VOLUME I

RCRA Permit Renewal Application
Part A and B
The New Bomb Area
Hawthorne Army Depot
Hawthorne, Nevada

Permit No. NEV HW0015, EPA ID #NV5210090010

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June 2012

This Application was revised and compiled from earlier permit information prepared by the following:

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Hazardous Waste Remedial Action Program (HAZWRAP)
HAZWRAP Support Contractor Office
Oak Ridge, Tennessee 37831

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2790 Mosside Boulevard
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RCRA PART A AND B APPLICATION
OPEN DETONATION-NEW BOMB
HAWTHORNE ARMY DEPOT
HAWTHORNE, NEVADA

RECEIVED
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ENVIRONMENTAL PROTECTION

PART B CERTIFICATION [*40 CFR 270.11*]

Part B applications must be accompanied by a certification as specified in 40 CFR 270.11(d). The certification must be signed as specified in 40 CFR 270.11(a). For a federal facility, the certification must be signed by either a principal executive officer or ranking elected official.

CERTIFICATION

I hereby 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.

Kirk Bausman
Deputy to the Commander
U.S. Army

20130528
Date

George R. Gram
General Manager
SOC Nevada LLC

5/29/13
Date

TABLE OF CONTENTS

SECTION **PAGE**

SECTION I PART A APPLICATION 1

SECTION II A FACILITY DESCRIPTION 17

II A.1 GENERAL DESCRIPTION [40 CFR 270.14(b)(l)] 17

II A.2 TOPOGRAPHIC MAPS [40 CFR 270.14(b)(19)] 17

II A.3 FACILITY LOCATION INFORMATION [40 CFR 270.14(b)(11) and 264.18] 20
II A.3.1 Seismic Requirements [40 CFR 270.14(b)(11)(ii) and 264.18(a)] 20
II A.3.2 Floodplain Requirements [40 CFR 270.14(b)(ll)(iii)(iv) and 264.18(b)] 20
II A.4 TRAFFIC PATTERNS [40 CFR 270.14(b)(10)] 22
II A.4.1 Traffic Volumes and Types of Vehicles 22
II A.4.2 Waste Transfer/Pick-Up Stations 22
II A.4.3 Quantity of Waste Moved 22
II A.4.4 Traffic Control Measures 22
II A.4.5 Road Surface Composition and Load-Bearing Capacity 23
II A.5 DOCUMENTATION OF COMPLIANCE WITH MANIFEST SYSTEM, RECORDKEEPING, AND REPORTING REQUIREMENTS [40 CFR 264.70] 23
II A.5.1 Use of Manifest System [40 CFR 264. 71] 24
II A.5.2 Manifest discrepancies [40 CFR 264.72] 24
II A.5.3 Operation Records [40 CFR 264.73] 24
II A.5.4 Availability, Retention, and Disposition of Records [40 CFR 264.74] 25
II A.5.5 Biennial Report [40 CFR 264.75] 25
II A.5.6 Additional Reports [40 CFR 264.77] 26
II A.6 DESCRIPTION OF TREATMENT UNITS [40CFR 270.23(a)1 &2) 26
II A.6.1 Topography 26
II A.6.2 Design and Operation 26
II A.6.3 Maintenance 27
II A.6.4 Inspections 28
II A.6.5 Monitoring 28
II A.6.6 Closure 28

SECTION II B – WASTE CHARACTERISTICS 36

II B.1 PHYSICAL AND CHEMICAL CHARACTERISTICS OF WASTES AND RESIDUES [40 CFR 270.14(b)(2) and 264.13(a)] 36
II B.1.1 Volume and Composition of Wastes 36
II B.1.2 Parameters and Rationale 38
II B.1.3 Additional Requirements for Ignitable, Reactive, or Incompatible Wastes [40 CFR 264.13(b)(6) and 264.17] 38
II B.2 WASTE ANALYSIS PLAN [CFR 270.14(b)(3) and 264.13(b) and (c)] 39
II B.2.1 Purpose 39

