L	4.00	0.048	0.44	*0.14*	0.052	0.048	0.40	0.047	---
	o-Nitrotoluene (2-nitrotoluene)	SW846 8330	µg/L	70	0.082	0.083	0.086	0.088	0.08	0.081	0.079	---
	m-Nitrotoluene (3-nitrotoluene)	SW846 8330	µg/L	140	0.080	0.081	0.084	0.086	0.079	0.079	0.77	---
	4-amino-2, 6-Dinitrotoluene	SW846 8330	µg/L	4.00	0.055	0.42	*0.18*	0.059	0.055	0.40	0.053	---
	p-Nitrotoluene (4-nitrotoluene)	SW846 8330	µg/L	70	0.19	0.19	0.20	0.21	0.19	0.19	0.18	---
	HMX	SW846 8330	µg/L	350	0.084	*0.13*	*0.13*	39	59	*0.14*	0.081	---
	RDX	SW846 8330	µg/L	10	0.30	3.10	3.80	**29**	**72**	3.20	0.048	---
BTEX	Benzene	SW846 8260B	µg/L	1	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38
	Ethylbenzene	SW846 8260B	µg/L	30	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
	Toluene	SW846 8260B	µg/L	40	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70
	Total Xylenes	SW846 8260B	µg/L	20	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60

Notes:
Grayscale indicates value less than method detection limit (MDL)
Italics indicate result between MDL and reporting limit (RL)
Underlined results are estimated low
Redscale indicates an exceedance of GCTL
GCTLs are from current FDEP Permit # 0006176-HO-007
Laboratory: Test America, Pensacola, FL
MS/MSD volume collected

POC: Point of Compliance
GCTL: Groundwater Cleanup Target Level
NGVD: National Geodetic Vertical Datum
EPA: Environmental Protection Agency
SOP: Standard Operation Procedure
mS/cm: millisiemens per centimeter
˚C: degree Celsius

mg/L: milligrams per liter
mV: millivolts
NTU: Nephelometric Turbidity Unit
gpm: gallons per minute
µg/L: micrograms per liter
BTEX: benzene, toluene, ethylbenzene, and total xylenes

Water Quality Summary - May 2019
Range C-62
Eglin Air Force Base, Florida

	FDEP Permit # 006176-009-HO				MW-94-62-01	MW-94-62-02	MW-94-62-03	MW-94-62-04	MW-94-62-05	MW-94-62-02-DUP	C-62 EB	C-62 TD
	Parameter	**Method**	**Unit**	**GCTL**	Sampled May 14, 2019						Equipment Blank	
WELL INFORMATION	Permit Designation				Background	POC	POC	POC	POC	POC	---	---
	Top of Casing	---	feet NGVD	---	188.22	173.55	172.36	178.50	177.81	173.55	---	---
	Water level (Day of Sampling)	EPA SOP	feet BTOC	---	14.22	10.10	10.90	18.84	19.37	10.10	---	---
	Water elevation	calculation	feet NGVD	---	174.00	163.45	161.46	159.66	158.44	163.45	---	---
	Well condition	observation	---	---	Okay	Okay	Okay	Okay	Okay	Okay	---	---
	Well Inside Diameter	---	inches	---	4	4	4	4	4	4	---	---
	Well depth	EPA SOP	feet BTOC	---	34.25	38.90	39.63	38.90	39.41	38.90	---	---
FIELD PARAMETERS	Color	observation	---	---	clear	clear	clear	clear	clear	clear	clear	clear
	odor	observation	---	---	none	none	none	none	none	none	none	none
	pH	150.1	standard units	6.5-8.5	4.04	4.38	4.35	5.69	4.44	4.38	---	---
	Specific Conductance (field)	120.1	mS/cm	---	0.008	0.012	0.012	0.024 **	0.016 **	0.012	---	---
	Temperature	170.1	˚C	---	22.54	22.65	22.28	22.20	22.46	22.65	---	---
	Dissolved oxygen	360.1	mg/L	---	7.56	7.25	6.85	7.62	7.93	7.25	---	---
	Turbidity	180.1	NTU	---	0.45	1.96	1.57	2.44	1.51	1.96	---	---
	Purging rate	---	gpm	---	0.10	0.10	0.10	0.10	0.10	0.10	---	---
GENERAL PARAMETERS	Nitrogen, Nitrate	EPA 300.0	mg/L	10	0.012	0.15	*0.10*	0.64	0.42	0.16	0.012	---
	Nitrogen, Nitrite	EPA 300.0	mg/L	1	0.021	0.021	0.021	0.021	0.021	0.021	0.021	---
	Final pH (lab)	150.1	standard units	6.5-8.5	5.5	5.9	6.3	6.7	5.7	5.3	5.5	
EXPLOSIVES PARAMETERS	1,3,5 Trinitrobenzene	SW846 8330	µg/L	210	0.20	0.20	0.21	0.21	0.20	0.20	0.22	---
	1,3-Dinitrobenzene	SW846 8330	µg/L	0.70	0.088	0.089	0.095	0.094	0.09	0.089	0.098	---
	2,4,6 Trinitrotoluene	SW846 8330	µg/L	10	0.160	0.160	0.17	0.170	0.16	0.16	0.18	---
	2,4-Dinitrotoluene	SW846 8330	µg/L	0.60	0.083	0.084	0.089	0.088	0.085	0.084	0.093	---
	2,6-Dinitrotoluene	SW846 8330	µg/L	0.20	0.064	0.065	0.069	0.068	0.066	0.064	0.072	---
	2-amino-4, 6-Dinitrotoluene	SW846 8330	µg/L	4.00	0.05	0.051	0.054	0.054	0.052	0.40	0.056	---
	o-Nitrotoluene (2-nitrotoluene)	SW846 8330	µg/L	70	0.085	0.086	0.091	0.090	0.087	0.085	0.095	---
	m-Nitrotoluene (3-nitrotoluene)	SW846 8330	µg/L	140	0.190	0.20	0.21	0.210	0.20	0.19	0.22	---
	4-amino-2, 6-Dinitrotoluene	SW846 8330	µg/L	4.00	0.057	0.40	0.062	0.061	0.059	0.38	0.064	---
	p-Nitrotoluene (4-nitrotoluene)	SW846 8330	µg/L	70	0.20	0.20	0.21	0.21	0.20	0.20	0.22	---
	HMX	SW846 8330	µg/L	350	0.087	0.14	0.15	39	91	0.55	0.097	---
	RDX	SW846 8330	µg/L	10	*0.17*	2.90	3.90	**26**	**52**	2.90	0.18	---
BTEX	Benzene	SW846 8260B	µg/L	1	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38
	Ethylbenzene	SW846 8260B	µg/L	30	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
	Toluene	SW846 8260B	µg/L	40	0.41	0.41	0.50	0.41	0.41	0.41	0.41	0.41
	Total Xylenes	SW846 8260B	µg/L	20	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60

Notes:

Grayscale indicates value less than or equal to method detection limit (MDL)

Italics indicate result between MDL and reporting limit (RL)

Underlined results are estimated low

Redscale indicates an exceedance of GCTL

GCTLs are from current FDEP Permit # 0006176-009-HO

Laboratory: Test America, Pensacola, FL and Denver, CO

MS/MSD volume collected

POC: Point of Compliance
GCTL: Groundwater Cleanup Target Level
NGVD: National Geodetic Vertical Datum
EPA: Environmental Protection Agency
SOP: Standard Operation Procedure
mS/cm: millisiemens per centimeter
˚C: degree Celsius

mg/L: milligrams per liter
mV: millivolts
NTU: Nephelometric Turbidity Unit
gpm: gallons per minute
µg/L: micrograms per liter
BTEX: benzene, toluene, ethylbenzene, and total xylenes

** In the process of calibrating the two YSI meters used to obtain groundwater parameters, one unit was calibrated to a value in which the decimal point was omitted for the value for specific conductance. The value of 1409 was entered during calibration, rather than 1.409, resulting in the reported values during sampling being multipled by 1,000 (ex. 16 v. 0.016).

TABLE 3-1
Water Quality Summary - June 2020
Range C-52N
Eglin Air Force Base, Florida

	FDEP Permit # 006176-009-HO				MW-94-52-01	MW-94-52-02	MW-94-52-03	MW-94-52-02-DUP	C-52N EB
	Parameter	**Method**	**Unit**	**GCTL**	Sampled June 19, 2020				Equipment Blank
WELL INFORMATION	Permit Designation				Background	POC	POC	POC	---
	Top of Casing	---	feet NGVD	---	156.73	115.54	125.34	115.54	---
	Initial Water level (Day of sampling)	EPA SOP	feet BTOC	---	36.92	14.30	20.10	14.30	---
	Water elevation	calculation	feet NGVD	---	119.81	101.24	105.24	101.24	---
	Well condition	observation	---	---	Okay	Okay	Okay	Okay	---
	Well Inside Diameter	---	inches	---	4	4	4	4	---
	Well depth	EPA SOP	feet BTOC	---	45.15	39.35	39.61	39.35	---
FIELD PARAMETERS	Color	observation	---	---	lt. brown tint	clear	clear	clear	clear
	odor	observation	---	---	none	none	none	none	none
	pH	150.1	standard units	6.5-8.5	3.20	5.26	5.40	5.26	---
	Specific Conductance (field)	120.1	mS/cm	---	30	52	52	52	---
	Temperature	170.1	˚C	---	23.58	20.36	20.49	20.36	---
	Dissolved oxygen	360.1	3	---	7.15	3.13	3.89	3.13	---
	Turbidity	180.1	NTU	---	7.03	3.87	0.81	3.87	---
	Purging rate	---	gpm	---	0.14	0.10	0.10	0.10	---
GENERAL PERAMETERS	Nitrogen, Nitrate	EPA 300.0	mg/L	10	0.210	0.033	0.033	0.033	0.033
	Nitrogen, Nitrite	EPA 300.0	mg/L	1	0.026	0.026	0.026	0.026	0.026
	Final pH (lab)	150.1	standard units	6.5-8.5	5.0	5.7	5.1	5.8	5.1
EXPLOSIVES PARAMETERS	1,3,5 Trinitrobenzene	SW846 8330	µg/L	210	0.083	0.084	0.084	0.083	0.084
	1,3-Dinitrobenzene	SW846 8330	µg/L	0.7	0.037	0.037	0.037	0.036	0.037
	2,4,6 Trinitrotoluene	SW846 8330	µg/L	10	0.045	0.045	0.045	0.044	0.045
	2,4-Dinitrotoluene	SW846 8330	µg/L	0.6	0.027	0.027	0.027	0.027	0.028
	2,6-Dinitrotoluene	SW846 8330	µg/L	0.2	0.040	0.040	0.040	0.040	0.040
	2-amino-4, 6-Dinitrotoluene	SW846 8330	µg/L	4.0	0.050	0.050	0.051	0.050	0.051
	o-Nitrotoluene (2-nitrotoluene)	SW846 8330	µg/L	70	0.085	0.085	0.085	0.084	0.086
	m-Nitrotoluene (3-nitrotoluene)	SW846 8330	µg/L	140	0.190	0.190	0.190	0.190	0.200
	4-amino-2, 6-Dinitrotoluene	SW846 8330	µg/L	4.0	0.057	0.057	0.058	0.057	0.058
	p-Nitrotoluene (4-nitrotoluene)	SW846 8330	µg/L	70	0.10	0.10	0.10	0.099	0.10
	HMX	SW846 8330	µg/L	350	0.087	0.087	0.087	0.087	0.088
	RDX	SW846 8330	µg/L	10	0.77	0.051	0.051	0.051	0.052

Notes:

Grayscale indicates value less than or equal to method detection limit (MDL)

Italics indicate result between MDL and reporting limit (RL)

Underlined results are estimated low

Redscale indicates an exceedance of GCTL

GCTLs are from current FDEP Permit # 0006176-009-HO

Laboratory: Test America, Pensacola, FL and Denver, CO

MS/MSD volume collected

POC: Point of Compliance

GCTL: Groundwater Cleanup Target Level

NGVD: National Geodetic Vertical Datum

EPA: Environmental Protection Agency

SOP: Standard Operation Procedure

mS/cm: millisiemens per centimeter

˚C: degree Celsius

mg/L: milligrams per liter

mV: millivolts

NTU: Nephelometric Turbidity Unit

gpm: gallons per minute

µg/L: micrograms per liter

BTEX: benzene, toluene, ethylbenzene, and total xylenes

TABLE 3-2
Water Quality Summary - July 2020
Range C-62
Eglin Air Force Base, Florida

	FDEP Permit # 006176-009-HO				MW-94-62-01	MW-94-62-02	MW-94-62-03	MW-94-62-04	MW-94-62-05	MW-94-62-05-DUP	SURF-62-1	C-62 EB	C-62 TD
	Parameter	**Method**	**Unit**	**GCTL**	Sampled July 9, 2020							Equipment Blank	
WELL INFORMATION	Permit Designation				Background	POC	POC	POC	POC	POC	Surface water	---	---
	Top of Casing	---	feet NGVD	---	188.22	173.55	172.36	178.50	177.81	177.81	---	---	---
	Initial Water level (Day of Sampling	EPA SOP	feet BTOC	---	17.51	11.49	10.96	19.84	20.23	20.23	---	---	---
	Water elevation	calculation	feet NGVD	---	170.71	162.06	161.40	158.66	157.58	157.58	---	---	---
	Well condition	observation	---	---	Okay	Okay	Okay	Okay	Okay	Okay	---	---	---
	Well Inside Diameter	---	inches	---	4	4	4	4	4	4	---	---	---
	Well depth	EPA SOP	feet BTOC	---	34.23	38.92	39.61	38.87	39.43	39.43	---	---	---
FIELD PARAMETERS	Color	observation	---	---	clear	clear	clear	clear	clear	clear	clear	clear	clear
	odor	observation	---	---	none	none	none	none	none	none	none	none	none
	pH	150.1	standard units	6.5-8.5	4.89	5.15	5.38	4.74	4.61	4.61	---	---	---
	Specific Conductance (field)	120.1	mS/cm	---	13.000	18.000	25.000	34	19	19	---	---	---
	Temperature	170.1	˚C	---	24.14	24.80	23.63	24.63	25.34	25.34	---	---	---
	Dissolved oxygen	360.1	mg/L	---	6.84	6.98	6.34	5.43	5.43	5.43	---	---	---
	Turbidity	180.1	NTU	---	0.66	2.43	0.49	1.53	1.16	1.16	---	---	---
	Purging rate	---	gpm	---	180.00	170.00	180.00	200.00	150.00	150.00	---	---	---
GENERAL PARAMETERS	Nitrogen, Nitrate	EPA 300.0	mg/L	10	*0.037*	0.240	0.170	0.600	0.480	0.480	---	0.033	---
	Nitrogen, Nitrite	EPA 300.0	mg/L	1	0.026	0.026	0.026	0.026	0.026	0.026	---	0.026	---
	Final pH (lab)	150.1	standard units	6.5-8.5	5.1	5.7	5.4	6.3	5.0	5.1		5.0	
EXPLOSIVES PARAMETERS	1,3,5 Trinitrobenzene	SW846 8330	µg/L	210	0.092	0.089	0.091	0.089	0.092	0.091	---	0.091	---
	1,3-Dinitrobenzene	SW846 8330	µg/L	0.70	0.040	0.039	0.040	0.039	0.040	0.040	---	0.040	---
	2,4,6 Trinitrotoluene	SW846 8330	µg/L	10	0.049	0.048	0.049	0.048	0.049	0.048	---	0.049	---
	2,4-Dinitrotoluene	SW846 8330	µg/L	0.60	0.030	0.029	0.030	0.029	0.030	0.030	---	0.030	---
	2,6-Dinitrotoluene	SW846 8330	µg/L	0.20	0.044	0.042	0.043	0.043	0.044	0.043	---	0.043	---
	2-amino-4, 6-Dinitrotoluene	SW846 8330	µg/L	4.00	0.055	0.054	0.055	0.054	0.055	0.055	---	0.055	---
	o-Nitrotoluene (2-nitrotoluene)	SW846 8330	µg/L	70	0.093	0.090	0.092	0.091	0.093	0.092	---	0.093	---
	m-Nitrotoluene (3-nitrotoluene)	SW846 8330	µg/L	140	0.210	0.210	0.210	0.210	0.210	0.210	---	0.210	---
	4-amino-2, 6-Dinitrotoluene	SW846 8330	µg/L	4.00	0.063	0.061	0.062	0.061	0.063	0.062	---	0.062	---
	p-Nitrotoluene (4-nitrotoluene)	SW846 8330	µg/L	70	0.11	0.11	0.11	0.11	0.11	0.11	---	0.11	---
	HMX	SW846 8330	µg/L	350	0.095	0.093	0.095	46	120	120	---	0.095	---
	RDX	SW846 8330	µg/L	10	0.40	2.70	3.50	**32**	**42**	**43**	0.59	0.056	---
BTEX	Benzene	SW846 8260B	µg/L	1	0.38	0.38	0.38	0.38	0.38	0.38	---	0.38	0.38
	Ethylbenzene	SW846 8260B	µg/L	30	0.50	0.50	0.50	0.50	0.50	0.50	---	0.50	0.50
	Toluene	SW846 8260B	µg/L	40	0.41	0.41	0.41	0.41	0.41	0.41	---	*0.59*	0.41
	Total Xylenes	SW846 8260B	µg/L	20	1.60	1.60	1.60	1.60	1.60	1.60	---	1.60	1.60

Notes:

Grayscale indicates value less than or equal to method detection limit (MDL)

Italics indicate result between MDL and reporting limit (RL)

Underlined results are estimated low

Redscale indicates an exceedance of GCTL

GCTLs are from current FDEP Permit # 0006176-009-HO

POC: Point of Compliance
GCTL: Groundwater Cleanup Target Level
NGVD: National Geodetic Vertical Datum
EPA: Environmental Protection Agency
SOP: Standard Operation Procedure
mS/cm: millisiemens per centimeter

mg/L: milligrams per liter
mV: millivolts
NTU: Nephelometric Turbidity Unit
gpm: gallons per minute
µg/L: micrograms per liter
BTEX: benzene, toluene, ethylbenzene, and total xylenes

Table 5
Groundwater Analytical Results, July 2021
Range C-62
Eglin Air Force Base, Florida

Client Sample ID:		FDEP GTCL* (FAC 62-777 2/05)	MW-94-62-01-JUL21	MW-94-64-02-JUL21	MW-94-62-03-JUL21	MW-94-62-04-JUL21	C62-DUP01-071421	MW-2021-62-01A-JUL21	MW-2021-62-02A-JUL21	MW-2021-62-03A-JUL21	MW-2021-62-04B-JUL21	MW-2021-62-05B-JUL21	MW-2021-62-06A-JUL21
Lab Sample ID:			FA87213-5	FA87463-1	FA87531-2	FA87213-6	FA87213--2/2R	FA87531-3	FA87213--3/3R	FA87120-2	FA87303-3	FA87213-4	FA87303-2
Date Sampled:			7/14/2021	7/21/2021	7/23/2021	7/14/2021	7/14/2021	7/23/2021	7/14/2021	7/9/2021	7/16/2021	7/14/2021	7/16/2021
Matrix:	**Units**		Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water
Field Parameters													
pH	pH Units	-	4.51	5.12	4.52	5.78	-	8.3	4.42	4.58	8.47	7.93	5.33
Temperature	°C	-	23.00	24.70	23.50	26.40	-	24.00	24.00	24.10	24.1	23.8	24.5
Specific Conductivity	µS/cm	-	10.0	13.0	12.5	26.0	-	199.0	11.0	13.0	70.8	67.4	16.2
Dissolved Oxygen	mg/L	-	7.68	8.02	8.22	6.08	-	6.35	7.93	8.23	3.26	3.35	4.61
Salinity	$^{0}/_{00}$	-	0.00	0.00	0.00	0.01	-	0.09	0.00	0.00	0.03	0.03	0.01
ORP	mV	-	239.5	132.1	286.5	573.2	-	167.1	472	251.8	49.8	-108.9	132.1
Turbidity	NTUs	-	2.48	3.98	1.49	6.27	-	>1100	2.95	6.86	8.12	7.25	1.54
MS Volatiles (SW846 8260B)													
Acetone	µg/L	6300	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U
Benzene	µg/L	1	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromobenzene	µg/L	-	-	-	-	-	-	-	-	-	-	-	-
Bromochloromethane	µg/L	91	-	-	-	-	-	-	-	-	-	-	-
Bromodichloromethane	µg/L	0.6	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromoform	µg/L	4.4	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
2-Butanone (MEK)	µg/L	4200	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
n-Butylbenzene	µg/L	-	-	-	-	-	-	-	-	-	-	-	-
sec-Butylbenzene	µg/L	-	-	-	-	-	-	-	-	-	-	-	-
tert-Butylbenzene	µg/L	-	-	-	-	-	-	-	-	-	-	-	-
Carbon Disulfide	µg/L	700	2.0 UJ	2.0 U	2.0 U	2.0 UJ	2.0 UJ	2.0 U	2.0 UJ	2.0 U	2.0 U	2.0 UJ	2.0 U
Carbon Tetrachloride	µg/L	3	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chlorobenzene	µg/L	100	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloroethane	µg/L	12	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Chloroform	µg/L	70	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
o-Chlorotoluene	µg/L	140	-	-	-	-	-	-	-	-	-	-	-
p-Chlorotoluene	µg/L	140	-	-	-	-	-	-	-	-	-	-	-
Dibromochloromethane	µg/L	0.4	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dibromo-3-chloropropane	µg/L	0.2	-	-	-	-	-	-	-	-	-	-	-
1,2-Dibromoethane	µg/L	0.02	-	-	-	-	-	-	-	-	-	-	-
Dichlorodifluoromethane	µg/L	1400	-	-	-	-	-	-	-	-	-	-	-
1,2-Dichlorobenzene	µg/L	600	-	-	-	-	-	-	-	-	-	-	-
1,3-Dichlorobenzene	µg/L	210	-	-	-	-	-	-	-	-	-	-	-
1,4-Dichlorobenzene	µg/L	75	-	-	-	-	-	-	-	-	-	-	-
1,1-Dichloroethane	µg/L	70	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloroethane	µg/L	3	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1-Dichloroethylene	µg/L	7	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
cis-1,2-Dichloroethylene	µg/L	70	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
trans-1,2-Dichloroethylene	µg/L	100	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloropropane	µg/L	5	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,3-Dichloropropane	µg/L	-	-	-	-	-	-	-	-	-	-	-	-
2,2-Dichloropropane	µg/L	-	-	-	-	-	-	-	-	-	-	-	-
1,1-Dichloropropene	µg/L	-	-	-	-	-	-	-	-	-	-	-	-
cis-1,3-Dichloropropene	µg/L	-	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U

Table 5
Groundwater Analytical Results, July 2021
Range C-62
Eglin Air Force Base, Florida

Client Sample ID:		FDEP GTCL* (FAC 62-777 2/05)	MW-94-62-01-JUL21	MW-94-64-02-JUL21	MW-94-62-03-JUL21	MW-94-62-04-JUL21	C62-DUP01-071421	MW-2021-62-01A-JUL21	MW-2021-62-02A-JUL21	MW-2021-62-03A-JUL21	MW-2021-62-04B-JUL21	MW-2021-62-05B-JUL21	MW-2021-62-06A-JUL21
Lab Sample ID:			FA87213-5	FA87463-1	FA87531-2	FA87213-6	FA87213--2/2R	FA87531-3	FA87213--3/3R	FA87120-2	FA87303-3	FA87213-4	FA87303-2
Date Sampled:			7/14/2021	7/21/2021	7/23/2021	7/14/2021	7/14/2021	7/23/2021	7/14/2021	7/9/2021	7/16/2021	7/14/2021	7/16/2021
Matrix:	**Units**		Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water
trans-1,3-Dichloropropene	µg/L	-	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Ethylbenzene	µg/L	30	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Hexachlorobutadiene	µg/L	0.4	-	-	-	-	-	-	-	-	-	-	-
2-Hexanone	µg/L	280	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Isopropylbenzene	µg/L	0.8	-	-	-	-	-	-	-	-	-	-	-
p-Isopropyltoluene	µg/L	-	-	-	-	-	-	-	-	-	-	-	-
Methyl Bromide	µg/L	9.8	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 UJ	5.0 U	5.0 UJ
Methyl Chloride	µg/L	2.7	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Methylene Bromide	µg/L	70	-	-	-	-	-	-	-	-	-	-	-
Methylene Chloride	µg/L	5	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
4-Methyl-2-pentanone (MIBK)	µg/L	560	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Methyl Tert Butyl Ether	µg/L	20	-	-	-	-	-	-	-	-	-	-	-
Naphthalene	µg/L	14	-	-	-	-	-	-	-	-	-	-	-
n-Propylbenzene	µg/L	-	-	-	-	-	-	-	-	-	-	-	-
Styrene	µg/L	100	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,1,2-Tetrachloroethane	µg/L	1.3	-	-	-	-	-	-	-	-	-	-	-
1,1,2,2-Tetrachloroethane	µg/L	0.2	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Tetrachloroethylene	µg/L	3	1.0 U	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Toluene	µg/L	40	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2,3-Trichlorobenzene	µg/L	70	-	-	-	-	-	-	-	-	-	-	-
1,2,4-Trichlorobenzene	µg/L	70	-	-	-	-	-	-	-	-	-	-	-
1,1,1-Trichloroethane	µg/L	200	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,2-Trichloroethane	µg/L	5	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Trichloroethylene	µg/L	3	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Trichlorofluoromethane	µg/L	2100	-	-	-	-	-	-	-	-	-	-	-
1,2,3-Trichloropropane	µg/L	0.02	-	-	-	-	-	-	-	-	-	-	-
1,2,4-Trimethylbenzene	µg/L	10	-	-	-	-	-	-	-	-	-	-	-
1,3,5-Trimethylbenzene	µg/L	10	-	-	-	-	-	-	-	-	-	-	-
Vinyl Acetate	µg/L	88	-	-	-	-	-	-	-	-	-	-	-
Vinyl Chloride	µg/L	1	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
m,p-Xylene	µg/L	20	-	-	-	-	-	-	-	-	-	-	-
o-Xylene	µg/L	20	-	-	-	-	-	-	-	-	-	-	-
Xylene (total)	µg/L	20	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U
MS Semi-volatiles (SW846 6850)													
Perchlorate	µg/L	4	3.5	**7.0**	1.6	**351**	**335**	1.0	0.20 U	**122**	**7.8**	**11.8**	**27.3**
MS Semi-volatiles (SW846 8270D)													
Benzoic Acid	µg/L	28000	51 U	50 UJ	48 U	67 U	50 U	250 U	50 U	50 UJ	52 U	49 U	48 UJ
4-Chloro-3-methyl Phenol	µg/L	63	5.1 U	5.0 U	4.8 U	6.7 U	5.0 U	10 U	5.0 U	5.0 U	5.2 U	4.9 U	4.8 U
2-Chlorophenol	µg/L	35	5.1 U	5.0 U	4.8 U	6.7 U	5.0 U	10 U	5.0 U	5.0 U	5.2 U	4.9 U	4.8 U
2,4-Dichlorophenol	µg/L	0.3	5.1 U	5.0 U	4.8 U	6.7 U	5.0 U	10 U	5.0 U	5.0 U	5.2 U	4.9 U	4.8 U
2,4-Dimethylphenol	µg/L	140	5.1 U	5.0 U	4.8 U	6.7 U	5.0 U	10 U	5.0 U	5.0 U	5.2 U	4.9 U	4.8 U
2,4-Dinitrophenol	µg/L	14	26 U	25 UJ	24 U	33 U	25 U	200 U	25 U	25 UJ	26 U	25 U	24 UJ

Table 5
Groundwater Analytical Results, July 2021
Range C-62
Eglin Air Force Base, Florida

Client Sample ID:		FDEP GTCL* (FAC 62-777 2/05)	MW-94-62-01-JUL21	MW-94-64-02-JUL21	MW-94-62-03-JUL21	MW-94-62-04-JUL21	C62-DUP01-071421	MW-2021-62-01A-JUL21	MW-2021-62-02A-JUL21	MW-2021-62-03A-JUL21	MW-2021-62-04B-JUL21	MW-2021-62-05B-JUL21	MW-2021-62-06A-JUL21
Lab Sample ID:			FA87213-5	FA87463-1	FA87531-2	FA87213-6	FA87213--2/2R	FA87531-3	FA87213--3/3R	FA87120-2	FA87303-3	FA87213-4	FA87303-2
Date Sampled:			7/14/2021	7/21/2021	7/23/2021	7/14/2021	7/14/2021	7/23/2021	7/14/2021	7/9/2021	7/16/2021	7/14/2021	7/16/2021
Matrix:	Units		Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water
4,6-Dinitro-o-cresol	µg/L	-	10 U	10 UJ	9.6 U	13 U	10 U	100 U	10 U	10 UJ	10 U	9.8 U	9.6 UJ
2-Methylphenol	µg/L	35	5.1 U	5.0 U	4.8 U	6.7 U	5.0 U	10 U	5.0 U	5.0 U	5.2 U	4.9 U	4.8 U
3&4-Methylphenol	µg/L	-	5.1 U	5.0 U	4.8 U	6.7 U	5.0 U	10 U	5.0 U	5.0 U	5.2 U	4.9 U	4.8 U
2-Nitrophenol	µg/L	-	5.1 U	5.0 U	4.8 U	6.7 U	5.0 U	10 U	5.0 U	5.0 U	5.2 U	4.9 U	4.8 U
4-Nitrophenol	µg/L	56	26 U	25 U	24 UJ	33 U	25 U	100 UJ	25 U	25 UJ	26 U	25 U	24 U
Pentachlorophenol	µg/L	1	26 U	25 U	24 U	33 U	25 U	100 U	25 U	25 U	26 U	25 U	24 U
Phenol	µg/L	10	5.1 U	5.0 U	4.8 U	6.7 U	5.0 U	10 U	5.0 U	5.0 U	5.2 U	4.9 U	4.8 U
2,4,5-Trichlorophenol	µg/L	1	5.1 U	5.0 U	4.8 U	6.7 U	5.0 U	10 U	5.0 U	5.0 U	5.2 U	4.9 U	4.8 U
2,4,6-Trichlorophenol	µg/L	3.2	5.1 U	5.0 U	4.8 U	6.7 U	5.0 U	10 U	5.0 U	5.0 U	5.2 U	4.9 U	4.8 U
Acenaphthene	µg/L	20	5.1 U	5.0 U	4.8 U	6.7 U	5.0 U	10 U	5.0 U	5.0 U	5.2 U	4.9 U	4.8 U
Acenaphthylene	µg/L	210	5.1 U	5.0 U	4.8 U	6.7 U	5.0 U	10 U	5.0 U	5.0 U	5.2 U	4.9 U	4.8 U
Anthracene	µg/L	2100	5.1 U	5.0 U	4.8 U	6.7 U	5.0 U	10 U	5.0 U	5.0 U	5.2 U	4.9 U	4.8 U
Benzo(a)anthracene	µg/L	0.05	5.1 U	5.0 U	4.8 U	6.7 U	5.0 U	10 U	5.0 U	5.0 U	5.2 U	4.9 U	4.8 U
Benzo(a)pyrene	µg/L	0.2	5.1 U	5.0 U	4.8 U	6.7 U	5.0 U	10 U	5.0 U	5.0 U	5.2 U	4.9 U	4.8 U
Benzo(b)fluoranthene	µg/L	0.05	5.1 U	5.0 U	4.8 U	6.7 U	5.0 U	10 U	5.0 U	5.0 U	5.2 U	4.9 U	4.8 U
Benzo(g,h,i)perylene	µg/L	210	5.1 U	5.0 U	4.8 U	6.7 U	5.0 U	10 U	5.0 U	5.0 U	5.2 U	4.9 U	4.8 U
Benzo(k)fluoranthene	µg/L	0.5	5.1 U	5.0 U	4.8 U	6.7 U	5.0 U	10 U	5.0 U	5.0 U	5.2 U	4.9 U	4.8 U
Benzyl Alcohol	µg/L	2100	5.1 U	5.0 U	4.8 U	6.7 U	5.0 U	10 U	5.0 U	5.0 U	5.2 U	4.9 U	4.8 U
4-Bromophenyl Phenyl Ether	µg/L	-	5.1 U	5.0 U	4.8 U	6.7 U	5.0 U	10 U	5.0 U	5.0 U	5.2 U	4.9 U	4.8 U
Butyl Benzyl Phthalate	µg/L	140	5.1 U	5.0 UJ	4.8 U	6.7 U	5.0 U	10 U	5.0 U	5.0 U	5.2 U	4.9 U	4.8 UJ
Carbazole	µg/L	1.8	5.1 U	5.0 U	4.8 U	6.7 U	5.0 U	10 U	5.0 U	5.0 U	5.2 U	4.9 U	4.8 U
4-Chloroaniline	µg/L	28	5.1 U	5.0 U	4.8 U	6.7 U	5.0 U	10 U	5.0 U	5.0 U	5.2 U	4.9 U	4.8 U
bis(2-Chloroethoxy)methane	µg/L	-	5.1 U	5.0 U	4.8 U	6.7 U	5.0 U	10 U	5.0 U	5.0 U	5.2 U	4.9 U	4.8 U
bis(2-Chloroethyl)ether	µg/L	0.03	5.1 U	5.0 U	4.8 U	6.7 U	5.0 U	10 U	5.0 U	5.0 U	5.2 U	4.9 U	4.8 U
2,2'-Oxybis(1-chloropropane)	µg/L	0.5	5.1 U	5.0 U	4.8 U	6.7 U	5.0 U	10 U	5.0 U	5.0 U	5.2 U	4.9 U	4.8 U
2-Chloronaphthalene	µg/L	560	5.1 U	5.0 U	4.8 U	6.7 U	5.0 U	10 U	5.0 U	5.0 U	5.2 U	4.9 U	4.8 U
4-Chlorophenyl Phenyl Ether	µg/L	-	5.1 U	5.0 U	4.8 U	6.7 U	5.0 U	10 U	5.0 U	5.0 U	5.2 U	4.9 U	4.8 U
Chrysene	µg/L	4.8	5.1 U	5.0 U	4.8 U	6.7 U	5.0 U	10 U	5.0 U	5.0 U	5.2 U	4.9 U	4.8 U
Dibenzo(a,h)anthracene	µg/L	0.005	5.1 U	5.0 U	4.8 U	6.7 U	5.0 U	10 U	5.0 U	5.0 U	5.2 U	4.9 U	4.8 U
Dibenzofuran	µg/L	28	5.1 U	5.0 U	4.8 U	6.7 U	5.0 U	10 U	5.0 U	5.0 U	5.2 U	4.9 U	4.8 U
1,2-Dichlorobenzene	µg/L	600	5.1 U	5.0 U	4.8 U	6.7 U	5.0 U	10 U	5.0 U	5.0 U	5.2 U	4.9 U	4.8 U
1,3-Dichlorobenzene	µg/L	210	5.1 U	5.0 U	4.8 U	6.7 U	5.0 U	10 U	5.0 U	5.0 U	5.2 U	4.9 U	4.8 U
1,4-Dichlorobenzene	µg/L	75	5.1 U	5.0 U	4.8 U	6.7 U	5.0 U	10 U	5.0 U	5.0 U	5.2 U	4.9 U	4.8 U
3,3'-Dichlorobenzidine	µg/L	0.08	5.1 U	5.0 U	4.8 U	6.7 U	5.0 U	10 U	5.0 U	5.0 U	5.2 U	4.9 U	4.8 U
Diethyl Phthalate	µg/L	5600	5.1 U	5.0 U	4.8 U	6.7 U	5.0 U	10 U	5.0 U	5.0 U	5.2 U	4.9 U	4.8 U
Dimethyl Phthalate	µg/L	70000	5.1 U	5.0 U	4.8 U	6.7 U	5.0 U	10 U	5.0 U	5.0 U	5.2 U	4.9 U	4.8 U
Di-n-butyl Phthalate	µg/L	700	5.1 U	5.0 U	4.8 U	6.7 U	5.0 U	10 U	5.0 U	5.0 U	5.2 U	4.9 U	4.8 U
Di-n-octyl Phthalate	µg/L	140	5.1 UJ	5.0 UJ	4.8 U	6.7 UJ	5.0 UJ	10 U	5.0 UJ	5.0 UJ	5.2 UJ	4.9 UJ	4.8 UJ
2,4-Dinitrotoluene	µg/L	0.05	5.1 U	5.0 U	4.8 U	6.7 U	5.0 U	10 U	5.0 U	5.0 U	5.2 U	4.9 U	4.8 U
2,6-Dinitrotoluene	µg/L	0.05	5.1 U	5.0 U	4.8 U	6.7 U	5.0 U	10 U	5.0 U	5.0 U	5.2 U	4.9 U	4.8 U
bis(2-Ethylhexyl)phthalate	µg/L	6	5.1 U	5.0 UJ	4.8 U	6.7 U	5.0 U	10 U	5.0 U	5.0 U	5.2 U	4.9 U	4.8 UJ
Fluoranthene	µg/L	280	5.1 U	5.0 U	4.8 U	6.7 U	5.0 U	10 U	5.0 U	5.0 U	5.2 U	4.9 U	4.8 U
Fluorene	µg/L	280	5.1 U	5.0 U	4.8 U	6.7 U	5.0 U	10 U	5.0 U	5.0 U	5.2 U	4.9 U	4.8 U
Hexachlorobenzene	µg/L	1	5.1 U	5.0 U	4.8 U	6.7 U	5.0 U	10 U	5.0 U	5.0 U	5.2 U	4.9 U	4.8 U
Hexachlorobutadiene	µg/L	0.4	5.1 U	5.0 U	4.8 U	6.7 U	5.0 U	10 U	5.0 U	5.0 U	5.2 U	4.9 U	4.8 U
Hexachlorocyclopentadiene	µg/L	50	5.1 U	5.0 U	4.8 UJ	6.7 U	5.0 U	35 UJ	5.0 U	5.0 U	5.2 U	4.9 U	4.8 U

Table 5
Groundwater Analytical Results, July 2021
Range C-62
Eglin Air Force Base, Florida

Client Sample ID:		FDEP GTCL* (FAC 62-777 2/05)	MW-94-62-01-JUL21	MW-94-64-02-JUL21	MW-94-62-03-JUL21	MW-94-62-04-JUL21	C62-DUP01-071421	MW-2021-62-01A-JUL21	MW-2021-62-02A-JUL21	MW-2021-62-03A-JUL21	MW-2021-62-04B-JUL21	MW-2021-62-05B-JUL21	MW-2021-62-06A-JUL21
Lab Sample ID:			FA87213-5	FA87463-1	FA87531-2	FA87213-6	FA87213--2/2R	FA87531-3	FA87213--3/3R	FA87120-2	FA87303-3	FA87213-4	FA87303-2
Date Sampled:			7/14/2021	7/21/2021	7/23/2021	7/14/2021	7/14/2021	7/23/2021	7/14/2021	7/9/2021	7/16/2021	7/14/2021	7/16/2021
Matrix:	**Units**		Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water
Hexachloroethane	µg/L	2.5	5.1 U	5.0 U	4.8 U	6.7 U	5.0 U	10 U	5.0 U	5.0 U	5.2 U	4.9 U	4.8 U
Indeno(1,2,3-cd)pyrene	µg/L	0.05	5.1 U	5.0 U	4.8 U	6.7 U	5.0 U	10 U	5.0 U	5.0 U	5.2 U	4.9 U	4.8 U
Isophorone	µg/L	37	5.1 U	5.0 U	4.8 U	6.7 U	5.0 U	10 U	5.0 U	5.0 U	5.2 U	4.9 U	4.8 U
2-Methylnaphthalene	µg/L	28	5.1 U	5.0 U	4.8 U	6.7 U	5.0 U	10 U	5.0 U	5.0 U	5.2 U	4.9 U	4.8 U
Naphthalene	µg/L	14	5.1 U	5.0 U	4.8 U	6.7 U	5.0 U	10 U	5.0 U	5.0 U	5.2 U	4.9 U	4.8 U
2-Nitroaniline	µg/L	21	5.1 U	5.0 U	4.8 U	6.7 U	5.0 U	10 U	5.0 U	5.0 U	5.2 U	4.9 U	4.8 U
3-Nitroaniline	µg/L	1.7	5.1 U	5.0 U	4.8 U	6.7 U	5.0 U	10 U	5.0 U	5.0 U	5.2 U	4.9 U	4.8 U
4-Nitroaniline	µg/L	1.7	5.1 U	5.0 U	4.8 U	6.7 U	5.0 U	10 U	5.0 U	5.0 U	5.2 U	4.9 U	4.8 U
Nitrobenzene	µg/L	3.5	5.1 U	5.0 U	4.8 U	6.7 U	5.0 U	10 U	5.0 U	5.0 U	5.2 U	4.9 U	4.8 U
N-Nitrosodi-n-propylamine	µg/L	0.005	5.1 U	5.0 U	4.8 U	6.7 U	5.0 U	10 U	5.0 U	5.0 U	5.2 U	4.9 U	4.8 U
N-Nitrosodiphenylamine	µg/L	7.1	5.1 U	5.0 U	4.8 U	6.7 U	5.0 U	10 U	5.0 U	5.0 U	5.2 U	4.9 U	4.8 U
Phenanthrene	µg/L	210	5.1 U	5.0 U	4.8 U	6.7 U	5.0 U	10 U	5.0 U	5.0 U	5.2 U	4.9 U	4.8 U
Pyrene	µg/L	210	5.1 U	5.0 U	4.8 U	6.7 U	5.0 U	10 U	5.0 U	5.0 U	5.2 U	4.9 U	4.8 U
1,2,4-Trichlorobenzene	µg/L	70	5.1 U	5.0 U	4.8 U	6.7 U	5.0 U	10 U	5.0 U	5.0 U	5.2 U	4.9 U	4.8 U
GC/LC Semi-volatiles (SW846 8330B)													
HMX	µg/L	350	0.19 U	0.17 J	0.45 J	42.5	36.3	2.4 J	0.19 U	81.9	0.19 U	0.19 U	2.2
RDX	µg/L	10*	0.17 J	2.3	4.1 J	**30.3**	**26.3**	0.20 U	0.20 J	**25.9**	0.28 J	0.64	3.8
3,5-Dinitroaniline	µg/L	-	0.19 U	0.20 U	0.40 U	0.19 U	0.19 U	0.20 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U
1,3-Dinitrobenzene	µg/L	0.7	0.19 U	0.20 U	0.40 U	0.19 U	0.19 U	0.20 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U
2,6-Dinitrotoluene	µg/L	0.05	0.19 U	0.20 U	0.40 U	0.19 U	0.19 U	0.20 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U
2,4-Dinitrotoluene	µg/L	0.05	0.19 U	0.20 U	0.40 U	0.19 U	0.19 U	0.20 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U
2-amino-4,6-Dinitrotoluene	µg/L	-	0.19 U	0.33	0.19 J	0.19 U	0.19 U	0.20 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U
4-amino-2,6-Dinitrotoluene	µg/L	-	0.19 U	0.31 J	0.40 U	0.19 U	0.19 U	0.20 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U
Nitrobenzene	µg/L	3.5	0.19 U	0.20 U	0.40 U	0.19 U	0.19 U	0.20 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U
o-Nitrotoluene	µg/L	70	0.19 U	0.20 U	0.40 U	0.19 U	0.19 U	0.20 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U
m-Nitrotoluene	µg/L	140	0.19 U	0.20 U	0.40 U	0.19 U	0.19 U	0.20 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U
p-Nitrotoluene	µg/L	70	0.19 U	0.20 U	0.40 U	0.19 U	0.19 U	0.20 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U
Tetryl	µg/L	70	0.19 U	0.20 UJ	0.40 U	0.19 U	0.19 U	0.20 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U
1,3,5-Trinitrobenzene	µg/L	210	0.19 U	0.20 U	0.40 U	0.19 U	0.19 U	0.20 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U
2,4,6-Trinitrotoluene	µg/L	1.2	0.19 U	0.20 U	0.40 U	0.19 U	0.19 U	0.20 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U
Nitroglycerine	µg/L	-	1.9 U	2.0 U	4.0 U	1.9 U	1.9 U	2.0 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U
PETN	µg/L	-	1.9 U	2.0 U	4.0 U	1.9 U	1.9 U	2.0 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U
Metals Analysis													
Aluminum	µg/L	200	200 U	78.6 J	15.1 J	**359 J**	**215 J**	**86200**	30.7 J	93.9 J	**289**	**352**	200 U
Antimony	µg/L	6	6.0 U	6.0 U	6.0 U	6.0 U	6.0 U	6.0 U	6.0 U	6.0 U	6.0 U	6.0 U	6.0 U
Arsenic	µg/L	10	10 U	10 U	10 U	10 U	10 U	4.8 J	10 U	10 U	10 U	10 U	10 U
Barium	µg/L	2000	2.6 J	2.6 J	3.6 J	4.7 J	4.7 J	16.3 J	2.8 J	5.7 J	32.1 J	10.4 J	10.3 J
Beryllium	µg/L	4	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	0.30 J	4.0 U	4.0 U	0.20 J	4.0 U	4.0 U
Cadmium	µg/L	5	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	0.30 J
Calcium	µg/L	-	1000 U	929 J	276 J	3170	3300	511 J	169 J	198 J	13100	6820	1610
Chromium	µg/L	100	10 U	10 U	10 U	10 U	10 U	78.6	10 U	10 U	10 U	10 U	10 U
Cobalt	µg/L	140	50 U	50 U	50 U	50 U	50 U	0.50 J	50 U	50 U	50 U	50 U	0.70 J
Copper	µg/L	1000	25 U	25 U	25 U	25 U	25 U	8.4 J	25 U	25 U	25 U	25 U	25 U
Iron	µg/L	300	300 U	35.1 J	300 U	300 U	300 U	**23900**	37.4 J	105 J	116 J	121 J	251 J
Lead	µg/L	15	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	6.7	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U

Table 5
Groundwater Analytical Results, July 2021
Range C-62
Eglin Air Force Base, Florida

Client Sample ID:		FDEP GTCL* (FAC 62-777 2/05)	MW-94-62-01-JUL21	MW-94-64-02-JUL21	MW-94-62-03-JUL21	MW-94-62-04-JUL21	C62-DUP01-071421	MW-2021-62-01A-JUL21	MW-2021-62-02A-JUL21	MW-2021-62-03A-JUL21	MW-2021-62-04B-JUL21	MW-2021-62-05B-JUL21	MW-2021-62-06A-JUL21
Lab Sample ID:			FA87213-5	FA87463-1	FA87531-2	FA87213-6	FA87213--2/2R	FA87531-3	FA87213--3/3R	FA87120-2	FA87303-3	FA87213-4	FA87303-2
Date Sampled:			7/14/2021	7/21/2021	7/23/2021	7/14/2021	7/14/2021	7/23/2021	7/14/2021	7/9/2021	7/16/2021	7/14/2021	7/16/2021
Matrix:	**Units**		Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water
Magnesium	µg/L	-	142 J	360 J	207 J	353 J	396 J	250 J	181 J	247 J	1010 J	735 J	419 J
Manganese	µg/L	50	15 U	1.2 J	1.1 J	1.5 J	1.5 J	20.3	4.7 J	3.2 J	18.2	24.4	46.4
Mercury	µg/L	2	0.50 U	0.060 J	0.50 U	0.50 U	0.50 U	0.16 J	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Nickel	µg/L	100	40 U	40 U	40 U	40 U	40 U	4.5 J	40 U	0.40 J	0.40 J	40 U	1.2 J
Potassium	µg/L	-	10000 U	219 J	250 J	292 J	284 J	34500	10000 U	319 J	568 J	634 J	10000 U
Selenium	µg/L	50	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Silver	µg/L	100	10 U	10 U	1.3 J	10 U	10 U	1.1 J	10 U	10 U	10 U	10 U	10 U
Sodium	µg/L	160000	672 J	3340 J	1510 J	734 J	741 J	12600	658 J	657 J	3160 J	5440 J	685 J
Thallium	µg/L	2	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Titanium	µg/L	-	10 U	1.2 J	10 U	1.3 J	10 U	219	10 U	1.1 J	4.2 J	13.6	10 U
Tungsten	µg/L	-	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
Vanadium	µg/L	49	50 U	50 U	50 U	50 U	50 U	**113**	50 U	50 U	0.90 J	1.5 J	50 U
Zinc	µg/L	5000	20 U	246	21.4	5.0 J	20 U	36	20 U	20 U	10.6 J	20 U	7.4 J
Zirconium	µg/L	-	10 U	10 U	10 U	10 U	10 U	141	10 U	10 U	10 U	10 U	10 U
General Chemistry													
Chloride	mg/L	250	1.2 J	1.6 J	1000 U	1.7 J	1.7 J	2.3	1.4 J	1.3 J	1.6 J	2.0	1.6 J
Cyanide, Total	mg/L	0.2	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U
Nitrogen, Ammonia	mg/L	2.8	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Nitrogen, Nitrate	mg/L	10	0.060 J	0.28	50 UJ	0.61	0.61	0.76	0.056 J	0.32 J	0.27	0.39	0.056 J
Nitrogen, Nitrite	mg/L	1	0.10 U	0.10 UJ	50 UJ	0.10 U	0.10 U	0.047 J	0.10 U	0.10 UJ	0.040 J	0.042 J	0.10 U
Phosphorus, Total	mg/L	-	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.38	0.10 U	0.039 J	0.10 U	0.10 U	0.10 U
Solids, Total Dissolved	mg/L	500	50 U	50 U	1020	50 U	50 U	2500 U	50 U	50 U	50 U	50 U	50 U
Sulfate	mg/L	250	2.0 U	2.0 U	1000 U	2.0 U	2.0 U	30.4	2.0 U	2.0 U	0.62 J	2.8	1.2 J
Sulfide	mg/L	-	0.71 U	0.70 U	0.69 U	0.71 U	0.75 U	0.69 U	0.74 U	0.71 U	0.70 U	0.69 U	0.70 U

Notes:

* denotes RDX is compared to the Permit RDX Concentration Limit (10 µg/L) in accordance with the RCRA Hazardous Waste Permit.

denotes compound was detected.

denotes compound exceeded respective criteria.

denotes change in validation qualifier.

°C denotes degrees Celcius.

J denotes the concentration is estimated.

mg/L denotes milligrams per liter.

mV denotes millivolts.

µg/L denotes micrograms per liter.

µS/cm denotes microSiemens per centimeter.

FDEP denotes Florida Department of Environmental Protection.

GCTL denotes Groundwater Cleanup Target Level.

NTU denotes Nephelometric Turbidity Units.

U denotes the concentration is non-detect.

Table 6
Groundwater Analytical Appendix IX Results, July 2021
Range C-62
Eglin Air Force Base, Florida

Client Sample ID:		FDEP GTCL* (FAC 62-777 2/05)	MW-94-62-05-JUL21
Lab Sample ID:			FA87487-2
Date Sampled:			7/22/2021
Matrix:	Units		Ground Water
Field Parameters			
pH	pH Units	-	5.17
Temperature	°C	-	26.5
Specific Conductivity	µS/cm	-	15
Dissolved Oxygen	mg/L	-	6.43
Salinity	$^{0}/_{00}$	-	0.01
ORP	mV	-	273.7
Turbidity	NTUs	-	5.45
MS Volatiles (SW846 8260B)			
Acetone	ug/l	6300	50 U
Acetonitrile	ug/l	42	50 U
Acrolein	ug/l	3.5	40 U
Acrylonitrile	ug/l	0.06	20 U
Allyl Chloride	ug/l	35	4.0 U
Benzene	ug/l	1	2.0 U
Bromodichloromethane	ug/l	0.6	2.0 U
Bromoform	ug/l	4.4	2.0 U
2-Butanone (MEK)	ug/l	4200	10 U
Carbon Disulfide	ug/l	700	4.0 U
Carbon Tetrachloride	ug/l	3	2.0 U
Chlorobenzene	ug/l	100	2.0 U
Chloroethane	ug/l	12	4.0 U
Chloroform	ug/l	70	2.0 U
Chloroprene	ug/l	140	10 U
Dibromochloromethane	ug/l	0.4	2.0 U
1,2-Dibromo-3-chloropropane	ug/l	0.2	10 U
1,2-Dibromoethane	ug/l	0.02	4.0 U
Dichlorodifluoromethane	ug/l	1400	4.0 U
trans-1,4-Dichloro-2-Butene	ug/l	-	20 U
1,1-Dichloroethane	ug/l	70	2.0 U
1,2-Dichloroethane	ug/l	3	2.0 U
1,1-Dichloroethylene	ug/l	7	2.0 U
trans-1,2-Dichloroethylene	ug/l	100	2.0 U
1,2-Dichloropropane	ug/l	5	2.0 U
cis-1,3-Dichloropropene	ug/l	-	2.0 U
trans-1,3-Dichloropropene	ug/l	-	2.0 U
1,4-Dioxane	ug/l	3.2	400 U
Ethylbenzene	ug/l	30	2.0 U
Ethyl Methacrylate	ug/l	630	10 U
2-Hexanone	ug/l	280	20 U
Isobutyl Alcohol	ug/l	2100	100 U
Methacrylonitrile	ug/l	0.7	40 U
Methyl Bromide	ug/l	9.8	10 U
Methyl Chloride	ug/l	2.7	4.0 U
Methyl Iodide	ug/l	-	10 U
Methyl Methacrylate	ug/l	25	10 U
Methylene Bromide	ug/l	70	4.0 U

Table 6
Groundwater Analytical Appendix IX Results, July 2021
Range C-62
Eglin Air Force Base, Florida

Client Sample ID:		FDEP GTCL* (FAC 62-777 2/05)	MW-94-62-05-JUL21
Lab Sample ID:			FA87487-2
Date Sampled:			7/22/2021
Matrix:	Units		Ground Water
Methylene Chloride	ug/l	5	10 U
4-Methyl-2-pentanone (MIBK)	ug/l	560	10 U
Pentachloroethane	ug/l	-	20 U
Propionitrile	ug/l	-	40 U
Styrene	ug/l	100	2.0 U
1,1,1,2-Tetrachloroethane	ug/l	1.3	2.0 U
1,1,2,2-Tetrachloroethane	ug/l	0.2	2.0 U
Tetrachloroethylene	ug/l	3	2.0 U
Toluene	ug/l	40	2.0 U
1,1,1-Trichloroethane	ug/l	200	2.0 U
1,1,2-Trichloroethane	ug/l	5	2.0 U
Trichloroethylene	ug/l	3	2.0 U
Trichlorofluoromethane	ug/l	2100	4.0 U
1,2,3-Trichloropropane	ug/l	0.02	4.0 U
Vinyl Acetate	ug/l	88	20 U
Vinyl Chloride	ug/l	1	2.0 U
Xylene (total)	ug/l	20	6.0 U
MS Semi-volatiles (SW846 6850)			
Perchlorate	ug/l	4.0	**248**
MS Semi-volatiles (SW846 8270D)			
4-Chloro-3-methyl Phenol	µg/L	63	4.8 U
2-Chlorophenol	µg/L	35	4.8 U
2,4-Dichlorophenol	µg/L	0.3	4.8 U
2,6-Dichlorophenol	µg/L	0.2	4.8 U
2,4-Dimethylphenol	µg/L	140	4.8 U
2,4-Dinitrophenol	µg/L	14	24 U
4,6-Dinitro-o-cresol	µg/L	-	9.6 U
2-Methylphenol	µg/L	35	4.8 U
3&4-Methylphenol	µg/L	-	4.8 U
2-Nitrophenol	µg/L	-	4.8 U
4-Nitrophenol	µg/L	56	24 UJ
Pentachlorophenol	µg/L	1	24 U
Phenol	µg/L	10	4.8 U
2,3,4,6-Tetrachlorophenol	µg/L	210	4.8 U
2,4,5-Trichlorophenol	µg/L	1	4.8 U
2,4,6-Trichlorophenol	µg/L	3.2	4.8 U
Acenaphthene	µg/L	20	4.8 U
Acenaphthylene	µg/L	210	4.8 U
Acetophenone	µg/L	700	4.8 U
2-Acetylaminofluorene	µg/L	-	4.8 U
4-Aminobiphenyl	µg/L	-	4.8 U
Aniline	µg/L	6.1	4.8 U
Anthracene	µg/L	2100	4.8 U
Aramite	µg/L	1.4	9.6 U
Benzo(a)anthracene	µg/L	0.05	4.8 U
Benzo(a)pyrene	µg/L	0.2	4.8 U
Benzo(b)fluoranthene	µg/L	0.05	4.8 U

Table 6
Groundwater Analytical Appendix IX Results, July 2021
Range C-62
Eglin Air Force Base, Florida

Client Sample ID:		FDEP GTCL* (FAC 62-777 2/05)	MW-94-62-05-JUL21
Lab Sample ID:			FA87487-2
Date Sampled:			7/22/2021
Matrix:	Units		Ground Water
Benzo(g,h,i)perylene	µg/L	210	4.8 U
Benzo(k)fluoranthene	µg/L	0.5	4.8 U
Benzyl Alcohol	µg/L	2100	4.8 U
4-Bromophenyl Phenyl Ether	µg/L	-	4.8 U
Butyl Benzyl Phthalate	µg/L	140	4.8 U
4-Chloroaniline	µg/L	28	4.8 U
Chlorobenzilate	µg/L	0.1	4.8 U
bis(2-Chloroethoxy)methane	µg/L	-	4.8 U
bis(2-Chloroethyl)ether	µg/L	0.03	4.8 U
2,2'-Oxybis(1-chloropropane)	µg/L	0.5	4.8 U
2-Chloronaphthalene	µg/L	560	4.8 U
4-Chlorophenyl Phenyl Ether	µg/L	-	4.8 U
Chrysene	µg/L	4.8	4.8 U
Diallate	µg/L	0.6	4.8 U
Dibenzo(a,h)anthracene	µg/L	0.005	4.8 U
Dibenzofuran	µg/L	28	4.8 U
1,2-Dichlorobenzene	µg/L	600	4.8 U
1,3-Dichlorobenzene	µg/L	210	4.8 U
1,4-Dichlorobenzene	µg/L	75	4.8 U
3,3'-Dichlorobenzidine	µg/L	0.08	4.8 U
Diethyl Phthalate	µg/L	5600	4.8 U
Dimethoate	µg/L	1.4	4.8 U
p-(Dimethylamine)azobenzene	µg/L	-	4.8 U
7,12-Dimethylbenz(a)anthracene	µg/L	-	4.8 U
3,3'-Dimethylbenzidine	µg/L	0.004	9.6 U
A,A-Dimethylphenethylamine	µg/L	-	24 U
Dimethyl Phthalate	µg/L	70000	4.8 U
Di-n-butyl Phthalate	µg/L	700	4.8 U
Di-n-octyl Phthalate	µg/L	140	4.8 U
m-Dinitrobenzene	µg/L	0.7	4.8 U
2,4-Dinitrotoluene	µg/L	0.05	4.8 U
2,6-Dinitrotoluene	µg/L	0.05	4.8 U
Diphenylamine	µg/L	180	4.8 U
Disulfoton	µg/L	0.3	4.8 U
bis(2-Ethylhexyl)phthalate	µg/L	6	4.8 U
Ethyl Methanesulfonate	µg/L	-	4.8 U
Famphur	µg/L	3.5	4.8 U
Fluoranthene	µg/L	280	4.8 U
Fluorene	µg/L	280	4.8 U
Hexachlorobenzene	µg/L	1	4.8 U
Hexachlorobutadiene	µg/L	0.4	4.8 U
Hexachlorocyclopentadiene	µg/L	50	4.8 UJ
Hexachloroethane	µg/L	2.5	4.8 U
Hexachlorophene	µg/L	2.1	96 U
Hexachloropropene	µg/L	-	4.8 U
Indeno(1,2,3-cd)pyrene	µg/L	0.05	4.8 U
Isodrin	µg/L	-	4.8 U

Table 6
Groundwater Analytical Appendix IX Results, July 2021
Range C-62
Eglin Air Force Base, Florida

Client Sample ID:		FDEP GTCL* (FAC 62-777 2/05)	MW-94-62-05-JUL21
Lab Sample ID:			FA87487-2
Date Sampled:			7/22/2021
Matrix:	Units		Ground Water
Isophorone	µg/L	37	4.8 U
Isosafrole	µg/L	-	4.8 U
Kepone	µg/L	0.004	19 U
Methapyrilene	µg/L	-	19 U
3-Methylcholanthrene	µg/L	-	4.8 U
Methyl Methanesulfonate	µg/L	-	4.8 U
2-Methylnaphthalene	µg/L	28	4.8 U
Methyl Parathion	µg/L	1.8	4.8 U
Naphthalene	µg/L	14	4.8 U
1,4-Naphthoquinone	µg/L	-	4.8 U
1-Naphthylamine	µg/L	-	4.8 U
2-Naphthylamine	µg/L	0.0003	4.8 U
2-Nitroaniline	µg/L	21	4.8 U
3-Nitroaniline	µg/L	1.7	4.8 U
4-Nitroaniline	µg/L	1.7	4.8 U
Nitrobenzene	µg/L	3.5	4.8 U
5-Nitro-o-toluidine	µg/L	1.1	4.8 U
N-Nitrosodiethylamine	µg/L	0.0002	4.8 U
N-Nitrosodimethylamine	µg/L	0.0007	4.8 U
N-Nitrosodi-n-butylamine	µg/L	0.006	4.8 U
N-Nitrosodi-n-propylamine	µg/L	0.005	4.8 U
N-Nitrosodiphenylamine	µg/L	7.1	4.8 U
N-Nitrosomethylethylamine	µg/L	0.002	4.8 U
N-Nitrosomorpholine	µg/L	-	4.8 U
N-Nitrosopiperidine	µg/L	-	4.8 U
N-Nitrosopyrrolidine	µg/L	0.02	4.8 U
4-Nitroquinoline 1-Oxide	µg/L	-	19 U
O,O,O-Triethyl Phosphorothioate	µg/L	-	4.8 U
Parathion	µg/L	4.2	4.8 U
Pentachlorobenzene	µg/L	5.6	4.8 U
Pentachloronitrobenzene	µg/L	0.1	4.8 U
Phenacetin	µg/L	-	4.8 U
Phenanthrene	µg/L	210	4.8 U
p-Phenylenediamine	µg/L	1300	48 U
Phorate	µg/L	1.4	4.8 U
2-Picoline	µg/L	-	4.8 U
Pronamide	µg/L	53	4.8 U
Pyrene	µg/L	210	4.8 U
Pyridine	µg/L	7	9.6 U
Safrole	µg/L	-	4.8 U
1,2,4,5-Tetrachlorobenzene	µg/L	2.1	4.8 U
Tetraethyl dithiopyrophosphate	µg/L	3.5	4.8 U
Thionazin	µg/L	-	4.8 U
o-Toluidine	µg/L	0.1	4.8 U
1,2,4-Trichlorobenzene	µg/L	70	4.8 U
sym-Trinitrobenzene	µg/L	210	4.8 U
Organochlorine Pesticides (SW846 8081B)			

Table 6
Groundwater Analytical Appendix IX Results, July 2021
Range C-62
Eglin Air Force Base, Florida

Client Sample ID:		FDEP GTCL* (FAC 62-777 2/05)	MW-94-62-05-JUL21
Lab Sample ID:			FA87487-2
Date Sampled:			7/22/2021
Matrix:	Units		Ground Water
Aldrin	µg/L	0.002	0.043 UJ
alpha-BHC	µg/L	0.006	0.043 UJ
beta-BHC	µg/L	0.02	0.043 UJ
delta-BHC	µg/L	2.1	0.043 UJ
gamma-BHC (Lindane)	µg/L	0.2	0.043 UJ
Chlordane	µg/L	2	0.43 UJ
Dieldrin	µg/L	0.002	0.043 UJ
4,4'-DDD	µg/L	0.1	0.087 U
4,4'-DDE	µg/L	0.1	0.087 UJ
4,4'-DDT	µg/L	0.1	0.087 U
Endrin	µg/L	2	0.087 UJ
Endosulfan sulfate	µg/L	42	0.087 U
Endrin aldehyde	µg/L	-	0.087 U
Endosulfan-I	µg/L	42	0.043 UJ
Endosulfan-II	µg/L	42	0.043 U
Heptachlor	µg/L	0.4	0.043 U
Heptachlor epoxide	µg/L	0.2	0.043 UJ
Methoxychlor	µg/L	40	0.087 U
Toxaphene	µg/L	3	2.2 U
PCBs (SW846 8082A)			
Aroclor 1016	µg/L	0.5	0.43 U
Aroclor 1221	µg/L	0.5	0.43 U
Aroclor 1232	µg/L	0.5	0.43 U
Aroclor 1242	µg/L	0.5	0.43 U
Aroclor 1248	µg/L	0.5	0.43 U
Aroclor 1254	µg/L	0.5	0.43 U
Aroclor 1260	µg/L	0.5	0.43 U
Organophosphorus Compounds (SW846 8141B)			
Dimethoate	µg/L	1.4	4.2 U
Disulfoton	µg/L	0.3	1.7 U
Ethyl Parathion	µg/L	4.2	1.7 U
Famphur	µg/L	3.5	4.2 U
Methyl Parathion	µg/L	1.8	1.7 U
Phorate	µg/L	1.4	1.7 U
Sulfotep	µg/L	3.5	1.7 U
Thionazin	µg/L	-	1.7 U
O,O,O-Triethylphosphorothioate	µg/L	-	1.7 U
Herbicides (SW846 8151A)			
2,4-D	µg/L	70	2.1 U
2,4,5-TP (Silvex)	µg/L	50	0.21 U
2,4,5-T	µg/L	70	0.21 U
Dinoseb	µg/L	7	4.2 U
Dioxins (SW846 8290A)			
2,3,7,8-TCDD	pg/L	30	2.65 U
1,2,3,7,8,9-HxCDD	pg/L	6.0	10.6 U
Explosives (SW846 8330B)			
HMX	µg/L	350	93

Table 6
Groundwater Analytical Appendix IX Results, July 2021
Range C-62
Eglin Air Force Base, Florida

Client Sample ID:		FDEP GTCL* (FAC 62-777 2/05)	MW-94-62-05-JUL21
Lab Sample ID:			FA87487-2
Date Sampled:			7/22/2021
Matrix:	Units		Ground Water
RDX	µg/L	10*	**30.5**
3,5-Dinitroaniline	µg/L	-	0.20 U
1,3-Dinitrobenzene	µg/L	0.7	0.20 U
2,6-Dinitrotoluene	µg/L	0.05	0.20 U
2,4-Dinitrotoluene	µg/L	0.05	0.20 U
2-amino-4,6-Dinitrotoluene	µg/L	-	0.20 U
4-amino-2,6-Dinitrotoluene	µg/L	-	0.20 U
Nitrobenzene	µg/L	3.5	0.20 U
o-Nitrotoluene	µg/L	70	0.20 U
m-Nitrotoluene	µg/L	140	0.20 U
p-Nitrotoluene	µg/L	70	0.20 U
Tetryl	µg/L	70	0.20 U
1,3,5-Trinitrobenzene	µg/L	210	0.20 U
2,4,6-Trinitrotoluene	µg/L	1.2	0.20 U
Nitroglycerine	µg/L	-	2.0 U
PETN	µg/L	-	2.0 U
Metals Analysis			
Aluminum	µg/L	200	34.4 J
Antimony	µg/L	6	1.1 J
Arsenic	µg/L	10	10 U
Barium	µg/L	2000	7.9 J
Beryllium	µg/L	4	4.0 U
Cadmium	µg/L	5	5.0 U
Calcium	µg/L	-	601 J
Chromium	µg/L	100	10 U
Cobalt	µg/L	140	50 U
Copper	µg/L	1000	25 U
Iron	µg/L	300	300 U
Lead	µg/L	15	5.0 U
Magnesium	µg/L	-	380 J
Manganese	µg/L	50	2.1 J
Mercury	µg/L	2	0.049 J
Nickel	µg/L	100	40 U
Potassium	µg/L	-	273 J
Selenium	µg/L	50	10 U
Silver	µg/L	100	10 U
Sodium	µg/L	160000	696 J
Thallium	µg/L	2	10 U
Titanium	µg/L	-	10 U
Tungsten	µg/L	-	100 U
Vanadium	µg/L	49	50 U
Zinc	µg/L	5000	20 U
Zirconium	µg/L	-	10 U
General Chemistry			
Chloride	mg/L	250	10 U
Cyanide, Total	mg/L	0.2	0.010 U
Nitrogen, Ammonia	mg/L	2.8	0.20 U

Table 6
Groundwater Analytical Appendix IX Results, July 2021
Range C-62
Eglin Air Force Base, Florida

Client Sample ID:		FDEP GTCL* (FAC 62-777 2/05)	MW-94-62-05-JUL21
Lab Sample ID:			FA87487-2
Date Sampled:			7/22/2021
Matrix:	Units		Ground Water
Nitrogen, Nitrate	mg/L	10	0.63
Nitrogen, Nitrite	mg/L	1	0.50 U
Phosphorus, Total	mg/L	-	0.032 J
Solids, Total Dissolved	mg/L	500	50 U
Sulfate	mg/L	250	3.0 J
Sulfide	mg/L	-	0.69 U

Notes:
* denotes RDX is compared to the Permit RDX Concentration Limit (10 µg/L) in accordance with the RCRA Hazardous Waste Permit.
denotes compound was detected.
denotes compound exceeded respective criteria.
denotes change in validation qualifier.
°C denotes degrees Celcius.
J denotes the concentration is estimated.
mg/L denotes milligrams per liter.
mV denotes millivolts.
µg/L denotes micrograms per liter.
µS/cm denotes microSiemens per centimeter.
FDEP denotes Florida Department of Environmental Protection.
GCTL denotes Groundwater Cleanup Target Level.
NTU denotes Nephelometric Turbidity Units.
U denotes the concentration is non-detect.

Table 7
Groundwater Analytical Results, February/March 2022
Range C-62
Eglin Air Force Base, Florida

Client Sample ID: / Permit Well Designation		Permit Designated GWPS*	MW-94-62-01	MW-94-64-02	MW-94-62-03	MW-94-62-04	MW-94-62-04 DUP	MW-94-62-05	MW-2021-62-01A	MW-2021-62-01A	MW-2021-62-06A	MW-2021-62-02A	MW-2021-62-03A	MW-2021-62-04B	MW-2021-62-05B	ODC-01
			POC	POC	POC	POC	POC	POC	POC	POC	POC	ASSESSMENT	ASSESSMENT	ASSESSMENT	ASSESSMENT	N/A
Lab Sample ID:			FA93859-2	FA93461-7	FA93461-8	FA93461-11	FA93461-12	FA93484-5	FA93461-9	FA93461-9F	FA93859-5	FA94089-1	FA93484-6	FA93461-10	FA93484-4	FA93484-7
Date Sampled:			3/11/2022	2/25/2022	2/25/2022	2/25/2022	2/25/2022	2/24/2022	2/25/2022	2/25/2022	3/11/2022	3/18/2022	2/24/2022	2/25/2022	2/24/2022	2/24/2022
Matrix:	**Units**		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater/ Filtered	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Field Parameters																
pH	pH Units	-	4.15	4.62	4.27	5.49	-	4.12	4.63	-	4.25	4.41	4.31	5.66	6.70	5.69
Temperature	°C	-	22.00	21.80	21.90	22.40	-	22.70	22.50	-	20.30	20.20	21.10	22.40	22.60	23.30
Specific Conductivity	mS/cm	-	0.010	0.014	0.015	0.026	-	0.016	0.018	-	0.012	0.011	0.016	0.032	0.075	0.000216
Dissolved Oxygen	mg/L	-	6.20	8.44	6.88	6.70	-	8.97	6.66	-	4.36	5.67	7.05	6.17	2.04	5.34
Salinity	$^{0}/_{00}$	-	0.00	0.01	0.01	0.01	-	0.01	0.01	-	0.00	0.00	0.01	0.01	0.03	0.10
ORP	mV	-	357	125.6	128.5	66.3	-	103.4	98.6	-	328.8	242.5	136.2	53.3	-23.8	72.6
Turbidity	NTUs	-	0.45	7.38	2.91	4.43	-	4.91	5.18	-	2.87	9.44	6.23	7.40	3.25	43
MS Semi-volatiles (SW846 6850)																
Perchlorate	µg/L	4	**4.5**	**7.2**	1.9	**16.8**	**17**	**257**	3.1	-	**38.1**	0.10 U	**110**	**14.4**	**18**	**4090**
GC/LC Semi-volatiles (SW846 8330A)																
HMX	µg/L	350	-	-	-	-	-	-	-	-	-	0.096 U	68.4	0.29	0.14 I	**532**
RDX**	µg/L	10	-	-	-	-	-	-	-	-	-	0.096 U	**22.9**	0.56	0.58	**683**
1,3-Dinitrobenzene	µg/L	0.7	-	-	-	-	-	-	-	-	-	0.096 U	0.096 U	0.097 U	0.096 U	0.097 U
2,6-Dinitrotoluene	µg/L	0.2	-	-	-	-	-	-	-	-	-	0.096 U	0.096 U	0.097 U	0.096 U	0.097 U
2,4-Dinitrotoluene	µg/L	0.6	-	-	-	-	-	-	-	-	-	0.096 U	0.096 U	0.097 U	0.096 U	**0.78**
2-amino-4,6-Dinitrotoluene**	µg/L	0.11	-	-	-	-	-	-	-	-	-	0.096 U	0.096 U	0.097 U	0.096 U	**1.1**
4-amino-2,6-Dinitrotoluene**	µg/L	0.15	-	-	-	-	-	-	-	-	-	0.096 U	0.096 U	0.097 U	0.096 U	**1.7**
Nitrobenzene	µg/L	3.5	-	-	-	-	-	-	-	-	-	0.096 U	0.096 U	0.097 U	0.096 U	0.097 U
o-Nitrotoluene	µg/L	70	-	-	-	-	-	-	-	-	-	0.096 U	0.096 U	0.097 U	0.096 U	0.097 U
m-Nitrotoluene	µg/L	140	-	-	-	-	-	-	-	-	-	0.096 U	0.096 U	0.097 U	0.096 U	0.097 U
p-Nitrotoluene	µg/L	70	-	-	-	-	-	-	-	-	-	0.096 U	0.096 U	0.097 U	0.096 U	0.097 U
Tetryl	µg/L	70	-	-	-	-	-	-	-	-	-	0.096 U	0.096 U	0.097 U	0.096 U	0.097 U
1,3,5-Trinitrobenzene	µg/L	210	-	-	-	-	-	-	-	-	-	0.096 U	0.096 U	0.097 U	0.096 U	0.097 U
2,4,6-Trinitrotoluene	µg/L	10	-	-	-	-	-	-	-	-	-	0.096 U	0.096 U	0.097 U	0.096 U	5.5
Metals Analysis																
Aluminum	µg/L	200	16.5 I	**493**	35.0 I	**585**	**568**	**205**	**327**	25 U	92.4 I	116 I	170 I	185 I	45.6 I	**7320**
Antimony	µg/L	6	3.2 I	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	3.7 I	5.0 U	1.1 I	5.0 U	5.0 U	**9.7**
Arsenic	µg/L	10	5.0 U	5.0 U	5.0 U	5.0 U	1.4 I	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	2.6 I
Barium	µg/L	2000	3.2 I	2.3 JB	3.5 JB	4.6 JB	4.6 JB	8.4 I	4.0 JB	4.0 JB	5.0 I	3.4 I	5.4 I	22.3 JB	12.2 I	30.6 I
Beryllium	µg/L	4	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Cadmium	µg/L	5	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	3.7 I
Calcium	µg/L	-	149 I	373 JB	292 JB	3190 JB	3190 JB	448 I	417 JB	436 JB	386 I	256 I	140 I	3960 JB	8190	6840
Chromium	µg/L	100	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.4 I
Cobalt	µg/L	140	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	0.20 I	0.30 I	0.20 I	0.30 I	0.30 I	1.0 U	1.0 U	1.0 U	7.8 I
Copper	µg/L	1000	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	1.1 I	2.0 U	2.0 U	2.0 U	1.4 I	2.0 U	2.0 U	2.0 U	290
Iron	µg/L	300	50 U	116 I	72.8 I	20.2 I	19.1 I	88.3 I	74.7 I	50 U	137 I	**458**	136 I	109 I	47.3 I	**2160**

Table 7
Groundwater Analytical Results, February/March 2022
Range C-62
Eglin Air Force Base, Florida

Client Sample ID:		Permit Designated GWPS*	MW-94-62-01	MW-94-64-02	MW-94-62-03	MW-94-62-04	MW-94-62-04 DUP	MW-94-62-05	MW-2021-62-01A	MW-2021-62-01A	MW-2021-62-06A	MW-2021-62-02A	MW-2021-62-03A	MW-2021-62-04B	MW-2021-62-05B	ODC-01
Permit Well Designation			POC	POC	POC	POC	POC	POC	POC	POC	POC	ASSESSMENT	ASSESSMENT	ASSESSMENT	ASSESSMENT	N/A
Lab Sample ID:			FA93859-2	FA93461-7	FA93461-8	FA93461-11	FA93461-12	FA93484-5	FA93461-9	FA93461-9F	FA93859-5	FA94089-1	FA93484-6	FA93461-10	FA93484-4	FA93484-7
Date Sampled:			3/11/2022	2/25/2022	2/25/2022	2/25/2022	2/25/2022	2/24/2022	2/25/2022	2/25/2022	3/11/2022	3/18/2022	2/24/2022	2/25/2022	2/24/2022	2/24/2022
Matrix:	Units		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater/ Filtered	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Lead	µg/L	15	2.0 U	2.0 U	2.0 U	2.0 U	1.4 JB	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	1.1 JB	1.6 I	**42.2**
Magnesium	µg/L	-	130 I	165 JB	183 JB	320 JB	324 JB	368 I	57.9 JB	42.0 JB	263 I	246 I	232 I	676 JB	739 I	17500
Manganese	µg/L	50	2.0 U	1.3 I	1.4 I	1.8 I	1.7 I	3.3 I	9.0 I	8.7 I	13.6 I	2.9 I	2.1 I	28.6	28.1	**459**
Mercury	µg/L	2	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.034 I	0.10 U	0.10 U	0.038 I	0.10 U	0.10 U	0.10 U	0.033 I
Nickel	µg/L	100	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	0.60 I	1.0 U	1.0 U	1.0 U	1.0 U	14.8 I
Potassium	µg/L	-	500 U	500 U	500 U	299 JB	277 JB	316 I	2790 I	2930 JB	500 U	266 I	258 I	251 JB	375 I	2220 I
Selenium	µg/L	50	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	14.1 I
Silver	µg/L	100	0.90 I	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	1.5 I	2.0 U	2.0 U	2.0 U	0.90 I
Sodium	µg/L	160000	628 I	1090 JB	1160 JB	656 JB	657 JB	682 I	793 JB	892 JB	669 I	715 I	674 I	993 JB	2370 I	2280 I
Thallium	µg/L	2	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Titanium	µg/L	-	2.0 U	5.7 JB	2.0 U	1.0 JB	1.0 JB	1.9 I	7.3 JB	2.0 U	2.0 U	2.0 U	2.0 I	3.8 JB	2.1 I	58.1
Tungsten	µg/L	-	50 U	50 U	50 U	50 U	50 U	50 U	50 U	-	50 U	50 U	50 U	50 U	50 U	2010
Vanadium	µg/L	49	2.0 U	2.0 U	2.0 U	0.80 I	0.90 I	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	1.0 I	5.4 I
Zinc	µg/L	5000	11.4 I	5.0 U	5.0 U	5.1 JB	5.0 U	5.0 U	5.0 U	5.0 U	5.8 I	7.0 I	5.0 U	5.0 U	5.0 U	441
Zirconium	µg/L	-	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	-	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	4.2 I
General Chemistry																
Chloride	mg/L	250		-	-	-	-	-	-	-	-	1.5 I	1.1 I	1.3 I	1.4 I	-
Nitrogen, Nitrate	mg/L	10	-	-	-	-	-		-	-	-	0.056 I	0.33 J	0.47	0.24 J	-
Nitrogen, Nitrite	mg/L	1	-	-	-	-	-		-	-	-	0.050 U	0.044 I	0.050 U	0.046 I	-
Phosphorus, Total	mg/L	-		-	-	-	-	-	-	-	-	0.065 I	0.074 I	0.050 U	0.053 I	-
Solids, Total Dissolved	mg/L	500	50 U	50 U	50 U	50 U	50 U	50 U	50 U	-	50 U	50 U	50 U	50 U	110	-
Sulfate	mg/L	250		-	-	-	-	-	-	-	-	0.74 I	1.0 U	1.0 U	3.7	-

Notes:
* denotes compounds are compared to the Permit Groundwater Protection Standard identified in RCRA Hazardous Waste Permit No 006176-12-HO. Concentration value is equal to the FDEP GCTL unless otherwise denoted.
** denotes compound GWPS is different than or has no established FDEP GCTL.
denotes compound was detected.
denotes compound exceeded respective criteria.
°C denotes degrees Celcius.
FDEP denotes Florida Department of Environmental Protection.
GCTL denotes Groundwater Cleanup Target Level.
I denotes The reported value is greater than the laboratory detection limit (DL) but less than the laboratory limit of quantitation (LOQ).
J denotes the concentration is estimated.
JB denotes concentration is estimated as it was detected in the field blank.
mg/L denotes milligrams per liter.
mS/cm denotes milliSiemens per centimeter.
mV denotes millivolts.
N/A denotes not applicable.
NTU denotes Nephelometric Turbidity Units.
µg/L denotes micrograms per liter.
U denotes the concentration is non-detect.