II B.2.2 Waste Acceptance 39
II B.2.3 Waste Receiving 40
II B.2.3.1 Management of Waste Generated Off-Site [40 CFR 264.13(c)] 40
II B.2.4 Waste Inspection 40
II B.2.5 Items Prohibited from Treatment 40
II B.2.6 Verification of Treatment Effectiveness 41
II B.2.7 Test Methods 42
II B.3 SAMPLING AND ANALYSIS PLAN [40 CFR 264, Subpart X and 40 CFR 268.48] ..74
II B.3.1 Physical And Chemical Characteristics Of Wastes And Residues [40 CFR 270.14(b)(2) and 264.13(a)] 74
II B.3.1.1 Purpose 74
II B.3.1.2 Applicability 74
II B.3.1.3 Sampling Frequency: 75
II B.3.1.4 Sampling Locations: 75
II B.3.1.5 Sampling Procedures: 75
II B.3.1.5.1 Equipment: 75
II B.3.1.5.2 Preparation 75
II B.3.1.5.3 Precautions 76
II B.3.1.5.4 Field activities 76
II B.3.1.5.5 Documentation Of Field Activities 76
II B.3.1.5.6 Sample Shipping 77
II B.3.1.6 Data Assessment 77
II B.3.1.7 Reporting 78

SECTION II C PROCEDURES TO PREVENT HAZARDS 81

II C.I SECURITY PROCEDURES AND EQUIPMENT [40 CFR 270.14(b)(4) and 264.14] 81
II C.1.1 Description of Artificial and Natural Barriers [40 CFR 264.14(b)(2)(i)] 81
II C.1.2 Means to Control Entry [40 CFR 264.14(b)(2)(ii)] 81
II C.1.3 Warning Signs [40 CFR 264.14(c)] 82
II C.2 INSPECTION SCHEDULE [40 CFR 270.14(b)(5) and 264.15] 82
II C.2.2.1 Inspection Schedule and Types of Problems [40 CFR 264.15(b)(I)(2)(3)] 82
II C.2.2 Frequency of Inspections [40 CFR 264.15(b)(4)] 83
II C.2.3 Inspection Recordkeeping [40 CFR 264.15(d)] 83
II C.2.4 Schedule of Remedial Action [40 CFR 264.15(c)] 84
II C.3 PREPAREDNESS AND PREVENTION [40 CFR 270.14(b)(6) and 264(Subpart C)] 84
II C.3.1 Internal Communications [40 CFR 264.32(a)] 85
II C.3.2 External Communications [40 CFR 264.32(b)] 85
II C.3.3 Access to Communications [40 CFR 264.34] 85
II C.3.4 Fire Control, Spill, and Decontamination Equipment [40 CFR 264.32(c)] 85
II C.3.5 Water for Fire Control [40 CFR 264.32(d)] 86
II C.3.6 Testing and Maintenance Schedule [40 CFR 264.33] 86
II C.4 GENERAL HAZARD PREVENTION [40 CFR 270.14(b)(8)] 87
II C.4.1 Loading/Unloading Operations [40 CFR 270.14(b)(8)(i)] 87
II C.4.2 Runoff [40 CFR 270.14(b)(8)(ii)] 87

II C.4.3 Water Supplies [40 CFR 270.14(b)(8)(iii)] 87
II C.4.4 Equipment and Power Failure [40 CFR 270.14(b)(8)(iv)] 87
II C.4.5 Personnel Protection Procedures [40 CFR 270.14(b)(8)(v)] 88
II C.4.6 Releases to the Atmosphere [40 CFR 270.14(b)(8)(vi)] 88
II C.5 PREVENTION OF ACCIDENTAL IGNITION OR REACTION OF WASTES [40 CFR 264.17(a) and 270.14(b)(9)] 88
II C.6 DOCUMENTATION OF ADEQUACY [40 CFR 264.17(C)] 90
NOTE: INSPECTION WILL INITIAL EACH OF THE FOLLOWING DAILY. 95

SECTION II D CONTINGENCY PLAN 98

SECTION II E PERSONNEL TRAINING 99
II E.1 SUMMARY 99
II E.2 OUTLINE OF THE TRAINING PROGRAM [40 CFR 270.14(B)(12)] 99
II E.2.1 New Bomb Personnel Titles 99
II E.2.2 Annual Refresher Training 100
II E.2.3 Explosive Safety Training 100
II E.2.4 Technical Ammunition Training 100
II E.2.5 Incident Commander Training 100
II E.3 COURSE CURRICULUM 100

SECTION II F CLOSURE AND POST-CLOSURE PLANS 101
II F.1 APPLICABILITY 101
II F.2 CLOSURE PLAN 102
II F.2.1 Closure Performance Standard [40 CFR 264.111] 102
II F.2.2 Closure Goals for the Detonation Unit 103
II F.2.3 Establishing Cleanup Goals 104
II F.2.4 Partial Closure Activities and Final Closure Activities 106
II F.2.5 Maximum Waste Inventory [40 CFR 264.112(b)(3)] 106
II F.2.6 Sampling and Analysis Plan at Closure 107
II F.2.7 Selection of Remedial Actions 108
II F.2.8 Verification Sampling Plan 108
II F.2.9 Schedule for Closure [40 CFR 264.112(b)(6) and 264.113] 109
IIF.2.10 Closure Certification 109
II F.3 POST-CLOSURE PLAN [40 CFR 264.117,264.118,264.603] 110
II F.4 CLOSURE AND POST-CLOSURE COST ESTIMATE [40 CFR 264.142,264.144, 270.14(b)(15) and (16)] 111
II F.5 FINANCIAL ASSURANCE MECHANISMS [40 CFR 264.143,264.145, and 264.146]111
II F.6 NOTICE OF DEED [40 CFR 270.14(b)(14) and 264.119] 111
II F.7 INSURANCE POLICY [40 CFR 264.147] 111

SECTION II G PROTECTION OF GROUNDWATER 115

II G.1 UNIT IS A REGULATED UNIT [40 CFR 264.90(A)(2), 270.14(C) AND 270.23(B)] 115
II G.2 EXISTING GROUNDWATER MONITORING DATA [40 CFR 270.14(C) AND 270.23]115
II G.3 IDENTIFICATION OF UPPERMOST AQUIFER AND AQUIFERS HYDRAULICALLY INTERCONNECTED BENEATH THE FACILITY PROPERTY [40 CFR 270.14(C)(2) AND 270.23] 115
II G.4 GROUNDWATER FLOW, DIRECTION, RATE, AND SOURCE OF INFORMATION [40 CFR 270.14(C)(2) AND 270.23] 116
II G.5 DESCRIPTION OF ANY PLUME OF CONTAMINATION THAT HAS ENTERED THE GROUNDWATER FROM A REGULATED UNIT [40 CFR 270.14(C)(4) AND 270.23]116
II G.6 PROPOSED GROUNDWATER MONITORING PROGRAM [40 CFR 264.97, 264.600, 270.14(C)(5) AND 270.23] 116
II G. 7 SOIL SAMPLING 117
II G.7.1 Reporting 117
II G.8 DETECTION MONITORING PROGRAM [40 CFR 264.98,264.600, 270.14(C)(6) AND 270.23] 117
II G.9 COMPLIANCE MONITORING PROGRAM [40 CFR 264.94 AND 270.14(C)(7)]....117
II G.10 CORRECTIVE ACTION PROGRAM OR DATA SHOWING THAT THE EXISTING LEVELS ARE NOT HARMFUL [40 CFR 270.14(C)(8)] 117
II G.11 DETAILED PLANS AND ENGINEERING REPORT DESCRIBING THE CORRECTIVE ACTION TO BE IMPLEMENTED [40 CFR 270.14(C)(8)(III)] 118
II G.12 DESCRIPTION OF USE OF THE GROUNDWATER MONITORING PROGRAM TO DEMONSTRATE THE ADEQUACY OF THE CORRECTIVE ACTION [40 CFR 264.101, 270.14(C)(8)(IV) AND 270.14(D)] 118

SECTION II H PROTECTION OF SURFACE WATER 119

SECTION II I OTHER FEDERAL LAWS 120

II I.1 THE WILD AND SCENIC RIVERS ACT [40 CFR 270.3(a)] 120
II I.2 THE NATIONAL HISTORIC PRESERVATION ACT OF 1966 [40 CFR 270.3(b)] 120
II I.3 THE ENDANGERED SPECIES ACT [40 CFR 270.3(c)] 120
II I.4 THE COASTAL ZONE MANAGEMENT ACT [40 CFR 270.3(d)] 120
II I.5 THE FISH AND WILDLIFE COORDINATION ACT [40 CFR 270.3(e)] 120