Table 6
Groundwater Analytical Results, August/September 2022
Range C-62
Eglin Air Force Base, Florida

Client Sample ID:		Permit Designated GWPS*	MW-94-62-01	MW-94-64-02	MW-94-62-03	MW-94-62-04	MW-94-62-04 DUP	MW-94-62-05	MW-2021-62-01A	MW-2021-62-06A	MW-2021-62-02A	MW-2021-62-03A	MW-2021-62-04B	MW-2021-62-05B	ODC-01
Permit Well Designation			POC	POC	POC	POC	POC	POC	POC	POC	ASSESSMENT	ASSESSMENT	ASSESSMENT	ASSESSMENT	OD CRATER
Lab Sample ID:			FA97828-10	FA97828-8	FA97828-34	FA97828-6	FA97828-7	FA97828-4	FA97828-33	FA97828-11	FA97828-3	FA97828-5	FA97828-2	FA97828-1	FA99019-1
Date Sampled:			8/5/2022	8/4/2022	8/12/2022	8/4/2022	8/4/2022	8/4/2022	8/12/2022	8/5/2022	8/3/2022	8/4/2022	8/3/2022	8/3/2022	9/13/2022
Matrix:	Units		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	OD Crater
Field Parameters															
pH	pH Units	-	3.58	3.69	4.34	5.57	-	4.26	5.89	3.93	4.14	3.85	5.59	6.66	6.82
Temperature	°C	-	23.70	23.50	23.40	23.50	-	23.40	23.00	25.50	25.10	24.40	24.20	23.40	25.80
Specific Conductivity	mS/cm	-	0.012	0.014	0.014	0.028	-	0.018	0.047	0.014	0.012	0.015	0.024	0.065	0.17
Dissolved Oxygen	mg/L	-	8.27	7.21	6.64	7.96	-	6.25	5.97	5.38	4.59	6.37	6.64	2.85	6.74
Turbidity	NTUs	-	0.97	4.14	0.43	1.27	-	4.7	14.82	0.52	2.69	4.75	1.62	0.57	760.5
MS Semi-volatiles (SW846 6850)															
Perchlorate	µg/L	4	2.1	**7.7**	1.9	**60.2**	**62.5**	**45.2**	2.3	**29.5**	0.12 I	**30.2**	**15.1**	**20.2**	**2060 Q**
GC/LC Semi-volatiles (SW846 8330A)															
HMX	µg/L	350	0.097U	0.26	0.34	40.1	41.7	94.3	0.098 U	2.3	0.20 J	77.8	0.19 J	0.33	122
RDX**	µg/L	10	0.29	2.3	3.0	**27.5**	**23.4**	**26**	0.098 U	3.8	0.097 U	**29.5**	0.45	0.64	**64.1**
1,3-Dinitrobenzene	µg/L	0.7	0.097U	0.096 U	0.097 U	0.097 U	0.099 U	0.096 U	0.098 U	0.096 U	0.097 U	0.098 U	0.098 U	0.099 U	0.099 U
2,6-Dinitrotoluene	µg/L	0.2	0.097U	0.096 U	0.097 U	0.097 U	0.099 U	0.096 U	0.098 U	0.096 U	0.097 U	0.098 U	0.098 U	0.099 U	0.099 U
2,4-Dinitrotoluene	µg/L	0.6	0.097U	0.096 U	0.097 U	0.097 U	0.099 U	0.096 U	0.098 U	0.096 U	0.097 U	0.098 U	0.098 U	0.099 U	0.19 J
2-amino-4,6-Dinitrotoluene**	µg/L	0.11	0.097U	**0.39**	0.097 U	0.097 U	0.099 U	0.096 U	0.098 U	0.096 U	0.097 U	0.098 U	0.098 U	0.099 U	**1.0 J**
4-amino-2,6-Dinitrotoluene**	µg/L	0.15	0.097U	**0.27 J**	0.097 U	0.097 U	0.099 U	0.096 U	0.098 U	0.096 U	0.097 U	0.098 U	0.098 U	0.099 U	**1.9**
Nitrobenzene	µg/L	3.5	0.097U	0.096 U	0.097 U	0.097 U	0.099 U	0.096 U	0.098 U	0.096 U	0.097 U	0.098 U	0.098 U	0.099 U	0.099 U
o-Nitrotoluene	µg/L	70	0.097U	0.096 U	0.097 U	0.097 U	0.099 U	0.096 U	0.098 U	0.096 U	0.097 U	0.098 U	0.098 U	0.099 U	0.099 U
m-Nitrotoluene	µg/L	140	0.097U	0.096 U	0.097 U	0.097 U	0.099 U	0.096 U	0.098 U	0.096 U	0.097 U	0.098 U	0.098 U	0.099 U	0.099 U
p-Nitrotoluene	µg/L	70	0.097U	0.096 U	0.097 U	0.097 U	0.099 U	0.096 U	0.098 U	0.096 U	0.097 U	0.098 U	0.098 U	0.099 U	0.099 U
Tetryl	µg/L	70	0.097U	0.096 U	0.097 U	0.097 U	0.099 U	0.096 U	0.098 U	0.096 U	0.097 U	0.098 U	0.098 U	0.099 U	0.099 U
1,3,5-Trinitrobenzene	µg/L	210	0.097U	0.096 U	0.097 U	0.097 U	0.099 U	0.38 U	0.098 U	0.096 U	0.097 U	0.098 U	0.098 U	0.099 U	0.099 U
2,4,6-Trinitrotoluene	µg/L	10	0.097U	0.096 U	0.097 U	0.097 U	0.099 U	0.096 U	0.098 U	0.096 U	0.097 U	0.098 U	0.098 U	0.099 U	0.50
Metals Analysis															
Aluminum	µg/L	200	26.8 I	107 I	200 U	**217**	199 I	36.7 I	**968**	38.6 I	15.1 I	37.7 I	18.3 I	43.7 I	**32,700**
Antimony	µg/L	6	6.0 U	6.0 U	6.0 U	6.0 U	6.0 U	6.0 U	6.0 U	6.0 U	6.0 U	6.0 U	2.5 I	6.0 U	3.6 I
Arsenic	µg/L	10	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	4.7 I
Barium	µg/L	2000	2.9 I	2.3 I	3.9 I	4.6 I	4.4 I	7.9 I	5.5 I	5.4 I	2.1 I	5.8 I	19.0 I	10.2 I	55.6 I
Beryllium	µg/L	4	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	0.20 I	4.0 U	4.0 U	4.0 U	4.0 U	0.20 I
Cadmium	µg/L	5	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	0.30 I	5.0 U	5.0 U	5.0 U	5.0 U	**8.2**
Calcium	µg/L	-	123 I	343 I	277 I	3,360	3240	660 I	2490	270 I	87.8 I	201 I	2950	6810	4,990
Chromium	µg/L	100	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	23.7
Cobalt	µg/L	140	50 U	50 U	50 U	50 U	0.20 I	50 U	50 U	0.50 I	50 U	50 U	50 U	0.40 I	17.1 I
Copper	µg/L	1000	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U	421
Iron	µg/L	300	17.2 I	42.9 I	23.3 I	300 U	300 U	30.4 I	**410**	300 U	48.3 I	24.2 I	300 U	45.1 I	**12,200**

Table 6
Groundwater Analytical Results, August/September 2022
Range C-62
Eglin Air Force Base, Florida

Client Sample ID:		Permit Designated GWPS*	MW-94-62-01	MW-94-64-02	MW-94-62-03	MW-94-62-04	MW-94-62-04 DUP	MW-94-62-05	MW-2021-62-01A	MW-2021-62-06A	MW-2021-62-02A	MW-2021-62-03A	MW-2021-62-04B	MW-2021-62-05B	ODC-01
Permit Well Designation			POC	POC	POC	POC	POC	POC	POC	POC	ASSESSMENT	ASSESSMENT	ASSESSMENT	ASSESSMENT	OD CRATER
Lab Sample ID:			FA97828-10	FA97828-8	FA97828-34	FA97828-6	FA97828-7	FA97828-4	FA97828-33	FA97828-11	FA97828-3	FA97828-5	FA97828-2	FA97828-1	FA99019-1
Date Sampled:			8/5/2022	8/4/2022	8/12/2022	8/4/2022	8/4/2022	8/4/2022	8/12/2022	8/5/2022	8/3/2022	8/4/2022	8/3/2022	8/3/2022	9/13/2022
Matrix:	Units		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	OD Crater
Lead	µg/L	15	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	**57.3**
Magnesium	µg/L	-	144 I	173 I	214 I	352 I	350 I	362 I	105 I	328 I	181 I	284 I	476 I	887 I	9,160
Manganese	µg/L	50	1.2 I	1.3 I	2.1 I	1.7 I	1.5 I	3.8 I	8.0 I	9.8 I	15 U	1.9 I	5.7 I	20.8	**604**
Mercury	µg/L	2	0.50 U	0.50 U	0.046 I	0.50 U	0.50 U	0.50 U	0.049 I	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.13 I
Nickel	µg/L	100	40 U	40 U	40 U	40 U	40 U	40 U	40 U	1.1 I	40 U	40 U	40 U	0.90 I	62.6
Potassium	µg/L	-	10000 U	10000 U	10000 U	261 I	247 I	296 I	4090 I	10000 U	10000 U	276 I	233 I	311 I	1,660 I
Selenium	µg/L	50	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	7.8 I
Silver	µg/L	100	2.0 I	10 U	10 U	10 U	10 U	10 U	10 U	1.2 I	2.4 I	10 U	1.9 I	2.7 I	0.70 I
Sodium	µg/L	160000	774 I	1100 I	1220 I	719 I	697 I	702 I	2970 I	662 I	593 I	743 I	746 I	1970 I	1,230 I
Thallium	µg/L	2	1.4 I	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	2.0 U
Titanium	µg/L	-	10 U	1.3 I	10 U	10 U	10 U	10 U	9.0 I	10 U	10 U	10 U	10 U	1.2 I	167
Tungsten	µg/L	-	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	740
Vanadium	µg/L	49	50 U	50 U	50 U	0.70 I	0.70 I	50 U	1.5 I	50 U	50 U	50 U	50 U	0.70 I	28.1 I
Zinc	µg/L	5000	20 U	20 U	20 U	20 U	20 U	20 U	5.2 I	4.8 I	20 U	20 U	20 U	20 U	424
Zirconium	µg/L	-	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.70 I	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	4.29
General Chemistry															
Chloride	mg/L	250	-	-	-	-	-	-	-	-	1.5 I	1.3 I	1.6 I	1.4 I	-
Nitrogen, Nitrate	mg/L	10	-	-	-	-	-	-	-	-	0.064 I	0.38	0.48	0.5	-
Nitrogen, Nitrite	mg/L	1	-	-	-	-	-	-	-	-	0.10 U	0.10 U	0.10 U	0.10 U	-
Phosphorus, Total	mg/L	0.0001	-	-	-	-	-	-	-	-	0.10 UJ	0.10 U	0.10 U	0.10 U	-
Hardness, Total as CaCO3	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sulfate	mg/L	250	-	-	-	-	-	-	-	-	2.0 U	2.0 U	2.0 U	3.1	-

Notes:
* denotes compounds are compared to the Permit Groundwater Protection Standard identified in RCRA Hazardous Waste Permit No 006176-12-HO. Concentration value is equal to the FDEP GCTL unless otherwise denoted**.
** denotes compound GWPS is different than or has no established FDEP GCTL.
denotes compound was detected.
denotes compound exceeded respective criteria.
°C denotes degrees Celcius.
FDEP denotes Florida Department of Environmental Protection.
GCTL denotes Groundwater Cleanup Target Level.
I denotes The reported value is greater than the laboratory detection limit (DL) but less than the laboratory limit of quantitation (LOQ).
J denotes the concentration is estimated.
Q denotes sample result was reported outside of holding time.
mg/L denotes milligrams per liter.
mS/cm denotes milliSiemens per centimeter.
mV denotes millivolts.
N/A denotes not applicable.
NTU denotes Nephelometric Turbidity Units.
µg/L denotes micrograms per liter.
U denotes the concentration is non-detect.
NR denotes no reading.

Table 6
Groundwater Analytical Results, February 2023
Range C-62
Eglin Air Force Base, Florida

Client Sample ID:		Permit Designated GWPS*	MW-94-62-04	MW-94-62-05	MW-2021-62-01A	MW-2021-62-06A	MW-2021-62-03A	MW-2021-62-03A DUP	MW-2021-62-04B	MW-2021-62-05B
Permit Well Designation			POC	POC	POC	POC	ASSESSMENT	ASSESSMENT	ASSESSMENT	ASSESSMENT
Lab Sample ID:			FC2885-1	FC2885-2	FC2885-3	FC2974-1	FC2953-7	FC2953-8	FC2828-1	FC2828-2
Date Sampled:			2/21/2023	2/21/2023	2/21/2023	2/22/2023	2/23/2023	2/23/2023	2/20/2023	2/20/2023
Matrix:	Units		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Field Parameters										
pH	pH Units	-	6.22	4.83	5.04	3.68	3.70	-	3.61	6.04
Temperature	°C	-	22.8	23.0	22.8	21.6	21.8	-	22.1	22.3
Specific Conductivity	mS/cm	-	0.027	0.015	0.011	0.011	0.013	-	0.013	0.045
Dissolved Oxygen	mg/L	-	6.40	6.72	7.84	5.95	6.37	-	6.01	3.86
Salinity	‰	-	0.01	0.01	0.00	0.00	0.00	-	0.00	0.02
ORP	mV	-	165.9	25.7	214.0	400.4	421.6	-	363.3	222.7
Turbidity	NTUs	-	6.01	0.46	3.02	4.52	6.11	-	6.45	5.80
MS Semi-volatiles (SW846 6850)										
Perchlorate	µg/L	4	**290**	**227**	3.0	**25.7**	**146**	**146**	**21.1**	**137**
GC/LC Semi-volatiles (SW846 8330A)										
HMX	µg/L	350	-	-	-	-	62.1	61.4	0.080 U	56.6
RDX**	µg/L	10	-	-	-	-	**19.6**	**18.8**	0.36	**15.8**
1,3-Dinitrobenzene	µg/L	0.7	-	-	-	-	0.080 U	0.079 U	0.080 U	0.079 U
2,6-Dinitrotoluene	µg/L	0.2	-	-	-	-	0.080 U	0.079 U	0.080 U	0.079 U
2,4-Dinitrotoluene	µg/L	0.6	-	-	-	-	0.080 U	0.079 U	0.080 U	0.079 U
2-amino-4,6-Dinitrotoluene**	µg/L	0.11	-	-	-	-	0.080 U	0.079 U	0.080 U	0.079 U
4-amino-2,6-Dinitrotoluene**	µg/L	0.15	-	-	-	-	0.080 U	0.14 I	0.080 U	0.079 U
Nitrobenzene	µg/L	3.5	-	-	-	-	0.097 U	0.096 U	0.097 U	0.096 U
o-Nitrotoluene	µg/L	70	-	-	-	-	0.080 U	0.079 U	0.080 U	0.079 U
m-Nitrotoluene	µg/L	140	-	-	-	-	0.080 U	0.079 U	0.080 U	0.079 U
p-Nitrotoluene	µg/L	70	-	-	-	-	0.080 U	0.079 U	0.080 U	0.079 U
Tetryl	µg/L	70	-	-	-	-	0.080 U	0.079 U	0.080 U	0.079 U
1,3,5-Trinitrobenzene	µg/L	210	-	-	-	-	0.099 U	0.098 U	0.099 U	0.098 U
2,4,6-Trinitrotoluene	µg/L	10	-	-	-	-	0.080 U	0.079 U	0.080 U	0.079 U
Metals Analysis										
Aluminum	µg/L	200	**512**	20.8 I	53.9 I	70.6 I	64.4 I	63.9 I	20.2 I	31.3 I

Table 6
Groundwater Analytical Results, February 2023
Range C-62
Eglin Air Force Base, Florida

Client Sample ID:		Permit Designated GWPS*	MW-94-62-04	MW-94-62-05	MW-2021-62-01A	MW-2021-62-06A	MW-2021-62-03A	MW-2021-62-03A DUP	MW-2021-62-04B	MW-2021-62-05B
Permit Well Designation			POC	POC	POC	POC	ASSESSMENT	ASSESSMENT	ASSESSMENT	ASSESSMENT
Lab Sample ID:			FC2885-1	FC2885-2	FC2885-3	FC2974-1	FC2953-7	FC2953-8	FC2828-1	FC2828-2
Date Sampled:			2/21/2023	2/21/2023	2/21/2023	2/22/2023	2/23/2023	2/23/2023	2/20/2023	2/20/2023
Matrix:	Units		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Iron	µg/L	300	59.3 I	17 U	18.6 I	54.2 I	54.6 I	39.2 I	17 U	17 U
Vanadium	µg/L	49	0.90 I	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U
General Chemistry										
Chloride	mg/L	250	-	-	-	-	1.5 I	1.5 I	1.57	1.5 I
Nitrogen, Nitrate	mg/L	10	-	-	-	-	0.33	0.34	0.431	0.30 Q
Nitrogen, Nitrite	mg/L	1	-	-	-	-	0.040 U	0.040 U	0.150 I	0.040 UQ
Phosphorus, Total	mg/L	0.0001	-	-	-	-	0.066 I	0.048 I	0.038 I	0.048 I
Solids, Total Dissolved	mg/L	-	40 U	40 U	40 U	40 U	50 U	50 U	50 U	50 U
Sulfate	mg/L	250	-	-	-	-	0.68 I	0.89 I	0.182 I	0.73 I

Notes:
* denotes compounds are compared to the Permit Groundwater Protection Standard identified in RCRA Hazardous Waste Permit No 006176-12-HO. Concentration value is equal to the FDEP GCTL unless otherwise denoted**.
** denotes compound GWPS is different than or has no established FDEP GCTL.
denotes compound was detected.
denotes compound exceeded respective criteria.
°C denotes degrees Celcius.
FDEP denotes Florida Department of Environmental
GCTL denotes Groundwater Cleanup Target Level.
I denotes the reported value is greater than the laboratory detection limit (DL) but less than the laboratory limit of quantitation (LOQ).
Q denotes sample result was reported outside of holding time.
mg/L denotes milligrams per liter.
mS/cm denotes milliSiemens per centimeter.
mV denotes millivolts.
N/A denotes not applicable.
NTU denotes Nephelometric Turbidity Units.
µg/L denotes micrograms per liter.
U denotes the concentration is non-detect.

Table 6
Groundwater Analytical Results, August 2023
Range C-62
Eglin Air Force Base, Florida

Client Sample ID:		Permit Designated GWPS*	MW-94-62-02	MW-94-62-04	MW-94-62-05	MW-2021-62-01A	MW-2021-62-06A	MW-2021-62-03A	MW-2021-62-03A DUP	MW-2021-62-04B	MW-2021-62-05B
Permit Well Designation			POC	POC	POC	POC	POC	ASSESSMENT	ASSESSMENT	ASSESSMENT	ASSESSMENT
Lab Sample ID:			FC8468-1	FC8396-3	FC8396-4	FC8468-3	FC8468-2	FC8396-1	FC8396-2	FC8362-2	FC8362-1
Date Sampled:			8/4/2023	8/3/2023	8/3/2023	8/4/2023	8/4/2023	8/3/2023	8/3/2023	8/2/2023	8/2/2023
Matrix:	Units		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Field Parameters											
pH	pH Units	-	4.81 J	5.66 J	4.71 J	6.13 J	4.26 J	4.44 J	-	4.67 J	5.64 J
Temperature	°C	-	24.22 J	23.74 J	23.83 J	24.69 J	25.24 J	24.26 J	-	24.61 J	24.43 J
Specific Conductivity	mS/cm	-	0.014 J	0.024 J	0.016 J	0.07 J	0.014 J	0.014 J	-	0.013 J	0.035 J
Dissolved Oxygen	mg/L	-	8.37 J	6.69 J	6.1 J	5.00 J	5.64 J	8.47 J	-	5.69 J	7.50 J
Salinity	‰	-	0.00 J	0.01 J	0.01 J	0.03 J	0.00 J	0.00 J	-	0.00 J	0.01 J
ORP	mV	-	254.8 J	187.2 J	246.2 J	156.3 J	0.22 J	274.1 J	-	140.2 J	14.4 J
Turbidity	NTUs	-	2.15 J	0.64 J	2.16 J	0.32 J	284.8 J	0.57 J	-	0.29 J	1.15 J
MS Semi-volatiles (SW846 6850)											
Perchlorate	µg/L	4	**6.6**	**290**	**210**	**12.7**	**8.9**	**107**	**106**	**17.4 J**	**18.6 J**
GC/LC Semi-volatiles (SW846 8330A)											
HMX	µg/L	350	-	-	-	-	-	40.8	41.1	0.20 U	0.44 I
RDX**	µg/L	10	-	-	-	-	-	**15.9**	**16.2**	0.48	0.65
1,3-Dinitrobenzene	µg/L	0.7	-	-	-	-	-	0.080 U	0.080 U	0.081 U	0.080 U
2,6-Dinitrotoluene	µg/L	0.2	-	-	-	-	-	0.080 U	0.080 U	0.081 U	0.080 U
2,4-Dinitrotoluene	µg/L	0.6	-	-	-	-	-	0.080 U	0.080 U	0.081 U	0.080 U
2-amino-4,6-Dinitrotoluene**	µg/L	0.11	-	-	-	-	-	0.080 U	0.080 U	0.081 U	0.080 U
4-amino-2,6-Dinitrotoluene**	µg/L	0.15	-	-	-	-	-	0.080 U	0.080 U	0.081 U	0.080 U
Nitrobenzene	µg/L	3.5	-	-	-	-	-	0.097 U	0.097 U	0.098 U	0.097 U
o-Nitrotoluene	µg/L	70	-	-	-	-	-	0.080 U	0.080 U	0.081 U	0.080 U
m-Nitrotoluene	µg/L	140	-	-	-	-	-	0.080 U	0.080 U	0.081 U	0.080 U
p-Nitrotoluene	µg/L	70	-	-	-	-	-	0.080 U	0.080 U	0.081 U	0.080 U
Tetryl	µg/L	70	-	-	-	-	-	0.080 U	0.080 U	0.081 U	0.080 U
1,3,5-Trinitrobenzene	µg/L	210	-	-	-	-	-	0.099 U	0.099 U	0.10 U	0.099 U
2,4,6-Trinitrotoluene	µg/L	10	-	-	-	-	-	0.080 U	0.080 U	0.081 UJ	0.080 UJ

Table 6
Groundwater Analytical Results, August 2023
Range C-62
Eglin Air Force Base, Florida

Client Sample ID:		Permit Designated GWPS*	MW-94-62-02	MW-94-62-04	MW-94-62-05	MW-2021-62-01A	MW-2021-62-06A	MW-2021-62-03A	MW-2021-62-03A DUP	MW-2021-62-04B	MW-2021-62-05B
Permit Well Designation			POC	POC	POC	POC	POC	ASSESSMENT	ASSESSMENT	ASSESSMENT	ASSESSMENT
Lab Sample ID:			FC8468-1	FC8396-3	FC8396-4	FC8468-3	FC8468-2	FC8396-1	FC8396-2	FC8362-2	FC8362-1
Date Sampled:			8/4/2023	8/3/2023	8/3/2023	8/4/2023	8/4/2023	8/3/2023	8/3/2023	8/2/2023	8/2/2023
Matrix:	Units		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Metals Analysis											
Aluminum	µg/L	200	74.5 I	133 I	56.6 I	14 U	32.8 I	14 U	18.2 I	14 U	14 U
Antimony	µg/L	6	1.0 U	3.3 I	1.9 I	1.8 I	1.0 U	1.4 I	1.1 I	-	-
Arsenic	µg/L	10	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	-	-
Barium	µg/L	2000	2.3 I	4.1 I	6.6 I	3.2 I	5.4 I	4.9 I	4.8 I	-	-
Beryllium	µg/L	4	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	-	-
Cadmium	µg/L	5	0.20 U	0.20 U	0.20 U	0.20 U	0.20 I	0.20 U	0.20 U	-	-
Calcium	µg/L	-	519 I	2850	642 I	8360	205 I	190 I	123 I	-	-
Chromium	µg/L	100	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	-	-
Cobalt	µg/L	140	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	-	-
Copper	µg/L	1000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 I	1.0 U	-	-
Iron	µg/L	300	28.0 I	17 U	27.6 I	17 U	17 U	17 U	18.1 I	17 U	20.5 I
Lead	µg/L	15	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	-	-
Magnesium	µg/L	-	182 I	297 I	313 I	65.8 I	183 I	200 I	205 I	-	-
Manganese	µg/L	50	1.2 I	1.4 I	6.0 I	1.0 U	6.4 I	1.5 I	1.6 I	-	-
Mercury	µg/L	2	0.030 U	0.10 I	0.030 U	0.030 U	0.030 U	0.098 I	0.030 U	-	-
Nickel	µg/L	100	0.40 U	0.40 U	0.40 U	0.40 U	0.60 I	1.4 I	0.40 U	-	-
Potassium	µg/L	-	200 U	280 I	342 I	4380 I	200 U	354 I	287 I	-	-
Selenium	µg/L	50	2.9 U	2.9 U	2.9 U	2.9 U	2.9 U	2.9 U	2.9 U	-	-
Silver	µg/L	100	0.70 U	0.70 U	0.70 U	0.70 U	0.70 U	0.70 U	0.70 U	-	-
Sodium	µg/L	160000	647 I	660 I	689 I	3230 I	748 I	657 I	633 I	-	-
Thallium	µg/L	2	**3.8 I**	1.4 UJ	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	-	-
Vanadium	µg/L	49	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U
Zinc	µg/L	5000	17.2 I	20.1	17.9 I	15.5 I	17.4 I	6.8 I	15.1 I	-	-
General Chemistry											
Chloride	mg/L	250	-	-	-	-	-	1.7 I	1.4 I	1.6 I	1.4 I
Nitrogen, Nitrate	mg/L	10	-	-	-	-	-	0.28	0.28	0.36	0.49
Nitrogen, Nitrite	mg/L	1	-	-	-	-	-	0.040 U	0.040 U	0.040 U	0.045 I
Phosphorus, Total	mg/L	-	-	-	-	-	-	0.028 U	0.028 U	0.028 U	0.030 I
Solids, Total Dissolved	mg/L	-	40 U	46.0 I	40 U	88	60	40 U	48.0 I	52	48.0 I
Sulfate	mg/L	250	-	-	-	-	-	0.71 I	0.72 I	0.65 I	2.1

Table 6
Groundwater Analytical Results, August 2023
Range C-62
Eglin Air Force Base, Florida

Notes:
* denotes compounds are compared to the Permit Groundwater Protection Standard identified in RCRA Hazardous Waste Permit No 006176-HO-12. Concentration value is equal to the FDEP GCTL unless otherwise denoted**
** denotes compound GWPS is different than or has no established FDEP GCTL.
denotes compound was detected.
denotes compound exceeded respective criteria.
°C: degrees Celcius.
FDEP: Florida Department of Environmental Protection.
GCTL: Groundwater Cleanup Target Level.
I: the reported value is greater than the laboratory detection limit (DL) but less than the laboratory limit of quantitation (LOQ)
J: the measurement and/or concentration is considered an estimate.
Q: sample result was reported outside of holding time.
mg/L: milligrams per liter.
mS/cm: milliSiemens per centimeter.
mV: millivolts.
N/A: not applicable.
NTU: Nephelometric Turbidity Units.
µg/L: micrograms per liter.
U: the concentration is non-detect.

Table 6
Groundwater Analytical Results, February 2024
Range C-62
Eglin Air Force Base, Florida

Client Sample ID:		Permit Designated GWPS*	MW-94-62-02	MW-94-62-04	MW-94-62-05	MW-2021-62-01A	MW-2021-62-06A	MW-2021-62-03A	MW-2021-62-03A DUP	MW-2021-62-04B	MW-2021-62-05B
Permit Well Designation			POC	POC	POC	POC	POC	ASSESSMENT	ASSESSMENT	ASSESSMENT	ASSESSMENT
Lab Sample ID:			FC13237-3	FC13237-1	FC13183-2	FC13237-2	FC13183-3	FC13129-1	FC13129-2	FC13129-3	FC13183-1
Date Sampled:			2/8/2024	2/8/2024	2/7/2024	2/8/2024	2/7/2024	2/6/2024	2/6/2024	2/6/2024	2/7/2024
Matrix:	Units		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Field Parameters											
pH	SU	-	5.35	6.40	4.77	6.19	4.77	4.20	-	5.71	6.12
Temperature	°C	-	21.8	22.0	22.2	21.3	20.7	21.0	-	22.3	21.8
Specific Conductivity	µS/cm	-	19.2 J	30.8 J	16.0 J	36.7 J	12.3 J	14.5	-	19.3	29.4 J
Dissolved Oxygen	mg/L	-	8.69	6.42	7.19 J	7.16	5.73 J	6.73	-	6.90	5.56 J
ORP	mV	-	498.2	208.7	253.5	84.1	314.7	268.3	-	243.1	73.9
Turbidity	NTUs	-	8.02 J	2.27 J	2.07	15.5 J	0.86	7.62	-	2.85	1.97
MS Semi-volatiles (SW846 6850)											
Perchlorate	µg/L	4	**5.5**	**272**	**226**	**3.0**	**7.4**	**142**	**148**	**11.5**	**15.9**
GC/LC Semi-volatiles (SW846 8330A)											
HMX	µg/L	350	-	-	-	-	-	**45.5**	**44.7**	**0.38**	**0.42**
RDX**	µg/L	10	-	-	-	-	-	**20.5**	**20.5**	**0.53**	**0.58**
1,3-Dinitrobenzene	µg/L	0.7	-	-	-	-	-	0.081 U	0.079 U	0.080 U	0.078 U
2,6-Dinitrotoluene	µg/L	0.2	-	-	-	-	-	0.081 U	0.079 U	0.080 U	0.078 U
2,4-Dinitrotoluene	µg/L	0.6	-	-	-	-	-	0.081 U	0.079 U	0.080 U	0.078 U
2-amino-4,6-Dinitrotoluene**	µg/L	0.11	-	-	-	-	-	0.081 U	0.079 U	0.080 U	0.078 U
4-amino-2,6-Dinitrotoluene**	µg/L	0.15	-	-	-	-	-	0.081 U	0.079 U	0.080 U	0.078 U
Nitrobenzene	µg/L	3.5	-	-	-	-	-	0.098 U	0.096 U	0.097 U	0.095 U
o-Nitrotoluene	µg/L	70	-	-	-	-	-	0.081 U	0.079 U	0.080 U	0.078 U
m-Nitrotoluene	µg/L	140	-	-	-	-	-	0.081 U	0.079 U	0.080 U	0.078 U
p-Nitrotoluene	µg/L	70	-	-	-	-	-	0.081 U	0.079 U	0.080 U	0.078 U
Tetryl	µg/L	70	-	-	-	-	-	0.081 U	0.079 U	0.080 U	0.078 U
1,3,5-Trinitrobenzene	µg/L	210	-	-	-	-	-	0.10 U	0.098 U	0.099 U	0.097 U
2,4,6-Trinitrotoluene	µg/L	10	-	-	-	-	-	0.081 U	0.079 U	0.080 U	0.078 U
Metals Analysis											
Aluminum	µg/L	200	**365**	**444 J[a]**	**47.6 I**	**270**	**45.5 I**	**66.5 I**	**61.2 I**	**28.4 I**	**38.7 I**
Iron	µg/L	300	**116 I**	**26.1 J[a]**	**64.2 I**	**72.0 I**	**35.2 I**	**47.5 I**	**39.7 I**	17 U	**28.6 I**
Thallium	µg/L	2	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U
Vanadium	µg/L	49	**0.60 I**	**0.090 I**	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U
General Chemistry											
Chloride	mg/L	250	-	-	-	-	-	**1.3 I**	**1.3 I**	**1.6 I**	**1.4 I**
Nitrogen, Nitrate	mg/L	10	-	-	-	-	-	**0.33**	**0.33**	**0.43**	**0.52**
Nitrogen, Nitrite	mg/L	1	-	-	-	-	-	0.040 U	0.040 U	0.040 U	0.040 U
Phosphorus, Total	mg/L	0.0001	-	-	-	-	-	0.028 U	0.028 U	**0.031 I**	**0.047 I**
Solids, Total Dissolved	mg/L	-	40 U	**56.0 J[a]**	40 U	40 U	40 U	40 U	40 U	40 U	40 U
Sulfate	mg/L	250	-	-	-	-	-	0.60 U	0.60 U	0.60 U	**1.3 I**

Table 6
Groundwater Analytical Results, February 2024
Range C-62
Eglin Air Force Base, Florida

Notes:
* denotes compounds are compared to the Permit Groundwater Protection Standard identified in RCRA Hazardous Waste Permit No 006176-12-HO. Concentration value is equal to the FDEP GCTL unless otherwise denoted*
** denotes compound GWPS is different than or has no established FDEP GCTL
denotes compound was detected
denotes compound exceeded respective criteria.
J^a denotes chemistry results were qualified as estimated (J^a) due to laboratory duplicate precision outside QC limits.
$^{\circ}C$ denotes degrees Celcius
FDEP denotes Florida Department of Environmental Protection.
GCTL denotes Groundwater Cleanup Target Level
I denotes the reported value is greater than the laboratory detection limit (DL) but less than the laboratory limit of quantitation (LOQ
J denotes estimated value.
mg/L denotes milligrams per liter
mS/cm denotes milliSiemens per centimeter
mV denotes millivolts.
N/A denotes not applicable
NTU denotes Nephelometric Turbidity Units
SU denotes standard unit.
µg/L denotes micrograms per liter.
U denotes the concentration is non-detect

Table 6
Groundwater Analytical Results, August 2024
Range C-62, Eglin Air Force Base, Florida

Client Sample ID:		Permit Designated GWPS*	MW-94-62-01	MW-94-62-02	MW-94-62-04	MW-94-62-05	MW-2021-62-01A	MW-2021-62-06A	MW-2021-62-03A	MW-2021-62-03A DUP	MW-2021-62-04B	MW-2021-62-05B
Permit Well Designation			Background	POC	POC	POC	POC	POC	ASSESSMENT	ASSESSMENT	ASSESSMENT	ASSESSMENT
Lab Sample ID:			FC18100-7	FC18100-8	FC18201-1	FC18201-2	FC18100-9	FC18100-6	FC18150-1	FC18150-2	FC18149-1	FC18149-3
Date Sampled:			8/16/2024	8/16/2024	8/21/2024	8/21/2024	8/16/2024	8/15/2024	8/20/2024	8/20/2024	8/20/2024	8/20/2024
Matrix:	Units		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Field Parameters												
pH	SU	-	4.80	4.94	5.30	4.73	5.94	4.64	4.50	4.50	5.48	5.87
Temperature	°C	-	25.0	24.3	23.4	24.1	25.4	27.0	25.6	25.6	23.7	25.5
Specific Conductivity	µS/cm	-	10.6	13.7	19.0	15.8	31.9	12.5	14.2	14.2	16.5	19.9
Dissolved Oxygen	mg/L	-	6.39	6.27	6.49	5.52	2.68	4.73	5.50	5.50	6.87	6.72
ORP	mV	-	60.9	64.6	29.4	47.5	38.7	46.2	146.2	146.2	37.7	39.3
Turbidity	NTUs	-	0.77	1.64	2.55	3.56	0.04	0.12	0.11	0.11	2.54	0.02
MS Semi-volatiles (SW846 6850)												
Perchlorate	µg/L	4	**3.8**	**6.7**	**305**	**246**	**10.8**	**8.3**	**113**	**108**	**14.4**	**18**
GC/LC Semi-volatiles (SW846 8330A)												
HMX	µg/L	350	-	-	-	-	-	-	**28.5**	**28.5**	0.086 U	0.080 U
RDX**	µg/L	10	-	-	-	-	-	-	**19.5**	**19.5**	**0.41**	**0.6**
1,3-Dinitrobenzene	µg/L	0.7	-	-	-	-	-	-	0.084 U	0.080 U	0.086 U	0.080 U
2,6-Dinitrotoluene	µg/L	0.2	-	-	-	-	-	-	0.084 U	0.080 U	0.086 U	0.080 U
2,4-Dinitrotoluene	µg/L	0.6	-	-	-	-	-	-	0.084 U	0.080 U	0.086 U	0.080 U
2-amino-4,6-Dinitrotoluene**	µg/L	0.11	-	-	-	-	-	-	0.084 U	0.080 U	0.086 U	0.080 U
4-amino-2,6-Dinitrotoluene**	µg/L	0.15	-	-	-	-	-	-	0.084 U	0.080 U	0.086 U	0.080 U
Nitrobenzene	µg/L	3.5	-	-	-	-	-	-	0.10 U	0.097 U	0.10 U	0.097 U
o-Nitrotoluene	µg/L	70	-	-	-	-	-	-	0.084 U	0.080 U	0.086 U	0.080 U
m-Nitrotoluene	µg/L	140	-	-	-	-	-	-	0.084 U	0.080 U	0.086 U	0.080 U
p-Nitrotoluene	µg/L	70	-	-	-	-	-	-	0.084 U	0.080 U	0.086 U	0.080 U
Tetryl	µg/L	70	-	-	-	-	-	-	0.084 U	0.080 U	0.086 U	0.080 U
1,3,5-Trinitrobenzene	µg/L	210	-	-	-	-	-	-	0.10 U	0.099 U	0.11 U	0.099 U
2,4,6-Trinitrotoluene	µg/L	10	-	-	-	-	-	-	0.084 U	0.080 U	0.086 U	0.080 U
Metals Analysis												
Aluminum	µg/L	200	**24.6I**	**81.4 I**	**256**	**43.9 I**	**17.6 I**	**24.0 I**	**27.6 I**	**51.1 I**	**23.0 I**	14 U
Iron	µg/L	300	17U	**18.7 I**	17 U	**17.8 I**	17 U	17 U	**40.3 I**	17 U	17 U	17 U
Vanadium	µg/L	0.60 U	0.60U	**0.60 I**	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U
General Chemistry												
Chloride	mg/L	250	-	-	-	-	-	-	**1.4 I**	**1.4 I**	**1.71**	**1.5 I**
Nitrogen, Nitrate	mg/L	10	-	-	-	-	-	-	**0.28**	**0.3**	**0.43**	**0.58**
Nitrogen, Nitrite	mg/L	1	-	-	-	-	-	-	0.040 U	0.040 U	0.040 U	0.040 U
Phosphorus, Total	mg/L	0.0001	-	-	-	-	-	-	0.028 U	0.028 U	0.028 U	0.028 U
Solids, Total Dissolved	mg/L	-	40 U	40 U	**40.0 I**	**42.0 I**	40 U	40 U	40 U	40 U	40 U	40 U
Sulfate	mg/L	250	-	-	-	-	-	-	0.60 U	0.60 U	0.60 U	0.68 I

Notes:
* denotes compounds are compared to the Permit Groundwater Protection Standard identified in RCRA Hazardous Waste Permit No 006176-12-HO. Concentration value is equal to the FDEP GCTL unless otherwise denoted**.
** denotes compound GWPS is different than or has no established FDEP GCTL.
denotes compound was detected.
denotes compound exceeded respective criteria.

°C denotes degrees Celcius.
FDEP denotes Florida Department of Environmental Protection.
GCTL denotes Groundwater Cleanup Target Level.
I denotes the reported value is greater than the laboratory detection limit (DL) but less than the laboratory limit of quantitation (LOQ).
J denotes estimated value.
mg/L denotes milligrams per liter.
mS/cm denotes milliSiemens per centimeter.
mV denotes millivolts.
N/A denotes not applicable.
NTU denotes Nephelometric Turbidity Units.
SU denotes standard unit.
µg/L denotes micrograms per liter.
U denotes the concentration is non-detect. Value preceeding the U is the detection limit.

This page intentionally left blank.

Historical Surface Water Quality

This page intentionally left blank.

Table 8
Surface Water Analytical Results, February/March 2022
Range C-62
Eglin Air Force Base, Florida

Client Sample ID:		FL Freshwater Surface Water Criteria (FAC 62-777 2/05)	62-SW-01	62-SW-02	62-SW-03	62-SW-04	62-SW-04 DUP	62-SW-05	62-SW-06	62-SW-07	62-SW-08	62-SW-09	62-SG03-SW
Lab Sample ID:			**FA93570-1**	**FA93494-3**	**FA93494-5**	**FA93461-2**	**FA93461-6**	**FA93461-4**	**FA93859-1**	**FA93461-1**	**FA93484-3**	**FA93484-2**	**FA93402-1**
Date Sampled:			**3/2/2022**	**2/26/2022**	**2/26/2022**	**2/25/2022**	**2/25/2022**	**2/25/2022**	**3/11/2022**	**2/25/2022**	**2/24/2022**	**2/24/2022**	**2/23/2022**
Matrix:	**Units**		**Surface Water**	**Surface Water**	**Surface Water**	**Surface Water**	**Surface Water**	**Surface Water**	**Surface Water**	**Surface Water**	**Surface Water**	**Surface Water**	**Surface Water**
Field Parameters													
pH	pH	-	7.50	4.45	8.20	4.36	-	3.82	5.50	6.30	4.82	8.22	6.00
Temperature	°C	-	19.50	20.40	18.40	21.40	-	22.60	22.60	20.80	22.20	19.20	21.30
Specific Conductivity	mS/cm	-	0.032	0.014	0.022	0.015	-	0.017	0.022	0.016	0.014	0.012	0.010
Dissolved Oxygen	mg/L	-	4.90	4.48	5.50	4.50	-	5.03	4.57	6.00	6.80	6.96	8.39
Salinity	‰	-	0.01	0.00	0.01	0.01	-	0.01	0.01	0.01	0.00	0.00	0.00
ORP	mV	-	252.90	277.00	194.00	303.80	-	351.30	306.20	237.70	255.80	217.50	244.00
Turbidity	NTUs	-	0.94	144.70	0.12	0.88	-	0.73	0.00	0.00	0.28	0.22	2.44
MS Semi-volatiles (SW846 6850)													
Perchlorate	µg/L	-	0.38	0.91	1.8	3.9	4.1	3.4	0.39	0.6	0.58	3.8	2.6
GC/LC Semi-volatiles (SW846 8330A)													
RDX	µg/L	180	0.3	0.37	0.54	0.92	1.1	0.84	0.10 UJ	0.097 UJ	0.11 U	0.10 U	0.51
Metals Analysis													
Calcium	µg/L		164 I	128 I	138 I	142 I	-	129 I	189 I	211 I	193 I	248 I	147 I
Magnesium	µg/L		259 I	220 I	228 I	260 I	-	235 I	170 I	194 I	139 I	187 I	231 I
General Chemistry													
Hardness, Total as CaCO3	mg/L		1.5 I	1.2 I	1.3 I	1.4 I	-	1.3 I	1.2 I	1.3 I	1.1 I	1.4 I	1.3 I

Notes:
denotes compound was detected.
denotes compound exceeded respective criteria.
°C denotes degrees Celcius.
FDEP denotes Florida Department of Environmental Protection.
I denotes the reported value is greater than the laboratory
detection limit (DL) but less than the laboratory limit of quantitation (LOQ).
mg/L denotes milligrams per liter.
mS/cm denotes milliSiemens per centimeter.
mV denotes millivolts.
N/A denotes not applicable.
NTU denotes Nephelometric Turbidity Units.
SWCTL denotes Surfacewater Cleanup Target Level.
µg/L denotes micrograms per liter.
U denotes the concentration is non-detect.
UJ denotes estimated non-detect.

Table 7
Surface Water Analytical Results, August/September 2022
Range C-62
Eglin Air Force Base, Florida

Location			Western Branch								
Client Sample ID:		FL Freshwater	62-SW-01	62-SW-02	62-SW-02-DUP	62-SW-03	62-SW-04	62-SW-05	62-SW-10	62-SW-11	62-SW-11 DUP
Lab Sample ID:		Surface Water	FA97828-31	FA97828-27	FA97828-28	FA97828-25	FA97828-23	FA97828-20	FA99019-7	FA99019-4	FA99019-5
Date Sampled:		Criteria (FAC	8/11/2022	8/11/2022	8/11/2022	8/11/2022	8/11/2022	8/9/2022	9/13/2022	9/13/2022	9/13/2022
Matrix:	Units	62-777 2/05)	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
Field Parameters											
pH	pH	-	3.96	3.26	-	3.16	4.49	2.87	4.12	3.03	-
Temperature	°C	-	27.40	26.50	-	25.50	24.10	25.10	25.50	25.10	-
Specific Conductivity	mS/cm	-	0.010	0.010	-	0.009	0.009	0.009	0.009	0.008	-
Dissolved Oxygen	mg/L	-	5.50	4.25	-	5.40	6.45	6.72	3.10	6.27	-
Salinity	°/00	-	0.00	0.00	-	0.00	0.00	0.00	0.00	0.00	-
ORP	mV	-	355.90	355.00	-	376.70	237.50	398.80	246.60	311.20	-
Turbidity	NTUs	-	6.54	5.68	-	1.27	4.88	1.01	0.85	1.56	-
MS Semi-volatiles (SW846 6850)											
Perchlorate	µg/L	-	0.17 I	0.62	0.59	1.1	3.6	2.9	1.4 Q	1.7 Q	1.6 Q
GC/LC Semi-volatiles (SW846 8330A)											
RDX	ug/l	180	0.27	0.23	0.26	0.32	0.77	0.63	0.34 J	0.48	0.41
General Chemistry											
Hardness, Total as CaCO3	mg/L	-	1.5 I	1.3 I	-	1.6 I	1.2 I	1.3 I	1.3 I	1.1 I	-
Total Organic Carbon	mg/L	-	-	-	-	-	-	-	1.0 I	-	-

Notes:
denotes compound was detected.
denotes compound exceeded respective criteria.
°C denotes degrees Celcius.
DG denotes downgradient.
FDEP denotes Florida Department of Environmental Protection.
I denotes the reported value is greater than the laboratory detection limit (DL) but less than the laboratory limit of quantitation (LOQ).
J denotes the concentration is estimated.
mg/L denotes milligrams per liter.
mS/cm denotes milliSiemens per
mV denotes millivolts.
N/A denotes not applicable.
NTU denotes Nephelometric Turbidity Units.
Q denotes sample was analyzed out of hold time.
SWCTL denotes Surfacewater Cleanup Target Level.
µg/L denotes micrograms per liter.
U denotes the concentration is non-detect.
[b] Calculated as: (Calcium * 2.497) + (Magnesium * 4.118)

Table 7
Surface Water Analytical Results, August/September 2022
Range C-62
Eglin Air Force Base, Florida

Location			Eastern Branch						DG of Confluence
Client Sample ID:		FL Freshwater	62-SW-06	62-SW-07	62-SW-08	62-SW-09	62-SW-12	62-SW-13	62-SG03-SW
Lab Sample ID:		Surface Water	FA97828-17	FA97828-18	FA97828-15	FA97828-13	FA99019-3	FA99019-2	FA97828-12
Date Sampled:		Criteria (FAC	8/9/2022	8/10/2022	8/9/2022	8/9/2022	9/13/2022	9/13/2022	8/9/2022
Matrix:	Units	62-777 2/05)	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
Field Parameters									
pH	pH	-	4.41	4.19	3.09	3.04	3.47	3.65	3.19
Temperature	°C	-	25.50	25.40	28.10	25.80	25.60	25.20	24.20
Specific Conductivity	mS/cm	-	0.011	0.011	0.010	0.010	0.010	0.009	0.009
Dissolved Oxygen	mg/L	-	3.15	6.11	6.89	6.20	5.69	6.38	7.84
Salinity	°/00	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ORP	mV	-	227.30	257.60	328.70	380.60	286.50	248.60	370.00
Turbidity	NTUs	-	0.79	1.58	0.68	0.60	1.63	20.69	1.40
MS Semi-volatiles (SW846 6850)									
Perchlorate	µg/L	-	0.43	0.49	0.43	2.1	0.32 Q	0.50 Q	2.0
GC/LC Semi-volatiles (SW846 8330A)									
RDX	ug/l	180	0.10 U	0.096 U	0.10 U	0.098 U	0.22	0.097 U	0.37 J
General Chemistry									
Hardness, Total as CaCO3	mg/L	-	0.83 I	1.1 I	1.1 I	0.85 I	0.99 I	0.91 I	1.1 I
Total Organic Carbon	mg/L	-	-	-	-	-	-	-	-

Notes:
denotes compound was detected.
denotes compound exceeded respective criteria.
°C denotes degrees Celcius.
DG denotes downgradient.
FDEP denotes Florida Department of Environmental Protection.
I denotes the reported value is greater than the laboratory detection limit (DL) but less than the laboratory limit of quantitation (LOQ).
J denotes the concentration is estimated.
mg/L denotes milligrams per liter.
mS/cm denotes milliSiemens per
mV denotes millivolts.
N/A denotes not applicable.
NTU denotes Nephelometric Turbidity Units.
Q denotes sample was analyzed out of hold time.
SWCTL denotes Surfacewater Cleanup Target Level.
µg/L denotes micrograms per liter.
U denotes the concentration is non-detect.
[b] Calculated as: (Calcium * 2.497) + (Magnesium * 4.118)

Table 7
Surface Water Analytical Results, February 2023
Range C-62
Eglin Air Force Base, Florida

Location			Western Branch										
			Upstream to Downstream →										
Client Sample ID:		FL Freshwater	62-SW01	62-SW10	62-SW14	62-SW02	62-SW-02-DUP	62-SW11	62-SW03	62-SW15	62-SW04	62-SW05	62-SW05 DUP
Lab Sample ID:		Surface Water	FC2953-5	FC2953-13	FC2953-11	FC2953-1	FC2953-15	FC2953-9	FC2976-6	FC2981-3	FC2976-3	FC2976-1	FC2976-2
Date Sampled:		Criteria (FAC	2/23/2023	2/23/2023	2/23/2023	2/23/2023	2/23/2023	2/23/2023	2/22/2023	2/22/2023	2/22/2023	2/22/2023	2/22/2023
Matrix:	Units	62-777 2/05)	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
Field Parameters													
pH	pH Units	-	5.06	4.06	3.62	3.95	-	3.62	3.43	4.29	3.43	3.26	-
Temperature	°C	-	23.01	22.2	21.4	21.00	-	20.7	21.8	21.7	21.2	21.2	-
Specific Conductivity	mS/cm	-	0.012	0.023	0.010	0.011	-	0.012	0.010	0.010	0.009	0.009	-
Dissolved Oxygen	mg/L	-	5.51	3.2	6.23	5.41	-	5.75	1.90	6.89	7.10	7.40	-
Salinity	‰	-	0.00	0.01	0.00	0.00	-	0.00	0.00	0.00	0.00	0.00	-
ORP	mV	-	196.8	237.9	413.5	256.1	-	378.5	347.8	254.1	410.7	411.9	-
Turbidity	NTUs	-	0.02	8.43	2.89	0.06	-	4.83	5.08	2.42	7.52	6.54	-
MS Semi-volatiles (SW846 6850)													
Perchlorate	µg/L	-	0.31	0.050 U	0.26	0.67	0.71	2.0	1.9	5.6	5.5	4.3	4.4
General Chemistry													
Hardness, Total as CaCO3	mg/L	-	1.2 I	3.0 I	1.4 I	1.5 I	1.9 I	1.3 I	1.2 I	1.3 I	1.3 I	1.3 I	1.3 I

Notes:
denotes compound was detected.
denotes compound exceeded respective criteria.
°C denotes degrees Celcius.
DG denotes downgradient.
FDEP denotes Florida Department of Environmental Protection.
I denotes the reported value is greater than the laboratory detection limit (DL) but less than the laboratory limit of quantitation (LOQ).
mg/L denotes milligrams per liter.
mS/cm denotes milliSiemens per centimeter.
mV denotes millivolts.
N/A denotes not applicable.
NTU denotes Nephelometric Turbidity Units.
SWCTL denotes Surfacewater Cleanup Target Level.
µg/L denotes micrograms per liter.
U denotes the concentration is non-detect.
Total Hardness Calculated as: (Calcium * 2.497) + (Magnesium * 4.118)
62-SW07 specific conductivity likely recorded incorrectly on field forms compared to previous sampling event and nearby stream locations

Table 7
Surface Water Analytical Results, February 2023
Range C-62
Eglin Air Force Base, Florida

Location			Eastern Branch							DG of Confluence	DG of 62-SG-03
			Upstream to Downstream →								
Client Sample ID:		FL Freshwater	62-SW06	62-SW12	62-SW07	62-SW13	62-SW08	62-SW16	62-SW09	62-SG03-SW	62-SW17
Lab Sample ID:		Surface Water	FC2892-3	FC2983	FC2892-1	FC2894-1	FC2895-3	FC2981-1	FC2895-2	FC2895-1	FC2895-1
Date Sampled:		Criteria (FAC	2/21/2023	2/21/2023	2/21/2023	2/20/2023	2/20/2023	2/22/2023	2/20/2023	2/20/2023	2/20/2023
Matrix:	Units	62-777 2/05)	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
Field Parameters											
pH	pH Units	-	3.11	3.05	3.27	5.67	3.87	4.77	3.65	4.13	4.00
Temperature	°C	-	21.0	22.4	21.9	19.4	20.8	21.5	17.9	18.5	18.4
Specific Conductivity	mS/cm	-	0.014	0.011	0.011	0.015	0.015	0.011	0.012	0.009	0.009
Dissolved Oxygen	mg/L	-	5.77	6.51	5.55	6.17	8.05	7.35	7.89	8.75	8.98
Salinity	‰	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ORP	mV	-	320.3	319.3	261.2	209.3	306.1	149.5	312.6	312.6	302.4
Turbidity	NTUs	-	2.05	2.62	2.20	3.20	0.02	0.28	0.02	0.02	0.11
MS Semi-volatiles (SW846 6850)											
Perchlorate	µg/L	-	0.73	0.58	0.64	0.64	0.60	4.5	5.1	3.6	3.6
General Chemistry											
Hardness, Total as CaCO3	mg/L	-	1.2 I	1.3 I	1.4 I	1.4 I	1.5 I	1.3 I	1.4 I	1.3 I	1.3 I

Notes:
denotes compound was detected.
denotes compound exceeded respective criteria.
°C denotes degrees Celcius.
DG denotes downgradient.
FDEP denotes Florida Department of Environmental Protection.
I denotes the reported value is greater than the laboratory detection limit (DL) but less than the laboratory limit of quantitation (LOQ).
mg/L denotes milligrams per liter.
mS/cm denotes milliSiemens per centimeter.
mV denotes millivolts.
N/A denotes not applicable.
NTU denotes Nephelometric Turbidity Units.
SWCTL denotes Surfacewater Cleanup Target Level.
µg/L denotes micrograms per liter.
U denotes the concentration is non-detect.
Total Hardness Calculated as: (Calcium * 2.497) + (Magnesium * 4.118)
62-SW07 specific conductivity likely recorded incorrectly on field forms com

Table 7
Surface Water Analytical Results, August 2023
Range C-62
Eglin Air Force Base, Florida

Location			Western Branch										
			Upstream to Downstream →										
Client Sample ID:		FL Freshwater Surface Water Criteria (FAC 62-777 2/05)	62-SW01	62-SW14	62-SW14 DUP	62-SW02	62-SW11	62-SW11 DUP	62-SW03	62-SW15	62-SW04	62-SW18	62-SW05
Lab Sample ID:			FC8636-13	FC8636-4	FC8636-5	FC8670-1	FC8636-10	FC8636-11	FC8636-2	FC8556-5	FC8556-3	FC8670-7	FC8556-1
Date Sampled:			8/9/2023	8/8/2023	8/8/2023	8/10/2023	8/9/2023	8/9/2023	8/8/2023	8/8/2023	8/8/2023	8/10/2023	8/8/2023
Matrix:	Units		Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
Field Parameters													
Temperature	°C	-	29.27 J	28.82 J	-	25.24 J	27.87 J	-	26.30 J	27.22 J	26.50 J	26.75 J	25.54 J
pH	pH	-	4.85 J	5.37 J	-	5.28 J	4.99 J	-	3.83 J	3.77 J	3.23 J	4.38 J	3.48 J
Specific Conductivity	mS/cm	-	0.012 J	0.012 J	-	0.013 J	0.012 J	-	0.010 J	0.010 J	0.010 J	0.012 J	0.010 J
Dissolved Oxygen	mg/L	-	7.33 J	6.22 J	-	5.58 J	5.81 J	-	5.81 J	6.50 J	6.61 J	5.94 J	6.85 J
ORP	mV	-	196.0 J	130.8 J	-	97.7 J	165.4 J	-	244.0 J	241.5 J	291.7 J	173.1 J	286.0 J
Salinity	$^{0}/_{00}$	-	0.00 J	0.00 J	-	0.00 J	0.00 J	-	0.00 J	0.00 J	0.00 J	0.00 J	0.00 J
Turbidity	NTUs	-	1.00 J	0.74 J	-	0.73 J	0.97 J	-	1.63 J	1.40 J	0.97 J	-	1.18 J
MS Semi-volatiles (SW846 6850)													
Perchlorate	µg/L	-	0.13 I	0.23	0.24	0.48	0.89	0.89	0.73	3.4	3.3	2.9	2.7
General Chemistry													
Hardness, Total as CaCO3	mg/L	-	1.2 I	1.1 I	1.1 I	1.1 I	1.2 I	1.1 I	1.3 I	0.97 I	1.5 I	1.4 I	0.89 I

Notes:
denotes compound was detected.
denotes compound exceeded respective criteria.
°C denotes degrees Celcius.
DG denotes downgradient.
FDEP denotes Florida Department of Environmental Protection.
I denotes the reported value is greater than the laboratory detection limit (DL) but less than the practical limit of quantitation (PQL).
mg/L denotes milligrams per liter.
mS/cm denotes milliSiemens per centimeter.
mV denotes millivolts.
N/A denotes not applicable.
NTU denotes Nephelometric Turbidity Units.
SWCTL denotes Surfacewater Cleanup Target Level.
µg/L denotes micrograms per liter.
U denotes the concentration is non-detect.
Total Hardness Calculated as: (Calcium * 2.497) + (Magnesium * 4.118)

Table 7
Surface Water Analytical Results, August 2023
Range C-62
Eglin Air Force Base, Florida

Location			Eastern Branch									DG of Confluence	DG of 62-SG-03	DG of 62-SW17
			Upstream to Downstream →											
Client Sample ID:		FL Freshwater Surface Water Criteria (FAC 62-777 2/05)	62-SW06	62-SW12	62-SW07	62-SW13	62-SW08	62-SW21	62-SW16	62-SW19	62-SW09	62-SG03-SW	62-SW17	62-SW20
Lab Sample ID:			FC8556-9	FC8556-8	FC8556-7	FC8502-6	FC8502-5	FC8670-5	FC8502-3	FC8670-3	FC8502-1	FC8468-6	FC8468-5	FC8468-4
Date Sampled:			8/8/2023	8/8/2023	8/8/2023	8/7/2023	8/7/2023	8/10/2023	8/7/2023	8/10/2023	8/7/2023	8/4/2023	8/4/2023	8/4/2023
Matrix:	Units		Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
Field Parameters														
Temperature	°C	-	25.99 J	26.83 J	27.03 J	31.89 J	32.22 J	30.35 J	28.97 J	27.23 J	26.00 J	27.06 J	26.71 J	27.51 J
pH	pH	-	4.24 J	3.52 J	3.84 J	4.29 J	4.12 J	4.50 J	3.75 J	4.22 J	3.45 J	3.66 J	3.80 J	3.63 J
Specific Conductivity	mS/cm	-	0.013 J	0.013 J	0.012 J	0.011 J	0.011 J	0.013 J	0.010 J	0.012 J	0.011 J	0.010 J	0.011 J	0.011 J
Dissolved Oxygen	mg/L	-	5.60 J	5.94 J	6.72 J	5.64 J	5.75 J	5.08 J	6.54 J	6.46 J	6.37 J	7.50 J	7.64 J	7.58 J
ORP	mV	-	168.2 J	193.0 J	162.3 J	274.0 J	253.2 J	125.1 J	190.0 J	178.2 J	216.7 J	315.7 J	265.8 J	240.7 J
Salinity	$^{0}/_{00}$	-	0.00 J	0.00 J	0.00 J	0.00 J	0.00 J	0.00 J	0.00 J	0.00 J	0.00 J	0.00 J	0.00 J	0.00 J
Turbidity	NTUs	-	1.06 J	0.46 J	0.31 J	0.41 J	0.47 J	-	1.14 J	1.38 J	0.35 J	1.05 J	1.42 J	0.92 J
MS Semi-volatiles (SW846 6850)														
Perchlorate	µg/L	-	0.36	0.29	0.44	0.37	0.36	0.54	1.8	2.0	1.8	1.9	1.5	0.54
General Chemistry														
Hardness, Total as CaCO3	mg/L	-	0.72 I	0.99 I	0.64 I	0.70 I	0.70 I	0.87 I	0.93 I	0.76 I	0.80 I	0.99 I	0.94 I	0.99 I

Notes:
denotes compound was detected.
denotes compound exceeded respective criteria.
°C denotes degrees Celcius.
DG denotes downgradient.
FDEP denotes Florida Department of Environmental Protection.
I denotes the reported value is greater than the laboratory detection limit (DL) but less than the practical limit of quantitation (PQL
mg/L denotes milligrams per liter.
mS/cm denotes milliSiemens per centimeter.
mV denotes millivolts.
N/A denotes not applicable.
NTU denotes Nephelometric Turbidity Units.
SWCTL denotes Surfacewater Cleanup Target Level.
µg/L denotes micrograms per liter.
U denotes the concentration is non-detect.
Total Hardness Calculated as: (Calcium * 2.497) + (Magnesium * 4.118)

Table 10
Surface Water Analytical Results, February 2024
Range C-62
Eglin Air Force Base, Florida

Location			Western Branch									
			Upstream to Downstream →									
Client Sample ID:		FL Freshwater	62-SW-01	62-SW-14	62-SW-02	62-SW-11	62-SW-03	62-SW-15	62-SW-15 DUP	62-SW-04	62-SW-18	62-SW-05
Lab Sample ID:		Surface Water	FC13343-3	FC13343-2	FC13343-1	FC13279-7	FC13273-3	FC13279-2	FC13279-6	FC13273-1	FC13279-3	FC13237-11
Date Sampled:		Criteria (FAC	2/13/2024	2/13/2024	2/13/2024	2/9/2024	2/9/2024	2/9/2024	2/9/2024	2/9/2024	2/9/2024	2/8/2024
Matrix:	Units	62-777 2/05)	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
Field Parameters												
Temperature	°C	-	15.8	15.7	15.6	17.6	17.2	17.2	-	16.8	16.5	17.1
pH	SU	-	5.27	5.13	5.02	5.14	5.12	6.14	-	5.25	5.27	5.26
Specific Conductivity	µS/cm	-	17.5	15.9	16.4	10.6 J	17.9 J	10.1 J	-	16.92 J	9.9 J	9.6
Dissolved Oxygen	mg/L	-	4.84 J	7.08 J	6.64 J	6.58	7.60	7.41	-	7.43	8.05	8.05
ORP	mV	-	217.4	243.9	218.1	280.2	226.6	300.0	-	213.4	258.3	276.9
Turbidity	NTUs	-	1.48	0.46	0.83	0.39 J	0.48	0.23 J	-	0.64	0.36 J	0.47 J
MS Semi-volatiles (SW846 6850)												
Perchlorate	µg/L	-	**0.24**	**0.31**	**0.98**	**2.6**	**2.1**	**5.4**	**9.0**	**5.1**	**0.63**	**4.8**
General Chemistry												
Hardness	mg/L	-	1.3 I	1.4 I	1.2 I	1.2 I	1.1 I	1.1 I	1.1 I	1.2 I	1.7 I	1.1 I

Notes:
denotes compound was detected.
°C denotes degrees Celcius.
DG denotes downgradient.
FDEP denotes Florida Department of Environmental Protection.
I denotes the reported value is greater than the laboratory detection limit (DL) but less than the laboratory limit of quantitation (LOQ).
J denotes estimated value.
mg/L denotes milligrams per liter.
mV denotes millivolts.
NTU denotes Nephelometric Turbidity Units.
SU denotes standard unit.
SWCTL denotes Surfacewater Cleanup Target Level.
µg/L denotes micrograms per liter.
µS/cm denotes micrograms per centimeter.
U denotes the concentration is non-detect.
Total Hardness Calculated as: (Calcium * 2.497) + (Magnesium * 4.118)

Table 10
Surface Water Analytical Results, February 2024
Range C-62
Eglin Air Force Base, Florida

Location			Eastern Branch									DG of Confluence
			Upstream to Downstream →									
Client Sample ID:		FL Freshwater	62-SW-06	62-SW-12	62-SW-07	62-SW-13	62-SW-21	62-SW-21 DUP	62-SW-16	62-SW-19	62-SW-09	62-SG03-SW
Lab Sample ID:		Surface Water	FC13237-9	FC13237-6	FC13183-12	FC13183-11	FC13183-7	FC13183-8	FC13129-8	FC13129-7	FC13129-5-1	FC13129-4
Date Sampled:		Criteria (FAC	2/8/2024	2/8/2024	2/7/2024	2/7/2024	2/7/2024	2/7/2024	2/6/2024	2/6/2024	2/6/2024	2/6/2024
Matrix:	Units	62-777 2/05)	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
Field Parameters												
Temperature	°C	-	18.9	18.1	19.8	19.4	16.1	-	18.0	17.3	14.9	16.0
pH	SU	-	5.00	4.98	5.02	5.05	5.05	-	5.12	5.07	5.03	5.34
Specific Conductivity	µS/cm	-	10.8	11.1	10.6	10.5	10.7	-	11.1	11.7	12.3	10.1
Dissolved Oxygen	mg/L	-	5.92	6.45	8.59	7.73	9.03	-	8.15	8.35	8.95	9.03
ORP	mV	-	261.2	185.9	286.4	278.0	235.8	-	246.8	210.8	278.3	211.0
Turbidity	NTUs	-	0.25 J	0.82 J	0.74	2.89	0.27	-	0.18	0.32	0.21	0.47
MS Semi-volatiles (SW846 6850)												
Perchlorate	µg/L	-	**0.51**	**0.62 I**	**0.73 I**	**0.58 I**	**0.55**	**0.70**	**3.4**	**4.4**	**3.5**	**3.5**
General Chemistry												
Hardness	mg/L	-	0.88 I	0.99 I	1.1 I	1.2 I	1.1 I	1.1 I	1.2 I	1.2 I	1.2 I	1.1 I

Notes:
denotes compound was detected.

°C denotes degrees Celcius.

DG denotes downgradient.

FDEP denotes Florida Department of Environmental Protection.
I denotes the reported value is greater than the laboratory detection limit (DL) but less than the laboratory limit of quantitation (LOQ).
J denotes estimated value.
mg/L denotes milligrams per liter.
mV denotes millivolts.
NTU denotes Nephelometric Turbidity Units.
SU denotes standard unit.

SWCTL denotes Surfacewater Cleanup Target Level.

µg/L denotes micrograms per liter.
µS/cm denotes micrograms per centimeter.

U denotes the concentration is non-detect.

Total Hardness Calculated as: (Calcium * 2.497) + (Magnesium * 4.118)

Table 8
Surface Water Analytical Results, August 2024
Range C-62, Eglin Air Force Base, Florida

Location			Western Branch						Eastern Branch				DS of Confluence
			Upstream to Downstream →						Upstream to Downstream →				
Client Sample ID:		FL Freshwater	62-SW-14	62-SW-02	62-SW-DUP DUP of 62-SW-02	62-SW-15	62-SW-04	62-SW-18	62-SW-12	62-SW-21	62-SW-16	62-SW-19	62-SG03-SW
Lab Sample ID:		Surface Water	FC18100-1	FC18054-2	FC18054-3	FC18054-1	FC18002-6	FC18002-5	FC18002-2	FC18002-1	FC17945-4	FC17945-2	FC17945-1
Date Sampled:		Criteria (FAC	8/15/2024	8/14/2024	8/14/2024	8/14/2024	8/14/2024	8/14/2024	8/13/2024	8/13/2024	8/13/2024	8/12/2024	8/12/2024
Matrix:	Units	62-777 2/05)	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
Field Parameters													
Temperature	°C	-	28.5	29.5	29.5	27.8	24.7	24.6	28.6	30.7	27.8	31.9	27.0
pH	SU	-	6.76	5.19	5.19	5.26 J	5.06 J	5.13	4.57	5.36	4.45	4.95	4.71
Specific Conductivity	µS/cm	-	10.8	11.7	11.7	11.0	11.0	11.1	11.4	10.0	10.0	10.3	9.7
Dissolved Oxygen	mg/L	-	5.91	4.66	4.66	5.75	6.30	6.46	5.18	4.84	6.20	5.55	7.03
ORP	mV	-	7.2	9.1	9.1	8.4 J	17.7 J	32.8	50.2	8.0 J	39.5	37.4	63.1
Turbidity	NTUs	-	0.36	0.60	0.60	3.55	2.03	2.04	0.28	0.64	0.34	0.02	1.28
MS Semi-volatiles (SW846 6850)													
Perchlorate	µg/L	-	**0.42**	**1.10**	**1.10**	**3.6**	**3.6**	**3.4**	**0.36**	**0.52**	**1.4**	**1.5**	**1.8**
General Chemistry													
Hardness	mg/L	-	1.2 I	1.1 I	1.1 I	1.2 I	1.2 I	1.2 I	0.73 I	0.73 I	3.8 I	11.9 I	1.0 I

Notes:
denotes compound was detected.

°C denotes degrees Celcius.

DS downstream of the confluence of the Eastern and Western Branches.

FDEP denotes Florida Department of Environmental Protection.

I denotes the reported value is greater than the laboratory detection limit (DL) but less than the laboratory limit of quantitation (LOQ).

J denotes estimated value.

mg/L denotes milligrams per liter.

mV denotes millivolts.

NTU denotes Nephelometric Turbidity Units.

SU denotes standard unit.

SWCTL denotes Surface Water Cleanup Target Level.

µg/L denotes micrograms per liter.

µS/cm denotes micrograms per centimeter.

U denotes the concentration is non-detect. Value preceeding the U is the detection limit.

Total Hardness Calculated as: (Calcium * 2.497) + (Magnesium * 4.118)

FAC: Florida Administrative Code

DUP: duplicate

Historical Porewater Quality

This page intentionally left blank.

Table 9
Porewater Analytical Results, February/March 2022
Range C-62
Eglin Air Force Base, Florida

Client Sample ID:		FL Freshwater	62-PW-01	62-PW-02	62-PW-02 DUP	62-PW-03	62-PW-04	62-PW-05	62-PW-09
Lab Sample ID:		Surface Water	FA93570-2	FA93494-1	FA93494-2	FA93494-4	FA93461-3	FA93461-5	FA93484-1
Date Sampled:		Criteria (FAC	3/2/2022	2/26/2022	2/26/2022	2/26/2022	2/25/2022	2/25/2022	2/24/2022
Matrix:	Units	62-777 2/05)	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Field Parameters									
pH	pH Units	-	4.06	4.37	-	4.96	4.07	4.26	4.35
Temperature	°C	-	23.20	22.80	-	21.20	25.00	23.20	20.80
Specific Conductivity	mS/cm	-	0.015	0.015	-	0.014	0.012	0.012	0.014
Dissolved Oxygen	mg/L	-	1.74	4.42	-	0.22	2.63	4.09	0.21
Salinity	$^{0}/_{00}$	-	0.01	0.01	-	0.01	0.00	0.00	0.01
ORP	mV	-	307.30	329.00	-	154.70	327.10	330.90	79.00
Turbidity	NTUs	-	19.78	17.47	-	7.67	2.59	0.01	0.76
MS Semi-volatiles (SW846 6850)									
Perchlorate	µg/L	-	1.3	85.1	84.9	0.10 U	2.8	0.10 U	0.10 U
GC/LC Semi-volatiles (SW846 8330B)									
RDX	µg/L	180	0.099 U	6.7	6.8	0.096 U	0.11 U	0.10 U	0.10 U

Notes:
denotes compound was detected.
denotes compound exceeded respective criteria.
°C denotes degrees Celcius.
FDEP denotes Florida Department of Environmental Protection.
I - The reported value is greater than the laboratory
detection limit (DL) but less than the laboratory limit of quantitation (LOQ).
mg/L denotes milligrams per liter.
mS/cm denotes milliSiemens per centimeter.
mV denotes millivolts.
N/A denotes not applicable.
NTU denotes Nephelometric Turbidity Units.
µg/L denotes micrograms per liter.
U denotes the concentration is non-detect.

Table 8
Pore Water Analytical Results, August/September 2022
Range C-62
Eglin Air Force Base, Florida

Location			Western Branch					
Client Sample ID:		Permit Designated GWPS	62-PW-01	62-PW-02	62-PW-02 DUP	62-PW-03	62-PW-04	62-PW-05
Lab Sample ID:			FA97828-35	FA97828-29	FA97828-30	FA97828-26	FA97828-24	FA97828-21
Date Sampled:			8/12/2022	8/11/2022	8/11/2022	8/11/2022	8/11/2022	8/10/2022
Matrix:	Units		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Field Parameters								
pH	pH Units	-	3.29	3.94	-	3.99	4.26	3.59
Temperature	°C	-	26.10	26.70	-	25.80	24.90	23.50
Specific Conductivity	mS/cm	-	0.014	0.015	-	0.014	0.012	0.012
Dissolved Oxygen	mg/L	-	0.73	4.21	-	0.20	2.36	3.97
ORP	mV	-	329.50	395.10	-	215.10	310.00	NR
Turbidity	NTUs	-	0.96	1.65	-	3.27	2.48	0.67
MS Semi-volatiles (SW846 6850)								
Perchlorate	µg/L	4	1.0 U	**20.8**	**20.2**	0.068 I	2.2	0.10 U
GC/LC Semi-volatiles (SW846 8330B)								
RDX	ug/l	10	0.099 U	5.9	6	0.097 U	0.097 U	0.10 U
General Chemistry (SM5310/SW9060A)								
Total Organic Carbon	mg/l	-	-	-	-	-	-	-

denotes compound was detected

denotes compound exceeded respective criteria.

GWPS: groundwater protection standard

°C denotes degrees Celcius.

FDEP denotes Florida Department of Environmental Protection.

I - The reported value is greater than the laboratory detection limit (DL) but less than the laboratory limit of quantitation (LOQ).

mg/L denotes milligrams per liter.

mS/cm denotes milliSiemens per centimeter.

mV denotes millivolts.

NTU denotes Nephelometric Turbidity Units.

µg/L denotes micrograms per liter.

Q denotes the sample was analyzed out of hold time

U denotes the concentration is non-detect.

NR denotes no reading

Table 8
Pore Water Analytical Results, August/September 2022
Range C-62
Eglin Air Force Base, Florida

Location			Western Branch			Eastern Branch			
Client Sample ID:		**Permit Designated GWPS**	**62-PW-10**	**62-PW-10 DUP**	**62-PW-11**	**62-PW-07**	**62-PW-09**	**62-PW-12**	**62-PW-13**
Lab Sample ID:			**FA99019-8**	**FA99019-9**	**FA99019-6**	**FA97828-19**	**FA97828-14**	**FA97828-22**	**FA97828-16**
Date Sampled:			**9/15/2022**	**9/15/2022**	**9/13/2022**	**8/10/2022**	**8/9/2022**	**8/10/2022**	**8/9/2022**
Matrix:	**Units**		**Groundwater**	**Groundwater**	**Groundwater**	**Groundwater**	**Groundwater**	**Groundwater**	**Groundwater**
Field Parameters									
pH	pH Units	-	5.94	-	4.35	3.84	3.92	4.50	3.61
Temperature	°C	-	32.50	-	29.90	26.50	25.10	25.50	25.50
Specific Conductivity	mS/cm	-	0.036	-	0.010	0.013	0.014	0.025	0.013
Dissolved Oxygen	mg/L	-	5.71	-	5.38	6.96	0.12	5.33	0.40
ORP	mV	-	NR	-	133.60	NR	NR	441.60	NR
Turbidity	NTUs	-	22.86	-	2.47	8.99	0.87	7.98	3.44
MS Semi-volatiles (SW846 6850)									
Perchlorate	µg/L	4	0.10 UQ	0.10 UQ	2.3 Q	0.10 U	0.10 U	1.3	0.10 U
GC/LC Semi-volatiles (SW846 8330B)									
RDX	ug/l	10	0.74 I	0.10 U	0.099 U	0.10 U	0.10 U	0.10 U	0.097 U
General Chemistry (SM5310/SW9060A)									
Total Organic Carbon	mg/l	-	0.85 I	0.85 I	-	-	-	-	-

denotes compound was detected
denotes compound exceeded respective criteria.
GWPS: groundwater protection standard
°C denotes degrees Celcius.
FDEP denotes Florida Department of Environmental Protection.
I - The reported value is greater than the laboratory detection limit (DL) but less than the laboratory limit of quantitation (LOQ).
mg/L denotes milligrams per liter.
mS/cm denotes milliSiemens per centimeter.
mV denotes millivolts.
NTU denotes Nephelometric Turbidity Units.
µg/L denotes micrograms per liter.
Q denotes the sample was analyzed out of hold time
U denotes the concentration is non-detect.
NR denotes no reading

Table 8
Porewater Analytical Results, February 2023
Range C-62
Eglin Air Force Base, Florida

Location		Western Branch						
		Upstream to Downstream →						
Client Sample ID:		Permit Designated GWPS*	62-PW10	62-PW14	62-PW02	62-PW02 DUP	62-PW11	62-PW03
Lab Sample ID:			FC2953-14	FC2953-12	FC2953-3	FC2953-4	FC2953-10	FC2976-5
Date Sampled:			2/23/2023	2/23/2023	2/23/2023	2/23/2023	2/23/2023	2/22/2023
Matrix:	Units		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
ield Parameters								
pH	pH Units	-	6.24	4.71	4.67	-	4.01	5.87
Temperature	°C	-	22.5	21.8	22.8	-	24.0	24.1
Specific Conductivity	mS/cm	-	0.034	0.012	0.011	-	0.009	0.042
Dissolved Oxygen	mg/L	-	8.10	0.19	7.30	-	7.36	7.71
Salinity	$^{0}/_{00}$	-	0.01	0.00	0.00	-	0.00	0.02
ORP	mV	-	78.2	132.2	242.3	-	382.1	29.9
Turbidity	NTUs	-	5.12	0.07	1.66	-	10.17	11.90
MS Semi-volatiles (SW846 6850)								
Perchlorate	µg/L	4	0.050 U	0.050 U	**81.5**	**76.2**	1.1	0.050 U
GC/LC Semi-volatiles (SW846 8330B)								
RDX**	µg/l	10	0.76 J[a]	0.16 IJ[a]	3.2	3.2	0.080 U	0.080 U

denotes compound was detected.

denotes compound exceeded respective criteria.

°C denotes degrees Celcius.

FDEP denotes Florida Department of Environmental Protection.

I - The reported value is greater than or equal to
the MDL but less than the laboratory practical quantitation limit (PQL).

J[a] denotes primary and confirmation results differ by more than 40%.

0.11 / 0.0501 U

mS/cm denotes milliSiemens per centimeter.

mV denotes millivolts.

N/A denotes not applicable.

NTU denotes Nephelometric Turbidity Units.

µg/L denotes micrograms per liter.

U denotes the concentration is non-detect.

NR denotes no reading

Table 8
Pore Water Analytical Results, February 2023
Range C-62
Eglin Air Force Base, Florida

Location			Western Branch		Eastern Branch			
			Upstream to Downstream →		Upstrream to Downstream →			
Client Sample ID:		Permit Designated GWPS*	62-PW15	62-PW04	62-PW12	62-PW07	62-PW13	62-PW16
Lab Sample ID:			FC2981	FC2976-4	FC2893	FC2892-2	FC2894-2	FC2981
Date Sampled:			2/22/2023	2/22/2023	2/21/2023	2/21/2023	2/20/2023	2/22/2023
Matrix:	Units		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
ield Parameters								
pH	pH Units	-	4.82	3.83	3.85	4.03	4.93	5.21
Temperature	°C	-	21.7	23.3	24.0	23.2	22.2	22.9
Specific Conductivity	mS/cm	-	0.011	0.011	0.011	0.016	0.010	0.012
Dissolved Oxygen	mg/L	-	2.03	2.36	7.98	7.74	7.66	8.24
Salinity	$^{0}/_{00}$	-	0.00	0.00	0.00	0.01	0.00	0.00
ORP	mV	-	234.0	377.9	366.0	259.0	196.1	167.3
Turbidity	NTUs	-	4.31	10.70	9.58	2.07	0.02	285
MS Semi-volatiles (SW846 6850)								
Perchlorate	µg/L	4	**24.4**	**4.3**	**4.6**	0.050 U	0.050 U	0.87
GC/LC Semi-volatiles (SW846 8330B)								
RDX**	µg/l	10	0.87	0.081 U	0.079 U	0.11 I	0.14 I	0.078 U

denotes compound was detected.
denotes compound exceeded respective criteria.
°C denotes degrees Celcius.
FDEP denotes Florida Department of Environmental Protection.
I - The reported value is greater than or equal to
the MDL but less than the laboratory practical quantitation limit (PQL).
J[a] denotes primary and confirmation results differ by more than 40%.
0.11 / 0.0501 U
mS/cm denotes milliSiemens per centimeter.
mV denotes millivolts.
N/A denotes not applicable.
NTU denotes Nephelometric Turbidity Units.
µg/L denotes micrograms per liter.
U denotes the concentration is non-detect.

NR denotes no reading

Table 8
Pore Water Analytical Results, August 2023
Range C-62
Eglin Air Force Base, Florida

Location		Western Branch								
		Permit Designated GWPS*	Upstream to Downstream →							
Client Sample ID:			62-PW14	62-PW14 DUP	62-PW02	62-PW11	62-PW03	62-PW15	62-PW04	62-PW18	62-PW05
Lab Sample ID:			FC8636-6	FC8636-7	FC8670-2	FC8636-9	FC8636-3	FC8636-1	FC8556-4	FC8670-8	FC8556-2
Date Sampled:			8/8/2023	8/8/2023	8/10/2023	8/9/2023	8/8/2023	8/8/2023	8/8/2023	8/10/2023	8/8/2023
Matrix:	Units		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
ield Parameters											
pH	pH Units	-	4.77 J	-	4.60 J	5.32 J	5.48 J	4.04 J	4.12 J	4.87 J	4.56 J
Temperature	°C	-	25.90 J	-	26.30 J	30.98 J	26.82 J	25.44 J	25.46 J	36.06 J	27.00 J
Specific Conductivity	mS/cm	-	0.014 J	-	0.017 J	0.014 J	0.020 J	0.012 J	0.012 J	0.014 J	0.012 J
Dissolved Oxygen	mg/L	-	0.21 J	-	4.30 J	5.23 J	7.39 J	4.83 J	3.42 J	3.64 J	4.53 J
Salinity	$^{0}/_{00}$	-	0.01 J	-	0.01 J	0.00 J	0.01 J	0.00 J	0.00 J	0.00 J	0.00 J
ORP	mV	-	37.9 J	-	181.7 J	98.5 J	50.8 J	282.6 J	231.8 J	94.8 J	248.3 J
Turbidity	NTUs	-	1.88 J	-	1.27 J	1.76 J	2.08 J	0.57 J	0.00 J	1.20 J	8.67 J
MS Semi-volatiles (SW846 6850)											
Perchlorate	µg/L	4	0.050 U	0.050 U	**81.3**	1.7	0.050 U	**26.2**	2.6	1.5	0.050 U
GC/LC Semi-volatiles (SW846 8330B)											
RDX	µg/l	10	0.60 I	0.58 I	4.9	0.31 I	0.86 I	1.1	0.080 U	0.082 U	0.079 U

denotes compound was detected.
denotes compound exceeded respective criteria.
°C denotes degrees Celcius.
FDEP denotes Florida Department of Environmental Protection.
I - The reported value is greater than or equal to
the MDL but less than the laboratory practical quantitation limit (PQL).
J denotes values are estimated.
mS/cm denotes milliSiemens per centimeter.
mV denotes millivolts.
NTU denotes Nephelometric Turbidity Units.
µg/L denotes micrograms per liter.
U denotes the concentration is non-detect.