SECTION III A PROCESS INFORMATION 121

III A.1 APPLICABILITY AS A MISCELLANEOUS UNIT [40 CFR 264.600 and 270.23]....121
III A.1.1 The Western Area Demilitarization Facility (WADF) 122
III A.2 DESCRIPTION OF DETONATION UNIT [40 CFR 270.23(A)] 122
III A.2.1 Residue Management 123
III A.2.2 Run-On and Run-Off Management 123
III A.2.3 Operations 124
III A.2.3.1 Open Burning (Ob) In Containment Devices Where Unit Incorporates Soil as Part of the Unit [40 CFR 270.23(and 270.32] 124
III A.2.3.2 OB on the Ground Surface Where Unit Incorporates Soil as Part of the Unit [40 CFR 270.23 and 270.32] 124
III A.3 DETONATION [40 CFR 270.23 and 270.32] 124

III A.3.1 Appropriateness of Treatment Technology [40 CFR 270.32(b)] 124
III A.4 ALTERNATIVE METHODS CURRENTLY IN USE AT HWAD: 126
III A.4.1 Separation and Disassembly 126
III A.4.2 Wash-Out/Steam-Out Process 127
III A.4.3 High Pressure Ambient Temperature Water Wash-Out 127
III A.4.4 Low Pressure Hot Water Wash-Out Process 127
III A.4.5 Autoclave 128
III A.4.6 Plasma Ordnance Demilitarization Systems (PODS) 128
III A.4.7 RF9 Rotary Kiln Incinerators 128
III A.5 ALTERNATIVE METHODS PLANNED FOR THE NEAR FUTURE AT HWAD: 129
III A.5.1 Slurry Gel 129
III A.5.2 Bulk Energetics Demilitarization System (BEDS) (Bulk Slurry) 129
III A.6 ALTERNATIVE METHODS TO BE CONSIDERED AT HWAD: 129
III A.6.1 Cryofracture 129
III A.7 ALTERNATIVE METHODS IN THE RESEARCH AND DEVELOPMENT PHASE BY THE ARMY: 130
III A.7.1 Donovan Blast Chamber 130
III A.7.2 Fluidized Bed Incinerator 130
III A.7.3 Molten Salt Oxidation Technology Application 130
III A.7.4 Supercritical Water Oxidation 131
III A.7.5 Confined Burn Facility 131
III A.7.6 Femto-Second Laser 131
III A.7.7 Carbon Dioxide Blastout 132
III A.7.8 Advanced Removal Technologies for Cast-Loaded Munitions 132
III A.7.9 Recovery/Reuse of Energetic Materials from Multi-Base Propellants 133
III A.7.10 Recovery/Reuse of Energetic Materials from Single Base Propellants 133
III A.7.11 Advanced Cutting Technology for Munitions Demilitarization 133
III A.8 WASTE MINIMIZATION 134
III A.8.1 Recycling and Reuse 134
III A.8.2 Chemical Stabilization 134
III A.8.2.1 Electrochemical Reduction 134
III A.8.2.2 Chemical Conversion 134
III A.9 OTHER ONGOING ACTIVITIES TO SUPPLEMENT AND/OR REPLACE DETONATION TECHNOLOGIES 135
III A.9.1 Army Production Base Modernization Activity (PBMA) 135
III A.9.2 Joint Army, Navy, National Aeronautics and Space Administration, and Air Force (JANNAF) Inter-Agency Committee 135
III A.9.3 Large Rocket/Missile Motor (LRM) Demilitarization Program 135
III A.9.4 Demilitarization Equipment Upgrade Programs 135

III B ENVIRONMENTAL PERFORMANCE STANDARDS 140

III B.1 Applicability 140
III B.2 Volume, And Physical And Chemical Characteristics Of The Waste Treated At New Bomb 140
III B.3 Hydrogeological Characteristics Of The Site 141