Table 8
Pore Water Analytical Results, August 2023
Range C-62
Eglin Air Force Base, Florida

Location			Eastern Branch						
			Upstream to Downstream →						
Client Sample ID:		Permit Designated GWPS*	62-PW12	62-PW07	62-PW13	62-PW21	62-PW16	62-PW19	62-PW09
Lab Sample ID:			FC8636-8	FC8556-10	FC8556-6	FC8670-6	FC8502-4	FC8670-4	FC8502-2
Date Sampled:			8/9/2023	8/8/2023	8/8/2023	8/10/2023	8/7/2023	8/10/2023	8/7/2023
Matrix:	Units		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
ield Parameters									
pH	pH Units	-	4.93 J	4.95 J	4.80 J	4.61 J	5.12 J	4.72 J	4.52 J
Temperature	°C	-	30.23 J	26.35 J	27.57 J	25.11 J	30.46 J	25.95 J	26.86 J
Specific Conductivity	mS/cm	-	0.014 J	0.015 J	0.017 J	0.17J	0.016 J	0.016 J	0.014 J
Dissolved Oxygen	mg/L	-	5.67 J	0.43 J	2.17 J	2.55 J	3.84 J	0.14 J	0.38 J
Salinity	$^{0}/_{00}$	-	0.00 J	0.01 J	0.01 J	0.01 J	0.01 J	0.01 J	0.00 J
ORP	mV	-	108.5 J	-10.3 J	-58.1 J	105.3 J	73.7 J	43.8 J	-3.5 J
Turbidity	NTUs	-	4.34 J	1.26 J	0.51 J	3.41 J	9.72 J	1.60 J	0.98 J
MS Semi-volatiles (SW846 6850)									
Perchlorate	µg/L	4	1.7	0.050 U	0.050 U	**71.3**	0.38	**7.4**	0.24
GC/LC Semi-volatiles (SW846 8330B)									
RDX	µg/l	10	-	-	-	-	-	-	-

denotes compound was detected.
denotes compound exceeded respective criteria.
°C denotes degrees Celcius.
FDEP denotes Florida Department of Environmental Protection.
I - The reported value is greater than or equal to
the MDL but less than the laboratory practical quantitation limit (PQL).
J denotes values are estimated.
mS/cm denotes milliSiemens per centimeter.
mV denotes millivolts.
NTU denotes Nephelometric Turbidity Units.
µg/L denotes micrograms per liter.
U denotes the concentration is non-detect.

Table 11
Pore Water Analytical Results, February/March 2024
Range C-62
Eglin Air Force Base, Florida

Location			Western Branch										
			Upstream to Downstream →										
Client Sample ID:		Permit Designated GWPS*	62-PW-14	62-PW-02	62-PW-11	62-PW-03	62-PW-03	62-PW-15	62-PW-15 DUP	62-PW-04	62-PW-18	62-PW-18	62-PW-05
Lab Sample ID:			FC13343-4	FC13344-2	FC13344-1	FC13273-4	FC13343-5	FC13279-4	FC13279-5	FC13273-2	FC13279-1	FC14246	FC13237-10
Date Sampled:			2/13/2024	2/13/2024	2/13/2024	2/9/2024	2/13/2024	2/9/2024	2/9/2024	2/9/2024	2/9/2024	3/20/2024	2/8/2024
Matrix:	Units		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
ield Parameters													
pH	SU	-	5.16	4.98	5.07	6.96	6.81	5.85	-	5.30	5.07	4.79	5.03
Temperature	°C	-	18.6	18.4	15.4	19.0	17.8	18.1	-	19.6	19.7	20.3	20.2
Specific Conductivity	µS/cm	-	16.6	12.4	12.3	102.0 J	75.1	20.3 J	-	18.1 J	10.6 J	13.2	11.1
Dissolved Oxygen	mg/L	-	0.23 J	5.13	4.93	0.43	4.83 J	0.19	-	3.15	3.95	4.47	4.84
ORP	mV	-	96.3	417.3	377.4	-113.6	-91.9	80.2	-	164.6	334.3	247.8	290.0
Turbidity	NTUs	-	0.27	1.54	10.03	3.51	3.27	0.49 J	-	0.42	0.54 J	1.95	0.09 J
MS Semi-volatiles (SW846 6850)													
Perchlorate	µg/L	4	0.050 U	**84.1**	**1.9**	0.050 U	-	**4.0**	**4.8**	**2.0**	**5.8**	-	0.25 U
GC/LC Semi-volatiles (SW846 8330B)													
RDX	µg/l	10	0.078 U	**3.8**	0.079 U	-	0.080 U	**0.65 N[a]**	**0.62 N[a]**	**0.14 I**	-	0.081 U	0.078 U

denotes compound was detected.
denotes compound exceeded respective criteria.

°C denotes degrees Celcius.
FDEP denotes Florida Department of Environmental Protection.
I - The reported value is greater than or equal to the MDL but less than the laboratory practical quantitation limit (PQL).
J denotes the value is estimated.
mg/L denotes micrograms per liter.
mV denotes millivolts.
N[a] denotes primary and confirmation results differ by more than 40%.
NTU denotes Nephelometric Turbidity Units.
SU denotes standard unit.
U denotes the concentration is non-detect.
µg/L denotes micrograms per liter.
µS/cm denotes microSiemens per centimeter.

Table 11
Pore Water Analytical Results, February/March 2024
Range C-62
Eglin Air Force Base, Florida

Location			Eastern Branch							
			Upstrream to Downstream →							
Client Sample ID:		Permit Designated GWPS*	62-PW-12	62-PW-07	62-PW-13	62-PW-21	62-PW-21 DUP	62-PW-16	62-PW-19	62-PW-09
Lab Sample ID:			FC13237-7	FC13237-5	FC13237-4	FC13183-9	FC13183-10	FC13183-6	FC13183-5	FC13129-6
Date Sampled:			2/8/2024	2/8/2024	2/8/2024	2/7/2024	2/7/2024	2/7/2024	2/7/2024	2/6/2024
Matrix:	Units		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
ield Parameters										
pH	SU	-	4.98	5.39	5.19	4.86	-	5.48	4.87	4.99
Temperature	°C	-	20.9	18.4	15.4	21.0	-	15.4	16.0	18.6
Specific Conductivity	µS/cm	-	13.9	11.9	11.4	13.1	-	12.2	12.8	12.9
Dissolved Oxygen	mg/L	-	3.50	9.04	7.90	3.06	-	9.41	7.79	2.53
ORP	mV	-	247.4	84.2	46.5	265.3	-	81.1	147.2	17.2
Turbidity	NTUs	-	4.44 J	0.56 J	0.48 J	0.91	-	33.0	2.26	0.27
MS Semi-volatiles (SW846 6850)										
Perchlorate	µg/L	4	**3.8**	0.25 U	0.25 U	**48.6**	**38.3**	**0.39**	**5.6**	0.050 U
GC/LC Semi-volatiles (SW846 8330B)										
RDX	µg/l	10	-	-	-	-	-	-	-	-

denotes compound was detected.
denotes compound exceeded respective criteria.

°C denotes degrees Celcius.
FDEP denotes Florida Department of Environmental Protection.
I - The reported value is greater than or equal to the MDL but less than the laboratory practical quantitation limit (PQL).
J denotes the value is estimated.
mg/L denotes micrograms per liter.
mV denotes millivolts.
N[a] denotes primary and confirmation results differ by more than 40%.
NTU denotes Nephelometric Turbidity Units.
SU denotes standard unit.
U denotes the concentration is non-detect.
µg/L denotes micrograms per liter.
µS/cm denotes microSiemens per centimeter.

Table 7
Porewater Analytical Results, August 2024
Range C-62, Eglin Air Force Base, Florida

Location		Western Branch						Eastern Branch			
			Upstream to Downstream →					Upstream to Downstream →			
Client Sample ID:		Permit Designated GWPS*	62-PW-14	62-PW-02	62-PW- DUP DUP of 62-PW-02	62-PW-15	62-PW-04	62-PW-18	62-PW-12	62-PW-21	62-PW-16	62-PW-19
Lab Sample ID:			FC18100-3	FC18054-4	FC18054-5	FC18100-2	FC18002-8	FC18002-7	FC18002-3	FC18002-4	FC17945-5	FC17945-3
Date Sampled:			8/15/2024	8/14/2024	8/14/2024	8/15/2024	8/14/2024	8/14/2024	8/13/2024	8/13/2024	8/13/2024	8/12/2024
Matrix:	Units		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
ield Parameters												
pH	SU	-	4.81	4.63	4.63	4.47	4.33 J	4.85	4.78	1.11	5.62	4.74
Temperature	℃	-	26.9	28.0	28.0	26.3	26.2	24.8	29.7	25.8	29.5	27.2
Specific Conductivity	µS/cm	-	13.1	17.2	17.2	13.3	11.0	11.4	11.3	14.0	19.9	15.3
Dissolved Oxygen	mg/L	-	0.03	4.06	4.06	7.13	6.99	3.66	6.34	3.41	5.92	0.10
ORP	mV	-	4.2	64.9	64.9	185.5	46.5 J	42.5	43.3	196.0 J	12.2	37.4
Turbidity	NTUs	-	0.2	1.17	1.17	0.84	0.70	1.06	3.40	1.38	16.0	0.02
MS Semi-volatiles (SW846 6850)												
Perchlorate	µg/L	4	0.050 U	**235**	**222**	**27.5**	**3.6**	**0.55**	**2.9**	**109**	**0.24**	**2.4**
GC/LC Semi-volatiles (SW846 8330B)												
RDX	µg/l	10	0.086 U	**22.6**	**22.8**	**1.3**	0.084 U	0.084 U	-	-	-	-

denotes compound was detected.

denotes compound exceeded respective criteria.

°C denotes degrees Celcius.

FDEP denotes Florida Department of Environmental Protection.

I - The reported value is greater than or equal to the MDL but less than the laboratory practical quantitation limit (PQL).

J denotes the value is estimated.

mg/L denotes micrograms per liter.

mV denotes millivolts.

N[a] denotes primary and confirmation results differ by more than 40%.

NTU denotes Nephelometric Turbidity Units.

SU denotes standard unit.

U denotes the concentration is non-detect. The value preceeding the U is the detection limit.

µg/L denotes micrograms per liter.

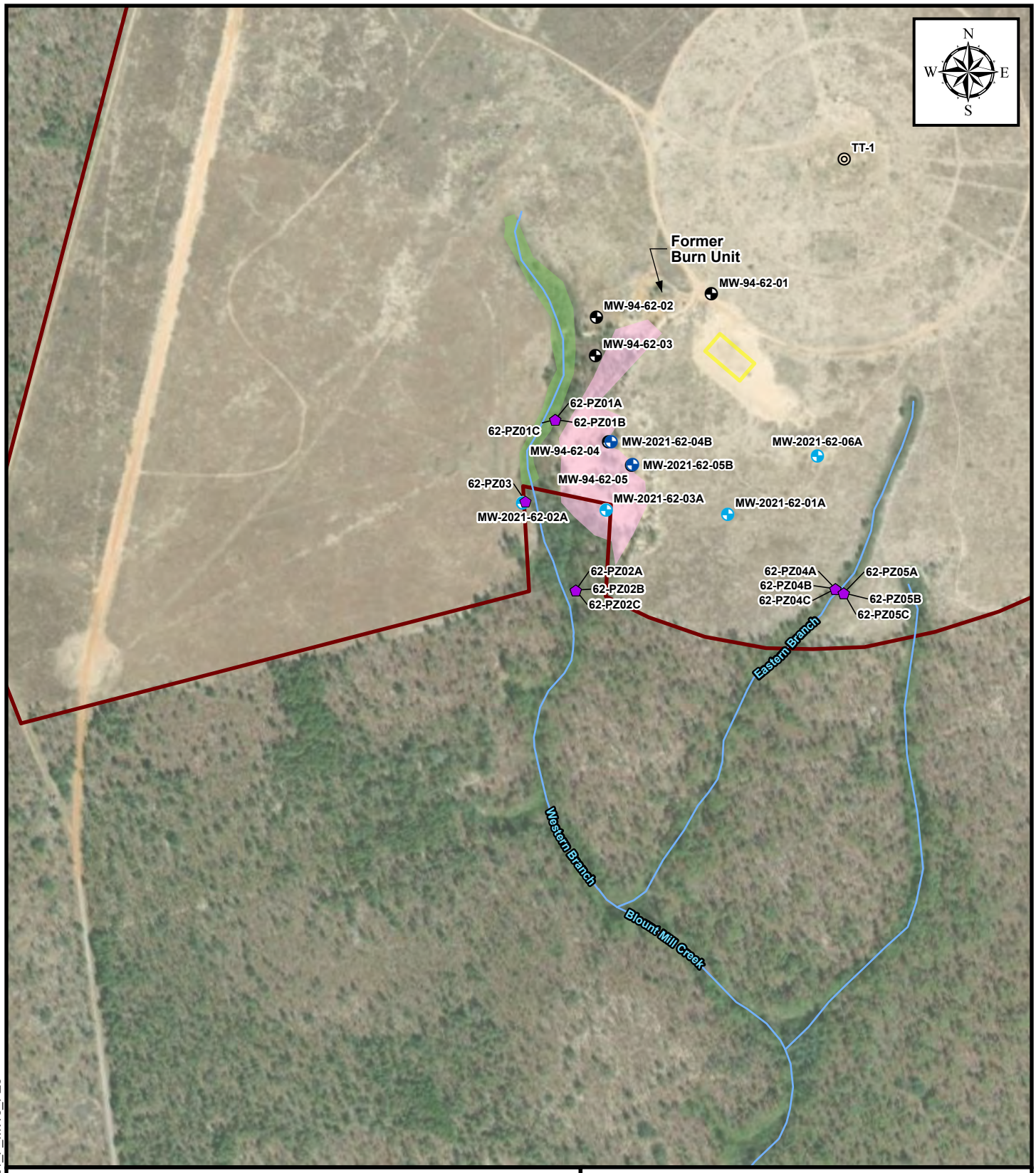
µS/cm denotes microSiemens per centimeter.

DUP: duplicate

Appendix L Range C 62 Monitoring Well and Piezometer Boring Logs

This page intentionally left blank.

Map of Monitoring Well and Piezometer Locations



Legend

- Deep Wells Installed by KGS
- Shallow Wells Installed by KGS
- Monitoring Well Installed by Others
- Newly Installed PZs - May 2024
- Bombing Target
- Seepage Bog
- Erosion Impact Area
- Open Detonation Unit (ODU)
- Range C-62 Boundary

Monitoring Well and Piezometer Locations
Range C-62

Open Detonation Unit
Eglin AFB, Florida

KOMAN Government Solutions, LLC
293 Boston Post Road West, Suite 100, Marlborough, MA 01752

0 300 600
Feet

Date: 12/02/2024

Figure 2

EAS ENVIRONMENTAL ASSESSMENT SERVICES
Wholly Owned Subsidiary of Natives of Kodiak

File: 0524_Eglin.aprx Layout: 1224_F_MWs_PZs

1994 Monitoring Well Installation Report with Boring Logs

3. FIELD INVESTIGATION

3.1 PERMITTING

In accordance with Chapter 40A-3.512(8), F.A.C., monitoring well permits were obtained from the Northwest Florida Water Management District (NWFWMD) prior to the commencement of drilling. The FDEP, Pensacola, Florida office was also advised by base personnel of the drilling schedule. Well completion records were submitted to the NWFWMD following well installation.

3.2 WORK PLAN

Due to scheduling conflicts with military missions being run on both ranges while the drilling activities were being conducted, the work schedule was modified from 20 days straight to 10 days on with 4 days off. Two tours were needed to accomplish the work due to mission scheduling conflicts with the military.

3.3 BORING/MONITORING WELL INSTALLATION

The original Work Plan (Field Sampling and Analysis Plan) called for three observation wells to be installed along with three hydropunch locations for both ranges. After being modified by the USAF, the plan called for drilling and installation of eight groundwater monitoring wells to first water and two pilot holes into the Pensacola Clay. One pilot hole was installed at each range (Range C-52N and Range C-62N). Soil boring logs and well logs are provided in Appendix A; geophysical well logs are included as Appendix B; and field notes are provided as Appendix C. Full CLP detail analytical data reports (Appendices D and E) are not provided directly with this report, but are separately bound and submitted.

3.3.1 Placement of Wells

Before work on the ranges began, all the accessways and drilling locations were cleared of any unexploded ordinance (UXO) by Eglin EOD personnel. All cleared areas were flagged or taped off with caution tape. No one was allowed outside of the cleared areas without the permission of EOD personnel. While working on Range C-52N, the boreholes were screened for UXOs to a depth of approximately 30 ft below grade before any drilling continued. While on both ranges, EOD teams escorted all personnel involved with the operations.

Range C-52N had three groundwater monitoring wells and one pilot hole installed. The locations were triangulated around the ground target known as the "cats eye." Monitoring well locations are presented in Figure 3-1.

Range C-62N had five groundwater monitoring wells and one pilot hole installed. The locations were set to surround the OB/OD units. Monitoring well locations are presented in Figure 3-2.

All drilling locations were located by EAFB environmental personnel prior to drilling.

3.3.2 Drilling

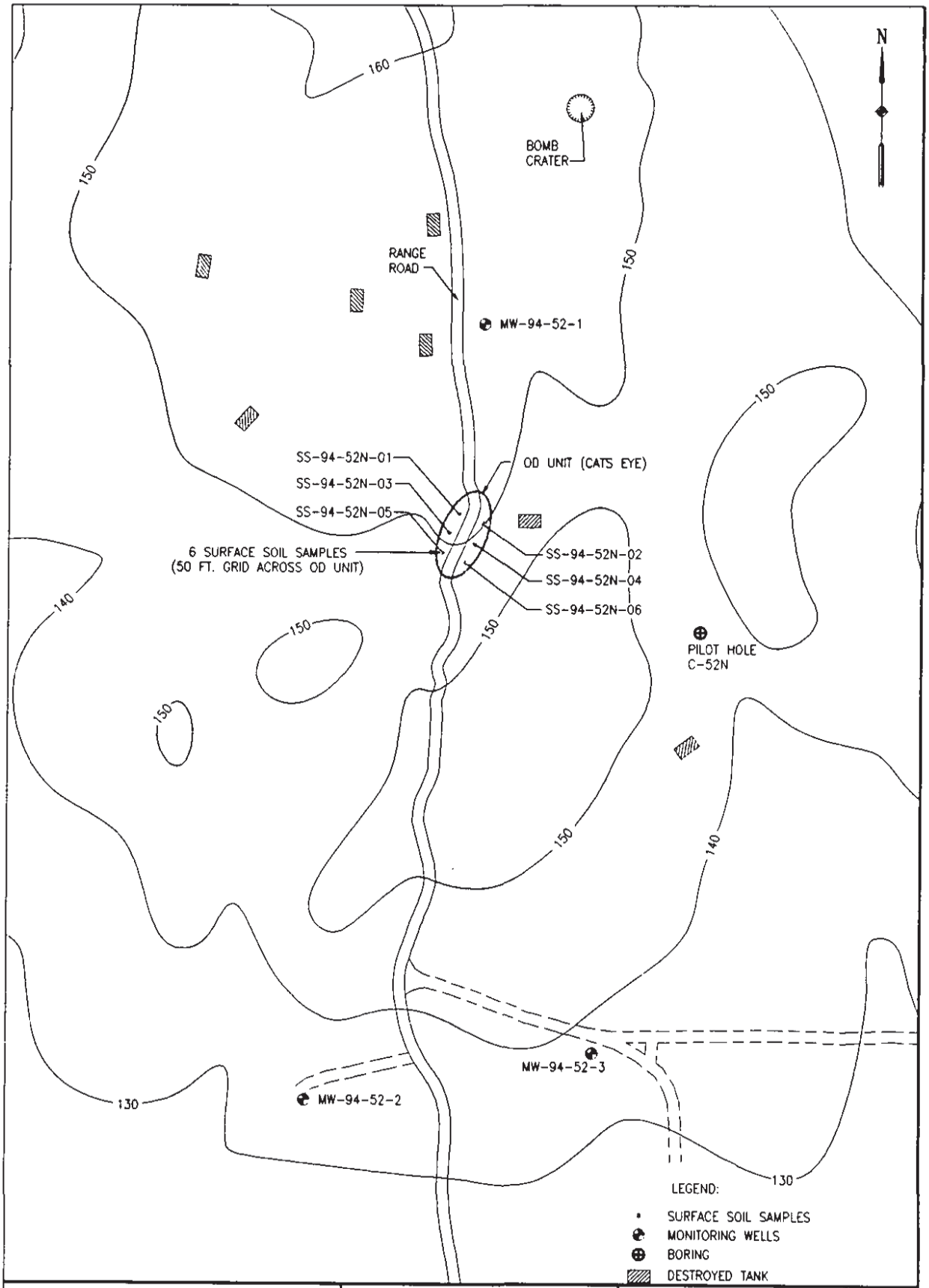
During the period 31 October 1994 through 22 November 1994, Groundwater Protection Inc. of Orlando, Florida (a certified water well driller), under the supervision of an EA geologist, installed and developed eight groundwater monitoring wells and two pilot holes. The monitoring wells were installed using hollow stem augers with split-spoon sampling. The two pilot holes were drilled using rotary mud drilling techniques. Monitoring wells were drilled to depths ranging from 36 ft to 45 ft below grade. The pilot hole at C-52N was drilled to 70 ft below grade. The pilot hole at Range C-62N was drilled to 110 ft below grade. Drilling logs of all borings/monitoring wells are presented in Appendix A.

3.3.3 Surface and Subsurface Soil Sampling

A total of 26 surface soil samples were collected from the OB/OD areas of both ranges for analysis. At Range C-52N, a total of six surface soils were collected from the "cats eye" (Figure 3-1).

At Range C-62N, a total of 20 surface soil samples were collected. Ten soil samples were collected from the OB unit area and 10 soil samples were collected from the OD unit area (Figure 3-2).

A detailed discussion of surface soil sampling procedures is presented in Sections 4.1 and 4.2 of the Field Sampling and Analysis Plan which was submitted for approval to USAF and FDEP and was accepted.

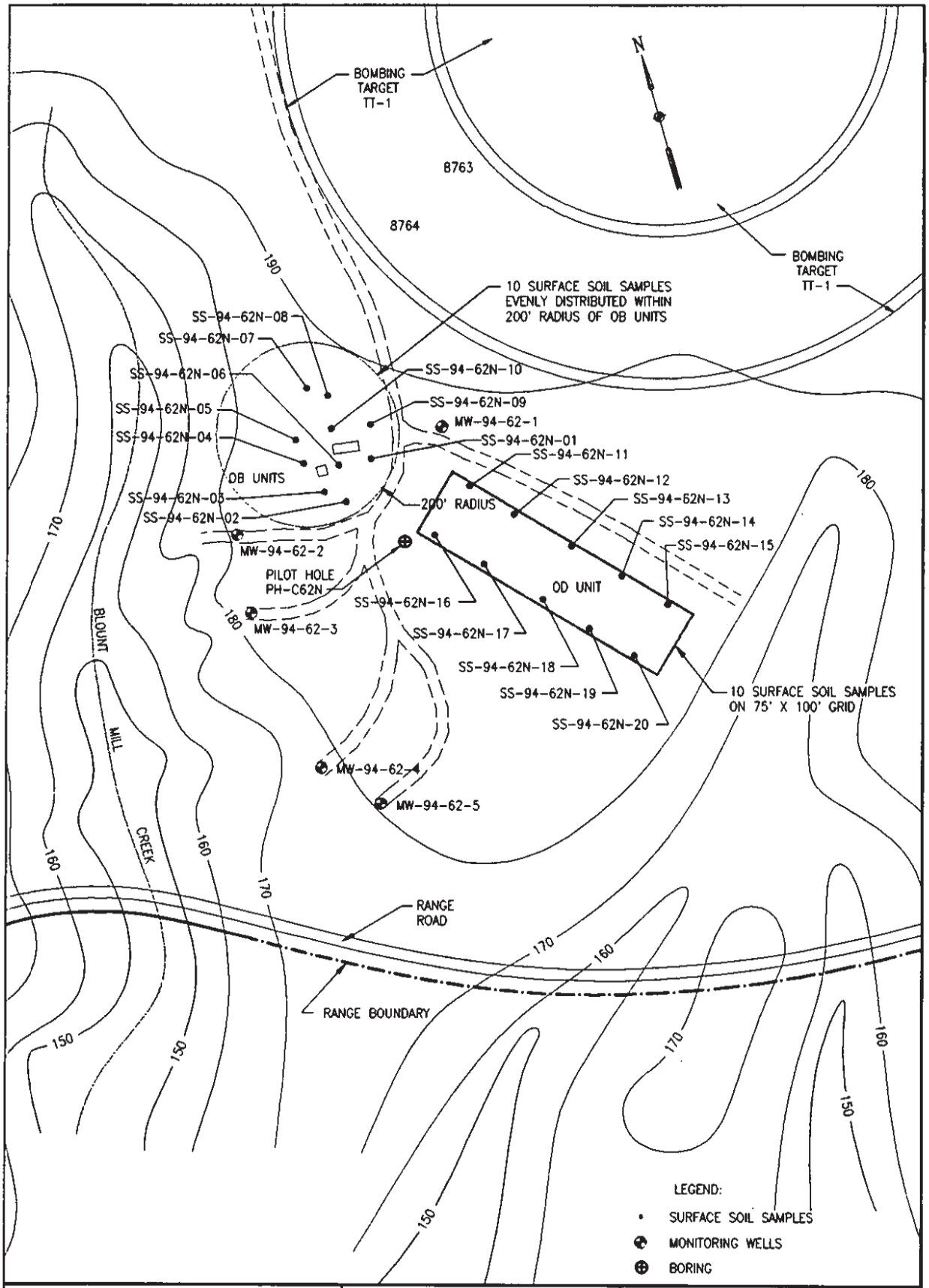


EA ENGINEERING, SCIENCE, AND TECHNOLOGY, INC.

EGLIN AIR FORCE BASE
WALTON COUNTY, FLORIDA

RANGE C-52N OD UNIT
PILOT HOLE, MONITORING WELLS
AND SOIL SAMPLING LOCATIONS

PROJECT MGR.	DESIGNED BY	DRAWN BY	CHECKED BY	DATE	SCALE	PROJECT NO	FILE NAME	FIGURE NO.	SHEET NO.
TAL	DPM	FDV	GEJ	3-15-95	1" = 200'	11206.27	3-1	3-1	3.3



EA ENGINEERING, SCIENCE, AND TECHNOLOGY, INC.

EGLIN AIR FORCE BASE
RANGE C-62
WALTON COUNTY, FLORIDA

RANGE C-62 OB/OD UNITS
GROUND WATER AND SOIL
SAMPLING LOCATIONS

PROJECT MGR.	DESIGNED BY	DRAWN BY	CHECKED BY	DATE	SCALE	PROJECT NO.	FILE NAME	FIGURE NO.	SHEET NO.
TAL	DPM	FDV	GEJ	3-16-95	1"=200'	11206.27	C62SAMPL	3-2	3.4

Subsurface soil samples were collected during drilling operations. Each borehole was advanced manually using a post hole digger for the first 4 ft below the surface to comply with safety regulations, followed by the drilling contractor and EA.

Grab soil samples were collected from 0 to 2 ft depths by dropping the soil from a clean post hole digger directly into the glass sampling jars. The post hole digger was decontaminated before each use. The boreholes were then advanced mechanically from approximately 4 ft below grade to total depth drilled. Soil samples were collected by driving a 2-in. diameter x 24-in. long, hardened steel, split-spoon sampler ahead of the augers into undisturbed sediment, in accordance with ASTM D-1586 procedures. Subsurface samples were collected at 5 ft intervals to total depth in each borehole.

All soil samples were classified lithologically according to the Unified Soil Classification System (USCS) (Jumikis 1984). The boring/monitoring well logs, along with a key, are provide in Appendix A.

A detailed discussion of the subsurface soil sampling is presented in Sections 5.1 and 5.2 of the Field Sampling and Analysis Plan.

3.3.4 Geophysical Well Logging

Geophysical well logs were run on the pilot borings drilled at ranges C-52N an C-62N. Footage was logged from bottom of boring to top. Pilot hole C-52N was logged from 3 to 65 ft below surface. Total drilling depth was noted at 70 ft. Pilot hole C-62N was logged from 3 to 105 ft below surface. Total drilling depth was noted at 108 ft. Both borings were filled with drilling mud to the surface prior to logging. Resistivity, spontaneous potential, natural gamma, and caliper logs were run. Data from the well logging are presented in Appendix B

3.3.5 Soil Analysis

The soil samples to be submitted for analytical analyses were collected by the field geologist in accordance with FDEP Standard Operating Procedure, "Soil Sampling Procedures," revised 25 October 1991 and EA's Generic Quality Assurance Manual, EA QAP-204, revised 31 March 1992, and COMP QAP #870045G, revised and submitted March 1993 with annual amendments through 1 July 1994. EA's Quality Assurance Plan (QAP) was prepared in

accordance with the FDEP Manual for Preparing Quality Assurance Plans (DER-QA-001/90) and FDEP Standard Operating Procedures for Laboratory Operations and Sample Collection Activities (DER-QA001/92). The QAP is a site-specific document for the Eglin Subpart X RCRA monitoring.

The soil samples reserved for analytical testing were packed in 4-oz glass sample jars. The jars were labeled, packed on ice, and shipped by overnight courier, under strict chain-of-custody procedures, to EA Laboratories in Sparks, Maryland for analytical testing.

One duplicate soil sample for every 10 collected and two rinsate blanks were collected and submitted for analytical testing, per the Florida DER QAS guidance document, "Minimum Field Quality Control Requirements per Chapter 17-160, F.A.C.," dated 1 November 1991. Soil sample analytical data are presented in Appendix C.

3.3.6 Monitoring Well Installation

All monitoring wells were completed using 4-in. diameter, flush threaded, Schedule 40 PVC factory slotted screen (0.010-in.) and riser (blank) pipe. The casing was capped at the bottom with flush threaded caps. The casing was installed through the augers with the screen interval set approximately 10-20 ft below the water table.

The annular space was sand packed using pre-cleaned inert silica sand from total depth to 2 ft above the screen interval. A 2-ft bentonite sanitary seal was then set in place above the sand pack and hydrated. The remaining annular space was grouted to the surface with a cement-bentonite grout mix.

The monitoring well surface completions were finished below grade, in flush-mounted watertight traffic boxes set in 24 in. square concrete pads with four bumper posts installed at the corners of the concrete pads. The tops of casing were secured with locking, expandable O-ring caps and locks. The well construction details are provided on the well logs in Appendix A.

3.3.7 Well Development

The monitoring wells were developed by pumping formation water through the sandpack and well screen in accordance with Florida DER Standard Operating Procedure, "Cleaning and

Decontaminating Procedures for Groundwater," revised 29 October 1991 and Standard Operating Procedure "Sampling Procedures for Groundwater," revised 28 October 1991, EA's Generic Quality Assurance Manual, EA QAP-204, revised 31 March 1992, and ACOMP QAP #870045G, revised and submitted March 1993 with annual amendments through 1 July 1994. EA's QAP was prepared in accordance with the FDEP Manual for Preparing QA Plans (DER-QA-001/90) and FDEP Standard Operating Procedures for Laboratory Operations and Sample Collection Activities (DER-QA001/92). The QAP is a site-specific document.

All the monitoring wells were developed by using a hand pump operated at a discharge rate of approximately 3-5 gpm. Formation water was pumped through the wells for approximately 90 minutes, with discharge rates ranging from approximately 90 gal (MW94-62-04) to 220 gal (MW94-52-03). The discharge was buff to tan to brown and turbid when purging started. Upon termination of purging, the discharge ranged from clear to cloudy.

3.3.8 Groundwater Sampling

Groundwater samples were collected in accordance with the FDEP Standard Operating Procedure "Sampling Procedures for Groundwater," revised 25 October 1991, Florida DER "General Sampling Protocols," revised 13 April 1992, EA's Generic Quality Assurance Manual, EA QAP-204, revised 31 March 1992, and COMP QAP #870045G, revised March 1993, with annual amendments through 1 July 1994. EA's QAP was prepared in accordance with the FDEP Manual for Preparing QA Plans (DER-QA-001/90) and FDEP Standard Operating Procedure for Laboratory Operations and Sample Collection Activities (DER-QA-001/92). The QAP is a site-specific document.

The monitoring wells were allowed to equilibrate for a period of 8 days prior to groundwater sampling. Water levels were first measured in each well using an electronic oil/water interface probe. Five well volumes of groundwater were purged from each monitoring well using a Homelite Model AP125 water pump equipped with clean suction hoses. Field records of well gauging, purging, and sampling are provide in Appendix C. Groundwater samples were collected by using pre-cleaned, clear Teflon bailers, braided nylon line, and inert rubber gloves dedicated to each well.

The Teflon bailer was slowly lowered through the top of the water table surface in each well casing. The groundwater sample was visually inspected for the presence of phase-separated compounds. The samples were then decanted into the appropriate sample bottles, properly

placed in resealable plastic bags, packed on ice, and delivered by overnight courier, under strict chain-of-custody procedures, to EA Laboratories in Sparks, Maryland for analytical testing. Soil sample analytical data are presented in Appendix D.

3.3.9 Vertical and Horizontal Control

Dowco Land Surveying, Inc. of Fort Walton Beach, Florida conducted the survey of the monitoring wells and surface sampling locations. The top of the interior and protective steel casing for all wells was surveyed to the nearest 0.01 ft.

The surface soil sample locations at C-52N's "cats eye" were based on field notes. Location marker stakes for the surface soil sites were not found when the survey crew located the new monitoring wells. It was assumed the surface locations were obliterated by munitions explosions or wind.

4. DATA SUMMARY AND ASSESSMENT

4.1 LITHOLOGY

The subsurface soil at Range C-52N consists of fine- to coarse-grained, moderate- to well-sorted quartz sands with minor amounts of yellow to orange silts present. The data suggest that these sediments are continuous across the site, with some discontinuous organic to peaty zones at the vadose/phreatic contact observed (MW94-52-1, Pilot Hole C-52N). The vadose zone ranges in thickness at Range C-52N from 12 ft in MW94-52-02 to 30 ft in MW94-52-01. Monitoring well MW94-52-01 is located approximately 20 ft higher topographically than the remaining wells at Range C-52N. The Pensacola Clay was encountered at 62 ft BGS at the Range C-52N pilot hole. Drilling was terminated at 6 ft into the Pensacola Clay.

The subsurface soil at Range C-62N consists of fine- to coarse-grained, moderate- to well-sorted quartz sands with reddish brown to orange silts present. The data suggest that these sediments are continuous across the site. No organic to peaty zones were encountered at Range C-62N. The vadose zone ranges from 9 ft in MW94-62-02 to 18 ft in MW94-62-05. The Pensacola Clay was encountered at 104.5 ft BGS at the Range C-62 pilot hole. Drilling was terminated 5.5 ft into the Pensacola Clay.

4.2 ANALYTICAL SOIL DATA

This section presents a discussion of surface and subsurface soil data for samples collected from Ranges C-52N and C-62 in November 1994. Chemical analyses were performed by EA Laboratories (Sparks, Maryland) and were presented in laboratory data reports dated 30 November and 8, 19, and 21 December 1994. Soil data interpretation is based upon comparison of site data with EPA Region III risk-based concentrations (RBCs) for residential soils (Appendix F). The EPA Region III RBCs are chemical-specific risk-based screening concentrations below which adverse health impacts would not be expected to occur as a result of exposures to that medium. The conservatively-derived EPA RBCs were developed with the intent of making risk assessments more efficient by removing chemicals of potential concern and rates of exposure that are unlikely to impact the overall risk calculation. Where no RBCs are available, data are compared to the range of trace chemical element content of natural soils as reported by the EPA Office of Solid Waste and Emergency Response, Hazardous Waste Land Treatment, SW-874 (EPA 1983). Finally, discussion of water quality guidance values (i.e., MCLs) is presented for some chemicals for which no RBCs or trace element content of

EA Engineering, Science, and Technology, Inc.

LOG OF SOIL BORING: MW94-62-01

Casing Above Grade:
Reference Elevation:
Reference Description:
Grout:
Bentonite:
Sandpack:

Job. No.	Client:	Location:
11206.70 0004	Armstrong Labs	Eglin AFB, FL Range C-62N

Drilling Method: Groundwater Protection
Diedrich D-120 Drill Rig, Hollow Stem Augers

Sampling Method:
Split Spoon Sampler

Boring #:
Sheet 1 of 2
Drilling:

Water Level					Start	Finish
Time:					14:00	17:00
Date:						
Reference:						

Well Comp.			Sample Number	Sample depth (feet)	OVM (ppm)	Blows per 6 in.	Depth in Feet	USCS Log	Surface Conditions: Sand
					0	2	0		SB-94-62-01-01 (0-2) 14:25
						2			Pale reddish brown (10yr 5/4) fine-medium grained, moderately
X		X				6	1		sorted sand. Silfer 5-10%. Quartz grains, clear, with some
X		X							staining, no odor, dry
X		X					2		
X		X							
X		X					3		
X		X							
X		X					4		
X		X							
X		X			0	6	5		14:30 Same as above
X		X				6			
X		X				9	6		
X		X							
X		X					7		
X		X							
X		X					8		SP
X		X							
X		X					9		
X		X							
X		X			0	9	10		14:35 Same as above
X		X				13			
X		X				15	1		
X		X							
X		X					2		
X		X							
X		X					3		
X		X							
X		X					4		
X		X							
X		X					15		14:50 SB-94-62-01-02 (17-19 ft) 15:00 pale yellowish
X		X							orange (10yr 8/6) coarse grained moderately sorted sand.
X		X					6		Silt 5-10% (yellow color) saturated no odor.
X		X							
X		X			0	11	7		
X		X				20			
X		X				21	8		
X		X							1st water est. at 16.50 ft
X		X					9		
X		X							
X		X					20		

EA Engineering, Science, and Technology, Inc.

LOG OF SOIL BORING: MW94-62-01

Casing Above Grade:
Reference Elevation:
Reference Description:
Grout:
Bentonite:
Sandpack:

Job. No.	Client:	Location:
11206.70 0004	Armstrong Labs	Eglin AFB, FL Range C-62N

Drilling Method: Groundwater Protection
Diedrich D-120 Drill Rig, Hollow Stem Augers

Sampling Method:
Split Spoon Sampler

Boring #:
Sheet 2 of 2
Drilling:

					Start	Finish
Water Level						
Time:					14:00	17:00
Date:					17 Nov	17 Nov
Reference:						

Well Comp.	Sample Number	Sample depth (feet)	OVM (ppm)	Blows per 6 in.	Depth in Feet	USCS Log	Surface Conditions: Sand
X X			0	10 10	20		15:20 Pale yellowish orange (10 yr 8/6) coarse grained, moderately sorted sand, silt 5-10%.
				13	21		Quartz grains clear, with minor iron staining, subrounded saturated no odor.
			0		22		
					23		
					24		
			0		25		15:35 Same as above
					26		
					27		
					28		
					29	SP	
			0		30		15:45 Same as above
					31		
					32		
					33		
					34		
			0		35		15:55 Pale yellowish orange (10yr 8/6) coarse grained, moderately sorted sand, silt 5-10%, Quartz grains, clear with minor iron staining, subrounded, saturated, no odor.
					36		TD 36 ft B.G.
					37		
					38		
					39		
			0		40		

EA Engineering, Science, and Technology, Inc.

LOG OF SOIL BORING: MW94-62-02

Casing Above Grade:
Reference Elevation:
Reference Description:
Grout:
Bentonite:
Sandpack:

Job. No.	Client:	Location:
11206.70 0004	Armstrong Labs	Eglin AFB, FL Range C-62N

Drilling Method: Groundwater Protection
Diedrich D-120 Drill Rig, Hollow Stem Augers

Sampling Method:
Split Spoon Sampler

Boring #:
Sheet 1 of 2
Drilling:

					Start	Finish
Water Level						
Time:					08::00	12:00
Date:					17 Nov	17 Nov
Reference:						

Well Comp.	Sample Number	Sample depth (feet)	OVM (ppm)	Blows per 6 in.	Depth in Feet	USCS Log	Surface Conditions: Sand
			0	2	0		Sample SB-94-62-02-01 (0-2 ft)
				2			Duplicate SB-94-62-02-Duplicate
X X				4	1		Pale yellowish orange (10yr 8/6) Fine to medium grained,
X X							moderately sorted sand. Silt 5-10%, Quartz grains, clear
X X					2		with minor iron staining, subrounded, dry, no odor.
X X							
X X					3		
X X							
X X					4		
X X							
X X			0	6	5		08:20 Same as above
X X				6			
X X				8	6		
X X							
X X					7	SP	
X X							
X X					8		
X X							Stabilized water at 9.09 ft.
X X					9		
X X							
X X			0	8	10		09:00 Same as above except sample wet
X X				10			
X X				10	11		
X X							
X X					12		
X X							
X X					13		
X X							
X X					14		
X X							
X X			0	12	15		SB-94-62-02 (15-17) 0940
X X				12			Dark yellowish orange (10yr 6/6) medium to coarse grained,
X X				14	16		moderately sorted sand. Silt 5-10%, Quartz grains, clear,
X X							subrounded wet to saturated, no odor.
X X					17		
X X							
X X					18		
X X							
X X					19		
X X							
X X			0		20		

EA Engineering, Science, and Technology, Inc.

LOG OF SOIL BORING: MW94-62-02

Casing Above Grade:
Reference Elevation:
Reference Description:
Grout:
Bentonite:
Sandpack:

Job. No.	Client:	Location:
11206.70 0004	Armstrong Labs	Eglin AFB, FL Range C-62N

Drilling Method: Groundwater Protection
Diedrich D-120 Drill Rig, Hollow Stem Augers

Sampling Method:
Split Spoon Sampler

Boring #:
Sheet 2 of 2
Drilling:

					Start	Finish
Water Level						
Time:					08::00	12:00
Date:					17 Nov	17 Nov
Reference:						

Well Comp.	Sample Number	Sample depth (feet)	OVM (ppm)	Blows per 6 in.	Depth in Feet	USCS Log	Surface Conditions: Sand
			0	11	20		09:50 Dark yellowish orange (10yr 6/6) Medium to coarse grained, moderately sorted sand. Silt 5-10%. Quartz grains, clear with minor iron staining, saturated, no odor.
				11			
				13	21		
					22		
					23		
					24		
			0		25	SP	10:05 Same as above
					26		
					27		
					28		
					29		
			0		30		10:20 Pale yellowish orange (10 yrs 8/6) medium to coarse grained, moderate to well sorted sand, silt 5%. Quartz grains, clear, subrounded, saturated, no odor.
					31		
					32		
					33		
					34		
			0		35		10:25 Same as above
					36		
					37		
					38		
					39		10:35 Pale yellowish orange (10yr 8/6) medium to coarse grained, moderate to well sorted sand. Silt 5%. Quartz grains, clear, subrounded, saturated. TD 40 ft B..G.
			0		40		

EA Engineering, Science, and Technology, Inc.

LOG OF SOIL BORING: MW94-62-03

Casing Above Grade:
Reference Elevation:
Reference Description:
Grout:
Bentonite:
Sandpack:

Job. No.	Client:	Location:
11206.70 0004	Armstrong Labs	Eglin AFB, FL Range C-62N

Drilling Method: Groundwater Protection
Diedrich D-120 Drill Rig, Hollow Stem Augers

Sampling Method:
Split Spoon Sampler

Boring #:
Sheet 1 of 2
Drilling:

Water Level					Start: 10:55 16 Nov
Time:					Finish: 17:00 16 Nov
Date:					
Reference:					

Surface Conditions:
Grass with 20 & 30mm rounds (blown up everywhere)

Well Comp.			Sample Number	Sample depth (feet)	OVM (ppm)	Blows per 6 in.	Depth in Feet	USCS Log	
					0	2	0		Sample:
						2			SB-94-62-03-01 (0-2 ft) at 11:00
X		X				4	1		Moderate reddish brown (10 yr 4/6) medium grained,
X		X							fairly sorted, silky sand., moist, no odor. Quartz grains
X		X					2		clear subrounded, silt 10%
X		X							
X		X					3		
X		X							
X		X					4		
X		X							
X		X			0	6	5		11:20 Same as above
X		X				6			
X		X				8	6		
X		X							
X		X					7		SM
X		X							
X		X					8		
X		X							
X		X					9		
X		X							
X		X			0	7	10		12:00 Same as above
X		X				9			
X		X				10	11		
X		X							
X		X					12		
X		X							
X		X					13		
X		X							
X		X					14		
X		X							
X		X			0	10	15		Sample: SB-94-62-03-02 (15-17 ft B.G.)
X		X				12			15:15
X		X				15	16		1st water at 15.50 ft B.G.
X		X							Very light gray (8N8) coarse grained well sorted
X		X					17		sand, saturated, no odor. Quartz grains clear,
X		X							subrounded
X		X					18		SP
X		X							
X		X					19		
X		X							
X		X			0		20		

EA Engineering, Science, and Technology, Inc.

LOG OF SOIL BORING: MW94-62-03

Casing Above Grade:
Reference Elevation:
Reference Description:
Grout:
Bentonite:
Sandpack:

Job. No.	Client:	Location:
11206.70 0004	Armstrong Labs	Eglin AFB, FL Range C-62N

Drilling Method: Groundwater Protection
Diedrich D-120 Drill Rig, Hollow Stem Augers

Sampling Method:
Split Spoon Sampler

Boring #:
Sheet 2 of 2
Drilling:

					Start	Finish
Water Level						
Time:					10:55	17:00
Date:					16 Nov	16 Nov
Reference:						

Surface Conditions:
Grass with 20 & 30mm rounds (blown up everywhere)

Well Comp.	Sample Number	Sample depth (feet)	OVM (ppm)	Blows per 6 in.	Depth in Feet	USCS Log	
			0	12	20		15:30 Pale yellowish orange (10yr 8/6) medium coarse grained, moderate-to-well sorted sand. Silt 5%. Quartz grains clear, subrounded, saturated, no odor.
				12			
				15	21		
					22		
					23	SP	
					24		
			0		25		15:40 Same as above
					26		
					27		
					28		
					29		
			0		30		15:45 Same as above
					31		
					32		
					33		
					34		
			0		35		15:50 Same as above
					36		
					37		
					38		
					39		15:55 Pale yellowish orange (10yr 8/6) medium to coarse grained moderate to well sorted sand. Quartz grains clear, subrounded, no odor, saturated. TD at 40 ft B.G.
			0		40		

EA Engineering, Science, and Technology, Inc.

LOG OF SOIL BORING: MW94-62-04

Casing Above Grade:
Reference Elevation:
Reference Description:
Grout:
Bentonite:
Sandpack:

Job. No.	Client:	Location:
11206.70 0004	Armstrong Labs	Eglin AFB, FL Range C-62N

Drilling Method: Groundwater Protection
Diedrich D-120 Drill Rig, Hollow Stem Augers

Sampling Method:
Split Spoon Sampler

Boring #:
Sheet 1 of 2
Drilling:

Water Level					Start	Finish
Time:					07:30	10:30
Date:					16 Nov	16 Nov
Reference:						

Surface Conditions:
Sand with scattered metal debris

Well Comp.			Sample Number	Sample depth (feet)	OVM (ppm)	Blows per 6 in.	Depth in Feet	USCS Log	
					0	2	0		
						2			SB-94-62-04-01 (0-2 ft) at 16:10 hrs 15 Nov
X		X				2	1		Dark yellowish orange (10yr 6/6) Fine to medium grained,
X		X							moderately sorted sand, silt 5%. Quartz grains clear with
X		X					2		minor iron staining, subrounded, dry, no odor
X		X							
X		X					3		
X		X							
X		X					4		
X		X							
X		X			0	3	5	SP	16 Nov 94, 07:30
X		X				3			Dark yellowish orange (10yr 6/6) Fine to medium grained,
X		X				7	6		moderately sorted sand, silt 5%. Quartz grains, partially clear
X		X							with iron staining, silt 10%, dry, no odor.
X		X					7		
X		X							
X		X					8		
X		X							
X		X					9		
X		X							
X		X			0	5	10		07:45 Moderate reddish brown (10yr 4/6)
X		X				9			Medium grained, poor to fairly sorted sandy silt.
X		X				9	11		Quartz grains, partially clear with iron staining, silt
X		X							10%, dry no odor.
X		X					12		
X		X							
X		X					13	SM	
X		X							
X		X					14		
X		X							
X		X			0	12	15		07:50 Same as above
X		X				14			
X		X				14	16		
X		X							
X		X					17		
X		X							
X		X					18		
X		X							
X		X					19		
X		X							
X		X			0		20		

EA Engineering, Science, and Technology, Inc.

LOG OF SOIL BORING: MW94-62-04

Casing Above Grade:
Reference Elevation:
Reference Description:
Grout:
Bentonite:
Sandpack:

Job. No.	Client:	Location:
11206.70 0004	Armstrong Labs	Eglin AFB, FL Range C-62N

Drilling Method: Groundwater Protection
Diedrich D-120 Drill Rig, Hollow Stem Augers

Sampling Method:
Split Spoon Sampler

Boring #:
Sheet 2 of 2
Drilling:

					Start	Finish
Water Level						
Time:					07:30	10:30
Date:					16 Nov	16 Nov
Reference:						

Well Comp.	Sample Number	Sample depth (feet)	OVM (ppm)	Blows per 6 in.	Depth in Feet	USCS Log	Surface Conditions: Sand with scattered metal debris (bombs & bullets)
			0	12	20		Sample: SB-94-62-04-02 (20-22 ft) at 0800
				12			Moderate Pink (5yr 7/4) to moderate red (yr 5/4)
				13	21	SM	Fine-medium grained, poor to fairly sorted sandy silt.
							Very wet, no odor. Quartz grains, clear, subrounded
					22		1st water est. at 23 ft B.G.
					23		
					24		
			0	11	25		08:15
				11			Pale yellowish orange (10yr 8/6) fine to medium grained,
				13	26		fairly sorted, silty sand. Quartz grains, clear, subrounded
							Silt 10ft, saturated, no odor.
					27		
					28		
					29		
			0	12	30		08:20 Same as above
				12			
				13	31	SM	
					32		
					33		
					34		
			0	13	35		08:30 Same as above
				13			
				12	36		
					37		
					38		
					39		08:52 Light red (R 6/6) to moderate red (yr 5/21) Fine medium grained
							fair to moderately sorted sand, silt 5-10%. Quartz grains subrounded
			0		40		clear, saturated, no odor. TD 40ft B.G.

EA Engineering, Science, and Technology, Inc.

LOG OF SOIL BORING: MW94-62-05

Casing Above Grade:
Reference Elevation:
Reference Description:
Grout:
Bentonite:
Sandpack:

Job. No.	Client:	Location:
11206.70 0004	Armstrong Labs	Eglin AFB, FL Range C-62N

Drilling Method: Groundwater Protection Diedrich D-120 Drill Rig, Hollow Stem Augers

Sampling Method: Split Spoon Sampler

Boring #:

Sheet 1 of 2

Drilling:

					Start	Finish
Water Level						
Time:					12:45	15:50
Date:					15 Nov	15 Nov
Reference:						

Well Comp.	Sample Number	Sample depth (feet)	OVM (ppm)	Blows per 6 in.	Depth in Feet	USCS Log	Surface Conditions: Sand with scattered metal debris (bombs & bullets)
X X X			0	2	0		SB-94-62-04-02 (0-2 ft) at 13:05
X X X				2			Moderate Brown (5yr 4/4) fine grained
X X X				4	1		Moderate to well sorted sand. Quartz grains clear,
X X X							subrounded, dry, no odor
X X X					2		
X X X							
X X X					3		
X X X							
X X X					4		
X X X							
X X X			0	4	5	SP	13:23
X X X				4			Pale yellowish-orange (10yr 8/6) fine-medium grained
X X X				8	6		moderate to well sorted sand. Quartz grains, clear,
X X X							subrounded, moist, no odor
X X X					7		
X X X							
X X X					8		
X X X							
X X X					9		
X X X							
X X X			0	8	10		13.29
X X X				8			Dark yellowish orange (10yr 6/6) fine-to-medium grained,
X X X				9	11		fair to moderate sorting silty sand. Quartz grains clear
X X X							with same staining (iron), moist, no odor
X X X					12		
X X X							
X X X					13		
X X X						SP	
X X X					14		
X X X							
X X X			0	9	15		13:37
X X X				10			Same as above
X X X				12	16		
X X X							
X X X					17		
X X X							
X X X					18		
X X X							
X X X					19		
X X X							Water at 19.60 ft B.G.
X X X			0		20		

EA Engineering, Science, and Technology, Inc.

LOG OF SOIL BORING: MW94-62-05

Casing Above Grade:
Reference Elevation:
Reference Description:
Grout:
Bentonite:
Sandpack:

Job. No.	Client:	Location:
11206.70 0004	Armstrong Labs	Eglin AFB, FL Range C-62N

Drilling Method: Groundwater Protection
Diedrich D-120 Drill Rig, Hollow Stem Augers

Sampling Method:
Split Spoon Sampler

Boring #:
Sheet 2 of 2
Drilling:

					Start	Finish
Water Level						
Time:					12:45	15:50
Date:					15 Nov	15 Nov
Reference:						

Well Comp.	Sample Number	Sample depth (feet)	OVM (ppm)	Blows per 6 in.	Depth in Feet	USCS Log	Surface Conditions: Sand with scattered metal debris (bombs & bullets)
			0	10	20		
				10			13:45
				12	21		Moderate Brown (5yr 3/4) Medium grained, poor to fairly
							sorted sandy silt. Wet, no odor.
					22		
						SM	
					23		
							1st water estimated at 24ft
					24		
			0	11	25	SP	13:50
				11			Moderate reddish brown (10yr 6/6) medium grained,
				13	26		poorly sorted, sandy silt, wet, no odor
					27		
					28		
					29		
			0	4	30		Sample SB-94-62-05-02 (30-32')
				10			1400 hrs Pale yellowish orange (10yr 8/6)
				10	31		Coarse grained, well sorted sand. Quartz grains,
							clear, subrounded, saturated
					32		
					33	SP	
					34		
					35		Sample test
					36		
					37		
					38		
					39		
			0		40		TD 40 ft B.G.

EA Engineering, Science, and Technology, Inc.

LOG OF SOIL BORING:

Casing Above Grade: Pilot Hole C-62N
Reference Elevation:
Reference Description:
Grout:
Bentonite:
Sandpack:

Job. No.	Client:	Location:
11206.70 0004	Armstrong Labs	Eglin AFB, FL Range C-62N

Drilling Method: Diedrich D-120 Drill Rig, Mud Rotary

Sampling Method: Cuttings

Boring #:

Sheet 1 of 6

Drilling:

					Start	Finish
Water Level						
Time:					10:30	17:30
Date:					19 Nov	19 Nov
Reference:						

Well Comp.	Sample Number	Sample depth (feet)	OVM (ppm)	Blows per 6 in.	Depth in Feet	USCS Log	Surface Conditions: Sand
					0		
					1		
					2		
					3		
					4		
B					5		10:35 Moderate reddish brown (10yr 4/6) coarse to very coarse grained, moderate to well sorted sand. Silt 2-5% Quartz grains, clear, with minor iron staining, subrounded
O					6		
R					7	SP	
I					8		
N					9		
G					10		10:40 Same as above
					11		
O					12		
N					13		
L					14		
Y					15		10:45 Pale yellowish orange (10yr 8/6) Coarse to very coarse grained, well sorted sand
					16	SP	
					17		
					18		
					19		
					20		

EA Engineering, Science, and Technology, Inc.

LOG OF SOIL BORING:

Casing Above Grade: Pilot Hole C-62N
Reference Elevation:
Reference Description:
Grout:
Bentonite:
Sandpack:

Job. No.	Client:	Location:
11206.70 0004	Armstrong Labs	Eglin AFB, FL Range C-62N
Drilling Method: Diedrich D-120 Drill Rig, Mud Rotary		
Sampling Method: Cuttings		Boring #:
		Sheet 2 of 6
		Drilling:

					Start	Finish
Water Level						
Time:					10:30	17:30
Date:					19 Nov	19 Nov
Reference:						

Well Comp.	Sample Number	Sample depth (feet)	OVM (ppm)	Blows per 6 in.	Depth in Feet	USCS Log	Surface Conditions: Sand
BORING ONLY					20		10:50 Pale yellowish orange (10yr 8/6) Coarse to very coarse grained, moderate to well sorted sand, silt 5% (color). Quartz grains, clear to white, with some iron staining, subrounded
					21		
					22		
					23		
					24		
					25		10:55 Same as above
					26		
					27	SP	
					28		
					29		
					30		11:00 Same as above
					31		
					32		
					33		
					34		
					35		11:10 Pale yellowish orange (10yr 8/6) very coarse grained, well sorted, gravelly sand, silt 5% (color). Quartz grains clear, subrounded
					36		
					37	GP	
					38		
					39		
					40		

EA Engineering, Science, and Technology, Inc.

LOG OF SOIL BORING:

Casing Above Grade: Pilot Hole C-62N
Reference Elevation:
Reference Description:
Grout:
Bentonite:
Sandpack:

Job. No.	Client:	Location:
11206.70 0004	Armstrong Labs	Eglin AFB, FL Range C-62N
Drilling Method: Diedrich D-120 Drill Rig, Mud Rotary		
Sampling Method: Cuttings		Boring #: Sheet 3 of 6
		Drilling:

					Start	Finish
Water Level						
Time:					10:30	17:30
Date:					19 Nov	19 Nov
Reference:						

Well Comp.	Sample Number	Sample depth (feet)	OVM (ppm)	Blows per 6 in.	Depth in Feet	USCS Log	Surface Conditions: Sand
					40		
							11:15 Pale yellowish orange (10yr 8/6)
					41		Coarse to very coarse, moderate to well sorted
							sand, silt 5% (color). Quartz grains, clear, subrounded
					42		some iron staining, subrounded
					43	SP	
					44		
B					45		11:20 Same as above
O					46		
R					47		
I					48		
N					49		
G					50		11:25 Same as above
					51		
O					52		
N					53		
L					54		
Y					55		11:45 Moderate orange pink (10yr 7/4)
							Coarse to very coarse grained, moderate to well sorted
					56		sand, silt 10-15%. Quartz grains, clear subrounded
					57		
						SM	
					58		
					59		
					60		

EA Engineering, Science, and Technology, Inc.

LOG OF SOIL BORING:

Casing Above Grade: Pilot Hole C-62N
Reference Elevation:
Reference Description:
Grout:
Bentonite:
Sandpack:

Job. No.	Client:	Location:
11206.70 0004	Armstrong Labs	Eglin AFB, FL Range C-62N
Drilling Method: Diedrich D-120 Drill Rig, Mud Rotary		
Sampling Method: Cuttings		Boring #: Sheet 4 of 6
		Drilling:

					Start	Finish
Water Level						
Time:					10:30	17:30
Date:					19 Nov	19 Nov
Reference:						

Well Comp.	Sample Number	Sample depth (feet)	OVM (ppm)	Blows per 6 in.	Depth in Feet	USCS Log	Surface Conditions: Sand
					60		
							12:00 Moderate reddish brown (10yr 6/6)
					61		Coarse to very coarse grained, moderate to well sorted
							sand, silt 5-10%. Quartz grains clear, subrounded.
					62		
					63		
					64		
B					65		12:10 Same as above
O					66		
R					67		
I					68	SP	
N					69		
G					70		12:20 Same as above
					71		
O					72		
N					73		
L					74		
Y					75		12:35 Same as above
					76		
					77		
					78		
					79		
					80		

EA Engineering, Science, and Technology, Inc.

LOG OF SOIL BORING:

Casing Above Grade: Pilot Hole C-62N
Reference Elevation:
Reference Description:
Grout:
Bentonite:
Sandpack:

Job. No.	Client:	Location:
11206.70 0004	Armstrong Labs	Eglin AFB, FL Range C-62N
Drilling Method: Diedrich D-120 Drill Rig, Mud Rotary		
Sampling Method: Cuttings		Boring #: Sheet 5 of 6
		Drilling:

					Start	Finish
Water Level						
Time:					10:30	17:30
Date:					19 Nov	19 Nov
Reference:						

Well Comp.	Sample Number	Sample depth (feet)	OVM (ppm)	Blows per 6 in.	Depth in Feet	USCS Log	Surface Conditions: Sand
					80		
					81	GP	12:41 White (N9) very coarse to gravelly grained, moderate to well sorted gravelly sand. Feldspurs present 4%. Quartz grains clear to white, some minor iron staining, subrounded
					82		
					83		
					84		
B					85		12:48 Same as above
O					86		
R					87		
I					88		
N					89		
G					90	SP	13:10 White (N9) coarse grained, well sorted sand. Minor feldspurs present. Quartz grains clear to white, subrounded
					91		
O					92		
N					93		
L					94		
Y					95		
					96		
					97		Pensacola clay
					98	ML	13:40 medium bluish gray (5B 5/1), clay, very soft, small stringers of sand present
					99		
					100		

EA Engineering, Science, and Technology, Inc.

LOG OF SOIL BORING:

Casing Above Grade: Pilot Hole C-62N
Reference Elevation:
Reference Description:
Grout:
Bentonite:
Sandpack:

Job. No.	Client:	Location:
11206.70 0004	Armstrong Labs	Eglin AFB, FL Range C-62N
Drilling Method: Diedrich D-120 Drill Rig, Mud Rotary		
Sampling Method: Cuttings		Boring #: Sheet 6 of 6
		Drilling:

					Start	Finish
Water Level						
Time:					10:30	17:30
Date:					19 Nov	19 Nov
Reference:						

Well Comp.	Sample Number	Sample depth (feet)	OVM (ppm)	Blows per 6 in.	Depth in Feet	USCS Log	Surface Conditions: Sand
					100		
					101		
					102		
					103	ML	
					104		
B					105		13:51 Medium bluish gray (5B 5/1), clay, minor sand stringers present
O					106		
R					107		
I					108		13:55 Dark greenish gray (5G 4/1) to medium bluish gray, clay, soft. Collected spoon at 108-110, 4 inches recovered
				7			
N				9	109	CL	
				12			TD = 110 ft B.G.
G					110		
					111		
O					112		
N					113		
L					114		
Y					115		
					116		
					117		
					118		
					119		
					120		

WELL CONSTRUCTION SUMMARY REPORT

Facility Eglin AFB

EPA Identification Number FL8570024366

Well identification Pilot Hole C-62N (Soil Boring)

Date(s) of installation 19 November 1994

Well driller's complete name Groundwater Protection, Inc.

Well driller's license number 2633

~~Latitude~~ Northing ~~Longitude~~ Easting

6	0	0	7	4	1	2	4	6	1	4	5	6	1	9	5	7	1	7
D	D	M	M	S	S	S	S		D	D	M	M	S	S	S	S		

Elevation surface 184.9' Elevation TOC N/A

Surveyor's name Middleton Dowden Surveyor's License # 4095 FLO.

Turbidity N/A Date of reading N/A (M M D D Y Y)

Static water level (msl) N/A Field geologist TE Carroll

Casing:

Material	Outside Diameter	Inside Diameter	Depth	
			From (ft)	To (ft)
N/A				

Screen:

Material	Outside Diameter	Inside Diameter	Depth		Slot Size
			From (ft)	To (ft)	
N/A					

Annulus:

Material including Additives for sealant	Size of Material	Depth		Installation Method
		From (ft)	To (ft)	
N/A				

Drilling Method	Bit/auger Diameter	From (ft)	To (ft)	Drilling fluids
Mud Rotary	5 7/8"	0	110	Drilling mud + water

Well Construction Diagram
Surface (msl) N/A

scale: 1 unit=____

Appendix B

Geophysical Well Logs

Woodward–Clyde Consultants

3676 Hartsfield Rd, Tallahassee Florida

WCC NO: 94F748

GEOPHYSICAL WELL LOG: GAMMA CALIPER 16N,64N, S.P.	PERMANENT DATUM: Mean Sea Level LOG MEASURED FROM: Land Surface ELEVATION Feet above MSL	OTHER SERVICES:

COMPANY: EA ENGINEERING
EGLIN AFB PILOT HOLES
WELL IDENTIFICATION: C–62 NORTH

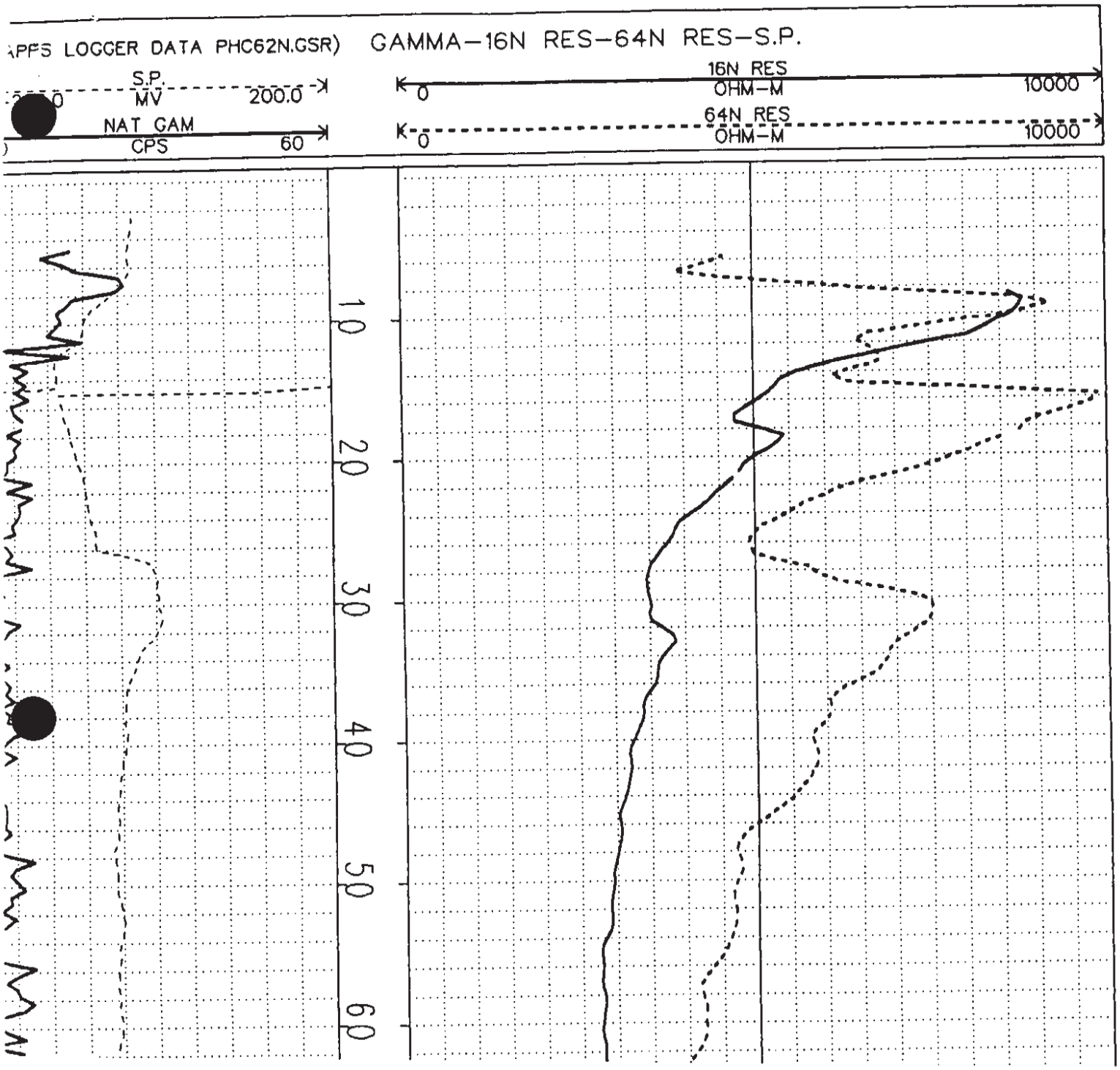
COUNTY: OKALOOSA STATE: FL

COORDINATES:
N:
E:
ELEVATION: KB:
DF:
GL:

COMPANY NO: 94F748
WELL: C–62 NORTH
LOCATION: C–62 NORTH OB UNIT

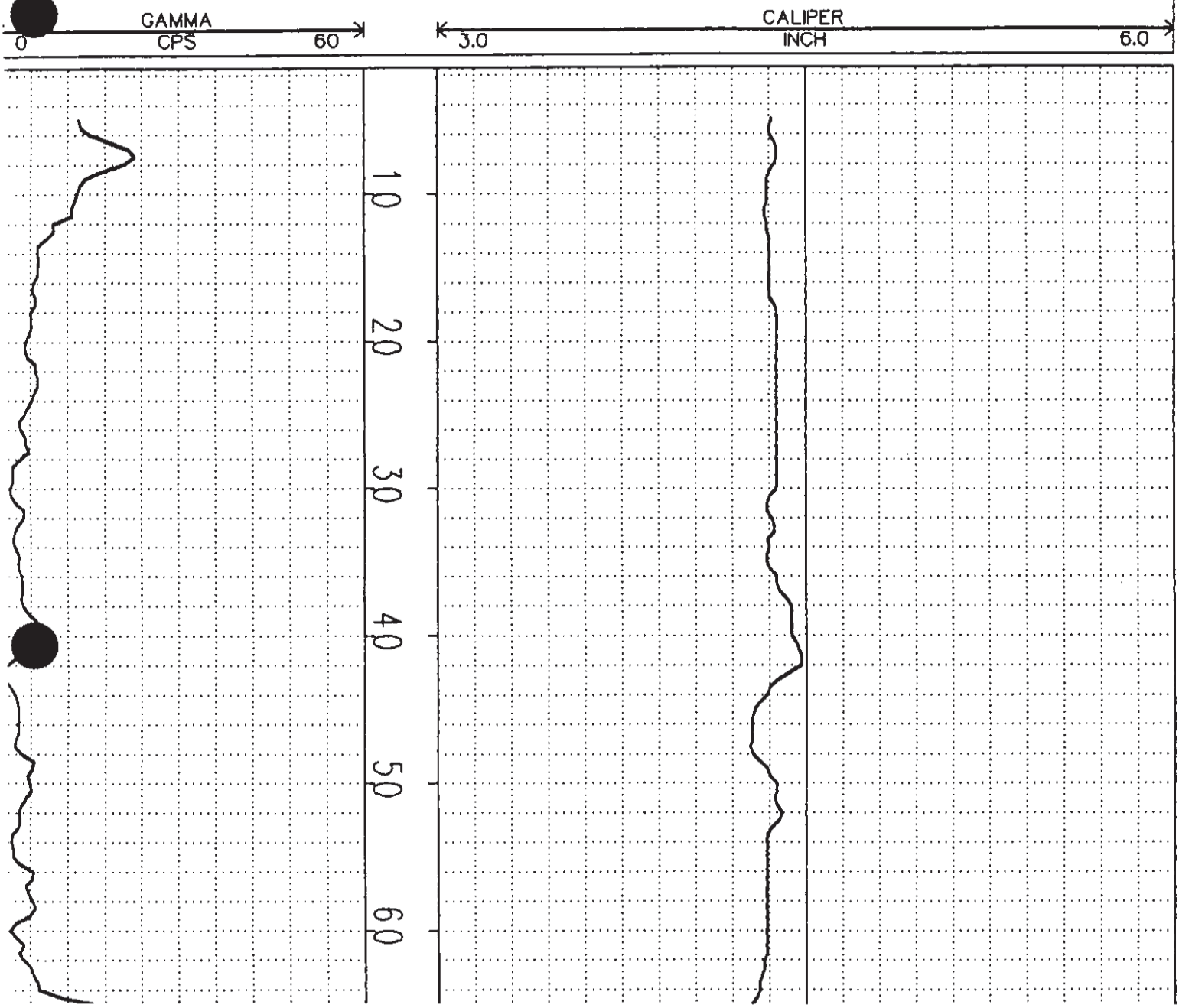
	Run No. 1		Run No. 1
Date	11–19–94	Fluid Level	SFC
First Reading	3 FEET	Fluid Nature	DRLNG MUD
Last Reading	108 FEET	Fluid Viscosity	
Footage Logged	105 FEET	Fl. Resistivity	
Bottom (Driller)	108 FEET	Fl. Res. at BHT	
Casing (from Log)	NONE	Fluid pH	
Casing (Driller)	NONE	Circulation Temp	
Casing Size	N/A	Bottom Hole Temp	
Bit Size	4 INCH		
		LOGGED BY:	J.D. KEMP
		WITNESSED BY:	TOM CARROLL

REMARKS:


APPS LOGGER DATA PHC62N.GSR)
GAMMA–16N RES–64N RES–S.P.
S.P.
MV
200.0
NAT GAM
CPS
60
16N RES
OHM–M
0
10000
64N RES
OHM–M
0
10000
10
20
30
40
50
60

APPS LOGGER DATA PHC62N.FF1)

GAMMA—CALIPER



Woodward–Clyde Consultants

3676 Hartsfield Rd, Tallahassee Florida

WCC NO: 94F748

GEOPHYSICAL WELL LOG:	PERMANENT DATUM: Mean Sea Level	OTHER SERVICES:
GAMMA CALIPER 16N,64N, S.P.	LOG MEASURED FROM: Land Surface ELEVATION Feet above MSL	

COMPANY: EA ENGINEERING
EGLIN AFB PILOT HOLES
WELL IDENTIFICATION: C–62 NORTH

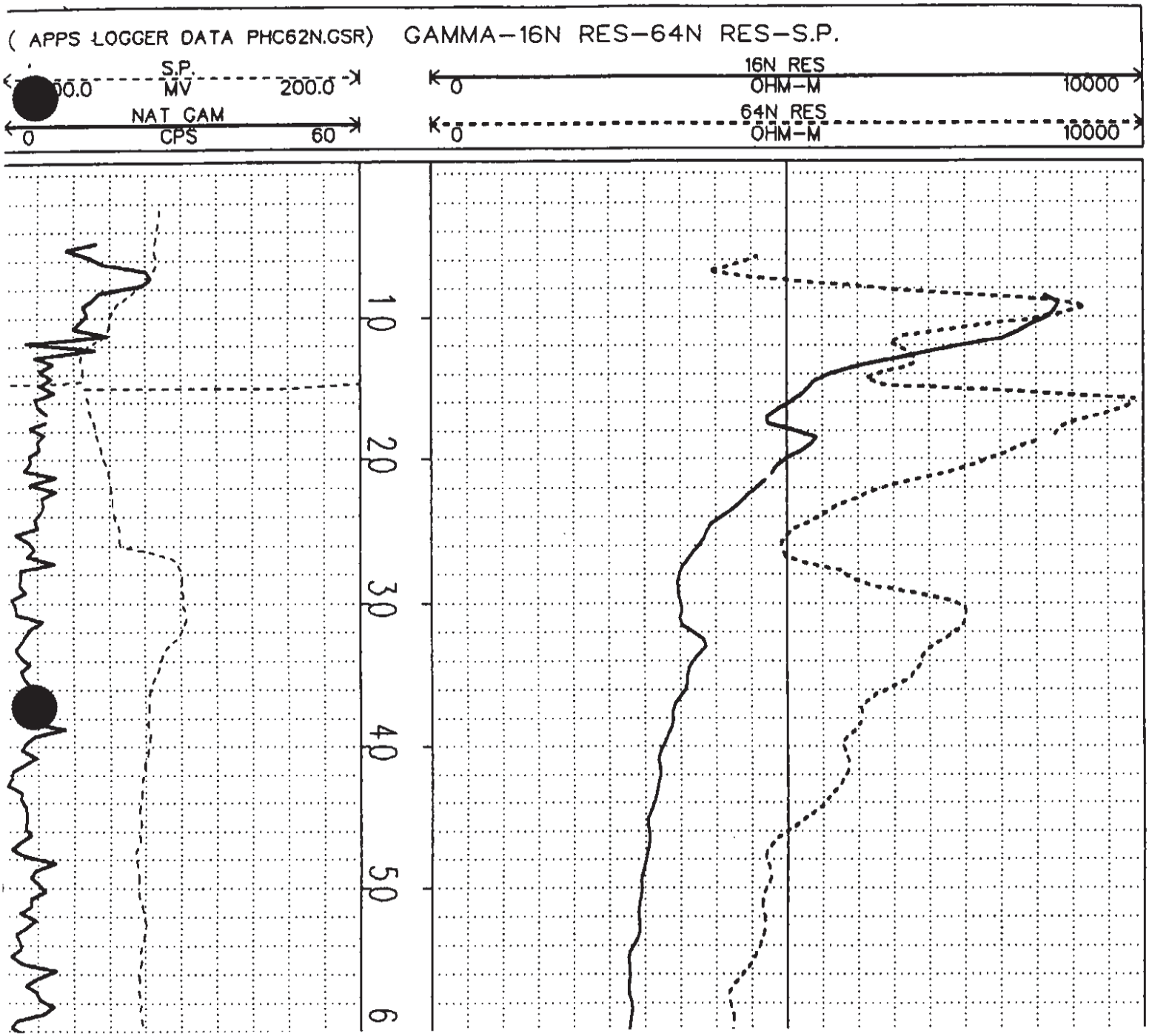
COUNTY: OKALOOSA STATE: FL

COORDINATES:
N:
E:
ELEVATION: KB:
DF:
GL:

COMPANY NO: 94F748
WELL: C–62 NORTH
LOCATION: C–62 NORTH OB UNIT

	Run No. 1		Run No. 1
Date	11–19–94	Fluid Level	SFC
First Reading	3 FEET	Fluid Nature	DRLNG MUD
Last Reading	108 FEET	Fluid Viscosity	
Footage Logged	105 FEET	Fl. Resistivity	
Bottom (Driller)	108 FEET	Fl. Res. at BHT	
Casing (from Log)	NONE	Fluid pH	
Casing (Driller)	NONE	Circulation Temp	
Casing Size	N/A	Bottom Hole Temp	
Bit Size	4 INCH		
		LOGGED BY:	J.D. KEMP
		WITNESSED BY:	TOM CARROLL

REMARKS:


(APPS LOGGER DATA PHC62N.GSR)
GAMMA–16N RES–64N RES–S.P.
S.P.
00.0
MV
200.0
NAT GAM
0
CPS
60
16N RES
0
OHM–M
10000
64N RES
0
OHM–M
10000
1p
2p
3p
4p
5p
6

Woodward–Clyde Consultants

3676 Hartsfield Rd, Tallahassee Florida

WCC NO: 94F748

GEOPHYSICAL WELL LOG: GAMMA CALIPER 16N,64N, S.P.	PERMANENT DATUM: Mean Sea Level LOG MEASURED FROM: Land Surface ELEVATION Feet above MSL	OTHER SERVICES:

COMPANY: EA ENGINEERING
EGLIN AFB PILOT HOLES
WELL IDENTIFICATION: C-62 NORTH

COUNTY: OKALOOSA STATE: FL

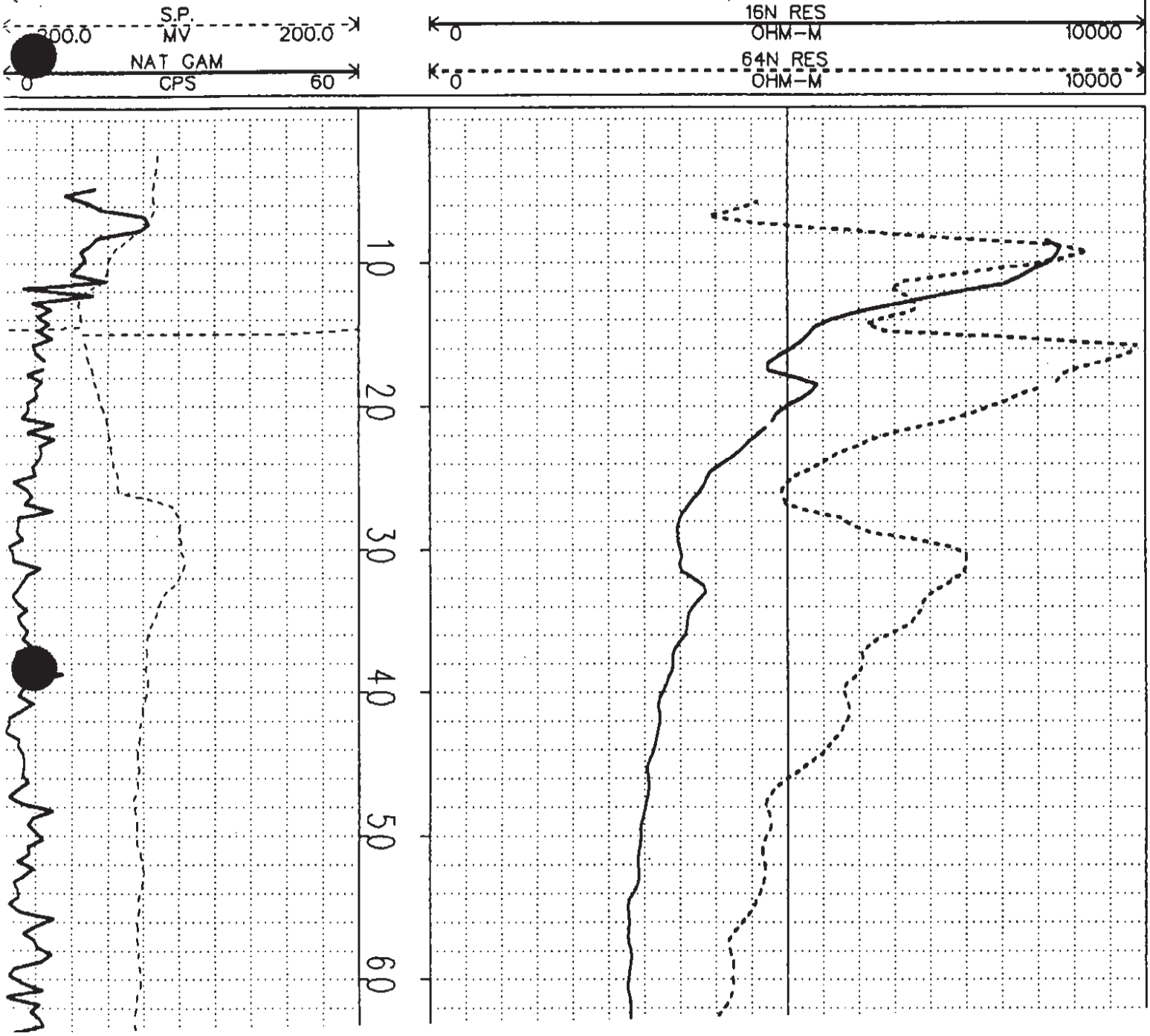
COORDINATES:
N:
E:
ELEVATION: KB:
DF:
GL:

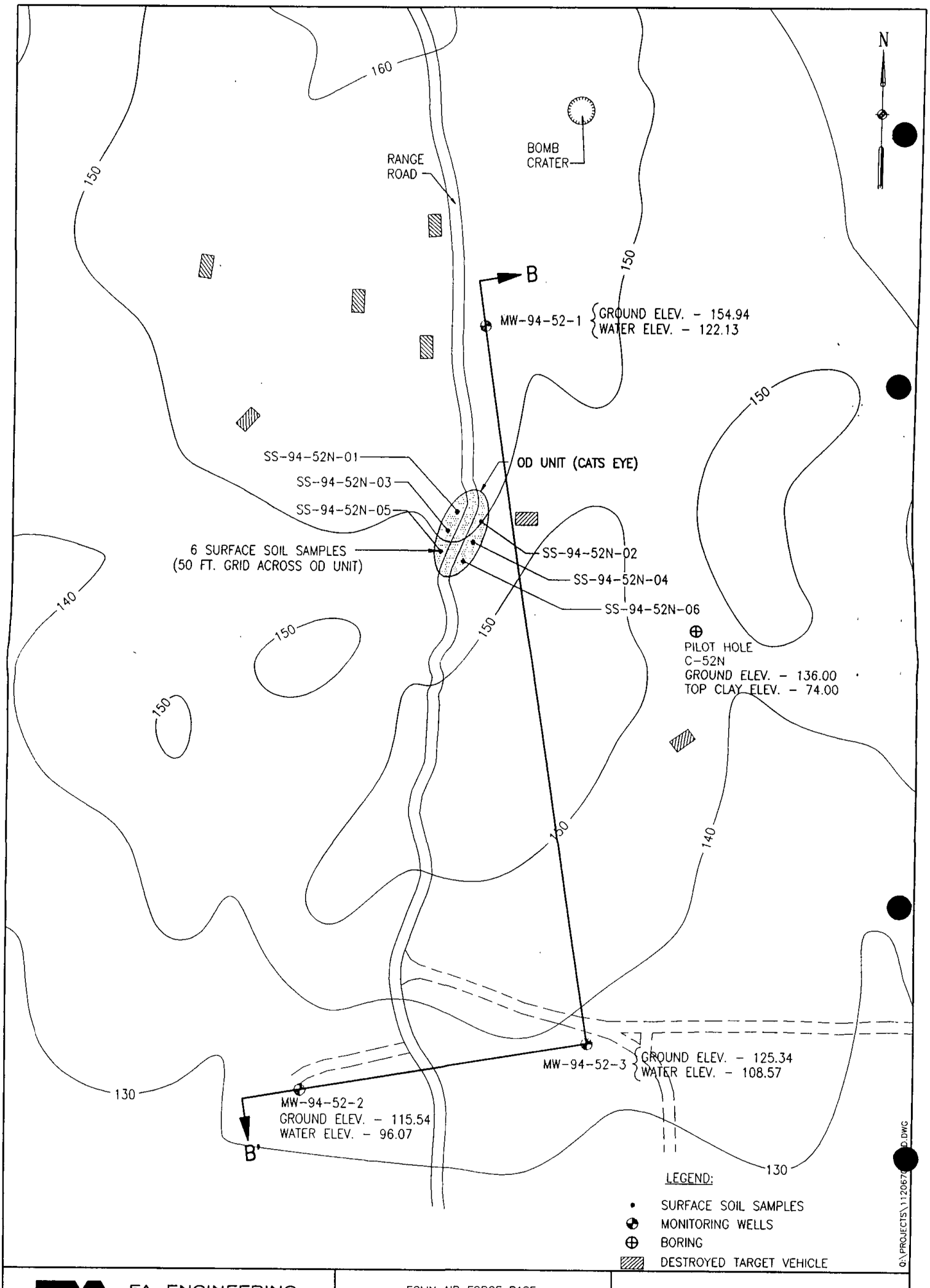
COMPANY NO: 94F748
WELL: C-62 NORTH
LOCATION: C-62 NORTH OB UNIT

	Run No. 1		Run No. 1
Date	11-19-94	Fluid Level	SFC
First Reading	3 FEET	Fluid Nature	DRLNG MUD
Last Reading	108 FEET	Fluid Viscosity	
Footage Logged	105 FEET	Fl. Resistivity	
Bottom (Driller)	108 FEET	Fl. Res. at BHT	
Casing (from Log)	NONE	Fluid pH	
Casing (Driller)	NONE	Circulation Temp	
Casing Size	N/A	Bottom Hole Temp	
Bit Size	4 INCH		
		LOGGED BY:	J.D. KEMP
		WITNESSED BY:	TOM CARROLL

REMARKS:

(APPS LOGGER DATA PHC62N.GSR) GAMMA–16N RES–64N RES–S.P.

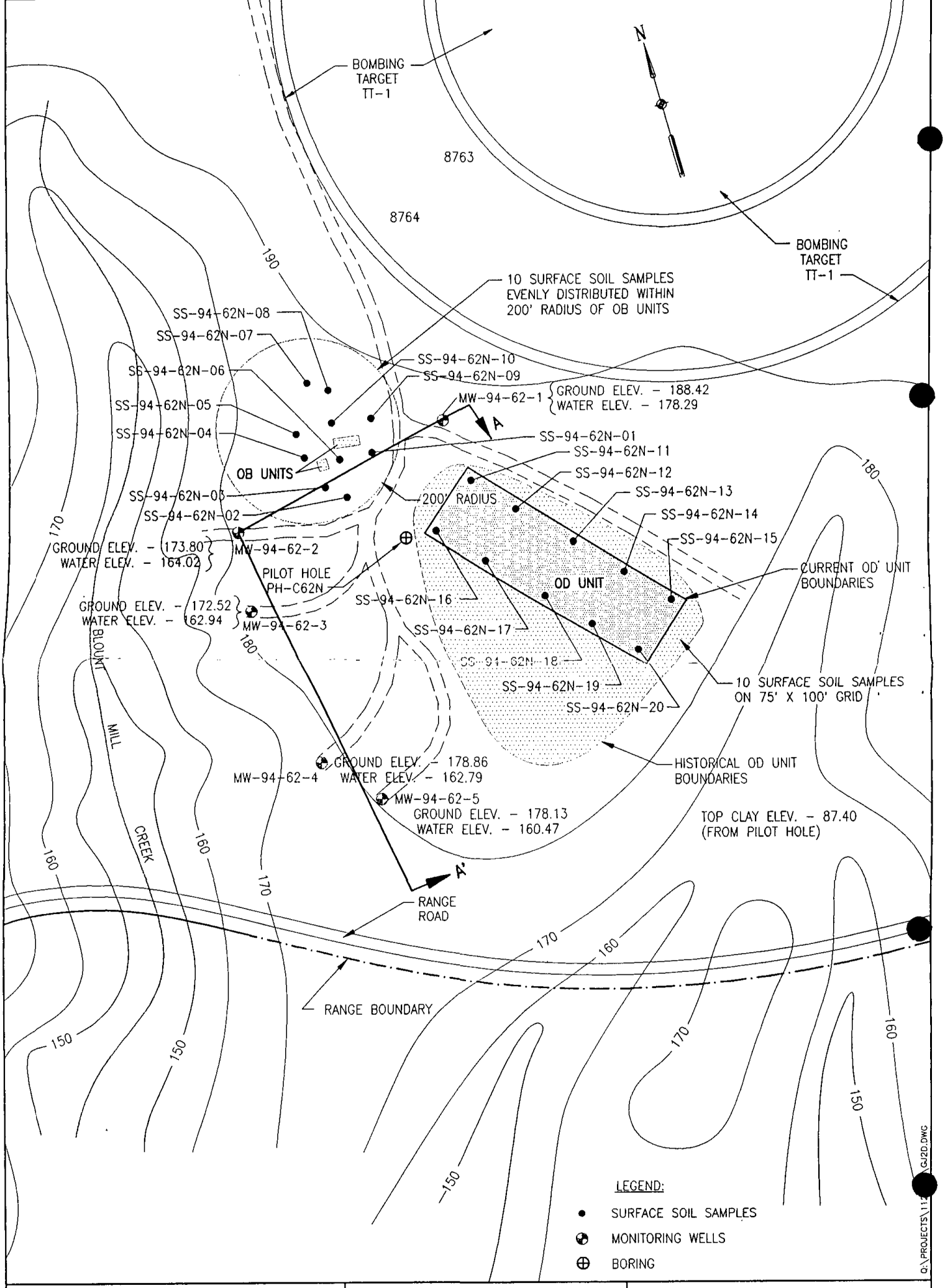




EA ENGINEERING,

EGLIN AIR FORCE BASE

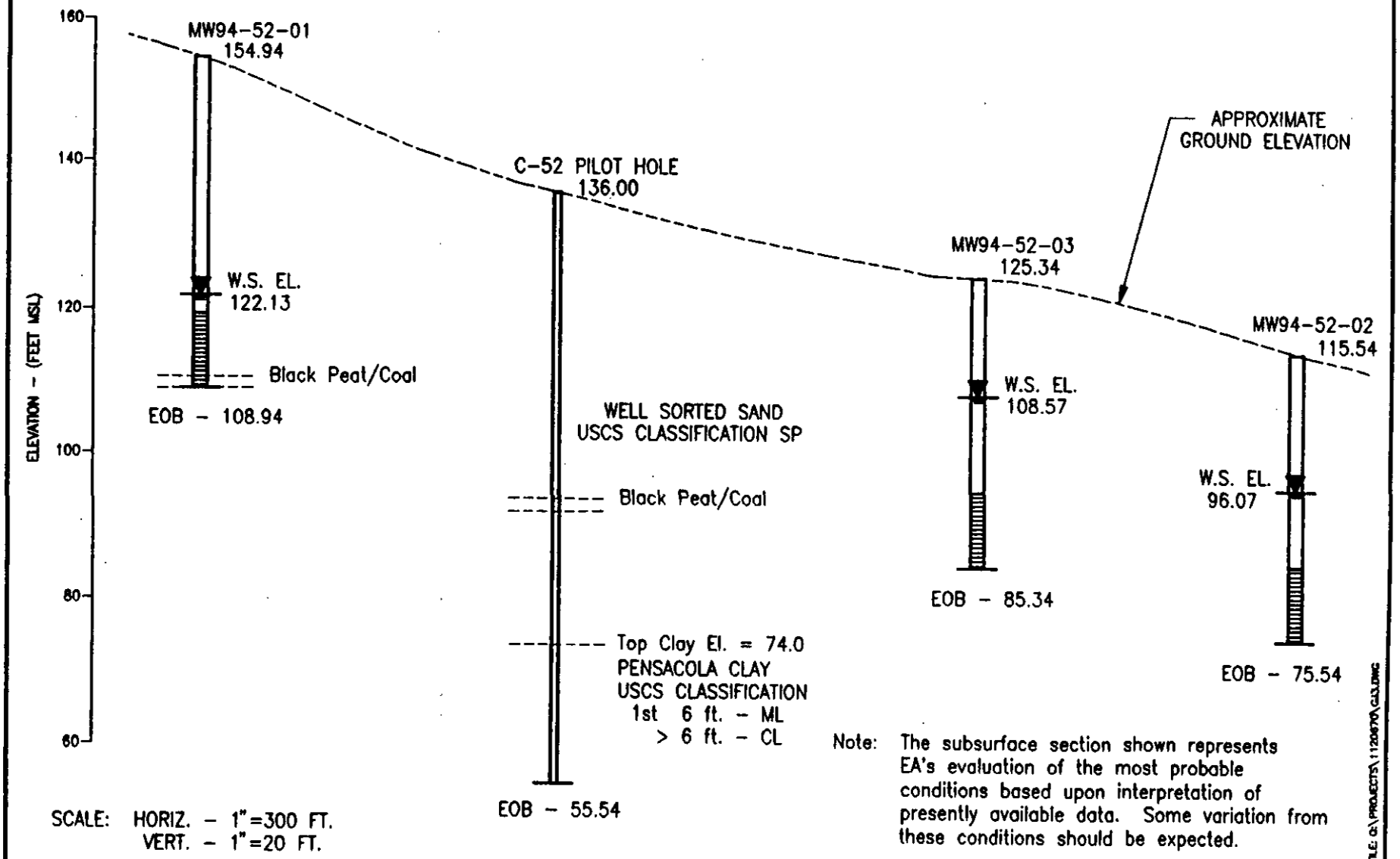
CROSS SECTION B-B'



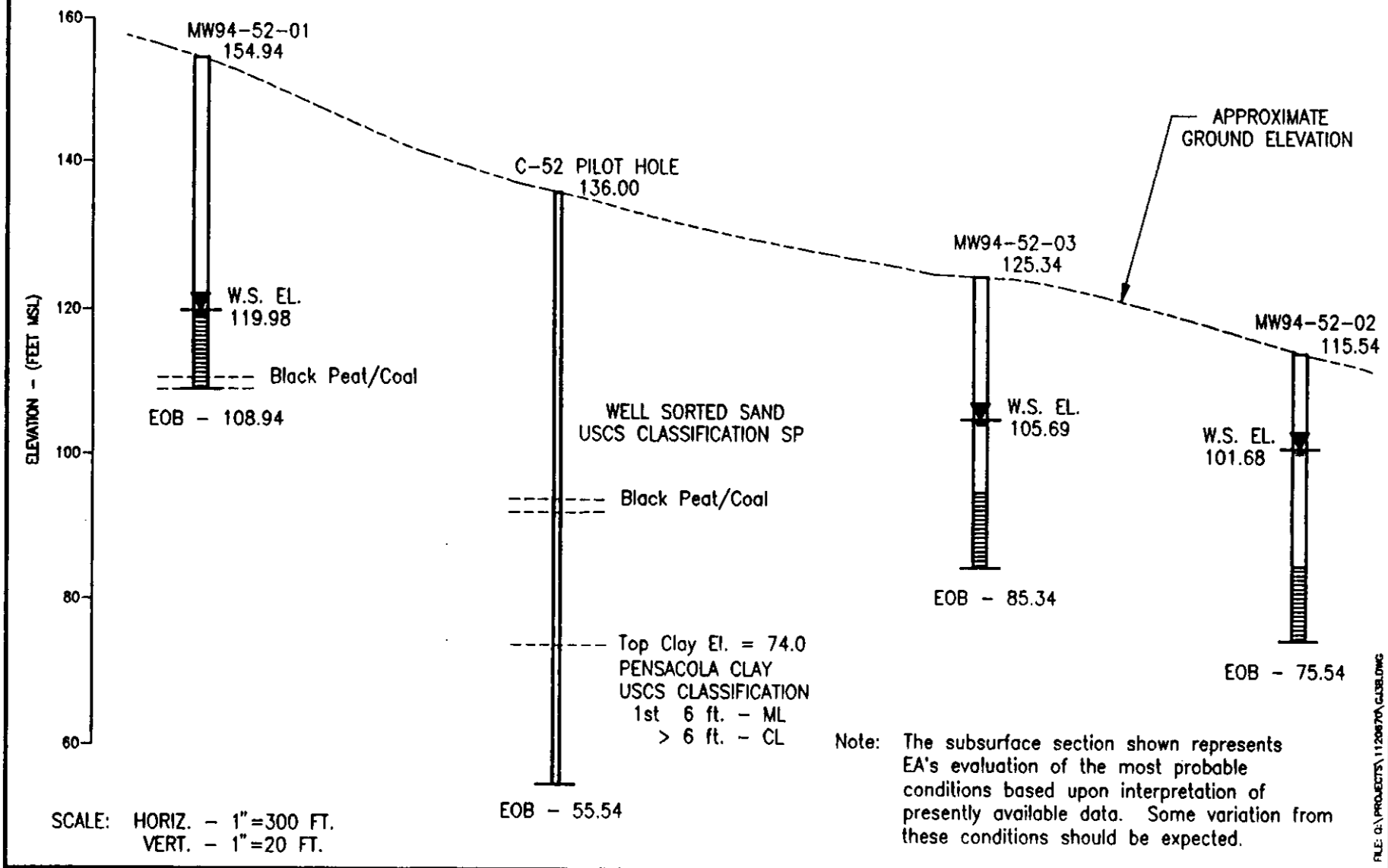
EA ENGINEERING,

EGLIN AIR FORCE BASE

CROSS-SECTION A-A'



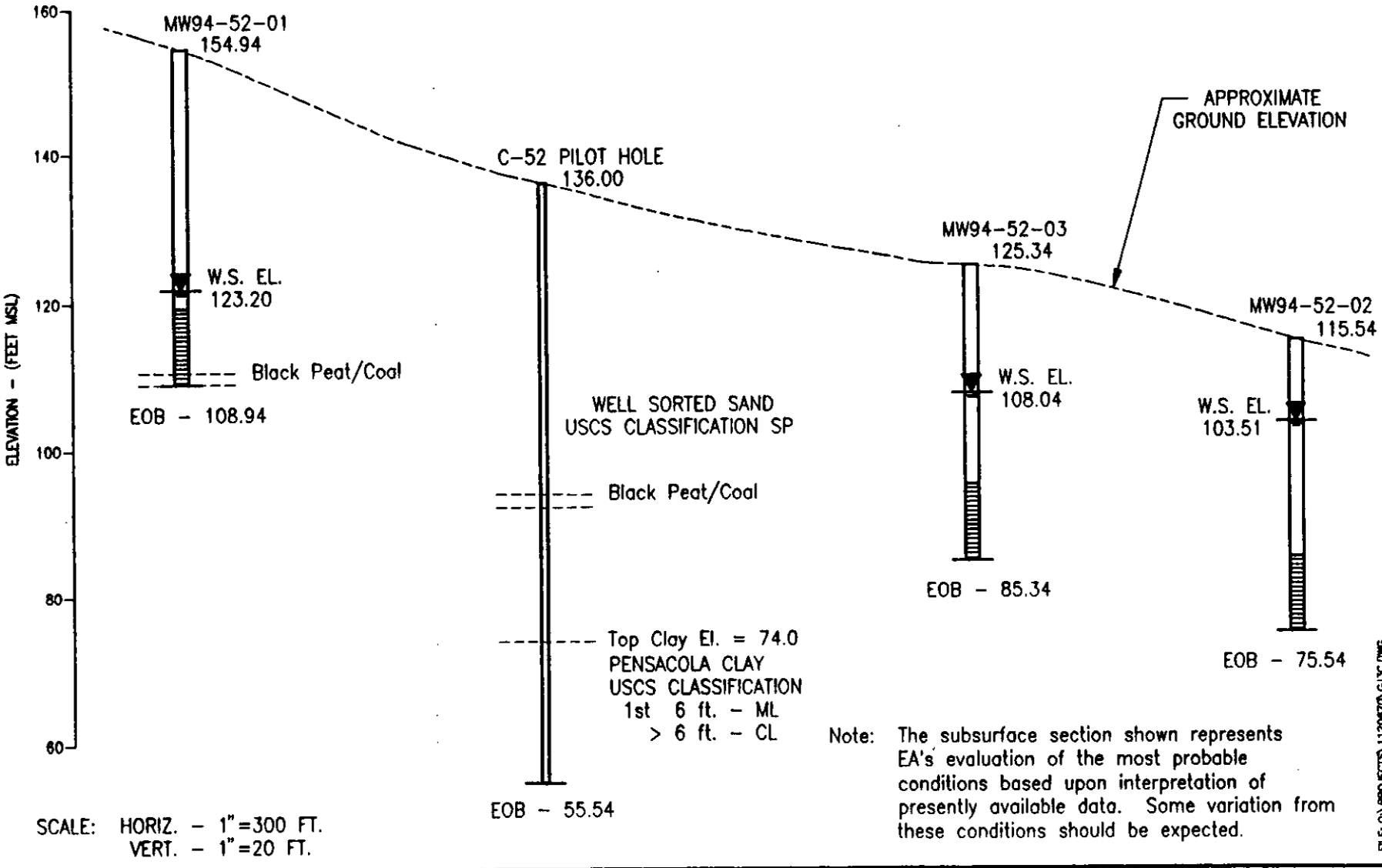
EA ENGINEERING, SCIENCE, AND TECHNOLOGY	RANGE C-52N OD UNIT EGLIN AIR FORCE BASE WALTON COUNTY, FLORIDA	STRATIGRAPHIC CROSS-SECTION ALONG LINE B-B' (1st QUARTER - DEC. 1994)	DESIGNED BY GEJ	DRAWN BY PMH	DATE 10-31-95	PROJECT NO. 11206.70
			CHECKED BY TC	PROJECT MGR. GEJ	SCALE AS SHOWN	FIGURE II-19A



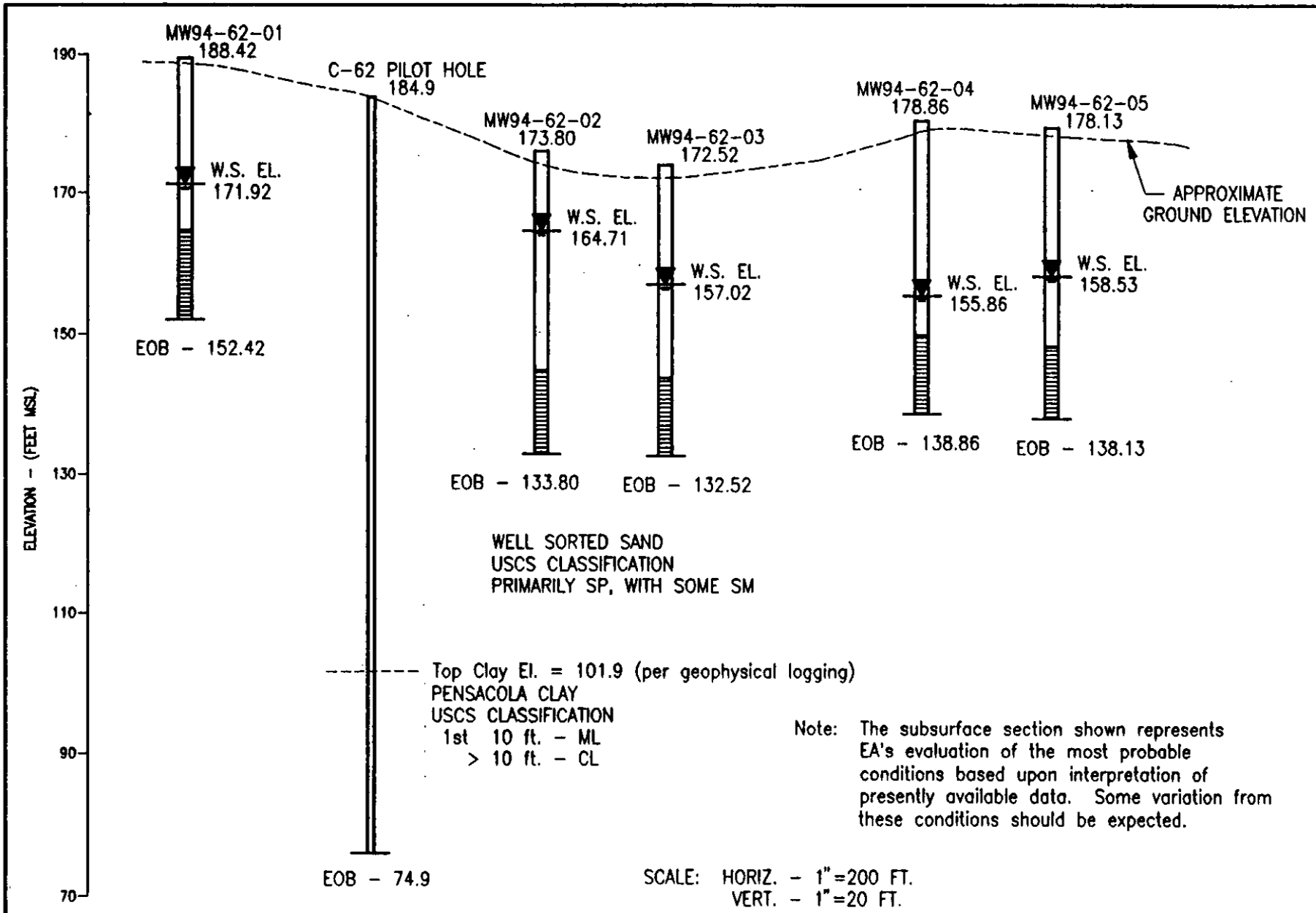
Note: The subsurface section shown represents EA's evaluation of the most probable conditions based upon interpretation of presently available data. Some variation from these conditions should be expected.

FILE: Q:\PROJECTS\11206.70\CJ3BLDWG

EA ENGINEERING, SCIENCE, AND TECHNOLOGY	RANGE C-52N OD UNIT EGLIN AIR FORCE BASE WALTON COUNTY, FLORIDA	STRATIGRAPHIC CROSS-SECTION ALONG LINE B-B' (2nd QUARTER - MAR. 1995)	DESIGNED BY: GEJ	DRAWN BY: PMH	DATE: 10-31-95	PROJECT NO.: 11206.70
			CHECKED BY: TC	PROJECT MGR.: GEJ	SCALE: AS SHOWN	FIGURE: II-19B

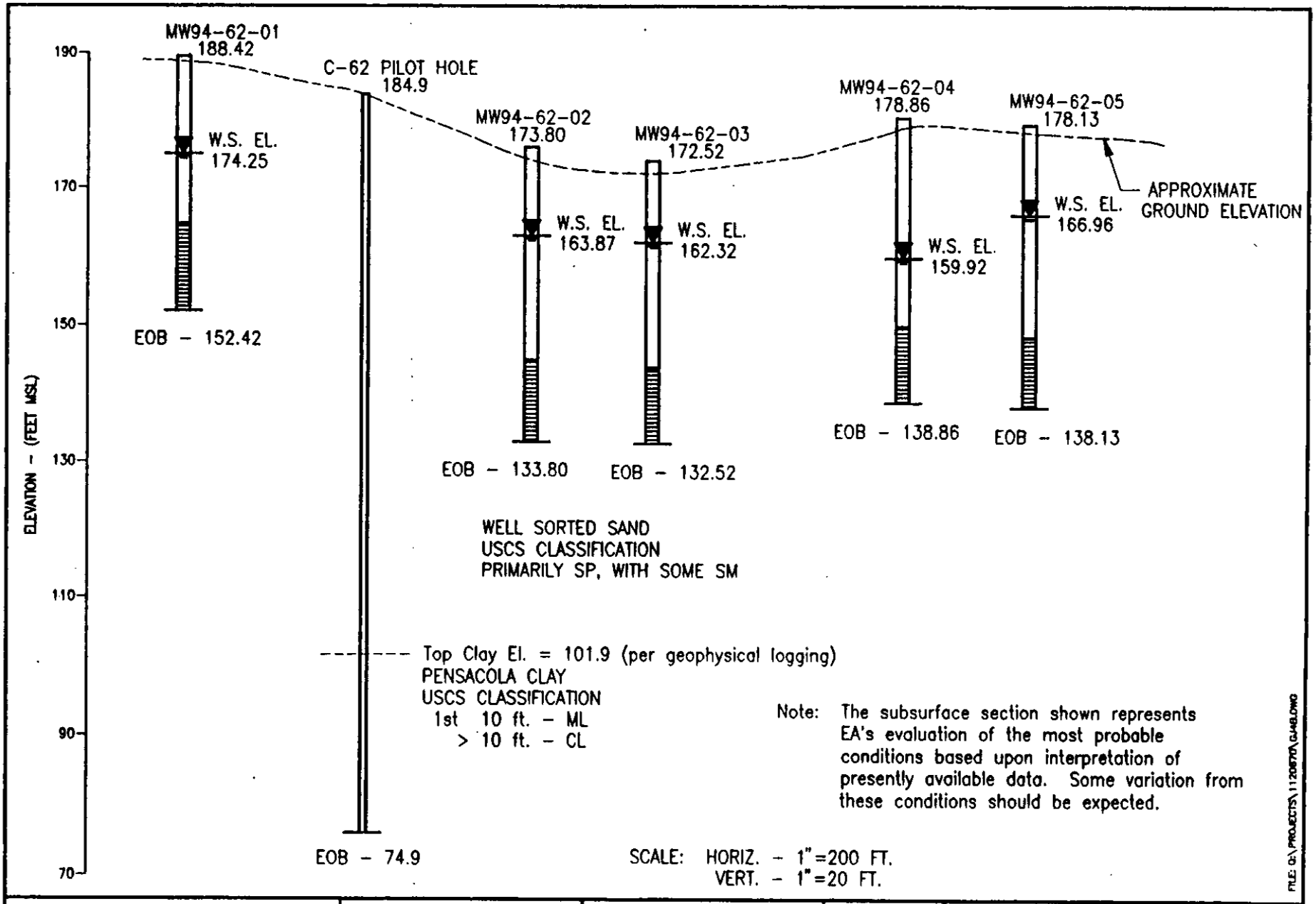


EA ENGINEERING, SCIENCE, AND TECHNOLOGY	RANGE C-52N OD UNIT EGLIN AIR FORCE BASE WALTON COUNTY, FLORIDA	STRATIGRAPHIC CROSS-SECTION ALONG LINE B-B' (3rd QUARTER - MAY 1995)	DESIGNED BY: GEJ	DRAWN BY: PMH	DATE: 10-31-95	PROJECT NO.: 11206.70
			CHECKED BY: TC	PROJECT MGR.: GEJ	SCALE: AS SHOWN	FIGURE: II-19C

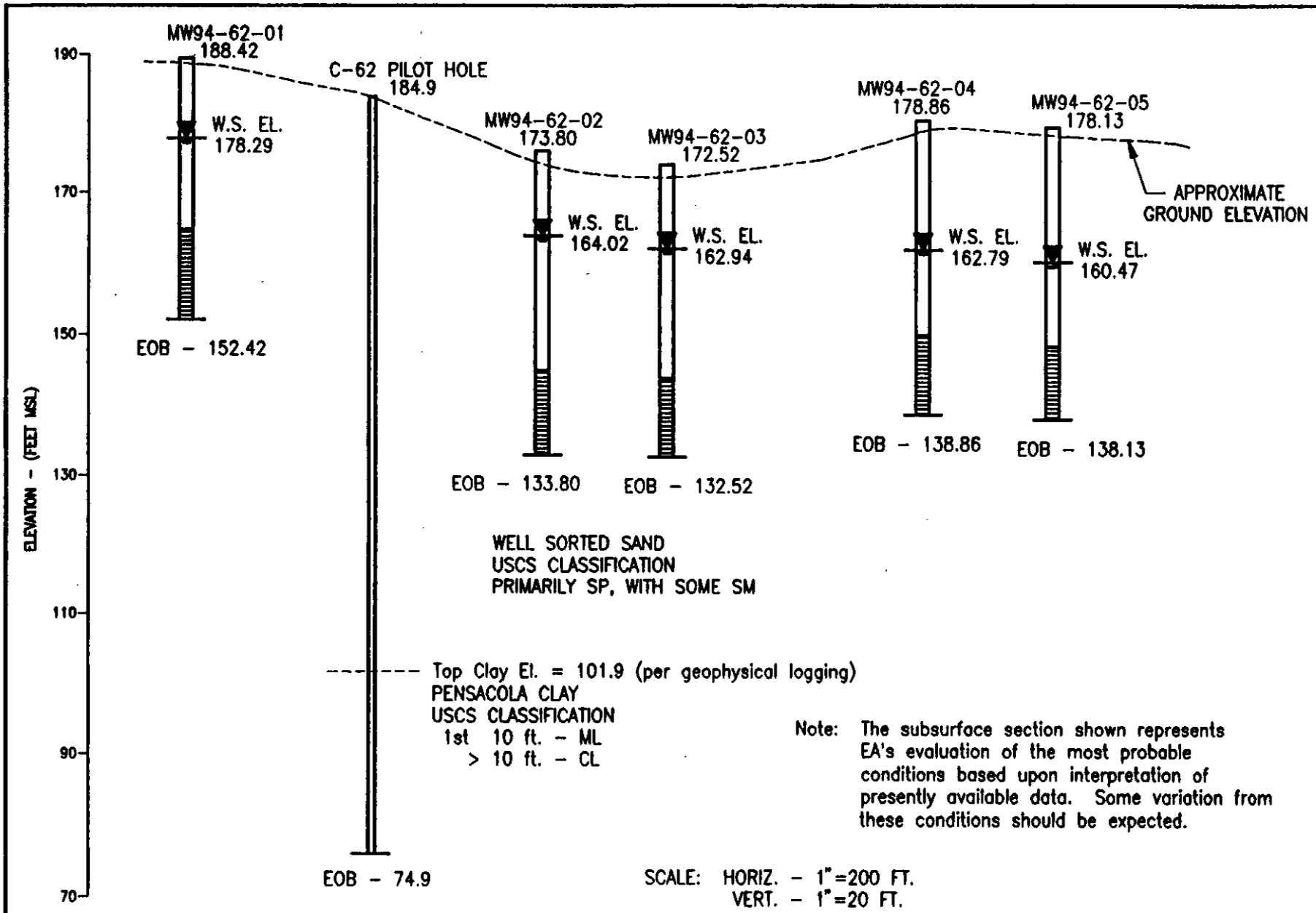


EA ENGINEERING, SCIENCE, AND TECHNOLOGY	RANGE C-62 OB/OD UNITS EGLIN AIR FORCE BASE WALTON COUNTY, FLORIDA	STRATIGRAPHIC CROSS-SECTION ALONG LINE A-A' (1st QUARTER - DEC. 1994)	DESIGNED BY GEJ	DRAWN BY PMH	DATE 10-31-95	PROJECT NO. 11206.70
			CHECKED BY TC	PROJECT MGR. GEJ	SCALE AS SHOWN	FIGURE II-18A

FILE: G:\PROJECTS\11206700\GJ4.DWG



EA ENGINEERING, SCIENCE, AND TECHNOLOGY	RANGE C-62 OB/OD UNITS EGLIN AIR FORCE BASE WALTON COUNTY, FLORIDA	STRATIGRAPHIC CROSS-SECTION ALONG LINE A-A' (2nd QUARTER - MAR. 1995)	DESIGNED BY: GEJ	DRAWN BY: PMH	DATE: 10-31-95	PROJECT NO.: 11206.70
			CHECKED BY: TC	PROJECT MGR.: GEJ	SCALE: AS SHOWN	FIGURE: II-18B



EA ENGINEERING, SCIENCE, AND TECHNOLOGY	RANGE C-62 OB/OD UNITS EGLIN AIR FORCE BASE WALTON COUNTY, FLORIDA	STRATIGRAPHIC CROSS-SECTION ALONG LINE A-A' (3rd QUARTER - MAY 1995)	DESIGNED BY GEJ	DRAWN BY PMH	DATE 10-31-95	PROJECT NO. 11206.70
			CHECKED BY TC	PROJECT MGR. GEJ	SCALE AS SHOWN	FIGURE II-18C

2021 Monitoring Well Boring and Construction Logs

HTRW DRILLING LOG

	DISTRICT: Eglin AFB, Florida	HOLE NUMBER: 01A
1. COMPANY NAME: CGS/Trinity	2. DRILLING CONTRACTOR: Walker-Hill Environmental	SHEET 1 OF 4 SHEETS
3. PROJECT: Eglin OBOD Permit Renewal	4. LOCATION: Range C-62	
5. NAME OF DRILLER	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe Sonic 8150 LS	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 6" steel pipe, 20' core barrel	8. HOLE LOCATION	
	9. SURFACE ELEVATION	
	10. DATE STARTED: 5/17/2021	11. DATE COMPLETED: 5/17/2021
12. OVERBURDEN THICKNESS: 30 ft	15. DEPTH GROUNDWATER ENCOUNTERED: 15.5 ft	
13. DEPTH DRILLED INTO ROCK: NA	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 15.5 ft, 30 min	
14. TOTAL DEPTH OF HOLE: 30 ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA			NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
NA						58 %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
		X		Marie Brealey

LOCATION SKETCH/COMMENTS — SCALE:

PROJECT	HOLE NO
Eglin OBOD	01A

ENG FORM 5056-R, AUG 94 (Proponent: CECW-EG)

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: 01A

PROJECT: Eglin OBOD

INSPECTOR: M. Presley + B. Santallana

SHEET 2 OF 4 SHEETS

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
	0	No recovery					Hole cleared by hydrovac 0-4 ft, no recovery
	1						
	2						
	3						
	4	SILTY SAND (SM), loose, dry, very pale brown (10YR 7/3), fine grained, some silt, trace clay, trace roots/organics					Run #1 4-10 ft. 2.5 ft recovery 42%
	5						
	6						
	7						
	8						
	9	CLAYEY SAND (SC), dry, dense, brownish yellow (10YR 6/8), fine to med. grained, little silt, some slightly plastic clay.					
	10						

PROJECT: Eglin OBOD

HOLE NO: 01A

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: 01A

PROJECT: Eglin OBOD

INSPECTOR: M. Presley + B. Santallana

SHEET 3 OF 4 SHEETS

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
	10	Same as 4-9 Ft					Run #2 10-20 ft. 7 ft recovery 70%
	11						
	12	Same as 9-10 Ft.					
	13						
	14						
	15	CLAYEY SAND (SC), med. dense to dense, dry, Yellowish red (5YR 5/8), fine grained, some silt, some slightly plastic clay.					WC @ 15.5'
	16						
	17						
	18						
	19						
	20						

PROJECT: Eglin OBOD

HOLE NO: 01A

HTRW DRILLING LOG (CONTINUATION SHEET)

PROJECT: Eglin OBOD

INSPECTOR: M. Presley + B. Santallana

HOLE NUMBER: 01A

SHEET: 4 OF 4 SHEETS

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
	20	SILTY SAND (SM), moist, loose, yellowish brown (10YR 5/4), fine grained, some silt, trace clay, some black sand imbedded					Run #3 20-30ft 6 ft recovery 60%
	21						
	22	SILTY SAND (SM), moist, loose to med dense, reddish yellow (5YR 6/6), fine grained, some silt, little clay					
	23						
	24						
	25						
	26						Note: Boring log is for original 01A hole. Second 01A hole was drilled after steel weight was dropped down original hole. This log will be used for new 01A.
	27						
	28	Same as above but pale red (5R 7/4) and yellow (2.5Y 8/6) interbedded throughout.					
	29						
	30						Boring Terminated 5/17/2021 30 ft.

PROJECT: Eglin OBOD

HOLE NO: 01A

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG

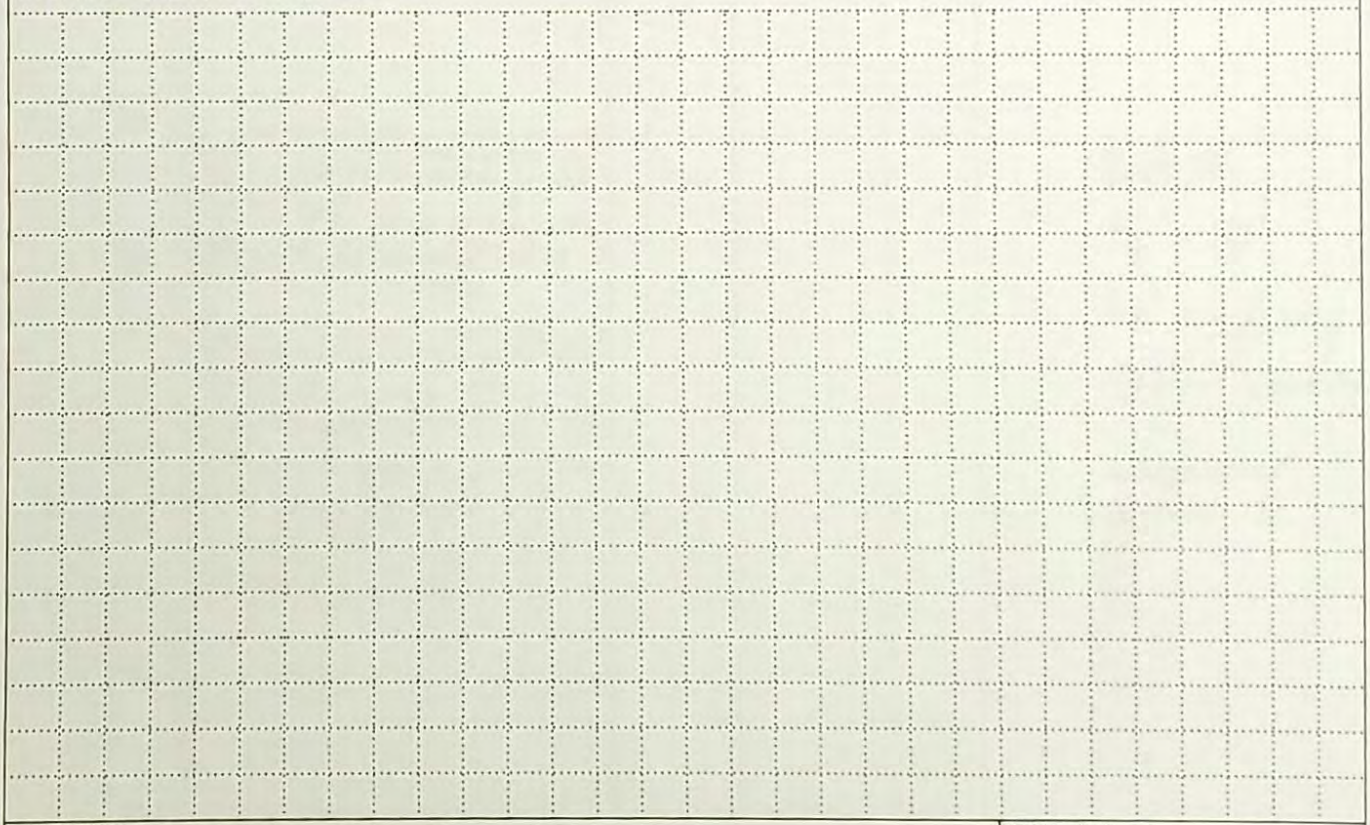
1. COMPANY NAME: KGS / Trinity	DISTRICT: Eglin AFB, Florida	HOLE NUMBER: 02A
	2. DRILLING CONTRACTOR: Walker-Hill Enviromental	SHEET 1 OF 3 SHEETS
3. PROJECT: Eglin OBOD	4. LOCATION: Range C-62	
5. NAME OF DRILLER: Lester Young	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe 8140 LC	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 6" steel casing (5' sections), 5' core barrel, Sonic rig	8. HOLE LOCATION	
	9. SURFACE ELEVATION	
	10. DATE STARTED: 9 Jun 21	11. DATE COMPLETED: 9 Jun 21
12. OVERBURDEN THICKNESS: 15' +	15. DEPTH GROUNDWATER ENCOUNTERED: 6'	
13. DEPTH DRILLED INTO ROCK: N/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 4.41 2hrs 20min	
14. TOTAL DEPTH OF HOLE: 15'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
N/A			N/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
N/A						75%

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
		X		M. Samtoller

LOCATION SKETCH/COMMENTS SCALE:



PROJECT	HOLE NO
Eglin OBOD	02A

ENG FORM 5056-R, AUG 94 (Proponent: CECW-EG)

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: 02A

PROJECT: Eglin OBOD

INSPECTOR: B. Santellana

SHEET 2 OF 3 SHEETS

ELEV (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO (e)	ANALYTICAL SAMPLE NO (f)	BLOW COUNT (g)	REMARKS (h)
	0	No Recovery					Hole cleared by Hydrovac; No recovery
	1						
	2						
	3						
	4						
	5	WELL GRADED SAND (SW), Very loose, brownish yellow (10YR 6/6), fine to medium grained to ~~trace~~ PS coarse grained, moist. Some					Run #1 5'-10' 4' recovery 80% recovery
	6						
	7	POORLY GRADED SAND WITH SILT (SP-SW), loose, reddis yellow (7.5YR 7/6), medium grained to trace fine grained, wet, trace coarse sand, few fine gravel, few silt.					Encounter water @ 6'
	8						
	9						
	10						

PROJECT: Eglin OBOD HOLE NO: 02A

ENG FORM 5056A-R, AUG 94 (Proponent: CECW-EG)

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: 02 A

PROJECT: Eglin OBOD

INSPECTOR: B. Santellana

SHEET 3 OF 3 SHEETS

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
	10	WELL ~~PO~~ GRADED as SW ~~POORLY SORTED~~ SAND (~~SP~~), loose, yellow (10YR 7/8), moist, medium grained to some fine, trace coarse grained, wet, trace silt.					Run # 2
	11	POORLY GRADED SAND (SP), very loose, light red (2.5YR 6/6), medium grained to trace fine grained, trace silt.					10'–15'
	12	POORLY GRADED SAND (SP) very loose, reddish yellow (7.5 YR 6/8), medium grained, wet, trace fine grained.					3.5' recovery
	13	POORLY GRADED SAND (SP), reddish yellow (7.5 YR 7/6), medium grained, wet, few silt, trace fine grained, trace coarse grained.					70% recovery
	14						
	15						Boring terminated 6/9/21
	16						
	17						
	18						
	19						
	20						

PROJECT: Eglin OBOD

HOLE NO: 02 A

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG

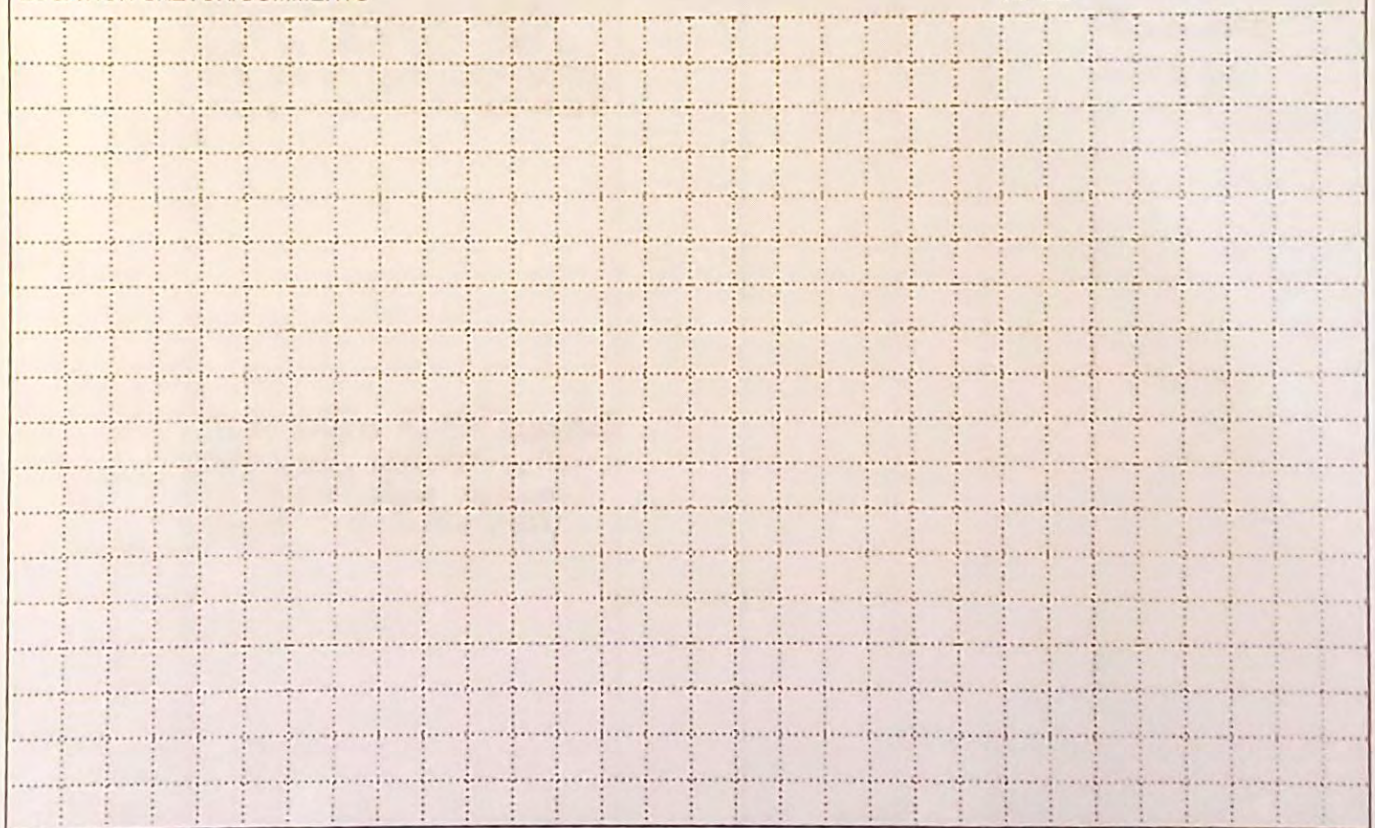
	DISTRICT: Eglin AFB, Florida	HOLE NUMBER: 03A
1. COMPANY NAME: CGS/Trinity	2. DRILLING CONTRACTOR: Walker-Hill	SHEET 1 OF 4 SHEETS
3. PROJECT: Eglin OBOD Permit Renewal	4. LOCATION: Range C-102	
5. NAME OF DRILLER: Anthony	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe Sonic 8150 LS	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 16" steel casing; 20' core barrels	8. HOLE LOCATION	
	9. SURFACE ELEVATION	
	10. DATE STARTED: 5/20/2021	11. DATE COMPLETED: 5/20/2021
12. OVERBURDEN THICKNESS: 21 ft	15. DEPTH GROUNDWATER ENCOUNTERED: 10 ft.	
13. DEPTH DRILLED INTO ROCK: NA	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	
14. TOTAL DEPTH OF HOLE: 21 ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA			NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
NA						

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
		X		Marie Presley

LOCATION SKETCH/COMMENTS — SCALE:



PROJECT	HOLE NO
Eglin OBOD	03A

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: 03A

PROJECT: Eglin OBOD

INSPECTOR: M. Presley + B. Santallana

SHEET 2 OF SHEETS

ELEV (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
	0	No Description					Cleared 0-4 ft with hand auger, no description..
	1						
	2						
	3						
	4	POORLY GRADED SAND WITH SILT (SP-SM), dry, loose, yellow (10YR 7/6), fine grained, little silt.					Run #1 4-10 ft. 1.5 ft recovery
	5						
	6						
	7	SILTY SAND WITH CLAY (SM) dry, loose, reddish yellow (5YR 6/6), fine grained, some silt, little clay					
	8						
	9						
	10						

PROJECT: Eglin OBOD

HOLE NO: 03A

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: 03A

PROJECT: Eglin OBOD

INSPECTOR: M. Presley and B. Santallana

SHEET 3 OF 4 SHEETS

ELEV (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO (e)	ANALYTICAL SAMPLE NO (f)	BLOW COUNT (g)	REMARKS (h)
	10	Same as Above					Run #2 10-20 ft 6 ft recovery
	11						Well screen 10-20 ft.
	12	WELL GRADED SAND WITH SILT (SW-SM) dry, loose, yellow (10YR 7/8), some silt, trace clay,					
	13	fine to coarse grained, some fine gravel, little white sand interbedded.					
	14						
	15	Same as above but weak red (5R 4/3).					
	16						
	17	Same as 12-13 ft.					
	18						
	19						
	20						

PROJECT: Eglin OBOD

HOLE NO: 03A

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: 03A

PROJECT: Eglin OBOD

INSPECTOR: H. Presley + B. Santallana

SHEET 4 OF 4 SHEETS

ELEV (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
	20	No Description.					No recovery 20-21 ft. 5/20/2021 Boring Terminated 21 ft.
	21	Boring Terminated					

PROJECT: Eglin OBOD

HOLE NO: 03A

ENG FORM 5056A-R, AUG 94

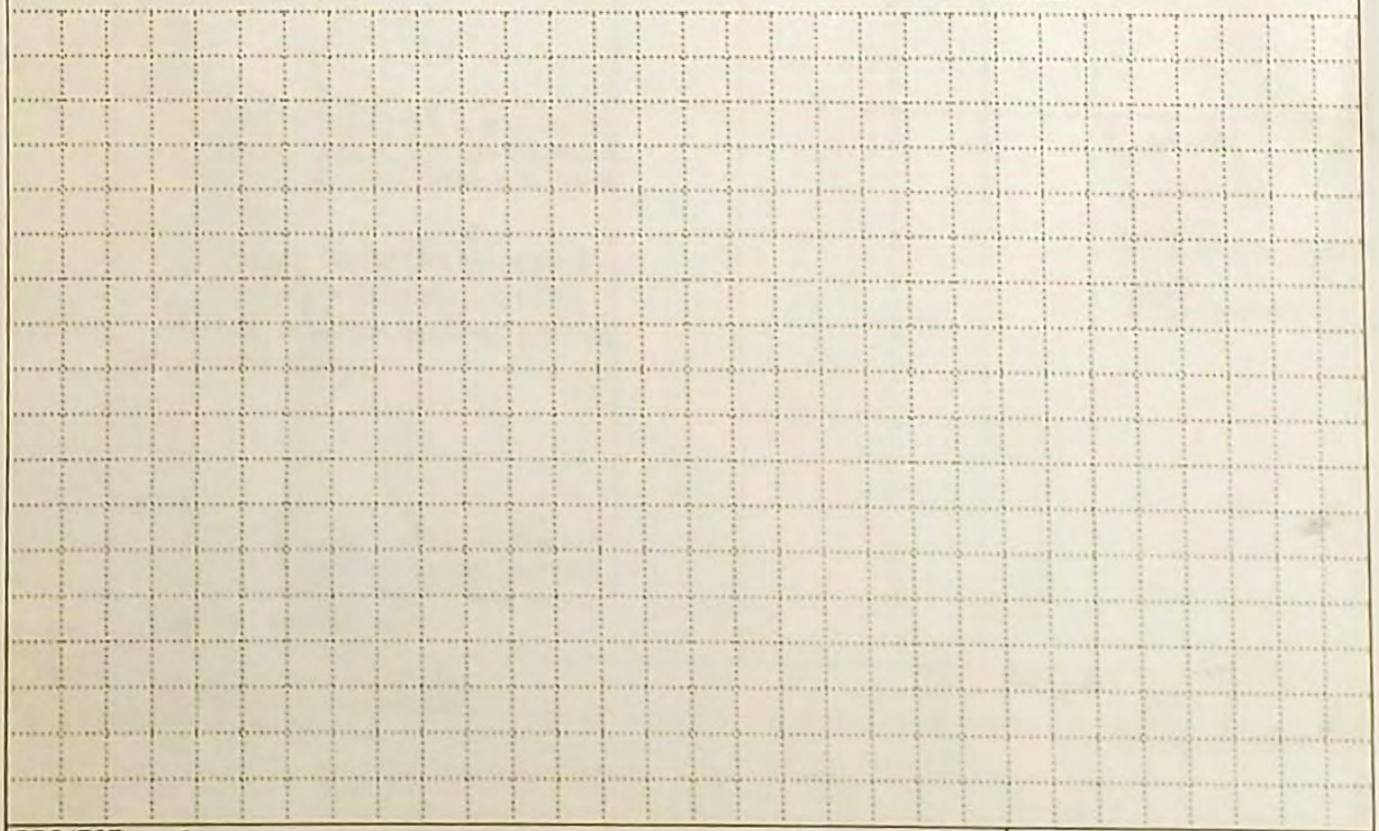
(Proponent CECW-EG)

HTRW DRILLING LOG

DISTRICT: Eglin AFB, Florida		HOLE NUMBER: 04B
1. COMPANY NAME: KGS/Trinity	2. DRILLING CONTRACTOR: Walker-Hill Environmental	SHEET 1 OF 11 SHEETS
3. PROJECT: Eglin OBOD Permit Renewal	4. LOCATION: Range C-62	
5. NAME OF DRILLER: Lester Young	6. MANUFACTURER'S DESIGNATION OF DRILL: GeoProbe 8140LC	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 6" Steel casing (5' sections) 5' core barrel Sonic rig	8. HOLE LOCATION	
	9. SURFACE ELEVATION	
	10. DATE STARTED: 7 JUN 21	11. DATE COMPLETED: 8 JUN 21
12. OVERBURDEN THICKNESS: 100' +	15. DEPTH GROUNDWATER ENCOUNTERED	
13. DEPTH DRILLED INTO ROCK: N/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 16.91' 24 hrs 50 min	
14. TOTAL DEPTH OF HOLE: 100'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES			
N/A			N/A			
20. SAMPLES FOR CHEMICAL ANALYSIS	**VOC**	**METALS**	**OTHER (SPECIFY)**	**OTHER (SPECIFY)**	**OTHER (SPECIFY)**	**21. TOTAL CORE RECOVERY**
N/A						96%
22. DISPOSITION OF HOLE	**BACKFILLED**	**MONITORING WELL**	**OTHER (SPECIFY)**	**23. SIGNATURE OF INSPECTOR**		
		X		M. Patch		

LOCATION SKETCH/COMMENTS SCALE:



PROJECT	HOLE NO
Eglin OBOD	04 B

ENG FORM 5056-R, AUG 94 (Proponent: CECW-EG)

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: 04B

PROJECT: EGLIN OBOD

INSPECTOR: B. Santallana

SHEET 2 OF 11 SHEETS

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
	0	No Recovery					Hole cleared by Hydrovac, No Recovery
	1						
	2						
	3						
	4						
	5						
	6	Silty Sand (SM), loose, moist, strong brown (7.5 YR 5/8), medium to fine grained, some silt, trace clay.					Run #1 6-10 ft. 3.3 ft recovery 83% recovery
	7	Clayey Sand (SC), medium, moist, yellowish red (5YR 5/8), medium to fine grained, some clay.					
	8						
	9	SANDY LEAN CLAY (CL), medium to stiff, ~~BS~~ dry, red (10R 4/8), non plastic, some medium to fine grained sand.					
	10						

PROJECT: EGLIN OBOD HOLE NO: 04B

ENG FORM 5056A-R, AUG 94 (Proponent: CECW-EG)

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: 04B

PROJECT: Eglin OBOD | INSPECTOR: B. Santallana | SHEET 3 OF 11 SHEETS

ELEV (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
	10	SILTY SAND (SM), loose, yellowish red (5YR 5/8), medium grained, moist, little silt, interlayered bands of red clay w/sand ~.5" thick.					Run #2 10-15 ft. 4 ft. recovery 80% recovery
	11						Inferred
	12						
		SANDY LEAN CLAY (CL), Stiff, reddish yellow (5YR 6/8), Dry non plastic, Some coarse to medium sand.	BS				
	13						
	14						
	15	POORLY GRADED SAND WITH SILT (SP-SM), medium dense, Brown (7.5 YR 5/3), fine to medium grained sand, dry, some silt, few clay.					Run #3 15-20 ft. 3.5 ft recovery 70% recovery
	16						
	17	SILTY SAND (SM), medium dense, reddish yellow (7.5 YR 7/8), fine grained sand with trace medium - coarse grained sand, moist, little silt, trace clay.					
	18						
	19						
	20						

PROJECT: Eglin OBOD | HOLE NO: 04B

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: 048

PROJECT: EGLIN OBOD

INSPECTOR: B. Santellana

SHEET 4 OF 11 SHEETS

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
	20	SILTY SAND (SM), loose, yellow (10YR 8/6), fine to medium grained, moist, some silt, trace clay, trace gravel.					Run #4 20-25 ft. 5 ft recovery 100% recovery
	21	SILTY SAND (SM), loose, reddish yellow (5YR 7/6), fine to medium grained, moist, some silt.					
	22						
	23						
	24	SILTY SAND (SM), medium dense, yellow w/ white (10YR 8/6), moist, >1mm white banding, some silt, trace gravel.					
	25	POORLY GRADED SAND (SP), very loose, reddish yellow (7.5 YR 7/6), wet, medium to fine grained, trace silt, trace gravel.					Run #5 25-30 ft. 5 ft recovery 100% recovery
	26	Poorly Graded SAND (SP), loose, yellow w/ white (10YR 8/6), moist, medium to fine grained, trace silt, few gravel.					
	27	POORLY GRADED SAND (SP), very loose, reddish yellow (5YR 6/6), medium to coarse grained, wet, few gravel, trace silt.					
	28	POORLY GRADED SAND (SP), very loose, red (10R 5/6), coarse to medium grained, trace silt.					
	29	SILTY SAND (SM), loose, light red (10R 7/6), wet, coarse to medium grained, few silt.					
	30						

PROJECT: Eglin OBOD

HOLE NO: 04B

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: 04 B

PROJECT: Eglin OBOD

INSPECTOR: B. Santallana

SHEET 5 OF 11 SHEETS

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
	30	SILTY SAND (SM), very loose, yellow (10 YR 8/6), medium to coarse grained, wet, few silt, little iron staining throughout, trace gravel.					Run #6 30-35 ft. 4.5 ft recovery 90% recovery
	31						
	32						
	33						
	34						
	35	SILTY SAND (SM), very loose, yellow (10 YR 8/6), medium to coarse grained, wet, few silt, few gravel.					Run #7 35 - 40 ft. 5 ft. recovery 100% recovery
	36	SILTY SAND (SM), loose, pink (2.5 YR 8/4), fine to medium grained, wet, few silt, few gravel, trace coarse sand.					
	37	SILTY SAND (SM), very loose, yellow (10R 8/6) medium to coarse grained, little silt, few gravel.					
	38						
	39	SILTY SAND (SM) very loose, light red (2.5 YR 6/8), wet, med to coarse, little silt. same as 37-39 with 7 1/2 inch white banding					
	40						

PROJECT: Eglin OBOD

HOLE NO: 04 B

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: 04B

PROJECT: Eglin OBOD

INSPECTOR: B. Santallana

SHEET 6 OF 11 SHEETS

ELEV (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
	40	~~WELL~~ POORLY GRADED SAND WITH GRAVEL (SW), very loose, light red (10R 7/8), medium to coarse grained, wet, few gravel, trace silt.					Run #8 40-50 ft. 10 ft. recovery 100% recovery
	41						
	42						
	43						
	44						
	45	Interbedded of 40-45 and 46-50.					
	46	~~POORLY~~ WELL GRADED SAND WITH SILT (SW-SM), very loose, white (10R 8/1), medium to fine grained, trace coarse grained, wet, few silt, trace gravel.					
	47						
	48						
	49						
	50						

PROJECT: Eglin OBOD

HOLE NO: 04B

ENG FORM 5056A-B, AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: 04 B

PROJECT: Eglin OBOD

INSPECTOR: B. Santellana

SHEET 7 OF 11 SHEETS

ELEV (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
	50	WELL GRADED SAND WITH SILT (SW-SM), loose, very pale brown (10YR 8/4), fine to medium grained to trace coarse grained, few silt, wet.					Run #9 50-60 ft 10 ft recovery 100% recovery
	51						
	52						
	53	Same as 50'-52.5' but with iron staining throughout. Staining is red (2.5YR 4/6)					
	54						
	55	Same as 52.5'-55'.					
	56						
	57						
	58						
	59						End drilling for day 6/7/21
	60						

PROJECT: Eglin OBOD

HOLE NO: 04 B

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: 04 B

PROJECT: Eglin OBOD

INSPECTOR: B. Santellana

SHEET 8 OF 11 SHEETS

ELEV (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO (f)	BLOW COUNT (g)	REMARKS (h)
	60	CLAYEY SAND (SC), loose, Very pale brown (10YR 8/4) mixed with lines of iron staining (red 2.5 YR 4/6), fine grained to few medium grained, Wet, some clay.					Run # 10 60' - 70' ft. 10 ft recovery 100% recovery recommenced drilling, 6/8/12
	61						
	62						
	63						
	64						
	65						
	66	POORLY GRADED SAND (SP) very loose, ~~very pale brown (10 YR 8/4)~~, fine to medium grained, moist. white (10R 8/1).					
	67	POORLY GRADED SAND (SP), very loose, very pale brown (10 YR 8/4), medium grained, trace coarse grained, moist.					
	68	WELL GRADED SAND (SW), very loose, white (10R 8/1), medium to fine to some coarse grained, moist, trace silt, trace gravel, little iron staining.					
	69						
	70	Same as above but reddish yellow (7.5 YR 7/6) and no staining					

PROJECT: Eglin OBOD

HOLE NO: 04 B

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: 04 B

PROJECT: Eglin OBOD

INSPECTOR: B. Santallana

SHEET 9 OF 11 SHEETS

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
	70	POORLY GRADED SAND WITH GRAVEL (SP), loose, Pink (5YR 7/3), medium to some coarse to little fine grained, wet, little gravel, trace silt.					Run #11 70'-80' 9.5 ft recovery 95% recovery
	71						
	72						
	73						
	74	WELL GRADED SAND WITH SILT (SW-SM), loose, yellow (10YR 8/6), wet, medium to fine grained, little coarse grained, trace gravel, few silt.					
B3	~~74~~						
	75						
B4	~~75~~						
	76						
B5	~~76~~						
	77						
B6	~~77~~						
	78						
B7	~~78~~						
	79	WELL GRADED SAND WITH SILT (SW-SM), loose, reddish yellow (7.5 7/8), wet, fine to medium to coarse grained, little silt, trace gravel.					
	80						

PROJECT: Eglin OBOD

HOLE NO: 04 B

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: 04 B

PROJECT: Eglin OBOD

INSPECTOR: B. Santallana

SHEET 10 OF 11

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO (e)	ANALYTICAL SAMPLE NO (f)	BLOW COUNT (g)	REMARKS (h)
	80	SILT ~~+ SAND (SM)~~, (ML) BS medium, pale brown (2.5Y 7/4), low plastic, wet, few mica, few fine grained sand.					Run #12 80 – 90 ft. 10ft recovery 100% recovery
	81						
	82						
	83						
	84						
	85						
	86						
	87						
	88						
	89						
	90						

PROJECT: Eglin OBOD

HOLE NO: 04 B

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: 04B

PROJECT: Eglin OBOD

INSPECTOR: B. Santellana

SHEET 11 OF 11 SHEETS

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
	90	SILT (ML), medium dense, dark grey (5Y 4/1), low plasticity, Wet, some medium plasticity clay, little mica.					Run 13
	91						90-100 ft
	92						10 ft recovery
	93						100% recovery
	94						
	95						
	96						
	97						
	98						
	99						
	100	Boring terminated 6/8/12					

PROJECT: Eglin OBOD

HOLE NO: 04B

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG

DISTRICT: Eglin AFB, Florida

HOLE NUMBER: 05B

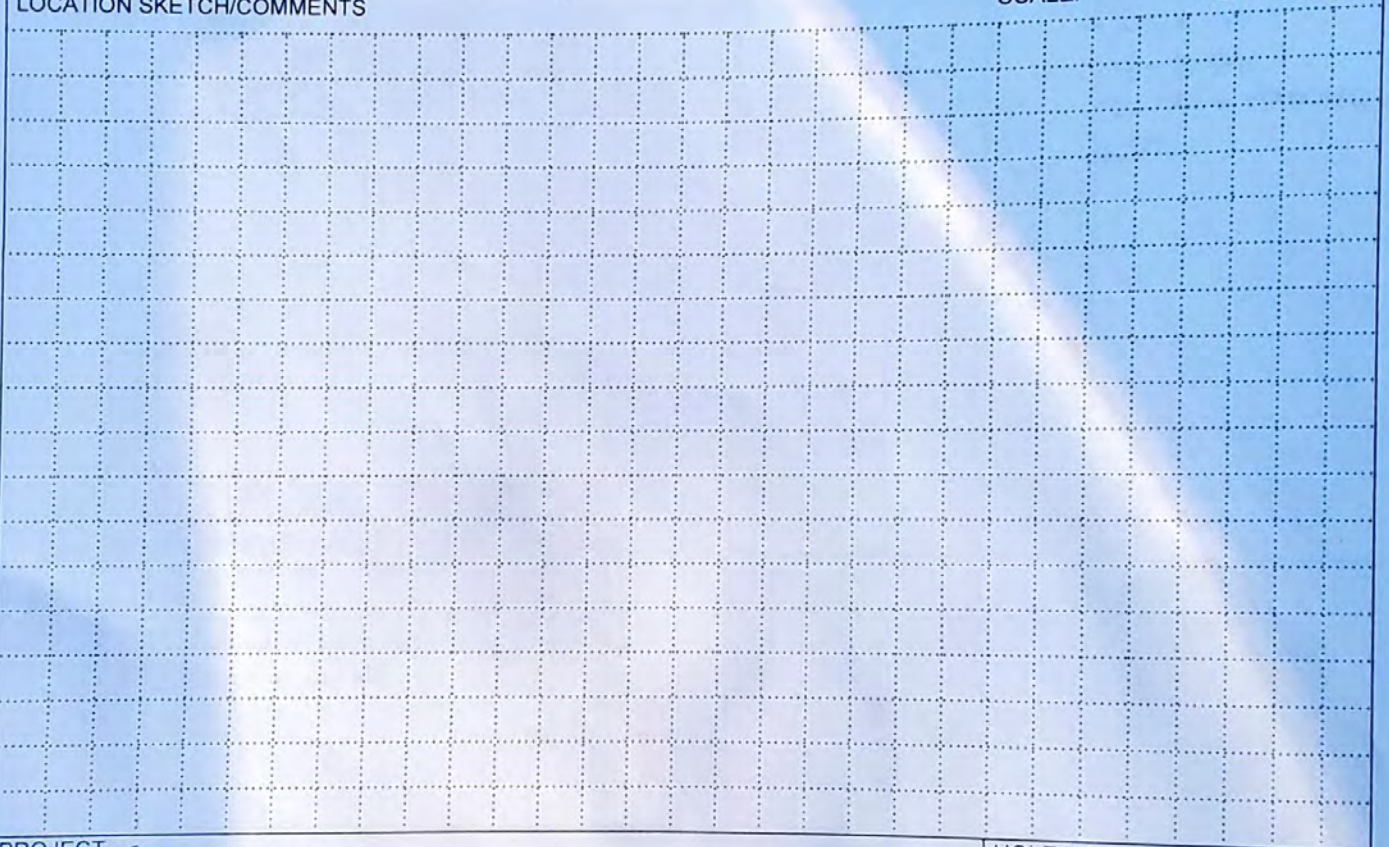
SHEET: 1 OF SHEETS: 11

1. COMPANY NAME: KGS | Trinity	2. DRILLING CONTRACTOR: Walker-Hill
3. PROJECT: Eglin OBOD Permit Renewal	4. LOCATION: Range C-62
5. NAME OF DRILLER: Anthony Maliden	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe Sonic 8150 LS
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 6" steel pipe; 20' core barrel	8. HOLE LOCATION
	9. SURFACE ELEVATION
	10. DATE STARTED: 5/18/2021 — 11. DATE COMPLETED: 5/19/2021
12. OVERBURDEN THICKNESS: 95 ft	15. DEPTH GROUNDWATER ENCOUNTERED: 30 ft
13. DEPTH DRILLED INTO ROCK: NA	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED
14. TOTAL DEPTH OF HOLE: 95ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES: NA			
NA						
20. SAMPLES FOR CHEMICAL ANALYSIS	**VOC**	**METALS**	**OTHER (SPECIFY)**	**OTHER (SPECIFY)**	**OTHER (SPECIFY)**	**21. TOTAL CORE RECOVERY %**
NA						85
22. DISPOSITION OF HOLE	**BACKFILLED**	**MONITORING WELL**	**OTHER (SPECIFY)**	**23. SIGNATURE OF INSPECTOR**		
		X		Marie Healy		

LOCATION SKETCH/COMMENTS

SCALE:



PROJECT	HOLE NO
Eglin OBOD	05B

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: 05B

PROJECT: Eglin OBOD

INSPECTOR: M. Presley + B. Santallana

SHEET 2 OF 11 SHEETS

ELEV (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO (e)	ANALYTICAL SAMPLE NO (f)	BLOW COUNT (g)	REMARKS (h)
	0	No recovery					0-4 ft cleared using hydrovac no recovery
	1						
	2						
	3						
	4	POORLY GRADED SAND W/ SILT (SP-SM), dry, loose, yellow (10YR 7/6), fine grained, little silt.					Run #1 4-8 ft. 2.5 ft recovery 63%.
	5						
	6						
	7						
	8	SILTY SAND W/ CLAY (SM), dry, loose, reddish yellow (10YR 6/6), fine grained, some silt, little clay. Same as above					Run #2 8-10 ft. 2 ft recovery 100%.
	9	Same as 4-7 ft but moist.					
	10						

PROJECT: Eglin OBOD HOLE NO: 05B

ENG FORM 5056A-R, AUG 94 (Proponent: CECW-EG)

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: 05B

PROJECT: Eglin OBOD

INSPECTOR: M. Presley + B. Santallana

SHEET 3 OF 11 SHEETS

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
	10	Same as Above with trace black staining.					Run # 3 10-20 ft. 10 Ft recovery 100%
	11						
	12						
	13	Well graded SAND w/ SILT (SW-SM), dry, 100%, reddish yellow (5YR 6/8) some silt, trace clay, fine to coarse grained.					
	14						
	15						
	16	SANDY LEAN CLAY (CL), dry, loose to med dense, brown (7.5YR 5/2), fgrain sand, some silt. Same as 12.5-15.5ft but yellow (10YR 7/8), some fine gravel					
	17						
	18	WELL GRADED SAND W/SILT (SW-SM), MOIST, loose with (8.5/N), fine to ~~coarse~~ medium grained, some silt, trace clay					
	19	18-19 ft interbedded with 19.5-20 ft.					
	20						

PROJECT: Eglin OBOD

HOLE NO: 05B

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: 05B

PROJECT: Eglin OBOD

INSPECTOR: M. Presley + B. Santallana

SHEET 4 OF 11

ELEV (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO (e)	ANALYTICAL SAMPLE NO (f)	BLOW COUNT (g)	REMARKS (h)
	20	Same as Above					Run #4 20-30 ft. 8.5 ft recovery 85%
	21	SILTY SAND (SM), loose to medium dense, pale red (2.5 YR 7/2), fine-medium grained, some silt, little clay, trace iron staining, some white sand interbedded. Same as above but yellow (10YR 7/6), trace fine gravel.					
	22	Same as 20.5-21.5 ft.					
	23						
	24	Same as 21.5-22 ft but some fine gravel.					
	25						
	26						
	27						
	28						
	29	Same as 20.5-21.5 but light red (10R 6/8)					water encountered.
	30						

PROJECT: Eglin OBOD

HOLE NO: 05B

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG (CONTINUATION SHEET)

PROJECT: Eglin OBOD | INSPECTOR: M. Presley + B. Santallana | HOLE NUMBER: 05B | SHEET 5 OF 11

ELEV (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO (e)	ANALYTICAL SAMPLE NO (f)	BLOW COUNT (g)	REMARKS (h)
	30	Same as 20.5-21.5 ft. but wet					Run #5 30-40 ft. 8 ft recovery 80%
	31						
	32	Same as 29-30 ft. but wet					
	33						
	34	POORLY GRADED SAND W/SILT (SP-SM), loose, wet, reddish yellow (7.5YR 7/8), medium to coarse grained, little silt, little fine gravel.					
	35						
	36	WELL GRADED SAND W/SILT (SW-SM), wet, loose to medium dense, light red (10R 6/8), fine to coarse grained, some fine gravel, some white striations/laminations throughout.					
	37						
	38						
	39	Same as 34-36 ft.					
	40						

PROJECT: Eglin OBOD | HOLE NO: 05B

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: 05B

PROJECT: Eglin OBOD

INSPECTOR: M. Presley + B. Santallana

SHEET 6 OF 11 SHEETS

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
	40	Same as Above					Run #10 40-50 ft 8 ft recovery 80%
	41						note: Sonic sleeve ripped when brought to lay out.
	42						
	43						
	44						
	45						
	46	Same as above but pale brown (2.5Y 8/3)					
	47						
	48						
	49	Same as 29-30 ft.					
	50						

PROJECT: Eglin OBOD

HOLE NO: 05B

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: 05B

PROJECT: Eglin OBOD

INSPECTOR: M. Presley + B. Santallana

SHEET 7 OF 11 SHEETS

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
	50	Same as Above					Run #7 50-60 ft 6 ft recovery 60%
	51	Same as 20.5-21.5 ft with white sand interbedded throughout, weak red (5R 4/3) sand from 50.50 to 52.75 ft.					Note: sonic sleeve ripped in the middle.
	52						
	53						
	54	Same as 21.5-22 ft with some gravel (fine).					
	55						
	56						
	57						
	58						
	59						
	60						

PROJECT: Eglin OBOD HOLE NO: 05B

ENG FORM 5056A-R, AUG 94 (Proponent: CECW-EG)

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: 05B

PROJECT: Eglin OBOD

INSPECTOR: M. Presley + B. Santallana

SHEET 8 OF 11 SHEETS

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
	60	SILT (ML), ~~dense~~ medium, moist, yellow (10YR 7/6), little plastic clay, trace fine grained sand, little fine gravel, abundant iron stains throughout.					Run #8 60-70 ft 9 ft recovery 90%
	61						
	62						
	63						
	64						
	65						
	66	WELL GRADED SAND W/GRAVEL (SW) very loose, moist, weak red (5R 5/3), fine to coarse grained, little fine gravel, trace silt.					
	67	POORLY GRADED SAND WITH SILT (SP-SM), loose, moist, pale brown (2.5Y 8/2), fine grained, little silt, trace fine gravel.					
	68						
	69						
	70						

PROJECT: Eglin OBOD

HOLE NO: 05B

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: 05B

PROJECT: Eglin OBOD

INSPECTOR: M. Presley + B. Santallana

SHEET 9 OF 11 SHEETS

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
	70	Same as Above					Run #9 70-80 Ft 8 Ft recovery 80%
	71						
	72						
	73						
	74	~~SILT (ML), medium, moist,~~ Same as Above but Yellow (10YR 8/8).					
	75						
	76						
	77						
	78						
	79						
	80						

PROJECT: Eglin OBOD

HOLE NO: 05B

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: 05B

PROJECT: Eglin OB01

INSPECTOR: M. Presley + B. Santallana

SHEET 10 OF 11 SHEETS

ELEV (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
	80	SILT (ML) medium, moist olive yellow (2.5 Y 6/6), little plastic clay, trace mica.					Run # 10 80-90 ft 9 ft recovery 90%
	81						
	82						
	83						
	84						
	85						
	86						
	87						
	88						
	89	SILT (ML), medium, moist, dark gray (5Y 4/1), little plastic clay, trace mica,					
	90	Pensacola Clay Formation					

PROJECT: Eglin OB05

HOLE NO: 05B

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: 05B

PROJECT: Eglin OBOD

INSPECTOR: M. Presley + B. Santallana

SHEET 11 OF 11 SHEETS

ELEV (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO (e)	ANALYTICAL SAMPLE NO (f)	BLOW COUNT (g)	REMARKS (h)
	90	Same as Above					Run #11 90-95 ft. 5 ft recovery 100%
	91						
	92						
	93						
	94						5/19/2021 Boring Terminated 95 ft
	95	Boring Terminated					

PROJECT: Eglin OBOD

HOLE NO: 05B

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG

	DISTRICT: Eglin AFB, Florida	HOLE NUMBER: 06A
1. COMPANY NAME: KGS | Trinity	2. DRILLING CONTRACTOR: Walker Hill Environmental	SHEET 1 OF 7 SHEETS
3. PROJECT: Eglin OBOD ~~Range C-62~~ Permit Renewal (comp)	4. LOCATION: Range C-62	
5. NAME OF DRILLER	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe Sonic 8150 LS	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 6" steel pipe; 20 ft core barrel	8. HOLE LOCATION	
	9. SURFACE ELEVATION	
	10. DATE STARTED: 5/17/2021	11. DATE COMPLETED: 5/17/2021
12. OVERBURDEN THICKNESS (comp): ~~NA~~ 60 ft	15. DEPTH GROUNDWATER ENCOUNTERED: 12 ft	
13. DEPTH DRILLED INTO ROCK: NA	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 12 ft, 80 minutes	
14. TOTAL DEPTH OF HOLE: 60 ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA			NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
NA						80

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
		X		Marin Presley

LOCATION SKETCH/COMMENTS — SCALE:

PROJECT	HOLE NO
Eglin OBOD Permit Renewal	06A

ENG FORM 5056-R, AUG 94 (Proponent: CECW-EG)

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: 06A

PROJECT: Eglin OBOD Range C-62

INSPECTOR: M. Presley + B. Santallana

SHEET 2 OF 7 SHEETS

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
	0	No recovery					0-4 ft cleared by hydrovac, no recovery
	1						
	2						
	3						
	4	POORLY GRADED SAND W/ SILT (SP-SM) very loose, brownish yellow (10YR6/6), fine grained, dry, little silt,					Run # 1 4-10 ft 2.75 ft recovery 45%
	5						
	6						
	7						
	8						
	9						
	10						

PROJECT: Eglin OBOD Permit Renewal

HOLE NO: 06A

(Proponent: CECW-EG)

ENG FORM 5056A-R, AUG 94

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: 06A

PROJECT: Eglin OBOD

INSPECTOR: M. Presley + B. Santallana

SHEET 3 OF 7

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
	10	Same as Above					Run #2 10-20 ft 3.5 ft recovery 35%
	11						
	12	POORLY GRADED SAND w/ SILT (SP-SM), same as above but white (10YR 8/1)					WL @ 12 ft
	13						
	14						
	15						
	16						
	17						
	18	SILTY SAND (SM), loose, yellow (10YR 7/6), fine grained, subrounded, dry, some silt, little clay.					
	19						
	20						

HOLE NO 06A

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: 106A

PROJECT: Eglin OBOD

INSPECTOR: M. Presley + B. Santallana

SHEET 4 OF 7 SHEETS

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
	20	SILTY SAND (SM), loose, pale brown (2.5Y 8/2), fine grained, wet, some silt, some gray to black fine grained sand throughout					Run #3 20-30 ft, 10 ft recovery 100%
	21	SILTY SAND (SM), loose, moist, ~~light~~ yellow (10YR 7/6) fine grained, some silt, trace clay	none				
	22	SILTY SAND (SM), loose to medium dense, white (10YR 8/1), fine-med grained, some silt, little clay, some iron staining throughout					
	23						
	24						
	25						
	26						
	27						
	28	SILTY SAND w/ GRAVEL (SM), dense, dry, white (10YR 8/1), fine-med grained, some silt, some clay, some iron stains - some gravel					
	29	WELL GRADED SAND w/ SILT (SW-SM), moist, loose, white (8.5/N), fine to coarse grained, some silt, trace clay					
	30						

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: D6A

PROJECT: Eglin OBOD

INSPECTOR: M. Presley + B. Santallana

SHEET 5 OF 7 SHEETS

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
	30	WELL GRADED SAND W/ SILT AND GRAVEL (SW-SM), very loose, moist, red (2.5YR 4/8), fine-coarse grained sand, some silt, some gravel (fine gravel), trace clay					Run #4 30-40 ft, 10 ft recovery 100%
	31	Same above but pale red (2.5YR 7/2)					
		Same above but brownish yellow (10YR 6/8)					
	32	Same above but pale red (2.5YR 7/2)					
		Same above but white (8.5/N)					
		Same above but brownish yellow (10YR 6/8)					
	33	Same above but red (2.5YR 4/8)					
		Same above but white (8.5/N)					
	34	Same above but red (2.5YR 4/8)					
		Same above but brownish yellow (10YR 6/8), some red (2.5YR 4/8) interbedded throughout.					
	35						
	36						
	37						
	38						
	39						
	40						

PROJECT: Eglin OBOD

HOLE NO: D6A

(Proponent: CECW-EG)

ENG FORM 5056A-R, AUG 94

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: 06A

PROJECT: Eglin OBOD

INSPECTOR: M. Presley + B. Santallana

SHEET 6 OF 7

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
	40	Same above but red (2.5YR4/8)					Run #5 40 - 50 ft, 10 ft recovery 100%.
		Same above but pale red (2.5 YR 7/2)					
	41	Same above but pale Yellow (2.5Y 8.5/2) pale					
	42						
	43						
	44						
	45	Same above but pale red (2.5YR7/2), fine to medium grained.					
	46						
	47	Same above but pale Yellow (2.5Y 8.5/2)					
	48						
	49						
	50						

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: 06A

PROJECT: Eglin OBOD

INSPECTOR: M. Presley + B. Santallana

SHEET 7 OF 7

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
	50	Same as Above					Run #6 50-60 ft, 10 ft recovery 100%
	51						
	52						
	53						
	54						
	55						
	56						
	57						
	58						approx. 125 gal used during drilling.
	59	Same as above but interbedded with weak red (5R 5/3) throughout					60 ft - Boring Terminated
	60						