III B.3.1 Depth to Water Beneath the Unit [40 CFR 264.601 (a)(2) and 270.23(b)] 141
III B.3.2 Estimate of Net Recharge Rate [40 CFR 264.601(a)(2) and 270.23(b)] 142
III B.3.3 Description of Uppermost Aquifer [40 CFR 264.601(a)(2) and 270.23(b)] 142
III B.3.4 Topography of the Unit Area [40 CFR 264.601(a)(2) and 270.23(b)] 143
III B.4 Protection Of Groundwater And Subsurface Environment 143
III B.4.1 Potential for Migration Through Soil, Liners, and Containing Structures [40 CFR 264.601(a)(l)] 143
III B.4.2 Groundwater Quality and All Possible Sources of Contamination [40 CFR 264.601(a)(3)] 143
III B.4.3 Groundwater Flow and Rate [40 CFR 264.601(a)(4) and (b)(5)] 144
III B.4.4 Proximity to and Withdrawal Rates of Current and Potential Groundwater Users [40 CFR 264.601(a)(5)] 144
III B.4.5 Potential for Damaging Unsaturated Zone [40 CFR 264.601(b)(8)] 145
III B.5 Land Use Patterns In The Area [40 CFR 264.601(A)(6) AND (B)(9)] 145
III B.6 Potential For Deposition Or Migration Of Waste Constituents Into Subsurface 145
III B.6.1 Physical Structures, and Into Root Zone of Food Chain Crops and Other Vegetation [40 CFR 264.601(a)(7)] 145
III B.7 Effects Of Explosion On Geologic Units And Groundwater Flow Under The Unit [40 CFR 264.601(A)(1), AND (B)(2) AND 270.23(E)] 146
III B.7.1 Potential Impacts on Human Health [40 CFR 264.601(a)(8) and (b)(10)J 146
III B.7.2 Potential for Damage to Flora, Fauna, and Physical Structures Due to Exposure [40 CFR 264.601(a)(9) and (b)(l1)] 146
III B.8 Protection Of Surface Water, Wetlands, And Soil Surface 146
III B.8.1 Effectiveness and Reliability of Containing, Confining, and Collecting Systems and Structures in Preventing Migration [40 CFR 264.601(b)(2)] 146
III B.8.2 Precipitation Patterns in the Area [40 CFR 264.601(b)(4)] 146
III B.8.3 Proximity of Units to Surface Waters [40 CFR 264.601(b)(6)] 147
III B.8.4 Water and Surface Soil Quality Standards, Quality Data, and Uses [40 CFR 264.601(b)(7) and (8)] 147
III B.9 Soil, Groundwater, And Surface Water Pathways Assessment [40 CFR 264.601(a)(8) and (b)(10)] 147
III B.9.1 Modeling Approach 147
III B.9.1.1 General 147
III B.9.2 Source Term Calculations 148
III B.9.2.1 Source Term 148
III B.9.3 Potential for Migration, Groundwater Flow/Environmental Parameters 149
III B.9.3.1 Potential for Migration 149
III B.9.3.2 Potential Impacts / Environmental Concentrations 150
III B.9.3.3 Proximity To Groundwater Users 150
III B.9.3.4 Sensitivity Analysis of the Results 150

SECTION III C AIR QUALITY 161

SECTION III D POTENTIAL PATHWAYS OF EXPOSURE AND POTENTIAL EXPOSURE MAGNITUDE 162

III D.1 APPLICABILITY 162

III D.2 POTENTIAL HUMAN AND ENVIRONMENTAL RECEPTORS [40 CFR 270.23(c)]162
III D.3 POTENTIAL EXPOSURE PATHWAYS [40 CFR 270.23(c)] 163
III D.4 POTENTIAL MAGNITUDE AND NATURE OF EXPOSURE [40 CFR 270.23(c)] ...163

SECTION III E EFFECTIVENESS OF THE TREATMENT [40 CFR 270.23(d)]..... 164

SECTION III F .....ADDITIONAL INFORMATION 165

III F.1 NOISE CONSIDERATIONS 165
III F.2 DETONATION NOISE IMPACTS 166
III F.3 MINIMUM PROTECTIVE DISTANCE [40 CFR 265.382 and 270.23(e)] 167

SECTION IV SOLID WASTE MANAGEMENT UNITS 169

SECTION V REFERENCES 171

APPENDICES

Appendix A - Form 8700-22
Appendix B – Ammunitions Transfer Record (ATR)