PROJECT: Boring Terminated

HOLE NO: 06A

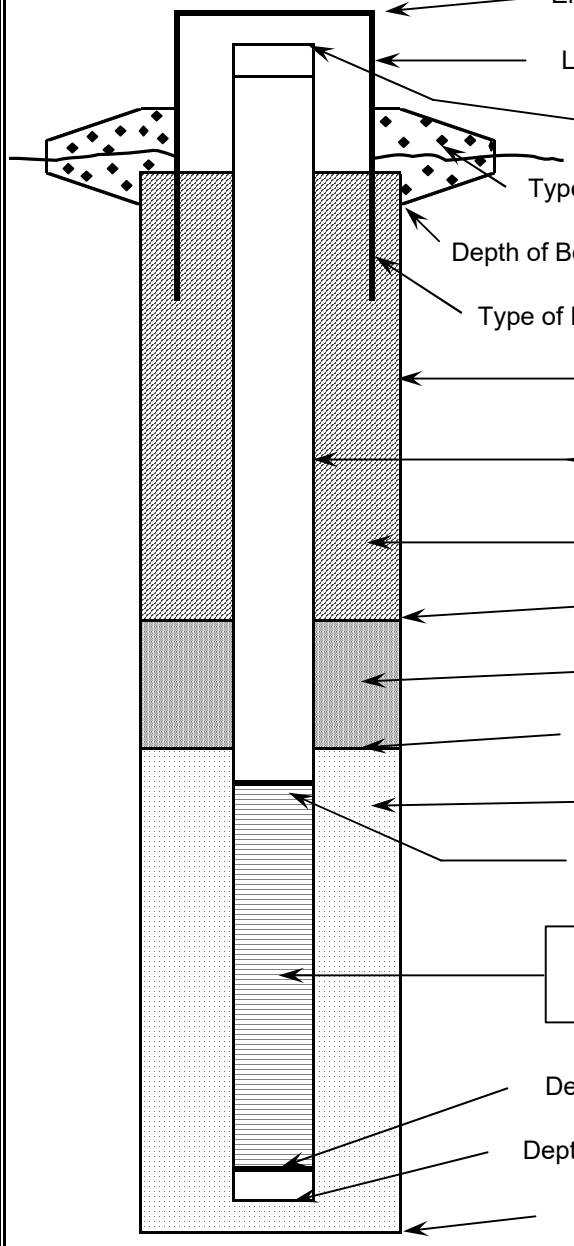
WELL ID: MW-2021-62-01A

Ground Surface Elevation*: 177.6'

KGS/Trinity

As-Built Groundwater Monitoring Well Construction Diagram - Overburden

Project:	Eglin OBOD Permit Renewal	Location:	Range C-62
Project #:	10A020-023	Drilling Company:	Walker Hill Environmental
Date Start:	17 May 2021	Drilling Method:	Sonic Geoprobe
Date End:	18 May 2021	Drilling Foreman:	Tyler Smith
Logged By:	Marie Presley	Checked By:	RM
Boring ID:	MW-2021-62-01A		



Elev. Top of Protective Casing or Roadbox*: 180.85'

Length of Protective Casing Above Surface: 3.25'

Top of Riser Elevation*: 180.07'

Type of Surface Seal: Concrete

Depth of Bottom of Surface Seal (BSG): 2"

Type of Protective Casing or Roadbox & Diameter: Aluminum & 6"

Boring Diameter: 6"

Type of Riser: PVC

Diameter of Riser: 2"

Type of Backfill: Grout (Portland cement& 5% Bentonite [CETCO Super Gel-X])

Depth Top of Seal (BSG): 13' Elevation**: 164.6'

Type of Seal: Fine sand Thickness: 2'

Depth Top of Sand (BSG): 15' Elevation**: 162.6'

Type of Sand Pack: Consolidated Aggregates 20/40 Picayune, MS 39466

Depth Top of Screen (BSG): 17' Elevation**: 160.6'

Type of Screen: Mill slotted

Length of Screen: 10'

Screen Slot Size: 0.010"

Diameter of Screen: 2"

Depth Bottom of Screen (BSG): 27' Elevation**: 150.6'

Depth Bottom of Sediment Sump: 30' Elevation**: 147.6'

Depth Bottom of Hole (BSG): 30' Elevation**: 147.6'

BSG = Below Surface Grade (feet)

* = Surveyed elevation

** = Elevation calculated based on surveyed ground surface elevation

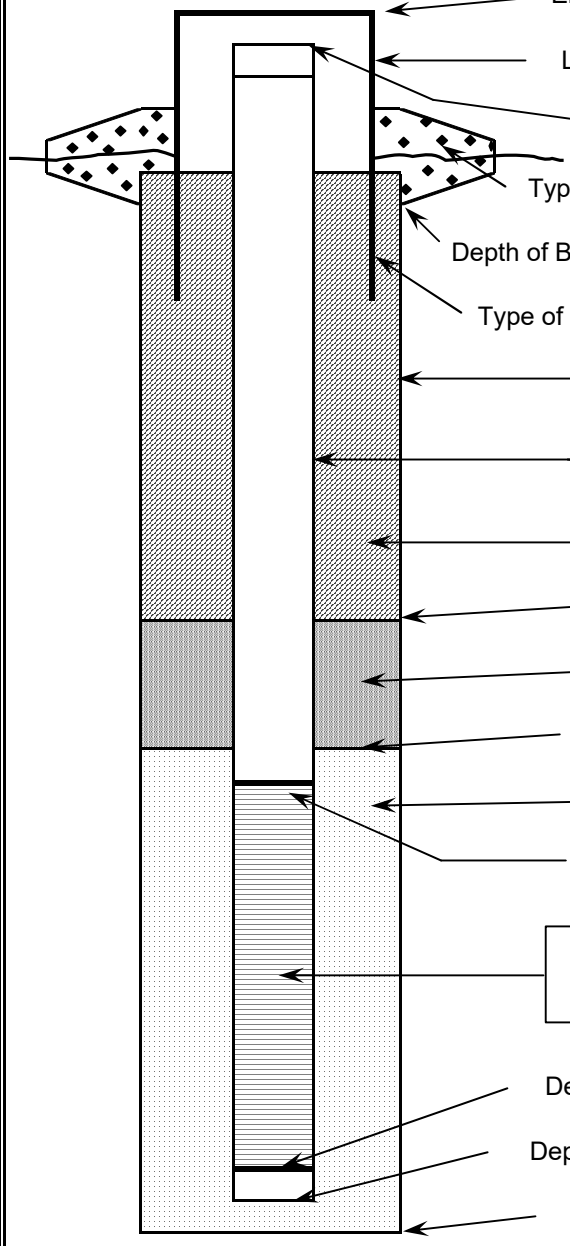
WELL ID: MW-2021-62-02A

Ground Surface Elevation*: 153.4'

KGS/Trinity
As-Built Groundwater Monitoring Well Construction Diagram - Overburden

Project: Eglin OBOD Permit Renewal
Project #: 10A020-023
Date Start: 09 June 2021
Date End: 09 June 2021
Logged By: Marie Presley
Boring ID: MW-2021-62-02A

Location: Range C-62
Drilling Company: Walker Hill Environmental
Drilling Method: Sonic Geoprobe
Drilling Foreman: Tyler Smith
Checked By: RM



Elev. Top of Protective Casing or Roadbox*: 156.23'
Length of Protective Casing Above Surface: 2.83'
Top of Riser Elevation*: 155.75'
Type of Surface Seal: Concrete
Depth of Bottom of Surface Seal (BSG): 2"
Type of Protective Casing or Roadbox & Diameter: Aluminum & 6"
Boring Diameter: 6"
Type of Riser: PVC
Diameter of Riser: 2"
Type of Backfill: Grout (Portland cement & 5% bentonite [CETCO Super Gel-X])
Depth Top of Seal (BSG): 2" Elevation**: 153.24'
Type of Seal: Grout (see above) Thickness: 3'
Depth Top of Sand (BSG): 3' Elevation**: 150.4'
Type of Sand Pack: Consolidated Aggregates 20/40 Picayune, MS 39466
Depth Top of Screen (BSG): 5' Elevation**: 148.4'
Type of Screen: Mill slotted
Length of Screen: 10'
Screen Slot Size: 0.010"
Diameter of Screen: 2"
Depth Bottom of Screen (BSG): 15' Elevation**: 138.4
Depth Bottom of Sediment Sump: 15' Elevation**: 138.4'
Depth Bottom of Hole (BSG): 15' Elevation**: 138.4'

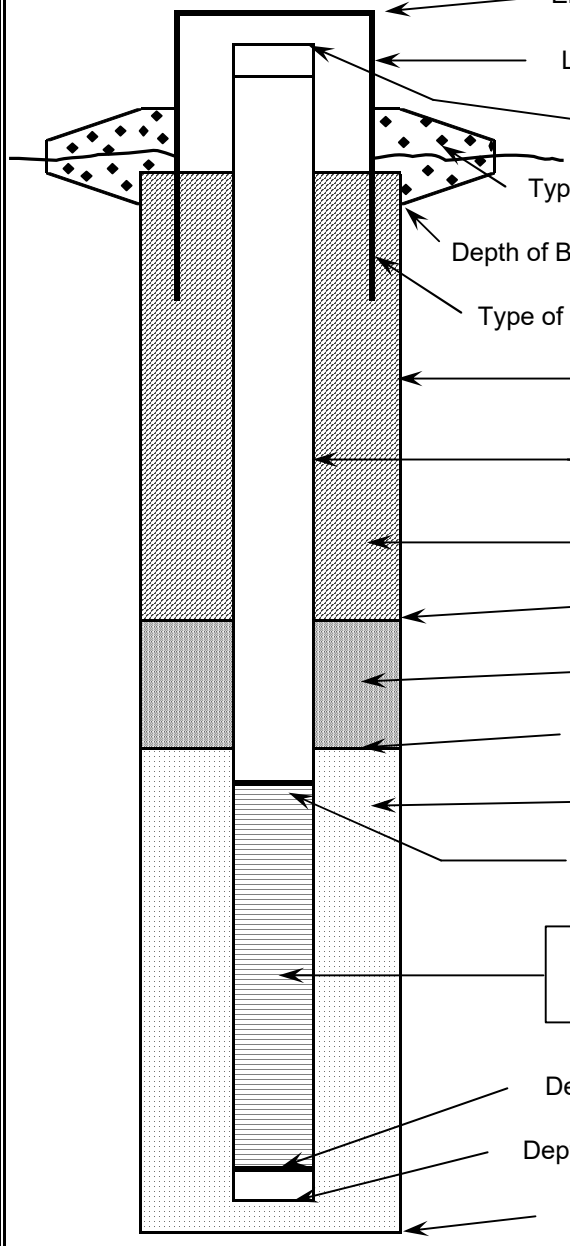
BSG = Below Surface Grade (feet)
* = Surveyed elevation
** = Elevation calculated based on surveyed ground surface elevation

WELL ID: MW-2021-62-03A

Ground Surface Elevation*: 159.9'

KGS/Trinity
As-Built Groundwater Monitoring Well Construction Diagram - Overburden

Project:	Eglin OBOD Permit Renewal	Location:	Range C-62
Project #:	10A020-023	Drilling Company:	Walker Hill Environmental
Date Start:	20 May 2021	Drilling Method:	Sonic Geoprobe
Date End:	21 May 2021	Drilling Foreman:	Tyler Smith
Logged By:	Marie Presley	Checked By:	RM
Boring ID:	MW-2021-62-03A		



Elev. Top of Protective Casing or Roadbox*: 163.07'
Length of Protective Casing Above Surface: 3.17'
Top of Riser Elevation*: 162.43'
Type of Surface Seal: Concrete
Depth of Bottom of Surface Seal (BSG): 2"
Type of Protective Casing or Roadbox & Diameter: Aluminum & 6"
Boring Diameter: 6"
Type of Riser: PVC
Diameter of Riser: 2"
Type of Backfill: Grout (Portland cement & 5% bentonite [CETCO Super Gel-X])
Depth Top of Seal (BSG): 3' Elevation**: 156.9'
Type of Seal: Fine Sand Thickness: 4'
Depth Top of Sand (BSG): 7' Elevation**: 152.9'
Type of Sand Pack: Consolidated Aggregates 20/40 Picayune, MS 39466
Depth Top of Screen (BSG): 10' Elevation**: 149.9'
Type of Screen: Mill slotted
Length of Screen: 10'
Screen Slot Size: 0.010"
Diameter of Screen: 2"
Depth Bottom of Screen (BSG): 20' Elevation**: 139.9
Depth Bottom of Sediment Sump: 21' Elevation**: 138.9'
Depth Bottom of Hole (BSG): 21' Elevation**: 138.9'

BSG = Below Surface Grade (feet)
* = Surveyed elevation
** = Elevation calculated based on surveyed ground surface elevation

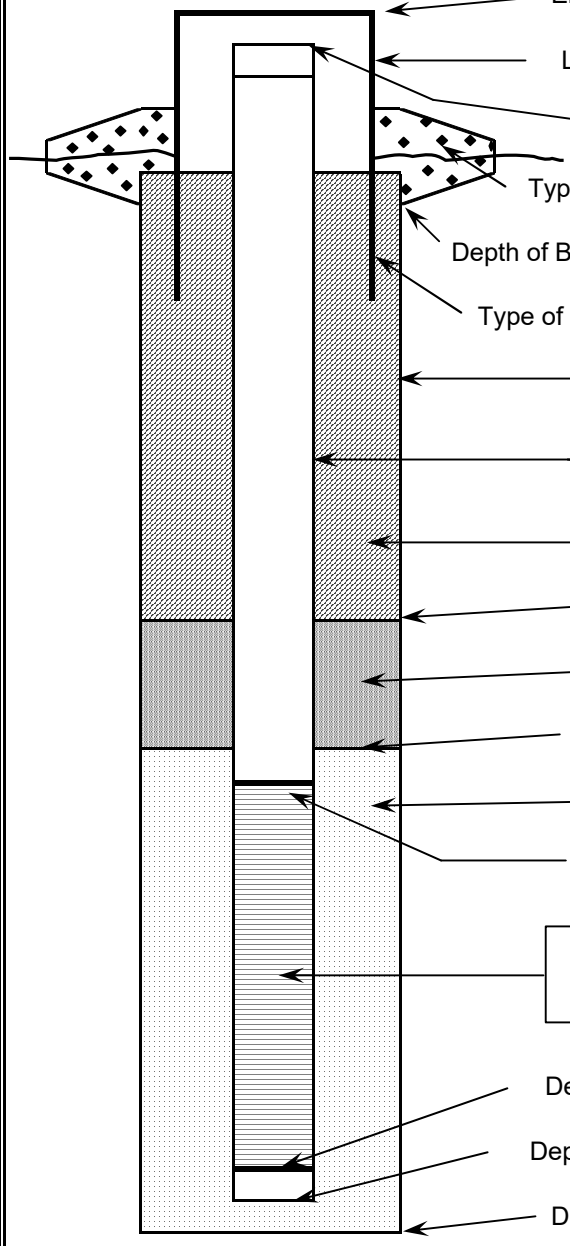
WELL ID: MW-2021-62-04B

Ground Surface Elevation*: 178.3'

KGS/Trinity

As-Built Groundwater Monitoring Well Construction Diagram - Overburden

Project:	Eglin OBOD Permit Renewal	Location:	Range C-62
Project #:	10A020-023	Drilling Company:	Walker Hill Environmental
Date Start:	07 June 2021	Drilling Method:	Sonic Geoprobe
Date End:	09 June 2021	Drilling Foreman:	Tyler Smith
Logged By:	Brianna Santallana	Checked By:	RM
Boring ID:	MW-2021-62-04B		



Elev. Top of Protective Casing or Roadbox*: 181.42'

Length of Protective Casing Above Surface: 3.12'

Top of Riser Elevation*: 180.91'

Type of Surface Seal: Concrete

Depth of Bottom of Surface Seal (BSG): 2"

Type of Protective Casing or Roadbox & Diameter: Aluminum & 6"

Boring Diameter: 6"

Type of Riser: PVC

Diameter of Riser: 2"

Type of Backfill: Grout (Portland cement & 5% bentonite [CETCO Super Gel-X])

Depth Top of Seal (BSG): 63' Elevation**: 115.3'

Type of Seal: Bentonite pellets Thickness: 3'

Depth Top of Sand (BSG): 66' Elevation**: 112.3'

Type of Sand Pack: Consolidated Aggregates 20/40 Picayune, MS 39466

Depth Top of Screen (BSG): 68' Elevation**: 110.3'

Type of Screen: Mill slotted

Length of Screen: 10'

Screen Slot Size: 0.010"

Diameter of Screen: 2"

Depth Bottom of Screen (BSG): 78' Elevation**: 100.3'

Depth Bottom of Sediment Sump: 79' Elevation**: 99.3'

Depth Bottom of Hole (BSG)***: 100' Elevation**: 78.3'

BSG = Below Surface Grade (feet)

* = Surveyed elevation

** = Elevation calculated based on surveyed ground surface elevation

*** = Borehole backfilled with bentonite to 79 feet bgs

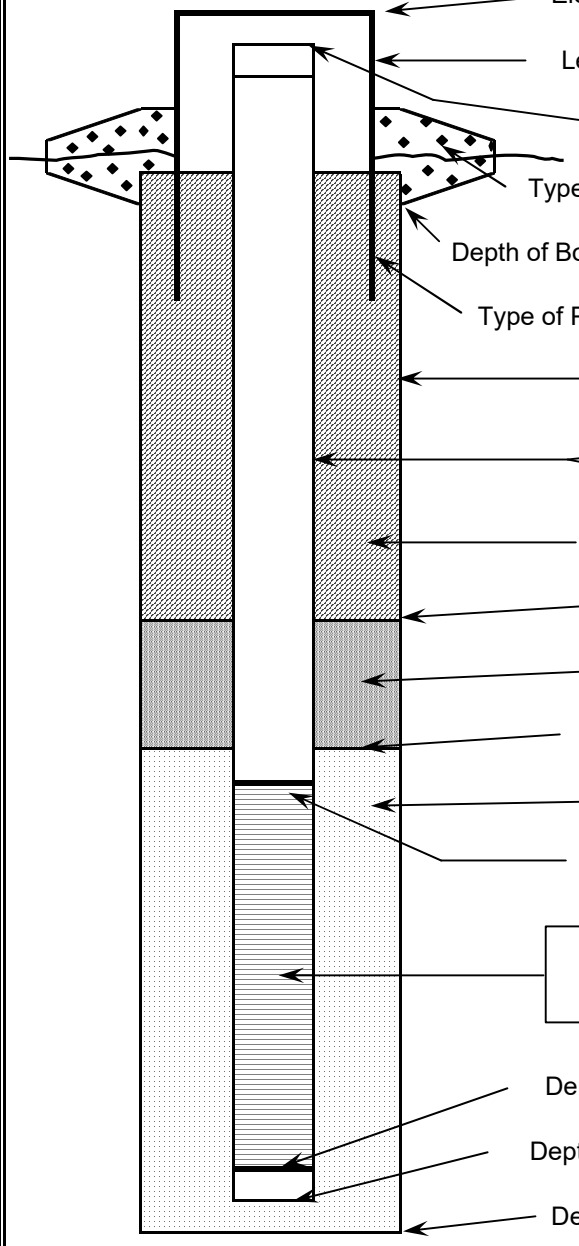
WELL ID: MW-2021-62-05B

Ground Surface Elevation*: 177.3'

KGS/Trinity
As-Built Groundwater Monitoring Well Construction Diagram - Overburden

Project: Eglin OBOD Permit Renewal
Project #: 10A020-023
Date Start: 18 May 2021
Date End: 20 May 2021
Logged By: M Presley & B Santallana
Boring ID: MW-2021-62-05B

Location: Range C-62
Drilling Company: Walker Hill Environmental
Drilling Method: Sonic Geoprobe
Drilling Foreman: Tyler Smith
Checked By: RM



Elev. Top of Protective Casing or Roadbox*: 180.45'
Length of Protective Casing Above Surface: 3.15'
Top of Riser Elevation*: 179.77'
Type of Surface Seal: Concrete
Depth of Bottom of Surface Seal (BSG): 2"
Type of Protective Casing or Roadbox & Diameter: Aluminum & 6"
Boring Diameter: 6"
Type of Riser: PVC
Diameter of Riser: 2"
Type of Backfill: Grout (Portland cement & bentonite [CETCO Super Gel-X])
Depth Top of Seal (BSG): 66' Elevation**: 111.3'
Type of Seal: Bentonite pellets Thickness: 2'
Depth Top of Sand (BSG): 68' Elevation**: 109.3'
Type of Sand Pack: Consolidated Aggregates 20/40 Picayune, MS 39466
Depth Top of Screen (BSG): 72' Elevation**: 105.3'
Type of Screen: Mill slotted
Length of Screen: 10'
Screen Slot Size: 0.010"
Diameter of Screen: 2"
Depth Bottom of Screen (BSG): 82' Elevation**: 95.3
Depth Bottom of Sediment Sump: 82.5' Elevation**: 94.8
Depth Bottom of Hole (BSG)***: 95' Elevation**: 82.3'

BSG = Below Surface Grade (feet)
* = Surveyed elevation
** = Elevation calculated based on surveyed ground surface elevation
*** = Borehole backfilled to a depth of 82.5 feet bgs

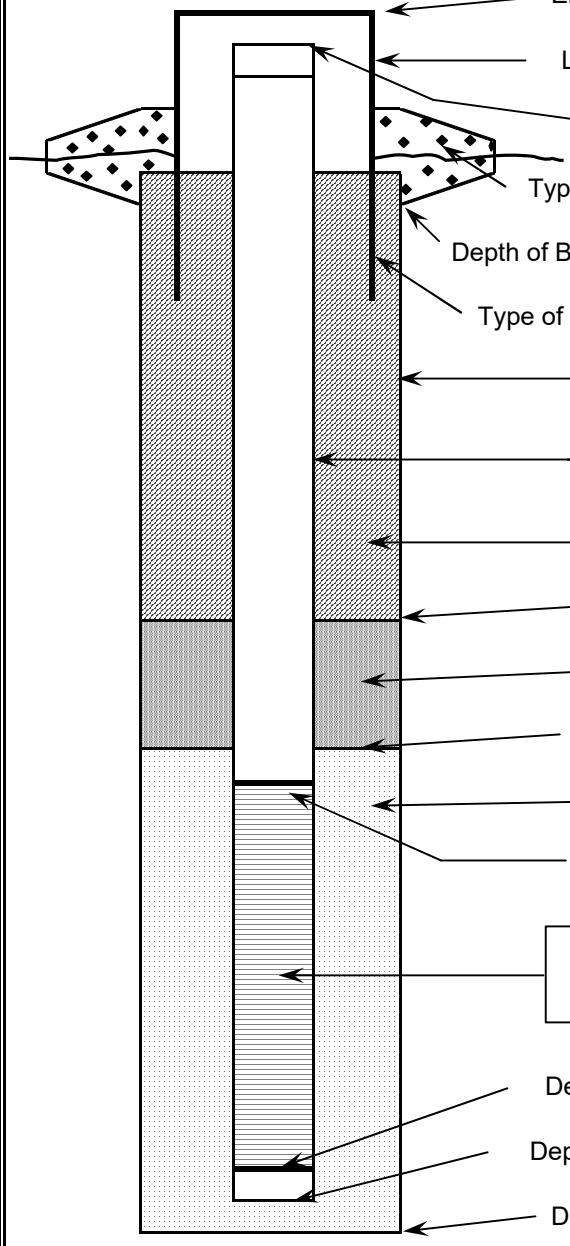
WELL ID: MW-2021-62-06A

Ground Surface Elevation*: 180.9'

KGS/Trinity

As-Built Groundwater Monitoring Well Construction Diagram - Overburden

Project:	Eglin OBOD Permit Renewal	Location:	Range C-62
Project #:	10A020-023	Drilling Company:	Walker Hill Environmental
Date Start:	17 May 2021	Drilling Method:	Sonic Geoprobe
Date End:	17 May 2021	Drilling Foreman:	Tyler Smith
Logged By:	Marie Presley	Checked By:	RM
Boring ID:	MW-2021-62-06A		



Elev. Top of Protective Casing or Roadbox*: 184.92'

Length of Protective Casing Above Surface: 4.02'

Top of Riser Elevation*: 184.17'

Type of Surface Seal: Concrete

Depth of Bottom of Surface Seal (BSG): 2"

Type of Protective Casing or Roadbox & Diameter: Aluminum & 6"

Boring Diameter: 6"

Type of Riser: PVC

Diameter of Riser: 2"

Type of Backfill: Grout (Portland cement & 5% bentonite [CETCO Super Gel-X])

Depth Top of Seal (BSG): 11' Elevation**: 169.9'

Type of Seal: Bentonite pellets Thickness: 2'

Depth Top of Sand (BSG): 13' Elevation**: 167.9'

Type of Sand Pack: Consolidated Aggregates 20/40 Picayune, MS 39466

Depth Top of Screen (BSG): 15' Elevation**: 165.9'

Type of Screen: Mill slotted

Length of Screen: 10'

Screen Slot Size: 0.010"

Diameter of Screen: 2"

Depth Bottom of Screen (BSG): 25' Elevation**: 155.9'

Depth Bottom of Sediment Sump: 25' Elevation**: 155.9'

Depth Bottom of Hole (BSG)***: 60' Elevation**: 120.9'

BSG = Below Surface Grade (feet)

* = Surveyed elevation

** = Elevation calculated based on surveyed ground surface elevation

*** = Borehole overdilled. Borehole collapsed to 27 feet bgs

2024 Piezometer Boring and Construction Logs

Environmental Assessment Solutions, LLC
Soil Boring Log

Project: ~~Phase I Soil Sampling~~ Piezometer Installation	Boring No.: 62-PZ01C
Project No.: J10103	Drilling Co.: Walker-Hill Environmental, Inc.
Address: Open Detonation Unit, Range C-62, Eglin AFB, FL	Driller: Frank Hennyton / Jesse Belanger
Logger: Ross McCormick / Andy Miller	Drilling Method: Sonic, Continuous Core, 4-inch dia core, 6-inch override
Date: 5-3-24	Drilling Equip: 8150 LS Geoprobe Sonic Rig
Total Boring Depth: 70'	Static Water During Drilling: 2.0' bgs

Core Section	Recovery (ft)	Interval (ft)	PID (ppm)	Soil Profile	GEOLOGIC LOG
1 0-10	5.5				0-0.5' SAND(SP) fine-medium sand, trace silt 10YR 6/6 Brownish Yellow, moist. Loose 0.5-1.1' SAND(SP) fine-medium sand, trace silt 5YR 5/8 Yellowish Red. moist. Loose 1.1-1.3' SAND(SP) fine-medium sand, trace silt 10YR 5/8
2 10-20	8.9				Yellowish Brown, moist Loose 1.3-10': SAND(SP) fine-medium sand, trace silt 2.5Y 2.5/8 Black. Loose wet.
3 20-30	9.5				10-11.6: SAND(SP) fine-medium sand, trace coarse sand, trace silt. wet. 10YR 4/2 Dark grayish brown 11.6-13.1: SAND(SP) fine-medium sand, little coarse sand, wet 10YR 7/1 Light Gray 13.1-20: SAND(SP) fine-coarse sand, trace subrounded gravel (1/4-inch), trace silt, wet. 13.1-14.2 2.5Y 8/2 Pale Yellow 14.2-20 2.5Y 8/8 Yellow, minor 7.5YR 7/6 reddish yellow stringers.
					20-22.9: SAND(SP) fine-coarse sand, trace subrounded gravel (1/4-inch), trace silt, wet. 2.5Y 8/2 Pale Yellow.
					22.9-24.4: SAND(SM) fine sand and silt, wet, 7.5YR 8/2 Pinkish white. 24.4-24.5: Thin lense of Clayey Silt (CL) 2.5Y 8/1 white. 24.5-24.55 thin band of iron staining
					24.55-26.6: SAND(SP) fine-coarse, trace subrounded gravel (1/4-inch), trace silt. wet. 7.5YR 8/2 Pinkish white 26.6-30: SAND(SM) fine sand and silt. wet. 7.5YR 8/2 Pinkish white w/ bands of dark red iron staining

Notes:

EAS ENVIRONMENTAL ASSESSMENT SERVICES
Wholly Owned Subsidiary of Tetra Tech

Environmental Assessment Solutions, LLC
Soil Boring Log

Project: ~~Phase I Soil Sampling~~ Piezometer Installation	Boring No.: 62.PZ01C
Project No.: J10103	Drilling Co.: Walker-Hill Environmental, Inc.
Address: Open Detonation Unit, Range C-62, Eglin AFB, FL	Driller: Frank Herrington / Jesse Belanger
Logger: Ross McCormick / Andy Miller	Drilling Method: Sonic, Continuous Core, 4-inch dia core, 6-inch override
Date: 5.3.24	Drilling Equip: Sonic Geoprobe 8150 LS
Total Boring Depth: 70' bgs	Static Water During Drilling: 2.0' bgs

Core Section	Recovery (ft)	Interval (ft)	PID (ppm)	Soil Profile	GEOLOGIC LOG
4 30-40	8.5				30-40': SAND (SW) Fine Sand and Silt, Trace medium sand, wet. Alternating bands of 7.5 YR 8/1 white and dark reddish purple and 2.5 Y 8/6 Pale Yellow Signs of plume migration?
5 40-50	8.8				40-43.95': SAND (SW) Fine Sand and Silt, trace medium sand, wet. Alternating bands of 7.5 YR 8/1 white, dark reddish purple; and 2.5 Y 8/6 Pale Yellow Signs of plume migration?
6 50-60	7.5				43.95-50: SAND (SP) Med-coarse sand, little fine sand trace subrounded (1/4 inch) gravel, trace silt, wet. Mix of 2.5 Y 8/1 white and 2.5 Y 8/4 Pale Yellow.
7 60-70	10				50-59.2: SAND (SP) Fine-med Sand, trace coarse sand wet, 10 YR 8/2 very pale brown 59.2-60': SAND (SP) medium Sand; some fine sand, little coarse sand, wet. 10 YR 8/8 Yellow.
					60-67.8: Silt (ML-H), trace clay, moist. 2.5 Y 7/6 Yellow from 60-66.4' Color change from 66.4-67.8 2.5 Y 6/3 Light yellowish Brown. Med Dense.
					67.8-70': Clayey Silt (CL), micaceous, moist, Med. Dense 1GY/5/5GY Greenish Gray "Pensacola Clay"

Notes:

Recommend "C" well screen from 58-60' bgs
"B" Well Screen fm 25-27' bgs
"A" Well Screen from 10-12' bgs or water table (4-6' bgs)

EAS ENVIRONMENTAL ASSESSMENT SERVICES
Wholly Owned Subsidiary of Natives of Kodiak

Environmental Assessment Solutions, LLC
Soil Boring Log

Project: Phase I Soil Sampling	Boring No.: 62-PZ02C
Project No.: J10103	Drilling Co.: Walker-Hill Environmental, Inc.
Address: Open Detonation Unit, Range C-62, Eglin AFB, FL	Driller: Jesse Bellanger
Logger: Andy Miller	Drilling Method: Sonic, Continuous Core, 4-inch dia core, 6-inch override
Date: May 06, 2024	Drilling Equip: 8150 LS Geoprobe Sonic Rig
Total Boring Depth: 70.0 ft bgs	Static Water During Drilling: ~5ft bgs based on nearby creek

Core Section	Recovery (ft)	Interval (ft)	PID (ppm)	Soil Profile	GEOLOGIC LOG
1 0-10 1130	5.9 of 10ft			0-10:	SAND (SP) medium, trace coarse, trace fine, trace silt, 2.5Y4/2 dark grayish brown to 10YR6/6 brownish yellow to 10YR 8/1 white. Loose, wet, no odor
2 10-20 1134	8.0 of 10ft				10-20 SAND (SP) medium, trace coarse, trace fine 10YR7/6 yellow with occasional 3" thick bands of 10R4/6 red and 10R8/1 white. Loose, wet, no odor
3 30-40 1140	8.2 of 10.0ft				20-30 SAND (SP) medium, trace to little fine, trace coarse. 2.5Y 7/4 pale yellow. Loose, wet, no odor, Trace fine rounded gravel
				amm 5-6-24	~~30-40~~ 30-31 same as 20-30
4 40-50 1148	10.0 of 10.0 ft				31-39.5 SILT (ML) trace to little fine sand. 2.5Y 7/6 yellow. Bottom 2ft has 1-2mm bands of 10R4/6 red. Loose, wet, no odor, non plastic
5 50-60 1205	9.1 ~~10.0~~ amm 5-6-24 of 10.0ft				39.5-40 SAND (SP) medium, trace coarse, trace fine 10R4/6 red and 1-2 mm bands of 10R 8/1 white. Loose, wet, no odor
6 60-70 ~~1210~~ 1228	9.0 of 10.0				40-50 SAND (SP) medium, trace fine, 2.5Y 7/4 yellow. Loose, wet, no odor
amm 5-6-24					

Notes:

Target Well Screen Depths:
A: 10-12: (good permeability, top of aquifer)
B: 29-31: good permeability above silt that is 31-39.5

EAS ENVIRONMENTAL ASSESSMENT SERVICES

C: 48-50: last permeable zone above silt from 50-70

Environmental Assessment Solutions, LLC
Soil Boring Log

Project: Phase I Soil Sampling	Boring No.: 62-PZ02C
Project No.: J10103	Drilling Co.: Walker-Hill Environmental, Inc.
Address: Open Detonation Unit, Range C-62, Eglin AFB, FL	Driller: Jesse Bellanger
Logger: Andy Miller	Drilling Method: Sonic, Continuous Core, 4-inch dia core, 6-inch override
Date: 05-06-2024	Drilling Equip: 8150LS Geoprobe Sonic Rig
Total Boring Depth: 70.0ft bgs	Static Water During Drilling: ~58ft bgs based on nearby creek

Core Section	Recovery (ft)	Interval (ft)	PID (ppm)	Soil Profile	GEOLOGIC LOG
					50-60 SILT (ML) trace fine sand, 2.5Y 7/6 yellow, soft, wet, no odor, non-plastic, micaceous
					60-68 SILT (ML) same as 50-60
					68-70 SILT (ML) trace fine sand, trace clay, 5Y5/2 olive gray, micaceous, moist, soft, no odor, non plastic. PENSACOLA CLAY

Notes:

Low permeability zones:
31-39.5: SILT (ML)
50-60 : SILT (ML)
60-70 : SILT (ML)

EAS ENVIRONMENTAL ASSESSMENT SERVICES

Environmental Assessment Solutions, LLC
Soil Boring Log

Project: Phase I Soil Sampling	Boring No.: 62-PZ03 (amm 05-09-24
Project No.: J10103	Drilling Co.: Walker-Hill Environmental, Inc.
Address: Open Detonation Unit, Range C-62, Eglin AFB, FL	Driller: Jesse Belkinger
Logger: Andy Miller	Drilling Method: Sonic, Continuous Core, 4-inch dia core, 6-inch override
Date: 05-09-2024	Drilling Equip: 8150LS Geoprobe Sonic Rig
Total Boring Depth: 70.0	Static Water During Drilling: ~4ft bisd on nearby creek

Core Section	Recovery (ft)	Interval (ft)	PID (ppm)	Soil Profile	GEOLOGIC LOG
1 0-10 0838	6.1 of 10.0				0-13 SAND (SP) medium, trace fine, trace silt, dry 0-1, wet 1-10, loose, no odor 0-1 10YR 6/2 light brownish gray 1-3 10YR 5/4 yellowish brown wet 3-4 10YR 7/2 light gray 4-10 10YR 6/6 brownish yellow 10-13 10YR 6/6 brownish yellow
2 10-20 0842	9.0 of 10.0				13-22 SAND (SP) medium, trace coarse, trace rounded, spherical fine gravel, trace fine sand, wet, loose, no odor 13-16 10YR 6/6 brownish yellow 16-22 10YR 8/1 white and 10YR 6/6 yellow
3 20-30 0858	10.0 of 10.0				22-34.5 SAND (SP) medium, trace fine, trace coarse, loose, wet, no odor 22-34.5 10YR 6/6 yellow 27: 3" layer 10R 4/4 weak red 40 amm 5.9.24
4 30-40 0906	10.0 of 10.0				34.5-50 SILT (ML) trace to little fine sand 2.5Y 7/6 yellow with occasional 1-2mm bands of 10R 4/4 weak red. Moist, medium soft, no odor, non plastic
5 40-50 0915	7.8 of 10.0				40-55.8 SAND (SP) medium, trace fine, trace coarse, occasional fine rounded spherical gravel. 10YR 7/6 yellow with occasional 3" thick layers of 10YR 8/1 white and 10R 4/4 weak red
6 50-60 0923	7.0 of 10.0				

Notes:

Target screen zone: 48.0-50.0 - deepest, most coarse sand zone above ML (silt) which goes to Pensacola clay. Also, similar depth as other deep piezos along Western branch

EAS ENVIRONMENTAL ASSESSMENT SERVICES
Wholly-Owned Subsidiary of Tetra Tech

Environmental Assessment Solutions, LLC
Soil Boring Log

Project: Phase I Soil Sampling	Boring No.: 67-PZ03
Project No.: J10103	Drilling Co.: Walker-Hill Environmental, Inc.
Address: Open Detonation Unit, Range C-62, Eglin AFB, FL	Driller: Jesse Bellanger
Logger: Andy Miller	Drilling Method: Sonic, Continuous Core, 4-inch dia core, 6-inch override
Date: 05-09-2024	Drilling Equip: 8150LS Geoprobe Sonic Rig
Total Boring Depth: 70.0	Static Water During Drilling: ~4ft based on nearby creek

Core Section	Recovery (ft)	Interval (ft)	PID (ppm)	Soil Profile	GEOLOGIC LOG
7 60-70 0933	7.3 of 10.0				55.8-67.5 SILT (ML) trace to little fine sand 10YR 7/8 yellow, micaceous, medium soft, no odor, nonplastic, moist, occasional fine gravel-size white, no change in lithology w/ color change 67.5-70.0 SILT (ML) trace to little fine sand, micaceous 5Y 4/1 dark gray, stiff, moist, no odor, PENSACOLA CLAY

Notes:

Bottom of piezometer (target depth): 5ft bgs

EAS ENVIRONMENTAL ASSESSMENT SERVICES
Wholly Owned Subsidiary of Tetra Tech

Environmental Assessment Solutions, LLC
Soil Boring Log

Project: Phase I Soil Sampling	Boring No.: 62-PZ04C
Project No.: J10103	Drilling Co.: Walker-Hill Environmental, Inc.
Address: Open Detonation Unit, Range C-62, Eglin AFB, FL	Driller: Jesse Bellanger
Logger: Andy Miller	Drilling Method: Sonic, Continuous Core, 4-inch dia core, 6-inch override
Date: 05-07-2024	Drilling Equip: 8150LS Geoprobe Sonic Rig
Total Boring Depth: 90.0	Static Water During Drilling: ~3ft based on adjacent creek

Core Section	Recovery (ft)	Interval (ft)	PID (ppm)	Soil Profile	GEOLOGIC LOG
1 0-10 0823	6.6 of 10.0				0-10 SAND(SP) medium, trace to little fine, trace silt 5Y6/3 pale olive. Trace clay 6-8 ft. Loose to firm, wet, no odor
2 10-20 0825	8.7 of 10.0				10-20 SAND(SP) medium, trace to little fine. 5Y8/1 white; 10-12: 5YR8/1 white 12-13: 10R4/6 red 13-14: 5Y8/1 white 14-20: 10YR7/8 yellow Loose, wet, no odor
3 20-30 0832	7.9 of 10.0			qam 05-07-2024	10-20-30 SAND(SP) medium, trace fine. 20-22: 10YR7/8 yellow 22-30: 10YR8/1 white thin band (0.25" thick) 10R3/6 dark red at 28ft. Loose, wet, no odor
4 30-40 0842	8.0 of 10.0			qam 5-7-24	30-40 SAND(SP) fine-med grain size 10YR8/1 white. Loose, wet, no odor
5 40-50 0853	8.2 of 10.0			qam 5-7-24	40-50; 40-41: SAND(SP) same as 30-40 41-50: SILT(ML), trace to little fine sand 10YR8/1 white with 1mm bands of 10R6/6 light red 49-50. Soft, non-plastic, wet, no odor. Fine sand content increases to SP-SM 49-50
6 50-60 0913	7.9 of 10.2				

Notes:

Target Screen Settings: 6-8 am 5-7-24
A= 8-10: below trace clay at ~~8~~ 8; deep enough to get good surface soil
B= 35-37: in SP, mid-way between A zone and C zone

C= 61-63: last permeable sand zone (SP) above ML which goes to Pensacola Clay

Environmental Assessment Solutions, LLC
Soil Boring Log

Project: Phase I Soil Sampling	Boring No.: 62-PZ04C
Project No.: J10103	Drilling Co.: Walker-Hill Environmental, Inc.
Address: Open Detonation Unit, Range C-62, Eglin AFB, FL	Driller: Jesse Bellanger
Logger: Andy Miller	Drilling Method: Sonic, Continuous Core, 4-inch dia core, 6-inch override
Date: May 07 2024	Drilling Equip: 8150 LS Geoprobe Sonic Rig
Total Boring Depth: 90.0 finished 5-7-24 90.0	Static Water During Drilling: ~35ft based on nearby creek

Core Section	Recovery (ft)	Interval (ft)	PID (ppm)	Soil Profile	GEOLOGIC LOG
7 60-70 0925	7.6 of 10.0				50-58 SAND (SP) fine, trace silt, silt content decreases with depth. 10YR 8/1 white. Loose, wet, no odor 58-60 SAND (SP) medium, trace fine, trace coarse 10YR 8/1 white except for 1" thick band of 10R 4/6 red at 58 ft bgs. Loose, wet, no odor
8 70-80 0937	10.0 of 10.0				60-64 SAND (SP) same as 58-60 64-70 SILT (ML) trace fine sand 2.5Y 7/6 yellow, soft, moist, no odor, non-plastic
9 80-90 1008 End of drilling	10.0 of 10.0				70-80 SILT (ML) same as 64-70 : trace fine sand, 2.5Y 7/6 yellow, soft, moist, no odor, non plastic 80-81.5 SILT (ML) same as 64-70
Total depth of borehole = 90.0 ft bgs					81.5-90.0 SILT (ML) little fine sand, micaceous, 5Y 5/1 gray, stiff to very stiff. PENSACOLA CLAY

Notes:

EAS ENVIRONMENTAL ASSESSMENT SERVICES

Environmental Assessment Solutions, LLC
Soil Boring Log

Project: Phase I Soil Sampling	Boring No.: 62-PZ05C
Project No.: J10103	Drilling Co.: Walker-Hill Environmental, Inc.
Address: Open Detonation Unit, Range C-62, Eglin AFB, FL	Driller: Jesse Belknap
Logger: Andy Miller	Drilling Method: Sonic, Continuous Core, 4-inch dia core, 6-inch override
Date: 05-08-2024	Drilling Equip: 8150LS Geoprobe Sonic Rig
Total Boring Depth: 85.0	Static Water During Drilling: ~3ft bgs based on nearby creek

Core Section	Recovery (ft)	Interval (ft)	PID (ppm)	Soil Profile	GEOLOGIC LOG
1 0-10 0845	5.0 of 10.0				0-9 Tree or tree root 9-40 SAND(SP) Medium, trace fine 5Y6/2 light olive gray, Firm, wet, no odor 10-15: 5Y 8/1 white, loose
2 10-20 0854	7.2 of 10.0				15-16: 7.5YR 5/6 strong brown, loose 16-20: 10YR 7/8 yellow, loose 16.5: 2" thick layer 10YR 8/1 white, loose 20-22: 10YR 7/8 yellow, loose 22-30: 10YR 8/1 white, loose
3 20-30 0900	8.4 of 10.0				At 22 ft: cobble-size piece of steel, rusty, 10YR 4/3 brown, angular, non-spherical, elongated 30-40: 10YR 8/1 white, loose, much of core slipped out before getting bag under core barrel
4 30-40 0920	5.3 of 10.0				39-40: 10YR 8/8 yellow 40-41 SAND (SP) medium, trace coarse, trace fine rounded spherical gravel 10YR 7/8 yellow, loose, wet, no odor
5 40-50 0929	8.0 of 10.0				41-42 SAND(SP) medium, trace coarse, trace fine 10YR 8/1 white, loose, wet, no odor
6 50-60 0942	6.2 of 10.0				42-49.5 SILT (ML) trace fine sand 10YR 8/3 very pale brown to 10R6/4 pale red, soft, non plastic, wet to moist

Notes: Target well screen intervals:

A: 8-10: in water table, SAND (SP) and same as PZ04A

B: 33-35: in SAND (SP) and mid-way between A zone and B zone

C: 58-60: near bottom of SAND (SP) before getting into silt (ML) that leads to Pensacola Clay

EAS ENVIRONMENTAL ASSESSMENT SERVICES
Wholly Owned Subsidiary of Natives of Kodiak

Environmental Assessment Solutions, LLC
Soil Boring Log

Project: Phase I Soil Sampling	Boring No.: GZ-PZ05C
Project No.: J10103	Drilling Co.: Walker-Hill Environmental, Inc.
Address: Open Detonation Unit, Range C-62, Eglin AFB, FL	Driller: Jesse Bellanger
Logger: Andy Miller	Drilling Method: Sonic, Continuous Core, 4-inch dia core, 6-inch override
Date: 05-08-2024	Drilling Equip: 8150LS Geoprobe Sonic Rig
Total Boring Depth: 85.0	Static Water During Drilling: ~3 ft bgs based on nearby creek

Core Section	Recovery (ft)	Interval (ft)	PID (ppm)	Soil Profile	GEOLOGIC LOG
7 60-70 0951	10.0 of 10.0				49.5-50 SAND (SP) medium, trace coarse, trace fine 10R8/1 white, loose, wet, no odor 50.0-57.5 SAND (SP) fine, trace silt, trace medium sand 10R8/1 white. Loose, wet, no odor 57.5-63.5 SAND (SP) medium and coarse 10R8/1 white with 1" bands of 7.5YR 6/6 reddish yellow. SAND is coarser in the reddish yellow bands. loose, wet, no odor 63.5-80.0 SILT (ML) trace fine sand 10YR 8/8 yellow with ~3% coarse sand size white round inclusions (no change in lithology). Soft, non-plastic, moist to wet, no odor micaceous starting at 70 ft bgs color change to 10YR 6/3 pale brown at 78 ft bgs 80.0-85.0 SILT (ML) trace to little fine sand 5Y4/1 dark gray, non-plastic, moist, stiff PENSACOLA CLAY micaceous
8 70-80 1003	9.5 of 10.0				
9 80-85 1035	5.0 of 5.0				
Notes:					

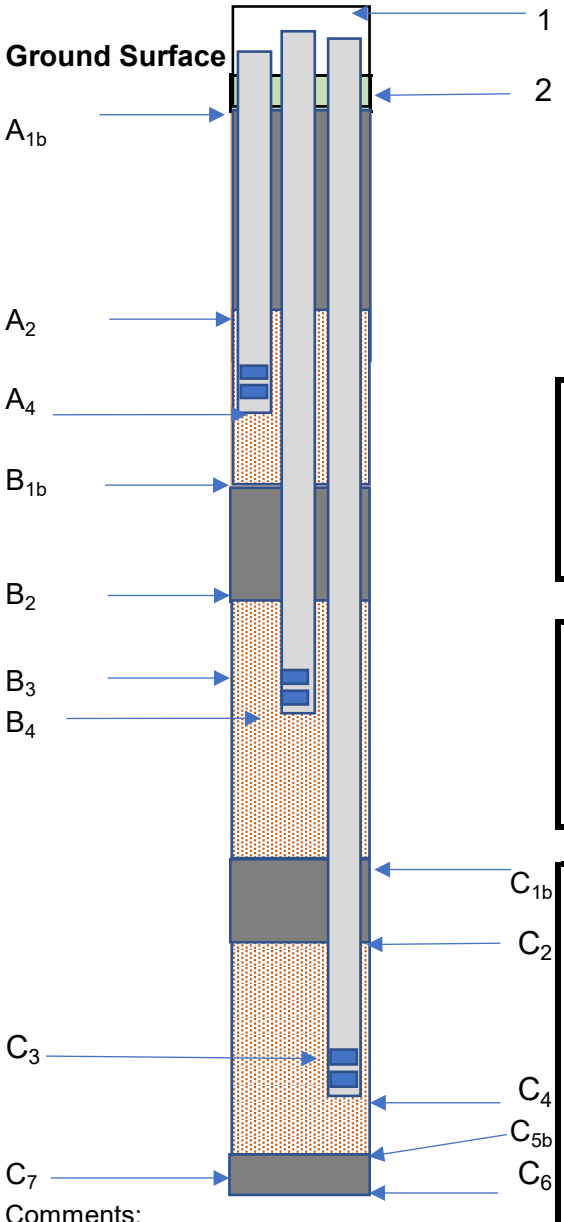
EAS ENVIRONMENTAL ASSESSMENT SERVICES
Wholly Owned Subsidiary of Haskell

EAS ENVIRONMENTAL ASSESSMENT SERVICES

Project:Piezometer Installation	Well Identification: 62-PZ01A/B/C
Project Number: J10103.008	

WELL CONSTRUCTION DIAGRAM

Client: USACE Omaha District/Eglin AFB	Location: Range C-62, Eglin Air Force Base
Drilling Company: Walker Hill Environmental, Inc.	Associated Boring Log: 62-PZ01C
Drilling Method and Equipment: Rotosonic, 4" core barrel x 6" override casing	
Drilling Date(s): 5/3/2024 to 5/6/2024	Well Construction Date: 5/6/2024
KGS Field Personnel: Russ McCormick	"A" Riser Elevation (NAV88, US Survey Ft): 160.98
Ground Elevation (NAVD88, US Survey Ft): 157.7	"B" Riser Elevation (NAV88, US Survey Ft): 161.09
Casing Elevation (NAVD88, US Survey Ft) 160.96	"C" Riser Elevation (NAV88, US Survey Ft): 161.02



1. Well Protection Type:	6" x 6" Aluminum Stickup
Stickup Height:	3.26 feet
2. Concrete Pad:	2' x 2' x 6"
3. Well Materials:	1.5-in Sch 40 PVC, Flush Threaded
4. Well Screen:	1.5-in Sch 40 PVC, 0.010-in mill slotted
5. Sand Pack Size:	Consolidate Aggregates, 20-40 Silica Sand
6. Bentonite Seal:	Enviroplug Medium Bentonite Chips

A	A_{1a}.Type of Seal:	Bentonite
	A_{1b}. Top/Bottom of Seal:	0-8 feet bgs
	A_2. Top/Bottom of Filter Pack:	8-13 feet bgs
	A_3. Screen interval:	10.3-12.3 feet bgs
	A_4. Bottom of Sump:	12.8 feet bgs

B	B_{1a}.Type of Seal:	Bentonite
	B_{1b}. Top/Bottom of Seal:	13-23 feet bgs
	B_2. Top/Bottom of Filter Pack:	23-28 feet bgs
	B_3. Screen interval:	25.6-27.6 feet bgs
	B_4. Bottom of Sump:	28.1 feet bgs

C	C_{1a}.Type of Seal:	Bentonite
	C_{1b}. Top/Bottom of Seal:	28-55.5 feet bgs
	C_2. Top/Bottom of Filter Pack:	28-64 feet bgs
	C_3. Screen interval:	60.6-62.6 feet bgs
	C_4. Bottom of Sump:	63.1 feet bgs
	C_{5a}. Type of Seal:	Bentonite
	C_{5b}.Top/Bottom of Seal:	64-70 feet bgs
	C_6. Bottom of Boring:	70 feet bgs
	C_7. Diameter of borehole:	6.75-inch

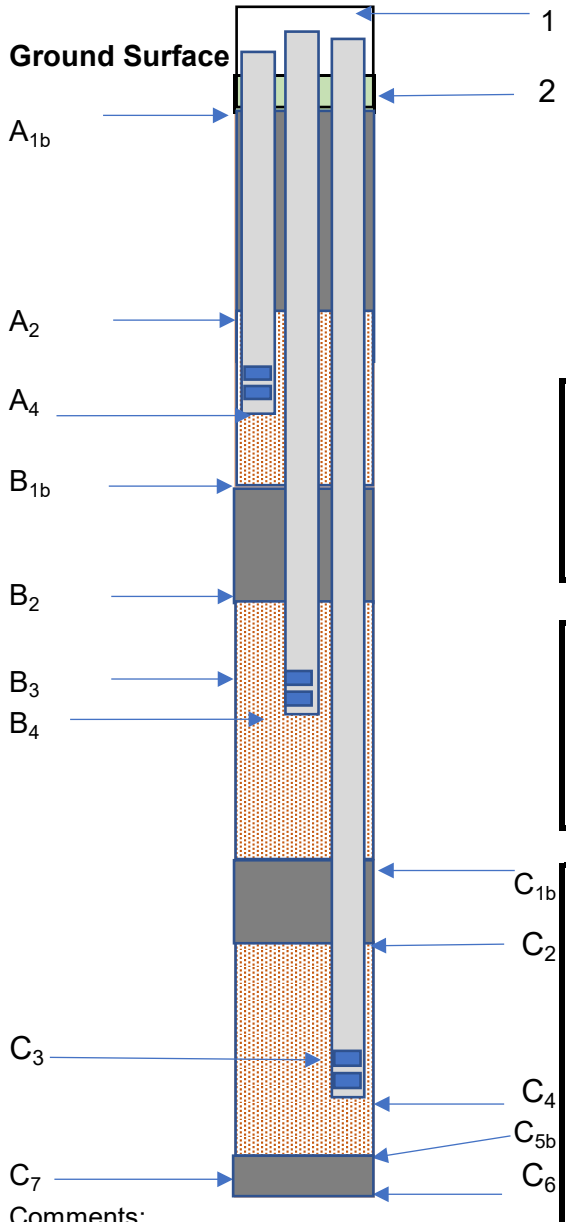
Comments:

DTW During Drilling: ~2 feet bgs.

EAS ENVIRONMENTAL ASSESSMENT SERVICES	Project:Piezometer Installation	Well Identification: 62-PZ02A/B/C
	Project Number: J10103.008	

WELL CONSTRUCTION DIAGRAM

Client: USACE Omaha District/Eglin AFB	Location: Range C-62, Eglin Air Force Base
Drilling Company: Walker Hill Environmental, Inc.	Associated Boring Log: 62-PZ02C
Drilling Method and Equipment: Rotosonic, 4" core barrel x 6" override casing	
Drilling Date(s): 5/6/2024	Well Construction Date: 5/6/2024
KGS Field Personnel: Russ McCormick	"A" Riser Elevation (NAV88, US Survey Ft): 148.98
Ground Elevation (NAVD88, US Survey Ft): 145.50	"B" Riser Elevation (NAV88, US Survey Ft): 149.07
Casing Elevation (NAVD88, US Survey Ft): 148.96	"C" Riser Elevation (NAV88, US Survey Ft): 148.85



1. Well Protection Type:	6" x 6" Aluminum Stickup
Stickup Height:	3.46 feet
2. Concrete Pad:	2' x 2' x 6"
3. Well Materials:	1.5-in Sch 40 PVC, Flush Threaded
4. Well Screen:	1.5-in Sch 40 PVC, 0.010-in mill slotted
5. Sand Pack Size:	Consolidate Aggregates, 20-40 Silica Sand
6. Bentonite Seal:	Enviroplug Medium Bentonite Chips

A	A_{1a}.Type of Seal:	Bentonite
	A_{1b}. Top/Bottom of Seal:	0-8.2 feet bgs
	A_2. Top/Bottom of Filter Pack:	8.2-13 feet bgs
	A_3. Screen interval:	10.4-12.4 feet bgs
	A_4. Bottom of Sump:	12.9 feet bgs

B	B_{1a}.Type of Seal:	Bentonite
	B_{1b}. Top/Bottom of Seal:	13-27 feet bgs
	B_2. Top/Bottom of Filter Pack:	27-32 feet bgs
	B_3. Screen interval:	28.3-30.3 feet bgs
	B_4. Bottom of Sump:	30.8 feet bgs

C	C_{1a}.Type of Seal:	Bentonite
	C_{1b}. Top/Bottom of Seal:	32-46 feet bgs
	C_2. Top/Bottom of Filter Pack:	32-50.2 feet bgs
	C_3. Screen interval:	49.7-51.7 feet bgs
	C_4. Bottom of Sump:	52.2 feet bgs
	C_{5a}. Type of Seal:	Bentonite
	C_{5b}.Top/Bottom of Seal:	50.2-70 feet bgs
	C_6. Bottom of Boring:	70 feet bgs
	C_7. Diameter of borehole:	6.75-inch

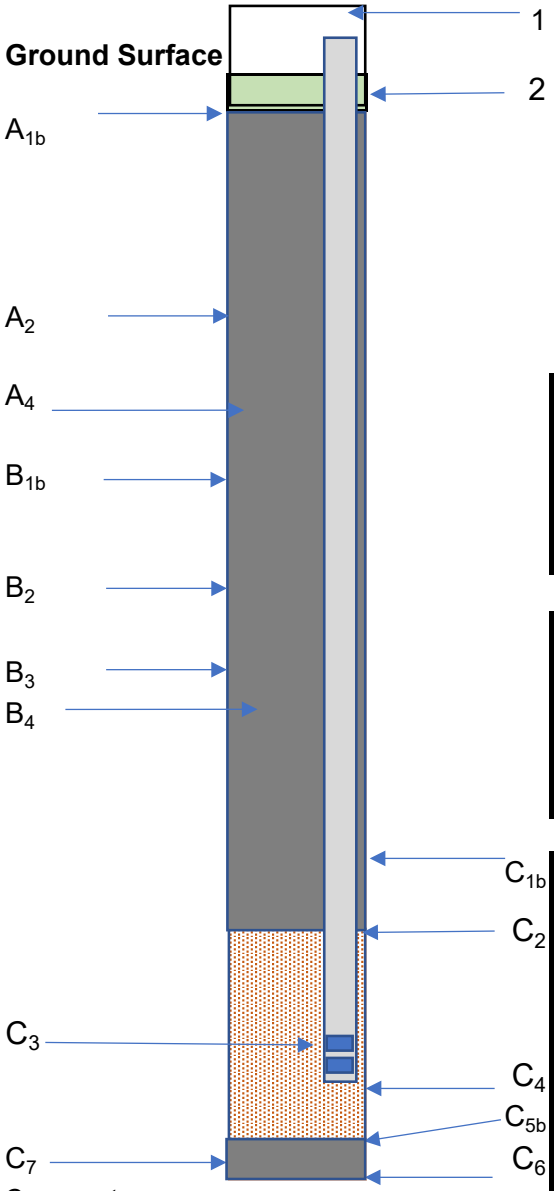
Comments:

DTW During Drilling: ~5 feet bgs.

EAS ENVIRONMENTAL ASSESSMENT SERVICES	Project:Piezometer Installation	Well Identification: 62-PZ03
	Project Number: J10103.008	

WELL CONSTRUCTION DIAGRAM

Client: USACE Omaha District/Eglin AFB	Location: Range C-62, Eglin Air Force Base
Drilling Company: Walker Hill Environmental, Inc.	Associated Boring Log: 62-PZ03
Drilling Method and Equipment: Rotosonic, 4" core barrel x 6" override casing	
Drilling Date(s): 5/9/2024	Well Construction Date: 5/9/2024
KGS Field Personnel: Russ McCormick	"A" Riser Elevation (NAV88, US Survey Ft): 154.97
Ground Elevation (NAVD88, US Survey Ft): 151.20	"B" Riser Elevation (NAV88, US Survey Ft): N/A
Casing Elevation (NAVD88, US Survey Ft): 154.93	"C" Riser Elevation (NAV88, US Survey Ft): N/A



1. Well Protection Type:	6" x 6" Aluminum Stickup	
Stickup Height:	3.73 feet	
2. Concrete Pad:	2' x 2' x 6"	
3. Well Materials:	1.5-in Sch 40 PVC, Flush Threaded	
4. Well Screen:	1.5-in Sch 40 PVC, 0.010-in mill slotted	
5. Sand Pack Size:	Consolidate Aggregates, 20-40 Silica Sand	
6. Bentonite Seal:	Enviroplug Medium Bentonite Chips	

A	A_{1a}.Type of Seal:	N/A	
	A_{1b}. Top/Bottom of Seal:	N/A	feet bgs
	A_2. Top/Bottom of Filter Pack:	N/A	feet bgs
	A_3. Screen interval:	N/A	feet bgs
	A_4. Bottom of Sump:	N/A	eet bgs

B	B_{1a}.Type of Seal:	N/A	
	B_{1b}. Top/Bottom of Seal:	N/A	feet bgs
	B_2. Top/Bottom of Filter Pack:	N/A	feet bgs
	B_3. Screen interval:	N/A	feet bgs
	B_4. Bottom of Sump:	N/A	feet bgs

C	C_{1a}.Type of Seal:	Bentonite
	C_{1b}. Top/Bottom of Seal:	0-45.5 feet bgs
	C_2. Top/Bottom of Filter Pack:	0-51 feet bgs
	C_3. Screen interval:	48.4-50.4 feet bgs
	C_4. Bottom of Sump:	50.9 feet bgs
	C_{5a}. Type of Seal:	Bentonite
	C_{5b}.Top/Bottom of Seal:	51-70 feet bgs
	C_6. Bottom of Boring:	70 feet bgs
	C_7. Diameter of borehole:	6.75-inch

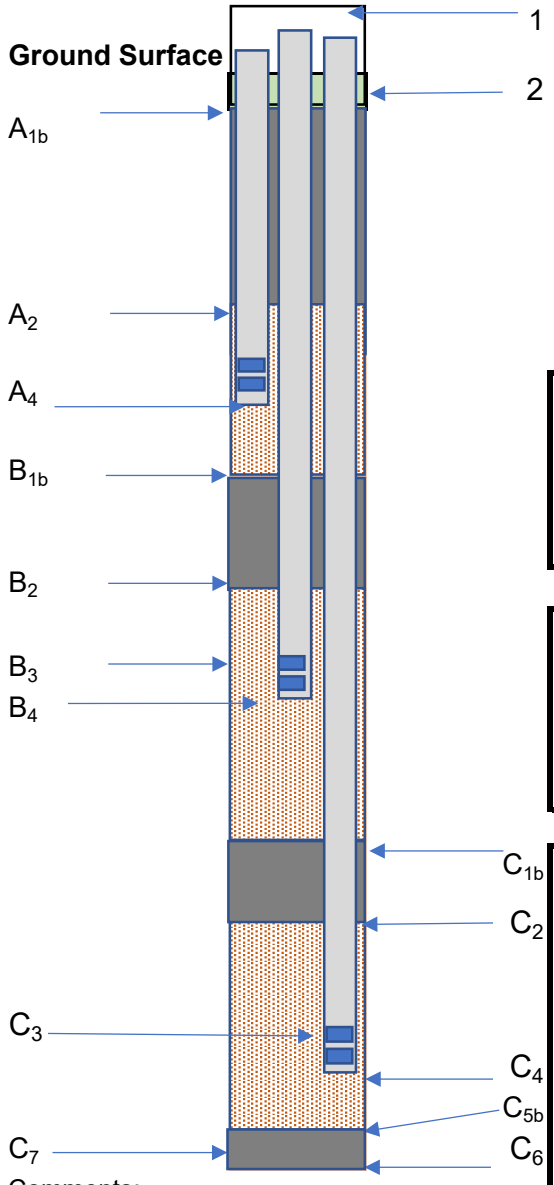
Comments:

DTW During Drilling: ~4 feet bgs.

EAS ENVIRONMENTAL ASSESSMENT SERVICES	Project:Piezometer Installation	Well Identification: 62-PZ04A/B/C
	Project Number: J10103.008	

WELL CONSTRUCTION DIAGRAM

Client: USACE Omaha District/Eglin AFB	Location: Range C-62, Eglin Air Force Base
Drilling Company: Walker Hill Environmental, Inc.	Associated Boring Log: 62-PZ04C
Drilling Method and Equipment: Rotosonic, 4" core barrel x 6" override casing	
Drilling Date(s): 5/7/2024	Well Construction Date: 5/7/2024
KGS Field Personnel: Russ McCormick	"A" Riser Elevation (NAV88, US Survey Ft): 161.23
Ground Elevation (NAVD88, US Survey Ft): 158.20	"B" Riser Elevation (NAV88, US Survey Ft): 161.29
Casing Elevation (NAVD88, US Survey Ft): 161.27	"C" Riser Elevation (NAV88, US Survey Ft): 161.33



1. Well Protection Type:	6" x 6" Aluminum Stickup
Stickup Height:	3.07 feet
2. Concrete Pad:	2' x 2' x 6"
3. Well Materials:	1.5-in Sch 40 PVC, Flush Threaded
4. Well Screen:	1.5-in Sch 40 PVC, 0.010-in mill slotted
5. Sand Pack Size:	Consolidate Aggregates, 20-40 Silica Sand
6. Bentonite Seal:	Enviroplug Medium Bentonite Chips

A	A_{1a}.Type of Seal:	Bentonite
	A_{1b}. Top/Bottom of Seal:	0-6 feet bgs
	A_2. Top/Bottom of Filter Pack:	6-11 feet bgs
	A_3. Screen interval:	8.4-10.4 feet bgs
	A_4. Bottom of Sump:	10.9 feet bgs

B	B_{1a}.Type of Seal:	Bentonite
	B_{1b}. Top/Bottom of Seal:	13-33 feet bgs
	B_2. Top/Bottom of Filter Pack:	33-38 feet bgs
	B_3. Screen interval:	35-37 feet bgs
	B_4. Bottom of Sump:	37.5 feet bgs

C	C_{1a}.Type of Seal:	Bentonite
	C_{1b}. Top/Bottom of Seal:	38-59 feet bgs
	C_2. Top/Bottom of Filter Pack:	38-65 feet bgs
	C_3. Screen interval:	62.7-64.7 feet bgs
	C_4. Bottom of Sump:	65.2 feet bgs
	C_{5a}. Type of Seal:	Bentonite
	C_{5b}.Top/Bottom of Seal:	65-90 feet bgs
	C_6. Bottom of Boring:	90 feet bgs
	C_7. Diameter of borehole:	6.75-inch

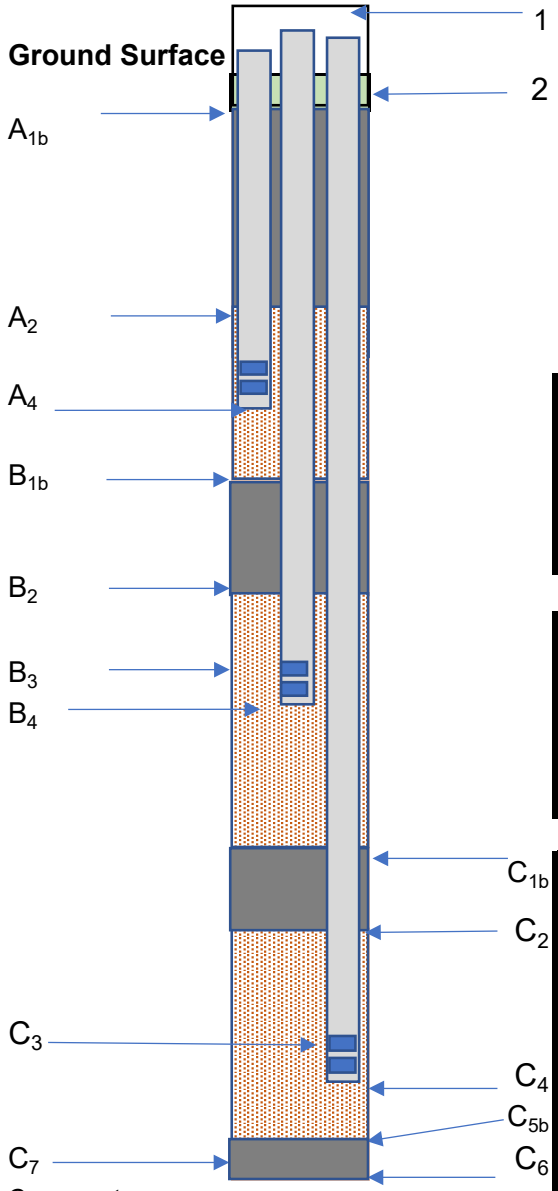
Comments:

DTW During Drilling: ~3 feet bgs.

EAS ENVIRONMENTAL ASSESSMENT SERVICES	Project:Piezometer Installation	Well Identification: 62-PZ05A/B/C
	Project Number: J10103.008	

WELL CONSTRUCTION DIAGRAM

Client: USACE Omaha District/Eglin AFB	Location: Range C-62, Eglin Air Force Base
Drilling Company: Walker Hill Environmental, Inc.	Associated Boring Log: 62-PZ05C
Drilling Method and Equipment: Rotosonic, 4" core barrel x 6" override casing	
Drilling Date(s): 5/8/2024	Well Construction Date: 5/8/2024
KGS Field Personnel: Russ McCormick	"A" Riser Elevation (NAV88, US Survey Ft): 161.54
Ground Elevation (NAVD88, US Survey Ft): 158.60	"B" Riser Elevation (NAV88, US Survey Ft): 161.43
Casing Elevation (NAVD88, US Survey Ft): 161.63	"C" Riser Elevation (NAV88, US Survey Ft): 161.50



	1. Well Protection Type:	6" x 6" Aluminum Stickup
	Stickup Height:	3.03 feet
	2. Concrete Pad:	2' x 2' x 6"
	3. Well Materials:	1.5-in Sch 40 PVC, Flush Threaded
	4. Well Screen:	1.5-in Sch 40 PVC, 0.010-in mill slotted
	5. Sand Pack Size:	Consolidate Aggregates, 20-40 Silica Sand
	6. Bentonite Seal:	Enviroplug Medium Bentonite Chips
A	A_{1a}.Type of Seal:	Bentonite
	A_{1b}. Top/Bottom of Seal:	0-6 feet bgs
	A_2. Top/Bottom of Filter Pack:	6-11 feet bgs
	A_3. Screen interval:	8-1-10.1 feet bgs
	A_4. Bottom of Sump:	10.6 feet bgs
B	B_{1a}.Type of Seal:	Bentonite
	B_{1b}. Top/Bottom of Seal:	11-31 feet bgs
	B_2. Top/Bottom of Filter Pack:	31-36.5 feet bgs
	B_3. Screen interval:	33.1-35.1 feet bgs
	B_4. Bottom of Sump:	35.6 feet bgs
C	C_{1a}.Type of Seal:	Bentonite
	C_{1b}. Top/Bottom of Seal:	36.5-56 feet bgs
	C_2. Top/Bottom of Filter Pack:	36.5-61 feet bgs
	C_3. Screen interval:	58.1-60.1 feet bgs
	C_4. Bottom of Sump:	60.6 feet bgs
	C_{5a}. Type of Seal:	Bentonite
	C_{5b}.Top/Bottom of Seal:	61-85 feet bgs
	C_6. Bottom of Boring:	85 feet bgs
	C_7. Diameter of borehole:	6.75-inch

Comments:

DTW During Drilling: ~3 feet bgs.

Appendix M Environmental Monitoring Plan

ENVIRONMENTAL MONITORING PLAN
HAZARDOUS WASTE PERMIT
RENEWAL APPLICATION
MARCH 2025
OPEN DETONATION UNIT, RANGE C-62
EGLIN AIR FORCE BASE, FLORIDA

SUBMITTED TO:

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
HAZARDOUS WASTE PERMITTING AND PROGRAMS
2600 BLAIR STONE ROAD, TALLAHASSEE, FL 32399-2400

FL8570024366
Permit #: 006176-XX-XX

Prepared by:

KOMAN Government Solutions, LLC
1002 N. Eglin Pkwy
Shalimar, Florida 32579

March 2025

TABLE OF CONTENTS

LIST OF EXHIBITS ..... **ii**

LIST OF FIGURES ..... **ii**

LIST OF TABLES ..... **ii**

LIST OF ATTACHMENTS ..... **ii**

ACRONYMS AND ABBREVIATIONS ..... **iii**

CERTIFICATION PAGE ..... **iv**

1.0 INTRODUCTION **1-1**

2.0 BACKGROUND **2-1**

3.0 CONTAMINANTS OF POTENTIAL CONCERN (COPCs) **3-1**
3.1 Sampling Investigation Summary 3-1
3.1.1 Soil 3-1
3.1.2 Groundwater 3-1
3.1.3 Porewater 3-2
3.1.4 Surface Water 3-2
3.2 COPC Selection 3-2

4.0 COPC FATE AND TRANSPORT **4-1**
4.1 Plume Attenuation 4-1
4.2 Plume Configuration 4-1

5.0 GROUNDWATER TRAVEL TIME AND SAMPLING FREQUENCY EVALUATION **5-1**

6.0 ANALYTICAL PARAMETER SELECTION **6-1**
6.1 Groundwater Monitoring 6-1
6.2 Surface Water and Porewater Monitoring 6-2
6.3 Recommended Analytical Parameters and Monitoring Locations 6-3

7.0 PROPOSED NEWLY-INSTALLED MONITORING WELLS **7-1**
7.1 Monitoring Well Locations and Rationale 7-1
7.2 Monitoring Well Installation Methods 7-1
7.3 Schedule, New Monitoring Wells 7-2
7.4 Monitoring Well Sampling, New Monitoring Wells 7-2

8.0 COMPLIANCE MONITORING PROGRAM **8-1**
8.1 Monitoring Well Network 8-1
8.2 Sampling Frequency 8-1
8.3 Field and Laboratory Parameters 8-1
8.4 Analytical Laboratory Certifications 8-2
8.5 Equipment Calibration 8-2
8.6 Groundwater Sampling Standard Operating Procedures (SOPs) 8-2
8.7 Collection of Monitoring Well Water Levels and Total Depths 8-2
8.8 Investigative Derived Waste (IDW) 8-3
8.9 Groundwater Reporting Requirements 8-3
8.10 Groundwater Monitoring Well Operation and Maintenance 8-4
8.11 Groundwater Monitoring Well Security 8-4
8.12 Quality Assurance/Quality Control (QA/QC) Samples 8-4
8.13 Sampling Notifications to Florida Department of Environmental Protection 8-4

9.0 REFERENCES **9-1**

LIST OF EXHIBITS

Exhibit 4-1 Groundwater Trend Analysis (RDX, Perchlorate, and Aluminum) 4-2
Exhibit 4-2 Western and Eastern Branch Surface Water and Porewater Trend Analysis (Perchlorate) 4-3
Exhibit 6-1 Current Operating Permit (006176-12-HO) and Most Recent Analytical Parameters and Monitoring Locations 6-1
Exhibit 6-2 Recommendations to Retain or Delete Analytical Parameters for New Operating Permit (006176-XX-XX) 6-1
Exhibit 6-3 Recommended Analytical Parameters and Monitoring Locations for New Operating Permit (006176-XX-XX) 6-2
Exhibit 6-4 Current Operating Permit (006176-12-HO) and Most Recent Analytical Parameters and Monitoring Locations 6-2
Exhibit 6-5 Recommendations to Retain or Delete Analytical Parameters for New Operating Permit (006176-XX-XX) 6-2
Exhibit 7-1 Proposed New Monitoring Well Screen Depth Summary and Rationale 7-3

LIST OF FIGURES

Figure 1 Site Location
Figure 2 Site Layout
Figure 3 Monitoring Well Locations, RDX Plume, July/September 2024
Figure 4 Monitoring Well Locations, Perchlorate Plume, July/September 2024

LIST OF TABLES

Table 1 Monitoring Well Construction Details and Compliance Sampling Recommendations
Table 2 Compliance Monitoring Program

LIST OF ATTACHMENTS

Attachment 1 Field Forms
Attachment 2 Disposal of Investigative Derived Waste (IDW) Approval Email

ACRONYMS AND ABBREVIATIONS

AFB	Air Force Base
CCV	continuing calibration verification
COC	contaminant of concern
COPC	contaminant of potential concern
EAS	Environmental Assessment Services, LLC
EMP	Environmental Monitoring Plan
EMR	Environmental Monitoring Report
EPA	Environmental Protection Agency
EIA	Erosion Impact Area
FDEP	Florida Department of Environmental Protection
ft	feet
GWPS	Groundwater Protection Standard
GWTCL	ground water cleanup target level
ICV	initial calibration verification
IDW	Investigative Derived Waste
NELAP	National Environmental Laboratory Accreditation Program
NTUs	nephelometric turbidity units
OB	open burn
OD	open detonation
ODU	open detonation unit
ORP	oxidation-reduction potential
PCB	polychlorinated biphenyl
pH	potential of hydrogen
PPE	personal protective equipment
PVC	polyvinyl chloride
QA	quality assurance
QC	quality control
RCRA	Resource Conservation and Recovery Act
RDX	hexahydro-1,2-5-trinitro-1,2,5-triazine
RSL	regional screening level
SCTL	soil cleanup target level
SOP	standard operating procedure
SWCTL	surface water cleanup target level
SVOC	semi volatile organic compound
TDS	total dissolved solids
USACE	U.S. Army Corps of Engineers
UXO	unexploded ordnance
VOC	volatile organic compound
VP	vertical profile
WACS	Water Assurance Compliance System

CERTIFICATION PAGE

Environmental Monitoring Plan
Hazardous Waste Permit
Renewal Application
Range C-62 (Part II)
Eglin Air Force Base, Florida

FL8570024366
Permit #: 006176-HO-12

Under Contract to:
U.S. Army Corps of Engineers, Mobile District
109 St. Joseph Street
Mobile, Alabama 36602

Prepared by:
KOMAN Government Solutions, LLC
1002 N. Eglin Pkwy, Shalimar, Florida 32579
850-613-6800

This *Environmental Monitoring Plan, Hazardous Waste Permit, Renewal Application, Range C-62 (Part II), Eglin Air Force Base, Florida* was prepared under my supervision and review. To the best of my knowledge, all of the work performed for this plan is in accordance with applicable state and federal regulations and accepted professional practices.

Andrew M. Miller
Florida Professional Geologist No. 2564
KOMAN Government Solutions, LLC

Feb 11, 2025
Date

1.0 INTRODUCTION

This Environmental Monitoring Plan (EMP) for compliance monitoring accompanies the Eglin Air Force Base (AFB) Range C-62 Hazardous Waste Permit Renewal Application for the disposal of military munitions and explosives through open detonation (OD). The permit has an issue date of 2025. This EMP describes sampling locations, media, analytical methods, and frequency. The results from each sampling event will be described and evaluated in an Environmental Monitoring Report (EMR) that will be submitted to the Florida Department of Environmental Protection (FDEP) within 90 days of the completion of field activities.

Each EMR will contain a section that will include recommendations to enhance and refine the EMP (e.g., the addition or deletion of wells from the plan, changes in sampling frequency, and/or changes in contaminants of concern and associated laboratory analytical parameters). The recommendations will be based on sampling results and statistical trends. FDEP will have an opportunity to comment on the recommendations prior to the next sampling event.

Sampling under this EMP will take into effect upon approval of the permit application and this EMP.

2.0 BACKGROUND

Open detonation (OD) of military munitions and explosives-contaminated items is performed at a designated area known as the Open Detonation Unit (ODU) on Range C-62 on Eglin AFB as shown in **Figure 1** and **Figure 2**. Open detonation activities do not utilize any type of equipment or engineered treatment units. Detonation occurs on top of the ground surface within a cleared 100-by-200 feet (ft) area marked by a T-post in each corner. The area is almost completely devoid of vegetation and is surrounded by a circular berm that is maintained to prevent surface water run-on and run-off. Craters developed by OD operations are filled with surrounding soil shortly after each OD event.

A Resource Conservation and Recovery Act (RCRA) Part A permit application for open burn (OB) and OD of explosive wastes at Eglin Air AFB was submitted to Environmental Protection Agency (EPA) Region IV and FDEP in June 1989. The FDEP accepted the removal of the OB kettles from Operation Permit HO46-286388 on October 13, 2000. The burn kettles were removed in November 2000. Open detonation has been performed at Range C-62 since January 1995 and continues to the present.

Based on recent environmental investigations as described in EAS, 2024a (sampling performed in August 2024 which is the most recent EMR); EAS, 2024b (the results from Phase II vertical profile [VP] sampling); and EAS, 2024c (soil sampling within and adjacent to the OD Area), OD operations have resulted in the release of perchlorate and hexaydro-1,3,5-trinitro-1,3,5-triazine (RDX) to the environment. Groundwater, porewater, surface water, and soil sampling show that OD operations have contributed perchlorate and RDX to the environment. The target training area (TT-1), which is hydraulically upgradient of the ODU, may also contribute perchlorate and RDX to the environment.

The permit currently in effect is 006176-HO-12, which was issued by the FDEP on March 11, 2022. The expiration date of the permit currently in effect is September 1, 2025. This EMP would take into effect immediately, upon approval of the Permit Application by FDEP.

3.0 CONTAMINANTS OF POTENTIAL CONCERN (COPCs)

In order to eliminate or consider contaminants of potential concern (COPCs) for future compliance monitoring, various sampling and site assessment activities have occurred from July 2021 to October 2024. The investigations included 1) routine compliance groundwater, surface water, and porewater sampling under the current operating Permit (006176-HO-12) (EAS, 2024a), 2) groundwater plume delineation through vertical profile sampling (EAS, 2024b), and 3) soil sampling within and surrounding the immediate vicinity of the source area (i.e., ODU) (EAS, 2024c) Impact Area (EIA). The sections below describe COPCs by media and a recommendation to carry the COPC through for the next compliance sampling covered under this Permit Application (refer to Section 6.0 of this EMP).

3.1 Sampling Investigation Summary

3.1.1 Soil

Soil samples collected from the surface down to the water table (15 to 16 ft below ground surface [bgs]) at 29 borings within and in the immediate vicinity to the ODU (i.e., the source of COPCs) have been analyzed for perchlorate by EPA Method 6850, for explosives by EPA Method 8330, for VOCs by EPA Method 8260, for SVOCs by EPA Method 8270, for metals by EPA Method 6010, for mercury by EPA Method 7470, and for general chemistry parameters (ammonia, cyanide, sulfate, sulfide, nitrate, nitrite, chloride, and phosphorus) by EPA Method 9060. Samples analyzed for polychlorinated biphenyls (PCBs) by EPA Method 8082 and for dioxins/furans by EPA Method 8290 were also collected at locations suspected to represent former craters (i.e., areas suspected to contain the greatest variety and magnitude of potential contaminants).

Soil sample results were compared to FDEP Soil Cleanup Target Levels (SCTLs) for Residential (0 to 2 feet bgs) and Industrial (2 to 15 feet bgs) Direct Exposure scenarios. Analytical results were also compared to FDEP Leachability to Groundwater criteria. The following is a summary from the Phase I Soil Sample Site Assessment Report (EAS, 2024c):

- VOCs, SVOCs, PCBs, Dioxins/Furans, and general chemistry parameters were mostly “non-detect” and below FDEP Residential and Industrial Direct Exposure criteria and FDEP Leachability Based on Groundwater criteria. Given that all of these compounds have either not been detected in groundwater or have not been detected in groundwater above applicable FDEP GWTCLs, these parameters are considered eliminated as COPCs.
- Perchlorate was detected in nearly every sample; however, there are no FDEP criteria for perchlorate and there is no perchlorate EPA Soil to Groundwater Regional Screening Level (RSL). The concentrations are well below EPA Residential and Composite Worker Direct Exposure RSLs.
- Arsenic, copper, 2,4-dinitrotoluene, 2,6-dinitrotoluene, and tungsten were above FDEP Residential Direct Contact Exposure criteria, arsenic was above FDEP Industrial Direct Contact Exposure criteria, and HMX was above the EPA Soil to Groundwater RSL; HMX has no FDEP leachability criteria. 2,4-dinitrotoluene, 2,6-dinitrotoluene, 2,4,6-trinitrotoluene, tungsten, zirconium, cyanide, and chromium were detected above FDEP Leachability Based on Groundwater Criteria. These compounds have either not been detected or have been below applicable FDEP GWCTLs in site groundwater.
- Most of the detection limits for RDX were above the FDEP Leachability Based on Groundwater Criteria. Given that RDX is detected in groundwater above its GWPS (10 µg/L), it is leaching from soil to groundwater.

3.1.2 Groundwater

Groundwater from monitoring wells and vertical profile locations has been analyzed for a combination of explosives compounds by EPA Method 8330; for perchlorate by EPA Method 6850; for target analyte list (TAL) metals (including mercury, tungsten, and zirconium) by EPA Methods 6010/7470; for volatile organic compounds (VOCs) (by EPA Method 8260), for semi-VOCs (SVOCS) by EPA Method 8270; and for general chemistry parameters (chloride, cyanide, ammonia [as nitrogen, nitrate], nitrate, nitrite, total phosphorus, total dissolved solids [TDS], sulfate, and sulfide). General chemistry was performed by EPA Method 9060A, with the exception of TDS (EPA Method SM2540). Monitoring well MW-94-62-05 was also sampled for

Appendix IX parameters (KGS/Trinity, 2022). MW-94-62-05 was selected for Appendix IX parameters because it represents an in-plume well with some of the highest concentrations detected in groundwater from a permanent monitoring location.

Results from groundwater investigations show that, in some monitoring wells, perchlorate, RDX, and aluminum are above their respective groundwater protection standards (GWPS) (4 micrograms per liter [µg/L] for perchlorate, 10 µg/L for RDX, and 200 µg/L for aluminum). Aluminum is naturally occurring and not considered a COPC. The RDX and perchlorate plumes are defined by their groundwater criteria. Plume maps are shown in **Figure 3** and **Figure 4**.

3.1.3 Porewater

Porewater has been analyzed for perchlorate by EPA Method 6850 and for RDX by EPA Method 8330 since 2022. Porewater analytical results are compared to groundwater criteria for the purposes of the permit. Perchlorate was detected above its GWPS (4 µg/L) in 62-PW02, 62-PW15, 62-PW-04 (one event in February 2023), 62-PW18 (one event in February 2024), 62-PW12 (one event in February 2023), 62-PW21, and 62-PW19. RDX was detected above its GWPS (10 µg/L) in 62-PW-02 (only two events, in August 2021 and August 2024, respectively).

3.1.4 Surface Water

Since 2021, surface water has been sampled at co-located porewater locations and downstream of the confluence of the Eastern Branch and Western Branch to Blount Mill Creek. Samples have been analyzed for perchlorate by EPA Method 6850, for RDX by EPA Method 8330, and for hardness by SM2340B. RDX has never exceeded the FDEP surface water cleanup target level (SWCTL) for freshwater (180 µg/L) and is no longer monitored. The highest perchlorate surface water concentration during the August 2024 sampling event was 3.6 µg/L. Perchlorate has no FDEP SWCTL. Hardness has no FDEP SWCTL.

3.2 COPC Selection

Based on the results of the additional investigations and historical sampling summarized above and detailed in referenced documents (EAS, 2024a; EAS, 2024b; and EAS, 2024c), perchlorate and RDX are recommended to be considered as COPCs that need to be included in long-term monitoring. These are the only two compounds that are leaching from soil that are detected in groundwater above their respective GWPS (4 µg/L and 10 µg/L, respectively). Refer to Section 6.0 for additional details.

.

4.0 COPC FATE AND TRANSPORT

4.1 Plume Attenuation

As contaminants travel though the groundwater system, in general, they are influenced by mechanisms that include dilution, dispersion, adsorption, and biodegradation. RDX and perchlorate are mainly resistant to adsorption and biodegradation. Therefore, the primary fate and transport mechanisms in groundwater are dilution and dispersion.

Dilution, dispersion, adsorption, and biodegradation also apply to contaminant migration through porewater and surface water. Due to the resistance of RDX and perchlorate to adsorption and biodegradation, the primary fate and transport mechanisms in surface water and porewater are dilution and dispersion. Surface water also has aeration and photodegradation as additional mechanisms, as well as phytoremediation.

Attenuation of RDX and perchlorate is demonstrated through comparing the concentrations at the source to downgradient or downstream concentrations. Source water was sampled in a former OD crater and designated ODC-01 in August 2022. The concentration of RDX was 683 µg/L; the concentration of perchlorate was 4,090 µg/L. RDX and perchlorate concentrations decrease by a factor of 10 within the groundwater plumes as groundwater approaches the branches. RDX and perchlorate concentrations decrease by a factor of 10 to 100 when in surface water (EAS, 2024a and EAS, 2024b).

4.2 Plume Configuration

OD operations in the vicinity of the current configuration of the ODU has been ongoing since January 1995, or approximately 30 years (i.e., about 10,900 days). Estimates of groundwater velocity were made for 12 sets of wells and range from 0.16 to 0.56 ft per day (ft/day). The mean and median velocities are 0.24 ft/day and 0.23 ft/day, respectively.

Using the mean velocity of 0.24 ft/day, the plume would have migrated approximately 2,600 ft from the ODU (i.e., 10,900 days at 0.24 ft/day). However, the extent of perchlorate and RDX from the OD crater to the Eastern Branch and Western Branch is about 1,800 ft. This indicates that the plumes would have reached the Eastern Branch and Western Branch approximately 20 years ago and have been at the branches for about 10 years.

Statistical trend analyses for concentrations of perchlorate and RDX in groundwater is described in detail in EAS (2024b, Appendix E). **Exhibit 4-1** and **Exhibit 4-2** summarize the results of the trend analyses.

Statistical evaluation of contaminant concentrations shows that groundwater, surface water, and porewater COPC concentrations are either stable, show no trend, are probably decreasing, or are decreasing. The only exception is MW-2021-62-01A where perchlorate shows probably increasing.

Groundwater velocity calculations show that the plumes would have reached the branches about 20 years ago. Plume concentrations which are stable, show no trend, or show probably-decreasing or decreasing trends indicate that the plumes are likely in a steady-state configuration. Alternatives to a steady state plume configuration are an increasing trend (which would result from the plume not reaching its endpoints or the addition of COPCs to the source area) or a decreasing trend (which would result from elimination of the source area or a mechanism such as biodegradation). Groundwater velocity estimates and COPC concentration trends support a steady-state plume configuration for which COPC inputs to the hydrologic system are about equal to dilution and dispersion.

Groundwater velocity calculations show that the plumes would have reached the branches about 20 years ago. Plume concentrations which are stable, show no trend, or show probably-decreasing or decreasing trends indicate that the plumes are likely in a steady-state configuration. Alternatives to a steady state plume configuration are an increasing trend (which would result from the plume not reaching its endpoints or the addition of COPCs to the source area) or a decreasing trend (which would result from elimination of the source area or a mechanism such as biodegradation). Groundwater velocity estimates and COPC concentration trends support a steady-state plume configuration for which COPC inputs to the hydrologic system are about equal to dilution and dispersion.

Exhibit 4-1 Groundwater Trend Analysis (RDX, Perchlorate, and Aluminum)

Monitoring Well	Location Relative to ODU	Contaminant	Trend	August 2024: Above or Below GWPS?
POC Wells				
MW-94-62-01	Upgradient-Background	Perchlorate	Stable	Below
		Aluminum	No Trend	Below
MW-94-62-02	Cross-Gradient	Perchlorate	Stable	Above
		Aluminum	Stable	Below
MW-94-62-04	Downgradient	Perchlorate	No Trend	Above
		Aluminum	Stable	Above
MW-94-62-05	Downgradient	Perchlorate	Stable	Above
		Aluminum	No Trend	Below
MW-2021-62-01A	Downgradient	Perchlorate	Probably Increasing	Above
		Aluminum	Decreasing	Below
MW-2021-62-06A	Downgradient	Perchlorate	Decreasing	Above
		Aluminum	Decreasing	Below
Assessment Wells				
MW-2021-62-03A	Downgradient	RDX	Probably Decreasing	Above
		Perchlorate	No Trend	Above
		Aluminum	Stable	Below
MW-2021-62-04B	Downgradient	RDX	No Trend	Below
		Perchlorate	No Trend	Above
		Aluminum	No Trend	Below
MW-2021-62-05B	Downgradient	RDX	No Trend	Below
		Perchlorate	No Trend	Above
		Aluminum	Decreasing	Below

Exhibit 4-2 Western and Eastern Branch Surface Water and Porewater Trend Analysis (Perchlorate)

Location	Trend	August 2024: Above or Below GWPS?
Western Branch		
62-SW-01	Stable	Not Applicable
62-SW-14	No Trend	Not Applicable
62-PW-14	Stable	Below
62-SW-02	No Trend	Not Applicable
62-PW-02	No Trend	Above
62-SW-11	No Trend	Not Applicable
62-PW-11	Stable	Below
62-SW-03	No Trend	Not Applicable
62-PW-03	Prob. Decreasing	Below
62-SW-15	Stable	Not Applicable
62-PW-15	No Trend	Above
62-SW-04	Stable	Not Applicable
62-PW-04	Stable	Below
62-SW-18	Insufficient Data	Not Applicable
62-PW-18	Insufficient Data	Below
62-SW-05	No Trend	Not Applicable
62-PW-05	No Trend	Below
Eastern Branch		
62-SW-06	No Trend	Not Applicable
62-SW-12	No Trend	Not Applicable
62-PW-12	No Trend	Below
62-SW-13	Stable	Not Applicable
62-PW-13	No Trend	Below
62-SW-21	Insufficient Data	Not Applicable
62-PW-21	Insufficient Data	Above
62-SW-16	Stable	Not Applicable
62-PW-16	Stable	Below
62-SW-19	Insufficient Data	Not Applicable
62-PW-19	Insufficient Data	Below
62-SW-09	Stable	Not Applicable
62-PW-09	Stable	Below
Downgradient of the Confluence		
62-SG03-SW	Stable	Not Applicable

5.0 GROUNDWATER TRAVEL TIME AND SAMPLING FREQUENCY EVALUATION

The monitoring frequency under the permit currently in effect (Permit Number 006176-12-HO, dated 21 July 2021, received by FDEP 12 August 2021, expiration date 01 September 2025) is biannual (i.e., every six months). Sampling occurs in January/February (representative of the dry season) and in August/September (representative of the wet season).

Using the mean groundwater velocity of 0.24 ft/day, groundwater travels approximately 45 ft every six months or about 90 ft every year. The plume is in a steady state, concentrations of COCs are mainly stable, groundwater travels less than 100 ft per year, and there are no pronounced seasonal COC concentration fluctuations. Therefore, annual sampling is recommended. During a meeting between FDEP and Eglin AFB on 05 September 2024, FDEP suggested to shift “wet’ season sampling from August/September to October based on current weather trends. A sample time of October/November is therefore recommended in order to give flexibility, taking into account available range time, and weather impacts (e.g., hurricanes).

6.0 ANALYTICAL PARAMETER SELECTION

Sampling locations are shown on **Figure 3** and **Figure 4**. The most recent analytical parameters and recommendations to retain or remove them from future sampling are as follows. Statistical analyses detailed in EAS (2024b, Appendix E) are used to assist with the recommendations.

6.1 Groundwater Monitoring

Exhibit 6-1 Current Operating Permit (006176-HO-12) and Most Recent Analytical Parameters and Monitoring Locations

Permit Designation	Wells	Laboratory Analysis
Background and POC Wells	Background: MW-94-62-01 POC: MW-94-62-02; MW-94-62-03, MW-94-62-04; MW-94-62-05; MW-2021-62-01A; MW-2021-62-06A	- Perchlorate - Metals (aluminum, iron, vanadium) - Total Dissolved Solids (TDS)
Assessment Wells	MW-2021-62-02A; MW-2021-62-03A; MW-2021-62-04B; MW-2021- 62-05B	- Perchlorate - Metals (aluminum, iron, vanadium) - Explosives (full suite) - General Chemistry Parameters (chloride, nitrate, nitrite, phosphorous, sulfate) - TDS

Exhibit 6-2 Recommendations to Retain or Delete Analytical Parameters for New Operating Permit (006176-XX-XX)

Analyte	Retain or Delete	Description
Perchlorate	Retain	- Site COPC. - Concentrations are greater than and less than the GWPS of 4 µg/L. - Concentrations define the extent of the perchlorate plume.
Explosives	Retain RDX only	- RDX: Retain. Site COPC. Concentrations are greater than and less than the GWPS of 10 µg/L. Concentrations define the extent of the RDX plume. - HMX: Delete. Concentrations vary between non-detect to 61.4 µ/L during the previous four sampling events. The GWPS is 350 µ/L. - All other explosives: Delete. Non-detect during the previous four sampling events.
Metals: Aluminum	Delete	- Concentrations occasionally exceed the GWPS of 200 µg/L. - Likely naturally occurring; aluminum is the third most abundant element in the Earth's crust and the most abundant metal found in the Earth's crust. - Aluminum was detected in all samples taken for Phase I soil sampling (EAS, 2024c), including samples that contained no perchlorate or RDX.
Metals: Iron	Delete	- No exceedance of the GWPS of 300 µg/L during the previous four sampling events. - Concentrations vary between non-detect to one order of magnitude less than the GWPS.
Metals: Vanadium	Delete	- No exceedance of the GWPS of 49 µg/L during the previous four sampling events. - Concentrations vary between non-detect to two orders of magnitude less than the GWPS.
TDS	Delete	- Not a site COC. - The FDEP groundwater criteria is 500 milligrams (mg)/L. - Concentrations vary between non-detect to 88 mg/L during the previous four sampling events.
General Chemistry Parameters: Chloride Nitrate Nitrite Phosphorous Sulfate	Delete	- Chloride: Highest concentration during the previous four sampling events is 1.7 mg/L. The GWPS is 250 mg/L. - Nitrate: Highest concentration during the previous four sampling events is 0.58 mg/L. The GWPS is 10 mg/L. - Nitrite: Highest concentration during the previous four sampling events is 0.150 mg/L. The GWPS is 1 mg/L. - Phosphorous: Highest concentration during the previous four sampling events is 0.047 mg/L. There is no GCTL for phosphorus. - Sulfate: Highest concentration during the previous four sampling events is 2.1 mg/L. The GWPS 250 mg/L.

Exhibit 6-3 Recommended Analytical Parameters and Monitoring Locations for New Operating Permit (006176-XX-XX)

Permit Designation	Wells	Laboratory Analysis	Sampling Frequency
Existing Background and POC Wells	Background: MW-94-62-01 POC: MW-2024-62-01A, MW-2024-62-01B, MW-2024-62-02A, MW-2024-62-02B, MW-2024-62-03A, MW-2024-62-03B, MW-2021-62-02A.	- Perchlorate - RDX	Annual October/November
Assessment Wells	MW-94-62-04; MW-94-62-05; MW-2021-62-03A; MW-2021-62-04B; MW-2021-62-05B.	- Perchlorate - RDX	Annual October/November
Assessment Wells	MW-94-62-02; MW-94-62-03; MW-2021-62-01A; MW-2021-62-06A.	- Perchlorate - RDX	Biennial (once every 2 years) October/November

The recommendation is to retain groundwater monitoring for perchlorate and RDX. Deleting all other analytes is recommended based on the analytes being not detected, being detected at well below the GWPS or GCTL, or because no standard exists. Sampling of most wells is recommended on an annual basis due to the steady-state nature of the plume, relatively slow groundwater migration, groundwater velocity, and the lack of pronounced seasonal COPC concentration fluctuations. Sampling of MW-94-62-02, MW-94-62-03, MW-2021-62-01A, and MW-2021-62-06A will occur on a biennial basis (i.e., once every two years).

Proposed Assessment Wells are discussed further in Section 7.0.

6.2 Surface Water and Porewater Monitoring

Exhibit 6-4 Current Operating Permit (006176-HO-12) and Most Recent Analytical Parameters and Monitoring Locations

Permit Designation	Sample Locations	Laboratory Analysis
Surface Water	Western Branch: 62-SW01 through 62-SW-05, 62-SW10, 62-SW11, 62-SW14, 62-SW15, 62-SW18 Eastern Branch: 62-SW06 through 62-SW09, 62-SW12, 62-SW13, 62-SW16, 62-SW19, 62-SW21 Downstream: 62-SG03-SW, 62-SW17, 62-SW20	- Perchlorate - RDX - Hardness
Porewater	Western Branch: 62-PW01 through 62-PW05, 62-PW10, 62-PW11, 62-PW14, 62-PW15, 62-PW18 Eastern Branch: 62-PW06 through 62-SPW09, 62-PW12, 62-PW13, 62-PW16, 62-PW19, 62-PW21	- Perchlorate (Western and Eastern Branch locations) - RDX (Western Branch only)

Exhibit 6-5 Recommendations to Retain or Delete Analytical Parameters for New Operating Permit (006176-XX-XX)

Permit Designation	Analyte	Retain or Delete
Surface Water	Perchlorate	Delete. Perchlorate surface water CTLs have not been published by FDEP for either freshwater or marine environments.
	RDX	Delete. Concentrations of RDX in surface water are either non-detect or significantly less than the Freshwater Surface Water Criteria of 180 µg/L.
	Hardness	Delete. Hardness surface water CTLs have not been developed by FDEP for either freshwater or marine environments.

Permit Designation	Analyte	Retain or Delete
Porewater	Porewater	Delete. Porewater discharges to surface water and perchlorate surface water CTLs have not been published by FDEP for either freshwater or marine environments.
	RDX	Delete. Porewater discharges to surface water and concentrations of RDX in surface water are either non-detect or significantly less than the Freshwater Surface Water Criteria of 180 µg/L.

6.3 Recommended Analytical Parameters and Monitoring Locations

Discontinue monitoring of surface water and porewater. RDX concentrations in surface water have always been non-detect or significantly less than the Freshwater SWCTL. There are no published SWCTLs for perchlorate or hardness for either freshwater or marine environments. Porewater discharges to surface water based on generally upward gradients shown by comparisons between surface water and porewater level measurements. Concentrations of RDX in porewater are not adversely affecting surface water as demonstrated by surface water RDX concentrations at non-detect to significantly less than the RDX Freshwater SWCTL. Therefore, no further porewater sampling is recommended.

7.0 PROPOSED NEWLY-INSTALLED MONITORING WELLS

This section presents a summary of the newly-installed proposed monitoring wells that are to be installed and sampled, the locations and rationale, the installation methods, and the schedule for sampling. A summary of the proposed screen depths is provided in **Exhibit 7-1**. Actual monitoring well construction details for any newly-installed monitoring well will be provided separately after installation and reported in an EMR. Once installed, all well construction information will be submitted in electronic Excel spreadsheet format for inclusion in the Department's Water Assurance Compliance System (WACS) database. All coordinates will be in latitude and longitude. The information will be submitted within 30 days of installation.

7.1 Monitoring Well Locations and Rationale

Additional monitoring wells are recommended and will provide permanent monitoring points for assisting in defining the lateral and vertical extent of groundwater contamination required under Part II Subpart B.6.a of the RCRA Permit# 006176-12-HO (EAS, 2024b). Proposed monitoring well locations were plotted to show where they will be in relation to both the RDX and perchlorate plume, as shown in **Figure 3** and **Figure 4**, respectively.

A total of six (6) permanent monitoring wells are recommended (three clusters of two wells per cluster, with a shallow and deep well in each cluster). The new monitoring wells are recommended to assist with the identification of the extent of the RDX and perchlorate plumes as groundwater migrates towards the Western and Eastern Branches, and to evaluate the southern extent of the perchlorate plume (**Figure 3** and **Figure 4**). Specifically, the data quality objectives of installing wells near the Western and Eastern Branches are as follows:

- Delineate the downgradient portion of plumes at the highest groundwater concentrations measured at the temporary screening locations VP04 and VP13. The wells placed in these areas (MW-2024-62-01A/B and MW-2024-62-03A/B, respectively) will represent wells placed within highly-concentrated areas in-plume as groundwater approaches the Eastern and Western Branches, respectively. Concentrations from screening data are higher on the side of the ODU as compared to on the opposite side of the branches. Confirmation of these screening locations is well reasoned before stepping across a hydraulic divide at the branches.
- Perform further evaluation of the contaminant migration pathways in shallow and deep well pairs as groundwater upwells and flows towards the Western and Eastern Branches. These migration pathways will be evaluated at locations MW-2024-62-01A/B and MW-2024-62-03A/B and will provide further insight into the interaction between shallow and deep groundwater and confirm that the Western and Eastern Branches act as a shallow groundwater divide. With one exception, VP18, the screening data collected to date on the opposite side of the branches provide evidence that the plumes (i.e., contamination above the GWPS) within the upper portion of the aquifer upwell and discharge into the branches. Installing wells at the hydraulic divide will help confirm migration pathways.
- Identify the southern extent of the perchlorate plume (monitoring well location MW-2024-62-02A/B).

RDX and perchlorate concentration data from the proposed permanent monitoring wells will be evaluated and will guide the decision process for the next phase of work, if required. Proposed monitoring well coordinates, screen depths, and rationale for the monitoring wells are shown in **Table 1**.

7.2 Monitoring Well Installation Methods

Borehole installation will be performed using continuous core sonic drilling procedures. An experienced geologist will be on site at all times to describe core and direct monitoring well installation. The experienced geologist will have direct experience in drilling in areas of similar geology (e.g., coastal plain, deltaic deposits). The experienced geologist will also have at least three years of experience with sonic drilling techniques (coring and well installation) in similar geologic environments. A registered Florida Professional Geologist will be available to the field geologist at all times during field operations to guide the work (via phone, email, and text).

Decontamination of drill tooling will consist of a high-pressure rinse. Spoils and aqueous fluids generated during the drilling processes will be spread/discharged near the borehole of generation in accordance with

EPA's Area of Contamination policy (EPA, 1996), and based on the results of previous soil, groundwater, and equipment blank sampling which indicates that the waste is nonhazardous.

Monitoring well installations and well development will follow the FDEP (2005), *Design, Installation, and Placement of Monitoring Wells*, and all local, federal, and state guidelines.

Each monitoring well will be constructed in an individual borehole. Boreholes will be advanced using a 4-inch diameter continuous core barrel followed by 6-inch diameter override casing. Monitoring wells within a shallow and deep pair, or cluster, will be spaced within about 10 ft of each other.

Upon reaching total depth, the monitoring wells will be assembled through 6-inch override casing. If over-drilled, the bottom of the borehole will be filled with 1/4" bentonite chips to within 2 ft of the bottom of the well screen zone. Then, the following well materials will generally be installed inside of the 6-inch diameter sonic drill casing, with the flexibility to determine actuals based on field conditions:

- Flush-threaded, Schedule 40, 2-inch diameter polyvinyl chloride (PVC) bottom cap, 10.0 ft of well screen (mill-slotted, 0.010-inch slots), and PVC casing to extend above ground surface.
- Sand pack from 2 ft below to 2 to 4 ft above the well screen zone.
- Approximately 2 to 4 ft of 1/4-inch bentonite chips.
- Cement grout consisting of portland cement (Quickrete Type I/II), water from a public water supply, and up to 5% bentonite powder by weight (CETCO Super Gel-X®). Grout will be placed via tremie pipe pumped through a positive-displacement pump.
- Aluminum, 6-inch square, above-ground protective casing finished above grade, in a 2-foot x 2-foot x 4-inch-thick square concrete pad. The annular space between the well casing and protective casing can be filled with sand pack to within about 1 foot of the top of the casing to stabilize the well casing.
- Bollards will be placed at each corner of the 2-foot x 2-foot x 4-inch-thick square concrete pad. Bollards will consist of 2-inch to 3-inch diameter steel or aluminum pipe placed approximately 2-ft bgs and extend to between 2 and 3 ft above grade. The bollards will be filled with sand to within about 1 ft of the top of the bollard. The uppermost portion of the bollard will be filled with concrete.
- Following a minimum of 24-hours after placement of grout, monitoring wells will be developed using pumping and surging methods, using an electric submersible pump. Well development will be considered complete a) upon removal of a volume of water equivalent to five times the volume of water used during drilling (exclusive of water used for cement and hydration of bentonite), b) upon stabilization of field parameters (temperature, specific conductivity, pH, and dissolved oxygen), and c) when water is visibly clear of sediment. Purge water generated will be temporarily containerized and disposed of within the ODU upon completion.

7.3 Schedule, New Monitoring Wells

The timing of the permanent monitoring well installations, well development, and sampling will be dependent on receiving approval by the FDEP on the recommendations made within the Phase II Vertical Profile Report (EAS, 2024b), and Range and subcontractor availability. Monitoring well installation is anticipated during 2025 and in advance of the October/November annual sampling event. The first sampling event for the new monitoring wells is anticipated to coincide with the October/November 2025 sampling event.

7.4 Monitoring Well Sampling, New Monitoring Wells

Baseline sampling (to establish perchlorate and RDX concentrations) of the newly-installed monitoring wells will occur on an annual frequency for perchlorate and RDX. Sampling will be performed in accordance with FDEP *DEP-SOP-001/01 FS 2200 Groundwater Sampling, Revised January 2017, effective April 16, 2018*. Sampling will follow low-flow techniques.

It is anticipated that the results will be included in the October/November 2025 Environmental Monitoring Report if sampling coincides with that sampling event.

Exhibit 7-1 Proposed New Monitoring Well Screen Depth Summary and Rationale

Monitoring Well ID	Estimated Ground Surface Elevation (ft)[1]	Estimated Coordinates[2]	Screen Interval (ft bgs)[3]	Screen Depth Rationale
MW-2024-62-01A/B	162.75	X-1425508.07 Y-599959.18	A- 26-36 B- 58-68	• Shallow and deep monitoring well pair downgradient and in-plume from VP04. • Located on the west side of the Eastern Branch. • Provide lateral and vertical definition of contaminant concentrations that were measured approximately 25 feet below the water table at VP04. VP04 contained the highest concentrations detected in groundwater at this site. The deep well will be installed to verify concentrations detected in VP04 and that the plume is not migrating below the Eastern Branch with deep groundwater. • Provide shallow and deep zone piezometric surface measurements. • Proposed “A” well screen zone will span the elevation (133-130) of the highest maximum concentration (466 µg/L) at VP04. The proposed “B” screen zone will be within the last permeable zone above the top of the lower zone silt.
MW-2024-62-02A/B	166.71	X-1424505.78 Y-599159.19	A- 40-50 B- 68-78	• Shallow and deep monitoring well pair between VP08 (not affected by site COPCs) and VP21/VP22 (affected by site COPCs). • Provide lateral and vertical definition of contaminant concentrations (i.e., the shallow and deep zones), and shallow and deep zone piezometric surface measurements. Also to define the downgradient (i.e., southern) extent of the plume. • The proposed “A” screen zone would be 20 – 30 ft below the water table to allow for shallow zone monitoring and a fully submerged monitoring well screen. The proposed “B” screen zone will be within the last permeable zone above the top of the lower zone silt and coincide with the highest perchlorate concentrations at VP22.

8.0 COMPLIANCE MONITORING PROGRAM

8.1 Monitoring Well Network

Compliance monitoring will consist of annual sampling of the following:

- One (1) Background monitoring well: MW-94-62-01.
- Seven (7) Point of Compliance Downgradient monitoring wells: MW-2024-62-01A, MW-2024-62-01B, MW-2024-62-02A, MW-2024-62-02B, MW-2024-62-03A, MW-2024-62-03B, MW-2021-62-02A.
- Five (5) Assessment monitoring wells: MW-94-62-04, MW-94-62-05, MW-2021-62-03A, MW-2021-62-04B, MW-2021-62-05B.

Biennial compliance monitoring will consist of the following:

- Four (4) Assessment monitoring wells: MW-94-62-02, MW-94-62-03, MW-2021-62-01A, MW-2021-62-06A.

Sampling locations are shown in **Figure 3** and **Figure 4**. Proposed monitoring well coordinates and screen depths to be sampled are shown in **Table 1**. Note, newly installed monitoring well nonmenclature will be updated to reflect the year they are installed. Sampling requirements are shown in **Table 2**. Monitoring well construction details for any newly-installed monitoring well will be provided separately after installation and reported in an EMR. All sampling and analysis activities will comply with Rule 62-160.110(5), F.A.C. All records of monitoring information shall include all required items in Chapter 62-160 F.A.C, and include:

- The date, exact place, and time of sampling or measurements.
- The person responsible for performing the sampling or measurements.
- The dates that analyses were performed.
- The person responsible for performing the analyses.
- The analytical techniques or methods used.
- The results of such analyses.

8.2 Sampling Frequency

Sampling will be performed once per year in October/November for all wells.

8.3 Field and Laboratory Parameters

Field parameters will be collected using a YSI® water quality meter (or equivalent) and a separate turbidimeter (HACH® or Lamotte®, or equivalent). Purging and recording of the field parameters, and stability requirements will comply with FDEP *DEP-SOP-001/01 FS 2200 Groundwater Sampling, Revised January 2017, effective April 16, 2018*. Field parameters to be monitored during purging will consist of the following:

- pH.
- Specific conductance.
- Temperature.
- Dissolved oxygen.
- Oxidation-reduction potential.
- Turbidity.

Sampling will be performed in accordance with FDEP *DEP-SOP-001/01 FS 2200 Groundwater Sampling, Revised January 2017, effective April 16, 2018*. Sampling will follow low-flow techniques.

Sampling equipment will include the following:

- Electronic water-level probe showing ft and hundredths of ft.
- Graduated measuring cup and 5-gallon bucket.
- Water quality multi parameter meter (YSI 556 or equivalent).
- Turbidity meter (LaMotte 2020 or equivalent).
- Stainless steel electronic submersible pump (Grundfos® or equivalent).
- Peristaltic pump (Geotech® or equivalent).
- Single-use high density polyethylene tubing and silicone tubing, or equivalent.
- Marine batteries.
- Sample coolers and sample containers.

Laboratory parameters will consist of the following:

- RDX by EPA Method 8330.
- Perchlorate by EPA Method 6850.

8.4 Analytical Laboratory Certifications

Laboratory analyses of groundwater samples will be performed by SGS Laboratories, Inc., of Orlando, Florida, or Eurofins Environment Testing of Denver, Colorado. Both laboratories are accredited through the National Environmental Laboratory Accreditation Program (NELAP) and are certified by the Florida Department of Health. The FDEP will be notified if any changes in the selected laboratory occur.

8.5 Equipment Calibration

A daily calibration followed by an initial calibration verification (ICV) will be performed each day of sampling, on each set of water quality instruments (i.e., YSITM and turbidity meters) prior to mobilization into the field. At the end of each sampling day, a continuing calibration verification (CCV) will be performed on each set of water quality instruments used in the field. Calibrations, ICVs, and CCVs will be conducted in accordance with *FDEP Standard Operating Procedure (SOP) FT1000*, *FDEP SOP FT 1100 (pH)*, *FDEP SOP FT 1200 (Specific Conductance)*, *FDEP SOP FT 1500 (Dissolved Oxygen)*, and *FDEP SOP FT 1600 (Turbidity)*, and the *EPA Region 4, Operating Procedure, Field Measurement of Oxidation-Reduction Potential (ORP)*. In accordance with respective SOPs, if CCVs were outside control limits, then a "J" [estimated] value will be added to the appropriate effected parameter(s) on the appropriate form. Calibration forms are provided in Attachment 1.

8.6 Groundwater Sampling Standard Operating Procedures (SOPs)

Groundwater sampling will be in accordance with applicable sections of DEP-SOP-001/01 FS 2200 Groundwater Sampling, Revised January 2017, effective April 16, 2018. Filters will not be used during the collection of groundwater samples. All sampling and analytical procedures will meet the requirements of Chapter 62-160, Florida Administrative Code (F.A.C.), *Quality Assurance*, dated April 16, 2018. Any new or alternative field methods will also meet Chapter 62-160, F.A.C. requirements. All samples will be obtained using an After (Through) Peristaltic Pump (APP).

The FDEP Form FD 9000-24: Groundwater Sampling Log will be completed and submitted with each monitoring report. The current form is located in Attachment 1. Any form substitutions will capture all required information in FD 9000-24. Groundwater sampling equipment calibration logs and maintenance records will be submitted with each monitoring report.

8.7 Collection of Monitoring Well Water Levels and Total Depths

Groundwater elevations will be measured within the same 24-hour period and prior to the sampling event at each range. These data will be used to assist in the determination of horizontal and vertical groundwater flow directions, groundwater gradients, and flow rates. Prior to groundwater sample collection, the monitoring wells will be inspected for suitability of sample collection and damage. The total depths of all monitoring wells will also be determined by physical measurement to the closest 0.01 ft. All monitoring

wells, piezometers, and staff gauges will be gauged. The current list of monitoring wells (current and newly-proposed monitoring wells), piezometers, and staff-gauges to include in the gauging event are provided in **Table 2**. The synoptic water level form is located in Attachment 1.

8.8 Investigative Derived Waste (IDW)

All purged groundwater from existing monitoring well events will be collected and dumped onto the ground surface at the monitoring well location it was removed from. This procedure was approved by FDEP's Merlin Russell and Michell Smith in the e-mail Titled "Non-containment of Purge Water Approval FDEP (002).pdf" on September 25, 2019. The corresponding e-mail has been included in Attachment 2 of this EMP.

Historical and most recent groundwater sampling results do not indicate contaminants above regulatory levels based on the Toxicity Characteristics in 40 CFR 261.24; therefore, management of IDW will be disposed of in accordance with solid waste regulations.

Used personal protective equipment (PPE), disposable sampling equipment, and other trash will be consolidated in trash bags at the end of each day and sealed. The contractor will dispose of all debris, PPE, and other trash off site.

All contaminated media management shall be in accordance with *Management of Contaminated Media Under RCRA* (FDEP, 2006). Management of IDW shall be in accordance with Management of Remediation Waste Under RCRA, EPA530-F-98-026, October 1998.

8.9 Groundwater Reporting Requirements

Annual groundwater monitoring reports will contain the following information. Annual reports will be submitted to FDEP within 90 days of the completion of sampling.

1. A map/figure showing Range C-62 and associated monitoring well sampling locations.
2. Any necessary repairs or redevelopment of the wells since the last report.
3. Groundwater elevations from each well, estimates of groundwater flow rate(s), and flow direction(s).
4. A plume map showing iso-concentration contours for each laboratory parameter (i.e., RDX, perchlorate) in a format required by Subparagraph 62-780.600(8)(a)(28), F.A.C.
5. An analysis and evaluation of the current analytical results (e.g., narrative, tables, graphs, statistics).
6. Field sampling notes.
7. Groundwater Sampling Log (DEP Form FD 9000-24 or equivalent).
8. Equipment Calibration logs.
9. Laboratory reports.
10. An analysis and evaluation of the environmental monitoring program including recommendations to enhance and refine this EMP (e.g., the addition or deletion of wells from the plan, changes in sampling frequency at a well, or changes in contaminants of concern).
11. Automated Data Processing Tool (ADaPT) files. All laboratory data will be submitted to FDEP using ADaPT quality assurance software.
12. A statement that records will be maintained for a minimum three-year period.
13. A table or tables listing all wells sampled (or potentially sampled) or measured, and the following information:
    a. Well depth, the screening interval, and surveyed ground surface.
    b. Elevation and surveyed top of casing elevation.
    c. The regulatory status of each well (e.g., background, point of compliance, assessment).
    d. The frequency of sampling for each location (i.e., annual, not currently sampled).

8.10 Groundwater Monitoring Well Operation and Maintenance

Groundwater monitoring wells will be visually inspected for monitoring well integrity during each groundwater sampling event. Needed repairs will be made as soon as practicable. Repair activities will require range clearance from Eglin Range Control before repairs can be completed. If the repairs can't be conducted within 30 days, the FDEP will be notified via e-mail and an extension will be requested. Well re-development will be triggered when occlusion of 20 percent or more of the screened interval with sediment has occurred, or when the sample turbidity criterion of 10 Nephelometric Turbidity Units (NTU) cannot be obtained or is difficult to obtain during sampling (e.g., greater than 30-minute purge time).

8.11 Groundwater Monitoring Well Security

Groundwater monitoring wells are located inside gated and secured test ranges. Access to Range C-62 requires site-specific mission clearance from Eglin Range Control. Eglin test ranges are continuously monitored by Eglin Range Patrol. Prior to entering the Eglin ranges, entrants must watch the Unexploded Ordnance (UXO) Safety Brief video. Zip-ties will be used on applicable stickup wells to ensure that the well has not been tampered with in between sampling events.

8.12 Quality Assurance/Quality Control (QA/QC) Samples

Parent and QA/QC samples will be taken at the following frequency:

- Duplicate samples (10%)
- Matrix spike samples (5%)
- Matrix spike duplicate samples (5%)
- Equipment blank samples (0%): none (0). Previous sampling events have shown that sampling equipment is not a source of RDX or perchlorate. Additionally, all equipment in contact with groundwater samples (i.e., polyethylene tubing and silicone tubing) is single-use and discarded upon completion of sampling each monitoring well.
- Trip blanks: none.
- Temperature blanks: one per cooler.

8.13 Sampling Notifications to Florida Department of Environmental Protection

FDEP will be notified by telephone, letter, or electronically (e.g., email) by Eglin AFB at least seven calendar days prior to each sampling event, in accordance with Subsection 62-780.220(1), F.A.C. FDEP will have the opportunity to observe groundwater sampling and split samples.

9.0 REFERENCES

Chapter 62-160, Florida Administrative Code (F.A.C.), Quality Assurance (QA Rules), latest version.

EAS, 2024a. Draft Final Environmental Monitoring Report, August 2024, Open Detonation Unit, Range C-62, Eglin Air Force Base, Florida. October.

EAS, 2024b. Final Site Assessment Report, Phase II Vertical Profile Sample Results, July – September 2024, Open Detonation Area, Range C-62 Eglin Air Force Base, Florida. November.

EAS, 2024c. Phase I Soil Sampling Site Assessment Report, April/May 2024, Open Detonation Unit, Range C-62, Eglin Air Force Base, Florida.

Florida Department of Environmental Protection, Standard Operating Procedure -001/01 FS 2200 Groundwater Sampling, Revised January 2017, effective April 16, 2018.

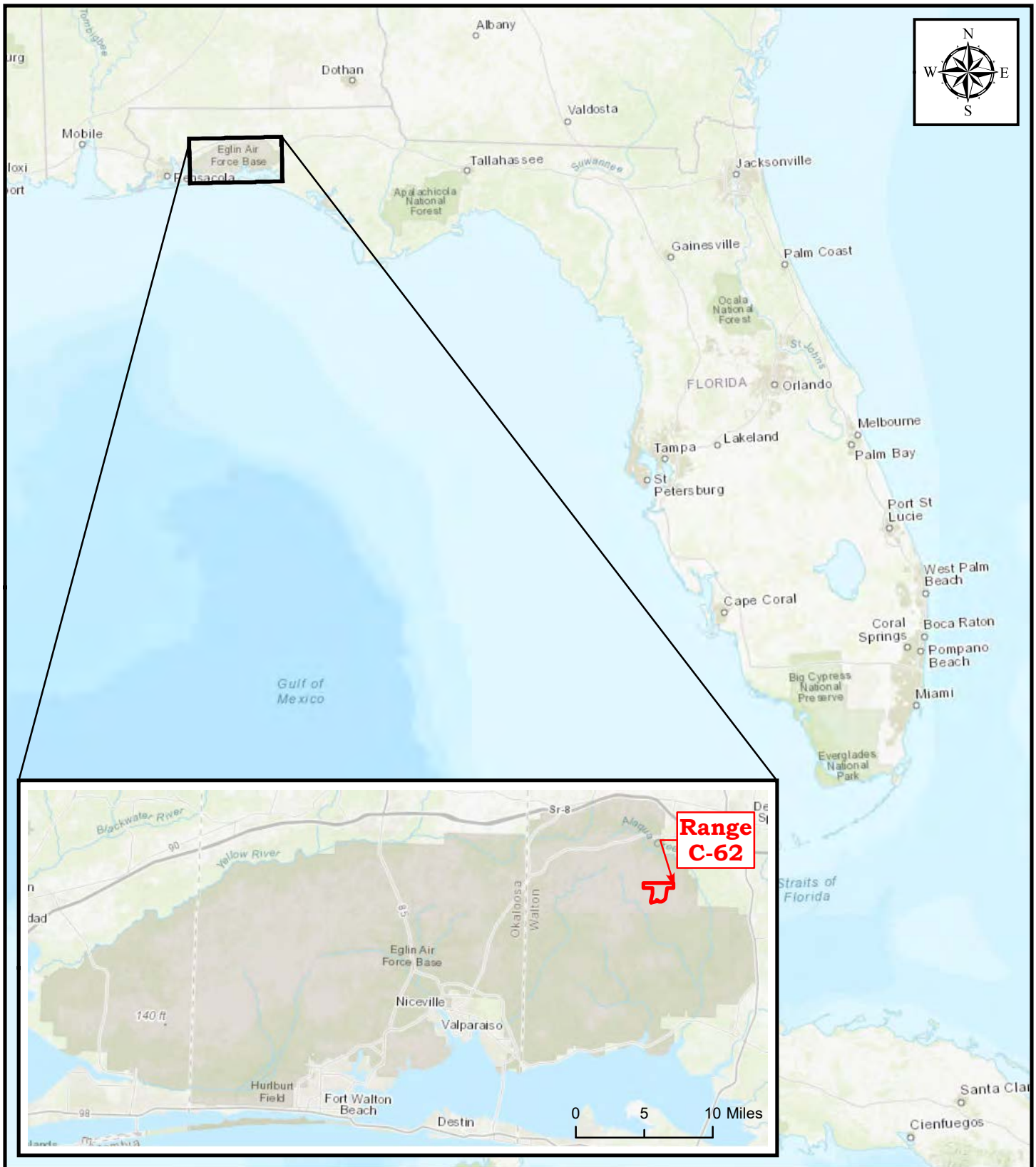
Florida Department of Environmental Protection, Standard Operating Procedure -001/01 FS 2100 Surface Water Sampling, Revised January 2017, effective April 16, 2018.

Florida Department of Environmental Protection, 2006. Management of Contaminated Media Under RCRA. August 9, 2006.

KOMAN Government Solutions, LLC/Trinity (KGS/Trinity), 2022. Range C-62 Plume Delineation Site Assessment Report, Open Detonation Range C-62, Eglin Air Force Base, Florida. March.

U.S. Environmental Protection Agency Region 4, 2020. Pore Water Sampling. May.

FIGURES



Legend

Range Area

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

Site Location
Range C-62

Range C-62
Eglin AFB, Florida

KOMAN Government Solutions, LLC
293 Boston Post Road West, Suite 100, Marlborough, MA 01752

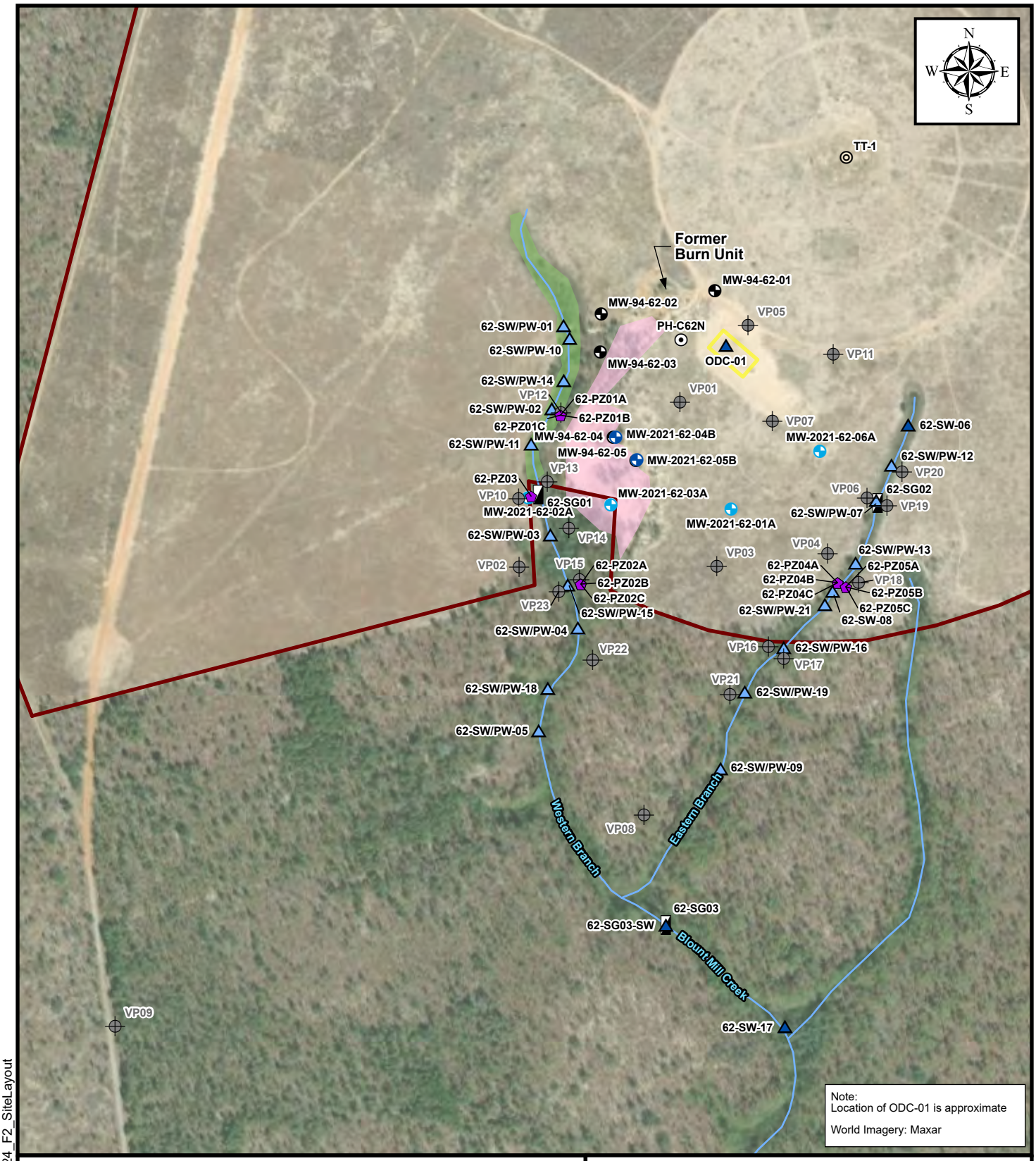
0 40 80
Miles

Date: 11/20/2024

Figure 1

KGS TRINITY

File: EglinAFB_F1_Site.mxd



Legend

- Deep Wells Installed by KGS
- Shallow Wells Installed by KGS
- Monitoring Well Installed by Others
- Pilot Hole
- Newly Installed Staff Gauges
- Newly Installed PZs - May 2024
- Bombing Target
- Surface Water / Porewater Location
- Surface Water Location
- Vertical Profile Location
- Seepage Bog
- Erosion Impact Area
- Open Detonation Unit (ODU)
- Range C-62 Boundary

Site Layout
Range C-62

Open Detonation Unit
Eglin AFB, Florida

KOMAN Government Solutions, LLC
293 Boston Post Road West, Suite 100, Marlborough, MA 01752

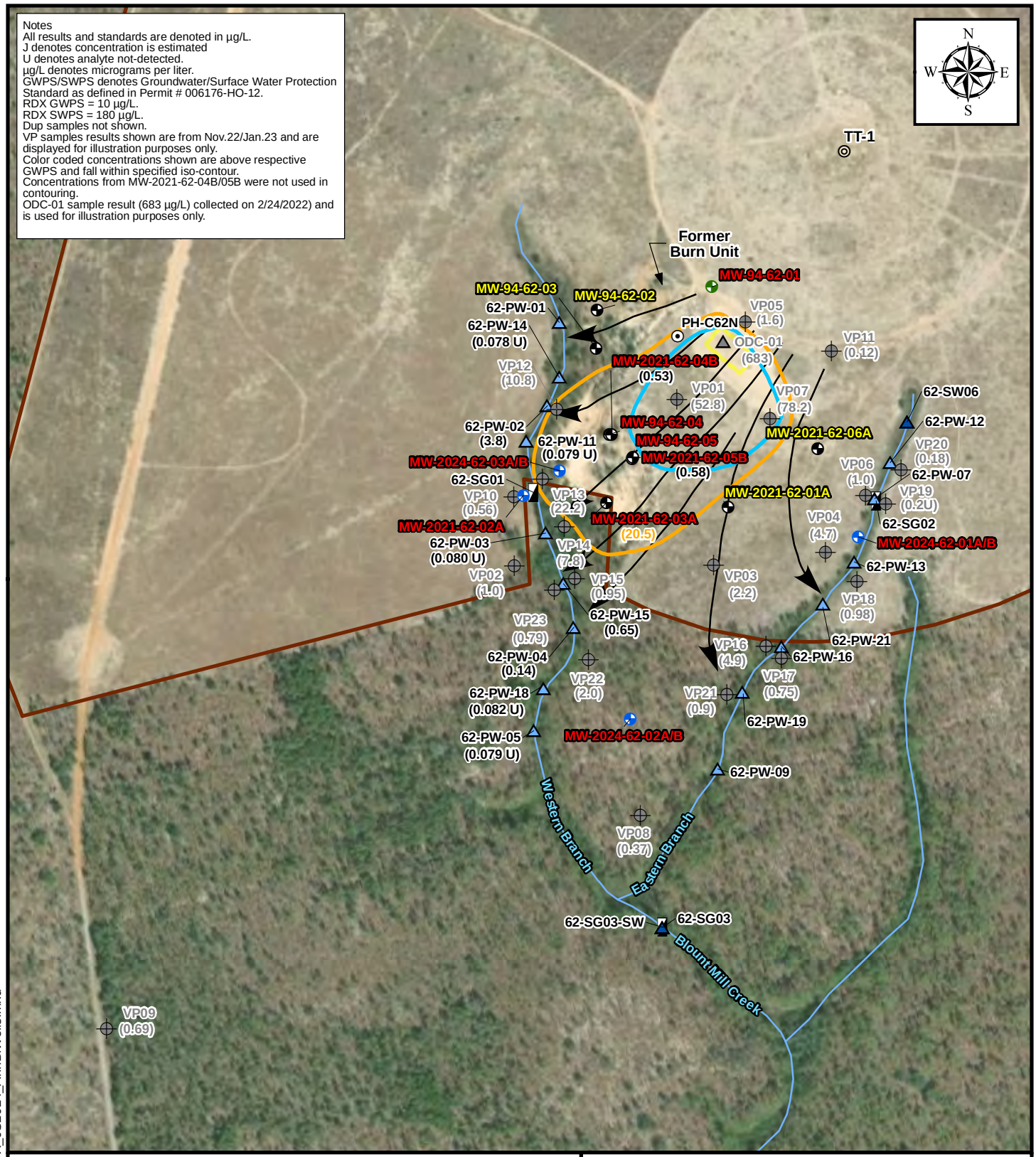
0 300 600
Feet

Date: 02/06/2025

Figure 2

EAS Environmental Assessment Services
Wholly Owned Subsidiary of Natives of Kodiak

File: 0524_Eglin.aprx Layout: 1224_F2_SiteLayout



Legend

- Well ID — Annual Sampling Frequency
- Well ID — Biennial Sampling Frequency
- Point of Compliance Well
- Assessment Well
- Background Well
- Newly Installed Staff Gauges
- Vertical Profile Location
- Surface Water / Porewater Location
- Surface Water Location
- Pilot Hole
- Bombing Target
- Range C-62 Boundary
- Open Detonation (OD) Area
- Groundwater Flow Paths
- Isocontour: 50 µg/L
- Isocontour: 10 µg/L
- (3.8) RDX Concentration

Monitoring Well Locations
RDX Plume
July/September 2024
Range C-62

Open Detonation Unit
Eglin AFB, Florida

KOMAN Government Solutions, LLC
293 Boston Post Road West, Suite 100, Marlborough, MA 01752

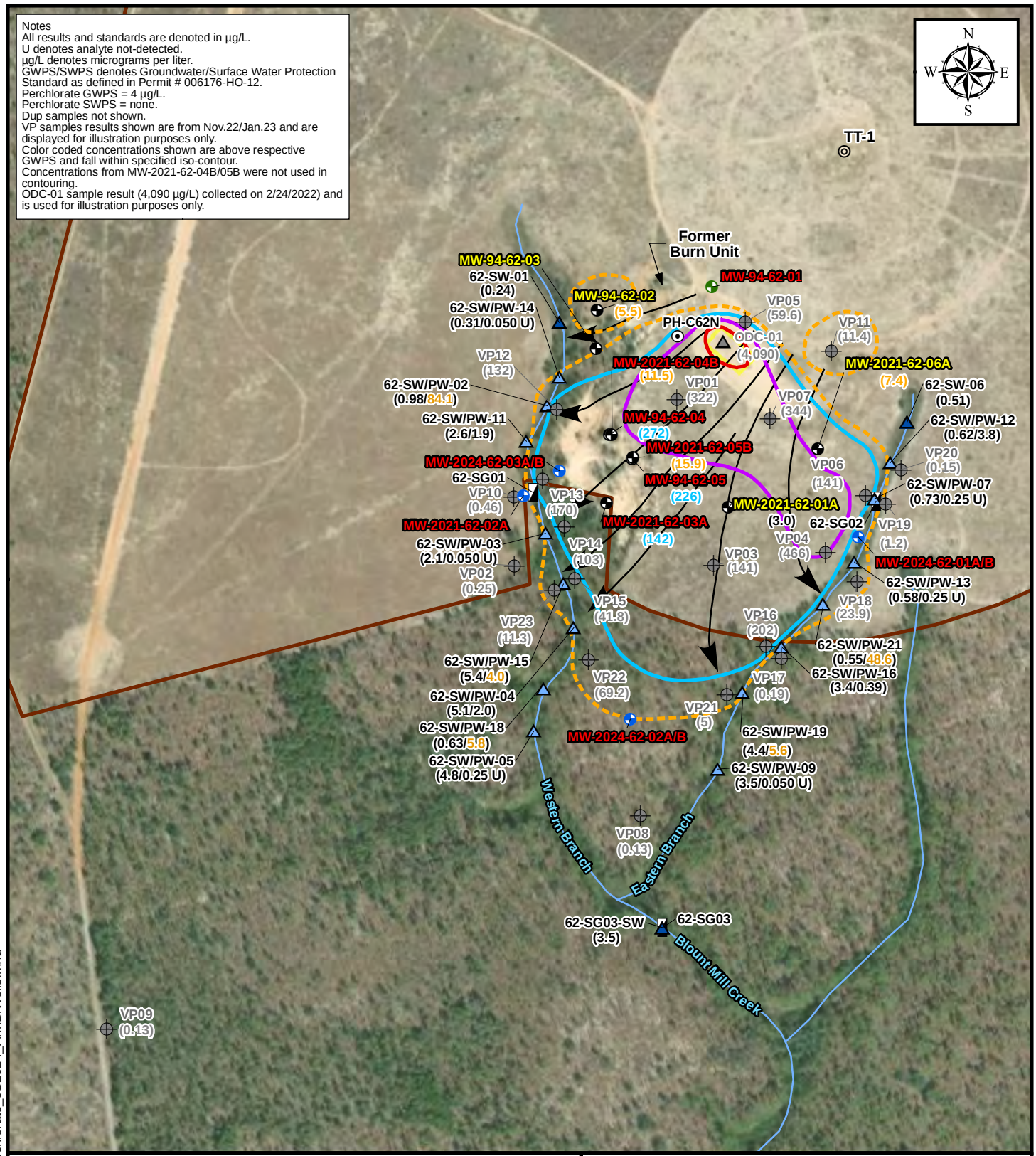
0 300 600
Feet

Date: 02/06/2025

Figure 3

KGS TRINITY

File: 1124_Eglin_PermitAPP_F3_RDX_JS2024_AnnBiWells.mxd



Legend

- Well ID — Annual Sampling Frequency
- Well ID — Biennial Sampling Frequency
- Point of Compliance Well
- Assessment Well
- Background Well
- Newly Installed Staff Gauges
- Vertical Profile Location
- Surface Water / Porewater Location
- Surface Water Location
- Pilot Hole
- Bombing Target
- Range C-62 Boundary
- Open Detonation (OD) Area
- Groundwater Flow Paths

Isocontour Concentration

- 3,000 µg/L
- 300 µg/L
- 100 µg/L
- 4 µg/L
- Dashed where Inferred

(0.51) Perchlorate Concentration

Monitoring Well Locations
Perchlorate Plume
July/September 2024
Range C-62

Open Detonation Unit
Eglin AFB, Florida

KOMAN Government Solutions, LLC
293 Boston Post Road West, Suite 100, Marlborough, MA 01752

0 300 600
Feet

Date: 02/06/2025

Figure 4

KGS TRINITY

File: 1124_Eglin_PermitAPP_F4_Perchlorate_JS2024_AnnBiWells.mxd

TABLES

Table 1
Monitoring Well Construction Details
and Compliance Sampling Recommendations
Range C-62, Eglin Air Force Base, Florida

EXISTING MONITORING WELLS: SAMPLE FOR RDX AND PERCHLORATE

		Well ID	MW-94-62-01	MW-94-62-02	MW-94-62-03	MW-94-62-04	MW-94-62-05	MW-2021-62-01A	MW-2021-62-06A	MW-2021-62-02A	MW-2021-62-03A	MW-2021-62-04B	MW-2021-62-05B
Location	NAD83 FL North (FT)	Northing	601056.4800	600949.4190	600788.6460	600413.1590	600302.4260	600089.43	600347.35	600141.40	600110.28	600408.69	600307.66
		Easting	1424866.7340	1424362.1280	1424358.5870	1424415.9690	1424528.1690	1424935.86	1425328.93	1424035.47	1424401.82	1424424.49	1424517.87
Ground Surface Elevation		ft NGVD	188.42	173.80	172.52	178.86	178.13	177.60	180.90	153.40	159.90	178.30	177.30
Top of Casing Elevation		ft NGVD	188.22	173.55	172.36	178.50	177.81	180.07	184.17	155.75	162.43	180.91	179.77
Screen Length		ft	10	10	10	10	10	10	10	10	10	10	10
Screen Interval		ft bgs	25 - 35	30 - 40	30 - 40	29 - 39	30 - 40	17-27	15-25	5-15	10-20	68-78	72-82
Screen Interval		ft NGVD	163.42 - 153.42	143.80 - 133.80	142.52 - 132.52	149.86 - 139.86	148.13 - 138.13	160.60-150.60	165.90-155.90	148.40-138.40	149.90-139.90	110.30-100.3	105.30-95.30
Total Well Depth		ft bgs	34.24	38.92	39.76	39.36	39.52	27	25	15	20	78.00	82.00
Total Well Depth		ft NGVD	153.42	133.80	132.52	139.86	138.13	150.60	155.90	138.40	139.90	100.30	95.30
Well Material		---	PVC	PVC	PVC	PVC	PVC	PVC	PVC	PVC	PVC	PVC	PVC
Well Diameter		inches	4	4	4	4	4	2	2	2	2	2	2
Permit Designation		---	Background	Assessment	Assessment	Assessment	Assessment	Assessment	Assessment	POC	Assessment	Assessment	Assessment

PROPOSED ASSESSMENT MONITORING WELLS: SAMPLE FOR RDX AND PERCHLORATE

		Well ID	MW-2024-62-01A	MW-2024-62-01B	MW-2024-62-02A	MW-2024-62-02B	MW-2024-62-03A	MW-2024-62-03B
Location	NAD83 FL North (FT)	Northing	599959	599959	599159	599159	600249	600249
		Easting	1425508	1425508	1424506	1424506	1424194	1424194
Ground Surface Elevation		ft NGVD	163	163	167	167	155	155
Top of Casing Elevation		ft NGVD	160	160	164	164	152	152
Screen Length		ft	10	10	10	10	10	10
Screen Interval		ft bgs	26 - 36	58 - 68	40 - 50	68 - 78	11 - 21	47 - 57
Screen Interval		ft NGVD	137 - 127	105 - 95	127 - 117	99 - 89	144 - 134	108 - 98
Total Well Depth		ft bgs	36.2	68.2	50.2	78.2	21.2	57.2
Total Well Depth		ft NGVD	126.6	94.6	116.5	88.5	133.8	97.8
Well Material		---	PVC	PVC	PVC	PVC	PVC	PVC
Well Diameter		inches	2	2	2	2	2	2
Permit Designation		---	POC	POC	POC	POC	POC	POC

Notes:

NAD83: North Amercan Datum of 1983
ft: feet
bgs: below ground surface.
NGVD: National Geodetic Vertical Datum 88.
POC: Point of Compliance.
PVC: polyvinyl chloride.
TBD: to be determined

Table 2
Compliance Monitoring Program
Range C-62, Eglin Air Force Base, Florida

Permit Designation / Matrix	Monitoring Locations	Static Water Levels / Frequency	Laboratory Parameters		Purging Method
			Perchlorate (6850) / Frequency	RDX (8330A) / Frequency	
Background	MW-94-62-01 (25-35)	X - Annual	X - Annual	X - Annual	After (Through) Peristaltic Pump
POC -Groundwater	MW-2021-62-02A (5-15)	X - Annual	X - Annual	X - Annual	
	MW-2024-62-01A (TBD)*	X - Annual	X - Annual	X - Annual	
	MW-2024-62-01B (TBD)*	X - Annual	X - Annual	X - Annual	
	MW-2024-62-02A (TBD)*	X - Annual	X - Annual	X - Annual	
	MW-2024-62-02B (TBD)*	X - Annual	X - Annual	X - Annual	
	MW-2024-62-03A (TBD)*	X - Annual	X - Annual	X - Annual	
	MW-2024-62-03B (TBD)*	X - Annual	X - Annual	X - Annual	
Annual Assessment - Groundwater	MW-94-62-04 (29-39)	X - Annual	X - Annual	X - Annual	
	MW-94-62-05 (30-40)	X - Annual	X - Annual	X - Annual	
	MW-2021-62-03A (10-20)	X - Annual	X - Annual	X - Annual	
	MW-2021-62-04B (68-78)	X - Annual	X - Annual	X - Annual	
	MW-2021-62-05B (72-82)	X - Annual	X - Annual	X - Annual	
Biennial** Assessment - Groundwater	MW-94-62-02 (30-40)	X - Annual	X - Biennial	X - Biennial	
	MW-94-62-03 (30-40)	X - Annual	X - Biennial	X - Biennial	
	MW-2021-62-01A (17-27)	X - Annual	X - Biennial	X - Biennial	
	MW-2021-62-06A (5-15)	X - Annual	X - Biennial	X - Biennial	
Piezometers - Water Levels Only	62-PZ01A	X - Annual	-	-	Water Level Meter
	62-PZ01B	X - Annual	-	-	
	62-PZ01C	X - Annual	-	-	
	62-PZ02A	X - Annual	-	-	
	62-PZ02B	X - Annual	-	-	
	62-PZ02C	X - Annual	-	-	
	62-PZ03	X - Annual			
	62-PZ04A	X - Annual			
	62-PZ04B	X - Annual			
	62-PZ04C	X - Annual			
	62-PZ05A	X - Annual			
	62-PZ05B	X - Annual			
	62-PZ05C	X - Annual			
Staff Gauges	62-SG01	X - Annual	-	-	Direct Measurement
	62-SG02	X - Annual	-	-	
	62-SG03	X - Annual	-	-	
Quality Assurance/Quality Control	Field Duplicate	-	10% of total samples	10% of total samples	After (Through) Peristaltic Pump
	MS/MSD	-	5% of total samples	5% of total samples	
	Equipment Blank	-	-	-	
	Trip Blank	-	-	-	

Notes:
*denotes wells will be installed in 2025 and IDs may be updated to "2025".
**Biennial sampling will begin with the first scheduled event in 2025.
(10-20) denotes well screen depth in feet below ground surface for that particular monitoring well.
N/A denotes not applicable.
ORP dentoes Oxidation-Reduction Potential.
POC denotes Point of Compliance.
TBD denotes well screen depths will be determined during well installation.
- denotes not analyzed/required.

Table 2
Compliance Monitoring Program
Range C-62, Eglin Air Force Base, Florida

Permit Designation / Matrix	Monitoring Locations	Field Parameters
Background	MW-94-62-01 (25-35)	pH, Turbidity, Dissolved Oxygen, ORP, Specific Conductivity, Temperature
POC -Groundwater	MW-2021-62-02A (5-15)	
	MW-2024-62-01A (TBD)*	
	MW-2024-62-01B (TBD)*	
	MW-2024-62-02A (TBD)*	
	MW-2024-62-02B (TBD)*	
	MW-2024-62-03A (TBD)*	
	MW-2024-62-03B (TBD)*	
Annual Assessment - Groundwater	MW-94-62-04 (29-39)	
	MW-94-62-05 (30-40)	
	MW-2021-62-03A (10-20)	
	MW-2021-62-04B (68-78)	
	MW-2021-62-05B (72-82)	
Biennial** Assessment - Groundwater	MW-94-62-02 (30-40)	
	MW-94-62-03 (30-40)	
	MW-2021-62-01A (17-27)	
	MW-2021-62-06A (5-15)	
Piezometers - Water Levels Only	62-PZ01A	N/A
	62-PZ01B	
	62-PZ01C	
	62-PZ02A	
	62-PZ02B	
	62-PZ02C	
	62-PZ03	
	62-PZ04A	
	62-PZ04B	
	62-PZ04C	
	62-PZ05A	
	62-PZ05B	
	62-PZ05C	
Staff Gauges	62-SG01	N/A
	62-SG02	
	62-SG03	
Quality Assurance/Quality Control	Field Duplicate	Parent sample readings only
	MS/MSD	
	Equipment Blank	
	Trip Blank	

Notes:
*denotes wells will be installed in 2025 and IDs may be updated to "2025".
**Biennial sampling will begin with the first scheduled event in 2025.
(10-20) denotes well screen depth in feet below ground surface for that particular mon
N/A denotes not applicable.
ORP dentoes Oxidation-Reduction Potential.
POC denotes Point of Compliance.
TBD denotes well screen depths will be determined during well installation.
- denotes not analyzed/required.

Attachment 1
Field Forms

FIELD INSTRUMENT CALIBRATION RECORDS - CALIBRATION LOG - PRP

Project Site/FacID: _____

Calibrated by (Print)/Affiliation: _____

Boldly "X" this box if there is qualified data on this page.

Temperature (Quarterly) Date of Last Temp Verification: See log book:

DISSOLVED OXYGEN (DO) (REFERENCE: DEP SOP FT 1500) **Acceptance Criteria +/-0.3 mg DO/L**

Meter/Instrument Name and Unique ID: _____

CAL	ICV	CCV	Initials	Date	Time	Standard (DO %)	Temp °C	DO Saturation mg/L (100%)**	Response DO (%)	Response mg DO/L	Deviation mg DO/L	Pass or Fail
CAL	ICV	CCV				100%						P F
CAL	ICV	CCV				100%						P F
CAL	ICV	CCV				100%						P F
CAL	ICV	CCV				100%						P F
CAL	ICV	CCV				100%						P F
CAL	ICV	CCV				100%						P F

** See Table FS 2200-2 and/or Table FT 1500-1 for Dissolved Oxygen 100% Saturation (mg/L) corresponding to Temperature.

SPECIFIC CONDUCTANCE (REFERENCE: DEP SOP FT 1200) **Acceptance Criteria +/-5% the standard**

Meter/Instrument Name and Unique ID: _____

CAL	ICV	CCV	Initials	Date	Time	Standard (µmho/cm)	Exp. Date	Lot #	Response (µmho/cm)	Deviation (%)	Pass or Fail
CAL	ICV	CCV									P F
CAL	ICV	CCV									P F
CAL	ICV	CCV									P F
CAL	ICV	CCV									P F
CAL	ICV	CCV									P F
CAL	ICV	CCV									P F
CAL	ICV	CCV									P F
CAL	ICV	CCV									P F
CAL	ICV	CCV									P F

OXIDATION-REDUCTION POTENTIAL (ORP) **Acceptance Criteria +/-10 mV**

REFERENCE: ***EPA Region 4, Operating Procedure, Field Measurement of Oxidation-Reduction Potential (ORP)***

Meter/Instrument Name and Unique ID: _____

CAL	ICV	CCV	Initials	Date	Time	Standard (mV)	Exp. Date	Lot #	Response (mV)	Deviation (mV)	Pass or Fail
CAL	ICV	CCV									P F
CAL	ICV	CCV									P F
CAL	ICV	CCV									P F
CAL	ICV	CCV									P F
CAL	ICV	CCV									P F
CAL	ICV	CCV									P F

Perform ICVs and CCVs only in "READ/RUN" mode.

CAL - Calibration; ICV - Initial Calibration Verification; and, CCV - Continuing Calibration Verification.

Deviation (%) = 100-{(Response/Standard)*100}

FIELD INSTRUMENT CALIBRATION RECORDS - CALIBRATION LOG - PRP

Project Site/FacID: _____

Calibrated by (Print)/Affiliation: _____

Boldly "X" this box if there is qualified data on this page.

TURBIDITY (REFERENCE: DEP SOP FT 1600) Meter/Instrument Name and Unique ID: _____

Std=0.1-10 NTU +/-10% **Std=11-40 NTU +/-8%** **Std=41-100 NTU +/-6.5%** **Std>100 NTU +/-5%**

CAL	ICV	CCV	Initials	Date	Time	Standard (NTU)	Exp. Date	Lot #	Response (NTU)	Deviation (%)	Pass or Fail	
CAL	ICV	CCV									P	F
CAL	ICV	CCV									P	F
CAL	ICV	CCV									P	F
CAL	ICV	CCV									P	F
CAL	ICV	CCV									P	F
CAL	ICV	CCV									P	F
CAL	ICV	CCV									P	F
CAL	ICV	CCV									P	F
CAL	ICV	CCV									P	F
CAL	ICV	CCV									P	F
CAL	ICV	CCV									P	F
CAL	ICV	CCV									P	F
CAL	ICV	CCV									P	F
CAL	ICV	CCV									P	F

pH (REFERENCE: DEP SOP FT 1100) **Acceptance Criteria +/-0.2 SU**

Meter/Instrument Name and Unique ID: _____

CAL	ICV	CCV	Initials	Date	Time	Standard (SU)	Exp. Date	Lot #	Response (SU)	Deviation (SU)	Pass or Fail	
CAL	ICV	CCV									P	F
CAL	ICV	CCV									P	F
CAL	ICV	CCV									P	F
CAL	ICV	CCV									P	F
CAL	ICV	CCV									P	F
CAL	ICV	CCV									P	F
CAL	ICV	CCV									P	F
CAL	ICV	CCV									P	F
CAL	ICV	CCV									P	F
CAL	ICV	CCV									P	F
CAL	ICV	CCV									P	F
CAL	ICV	CCV									P	F
CAL	ICV	CCV									P	F
CAL	ICV	CCV									P	F

Perform ICVs and CCVs only in "READ/RUN" mode.

CAL - Calibration; ICV - Initial Calibration Verification; and, CCV - Continuing Calibration Verification.

Deviation (%) = 100-{(Response/Standard)*100}

FIELD INSTRUMENT CALIBRATION RECORDS - CALIBRATION LOG - PRP

Project Site/FacID: _____

Calibrated by (Print)/Affiliation: _____

Boldly "X" this box if there is qualified data on this page.

ORGANIC VAPOR ANALYZER (OVA) **Acceptance Criteria +/-5% the standard**

REFERENCE: *Portable Instruments User's Manual For Monitoring VOC Sources* , EPA-340/1-86-015, June 1986

Meter/Instrument Name and Unique ID: _____

CAL	ICV	CCV	Initials	Date	Time	Standard (ppm)	Exp. Date	Lot #	Response (ppm)	Deviation (%)	Pass or Fail	
CAL	ICV	CCV									P	F
CAL	ICV	CCV									P	F
CAL	ICV	CCV									P	F

FIELD INSTRUMENT CALIBRATION RECORDS - CALIBRATION LOG - PRP

THIS FORM MAY BE USED FOR NON-TYPICAL PARAMETERS.
THIS FORM SHALL ***NOT*** BE USED FOR TYPICAL PARAMETERS (i.e. pH, DO, ORP, OVA, Turbidity, Conductance, etc.).

Project Site/FacID: _____

Calibrated by (Print)/Affiliation: _____

Boldly "X" this box if there is qualified data on this page.

PARAMETER: _____ **Acceptance Criteria** _____ **the standard**

REFERENCE: _____

Meter/Instrument Name and Unique ID: _____

CAL	ICV	CCV	Initials	Date	Time	Standard (_____)	Exp. Date	Lot #	Response (_____)	Deviation (_____)	Pass or Fail
CAL	ICV	CCV									P F
CAL	ICV	CCV									P F
CAL	ICV	CCV									P F
CAL	ICV	CCV									P F
CAL	ICV	CCV									P F
CAL	ICV	CCV									P F
CAL	ICV	CCV									P F
CAL	ICV	CCV									P F
CAL	ICV	CCV									P F
CAL	ICV	CCV									P F
CAL	ICV	CCV									P F
CAL	ICV	CCV									P F
CAL	ICV	CCV									P F
CAL	ICV	CCV									P F
CAL	ICV	CCV									P F
CAL	ICV	CCV									P F
CAL	ICV	CCV									P F
CAL	ICV	CCV									P F

Notes (e.g. corrective actions, etc): _____

Perform only in Calibrate Mode: CAL - Calibrate
Perform only in Read/Run Mode: ICV - Initial Calibration Verification
Perform only in Read/Run Mode: CCV - Continuing Calibration Verification
Deviation (%) = 100-{(Response/Standard)*100}

Modified DEP Form FD 9000-24: GROUNDWATER SAMPLING LOG

SITE NAME: Range C-62		SITE LOCATION: Eglin AFB, FL	
WELL NO:	SAMPLE ID:		DATE:

PURGING DATA

WELL DIAMETER (inches):	TUBING DIAMETER (inches):	WELL SCREEN INTERVAL DEPTH: feet to feet		STATIC DEPTH TO WATER (feet):	PURGE PUMP TYPE OR BAILER:

WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH – STATIC DEPTH TO WATER) X WELL CAPACITY
(only fill out if applicable)
= (feet – feet) X gallons/foot = gallons

EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOL. = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME
(only fill out if applicable)
= gallons + (gallons/foot X feet) + gallons = gallons

INITIAL PUMP OR TUBING DEPTH IN WELL (feet):	FINAL PUMP OR TUBING DEPTH IN WELL (feet):	PURGING INITIATED AT:		PURGING ENDED AT:	TOTAL VOLUME PURGED (gallons):

TIME	VOLUME PURGED (gallons)	CUMUL. VOLUME PURGED (gallons)	PURGE RATE (gpm)	DEPTH TO WATER (feet)	pH (standard units)	TEMP. (°C)	COND. (circle units) µmhos/cm or µS/cm	DISSOLVED OXYGEN (circle units) mg/L or % saturation	ORP (mV)	TURBIDITY (NTUs)	COLOR (describe)	ODOR (describe)

WELL CAPACITY (Gallons Per Foot): **0.75"** = 0.02; **1"** = 0.04; **1.25"** = 0.06; **2"** = 0.16; **3"** = 0.37; **4"** = 0.65; **5"** = 1.02; **6"** = 1.47; **12"** = 5.88
TUBING INSIDE DIA. CAPACITY (Gal./Ft.): **1/8"** = 0.0006; **3/16"** = 0.0014; **1/4"** = 0.0026; **5/16"** = 0.004; **3/8"** = 0.006; **1/2"** = 0.010; **5/8"** = 0.016

PURGING EQUIPMENT CODES: **B** = Bailer; **BP** = Bladder Pump; **ESP** = Electric Submersible Pump; **PP =** Peristaltic Pump; **O** = Other (Specify)

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION:	SAMPLER(S) SIGNATURE(S):		SAMPLING INITIATED AT:	SAMPLING ENDED AT:
PUMP OR TUBING DEPTH IN WELL (feet):	TUBING MATERIAL CODE:		FIELD-FILTERED: Y N Filtration Equipment Type:	FILTER SIZE: _____ µm
Water Quality Meter Model/SN#:			Turbidity Meter Model/SN#:	
FIELD DECONTAMINATION: PUMP Y N	TUBING Y N (replaced)		DUPLICATE: Y N	

SAMPLE CONTAINER SPECIFICATION				SAMPLE PRESERVATION (including wet ice)						
SAMPLE ID CODE	# CONTAINERS	MATERIAL CODE	VOLUME	PRESERVATIVE USED	TOTAL VOL ADDED IN FIELD (mL)	FINAL pH		INTENDED ANALYSIS AND/OR METHOD	SAMPLING EQUIPMENT CODE	SAMPLE PUMP FLOW RATE (mL per minute)

REMARKS:

MATERIAL CODES: **AG** = Amber Glass; **CG** = Clear Glass; **HDPE** = High Density Polyethylene; **LDPE** = Low Density Polyethylene; **PP** = Polypropylene; **S** = Silicone; **T** = Teflon; **O** = Other (Specify)

SAMPLING EQUIPMENT CODES: **APP** = After (Through) Peristaltic Pump; **B** = Bailer; **BP** = Bladder Pump; **ESP** = Electric Submersible Pump; **RFPP** = Reverse Flow Peristaltic Pump; **SM** = Straw Method (Tubing Gravity Drain); **O** = Other (Specify)

NOTES: 1. The above do not constitute all of the information required by Chapter 62-160, F.A.C.

2. STABILIZATION CRITERIA FOR RANGE OF VARIATION OF LAST THREE CONSECUTIVE READINGS (SEE FS 2212, SECTION 3)

pH: ± 0.2 units **Temperature:** ± 0.2 °C **Specific Conductance:** ± 5% **Dissolved Oxygen:** all readings ≤ 20% saturation (see Table FS 2200-2); optionally, ± 0.2 mg/L or ± 10% (whichever is greater) **Turbidity:** all readings ≤ 20 NTU; optionally ± 5 NTU or ± 10% (whichever is greater)

Equipment Blank ID: Ambient Blank ID: MS/MSD ID:

Notes:
Due to naturally occurring conditions at the site (e.g., shallow water table, rainfall recharge through relatively permeable sediments) the less than or equal to 20-percent [%] saturation for DO could not be attained. Therefore the +/-0.2 mg/L or +/-10% (whichever is greater) stabilization criteria was used per DEP-SOP-001,01, FS2212, Section 3.2.

Project/Site Name: Eglin AFB/Range C-62 Synoptic Water Level Event

Date :

Field Team Member:

Weather:

Water Level Meter Model:

Well ID	Time	DTW (ft bTOR)	DTB (ft bTOR)	Lock Y/N	Bolts Y/N	Cap Y/N	Well Condition/Comments
MW-94-62-01							
MW-94-62-02							
MW-94-62-03							
MW-94-62-04							
MW-94-62-05							
MW-2021-62-01A							
MW-2021-62-06A							
MW-2021-62-02A							
MW-2021-62-03A							
MW-2021-62-04B							
MW-2021-62-05B							
MW-2024-62-01A							
MW-2024-62-01B							
MW-2024-62-02A							
MW-2024-62-02B							
MW-2024-62-03A							
MW-2024-62-03B							
62-PZ01A							
62-PZ01B							
62-PZ01C							
62-PZ02A							
62-PZ02B							
62-PZ02C							
62-PZ03							
62-PZ04A							
62-PZ04B							

Project/Site Name: Eglin AFB/Range C-62 Synoptic Water Level Event

Date : _____

Field Team Member: _____

Weather: _____

Water Level Meter Model: _____

Well ID	Time	DTW (ft bTOR)	DTB (ft bTOR)	Lock Y/N	Bolts Y/N	Cap Y/N	Well Condition/Comments
62-PZ04C							
62-PZ05A							
62-PZ05B							
62-PZ05C							
62-SG01*							
62-SG02*							
62-SG03*							

Notes:

* denotes reading will be taken directly from staff gauge.

bTOR = below top of PVC riser

ft = feet

Attachment 2
Disposal of Investigative Derived Waste (IDW) Approval Email

From: FREEMAN, DANIEL L NH-03 USAF AFMC 96 CEG/CEIEC
To: DOYLE, KEVIN R GS-12 USAF AFMC 96 CEG/CEIEC
Subject: FW: Non-Containment of Purge Water Approval FDEP (002).pdf
Date: Wednesday, September 25, 2019 7:41:02 AM
Attachments: image002.jpg
~WRD000.jpg

Looks like we have approval to dump purge water.

From: Russell, Merlin <Merlin.Russell@dep.state.fl.us>
Sent: Wednesday, September 25, 2019 6:38 AM
To: FREEMAN, DANIEL L NH-03 USAF AFMC 96 CEG/CEIEC <daniel.freeman@us.af.mil>
Subject: [Non-DoD Source] FW: Non-Containment of Purge Water Approval FDEP (002).pdf

Danny, I thought I'd share this with you so that the disposal method can be written into your renewal.

See you tomorrow.

merlin

From: Smith, Michell M. <Michell.M.Smith@dep.state.fl.us>
Sent: Wednesday, September 25, 2019 7:33 AM
To: Russell, Merlin <Merlin.Russell@dep.state.fl.us>
Cc: Sullivan, Russell <Russell.Sullivan@dep.state.fl.us>
Subject: RE: Non-Containment of Purge Water Approval FDEP (002).pdf

Merlin,

I have no objections either. I have no problem with allowing Eglin to continue their current method of handling the purge water.

FL-DEP-LOGO

Michell Mason Smith
Environmental Administrator
Division of Waste
Florida Department of Environmental Protection
Hazardous Waste Program & Permitting
Michell.M.Smith@FloridaDEP.gov
Office: 850-245-8721

From: Russell, Merlin <Merlin.Russell@dep.state.fl.us>
Sent: Wednesday, September 25, 2019 7:25 AM
To: Smith, Michell M. <Michell.M.Smith@dep.state.fl.us>
Cc: Sullivan, Russell <Russell.Sullivan@dep.state.fl.us>
Subject: FW: Non-Containment of Purge Water Approval FDEP (002).pdf

Michell,

Eglin dug up the attached e-mail approving of disposing of purge water on the ground. In this case, because the OB/OD units are within a bombing range, we really can't consider the soils to be clean, and I have no objection to continuing with this old decision. Let me know if you disagree. Eglin will want to know if we disagree well before the application is due so that it can be written into their Part B. Thanks.

merlin

From: FREEMAN, DANIEL L NH-03 USAF AFMC 96 CEG/CEIEC <daniel.freeman@us.af.mil>
Sent: Tuesday, September 24, 2019 3:47 PM
To: Russell, Merlin <Merlin.Russell@dep.state.fl.us>
Cc: DOYLE, KEVIN R GS-12 USAF AFMC 96 CEG/CEIEC <kevin.doyle.17@us.af.mil>
Subject: Non-Containment of Purge Water Approval FDEP (002).pdf

Merlin, here is the email chain addressing the purge water issue we talked about.

Danny

Appendix N Maps of EAFB's IRP Areas of Concern and Points of Interest/ Newly Identified SWMU/AOC Profile Sheets

A.1 List of SWMUs / AOCs requiring Confirmatory Sampling

SWMU/AOC Number/Letter	Alias	SWMU/AOC Name	Activity	Unit Size (Acres)	Dates of Operation	Name/Type of Waste	Constituents of Concern	Date of Release	Type/Nature of Waste Released	Quantity/Volume of Waster Released	Site Status	Site Comment and Basis for Determination	Potentially Affected Media
There are no units identified as requiring Confirmatory Sampling at this time pursuant to this permit.													

A.2 List of SWMUs / AOCs requiring a Site Assessment (a/k/a RCRA Facility Investigation (RFI) or a Risk Assessment)

SWMU/AOC Number/Letter	Alias	SWMU/AOC Name	Activity	Unit Size (Acres)	Dates of Operation	Name/Type of Waste	Constituents of Concern	Date of Release	Type/Nature of Waste Released	Quantity/Volume of Waster Released	Site Status	Site Comment and Basis for Determination	Potentially Affected Media
CF288A	CF-288A	Military Family Housing Pesticides (Poquito Bayou)	Housing	90.75	Unknown	Pesticides/ Termiticides	GW: Arsenic Soil: Arsenic, chlordane	Unknown	Legal application of pesticides/ termiticides	Unknown amount	Investigation	Analytical results from sampling events in 2014 and 2015 indicated that levels of pesticides in groundwater exceed FDEP GCTLs.	Soil, GW
CF288B	CF-288B	Military Family Housing Pesticides (Former Nothern Plew Housing)	Housing	34.23	Unknown	Pesticides/ Termiticides	GW: Arsenic Soil: Arsenic, chlordane	Unknown	Legal application of pesticides/ termiticides	Unknown amount	Investigation	Analytical results from sampling events in 2014 and 2015 indicated that levels of pesticides in groundwater exceed FDEP GCTLs.	Soil, GW
CF288C	CF-288C	Military Family Housing Pesticides (Ben's Lake Housing)	Housing	119.63	Unknown	Pesticides/ Termiticides	GW: Arsenic Soil: Arsenic, chlordane	Unknown	Legal application of pesticides/ termiticides	Unknown amount	Investigation	Analytical results from sampling events in 2014 and 2015 indicated that levels of pesticides in groundwater exceed FDEP GCTLs.	Soil, GW
CF288D	CF-288D	Military Family Housing Pesticides (Former Northern Wherry Housing)	Housing	5.78	Unknown	Pesticides/ Termiticides	GW: Arsenic Soil: Arsenic, chlordane	Unknown	Legal application of pesticides/ termiticides	Unknown amount	Investigation	Analytical results from sampling events in 2014 and 2015 indicated that levels of pesticides in groundwater exceed FDEP GCTLs.	Soil, GW

A.3 List of SWMUs / AOCs requiring a Remedial Action Plan or natural Attenuation with Monitoring Plan (A/k/a RCRA Corrective Measures Study [CMS])

SWMU/AOC Number/Letter	Alias	SWMU/AOC Name	Activity	Unit Size (Acres)	Dates of Operation	Name/Type of Waste	Constituents of Concern	Date of Release	Type/Nature of Waste Released	Quantity/Volume of Waster Released	Site Status	Site Comment and Basis for Determination	Potentially Affected Media
CF288	CF-288	Military Family Housing Pesticides (AOC214, AOC215, AOC216, and AOC217)	Housing	448.11	During the 1950's to 1970's pesticides were legally applied under slab foundations during the construction of the old MFH units.	Pesticides/ Termiticides	Soil, GW: Pesticides, including dieldrin, chlordane, heptachlor, and heptachlor expoxide.	1950s - 1970s	Legal application of pesticides/ termiticides	unknown	Site Assessment	FDEP is requiring that a Site Assessment be conducted on the site	Soil , GW
SS313	SS-313	F-22 Crash Site	Crash Site	0.08	NA	Jet fuel	GW: PAHs Soil: Benzene, TPRH	15-May-20	F-22 Raptor crashed and discharged jet fuel	unknown	Site Assessment	FDEP is requiring that a Site Assessment be conducted on the site	Soil, GW

A.4 List of SWMUs / AOCs Implementing a Remedial Action Plan or Natural Attenuation Monitoring Plan (a/k/a Corrective Measures Implementation)

SWMU/AOC Number/Letter	Alias	SWMU/AOC Name	Activity	Unit Size (Acres)	Dates of Operation	Name/Type of Waste	Constituents of Concern	Date of Release	Type/Nature of Waste Released	Quantity/Volume of Waster Released	Site Status	Site Comment and Basis for Determination	Potentially Affected Media
LF003	LF-003	Eglin Main Landfill DRMO, CE Storage Yard	Landfill	329.02	Early 1940s to the 1960s	Landfill materials consisting of construction rubble, tires, wire, general and sanitary refuse, suspected PCB transformers, pesticide containers waste oils, waste solvents, hydraulic fluids, septic tank sludge, medical wastes, and drums containing corrosive liquid. Pesticides were reportedly sprayed over the waste material to control the insect population over the landfill.	benzene, vinyl chloride, and iron	1940s - 1960s	For DRMA Storage Yard, landfill material waste. Also several spills or releases of hazardous substances have occurred to include fuel, waste fuel, oil, and solvents. Leaks and spills from the drums contaminated the soils with DDT. Between 1971 and 1981, PCB transformers were stored in the southeastern perimeter of the DRMO, many of which leaked. In June 1992, during construction of a retention pond, 38 buried drums (both intact and damaged) were discovered, removed from the site and disposed of as hazardous waste. Testing of the drum contents revealed RCRA-classified hazardous waste.	Unknown	Active/LUCS with periodic groundwater monitoring are in place	EPA and FDEP approved the LUCS Groundwater samples are collected every five years for remedial process optimization (RPO) evaluation. The last groundwater sampling event was completed in November 2020.	GW
ST069	ST-069	Building No. 3073 Waste Oil Tank	Former Waste Oil Tank Area	88.89	The tank system has been inactive since approximately 1989. Unknown start date.	Petroleum contaminants	Soil: Petroleum products (BTEX, naphthalene, and lead) GW: Petroleum products (BTEX, naphthalene, and lead) and CVOCs (PCE)	The tank system has been inactive since approximately 1989. Unknown start date.	Waste oil release from the pressure relief vent/valve at the dispenser island.	Unknown	Active with LUCs and ongoing pump and treat system. Annual or semiannual groundwater monitoring events.	Operating under the 2015 Remedial Action Plan. Based on the March 2022 groundwater analytical results, extraction well ST069-EW-07D was connected to the extraction system. Recommendations in Performance Monitoring Report No. 8 included reactivating extraction well ST069-EW-05D along with continued operation of ST069-EW-03D and ST069-EW-07D. Annual performance monitoring will continue in accordance with the RA – O and Optimization for Groundwater Treatment System, until GCTLs are achieved. Upon achievement of GCTLs, a Site Rehabilitation Completion Report (SRCR) will be prepared requesting RMO Level I closure.	Soil, GW
SS280	SS-280	33rd Fighter Wing Hot Pit (Pipeline Spill Site 280) LP Number 7	Fuel Farm	25.04	Unknown	JP-8	Soils, GW: BTEX, PAHs, and TRPH	29-Jul-08	JP-8 fuel leak discovered during pressure test. Investigation revealed that the release was a result of a gasket and valve failure.	Estimated 1,000 - 30,000 gallons	Active Groundwater samples are collected quarterly for RPO evaluation.	Once the GCTLs have been met, post closure and MNA monitoring will be evaluated to determine a site exit strategy.	Soil, GW
SS287	SS-287	Building 92 Jet-A UST Leak	Fuel Farm	0.39	Unknown-Present Day	Jet-A	Groundwater: PAHs and Free Product Soil: VOCs and PAHs	5-Jun-18	Jet-A leak from malfunctioning transfer switch box.	2706	Active	The remedial system at SS-287 consists of a two-phase pilot study consisting of FP skimmer pumps and a downgradient in situ chemical oxidation. Residual soil contamination using a soil vapor extraction (SVE) system is proposed after successful testing.	Soil, GW
SS319	SS-319	2022 Bulk Storage Diesel Fuel Spill	Fuel Farm	0.01	Unknown-Present Day	Diesel	Groundwater: Naphthalene Soil: VOCs and PAHs	1-Jun-23	Diesel discharge from the pressure relief vent/valve at the dispenser island.	29	Active	Monitor groundwater quarterly in the three site monitoring wells for one year. Collect confirmation soil samples after one year which could allow closure if soil and GW are below NFA levels.	Soil, GW

A.5 List of SWMUs / AOCs at which Site Rehabilitation Completion Determinations With Controls have been made

SWMU/AOC Number/Letter	Alias	SWMU/AOC Name	Activity	Unit Size (Acres)	Dates of Operation	Name/Type of Waste	Constituents of Concern	Date of Release	Type/Nature of Waste Released	Quantity/Volume of Waster Released	Site Status	Site Comment and Basis for Determination	Potentially Affected Media
LF005	LF-005	Former Eglin Main Landfill	Landfill	256.36	1972 - 1978	Landfill material consisted of hardfill, septic tank, and oil/water separator (OWS) sludge	(aluminum, arsenic, and iron), VOCs (benzene, 1,4-dichlorobenzene, vinyl chloride, and total xylenes) Surface Water: Iron and VOCs (benzene, vinyl chloride, 1,4-dichlorobenzene) Sediments: Iron	1972 - 1978	Landfill waste The IRP Phase I Records Search identified the site as a potential source of environmental contamination and determined that there is a potential for off-site migration because of the nature of the wastes deposited, the shallow groundwater table, and the proximity of surface waters.	Unknown	Revision 01, 2023 Biennial Environmental Monitoring and Site Rehabilitation Completion Report, IRP Site No. LF005, Eglin Main Landfill (BZJV, February 2024) recommended RMO Level II closure. FDEP notice of intent to approve was received April 26, 2024.	Annual site inspections and submittal of the Annual LUC Inspection Report to FDEP by July 1 of each year that LUCs remain in effect.	GW, Surface Water, Sediment
LF008	LF-008	Receiver Area Landfill	Landfill	29.47	The landfill was active for approximately 10 years and was closed in the late 1970s.	Landfill waste	Metals in surface water and groundwater. CVOCs, petroleum hydrocarbons, pesticides, and metals in sediments.	The landfill was active for approximately 10 years and was closed in the late 1970s.	Landfill waste. The debris included tires, wire, spools, mattresses, and concrete. Other materials suspected of being dumped at the landfill included asbestos insulation, PCB transformers, electrical components, paint shop residues, aqueous film forming foam (AFFF), waste fuel and oils, solvents, septic tank pumpings, federal prison garbage, pesticides, and pesticide containers. The northern part of the landfill has been serving as a storage and venting area for petroleum-contaminated soil since the late 1980s.	Unknown	LTM Site with LUCs	EPA and FDEP approved the LUCs. Annual LUC site inspections and submittal of the Annual LUC inspection Report to FDEP by July 1 of each year that LUCs remain in effect.	Soil, GW
DP009	DP-009	Mullet Creek Drum Disposal Area	Disposal Area	9.30	late 1960s - early 1970s	Hardfill (plastics, drums, concrete, etc.).	Pesticides (aldrin, heptachlor, delta-benzene hexachloride (delta-BHC]), dioxins, PAHs (benzo(a)pyrene), and metals (aluminum, arsenic, manganese, and selenium).	Between the late 1960s and early 1970s	Hardfill debris. Only nine of the 663 drums that were removed contained material (herbicides).	663 drums and approximately 120 cubic yards of debris were removed	LTM Site with LUCs	A SB, prepared in June 2001, was approved by the FDEP, EPA, and the public. Annual LUC site inspectors and submittal of the Annual LUC Inspection Report to FDEP by July 1 of each year that LUCs remain in effect.	soil, groundwater, surface water, and sediments
LF010	LF-010	Auxiliary Field No. 2 North Landfill	Landfill	17.55	1960s - 1973	Landfill waste	Surface Soils: metals Surface Waters and Sediments: CVOCs, petroleum hydrocarbons, pesticides, PCBs, and metals.	1960s - 1973	Landfill waste. Materials include runway debris, scrap metal, building demolition debris, refuse, trash, Ans suspected vehicle maintenance solvents and herbicide drums.	Unknown	LTM Site with LUCs	EPA and FDEP approved the LUCs. Annual LUC site inspection and submittal of the Annual LUC Inspection Report to FDEP by July 1 of each year that LUCs remain in effect.	Surface soils, surface waters, and sediments
SS025	SS-025	C-52A Herbicide Equipment Test Grid Area	Test Grid Area	909.01	1962 -1970	Herbicides, fuel oil, and malathion (insecticide)	Herbicides, dioxins, fuel oil, arsenic, and malathion (insecticide)	1962 -1970	Aerial spray application of Herbicides, fuel oil, and malathion (insecticide) to evaluate the effectiveness of difference spray patterns and spray equipment	Unknown	LTM site with LUCs	EPA and FDEP approved the LUCs. Annual LUC site inspection and submittal of the Annual LUC Inspection Report to FDEP by July 1 of each year that LUCs remain in effect.	Soils, sediments, surface water, and GW
SS026	SS-026	Eglin Hardstand 7	Hardstand	2.63	Unknown	Herbicides	Herbicides and dioxins	Unknown	Hardstand 7 site was used for storage of herbicide drums and transfer of herbicides to aircraft.	Unknown	LTM site with LUCs	EPA and FDEP approved the LUCs. Annual LUC site inspection and submittal of the Annual LUC Inspection Report to FDEP by July 1 of each year that LUCs remain in effect.	Soils, sediments, surface water, and GW
FT028	FT-028	Eglin Main Base Old Fire Training Area	Training Area	114.16	Site FT-28 was used as an FTA beginning in the 1950s. From 1993 to 2000, fire training exercises used AFFF that was performed in two concrete-line burn pits.	AFFF	PFAS	1993 - 2000	Fire Suppressant used during fire training	A portable AFFF system activated in the mid-1990s and released approximately 300 gallons of AFFF concentrate on the flightline and surrounding grass.	Active Currently undergoing a Phase I RI for PFAS (See FT028P-SUB in Table B.1)	On June 27, 2024, FDEP provided a response to the June 21, 2024 Technical Memorandum, Request for Risk Management Option Level III Closure, Revision 01, Site FT028. They denied RMO III conditional closure until the comingled PFAS groundwater and soil contamination meets NFA criteria.	Soil, GW
LF051	LF-051	Upper Memorial Lake Landfill	Landfill	25.78	Landfilling activities reportedly occurred at the site during an undetermined time period in the 1960s.	Residue from the drums disposed on site showed traces of herbicides.	Select pesticides (DDT,Dichlorodiphenyldichloroethane (DDD), and DDE).	Landfilling activities reportedly occurred at the site during an undetermined time period in the 1960s.	A surface geophysical study performed in 1992 revealed possible buried metallic objects, and a confirmatory excavation uncovered approximately 25 empty drums. Residue from these drums showed traces of herbicides	Unknown	Technical Memorandum, Request for Risk Management Option (RMO) Level III Closure, Site LF051, Upper Memorial Lake Landfill (BZJV, April 2024) recommended site closure with LUCs. FDEP letter of concurrence was received July 3, 2024.	Annual site inspections and submittal of the Annual LUC Inspection Report to FDEP by July 1 of each year that LUCs remain in effect.	Sediment
OT083	OT-083	Pocosin Pond Cattle Dipping Vat	Cattle Dipping Vat	1.29	Site is associated with the Cattle Tick Fever Eradication Program, which the state of Florida enacted in 1917 and discontinued in 1944.	Arsenic	Arsenic	1917 - 1944	Solution used in vats that cows were dipped in to remove ticks	Unknown	LTM site with LUCs	EPA and FDEP approved the LUCs. Annual LUC site inspection and submittal of the Annual LUC Inspection Report to FDEP by July 1 of each year that LUCs remain in effect.	Soil
DP084	DP-084	Jacks Lake Limb Disposal Area	Undesignated Disposal Area	0.59	The date of initial usage is unknown. Access to the area was uncontrolled until approximately 1991 when a guard was posted to control access and monitor material deposited on the site.	Large quantities of unknown materials were discarded in the area during the uncontrolled period. Scrap wood, plastic waste, tires, concrete fragments, and construction debris have been identified on the clearing surface.	PCBs (Aroclor-1260)	The date of initial usage is unknown. Access to the area was uncontrolled until approximately 1991 when a guard was posted to control access and monitor material deposited on the site.	Undesignated disposal of waste	Unknown	LTM site with LUCs	EPA and FDEP approved the LUCs. Annual LUC site inspection and submittal of the Annual LUC Inspection Report to FDEP by July 1 of each year that LUCs remain in effect.	Soil

A.5 List of SWMUs / AOCs at which Site Rehabilitation Completion Determinations With Controls have been made

SWMU/AOC Number/Letter	Alias	SWMU/AOC Name	Activity	Unit Size (Acres)	Dates of Operation	Name/Type of Waste	Constituents of Concern	Date of Release	Type/Nature of Waste Released	Quantity/Volume of Waster Released	Site Status	Site Comment and Basis for Determination	Potentially Affected Media
SS086	SS-086	Exterior Electric & Entomology Shops		140.99	1980s - present day	Pesticides (DDD, DDT, and chlordane)	GW: VOCs, PAHs, and pesticides Soils: pesticides	In the early 1980s, prior to constructing Building 692, Building 687 served as the primary storage location for pesticides used on base. Following completion of Building 692, Building 687 was refurbished and used for office space. Until mid-1995, Building 692 contained both the Exterior Electric Shop and the Entomology Shop. The Entomology	No specific date of release. Past storage of pesticides in buildings are related to contamination on site.	Unknown	Revision 02, Annual Environmental Monitoring Report Number 20 and Conditional Site Rehabilitation Completion Report, Site SS086, Exterior Electric and the Entomology Shops (BZJV, October 2024) recommended RMO Level III closure. FDEP notice of intent to approve was received October 30, 2024.	Annual site inspections and submittal of the Annual LUC Inspection Report to FDEP by July 1 of each year that LUCs remain in effect.	Soil, GW
OT100	OT-100	Shoal River Cattle Dipping Vat	Cattle Dipping Vat	6.39	Site is associated with the Cattle Tick Fever Eradication Program, which the state of Florida enacted in 1917 and discontinued in 1944.	Arsenic	Arsenic	1917 - 1944	Solution used in vats that cows were dipped in to remove ticks	Unknown	LTM Site with LUCs	EPA and FDEP approved the LUCs. Annual LUC site inspections and submittal of the Annual LUC Inspection Report to FDEP by July 1 of each year LUCs remain in effect.	Soil, GW
DP261	DP-261	Building 914 Dump Site	Dump Site	2.59	Between the late 1960s and early 1970s	Hardfill (plastics, metal debris, drum, concrete, etc.)	Pesticides (DDT and its breakdown products - DDE and DDD) and metals (arsenic)	Between the late 1960s and early 1970s	Dump site	Unknown	LTM site with LUCs	FDEP approved the LUCs. Annual LUC site inspections and submittal of the Annual LUC Inspection Report to FDEP by July 1 of each year LUCs remain in effect.	Soils and sediments
OT262	OT-262	Auxiliary Field No. 4 Cattle Dipping Vat	Cattle Dipping Vat	0.99	Site is associated with the Cattle Tick Fever Eradication Program, which the state of Florida enacted in 1917 and discontinued in 1944.	Arsenic	Arsenic	1917 to 1944	Solution used in vats that cows were dipped in to remove ticks	unknown	LTM Site with LUCs	SB submitted in June 2001 was approved by EPA and FDEP. No Further Investigation Action with LUCs for soil, and NFA for groundwater. A LUCIP that outlined the future site management was submitted in September 2001 and has been approved. Annual LUC site inspection and submittal of the Annual LUC Inspection Report to FDEP by July 1 of each year that LUCs remain in effect.	Soil
OT263	OT-263	Kepner Pond Cattle Dipping Vat	Cattle Dipping Vat	0.78	Site is associated with the Cattle Tick Fever Eradication Program, which the state of Florida enacted in 1917 and discontinued in 1944.	Arsenic	Arsenic	1918 to 1944	Solution used in vats that cows were dipped in to remove ticks	unknown	LTM Site with LUCs	SB submitted in June 2001 was approved by EPA and FDEP. No Further Investigation Action with LUCs for soil, and NFA for groundwater. A LUCIP that outlined the future site management was submitted in September 2001 and subsequently approved. Annual LUC site inspection and submittal of the Annual LUC Inspection Report to FDEP by July 1 of each year that LUCs remain in effect.	Soil
OT264	OT-264	RR 678 and RR 234 Cattle Dipping Vat	Cattle Dipping Vat	6.44	Site OT-262 is associated with the Cattle Tick Fever Eradication Program, which the state of Florida enacted in 1917 and discontinued in 1944.	Arsenic	Arsenic	1919 to 1944	Solution used in vats that cows were dipped in to remove ticks	unknown	LTM Site with LUCs	SB submitted in June 2001 was approved by EPA and FDEP. No Further Investigation Action with LUCs for soil, and NFA for groundwater. A LUCIP that outlined the future site management was submitted in September 2001 and has been approved. Annual LUC site inspection and submittal of the Annual LUC Inspection Report to FDEP by July 1 of each year that LUCs remain in effect.	Soil
OT265	OT-265	Owl's Head Branch Cattle Dipping Vat	Cattle Dipping Vat	4.38	Site is associated with the Cattle Tick Fever Eradication Program, which the state of Florida enacted in 1917 and discontinued in 1944.	Arsenic	Arsenic	1920 to 1944	Solution used in vats that cows were dipped in to remove ticks	unknown	LTM Site with LUCs	SB submitted in June 2001 was approved by EPA and FDEP. No Further Investigation Action with LUCs for soil, and NFA for groundwater. A LUCIP that outlined the future site management was submitted in September 2001 and subsequently approved. annual LUC site inspection and submittal of the Annual LUC Inspection Report to FDEP by July 1 of each year that LUCs remain in effect.	Soil
OT269	OT-269	Cherry Branch Cattle Dipping Vat	Cattle Dipping Vat	4.42	Site is associated with the Cattle Tick Fever Eradication Program, which the state of Florida enacted in 1917 and discontinued in 1944.	Arsenic	Arsenic	1921 to 1944	Solution used in vats that cows were dipped in to remove ticks	unknown	LTM Site with LUCs	SB submitted in May 2002 was approved by EPA and FDEP. No Further Investigation Action with LUCs for soil, and NFA for groundwater. A LUCIP that outlined the future site management was submitted in September 2002 and has been approved. Annual LUC site inspections and submittal of the Annual LUC Inspection Report to FDEP by July 1 of each year that LUCs remain in effect.	Soil
OT270	OT-270	Malone Creek Cattle Dipping Vat	Cattle Dipping Vat	1.25	Site is associated with the Cattle Tick Fever Eradication Program, which the state of Florida enacted in 1917 and discontinued in 1944.	Arsenic	Arsenic	1922 to 1944	Solution used in vats that cows were dipped in to remove ticks	unknown	LTM Site with LUCs	SB submitted in May 2002 was approved by EPA and FDEP. No Further Investigation Action with LUCs for soil, and NFA for groundwater. A LUCIP that outlined the future site management was submitted in September 2002 and has been approved. Annual LUC site inspection and submittal of the Annual LUC Inspection Report to FDEP by July 1 of each year that LUCs remain in effect.	Soil

A.5 List of SWMUs / AOCs at which Site Rehabilitation Completion Determinations With Controls have been made

SWMU/AOC Number/Letter	Alias	SWMU/AOC Name	Activity	Unit Size (Acres)	Dates of Operation	Name/Type of Waste	Constituents of Concern	Date of Release	Type/Nature of Waste Released	Quantity/Volume of Waster Released	Site Status	Site Comment and Basis for Determination	Potentially Affected Media
OT271	OT-271	Choctaw Field Cattle Dipping Vat	Cattle Dipping Vat	1.50	Site is associated with the Cattle Tick Fever Eradication Program, which the state of Florida enacted in 1917 and discontinued in 1944.	Arsenic	Arsenic	1923 to 1944	Solution used in vats that cows were dipped in to remove ticks	unknown	LTM Site with LUCs	SB submitted in May 2002 was approved by EPA and FDEP. No Further Investigation Action with LUCs for soil, and NFA for groundwater. This site has LUCs that prevent residential development without proper engineering controls. These LUCs have been approved by EPA, FDEP, and the public as the selected remedy. Annual LUC site inspection and submittal of the Annual LUC Inspection Report to FDEP by July 1 of each year that LUCs remain in effect.	Soil
SS278	SS-278	Green Ponds Cattle Dipping Vat	Cattle Dipping Vat	4.77	Site is associated with the Cattle Tick Fever Eradication Program, which the state of Florida enacted in 1917 and discontinued in 1944.	Arsenic	Arsenic	1924 to 1944	Solution used in vats that cows were dipped in to remove ticks	unknown	LTM Site with LUCs	SB submitted in August 2006 was approved by EPA and FDEP. No Further Investigation Action with LUCs for soil, and LUCs for groundwater. A LUCIP that outlined the future site management was submitted in March 2007 and has been approved. Annual LUC site inspection and submittal of the Annual LUC Inspection Report to FDEP by July 1 each year that LUCs remain in effect.	Soil
SS281	SS-281	Deep TCE Plume 33rd Fighter Wing	Parking Apron	170.45	Unknown - present day	TCE	1,1-DCE, TCE, Manganese, and 1,4-dioxane	Unknown	Unknown TCE source	Unknown	Natural Attenuation Monitoring Report No. 8, Florida Panhandle Optimized Remediation Contract, Site SS281, Deep Trichloroethene Plume, Revision 03 (BJZV, March 2024) recommended RMO Level III closure. FDEP notice of intent to approve was received May 8, 2024.	Annual site inspections and submittal of the Annual LUC Inspection Report to FDEP by July 1 of each year that LUCs remain in effect.	GW
SS283	SS-283	JP-8 Spill Site (Upgradient of Site ST-065)	Spill Site	1.75	Unknown	JP-8 Jet Fuel	naturally occurring iron and arsenic in groundwater. Humic and fulvic acids in the Citronelle bay muds are believed to be the source of naturally-occurring dissolved organic carbon that results in reducing conditions which in turn allows for the solubilization of native iron and arsenic in the groundwater.	Unknown	Petroleum constituents were found in the groundwater on site. The free-phase liquid was characterized as JP-8 jet fuel.	Unknown	Based on an FDEP letter issued on 17 September 2021 following review of the PARM Report and response to comments, the FDEP has established the general path to achieving Response Complete (RC) via preparation of a SRCR for RMO Level III closure.	In response to the SRCR, Notice of Intent to Approve was issued by FDEP on August 25, 2022 requiring public notice. Public comment period was September 20, 2022 through November 4, 2022 where no comments were received. An Institutional Control Implementation Plan (ICIP) has been submitted for FDEP review to support RMO Level III closure with final remedy of Institutional Controls (ICs) for groundwater.	Soil, GW
POI523	POI-523	Test Area B-71 Fast Cook-Off Test Spill Site	Spill Site	28.42	After a fast cook-off test in 2010, a suspect area of potential soil contamination adjacent to the burn pan was identified.	JP-8 Jet Fuel	Total petroleum hydrocarbons and 1,3,4-trimethylbenzene	2010	Site POI-523 is used to conduct equipment or munitions testing referred to as “Fast Cook-Off.” To conduct a test, heat energy is generated through the ignition and conflagration of JP-8 Jet Fuel beneath the test item. To ignite the fuel, the Eglin AFB Explosive Ordnance Disposal Unit places thermite grenades in various locations within the burn pan. After ignition and complete consumption of the fuel, any liquid remaining in the pan is removed and properly treated as petroleum contact water.	1,687 tons of petroleum contaminated soil were removed	LUCs with engineering controls	NFA with Institution Controls based on RMO Level II was recommended for Site POI-523. The Conditional SRCO was issued on May 20, 2015 and included the LUCIP as an attachment. Annual LUC site inspection and submittal of the Annual LUC Inspection Report to FDEP by July 1 of each year until LUCs are removed.	Soil

A.6 List of SWMUs / AOCs at which Site Rehabilitation Completion Determinations Without Controls have been made

SWMU/AOC Number/Letter	Alias	SWMU/AOC Name	Unit Size (Acres)	Site Comment and Basis for Determination
SS001	SS-001	A-20 Radar Site	21.92	SRCR submitted to FDEP on 13 January, 2025. Awaiting FDEP NOI.
OT035	OT-035	Former Seventh Street BX Service Station	2.38	SRCR for site dated June 2020.
SS036	SS-036	Petroleum, Oil, and Lubricants (POL) Tank Farm	24.61	SRCR submitted to FDEP on 14 January, 2025. Awaiting FDEP NOI.
OT046	OT-046	Open Detonation Site (Test Area C-52N)	54.47	AOC file closed. RCRA Subpart X permitted. The The C-52N Open Detonation Site is designated as IRP Site No. OT-46. The site was identified as a potential source of contamination in 1990 because of the use of fuel and other combustible materials. The C-52N Open Detonation Site is located in the northeast portion of the C-52N test range, and it has been operational since 1950. In the past, unwanted munitions were burned in the earthen pit with fuel used as an ignition source. Current practices exclude the use of fuel for the processing of waste munitions. On October 3, 1996 the RCRA Subpart X permit for this facility was signed. Permit conditions include air and groundwater monitoring and RCRA Closure and Corrective Actions.
ST052	ST-052	Gas Station And Motor Oil Storage, Building No. 673	1.45	FDEP issued a SRCO on 6 March 1995 specifying NFA.
ST053	ST-053	Tank Farm, Building No. 745	0.77	A SRCO was issued by FDEP on 28 March 1995, specifying NFA.
ST054	ST-054	Waste Fuel Storage Tank (Building 989)	2.51	A Site Rehabilitation Completion Report (SRCR) requesting an SRCO from FDEP was submitted in August 2012. The SRCO from the FDEP was received in 2013, and the wells and remediation system components were subsequently abandoned.
ST055A	ST-055A	Duke Field Tank Farm, Building No. 3206	3.44	Site ST-55A achieved no further action with SRCO dated October 4, 2019.
ST055B	ST-055B	Duke Field Tank Farm	0.01	A request for an SRCO was submitted to FDEP in July 2001 and approved on 14 September 2001 for ST-55B
ST056	ST-056	6th Ranger Training Camp, Building No. 6005	0.02	FDEP issued SRCO on 16 August 1994 specifying NFA, SRC report dated December 1994, NFA Letter dated August 1999
ST058	ST-058	Military Gas Station	3.18	SRC report dated June 2010, FDEP issued SRCO in October 2010, Well Abandonment Report dated February 2012
ST060	ST-060	Post'l Point Marina	0.13	FDEP issued SRCO in October 2000, SRC report dated October 2000
ST061	ST-061	Eglin Golf Course	0.16	FDEP issued SRCO in August 1994, SRCO SRC report dated December 1994
ST062	ST-062	Jackson Guard Complex	0.17	FDEP issued SRCO on August 1994, SRC report dated December 1994
ST064	ST-064	Aero Club (Building 68)	2.21	FDEP issued SRCO in May 1995, NFA letter dated August 1999
ST066	ST-066	Building 1353, Tactical Air Command (TAC)	0.08	EPA approved NFA request in February 1999, FDEP approved NFA in June 1999
ST068	ST-068	Hurlburt Field SOF Jet Fuel Facility	5.70	NFA December 1997
ST070	ST-070	ACC Tank Farm, Building No. 1342	0.17	FDEP issued SRCO in May 1995. SRC report dated October 1996.
ST071A	ST-071A	West Gate AAFES Gas Station	0.88	FDEP issued SRCO in December 2004
SS110	SS-110	Eglin Pipeline Spill Site, Pit 12	1.96	FDEP issued SRCO in August 2012, SRC report dated February 2012, Monitoring Well Abandonment Report dated January 2013
DP257	DP-257	Post'l Lake Prison Camp Drum Disposal Area	33.28	FDEP issued a SRCO on September 13, 2021.
DP268	DP-268	Main Base POL Waste Pile	11.65	FDEP issued an SRCO on November 14, 2018, approving NFA for site DP-257.
SS275	SS-275	Air Combat Command Tank Farm	14.36	SRCR submitted to FDEP on 8 January, 2025. Awaiting FDEP NOI.
SS279	SS-279	Eglin POL Spill Site at Bldg. 945	0.68	FDEP issued a SRCO on February 15, 2021, officially approving Risk Management Option Level I closure of SS-279. Therefore, well abandonment at SS-279 began on 15 April 2021 and was completed on 16 April 2021.
SS285	SS-285	ACC Pipeline Spill Site	2.24	FDEP issued SRCO in August 2019 approving NFA for site
SS286	SS-286	Building 440 McKinley Climatic Laboratory Fire Site	0.56	FDEP issued SRCO on 12 September 13, 2021
POI553	POI-553	Building 3029 Maintenance Dock Oil Water Separator (OW-C563)	0.01	FDEP issued SRCO on 28 May 2014

A.7 List of SWMUs / AOCs where No Further Action Determinations have been made based on no suspected or confirmed contamination (i.e. not contaminated sites' as defined by 62-780 F.A.C.)

SWMU/AOC Number/Letter	Alias	SWMU/AOC Name	Unit Size (Acres)	Site Comment and Basis for Determination
AOC001	AOC-001	Old Civil Engineering Salvage Yard	1.00	Site Investigation report for AOC-001 dated June 7, 1996 was submitted to EPA and FDEP. Both agencies approved the NFA recommendation; FDEP approved on August 30, 1996 and EPA approved on November 21, 1996.
AOC002	AOC-002	A-15 Former Electric Power Plant	4.46	Site Investigation report for AOC-002 dated June 28, 1996 was submitted. FDEP concurred with the NFA recommendation on August 30, 1996, and EPA concurred with the NFA recommendation on February 10, 1997.
SS002	SS-002	A-21 Radar Facility Diesel Fuel Leak	0.64	EPA approved NFA in letter dated 22 February 1999 after review of RCRA Facility Investigation Report Addendum II
AOC004	AOC-004	C-52 Munitions Disposal/Empty Drum Storage Area	11.73	Re-Evaluation of Site Investigation Data and Recommendation for Site Closure of AOC-004 report dated July 28, 2000 was submitted to FDEP and EPA. FDEP approved the document subject to land use controls restricting residential use with letter dated August 16, 2000. EPA concurred with the recommendation for NFA for purposes for the HWSA permit in letter dated March 27, 2001.
LF004	LF-004	Eglin Main Landfill (D2)	42.72	NFA has been approved for this site. However, because the site contains landfilled material, Eglin AFB is managing LF-04 under internal LUCs implemented in 2000. LUCs will remain in force perpetually.
AOC005	AOC-005	Auxiliary Field No. 1 Disposal Area	12.15	The Draft-Final Site Investigation (SI) report for AOC-005 was submitted to EPA and FDEP. EPA letter (November 21, 1996) and FDEP letter (September 3, 1996) both concurred with the recommendation for NFA.
AOC006	AOC-006	OWSS, Jet Building 1352 Engine Maintenance	0.80	Final SI Report Addendum AOC No. 06 dated September 18, 1998 was reviewed by FDEP and EPA. FDEP issued NFA letter dated June 30, 1999 and EPA issued NFA letter dated November 9, 1999.
DP006	DP-006	Disposal Pit Near Skeet Range	0.22	Draft Site Investigation (SI) report was submitted December 1995. FDEP issued NFA dated August 3, 1999
AOC007	AOC-007	Auxiliary Field No. 6 Sanitary Landfill	3.11	Remedial Optimization Re-Evaluation and Remedial Optimization Implementation Report, Revision I, AOC No. 07 dated April 25, 2001 was submitted to the EPA. The EPA concurred with the recommendation of NFA with letter dated August 16, 2001.
DP007	DP-007	A-19 Drum Disposal Site (D5)	0.81	Draft Site Investigation (SI) report was submitted December 1995. FDEP issued NFA dated August 3, 1999
AOC008	AOC-008	Auxiliary Field No. 7 Landfill	17.88	FDEP concurs with NFA in letter dated October 5, 1998. EPA concurs with NFA in letter dated November 9, 1999. These letters were issued after review of SI report dated April 13, 1999.
AOC009	AOC-009	Auxiliary Field No. 10 Hot Pit Refueling Area	7.02	Auxiliary Field No. 10 is leased by Naval Air Station (NAS) Pensacola. This site was identified in 1991 by Eglin personnel as a potential source of contamination associated with fuels storage, transfer, and handling. Reportedly excess fuel from operations was released to an adjacent grass surface. Stained soil was observed during a site visit in 1994. NAS performed assessment of the site. AOC file is closed. NAS Pensacola accepted responsibility for the site and obtained approval from FDEP (10/1/01) for site closure.
AOC010	AOC-010	Auxiliary Field No. 10 East Dump Site (Choctaw Field)	6.27	Remedial Optimization Re-Evaluation and Remedial Optimization Implementation Report dated April 2001 was reviewed by FDEP. FDEP concurred with NFA in letter dated November 6, 2001. EPA NFA letter dated August 16, 2001.
AOC011	AOC-011	Chemical/Biological Lab Disposal Area	6.09	EPA NFA letter dated November 21, 1996. FDEP NFA letter dated September 9, 1996.
DP011	DP-011	Auxiliary Field 2 Drum Disposal Area	0.87	Final Site Inspection/Confirmatory Sampling report for Nine Group I Sites was submitted in August 1996. FDEP issued NFA on August 3, 1999
AOC012	AOC-012	Bay Target Vessel	10.51	
LF012	LF-012	Niceville/Valparaiso Landfill (D18)	106.06	Since 2003, the County has been monitoring the groundwater and surface water quality on a semi-annual basis. The County has requested to implement a monitoring NA program at LF-12. Since the site is managed by Okaloosa County, IRP Site LF-12 is considered closed with regard to Eglin AFB's involvement. Eglin AFB provides only indirect oversight of the remedial activities and long-term property management requirements that Okaloosa County is completing. Discussions with the FDEP concerning long term remediation options have resulted in the selection of corrective actions for groundwater impacts to be addressed as set forth in the Assessment Monitoring Only Plan Modification as the current preferred option. Implementation of this process was approved by the FDEP on August 6, 2012 through the Assessment Monitoring Only Plan which is detailed in the Long-Term Care Permit No. 0078402-006-SF. (FY2022 SSR, June 2023)
AOC013	AOC-013	Eglin Old Asphalt Plant	0.31	EPA NFA letter dated November 21, 1996. FDEP NFA letter September 11, 1996.
AOC014	AOC-014	Duke Field Sanitary Landfill	7.40	EPA NFA letter dated June 30, 2003. FDEP NFA letter June 18, 2003.

A.7 List of SWMUs / AOCs where No Further Action Determinations have been made based on no suspected or confirmed contamination (i.e. not contaminated sites' as defined by 62-780 F.A.C.)

SWMU/AOC Number/Letter	Alias	SWMU/AOC Name	Unit Size (Acres)	Site Comment and Basis for Determination
LF021	LF-021	Wright Landfill	377.29	A groundwater extraction remediation system has been installed at the landfill and is currently operating. The monitoring wells are sampled in accordance with FDEP requirements, and Eglin AFB is apprised of the results of the sampling and analysis. The County is currently in the process of restoring the remediation system. In discussions and meetings with the FDEP, it was recognized that revisions to the original RAP were necessary. The restoration will include replacing the recovery well discharge piping, replacing the pump in radioactive waste (RW)-2, and developing a maintenance program for the system. Groundwater modeling was conducted with the intent to evaluate the system and determine if the two recovery wells are adequate to maintain complete capture of the groundwater downgradient of the landfill. The investigation indicated that capture may be possible with two recovery wells providing the system is optimized for performance. Currently, the landfill vicinity is used for mulching of yard wastes from the surrounding communities. Active remediation will continue until cleanup goals are met. Okaloosa County is responsible for cleanup of this landfill. A RAP modification has been prepared and proposes a one-year monitoring of the assessment wells. The plan will be implemented to coincide with completing the remediation system restoration. The data collected during the one-year event will be used to determine if the two recovery wells are adequate or if a third recovery well is necessary for complete downgradient capture. Okaloosa County will provide a new digital survey and legal description for inclusion in any new lease. Eglin AFB further involvement is limited to oversight. (FY2022 SSR, June 2023)
LF022	LF-022	A-11A Disposal Site D40	0.85	The SI Report was submitted for regulatory review in December 1995 and subsequently approved for NFA dated August 1999
SS023	SS-023	DRMO Storage Yard S2	12.93	Site SS-23, previously known as IRP site S2, was a surface spill site with lead, pesticide, and PCB contaminants. Site SS-23 has been incorporated into LF-03.
AOC024	AOC-024	C-52A Aerial Overspray Site	153.98	EPA NFA letter dated November 9, 1999. FDEP NFA letter February 9, 1998
SS024	SS-024	CE Storage Yard	0.39	Site is a apart of OU-1. Final Statement of Basis for OU-1 was submitted to FDEP on June 2001. FDEP issued a letter of concurrence on October 16, 2001 for agreeing with Eglin AFB's recommendation for land use controls and long-term monitoring
FT027	FT-027	Duke Field Fire Training Area	15.96	Post-Active Remediation Monitoring/Site Rehabilitation Completion Report was submitted to FDEP on August 31, 2015. FDEP issued a SRCO on September 16, 2016. Technical Memorandum for Well Abandonment and Treatment System Decommissioning for Site SS-274, Revision 1, Duke Field Fire Training Area was submitted to FDEP on June 7, 2017
OT029	OT-029	Missile Maintenance Paint Stripper Pit	0.05	Draft-Final Decision Document for Site OT-29, Missile Maintenance Paint Stripper Paint was submitted on April 27, 1999. The document stated that the permit should be amended to list Site OT-29 as a closed site. FDEP concurs with NFA and issues NFA let on June 30, 1999
OT030	OT-030	Electric Battery Shop	0.04	Final Decision Documents for Site OT-30, Electric Battery Shop dated September 1999 states that no corrective action is proposed for Site OT-30. An NFA was recommended in the Statement of Basis for the site, dated September 1999
OT031	OT-031	Paint Shop (IS3)	0.33	Site Investigation report was submitted in December 1995 and subsequently approved for NFA.
AOC032	AOC-032	Building No. 1339 Oil/Water Separators, ACC Area (OWS-539, OW-C540)	3.81	EPA NFA letter dated September 30, 1998. FDEP NFA letter June 2, 1998.
SS032	SS-032	HERD PCE Spill	17.55	RFI Addendum II Report for site was submitted on December 17, 1998. FDEP agreed upon NFA after review of document in letter dated June 15, 1999
SS033	SS-033	Base Auto Hobby Shop	3.50	A CMS, conducted in 1996, recommended NFA for the site. In February 1999, the EPA agreed to Eglin's request to consider the approved CMS (February 17, 1999) as in RFI Addendum. The EPA also concurred with the NFA recommendation for Site SS-33.
AOC034	AOC-034	Building No. 1410 Oil/Water Separator, ACC Area	0.25	EPA NFA letter dated September 30, 1998. FDEP NFA letter June 1, 1998.
SD034	SD-034	Motor Pool	14.23	An RFI report was submitted to EPA and FDEP in July 1995. An NFA was recommended for the site.
AOC035	AOC-035	Oil/Water Separator Building 138	0.02	The OWS accepts drainage from two trench drains within the fuel system repair facility and a storm drain west of the facility. The OWS was found to be in good condition and working properly during the 1991 site visit. No history of problems has been identified with this unit. The June 1995 OWS Report indicates the OWS is designed and functioning properly. AOC file closed.
AOC036	AOC-036	Oil/Water Separator Buildings 1398 and 1399	0.04	The OWS accepts discharge from fuel pits in Buildings 1398 and 1399, and a bermed fuel AST. The 1991 site visit found the OWS to be in good condition, in working order, with no evidence of staining. No history of problems has been identified with this unit. The June 1995 OWS Report indicates the OWS is designed and functioning properly. AOC file closed.
AOC037	AOC-037	Oil/Water Separator Building 686	0.06	The OWS services a wash rack located in the CE complex. Wash water passed through a sand trap, into the OWS, and finally into the sanitary sewer. The OWS has been in service for ~20 years. The 1991 site visit identified a number of oily stains on the concrete wash rack area. The June 1995 OWS Report indicates the OWS is designed and functioning properly. AOC file closed.
OT038	OT-038	Guided Weapon Evaluation Facility Mercury Site	0.31	The SI Report was submitted for regulatory review in December 1995 and subsequently approved for NFA.
AOC039	AOC-039	Oil/Water Separator Building 508	0.07	The OWS services a three-bay wash rack facility in the motor pool complex. The wash water drains through trench drains in each bay to sand traps that discharge into the OWS and finally to the sanitary sewer. The OWS was found to be in good condition and working properly during the 1991 site visit. No history of problems has been identified with this unit. The June 1995 OWS Report indicates the OWS is designed and functioning properly. AOC file closed.

A.7 List of SWMUs / AOCs where No Further Action Determinations have been made based on no suspected or confirmed contamination (i.e. not contaminated sites' as defined by 62-780 F.A.C.)

SWMU/AOC Number/Letter	Alias	SWMU/AOC Name	Unit Size (Acres)	Site Comment and Basis for Determination
RW040	RW-040	Depleted Uranium Site (Test Area C-64)	29.09	A Final Characterization Survey and ICM report (Revision 3) submitted in September 2001 were approved by EPA, FDEP, and the U.S. Air Force (USAF) Radioisotope Committee for no additional action under the current industrial land use. The site has been released back to the range for use as a conventional weapons test area (which includes no DU testing). LUCs were implemented in 2007 and will remain in force perpetually.
RW041	RW-041	Depleted Uranium Site (Test Area C-74L)	7.26	Eglin AFB submitted the FSS Report in December 2006. In September 2007, the NRC approved the FSS Report and granted the Department of AFB, Test Area C-74L for unrestricted use in accordance with 10 CFR 20.1402, "Radiological criteria for unrestricted use." This allows test range use over the entirety of the site (for non-DU testing). FDOH and EPA approved NFA for this site on June 6, 2007 and the Air Force RIC approved release of the land for use as a conventional weapon test range. The NRC granted the decommissioning of the site in September 2007. Eglin Bio-Environmental Engineering is managing RW-41 under internal LUCs.
AOC042	AOC-042	VORTAC Generator Spill Site	2.52	This site is the location of an uncontrolled release of an unknown amount of fuel. The release is likely associated with a UST and emergency generator located on site. Tanks removed in 1994. Chapter 62-761, F.A.C. site closure assessment indicated no contamination present. AOC file closed.
RW042	RW-042	Low-Level Radioactive Waste Site/Drum Burial	3.62	Environmental Monitoring Report for Site RW-42 date January 2000 recommended NFA for the site.
AOC043	AOC-043	A-15 Compound, Former BOMARC Launch Facility	0.65	The site is also the location of IRP Site No. RW-42, which is unrelated to AOC-43. The site has been inactive since the late 1960s. Reportedly, a drain field receives discharge from building floor drains. Two hydraulic fluid reservoirs and associated pipe work, and historic hydrazine and nitric acid spills are reportedly at this site. Appropriate removal actions and tank closure have been accomplished. Chapter 62-761, F.A.C. site closure assessment and groundwater data indicated no contamination present. Tanks were filled in place. AOC file closed.
AOC044	AOC-044	OW-550 Oil/Water Separator Building 1354, Battery and Hydraulic Shop, ACC	0.01	The two OWSs, at the ACC Area Battery and Hydraulic Shop, have been in service for ~20 years. The OWSs were in good condition and working properly during the 1991 site visit, with no evidence of staining. The OWS Report (June 1995) indicates the OWS is adequately designed and functioning properly. AOC file closed.
SS045	SS-045	Ground-Air Transmitter (GAT) Site	1.00	A Corrective Measures Completion Report was submitted in March 2003 requesting NFA for Site SS-45. EPA and FDEP approved closure of Site SS-45 without additional monitoring or LUCs on 5 May 2003 and 28 April 2003, respectively.
DP048	DP-048	Welding/Electroplating Shop (IS4)	0.36	SI Report was submitted for regulatory review in December 1995 and was subsequently approved for NFA
ST049	ST-049	Building No. 562	0.94	In November 1999, a SRCO was requested from FDEP to close the site with NFA. FDEP approved NFA at this site and issued the SRCO.
AOC050	AOC-050	Eglin Main Spray Field	204.47	No letter required. Has DEP permit
SD050	SD-050	Jet Engine Test Cell Oil/Water Separator Outfall	0.11	Site SD-50 is incorporated with Site ST-65. In 2012, Eglin established a new IRP Site No. SS-283 which encompasses the area of ST-65.
AOC051	AOC-051	Sewage Treatment Plant - Air Combat Command	3.29	No letter required. Has DEP permit
AOC052	AOC-052	Auxiliary Field No. 4 Dried Sludge Disposal Site	6.73	No letter required. Has DEP permit
AOC053	AOC-053	Weekly Bayou Hardfill	1.66	This construction debris disposal site is located in a sparsely vegetated area between Weekly Bayou and a base recreation area. The site is ~100 ft wide and 300 ft long and covers both sides of the recreation area access road to the edge of the bayou. During a site visit conducted in 1991, relatively recent deposits of asphalt, concrete, and other debris were found; no evidence of hazardous wastes was seen. Debris was removed in 1996. AOC file closed.
AOC054	AOC-054	Old Shalimar Gulf Power Substation	1.02	This former substation is located at the intersection of State Road 85 and Sunset Road and is ~ 3,150 square ft in size. The site is in an Active Lease Agreement with Gulf Power. The 1991 site visit found that all electrical equipment had been removed and a concrete pad had a large black stain; no other staining was observed. The site is under a FDEP Consent Order with Gulf Power for environmental assessment because PCB transformers, arsenic-based herbicides, and creosote may have been used on site. Gulf Power has completed the Site Assessment (SA), and FDEP concurs with Gulf Power's recommendation of NFA for soil and groundwater at this site. Groundwater was evaluated in 2017 and the wells properly abandoned; FDEP to issue a NFA letter in December 2018. AOC file closed.
AOC055	AOC-055	Auxiliary Field Number 2 Herbicide Loading Site	0.65	AOC file closed. This site is also designated as POI No. 338. Based on Preliminary Assessment (PA) at POI No. 338, NFA approved by USEPA on 11/9/99 and FDEP on 8/3/99.
AOC056	AOC-056	Auxiliary Field No. 10 South Dump Site (Choctaw OLF)	3.91	Auxiliary Field No. 10 is leased by NAS Pensacola. Several investigations have been conducted at this site. The 1994 AOC investigation states an agreement between the FDEP and Eglin Air Force Base (AFB) has concluded that no further investigation is necessary. AOC file closed.
AOC057	AOC-057	D-55 Test Area Creosote Pilings	156.53	This site was identified in 1991 as a potential source of contamination due to creosote used on n pilings that were installed in 1959. An environmental assessment focusing on the pilings was conducted in February 1994. AOC file closed.
ST057	ST-057	Test Area C-80W	0.00	A CA was completed in 1994. FDEP issued an SRCO on 11 January 1994 specifying NFA.
AOC058	AOC-058	Wolf Creek Drum Disposal Site	1.05	The 1994 AOC investigation does not recommend further sampling of the site based on a site inspection, interviews, and a records review. This document has been accepted by FDEP and the RAB. AOC file closed.

A.7 List of SWMUs / AOCs where No Further Action Determinations have been made based on no suspected or confirmed contamination (i.e. not contaminated sites' as defined by 62-780 F.A.C.)

SWMU/AOC Number/Letter	Alias	SWMU/AOC Name	Unit Size (Acres)	Site Comment and Basis for Determination
AOC059	AOC-059	Windham Tower Drum Disposal Site	0.17	This site was identified in 1990 as a potential source of environmental contamination associated with disposal of herbicide Orange drums. Because no evidence of herbicide Orange has been found during analytical testing, the 1994 AOC investigation determined that the site does not pose any environmental concerns. A technical document to support NFA was prepared for the site in August 1993. This document has been accepted by FDEP and the RAB. AOC file is closed.
ST059	ST-059	Ben's Lake Marina	0.70	Site Rehabilitation Completion report dated July 2023 was approved by FDEP with NOI letter issued on May 8, 2024. FDEP issued a Site Rehabilitation Completion Order (SRCO) dated 9 April 2024.
AOC060	AOC-060	Old Duke Sewage Treatment Plant	0.81	The 200-250 person capacity treatment plant was in operation for 30 years, all the buildings were razed in 1978, and the site was identified in 1991 as a potential source of contamination. The 1994 AOC investigation states that no visual evidence of contamination has been noted, exposure to contaminants (if present) is low, and primarily domestic sewage was treated. This document has been accepted by FDEP and the RAB. AOC file closed.
AOC061	AOC-061	Auxiliary Field Number 2 Sewage Treatment Plant	3.35	The plant was identified in 1991 as a potential source of environmental contamination. The plant, abandoned for about 20 years, was a small domestic waste plant used by refugees. The 1994 AOC investigation did not recommend further environmental action at this site. This document has been accepted by FDEP and the RAB. Physical structures were filled in place in 1995. AOC file closed.
AOC062	AOC-062	Auxiliary Field No. 5 Sewage Treatment Plant	0.80	The plant was abandoned in early 1970, and no information was found specifically detailing the operation history of the plant. The 1994 AOC investigation found no evidence of hazardous and industrial waste treatment during the field reconnaissance. This document has been accepted by FDEP and the RAB. AOC file closed.
AOC063	AOC-063	Isotope Burial Area North of C-74 Complex	0.60	EPA NFA letter October 5, 1998. Florida Department of Health (FDOH) NFA letter October 29, 1998.
ST063	ST-063	Waste Oil Receiver Yard	0.04	Site ST-63 has been incorporated into LF-03, which is under OU-1. Final Statement of Basis for OU-1 is dated June 2001. Report recommended for LUCs and long-term monitoring. FDEP reviewed Rev 01 of the Technical Memorandum Requesting RMO level III Closure for Site LF0003 dated June 11, 2024. Comments were left with no approval for RMO level III Closure.
AOC064	AOC-064	Auxiliary Field Number 4 Fire Training Area	5.69	The Fire Training Area was identified as a potential source of contamination associated with the use of fuels during fire training exercises. Confirmation of the existence of the Fire Training Area could not be obtained. AOC file closed. The site was determined not to exist.
AOC065	AOC-065	Fuel Spill Building 101	0.09	In July 1980, ~200 to 500 gal of fuel were spilled in the general vicinity of Building 101. The release reportedly accessed a drainage ditch associated with Runway 01/19, which flows south and eventually discharges to an unnamed tributary of Jack Lake. Reports indicated that most of the fuel was contained and recovered as a result of the spill response contingency plan that was implemented. Site visits in 1991 and 1993 found no evidence of a past fuel release nearby. AOC file closed.
ST065	ST-065	McKinley Climatic Lab, Building No. 455	0.40	In 2012, Eglin established a new IRP Site No. SS-283 which encompasses the area of ST-65. This new IRP has been established to evaluate contamination (JP-8 jet fuel) not associated with ST-65 (which historically had JP-4). Site ST-65 has been administratively closed out and absorbed into the SS-283 activities.
AOC067	AOC-067	C-74 Sled Track Burial Area	0.99	FDOH NFA letter October 29, 1998
ST067	ST-067	Building 1346, Tactical Air Command (TAC)	2.02	Site Rehabilitation Completion report dated August 2006 was submitted to FDEP. FDEP approved the report and issued a SRCO on October 20, 2006.
AOC068	AOC-068	Eglin Gunnery Butt Test Area A-22	87.35	FDOH NFA letter July 24, 2001
AOC070	AOC-070	C-52C Test Area (Napalm Grid)	6.58	The C-52C Test Area is an active test range and is used for testing small air-to-ground munitions, incendiary, and flame weapons. The Napalm Grid Site was reportedly used from the mid-1960s to the early 1970s as an experimental test site for various napalm compounds. No sampling has been conducted at this site; however, the munitions exploded at the site may have contained hazardous compounds that could have impacted the site. This site was included in a separate ordnance archive search that was completed February 2000. AOC file closed. Included in ongoing separate ordinance Archive Search Report.
AOC071	AOC-071	C-52 Smoke Week Test Area	1.67	No NFA letter required
ST071	ST-071	Building 2586 Army Air Force Exchange Service (AAFES) West Gate Shoppette	0.17	Site Rehabilitation Completion Report dated November 2004 was submitted to FDEP. FDEP approved the report and issued a SRCO on January 3, 2005.
ST072	ST-072	Air Combat Command (ACC) Tank Farm	7.32	Site ST-72 is closed. Site ST-72 has been combined, along with sites ST-70, ST-72A, and ST-72B, into ST-275.
AOC073	AOC-073	Lightwood Knot Creek Borrow Pit/Hardfill (B-26)	59.61	The site consists of building demolition debris and hardfill, and no evidence of disposal of other materials was observed in a site visit conducted in support of the 1994 AOC investigation. The 1994 AOC investigation concluded that due to the nature of the hardfill material at this site, it is unlikely to pose an environmental problem. AOC file closed.
SS073	SS-073	Waste Oil Receiver Yard, Building No. 552	0.36	A SRCO was issued by FDEP on 4 August 1997 specifying NFA.
AOC074	AOC-074	East Flight Line Drainage Ditch at Eglin Main Base, Northeast Section	0.95	EPA NFA letter March 28, 2001 and FDEP August 10, 2000
SS074	SS-074	A-3 Officer's Beach Club	0.13	A SRCO was issued by FDEP on 3 December 1996, specifying NFA.
AOC074	SWMU-074	East Flight Line Drainage Ditch at Eglin Main Base, Northeast Section	0.95	A Site Assessment Report dated July 2000 was submitted to FDEP with the recommendation that the site be listed as an NFA site.

A.7 List of SWMUs / AOCs where No Further Action Determinations have been made based on no suspected or confirmed contamination (i.e. not contaminated sites' as defined by 62-780 F.A.C.)

SWMU/AOC Number/Letter	Alias	SWMU/AOC Name	Unit Size (Acres)	Site Comment and Basis for Determination
AOC075	AOC-075	Duke Field Flight Line Drainage Ditch (IS-5)	0.21	The Flight Line Drainage Ditch provides drainage for storm water and wash water runoff from flight line operations. This site poses a potential for migration of waste fuels, oils, and wash water. No environmental sampling has been conducted. Stained soils were noted during the 1994 AOC investigation site visit. No evidence of past disposal exists. FDEP and USEPA concurred with NFA on 9/10/97. AOC file closed.
ST075	ST-075	ACC Area Hydrant System Near Building 1346	0.11	Site ST-75 has been incorporated into ST-67.
AOC076	AOC-076	Eglin Main Gate Transformer Leak Site	0.01	EPA NFA letter July 9, 1997. FDEP NFA letter August 15, 1997.
AOC077	AOC-077	B-82 Munition Test Area Disposal Site	4.48	The B-82 Munitions Test Area Disposal Site is on an active test range and is associated with a one time disposal of unspecified materials in the early 1980s. Follow-up conversations with an eyewitness of the event indicated that the material was UXO. A hole was dug; the UXO was placed in it and then exploded. This is an active munitions test area. AOC file closed. The site is included in Eglin's Munitions Archive Report.
ST077	ST-077	Building 2589 Water Tower, Well #7	0.20	The results of the IM investigation and remediation activities were presented to the Restoration Advisory Board (RAB) on 11 March 1998. The IM report recommending NFA was submitted to EPA and FDEP on 13 March 1998. NFA was approved for the site on 20 March 1998.
AOC078	AOC-078	Auxiliary Field No. 1 Northeast Landfill	17.29	Information concerning the history and location of the landfill could not be obtained. Therefore, the location of this site could not be identified. The Northeast Landfill is not considered an AOC unless or until further information is obtained. During an August 29, 1995 meeting, Mr. Jerry Champion indicated that he had no knowledge of a Northeast landfill at Field 1. Subsequent review of historical maps produced no evidence of a Northeast landfill. If the landfill is located, then the site will be investigated as AOC No. 78.
ST078	ST-078	Building 10351 Water Tower, Well #9	0.28	The results of the IM investigation and remediation activities were presented to the RAB on 11 March 1998. The IM report recommending NFA was submitted to EPA and FDEP on 13 March 1998. NFA was approved for the site on 20 March 1998.
AOC079	AOC-079	Auxiliary Field No. 4 Landfill	46.58	Landfill never located. Additional interviews indicate it does not exist. AOC file closed.
ST079	ST-079	Building 10940 Water Tower, Well #10	0.42	The results of the IM investigation and remediation activities were presented to the RAB on 11 March 1998. The IM report recommending NFA was submitted to EPA and FDEP on 13 March 1998. NFA was approved for the site on 20 March 1998.
AOC080	AOC-080	Test Area C-60 (Napalm Grid)	15.12	The location and operational history of the Test Area C-60 Napalm Grid is uncertain. Furthermore, the validity and/or existence of the Napalm grid are uncertain. In the area that was subject to a site visit in support of the 1994 AOC investigation, no evidence of hazardous waste contamination was found. This site was mislocated and does not exist at this location. AOC file closed.
ST080	ST-080	Building 2830 Water Tower, Well #12	0.27	The IM report recommending NFA was submitted to EPA and FDEP in November 2000. The site was closed on 2 March 2001.
AOC081	AOC-081	Lower Memorial Lake Burial Sites	4.13	This site consists of three potential herbicide Orange disposal sites southeast of Memorial Lake. Between 1966 and 1967, an estimated 50 to 150 drums of herbicide Orange were punctured and allowed to drain into a trench at these areas. These sites were initially identified in 1983, reexamined in 1990, and an additional site visit was conducted in 1991. A geophysical site survey conducted in 1991 failed to detect any buried drums, except drums found within the boundary of Landfill 4 (IRP Site No. LF-04). Soil sampling was conducted and analyzed for herbicide Orange; sampling results indicated no contamination. However, Eglin has been unable to confirm site location. AOC file closed.
ST081	ST-081	Building 2756 Water Tower, Well #16	0.28	FDEP approved NFA recommendation from Site Investigation Report dated October 3, 2003 in a letter dated October 8, 2003
AOC082	AOC-082	A-15 Compound Disposal Area	3.18	EPA NFA letter May 21, 1998. FDEP NFA letter February 3, 1998.
OT082	OT-082	Auxiliary Field No. 4 Hardfill Area	20.25	RFI for site was submitted in December 1997 with an NFA recommendation. FDEP approved NFA recommendation subsequently after review.
AOC083	AOC-083	C-52A Drum Disposal Area	1.19	EPA NFA letter September 30, 1998. FDEP NFA letter August 13, 1998.
AOC085	AOC-085	A-15 Compound Fire Training Area	1.11	EPA NFA letter May 24, 1999. FDEP NFA letter February 4,1999.
SS085	SS-085	Test Area C-6 Radar Facility	24.06	Based on the findings of the 2009 Semi-Annual Monitoring Report and No Further Action Proposal (RMO Level 1) completed in May 2010, NFA was recommended and subsequently approved by regulatory authorities in June 2010. A well abandonment report was submitted in August 2011.
FT087	FT-087	Auxiliary Field No. 2 Fire Training Area	1.89	Site Rehabilitation Completion Report dated August 2003 was submitted to FDEP. FDEP approved and issued SRCO on September 12, 2003.
AOC088	AOC-088	Hardstand 8 Alternate Loading Area	1.90	EPA NFA letter August 16, 2001. FDEP NFA letter July 18, 2001.
DP088	DP-088	Auxiliary Field No. 2 East Disposal Area	4.20	In 1996, an SI/RFA was completed. Based on the findings, NFA was recommended and subsequently approved by EPA and FDEP on 21 November 1996.
AOC089	AOC-089	Hardstand 1 Neutralization Pit	1.17	EPA NFA letter July 16, 1997. FDEP NFA letter August 15, 1997
OT089	OT-089	Eglin Golf Course Maintenance Facility	5.57	Based on the findings of the Groundwater Monitoring Report and No Further Action Proposal (RMO Level 1) completed in July 2010, NFA was recommended and subsequently approved by regulatory authorities in March 2011. A well abandonment report was submitted in August 2011.
SS090	SS-090	Nugget Oil Company Spill Site	0.87	In March 1999, groundwater results showed that BTEX and TRPH concentrations had decreased to below petroleum cleanup levels. FDEP issued an SRCO on 15 December 1999, specifying NFA.
AOC091	AOC-091	Pocosin Pond Test Area	11.64	EPA NFA letter July 17, 2001.
SS091	SS-091	Climatic Laboratory Methylene Chloride Spill	0.09	A risk assessment was submitted to FDEP for comments in 1993. The risk assessment indicated that there are no unacceptable risks under current land use scenarios. The site is closed
AOC092	AOC-092	Duke Field Hot Pit Refueling Area	1.03	EPA NFA letter February 20, 1998. FDEP NFA letter August 10, 1998.

A.7 List of SWMUs / AOCs where No Further Action Determinations have been made based on no suspected or confirmed contamination (i.e. not contaminated sites' as defined by 62-780 F.A.C.)

SWMU/AOC Number/Letter	Alias	SWMU/AOC Name	Unit Size (Acres)	Site Comment and Basis for Determination
FT092	FT-092	Eglin Skeet Range & Fire Training Area	12.66	RFI/ICM Report Revision I Report dated November 1998 recommended NFA for Site FT-92. FDEP approved NFA recommendation with NFA letter dated March 9, 1999.
AOC093	AOC-093	Munitions Disposal Area	4.82	Site is located on an active test range. During the 1970s, three or four trenches were used to dispose of spent munitions and target debris. The 1994 AOC investigation concluded the potential risk to human health or the environment is minimal. AOC is located within the active munitions range footprint. Included in a separate ordinance archive search, which was completed February 2000. AOC file is closed. SI (RFA) completed August 1996. NFA approved by USEPA on 9/30/98 and FDEP on 9/198.
ST093	ST-093	Water Tower No. 379, Main Base	0.19	An Interim Corrective Measures Report was submitted to FDEP in July 1999. NFA was approved for the site on 30 September 1999.
AOC094	AOC-094	A-11 Storage Bunkers	2.87	EPA NFA letter September 30, 1998. FDEP NFA letter September 1, 1998.
ST094	ST-094	Water Tower No. 225 - 3rd Street/Education Building	0.06	An Interim Corrective Measures Report was submitted to FDEP in July 1999. NFA was approved for the site on 30 September 1999.
AOC095	AOC-095	Abandoned Radar Site Pipeline	2.07	AOC file closed. The 1,000 ft-long pipeline was active during the 1960s BOMARC test program, and was identified by former Eglin AFB personnel as a potential source of environmental contamination as a result of diesel fuel handling. The pipeline was removed in 1990 and fuel recovery form the pipeline was necessary. Appropriate Chapter 62-770 F.A.C. sampling was conducted. All analysis results were below detection limits.
LF095	LF-095	Holley Navarre Landfill	67.87	Additional Investigation Activities report at the Holley Landfill/POI No. 500 area dated May 2010 was submitted to FDEP. The observed distribution and detected concentrations of these contaminants suggest both the Holley Landfill and POI No. 500 are potential source areas for groundwater contaminants. However, the data generated during this investigation suggest that the groundwater contaminant plume present under and south of the southern portion of POI No. 500 likely originated on POI No. 500.
AOC096	AOC-096	Hot Pit Refueling Area - Air Combat Command	2.64	EPA NFA letter February 20, 1998. FDEP NFA letter September 1, 1998.
DP096	DP-096	Taxiway 9E Disposal Area	2.13	Eglin AFB submitted an ICM report in April 2003 documenting the soil excavation and sediment sampling activities. additional sediment sampling was performed in summer 2003. On the basis of this work a closure letter was submitted in August 2003. This letter recommended NFA for site sediments and was approved by both EPA and FDEP on October 15, 2003.
DP097	DP-097	Old Base Hobby Shop	11.50	In 2004, IRP Site No. DP-97 was combined with Site SS-86, which is located contiguously. DP-97 was granted no further action status on the basis of this transfer.
AOC098	AOC-098	End of Runway 01 Hardfill - Eglin Main Base	5.72	EPA NFA letter August 16, 2001. FDEP NFA letter August 7, 2001
SS098	SS-098	USAF F-16 Crash Site at Pensacola, Florida	17.48	An Interim Remedial Action (IRA) report was submitted in 1996. Although, a risk assessment has not been performed for this site, the data presented indicate that over-excavation at the site was successful in removing all contaminated and excessively contaminated soils resulting from the crash. Therefore, there are no unacceptable human health risks associated with the site.
AOC099	AOC-099	C-80A Cellotex Burial Site	2.91	EPA NFA letter September 30, 1998. FDEP NFA letter September 9, 1998.
ST099	ST-099	Okaloosa County Air Terminal	0.65	Contamination was first noted at the site in July 1991 when Eglin and FDEP were notified of a fuel spill. From 1991 to 1994, contamination assessment activities included tank tightness tests, installation of deep soil borings, OVA analyses of surface and subsurface soils, and installation of monitoring wells. A CAR was submitted to FDEP in June 1994. A follow-up CAR Addendum was submitted in October 1994 to FDEP and the Okaloosa County Board of Commissioners. These investigation results indicated no migration of contamination. According to the then OCAT administration personnel (Mr. Terry Curry), all tanks and piping have been removed from the site, and an NFA determination is anticipated from FDEP, but it has not yet been received. A risk assessment has not been performed for this site. As of 2009, the site was awaiting state managed cleanup under the FDEP Bureau of Petroleum Storage Systems (BPSS) in Tallahassee, but it was very low on the priority ranking. It was assigned a ranking of 7 at that time. There are currently no further planned actions for this site.
AOC101	AOC-101	C-80B Celotex Disposal Area	8.57	EPA NFA letter February 20, 1998. FDEP NFA letter September 1, 1998.
ST101	ST-101	33rd ACC Water Tower No. 1322	0.12	In July 1999, an IM was conducted to remove lead-contaminated surface soil (maximum excavation depth of 1 foot bls) underneath and surrounding the water tower. Confirmatory analyses showed that the remaining soils were below cleanup levels (lead concentrations less than 500 mg/kg). NFA was approved for the site on 30 September 1999.
AOC102	AOC-102	Auxiliary Field No. 5 Sanitary Disposal Area	3.86	EPA NFA letter November 9, 1999. FDEP NFA letter November 22, 1999.
SS102	SS-102	Power Pro Equipment Storage Yard	1.33	An SI was completed in August 1997. Potential soil and groundwater impacts were evaluated. Based on the results of the SI, an ICM was completed in November 1998 and entailed the removal and off-site disposal of approximately 14 tons of petroleum-impacted soils. NFA was approved for the site in November 1999.
ST103	ST-103	EOD Water Tower No. 857 (Well #1)	0.43	An ICM report for Site ST-103 was submitted to EPA and FDEP in November 2000. NFA was approved for the site on 2 March 2001.
AOC104	AOC-104	C-52 Herbicide Triple Rinsed Drum Disposal Area	0.84	EPA NFA letter September 30, 1998. FDEP NFA letter September 15, 1998.
SS104	SS-104	Eglin Pipeline Spill Site, Pit 0	0.23	Post-active remediation monitoring of groundwater was conducted for four consecutive quarters. Sample results indicated that the site has been remediated. A SRCR was submitted for regulatory review in April 2003, stating that the site has met the requirements for NFA. FDEP approved closure of site on July 28, 2003.
AOC105	AOC-105	Duke Field Hardfill Disposal Area	4.69	EPA NFA letter November 21, 1996. FDEP NFA letter September 9, 1996.

A.7 List of SWMUs / AOCs where No Further Action Determinations have been made based on no suspected or confirmed contamination (i.e. not contaminated sites' as defined by 62-780 F.A.C.)

SWMU/AOC Number/Letter	Alias	SWMU/AOC Name	Unit Size (Acres)	Site Comment and Basis for Determination
SS105	SS-105	Eglin Pipeline Spill Site, Pit 1	0.87	In 1999, an SA was conducted, and a SAR was submitted in May 1999. The SAR recommended NFA. FDEP issued an SRCO on 30 July 1999 approving NFA for the site.
AOC106	AOC-106	Auxiliary Field No. 5 Munitions Site	10.60	EPA NFA letter February 18, 1997. FDEP NFA letter September 9, 1996.
SS106	SS-106	Eglin Pipeline Spill Site, Pit 3	1.22	In 1999, an SA was conducted, and a SAR was submitted in May 1999. The SAR recommended NFA. FDEP issued an SRCO on 30 July 1999 approving NFA for the site.
AOC107	AOC-107	C-52 Film Debris Disposal Area	0.44	EPA NFA letter February 20, 1998. FDEP NFA letter September 1, 1998.
SS107	SS-107	Eglin Pipeline Spill Site, Pit 4	0.57	Site SS-107 has been incorporated into LF-03. The Final Statement of Basis for OU-1 (Sites LF-03, SS-23, SS-24, ST-63, SS-107, SS-108, and SS-109) dated June 2001 recommended land use controls and long-term monitoring. FDEP concurred with recommendations in October 2001.
AOC108	AOC-108	Building No. 1385 and 1386 Soap Water Collection Tank	0.74	EPA NFA letter February 20, 1998. FDEP NFA letter September 1, 1998.
SS108	SS-108	Eglin Pipeline Spill Site, Pit 5	0.74	Site SS-108 has been incorporated into LF-03. The Final Statement of Basis for OU-1 (Sites LF-03, SS-23, SS-24, ST-63, SS-107, SS-108, and SS-109) dated June 2001 recommended land use controls and long-term monitoring. FDEP concurred with recommendations in October 2001.
SS109	SS-109	Eglin Pipeline Spill Site, Pit 5A	0.78	Site SS-109 has been incorporated into LF-03. The Final Statement of Basis for OU-1 (Sites LF-03, SS-23, SS-24, ST-63, SS-107, SS-108, and SS-109) dated June 2001 recommended land use controls and long-term monitoring. FDEP concurred with recommendations in October 2001.
AOC111	AOC-111	A-15 Compound Neutralization Pit	0.19	EPA NFA letter November 21, 1996. FDEP NFA letter September 17, 1996.
SS111	SS-111	Eglin Pipeline Spill Site, Pit 13	0.78	In 1999, an SA was conducted, and a SAR was submitted in May 1999. The SAR recommended NFA. FDEP issued an SRCO on 30 July 1999 approving NFA for the site.
AOC112	AOC-112	C-80C Hardfill	5.16	AOC file closed. SI (RFA) completed April 1998. NFA with institutional controls approved by USEPA on 8/21/98. FDEP agreed to No Further Investigative Action with LUCIP on 11/23/99. Eglin converted site to IRP Site No. DP-273 and performed an ICM in spring 2004. DP-273 is closed with NFA obtained in late summer 2004 from USEPA and FDEP.
ST112	ST-112	Base Ops Generator Tank, Building 60	0.20	A closure assessment was conducted at the site in September 1997, when the 500-gallon UST was removed, and excessively contaminated soils were discovered. An SA was conducted in 1998. The SAR recommended NFA. FDEP issued an SRCO on 17 July 1998 approving NFA for the site.
ST113	ST-113	RAPCON Building 104	0.37	A closure assessment was conducted at the site in November 1997 when the two 1,000-gallon USTs were removed, and excessively contaminated soil was discovered. An SA was conducted in 1998, and the SAR recommended NFA. FDEP issued an SRCO in July 1998 approving NFA for the site.
ST114	ST-114	Airfield Lighting, Between Building 118 and Building 104	0.38	A closure assessment was conducted at the site in October 1997, when the 500-gallon UST was removed, and excessively contaminated soils were discovered. An SA was conducted in 1998, and the SAR recommended NFA. FDEP issued an SRCO on 17 July 1998 approving NFA for the site.
ST115	ST-115	Communications Receiver, Building 926	0.04	A closure assessment was conducted at the site in October 1997, when the 500-gallon UST was removed and excessively contaminated soils were discovered. An SA was conducted in 1998, and the SAR recommended NFA. FDEP issued an SRCO on 17 July 1998 approving NFA for the site.
ST116	ST-116	Building No. 1391	0.04	A closure assessment was conducted at the site in December 1997, when the 6,000-gallon UST was removed and excessively contaminated soils were discovered. An SA was conducted in 1998, and the SAR recommended NFA. On 8 April 1998, the Okaloosa County Petroleum Program Department of Environmental Health Services issued a letter approving NFA for the site.
ST117	ST-117	Duke Field Phone Exchange, Building 3065	0.12	A closure assessment was conducted at the site in December 1997, when the 1,000-gallon UST was removed and excessively contaminated soils were discovered. An SA was conducted in 1998, and the SAR recommended NFA. FDEP issued an SRCO on 17 July 1998 approving NFA for the site.
ST118	ST-118	Site C-1 Tower, Building 8774	0.02	A closure assessment was conducted at the site in December 1997, when the 1,000-gallon UST was removed and excessively contaminated soils were discovered. An SA was conducted in 1997-1998, and the SAR recommended NFA. FDEP issued an SRCO on 12 October 1998 approving NFA for the site.
SS119	SS-119	Middle Fire Training Area	3.50	On 17 November 2000, approximately 1.2 cubic yards of arsenic-contaminated soil were removed. An SA was conducted for the site, and a SAR was submitted in December 2000, which recommended NFA. FDEP issued an SRCO in February 2001, approving NFA.
ST120	ST-120	Plew Sewage Treatment Plant, Building No. 2810	0.05	In December 1997, a closure assessment was conducted at the site when the 1,500-gallon UST was removed. In 1999, an SA was conducted, and a SAR was submitted in February 1999. The SAR recommended NFA. FDEP issued an SRCO on 01 July 1999 approving NFA for the site.
AOC213	AOC-213	Confluence of West Flight Line Drainage Ditch at Jack's Lake	1.98	EPA NFA letter March 28, 2001. FDEP NFA letter August 10, 2000.
ST251	ST-251	Eglin Water Tower No. 2100, Auxiliary Field 2	0.13	ICM report recommending NFA was submitted to EPA and FDEP on 27 February 2002. FDEP concurred with the NFA proposal on 27 February 2002, with EPA concurring on 25 April 2002.
ST252	ST-252	Eglin Water Tower No. 3100, Auxiliary Field No 3 (Duke Field)	0.09	ICM report recommending NFA was submitted to EPA and FDEP on 27 February 2002. FDEP concurred with the NFA proposal on 27 February 2002, with EPA concurring on 25 April 2002.
ST253	ST-253	Eglin Water Tower No. 5100, Auxiliary Field No. 5	0.19	Eglin performed an ICM at the site in late summer 2006. This ICM entailed the removal of the impacted soils to residential standards near the tower. Eglin has also stripped and repainted the water tower with paint that is not lead based. The ICM report recommending NFA was submitted to EPA and FDEP on 1 December 2006. FDEP and EPA concurred with the NFA proposal on 19 December 2006

A.7 List of SWMUs / AOCs where No Further Action Determinations have been made based on no suspected or confirmed contamination (i.e. not contaminated sites' as defined by 62-780 F.A.C.)

SWMU/AOC Number/Letter	Alias	SWMU/AOC Name	Unit Size (Acres)	Site Comment and Basis for Determination
ST254	ST-254	Eglin Water Tower No. 6100, Auxiliary Field No. 6	0.10	ICM report recommending NFA was submitted to EPA and FDEP on 27 February 2002. FDEP concurred with the NFA proposal on 27 February 2002, with EPA concurring on 25 April 2002.
ST255	ST-255	Eglin Water Tower No. 7100, Auxiliary Field No. 7	0.16	The ICM report recommending NFA was submitted to EPA and FDEP in February 2004. Both FDEP and EPA concurred with the NFA recommendation in May 2004.
ST256	ST-256	Eglin Water Tower No. 8637E & 8637W, Test Area C-6	0.09	The ICM report recommending NFA was submitted to EPA and FDEP in early 2004. Both FDEP and EPA concurred with the NFA recommendation.
ST258	ST-258	Eglin Water Tower No. 8782, Site C-1	0.05	The ICM report recommending NFA was submitted to EPA and FDEP on 27 February 2002. FDEP concurred with the NFA proposal on 27 February 2002, with EPA concurring on 25 April 2002.
ST259	ST-259	Eglin Water Tower No. 12511, Site A-15	0.35	The ICM report recommending NFA was submitted to EPA and FDEP on 1 December 2006. FDEP and EPA concurred with the NFA proposal on 19 December 2006.
ST260	ST-260	Eglin Water Tower No. 1100, Auxiliary Field No. 1	0.16	The ICM report recommending NFA was submitted to EPA and FDEP on 1 December 2006. FDEP and EPA concurred with the NFA proposal on 19 December 2006.
LF266	LF-266	Mills Dump Site/Encroachment Landfill	0.36	Contamination Assessment Report for IRP Site LF-266 Revision I dated December 2001 recommended no further action concerning the assessment activities. FDEP concurred with NFA letter dated March 18, 2002. FDEP additionally concurred with the recommendations to periodically inspect the site, monitor for erosion and place soil cover over any observed eroded areas, and installation of fence around the site.
SS267	SS-267	F-15 Tornado Site	0.21	A SAR was submitted to FDEP in June 2000, which recommended NFA. FDEP issued an SRCO on 30 June 2000, specifying NFA.
DP273	DP-273	C-80C Celotex Burial Site	3.83	In fall of 2003, Eglin collected additional background soil samples at the site and determined site-specific background values, which EPA and FDEP approved. In spring 2004, Eglin excavated the impacted soils that showed arsenic concentrations above this background value. An ICM Report documenting these activities and recommending NFA was submitted in summer 2004 and approved by EPA and FDEP.
SS274	SS-274	Duke Field Fire Training Area	20.39	It was concluded in the PARM/SRCR (AECOM/Bhate, August 2015) that soil, groundwater, and surface water at the site do not exceed FDEP Cleanup Target Levels (CTLs) or established Eglin background levels, and there are no known impacts to other media at the site. Consequently, the site met the applicable NFA criteria. The SRCO from the FDEP was received in September 2016, and the wells and remediation system have been abandoned.
ST276	ST-276	ACC Area, Building No. 1360	0.40	The site was identified as a potential source of contamination in June 2002 when Eglin AFB personnel responded to the reported spill. An SA was performed in 2003 to determine if the soil and groundwater have been impacted by the spill. This SA recommended NFA, and this recommendation was accepted by FDEP via a SRCO.
ST277	ST-277	AAFES Gas Station at Duke Field	0.04	SA report dated March 2004 was submitted to FDEP. FDEP approved of the NFA recommendation in letter dated August 24, 2004.
ST282	ST-282	ST282 West Gate Service Station	0.01	It was concluded in the Site Rehabilitation Completion Report (AECOM/Bhate, January 2015) that soil and groundwater at the site do not exceed FDEP CTLs or established Eglin background levels, and there are no known impacts to other media at the site. Consequently, the site met the applicable NFA criteria. A SRCO was issued by FDEP on June 1, 2015.
SS284	SS-284	CV-22 Crash Site	11.70	A Notice of Intent to approve the Draft-Final Site Assessment Report and Unconditional Site Closure was published on January 17, 2025.
POI301	POI-301	Building 808 Transformer Maintenance Facility	0.90	EPA NFA letter July 8, 1998. FDEP NFA letter June 1, 1998.
POI302	POI-302	Auxiliary Field 4 Small Arms Firing Range Cleaning Sump	0.35	EPA NFA letter March 26, 2001. FDEP NFA letter March 21, 2001.
POI303	POI-303	Chemical Waste Treatment Plant	21.47	EPA NFA letter December 9, 1998. FDEP NFA letter January 15, 1998.
POI304	POI-304	Mullet Creek Disposal Area	4.44	EPA NFA letter July 1, 1998. FDEP NFA letter June 3, 1998
POI306	POI-306	East Drum Disposal Site S.R. 285/R.R. 228	20.50	EPA NFA letter July 8, 1998. FDEP NFA letter April 27, 2000.
POI307	POI-307	Indigo Creek Dump Area	5.14	EPA NFA letter July 2, 1998. FDEP NFA letter June 3, 1998.
POI309	POI-309	Auxiliary Field No. 7 Pit Site B-12 with Paint Cans	0.42	EPA NFA letter December 9, 1998. FDEP NFA letter January 15, 1998.
POI310	POI-310	ACC Petroleum Site	8.42	EPA NFA letter September 30, 1998. FDEP NFA letter October 5, 1998.
POI312	POI-312	Mullet Festival Area	22.90	EPA NFA letter December 9, 1998. FDEP NFA letter January 15, 1998.
POI316	POI-316	C-52N East Rocky Creek Tributary	1.13	EPA NFA letter February 22, 1999. FDEP NFA letter June 30, 1999.
POI318	POI-318	Range Road 220 Disposal Area (East of Auxiliary Field No. 2)	2.08	EPA NFA letter July 8, 1998. FDEP NFA letter June 3, 1998.
POI319	POI-319	C-52A Soil Biodegradation Plots	0.36	EPA NFA letter December 9, 1998. FDEP NFA letter January 15, 1998.
POI320	POI-320	Twin Oaks Water Tower	0.24	EPA NFA letter December 9, 1998. FDEP NFA letter January 15, 1998.
POI322	POI-322	Site A-15: Polychlorinated Biphenyls (PCBs) Cleanup	0.05	EPA NFA letter March 13, 2002. FDEP NFA letter January 29, 2002.
POI323	POI-323	Building 3051: Garbage Pit	1.58	EPA NFA letter September 30, 1998. FDEP NFA letter May 26, 1998.
POI324	POI-324	First Baptist Church of Valparaiso Napalm Site	0.03	EPA NFA letter December 9, 1998. FDEP NFA letter January 15, 1998.
POI325	POI-325	Kemmons Pond Site	0.44	EPA NFA letter December 9, 1998. FDEP NFA letter January 15, 1998.
POI326	POI-326	Auxiliary Field Number 2 Disposal Area	20.65	EPA NFA letter November 9, 1999. FDEP NFA letter August 3, 1999.
POI327	POI-327	Auxiliary Field No. 1 Abandoned Wastewater Treatment Plant (WWTP)	2.02	EPA NFA letter November 9, 1999. FDEP NFA letter August 3, 1999.
POI328	POI-328	Main Base Ammunition Storage Facility Berm	0.11	EPA NFA letter November 9, 1999. FDEP NFA letter August 3, 1999.
POI329	POI-329	Duke Field Small Arms Firing Range	0.52	EPA NFA letter November 9, 1999. FDEP NFA letter August 3, 1999.
POI330	POI-330	Duke Field North Dump Site	5.31	EPA NFA letter November 9, 1999. FDEP NFA letter August 3, 1999.
POI331	POI-331	Auxiliary Field No. 1 Landfill	17.29	EPA NFA letter November 9, 1999. FDEP NFA letter November 22, 1999.
POI332	POI-332	Test Site D-3 Diesel Spill and Fuel Tank Removal	0.06	EPA NFA letter January 8, 1999. FDEP NFA letter December 17, 1998.
POI333	POI-333	Duke Field 728 Squadron Motor Pool: Potential Oil Spill at Refueling Station	5.26	EPA NFA letter November 9, 1999. FDEP NFA letter August 3, 1999.
POI334	POI-334	Site C-6 Radar Facility Chronic Petroleum, Oil, and Lubricants (POL) Spill	0.10	EPA NFA letter November 9, 1999. FDEP NFA letter July 29, 1999.
POI335	POI-335	Eglin Main Base Skeet Range - Bay Round Disposal Area	15.13	EPA NFA letter July 10, 2000. FDEP NFA e-mail January 4, 2002.
POI337	POI-337	Communication Building No. 935 Dump Site	3.02	EPA NFA letter November 9, 1999. FDEP NFA letter August 3, 1999.
POI338	POI-338	Auxiliary Field 2 (C-3) Herbicide Loading Area	0.65	EPA NFA letter November 9, 1999. FDEP NFA letter July 29, 1999.
POI339	POI-339	Auxiliary Field No. 7 Indigo Creek Dump Site	2.53	EPA NFA letter November 9, 1999. FDEP NFA letter August 3, 1999.
POI340	POI-340	Hospital Dump Site	8.36	EPA NFA letter November 9, 1999. FDEP NFA letter August 3, 1999.
POI342	POI-342	Barrels at Oak Hill Elementary School	21.04	EPA NFA letter November 9, 1999. FDEP NFA letter August 3, 1999.
POI343	POI-343	Camp Pinchot	0.46	EPA NFA letter August 8, 2001. FDEP NFA letter August 8, 1999.
POI344	POI-344	Auxiliary Field No. 6 Former Chemical/Biological Lab	3.82	
POI345	POI-345	Auxiliary Field No. 6 Bunker/Munitions	12.41	EPA NFA letter November 9, 1999. FDEP NFA letter August 3, 1999.
POI346	POI-346	Building No. 1354 Underground Storage Tank	0.62	EPA NFA letter November 9, 1999. FDEP NFA letter August 3, 1999.
POI347	POI-347	Golf Course Limb Disposal Dump Site	1.45	EPA NFA letter November 9, 1999. FDEP NFA letter August 3, 1999.
POI348	POI-348	Climatic Lab Storage Area	0.16	EPA NFA letter January 8, 1999. FDEP NFA letter December 17, 1998.
POI349	POI-349	Duke Field 728 Tactical Air Command (TAC) (ACC) JP4 Contamination	3.58	EPA NFA letter November 9, 1999. FDEP NFA letter August 3, 1999.
POI350	POI-350	Auxiliary Field No. 5 Armored Vehicle Scrapping Area	3.11	EPA NFA letter August 8, 2001. FDEP NFA letter June 12, 2001.

A.7 List of SWMUs / AOCs where No Further Action Determinations have been made based on no suspected or confirmed contamination (i.e. not contaminated sites' as defined by 62-780 F.A.C.)

SWMU/AOC Number/Letter	Alias	SWMU/AOC Name	Unit Size (Acres)	Site Comment and Basis for Determination
POI351	POI-351	Auxiliary Field 4 CS Testing Site	1.79	EPA NFA letter January 8, 1999. FDEP NFA letter December 15, 1998.
POI352	POI-352	Auxiliary Field No. 4 Runway Debris South	13.20	EPA NFA letter May 13, 1999. FDEP NFA letter February 4, 1999.
POI353	POI-353	Auxiliary Field Number 2 Burst Hill	17.66	EPA NFA letter November 9, 1999. FDEP NFA letter August 3, 1999.
POI354	POI-354	Auxiliary Field No. 2 POL Storage Area	8.88	EPA NFA letter November 9, 1999. FDEP NFA letter August 3, 1999.
POI355	POI-355	Basin Bayou Disposal Site	428.73	EPA NFA letter November 9, 1999. FDEP NFA letter August 3, 1999.
POI356	POI-356	A-11 Storage Bunkers Underground Storage Tank	0.08	EPA NFA letter February 19, 1999. FDEP NFA letter December 30, 1998.
POI357	POI-357	Duke Field Debris and Drum Pile	4.47	EPA NFA letter August 17, 2001. FDEP NFA letter October 12, 2001.
POI358	POI-358	Water Tower No. 1205	0.27	EPA NFA letter November 10, 1999. FDEP NFA letter January 29, 1999.
POI370	POI-370	C-7 Hell Fire	15.37	This site deals with fuel losses associated with tank testing at Test Area C-7. Therefore, this site is a compliance issue and responsibility has been transferred to Eglin EMC. POI file closed.
POI386	POI-386	Building No. 419 Maintenance Shop	0.08	EPA NFA letter January 8, 1999. FDEP NFA letter December 15, 1998.
POI389	POI-389	Auxiliary Field No. 1 Northeast Surface Disposal Area	1.62	EPA NFA letter March 28, 2001. FDEP NFA letter October 2, 2000.
POI390	POI-390	Transmission Building Site	0.16	EPA NFA letter November 9, 1999. FDEP NFA letter August 3, 1999.
POI392	POI-392	Prairie Creek Drum Dump Site	3.35	EPA and FDEP NFA email November 5, 1999.
POI393	POI-393	B-71 Hydraulic Tower	1.14	EPA NFA letter August 16, 2001. FDEP NFA letter April 26, 2000.
POI399	POI-399	Site 9 Burn Pots	1.83	EPA NFA letter September 13, 2001. FDEP NFA letter April 26, 2001.
POI400	POI-400	Test Area C-64A	2.06	FDOH NFA letter July 24, 2001.
POI401	POI-401	Test Area C-64C Advanced Warhead Experimental Facility	5.03	EPA NFA letter October 5, 1998. FDOH NFA letter October 29, 1998.
POI402	POI-402	Test Area C-80B	17.51	FDOH NFA letter July 24, 2001
POI403	POI-403	Test Area C-80A Water Total Recovery Facility (WTRF) DU-Discharge Area	0.55	FDOH NFA May 17, 2001
POI404	POI-404	Test Area B-5	3.95	EPA NFA letter November 7, 2001. FDOH NFA letter April 16, 2002.
POI405	POI-405	Test Area A-15	3.00	EPA NFA letter August 27, 2004. FDOH NFA letter October 14, 2004.
POI406	POI-406	Test Area C-72	1.20	EPA NFA letter August 7, 2001. FDOH NFA letter July 24, 2001.
POI407	POI-407	Test Area C-52 Chicken Little GO-27 Detector Boxes	0.18	EPA NFA letter October 5, 1998. FDOH NFA letter October 29, 1998.
POI408	POI-408	SAC Munitions Maintenance Area/33rd Flight Munitions Area	0.84	EPA NFA letter October 15, 2002. FDOH NFA letter October 21, 2002.
POI409	POI-409	Railroad Along Range Road 213	0.99	EPA NFA letter December 29, 2000. FDOH NFA letter July 24, 2001.
POI410	POI-410	Site NI-7	0.13	EPA NFA letter October 5, 1998. FDOH NFA letter October 29, 1998.
POI411	POI-411	Auxiliary Field Number 3	0.79	EPA NFA letter February 5, 1999. FDOH NFA letter May 24, 1999.
POI412	POI-412	High Explosives Research and Development (HERD) Facility Building 1206	1.35	EPA NFA letter October 5, 1998. FDOH NFA letter October 29, 1998.
POI413	POI-413	Test Area A-77 Proposed Bridge Target	365.91	EPA NFA letter October 5, 1998. FDOH NFA letter October 29, 1998.
POI414	POI-414	Test Area A-79 Proposed Bridge Target	461.99	EPA NFA letter October 5, 1998. FDOH NFA letter October 29, 1998.
POI416	POI-416	Proposed Air-to-Ground Firing of DU at Test Area B-82	555.41	EPA NFA letter October 5, 1998. FDOH NFA letter October 29, 1998.
POI417	POI-417	East Bay Swamp C-141 Crash Site	3.90	FDOH NFA letter April 16, 2002.
POI418	POI-418	C-52 Scrapyard Low Level Radioactive Material Site	8.47	EPA NFA letter October 15, 2002. FDOH NFA letter August 21, 2002.
POI419	POI-419	Test Area C-74L Disposal Site	0.98	EPA NFA letter November 7, 2001. FDOH NFA letter April 16, 2002.
POI420	POI-420	Range Road 416 Disposal Site (Test Area C-64 Dump Site)	1.93	EPA NFA letter August 27, 2004.
POI500	POI-500	Range Road 291 Bermed Area	8.17	EPA NFA letter November 8, 2002. FDEP NFA letter September 25, 2002.
POI501	POI-501	Former A-7 Radar Facility POL Site	0.04	EPA NFA letter May 3, 2001. FDEP NFA letter July 19, 2001.
POI503	POI-503	Cattle Dipping Vat Bear Creek	0.13	EPA NFA letter April 30, 2003. FDEP NFA letter April 23, 2003.
OW503	OW-503	Site 13 Oil Water Separator Building 13 Pump Drain Room (OW-C503)	0.00	On the basis of the results of the SI report (June 2013), unconditional NFA was recommended. FDEP concurred with the NFA recommendation in letter dated June 21, 2023.
POI504	POI-504	Auxiliary Field 5 Disposal Pit	0.58	EPA NFA letter May 29, 2003. FDEP NFA letter May 22, 2003.
OW504	OW-504	OW-504 Site 22 Oil Water Separator Building 22 Back Room Sump (OW-C504)	0.01	On the basis of the results of the SI report (June 2013), unconditional NFA was recommended. FDEP concurred with the NFA recommendation in letter dated June 21, 2023.
POI505	POI-505	Anderson Branch Disposal Area	1.06	EPA NFA letter October 19, 2004. FDEP NFA letter September 28, 2004.
OW505	OW-505	OW-505 Site 72 Oil Water Separator Building 72 Corrosion Control (OW-C505)	0.03	On the basis of the results of the SI report (June 2013), unconditional NFA was recommended. FDEP concurred with the NFA recommendation in letter dated June 21, 2023.
POI506	POI-506	Panther Branch Drum Site	0.45	EPA NFA letter June 30, 2003. FDEP NFA letter June 12, 2003.
POI507	POI-507	Wendell's Cattle Dipping Vat	0.08	EPA NFA letter August 5, 2004. FDEP NFA letter July 2, 2004.
POI508	POI-508	Green Ponds Cattle Dipping Vat	3.82	SI field work and the ICM were performed in the summers of 2003 and 2004. The ICM Report was submitted in late summer 2004, recommending LUC for soil. FDEP and USEPA accepted this recommendation. This site is now designated as IRP Site No. SS-278. An SB for SS-278, which includes LUCs, has been approved. POI file closed.
POI509	POI-509	Auxiliary Field 4 Water Tower No. 4100	0.56	EPA NFA letter October 19, 2004. FDEP NFA letter September 30, 2004.
OW509	OW-509	OW-509 Site 127 Oil Water Separator Building 127 Non-Destruct Test (OW-C509)	0.01	On the basis of the results of the SI report (June 2013), unconditional NFA was recommended. FDEP concurred with the NFA recommendation in letter dated June 21, 2023.
POI510	POI-510	Cape San Blas Lighthouse	0.31	FDEP NFA letter February 20, 2007
POI511	POI-511	Range Roads 356 and 433 Drum Disposal Site	0.55	EPA NFA letter March 15, 2006. FDEP NFA letter January 4, 2006.
OW511	OW-511	OW-511 Site 138 Oil Water Separator BLDG 138 Fuel Systems Maintenance (OW-C511)	0.01	On the basis of the results of the SI report (June 2013), unconditional NFA was recommended. FDEP concurred with the NFA recommendation in letter dated June 21, 2023.
POI512	POI-512	GERC Facility Dump Site	1.38	EPA NFA email concurrence letter December 15, 2006
POI513	POI-513	Main Base Dry Cleaning Site	2.20	SI report dated September 2007. FDEP NFA letter March 5, 2008.
POI514	POI-514	Whitmier Island Dump Site	0.47	FDEP NFA letter October 11, 2006.
POI515	POI-515	Climatic Lab Spill Site	0.21	SI report dated August 2007. FDEP NFA letter February 25, 2008
POI516	POI-516	Honey Creek Cattle Dipping Vat	0.17	SI and ICM report dated August 2009. FDEP NFA letter October 5, 2009.
OW516	OW-516	OW-516 Site 462 Surface Target Building 462 (OW-C516)	0.04	FDEP issued a letter concurring with no further investigation on 18 December 2013
POI517	POI-517	Pine Log Creek Cattle Dipping Vat	0.61	SI and ICM report dated August 2009. FDEP NFA letter October 5, 2009.
POI518	POI-518	Climatic Lab Methylene Chloride June 2007 Spill	1.71	Site Rehabilitation Completion Report dated May 2011. FDEP SRCO issued on August 19, 2011.
POI519	POI-519	Auto Hobby Shop Washrack Overflow Site	0.20	SI report for POI-519 dated April 2012 recommended NFA.
POI521	POI-521	F-16 Jet Fuel Spill Site	1.20	A PA and SI were conducted in the spring/summer of 2012 and included soil and groundwater sampling. The PA/SI Report was submitted in the fall 2012 and recommended NFA. This was approved by FDEP. POI file is closed.
OW527	OW-527	OW-527 Building 684 CE Equipment Wash (OW-C527)	0.02	On the basis of the results of the SI report (June 2013), unconditional NFA was recommended. FDEP concurred with the NFA recommendation in letter dated June 21, 2023.
OW537	OW-537	OW-537 Site 1219 Ord Wash Building 1219 Vehicle Wash (OW-C537)	0.00	On the basis of the results of the SI report (June 2013), unconditional NFA was recommended. FDEP concurred with the NFA recommendation in letter dated June 21, 2023.
OW538	OW-538	OW-538 Site 1318 Oil Water Separator Building 1318 33rd Hanger (OW-C538)	0.14	This site is located on land owned by the U.S and under the jurisdiction of the Secretary of Defense; however, no release or other DERA eligible activity has occurred at this site. Based on these factors, this site is not considered DERA eligible and is not recommended for validation (Technical Eval Report, Aug 2012)

A.7 List of SWMUs / AOCs where No Further Action Determinations have been made based on no suspected or confirmed contamination (i.e. not contaminated sites' as defined by 62-780 F.A.C.)

SWMU/AOC Number/Letter	Alias	SWMU/AOC Name	Unit Size (Acres)	Site Comment and Basis for Determination
OW542	OW-542	OW-542 Site 1343 Oil Water Separator Building 1343 33rd Hanger (OW-C542)	0.01	On the basis of the results of the SI report (June 2013), unconditional NFA was recommended. FDEP concurred with the NFA recommendation in letter dated June 21, 2023.
OW543	OW-543	OW-543 Site 1344 Oil Water Separator Building 1344 33rd Hanger (OW-C543)	0.01	On the basis of the results of the SI report (June 2013), unconditional NFA was recommended. FDEP concurred with the NFA recommendation in letter dated June 21, 2023.
OW544	OW-544	OW-544 Site 1345 Oil Water Separator Building 1345 33rd Hanger (OW-C544)	0.01	On the basis of the results of the SI report (June 2013), unconditional NFA was recommended. FDEP concurred with the NFA recommendation in letter dated June 21, 2023.
OW545	OW-545	OW-545 Site 1351 Oil Water Separator Building 1351 33rd Egress Shop (OW-C545)	0.01	On the basis of the results of the SI report (June 2013), unconditional NFA was recommended. FDEP concurred with the NFA recommendation in letter dated June 21, 2023.
OW549	OW-549	OW-549 Site 1353 Oil Water Separator Building 1553 33rd AGE (OW-C549)	0.02	On the basis of the results of the SI report (June 2013), unconditional NFA was recommended. FDEP concurred with the NFA recommendation in letter dated June 21, 2023.
POI550	POI-550	Building 455 Jet Engine Test Cell (OW-C515)	0.02	SI report Addendum (Final) dated November 2014. FDEP NFA letter January 28, 2015
OW550	OW-550	OW-550 Oil/Water Separator Building 1354, Battery and Hydraulic Shop, ACC	0.01	On the basis of the results of the SI report (June 2013), unconditional NFA was recommended. FDEP concurred with the NFA recommendation in letter dated June 21, 2023.
POI551	POI-551	OW-524 Building 562 Vehicle Refuel	0.03	FDEP letter supporting "no evidence of discharge" dated September 28, 2015.
OW551	OW-551	OW-551 Site 1360 Oil Water Separator Building 1360 33rd Egress Shop (OW-C551)	0.01	On the basis of the results of the SI report (June 2013), unconditional NFA was recommended. FDEP concurred with the NFA recommendation in letter dated June 21, 2023.
POI552	POI-552	Building 693A Civil Engineering Vehicle Maintenance (OW-C529)	0.02	FDEP letter supporting "no evidence of discharge" dated September 28, 2015.
OW553	OW-553	OW-553 Site 1385 Oil Water Separator Building 1385 33rd Plane Wash (OW-C553)	0.00	On the basis of the results of the SI report (June 2013), unconditional NFA was recommended. FDEP concurred with the NFA recommendation in letter dated June 21, 2023.
POI554	POI-554	Building 6024 Ranger Camp (OW-C570)	0.01	FDEP letter supporting "no evidence of discharge" dated September 28, 2015.
OW559	OW-559	OW-559 Site 1523 Oil Water Separator Building 1523 Golf Course (OW-C559)	0.01	Soil samples were collected and analyzed for TPH and VOCs by AECOM in June 2012. Contaminants were detected above the Reporting Limit and therefore, the site is DERA eligible. This site is owned by, leased to, or otherwise possessed by the U.S and under the DoD jurisdiction. A release of VOCs or contaminant has occurred at this site. Based on these factors, the site is DERA eligible and is planned for extensive investigation by the PBR contractor so is not recommended for validation. (Technical Eval Report, Aug 2012)
OW562	OW-562	OW-562 Site 3020 Oil Water Separator Building 3020 Maintenance Dock (OW-C562)	0.01	On the basis of the results of the SI report (June 2013), unconditional NFA was recommended. FDEP concurred with the NFA recommendation in letter dated June 21, 2023.
OW564	OW-564	OW-564 Site 3057 Oil Water Separator Building 3057 Duke Fld Wash Rack (OW-C564)	0.01	On the basis of the results of the SI report (June 2013), unconditional NFA was recommended. FDEP concurred with the NFA recommendation in letter dated June 21, 2023.
OW565	OW-565	OW-565 Site 3067 Oil Water Separator Building 3067 AC Maintenance Shop (OW-C565)	0.00	On the basis of the results of the SI report (June 2013), unconditional NFA was recommended. FDEP concurred with the NFA recommendation in letter dated June 21, 2023.
OW567	OW-567	OW-567 Site 3076 Oil Water Separator Building 3076 AC Maintenance Shop (OW-C567)	0.01	On the basis of the results of the SI report (June 2013), unconditional NFA was recommended. FDEP concurred with the NFA recommendation in letter dated June 21, 2023.
SWMU-601	SWMU-601	CD Trench and Fill Site	0.03	SWMU-601 has been closed with NFA required (9/12/2006).
SWMU-602	SWMU-602	Tire Burn Area	0.02	SWMU-602 has been closed with NFA required (9/12/2006).
SWMU-603	SWMU-603	CD Borrow Pit	0.03	SWMU-603 has been closed with NFA required (9/12/2006).
ST072A	ST-072A	ACC Tank Farm (Compliance Small Plume) (BLDG 1304)	0.11	NFA proposal for Site ST-72 was submitted to FDEP in February 2000. FDEP issued a SRCO on May 5, 2000.
ST072B	ST-072B	ACC Tank Farm	12.67	An EM report was completed for Site ST-72B in June 2002. Site ST-72B, along with sites ST-70, ST-72, and ST-72A, has been combined into ST-275. Site ST-72B is closed.
POI415A	POI-415A	B-70 Proposed DU Experimentation Area	6.28	EPA and FDOH NFA letters May 17, 2001.
POI415B	POI-415B	C-74 Proposed DU Experimentation Area	0.24	EPA and FDOH NFA letters May 17, 2001.
POI415C	POI-415C	C-74L Proposed DU Experimentation Area	0.66	EPA and FDOH NFA letters May 17, 2001.

A.8 List of RCRA Permitted Unit(s)

SWMU/AOC Number/Letter	Alias	SWMU/AOC Name	Activity	Unit Size (Acres)	Dates of Operation	Name/Type of Waste	Constituents of Concern	Date of Release	Type/Nature of Waste Released	Quantity/Volume of Waster Released	Site Status	Site Comment and Basis for Determination	Potentially Affected Media
OT047	OT-047	Open Burn/Detonation Site (Test Area C-62)	Open Detonation Range	32.22	1960s until sometime prior to the insulation of a RCRA subpart A.8 permit in the middle 1990s.	Waste military explosives and munitions	Perchlorate and RDX	Unknown	Hazardous waste release in the form of explosives and military munitions that are no longer suitable for service being openly detonated to destroy, excess, obsolete, or unserviceable munitions and energetic waste military explosives. The munitions were ignited using diesel fuel or charcoal lighter fluid. The area surrounding the bins was used as a storage/stockpile area and contained abandoned fuel storage tanks, telephone poles, metal plates, wooden pallets, and several 55-gallon drums.	Unknown	AOC file closed. RCRA Subpart X permitted.	The C-62 Open Burn/Detonation site was identified as a potential source of contamination in 1990 associated with the use of fuel and other combustible material. Two metal burn/detonation bins are located on site, and they are used to burn unwanted munitions using diesel fuel or charcoal lighter fluid as a fuel. On October 3, 1996 the RCRA Subpart X permit for this facility was singed. Permit conditions include air and groundwater monitoring and RCRA Closure and Corrective Actions. The open burn unit is no longer active.	GW

B.1 List of Release Areas requiring a Site Assessment (a/k/a Remedial Investigation) and possible response action pursuant to CERCLA

SWMU/AOC Number/Letter	Alias	SWMU/AOC Name	Activity	Unit Size (Acres)	Dates of Operation	Name/Type of Waste	Constituents of Concern	Date of Release	Type/Nature of Waste Released	Quantity/Volume of Waster Released	Site Status	Site Comment and Basis for Determination	Potentially Affected Media
SS289P	POI-700	A-15 Compound Fire Training Area	Fire Training Area	3.50	Fire training exercises were performed in a former pumphouse structure from 1985 to 1987 and a former storage bunker in the mid-1980s	AFFF	16 PFAS constituents (includes PFOS, PFOA, and PFBS)	During dates of operation	AFFF sprayed during fire training activities	Unknown amount	Undergoing RI	PFOS was detected in surface and subsurface soil at concentrations below the USEPA RSL, while PFOA and PFBS were not detected. PFOS, and PFOS+PFOA were detected in groundwater concentrations above the USEPA HA values at two locations, while PFOA concentrations were above the USEPA HA value at one location. PFBS was detected at groundwater concentrations below the USEPA Tap Water RSL at two locations.	Surface Soil, Subsurface Soil, GW
SS315P	POI-701	Auxiliary Field No. 2 Fire Training Area	Fire Training Area	4.13	1970s	AFFF	16 PFAS constituents (includes PFOS, PFOA, and PFBS)	During dates of operation	AFFF sprayed during fire training activities	Unknown amount	Undergoing RI	PFOA was detected in surface soil at concentrations below the USEPA RSL at one location. PFOS and PFBS were not detected in soil at any locations. PFOA and PFOS+PFOA were detected in groundwater at concentrations below the USEPA HA values at two locations. PFOS was detected in groundwater at concentrations below the USEPS HA value. PFBS was detected in groundwater at concentrations below the USEPA Tap Water RSL at one location.	Surface Soil, Subsurface Soil, GW
SS310P	POI-702	Eglin Skeet Range and Fire Training Area	Fire Training Area	0.64	Unknown	AFFF	16 PFAS constituents (includes PFOS, PFOA, and PFBS)	unknown	AFFF sprayed during fire training activities	Unknown amount	Undergoing RI	PFOS was detected in surface and/or subsurface soil at concentrations below the USEPA RSL at each location. PFOA was detected in subsurface soil at concentrations below the USEPA RSL at two sampling locations. PFBS was not detected in soil. PFOS, PFOA, and PFOS+PFOA in groundwater were detected at concentrations above the USEPA HA values at each location, while PFBS was detected in groundwater at concentrations below the USEPA Tap Water RSL at each location.	Surface Soil, Subsurface Soil, GW
FT028P-SUB	POI-703	Eglin Middle Fire Training Area	Fire Training Area	1.90	1993 to 2000	AFFF	16 PFAS constituents (includes PFOS, PFOA, and PFBS)	During dates of operation	AFFF sprayed during fire training activities	Unknown amount	Undergoing RI	PFOS was detected in surface or subsurface soil at concentrations above the USEPA RSL at each location. PFOA was detected in surface and/or subsurface soil at concentrations below the USEPA RSL at each location. PFBS was detected in surface and/or subsurface soil at concentrations below the USEPA RSL at each two locations. PFOS, PFOA and PFOS+PFOA were detected in groundwater at concentrations above the USEPA HA value at each locations, while PFBS was detected in groundwater below the Tap Water RSL at each location.	Surface Soil, Subsurface Soil, GW
SS290P	POI-704	Eglin Waste Water Treatment Plant	Waste Water Treatment Plant	3.19	Unknown	Receives excess fluids from the holding pond associated with POI-703 and from numerous fire suppression system activations at Main Base Eglin.	16 PFAS constituents (includes PFOS, PFOA, and PFBS)	Unknown	Receives excess fluids from the holding pond associated with POI-703 and from numerous fire suppression system activations at Main Base Eglin.	Unknown amount	Undergoing RI	PFOS in soil was detected in surface and/or subsurface soil at concentrations below the USEPA RSL at each location. PFOA was detected in surface and/or subsurface soil at concentrations below the USEPA RSL at two locations. PFBS was not detected in soil at this location. PFOS and PFOS+PFOA were detected in groundwater at concentrations above the USEPA HA value at two locations, while PFOA was detected in groundwater at concentrations above the USEPA HA value at one location. PFBS was detected in groundwater below the Tap Water RSL at two locations.	Surface Soil, Subsurface Soil, GW
	POI-705	Building 71	Hangar	1.01	Unknown	AFFF	16 PFAS constituents (includes PFOS, PFOA, and PFBS)	Unknown	Hangar contained an AFFF fire suppression system with one inadvertent activation that released AFFF into a storm drain inlet on the south side of the building.	Unknown amount	Undergoing RI	PFOS, PFOA and PFBS were not detected in soil at this location. PFOS and PFOS+PFOA were detected in groundwater at concentrations above the USEPA HA values at this location. PFOA and PFBS were detected in groundwater concentrations below the USEPA HA value and the Tap Water RSL, respectively.	Surface Soil, Subsurface Soil, GW
SS291P	POI-706	Building 72	Hangar	0.85	Unknown	AFFF	16 PFAS constituents (includes PFOS, PFOA, and PFBS)	2001 and 2014	Hangar contains an AFFF fire suppression system that had two inadvertent activations in 2001 and 2014 with AFFF released outside the hangar doors to the north and outside the back door of the hangar to the south	Unknown amount	Undergoing RI	PFOS was detected in surface soil at concentrations above the USEPA RSL at one location and was detected below the USEPA RSL at two locations. PFOA and PFBS were detected in surface soil at concentrations below the USEPA RSLs at one location. PFOS and PFOS+PFOA were detected in groundwater at concentrations above the USEPA HA values at each location. PFOA was detected in groundwater at concentrations above the USEPA HA value at two locations. PFBS was detected in groundwater at concentrations below the USEPA Tap Water RSL at each location.	Surface Soil, Subsurface Soil, GW

B.1 List of Release Areas requiring a Site Assessment (a/k/a Remedial Investigation) and possible response action pursuant to CERCLA

SWMU/AOC Number/Letter	Alias	SWMU/AOC Name	Activity	Unit Size (Acres)	Dates of Operation	Name/Type of Waste	Constituents of Concern	Date of Release	Type/Nature of Waste Released	Quantity/Volume of Waster Released	Site Status	Site Comment and Basis for Determination	Potentially Affected Media
SS292P	POI-707	Building 138	Hangar	0.46	Unknown	AFFF	16 PFAS constituents (includes PFOS, PFOA, and PFBS)	mid-1990s	Hangar contains an AFFF fire suppression system that had one inadvertent activation in the mid-1990s with AFFF released outside the hangar doors. Staining was also observed on the mechanical room floor from the AFFF tanks to a floor drain.	Unknown amount	Undergoing RI	PFOS was detected in surface soil at concentrations below the USEPA RSL at each location. PFOA and PFBS were not detected in surface or subsurface soil at this location. PFOS and PFOS+PFOA were detected in groundwater above the USEPA HA value at each location, while PFOA was detected in groundwater at concentrations above the USEPS HA value at two locations. PFBS was detected in groundwater at concentrations below the USEPA Tap Water RSL at each location.	Surface Soil, Subsurface Soil, GW
SS286P-SUB	POI-708	Building 440	McKinley Climatic Laboratory	3.22	Unknown	AFFF	16 PFAS constituents (includes PFOS, PFOA, and PFBS)	2002 and 2005/2006	Hangar contains an AFFF fire suppression system that had two inadvertent activations in 2002 and 2005/2006.	Approximately 4,000 gallons	Undergoing RI	PFOS was detected in surface and/or subsurface soil at concentrations below the USEPA RSL at each location, while PFOA was detected in surface and subsurface soil at concentrations below the USEPA RSL at one location. PFBS was not detected in soil. PFOS and PFOS+PFOA were detected in groundwater at concentrations above the USEPA HA value at two locations, while PFOA was detected in groundwater at concentrations above the USEPA HA value at one location. PFBS was detected in groundwater at concentrations below the USEPA Tap Water RSl at one location.	Surface Soil, Subsurface Soil, GW
SS293P	POI-709	Building 1386	Hangar	0.35	Unknown	AFFF	16 PFAS constituents (includes PFOS, PFOA, and PFBS)	late 1990s/early 2000s	Hangar contains an AFFF fire suppression system that had one inadvertent activation in the late 1990s/early 200s with AFFF released outside the hangar doors to the west.	Unknown amount	Undergoing RI	PFOS was detected in surface and/or subsurface soil at concentrations below the USEPA RSL at each location, while PFOA and PFBS were not detected. PFOS and PFOS+PFOA were detected in groundwater at concentrations above the USEPA HA values at two locations, while PFOA was detected in groundwater at concentrations below the USEPA HA value at each location. PFBS was detected in groundwater at concentrations below the USEPA Tap Water RSL at one location and was not detected at two locations.	Surface Soil, Subsurface Soil, GW
SS294P	POI-710	Building 1412	Hangar	2.96	Unknown	AFFF	16 PFAS constituents (includes PFOS, PFOA, and PFBS)	2010/2011 and 2014	Hangar contains an AFFF fire suppression system with two activations during initial and subsequent system testing in 2010/2011 and 2014 with AFFF released outside all four of the hangar doors.	Unknown amount	Undergoing RI	PFOS was detected in subsurface soil at concentrations below the USEPA RSL at one location, while PFOA and PFBS were not detected in surface and/or subsurface soil. PFOS+PFOA was detected in groundwater at concentrations below the USEPA HA values at each location. PFBS was detected in groundwater at concentrations below the USEPA Tap Water RSL at two locations and was not detected at one location.	Surface Soil, Subsurface Soil, GW
SS316P	POI-711	1997 F-15 Fire	Aircraft mishap	0.76	Unknown	AFFF	16 PFAS constituents (includes PFOS, PFOA, and PFBS)	1997	F-15 aircraft mishap occurred on the NE-SW runway with AFFF applied for fire suppression	Unknown amount	Undergoing RI	PFOS, PFOA, and PFBS were not detected in surface and/or subsurface soil at this location. PFOS and PFOS+PFOA were detected in groundwater at concentrations below the USEPA HA value, while PFOA and PFBS were not detected.	Surface Soil, Subsurface Soil, GW
SS295P	POI-715	Nozzle Spray Test Area Main Base Eglin	Spray Field	2.01	Unknown	AFFF	16 PFAS constituents (includes PFOS, PFOA, and PFBS)	Unknown	A portion of Taxiway L was used for quarterly and annual nozzle spray tests.	An estimated 300 and 1,000 gallons of AFFF was used for each quarterly and annual spray test, respectively.	Undergoing RI	PFOS was detected in surface and/or subsurface soil at concentrations above the USEPA RSL at two locations; PFOA was detected in surface and/or subsurface soil at concentrations above the USEPA HA value at each location, while PFOA was detected in groundwater at concentrations above USEPA HA value at three locations. PFBS was detected in groundwater at concentrations below the USEPA Tap Water RSL at one location.	Surface Soil, Subsurface Soil, GW
SS311P	POI-716	Nozzle Spray Test Area Duke Field	Spray Field	4.05	Unknown	AFFF	16 PFAS constituents (includes PFOS, PFOA, and PFBS)	Unknown	The northeast corner of an abandoned runway was used for quarterly and annual nozzle spray tests	An estimated 30 gallons of AFFF was dispensed per truck for each spray test.	Undergoing RI	PFOS was detected in surface and/or subsurface soil at concentrations below the USEPA RSL at three locations, while PFOA and PFBS were not detected. PFOA was detected at concentrations below the USEPA HA value at one location, while PFBS was not detected.	Surface Soil, Subsurface Soil, GW
SS296P	POI-717	Nozzle Spray Test Area Field 6 (Ranger Camp)	Spray Field	1.61	Unknown	AFFF	16 PFAS constituents (includes PFOS, PFOA, and PFBS)	Unknown	The northeast corner of an abandoned runway was used for quarterly and annual nozzle spray tests	An estimated 30 gallons of AFFF was dispensed per truck for each spray test.	Undergoing RI	PFOS was detected in surface and/or subsurface soil at concentrations below the USEPA RSL at four locations, while PFOA was detected in surface soil at one location. PFBS was not detected in soil. PFOS and PFOS+PFOA were detected in groundwater concentrations above the USEPA HA value at three locations and were detected below the USEPA HA value at one location. PFOA was detected in groundwater at concentrations below the USEPA HA value at three locations while PFBS was detected in groundwater at concentrations below the Tap Water RSL at two locations.	Surface Soil, Subsurface Soil, GW

B.1 List of Release Areas requiring a Site Assessment (a/k/a Remedial Investigation) and possible response action pursuant to CERCLA

SWMU/AOC Number/Letter	Alias	SWMU/AOC Name	Activity	Unit Size (Acres)	Dates of Operation	Name/Type of Waste	Constituents of Concern	Date of Release	Type/Nature of Waste Released	Quantity/Volume of Waster Released	Site Status	Site Comment and Basis for Determination	Potentially Affected Media
SS297P	POI-718	Nozzle Spray Test Area Test Range C-6	Spray Field	0.52	Unknown	AFFF	16 PFAS constituents (includes PFOS, PFOA, and PFBS)	Unknown	A helicopter pad was used for quarterly and annual nozzle spray tests	An estimated 30 gallons of AFFF was dispensed per truck for each spray test.	Undergoing RI	PFOS was detected in surface and/or subsurface soil at concentrations below the USEPA RSL at each location, while PFOA and PFBS were not detected. PFOS and PFOS+PFOA were detected in groundwater at concentrations above the USEPA HA value at two locations, while PFOA was detected in groundwater at concentrations above the HA value at one location. PFBS was detected in groundwater at concentrations below the Tap Water RSL at one location.	Surface Soil, Subsurface Soil, GW
SS298P	POI-719	Former WWTP and Spray Field at Duke Field	Spray Field	28.51	1950s to 2014	AFFF	16 PFAS constituents (includes PFOS, PFOA, and PFBS)	1950s to 2014	The WWTP received influent with AFFF from numerous fire suppressions system activations at Duke Field with effluent discharged to the adjacent spray field.	Unknown amount	Undergoing RI	PFOS was detected in surface and/or subsurface soil at concentrations below the USEPA RSL at each location, while PFOA was detected in subsurface soil at concentrations below the USEPA RSL at one location. PFBS was not detected in soil. PFOS and PFOS+PFOA were detected in groundwater at concentrations above the USEPA HA value at each location, and PFOA was detected in groundwater at concentrations above the HA value at one location. PFBS was detected in groundwater at concentrations below the Tap Water RSL at two locations.	Surface Soil, Subsurface Soil, GW
SS299P	POI-720	Eglin WWTP Spray Field	Spray Field	208.80	1950s to 2014	AFFF	16 PFAS constituents (includes PFOS, PFOA, and PFBS)	1950s to 2014	The WWTP received and processed influent with AFFF from numerous fire suppressions system activations at Main Base Eglin, with liquid effluent discharged to the adjacent spray field.	Unknown amount	Undergoing RI	PFOS was detected in surface soil at concentrations below the USEPA RSL at each location, while PFOA and PFBS were not detected. PFOS and PFOS+PFOA were detected in groundwater at concentrations above the USEPA HA value at each location, while PFOA was detected in groundwater at concentrations above the HA value at one location. PFBS was detected in groundwater at concentrations below the Tap Water RSL at two locations.	Surface Soil, Subsurface Soil, GW
SS300P	POI-721	AFFF Trailer Rupture	Trailer Tank Release	0.44	Unknown	AFFF concentrate	16 PFAS constituents (includes PFOS, PFOA, and PFBS)	2004	AFFF concentrate was released from a ruptured trailer tank in 2004 into a drainage ditch at the intersection of Freedom Self Storage Road and Martin Luther King Jr. Boulevard, adjacent to the Hurlburt Field.	Approximately 375 gallons	Undergoing RI	PFOS was detected in surface and subsurface soil at concentrations below the USEPA RSL at each location, while PFOA was detected in surface soil at concentrations below the USEPA RSL at one location and PFBS was not detected. PFOS and PFOS+PFOA were detected in groundwater at concentrations above the USEPA HA value at each location, while PFOA and PFBS was detected in groundwater at concentrations below the USEPA HA value and Tap Water RSL at each location, respectively.	Surface Soil, Subsurface Soil, GW
SS294P	POI-722	East-West Flightline Drainage Ditch	Ditch	8.76	Unknown	AFFF	16 PFAS constituents (includes PFOS, PFOA, and PFBS)	unknown	Unlined drainage ditch located adjacent to the North-South runway that potentially received AFFF via stormwater runoff from runway mishap sites and numerous building/hangar fire suppression system activations.	Unknown amount	Undergoing RI	PFOS, PFOA, and PFBS were not detected in surface or subsurface soil at this location. PFOS and PFOS+PFOA were detected in groundwater at concentrations above the USEPA HA value at two locations, while PFOA was detected in groundwater at concentrations below USEPA HA value at each location. PFBS was detected in groundwater at concentrations below the USEPA Tap Water RSL at two locations. PFOS, PFOA, and PFBS were not detected in sediment. PFOS and PFOS+PFOA were detected in surface water at concentrations below the USEPA HA value, while PFOA and PFBS were not detected.	Surface Soil, Subsurface Soil, Sediment, GW, Surface Water
SS292P	POI-723	Jack Lake	Lake	26.06	Unknown	AFFF	16 PFAS constituents (includes PFOS, PFOA, and PFBS)	Unknown	This surface water body may have received AFFF from the releases to the East-West and North-South Flightline Drainage Ditches.	Unknown amount	Undergoing RI	PFOS was detected in sediment at concentrations below the USEPA RSL at each location, while PFOA and PFBS were not detected. PFOS and PFOS-PFOA were detected in surface water at concentrations above the USEPA HA value at each location. PFBS was detected in surface water at concentrations below the USEPA Tap Water RSL at each location.	Sediment, Surface Water
FT028P-SUB	POI-724	Eglin Main Base Old Fire Training Area	Fire Training Area	1.38	1950s to early 2000s	AFFF	16 PFAS constituents (includes PFOS, PFOA, and PFBS)	Unknown	Fire training exercises employed AFFF release for fire suppression.	Unknown amount	Undergoing RI	Sampling results from SI indicated that PFOS and PFOA components are present in both soil and groundwater.	Surface Soil, Subsurface Soil, GW
SS292P	POI-725	North-South Flightline Drainage Ditch	Ditch	9.84	Unknown	AFFF	16 PFAS constituents (includes PFOS, PFOA, and PFBS)	Unknown	Unlined ditch located adjacent to the North-South runway that potentially received AFFF via stormwater runoff from runway mishap sites and numerous building/hangar fire suppression system activations.	Unknown amount	Undergoing RI	PFOS was detected in sediment at concentrations below the USEPA RSL, while PFOA and PFBS were not detected. PFOS and PFOS+PFOA were detected in surface water at concentrations above the USEPA HA value, while PFOA and PFBS were detected in surface water at concentrations below the USEPA HA value and Tap Water RSL, respectively.	Sediment, Surface Water

B.1 List of Release Areas requiring a Site Assessment (a/k/a Remedial Investigation) and possible response action pursuant to CERCLA

SWMU/AOC Number/Letter	Alias	SWMU/AOC Name	Activity	Unit Size (Acres)	Dates of Operation	Name/Type of Waste	Constituents of Concern	Date of Release	Type/Nature of Waste Released	Quantity/Volume of Waster Released	Site Status	Site Comment and Basis for Determination	Potentially Affected Media
SS317P	POI-726	Auxiliary Field 4 Dove Field	Field	16.21	1950s to 2014	AFFF sludge	16 PFAS constituents (includes PFOS, PFOA, and PFBS)	1950s to 2014	Sludge from the Eglin WWTP was land farmed at this location	Unknown amount	Undergoing RI	PFOS was detected in surface soil at a concentration below the USEPA RSL at one location, while PFOA and PFBS were not detected. PFOS and PFOS+PFOA were detected in groundwater at concentrations below the USEPA HA value at two locations, while PFOA and PFBS were detected below the USEPA HA value and USEPA Tap Water RSL at one location, respectively.	Surface Soil, Subsurface Soil, GW
SS304P	POI-728	.	Maintenance Building	1.56	Unknown	AFFF	16 PFAS constituents (includes PFOS, PFOA, and PFBS)	Unknown	AFFF was released from a fire truck during maintenance into a storm water sewer inlet south of the building that discharged to a nearby retention pond.	Approximately 100 gallons	Undergoing RI	PFOS was detected in surface and/or subsurface soil at concentrations below the USEPA RSL at each location, while PFOA and PFBS were not detected. PFOS and PFOS+PFOA were detected in groundwater at concentrations above the USEPA HA value at two locations, while PFOA was detected in groundwater at concentrations above the USEPA HA value at one location. PFBS was detected in groundwater at concentrations below the USEPA Tap Water RSL at two locations. PFOS was detected in sediment at concentrations below the USEPA RSL value, while PFOA and PFBS were not detected in sediment. PFOS, PFOA and PFOS+PFOA were detected in surface water at concentrations above the USEPA HA value, while PFBS was detected in surface water below the USEPA Tap Water RSL.	Surface Soil, Subsurface Soil, Sediment, GW, Surface Water
SS305P	POI-729	2011 Eglin Aero Club Beech C24R Crash Site	Crash Site	0.72	Unknown	AFFF	16 PFAS constituents (includes PFOS, PFOA, and PFBS)	2011	A Beech C24R aircraft mishap occurred on the apron/taxiway west of Building 102 adjacent to the North-South runaway in 2011 with AFFF was applied for fire suppression.	Unknown amount	Undergoing RI	PFOS was detected in surface and subsurface soil at concentrations below the USEPA RSL, while PFOA and PFBS were not detected. PFOS, PFOA, and PFOS+PFOA were detected in groundwater at concentrations above the USEPA HA value at this location. PFBS was detected in groundwater at concentrations below the USEPA Tap Water RSL at this location.	Surface Soil, Subsurface Soil, GW
SS306P	POI-731	AFFF Holding Pond	Pond	0.76	Unknown	AFFF	16 PFAS constituents (includes PFOS, PFOA, and PFBS)	Unknown	Holding pond constructed with a synthetic liner received AFFF from Building 440 releases via underground piping, and other building releases via a vacuum truck.	Unknown amount	Undergoing RI	PFOS was detected in surface and subsurface soil at concentrations below the USEPA RSL at each location, while PFOA was detected in surface soil below the USEPA RSL at two locations. PFBS was not detected in soil. PFOS, PFOA, and PFOS+PFOA were detected in groundwater at concentrations above the USEPA HA values at each location. PFBS was detected in groundwater at concentrations below the USEPA Tap Water RSL at each location.	Surface Soil, Subsurface Soil, GW
FT028P-SUB	POI-732	Building 916A	Portable Hangar	0.15	Unknown	AFFF	16 PFAS constituents (includes PFOS, PFOA, and PFBS)	mid-1990s	A portable AFFF system activated in the mid-1990s and released AFFF concentrate onto the flightline and surrounding grass.	Approximately 300 gallons	Undergoing RI	PFOS was detected in surface soil at concentrations below the USEPA RSL at two locations, while PFOA and PFBS were not detected. PFOS+PFOA was detected in groundwater at concentrations above the USEPA HA value at each location, while PFOS was detected above the USEPA HA value at two locations and PFOA was detected below the USEPA HA value at each locations. PFBS was detected in groundwater at concentrations below the USEPA Tap Water RSL at one location.	Surface Soil, Subsurface Soil, GW
SS307P	POI-733	Building 3087	Hangar	0.62	Unknown	AFFF	16 PFAS constituents (includes PFOS, PFOA, and PFBS)	mid-1990s	Hangar contains an AFFF fire suppression system that had one inadvertent activation in the mid-1990s with AFFF released into the sanitary sewer system and onto the flightline.	Unknown amount	Undergoing RI	PFOS was detected in surface and/or subsurface soil at concentrations below the USEPA RSL at each location, while PFOA and PFBS were not detected. PFOS and PFOS+PFOA were detected in groundwater at concentrations above the USEPA HA value at each location, while PFOA was detected in groundwater at concentrations above the USEPA HA value at two locations. PFBS was detected in groundwater at concentrations below the USEPA Tap Water RSL at each location.	Surface Soil, Subsurface Soil, GW
SS318P	POI-734	2016 F-16 Mishap	Aircraft mishap	0.57	unknown	AFFF	16 PFAS constituents (includes PFOS, PFOA, and PFBS)	2016	A F-16 aircraft experienced a wheels-up landing on the East-West runway in 2016 with an unknown amount of AFFF applied for fire prevention	Unknown amount	Undergoing RI	PFOS, PFOA, and PFBS were not detected in soil at this location. PFOS and PFOS+PFOA were detected in groundwater at concentrations below the USEPA HA values, while PFOA and PFBS were not detected.	Surface Soil, Subsurface Soil, GW
SS308P	POI-735	Building 3057	Hangar	0.94	Unknown	AFFF	16 PFAS constituents (includes PFOS, PFOA, and PFBS)	May 2017	Release of AFFF from the fire suppression system was identified outside the hangar doors and onto the surrounding grassy areas in May 2017.	Unknown amount	Undergoing RI	PFOS was detected in surface and/or subsurface soil at concentrations below the USEPA RSL at two locations, while PFOA and PFBS were not detected. PFOS+PFOA was detected in groundwater at concentrations above the USEPA HA value at each location, while PFOS was detected above the USEPA HA value at two locations and PFOA was detected in groundwater concentrations above the USEPA HA value at one location. PFBS was detected in groundwater at concentrations below the USEPA Tap Water RSL at one location.	Surface Soil, Subsurface Soil, GW

B.1 List of Release Areas requiring a Site Assessment (a/k/a Remedial Investigation) and possible response action pursuant to CERCLA

SWMU/AOC Number/Letter	Alias	SWMU/AOC Name	Activity	Unit Size (Acres)	Dates of Operation	Name/Type of Waste	Constituents of Concern	Date of Release	Type/Nature of Waste Released	Quantity/Volume of Waster Released	Site Status	Site Comment and Basis for Determination	Potentially Affected Media
SS309P	POI-736	Hanger 3150 and Duke Field Nozzle Spray Test Area	Hangar and Spray Field	2.31	Unknown	AFFF	16 PFAS constituents (includes PFOS, PFOA, and PFBS)	Unknown	AFFF from the fire suppression system at Hangar 3150 was released outside hangar doors, based on communications with the Fire Chief at Duke Field, In addition, the nozzle spray test area identified as Taxiway D in the PA (CH2MHILL, 2015), was confirmed to be located at Taxiway A.	Unknown amount	Undergoing RI	PFOS was detected in surface and subsurface soil at concentrations below the USEPA RSL at each location, while PFOA was detected in surface soil at concentrations below the USEPA RSL at one location and PFBS was not detected. PFOS and PFOS+PFOA were detected in groundwater at concentrations above the USEPA HA value at each location, while PFOA was detected in groundwater at concentrations above the USEPA HA value at two locations. PFBS was detected in groundwater at concentrations below the USEPA Tap Water RSL at one location.	Surface Soil, Subsurface Soil, GW
XU654	XU654	XU654 Legacy Bay Range 61-Choctawhatchee Bay	Range	1581.82	1944 - 1951	MEC, munitions, and munitions debris	NA	1944 - 1951	MEC, munitions, and munitions debris	Unknown	Undergoing RI	Underwater MMRP site. A Remedial Investigation was conducted in 2024. UXO and MEC were recovered from Choctawhatchee Bay. Additional Remedial Investigation efforts are expected to investigate additional underwater geophysical anomalies.	Sediment, Surface Water

B.2 List of Release Areas where Site Rehabilitation Completion Determinations Without Controls or No Further Action Determination have been made pursuant to CERCLA

SWMU/AOC Number/Letter	Alias	SWMU/AOC Name	Unit Size (Acres)	Site Comment and Basis for Determination
POI600	POI-600	XU656A Legacy Debris Pit Atwell Pond A and Atwell Pond B	0.48	The CSE Phase II recommended NFA for the site (Bay West, 2007) and it is currently closed.
POI601	POI-601	XU657A Burial Sites Prohibited Legacy Debris Pit 02-AF5A	5.31	The CSE Phase II recommended NFA for the site, and it is currently closed.
POI603	POI-603	XU656B Burial Sites Accessible Legacy Debris Pit 02-3AD	0.30	The CSE Phase II recommended NFA for the site (Bay West), and it is currently closed.
POI604	POI-604	XU656C Burial Sites Accessible Legacy Debris Pit 02-6AH	0.12	The CSE Phase II recommended NFA for the site (Bay West), and it is currently closed.
POI605	POI-605	XU656D Burial Sites Accessible Legacy Debris Pit 02-66C	0.32	The CSE Phase II recommended NFA for the site (Bay West), and it is currently closed.
POI606	POI-606	XU657B Burial Sites Prohibited Legacy Debris Pit 02-A77C	3.53	The CSE Phase II recommended NFA for the site, and it is currently closed.
POI606A	POI-606A	XU657I Range A-77 Area 2	17.43	The Final Modified CSE Phase I/II Report recommended NFA for the site, and it is currently closed (FDEP, 2016).
POI606B	POI-606B	XU657J Fire Bomb Pit	2.03	The Final Modified CSE Phase I/II Report recommended NFA for the site, and it is currently closed (FDEP, 2016).
POI607	POI-607	XU656E Burial Sites Accessible Legacy Debris Pit 02-B70A	1.30	The CSE Phase II recommended NFA for the site (Bay West, 2011), and it is currently closed.
POI610	POI-610	XU657C Burial Pit Sites Prohibited Legacy Debris Pit 02-B71A	0.17	The CSE Phase II recommended NFA for the site, and it is currently closed.
POI611	POI-611	XU657D Burial Pit Sites Prohibited Legacy Debris Pit 02-B71C	2.93	The CSE Phase II recommended NFA for the site, and it is currently closed.
POI612	POI-612	XU657E Burial Pit Sites Prohibited Legacy Debris Pit 02-B75	3.96	The CSE Phase II recommended NFA for the site, and it is currently closed.
POI613	POI-613	XU656F Burial Sites Accessible Legacy Debris Pit 02-C2A	0.90	The CSE Phase II recommended NFA for the site and it is currently closed.
POI614	POI-614	XU656G Burial Sites Accessible Legacy Debris Pit 02-C2H	0.37	The CSE Phase II recommended NFA for the site (Bay West, 2011), and it is currently closed.

B.2 List of Release Areas where Site Rehabilitation Completion Determinations Without Controls or No Further Action Determination have been made pursuant to CERCLA

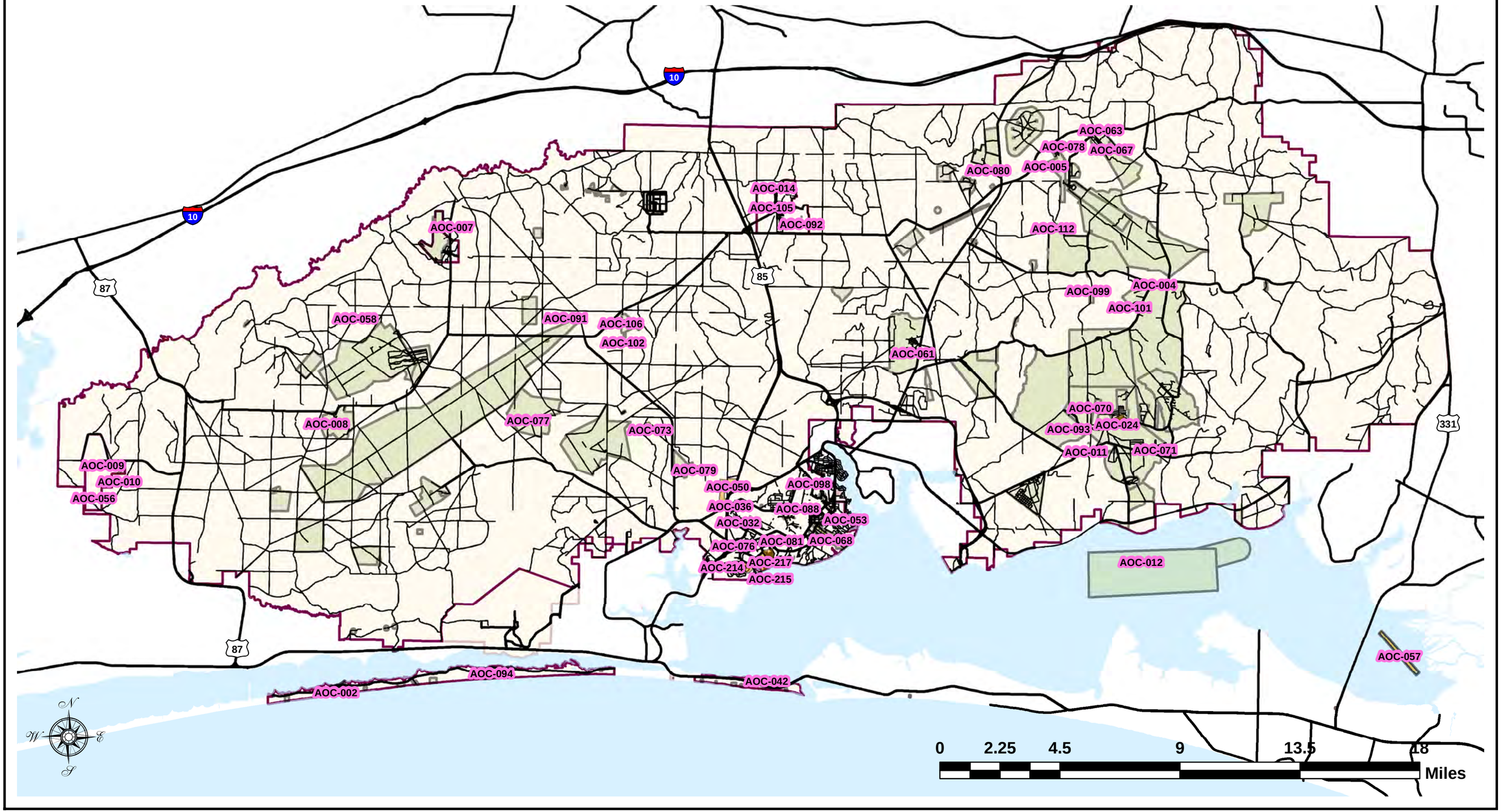
SWMU/AOC Number/Letter	Alias	SWMU/AOC Name	Unit Size (Acres)	Site Comment and Basis for Determination
POI615	POI-615	XU656H Burial Sites Accessible Legacy Debris Pit 02-C2AF	0.20	The CSE Phase II recommended NFA for the site (Bay West, 2011), and it is currently closed.
POI618	POI-618	XU657F Burial Pits Prohibited Legacy Debris Pit 02-C52B	3.64	The CSE Phase II recommended NFA for the site, and it is currently closed.
POI618A	POI-618A	XU657L POI-618 Area 2	6.05	The Final Modified CSE Phase I/II Report recommended NFA for the site, and it is currently closed (FDEP, 2016).
POI620	POI-620	XU657G Burial Pits Prohibited Legacy Debris Pit 02-C64A	5.07	The CSE Phase II recommended NFA for the site, and it is currently closed.
POI621	POI-621	XU657H Burial Pit Sites Prohibited Legacy Debris Pit 02-C72H	9.97	The CSE Phase II recommended NFA for the site, and it is currently closed.
POI622	POI-622	XU656I Burial Sites Accessible Legacy Debris Pit 02-D51A	4.42	The CSE Phase II recommended NFA for the site, and it is currently closed (Bay West 2011).
POI622A	POI-622A	XU656K D-51 Area 3	79.59	The Final Modified CSE Phase I/II Report recommended NFA for the site, and it is currently closed (FDEP, 2016).
POI622B	POI-622B	XU656L D-51 Area 4	50.94	The Final Modified CSE Phase I/II Report recommended NFA for the site, and it is currently closed (FDEP, 2016).
POI623	POI-623	XU656J Burial Pit Sites Accessible Legacy Debris Pit 02-D51B	0.52	The CSE Phase II recommended NFA for the site, and it is currently closed (Bay West 2011).
POI623A	POI-623A	XU656M Old Open Burn/Open Detonation (OB/OD) Area	6.44	The Final Modified CSE Phase I/II Report recommended NFA for the site, and it is currently closed (FDEP, 2016).

Solid Waste Management Unit (SWMU)/Area of Concern (AOC) Profile Sheet

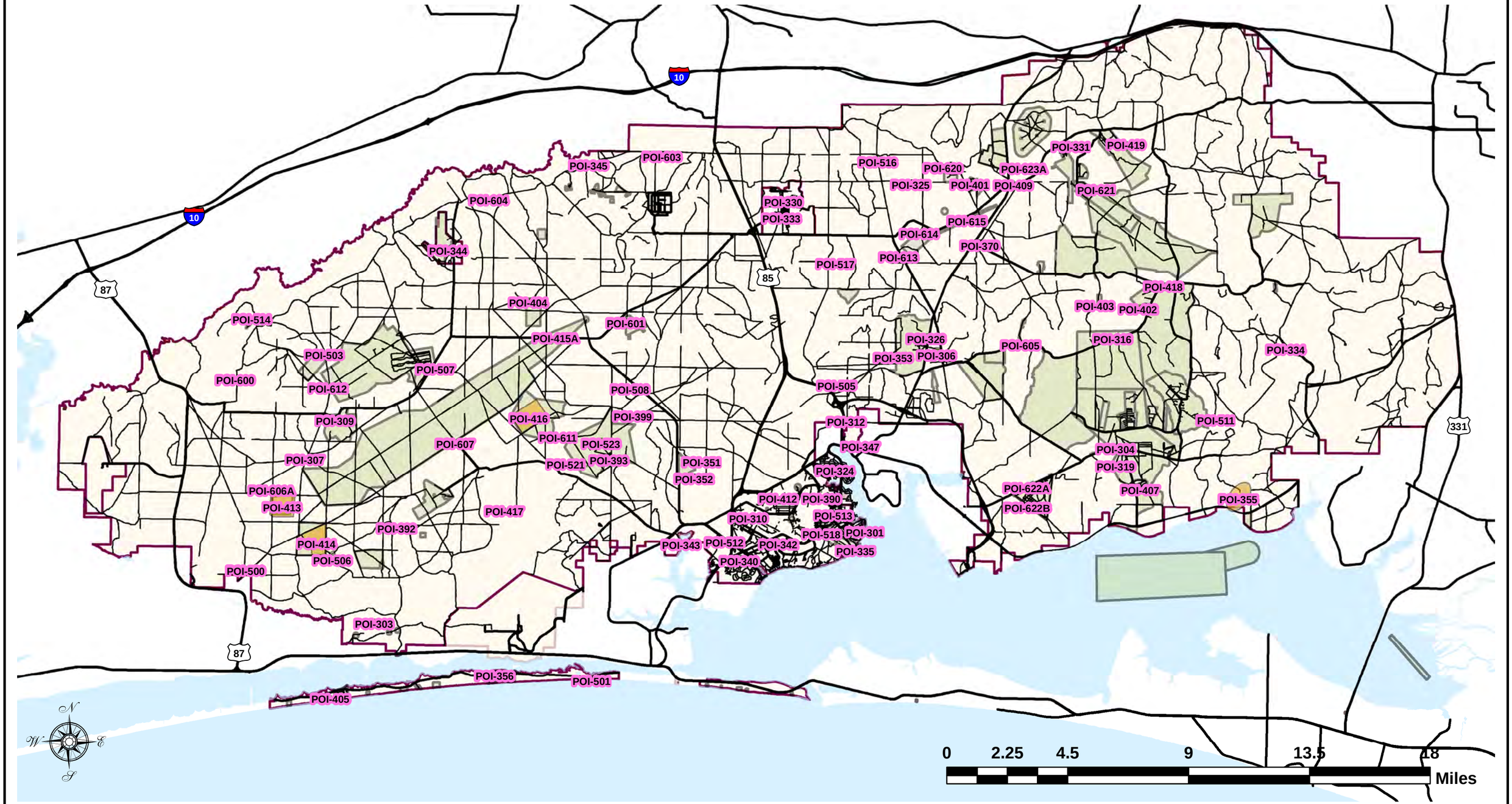
ACTION	**DESCRIPTION: F-22**
Number:	Generally, continue existing numbering sequence, e.g., SWMU-XX, AOC-Z.
Type of Unit: Crashed Aircraft near C-80	Crashed Aircraft near C-80 on Eglin range.
Name: F-22	F-22 crash site
Unit Characteristics:	See Dig permit for map of area. Approx. crash area 100 sq yards. No secondary containment.
Function/Purpose/Use:	Crash site
Operational History:	22 Jun 20 crash date.
Permits	Dig permit and AF Form 813 #57100
Current Status:	Soil samples in and around crash area taken by E-3, awaiting sample results.
Waste Characteristics:	Petroleum products released in crash/amount unknown.
Waste Management:	Petroleum contaminated soil dug and removed from are and taken to authorized landfill. Manifests created. PID used during soil removal to test areas for immediate test results.
Maintenance Procedures:	Contaminated soils removed and evacuated areas backfilled with clean soil.
Release History:	Unknown amount of petroleum products were released to crash area but no visual evidence existed. Distressed vegetation etc.
Potential Pathways: Soil High No water areas.	Soil High No water areas.
Exposure Potential:	N/A
Remedial Action:	Contaminated soil removed, placed in approved landfill. Soil samples sent to area lab. Awaiting results.
Recommendation and reason for recommendation Recommend closure once soil sample results are released.	Recommend closure once soil sample results are released.
References (if any) Jonathan Kramer: 850-240-1628 Al Pullen: 850-218-5415 Tim Langley 850-699-9149	Include title, date and author of any reports that support this table's information.
Photographs:	Available upon request.

Solid Waste Management Unit (SWMU)/Area of Concern (AOC) Profile Sheet

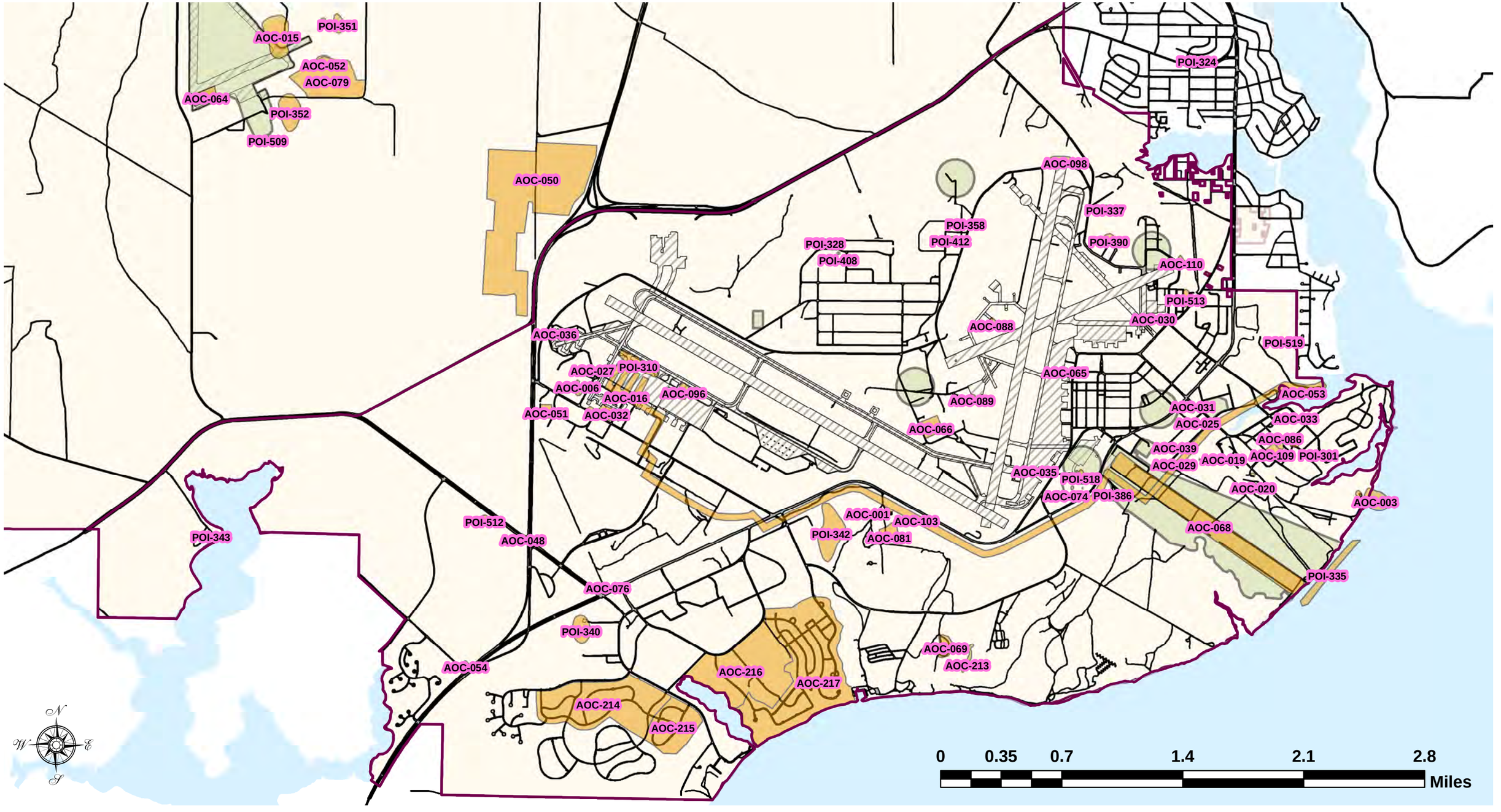
ACTION	**DESCRIPTION: F-35**
Number:	Generally, continue existing numbering sequence, e.g., SWMU-XX, AOC-Z.
Type of Unit:	Crashed Aircraft on Eglin midfield.
Name:	F-35
Unit Characteristics:	See Dig permit for map of area. Approx. crash area 50 sq yards. No secondary containment, soil area.
Function/Purpose/Use:	Crash site
Operational History:	04 Jun 20 crash date.
Permits	Dig permit FP 1014440 and AF Form 813 #57117
Current Status:	Soil samples in and around crash area taken by E-3, awaiting sample results.
Waste Characteristics:	Petroleum products released in crash/amount unknown. Believe most was burned up during crash.
Waste Management:	Most Petroleum believed to have been burned up during crash. Multiple confirmatory samples taken at site. PID used during soil removal to test areas for immediate test results.
Maintenance Procedures:	N/A
Release History:	Unknown amount of petroleum products were believed burned up during crash scorched area was visual. Distressed vegetation etc.
Potential Pathways:	Soil High No water areas. Ground water approx. 45 feet.
Exposure Potential:	N/A
Remedial Action:	Soil samples sent to area lab. Awaiting results.
Recommendation and reason for recommendation	Recommend closure once soil sample results are released.
References (if any) Jonathan Kramer: 850-240-1628 Al Pullen: 850-218-5415 Tim Langley 850-699-9149	Include title, date and author of any reports that support this table's information.
Photographs:	Available upon request



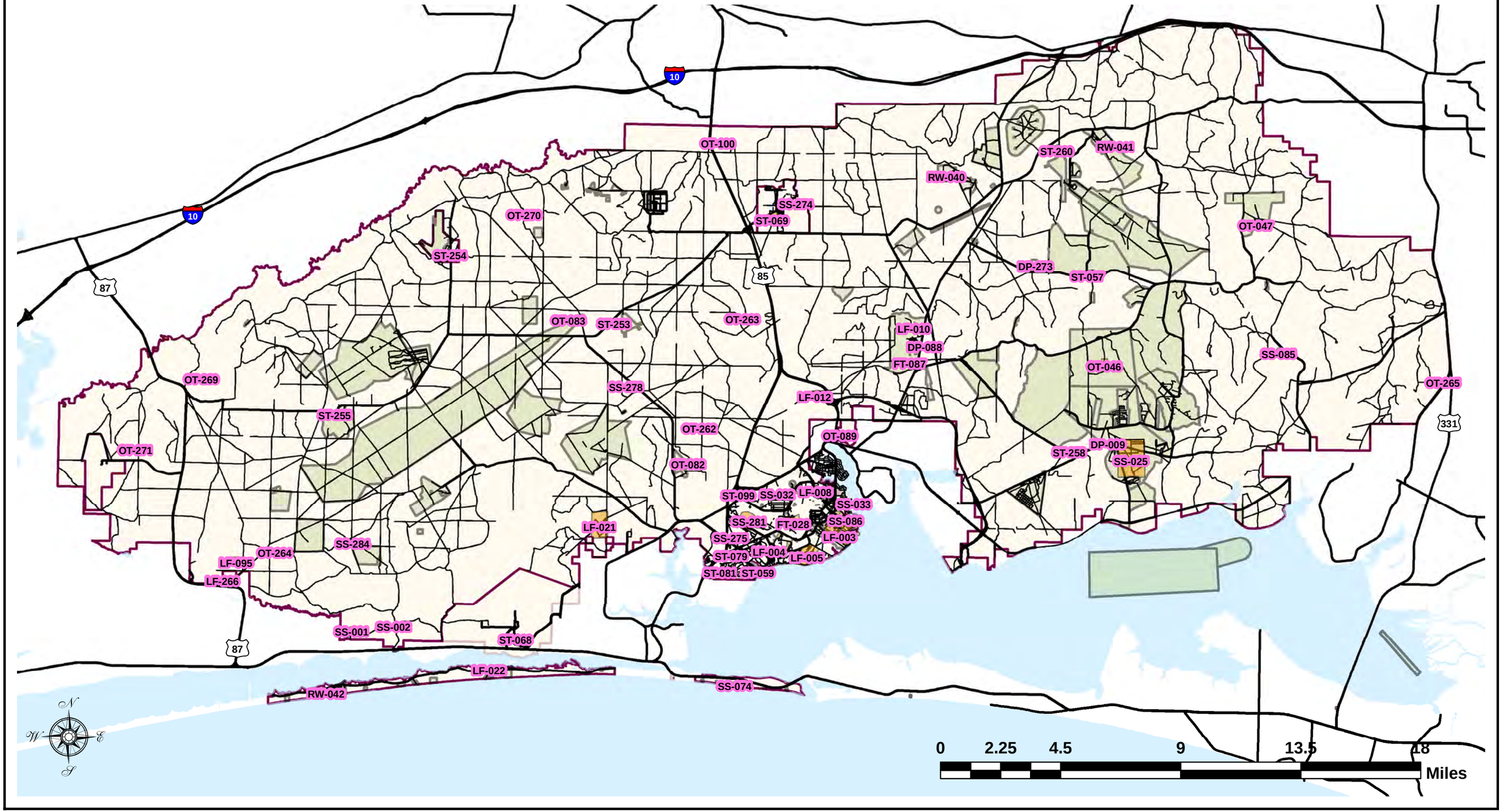
EGLIN AIR FORCE BASE INSTALLATION RESTORATION PROGRAM
AREAS OF CONCERN (AOC) IN THE PERMIT
FIGURE 1



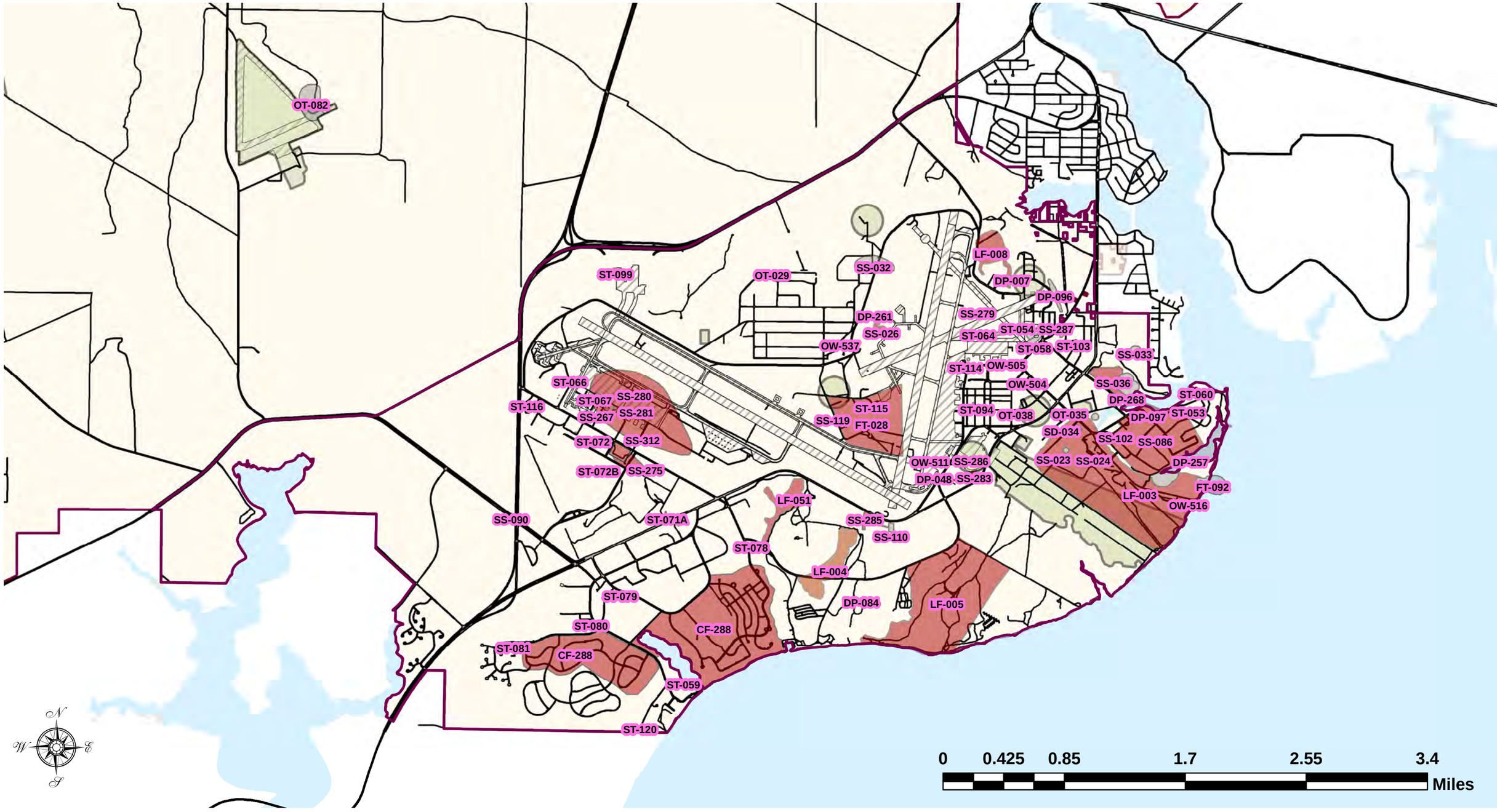
EGLIN AIR FORCE BASE INSTALLATION RESTORATION PROGRAM
POINTS OF INTEREST (POI) IN THE PERMIT
FIGURE 2



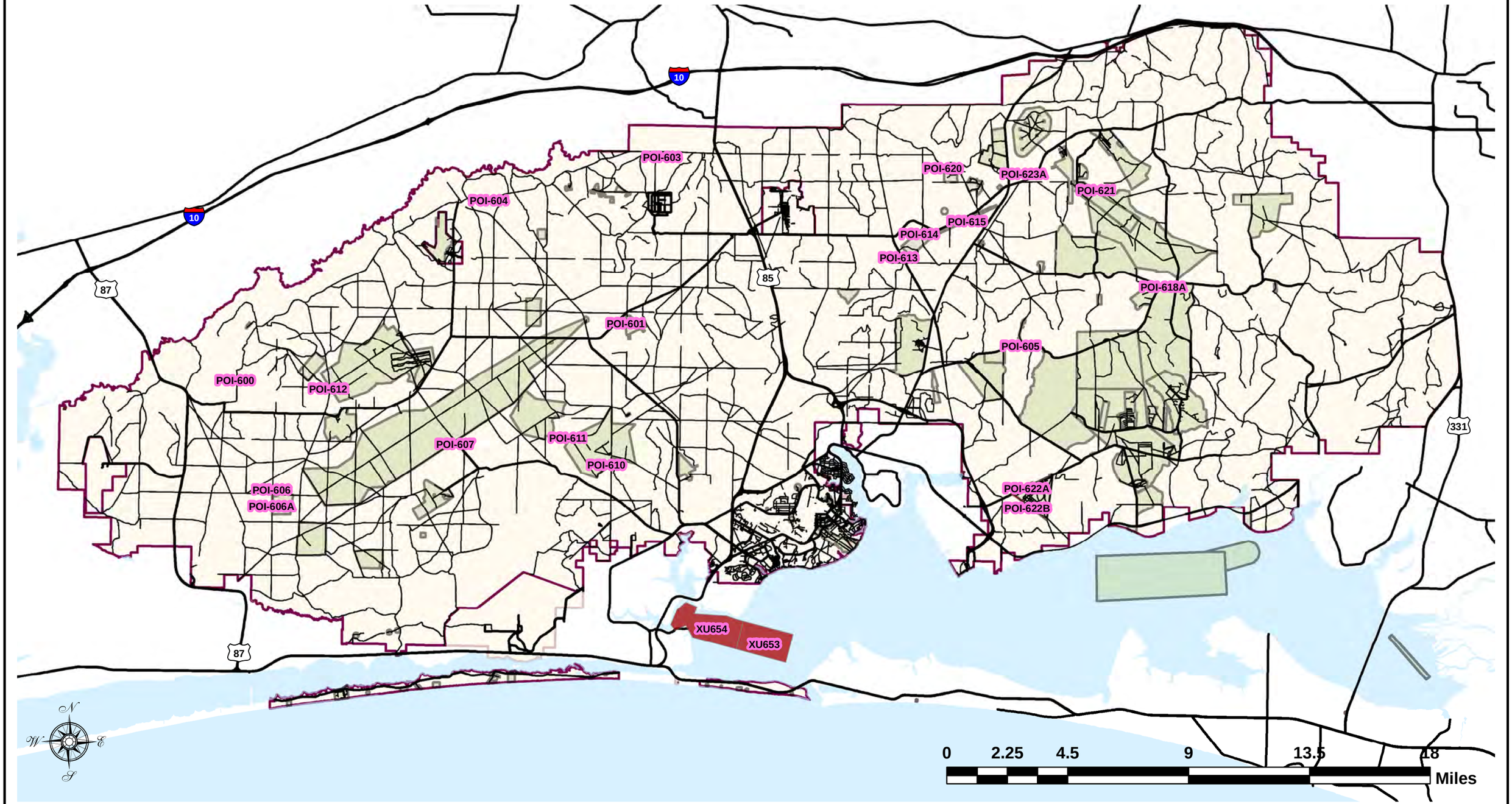
EGLIN AIR FORCE BASE INSTALLATION RESTORATION PROGRAM
EGLIN MAIN BASE AREAS OF CONCERN (AOC) AND POINTS OF INTEREST (POI) IN THE PERMIT
FIGURE 3



EGLIN AIR FORCE BASE INSTALLATION RESTORATION PROGRAM
SITES IN THE PERMIT
FIGURE 4



EGLIN AIR FORCE BASE INSTALLATION RESTORATION PROGRAM
EGLIN MAIN BASE SITES IN THE PERMIT
FIGURE 5



EGLIN AIR FORCE BASE INSTALLATION RESTORATION PROGRAM
MILITARY MUNTIONS RESPONSE PROGRAM (MMRP) IN THE PERMIT
FIGURE 6