TABLES

Table II-1: General Chemical Composition of Military Items Thermally Treated by Detonation at New Bomb 43
Table II-1A: General Composition of Munitions Casings and Metal Components Thermally Treated by Detonation At New Bomb 46
Table II-2: List of Munitions (by DODAC Number) Treated by Detonation at New Bomb 47
Table II-3 A: Chemical Composition of Energetic in Items Treated by Detonation at New Bomb 54
Table II-3B: Representative Munition Class Compositions for Other Items Treated by Detonation At New Bomb 64
Table II-4: TCLP Constituents (40 CFR 261.24) 77
Table II-5: Explosive (total) 78
Table II – 6: Inspection Schedule for detonation activities WHEN IN OPERATION 94
Table II-7: METEOROLOGICAL WEATHER STATION INSPECTION CHECKLIST 95
Table II-8: NEW BOMB DEMOLITION GROUNDS CHECKLIST 96
Table II – 9: Ground water Monitoring Well Inspections 97
Table II-10: List of Potential Contaminates of Concern New Bomb Facility 112
Table II-11: 95% Upper Tolerance limits for Naturally Occurring Constituents In the Hawthorne Valley Background Samples, NEW BOMB, HAWTHORNE, NEVADA 113
Table II-12: Schedule for Closure of the detonation Unit* 114
Table III -1: ENVIRONMENTAL PERFORMANCE STANDARDS SUMMARY FOR DETONATION AT HWAD 152
TABLE III-2: MAJOR CHEMICAL COMPONENTS ASSOCIATED WITH DETONATION OPERATIONS 153
Table III-3: CHEMICALS OF CONCERN EMISSION FACTORS FOR THE NEW BOMB OPERATIONS 155
Table III-4: SOIL CONCENTRATIONS PREDICTED FOR FUTURE OPERATIONS AT HWAD 157
Table III- 5: HEALTH CRITERIA FOR POTENTIAL CONTAMINANTS 158
Table III-6:DETONATION UNIT ADSORPTION COEFFICIENT (k_D vALUES) AT HWAD 158
Table III-7A: MEPAS MODEL RESULTS 159
Table III – 7B: ENVIRONMENTAL CRITERIA (ppm) 160

FIGURES

Figure II-1 LOCATION MAP / SURROUNDING LAND USE 29
Figure II-2 TOPOGRAPHIC MAP 30
Figure II-3 WIND ROSE 31
Figure II-4 TREATMENT CELL DESIGN 32
Figure II-5 PLAN VIEW OF TREATMENT UNIT OPERATION 33
Figure II-6 SITE PLAN 34
Figure II-7 Material staging area 35
Figure II-7 SAMPLING GRIDS 80
Figure II -8 Access Control at New Bomb 91
Figure II – 9 Warning Sign (example) 92
Figure II – 10 Bilingual Warning sign (example) 93
FIGURE III A 1 Flood Protection for New Bomb Site Plan Sheet 1 137
FIGURE III A 2 Flood Protection for New Bomb Site Plan 138
FIGURE III A 3 Flood Protection for New Bomb 139
Figure III – F-1 NOISE CONTOURS 168
FIGURE IV-1 AREA OF SUSPECTED BURIAL 170

SECTION I PART A APPLICATION

PDF

APPLICATION PAGE 1

VOLUME II

APPENDICES

APPENDIX A- STANDARD OPERATING PROCEDURES

A1 DZHC-OOOG-001 DEMILITARIZATION BY DETONATION

APPENDIX B- MASTER
TRAINING PLAN

APPENDIX C-
CONTINGENCY PLANS

C.1 NEW BOMB
C.2 MEMORANDUM OF AGREEMENT BETWEEN HWAD AND MINERAL COUNTY EMERGENCY MANAGMENT

APPENDIX D- NEW
BOMB AIR PERMT

APPENDIX E- SOIL
SAMPLING DATA

APPENDIX F- TEST
STUDY

APPENDIX G- SAMPLING AND ANALYSIS PLAN FOR CLOSURE

G.1 INTRODUCTION
G.2
SAMPLING
ACTIVITIES
G.3
LABORATO
RY
ANALYSIS
G.4 EVALUATION OF SITE CHARACTERIZATION DATA

APPENDIX H- H.1 - H.6

H.1 BORING LOG 1984
H.2 INSTILLATION REPORT MONITORING WELL 1996
1.0 Introduction
2.0 Facility Setting and Monitoring Well Location
3.0 Summary of Field Activities
4.0 Summary of Analytical Results
5.0 Conclusions
6.0 References

H.3 HAWTHORNE WATER QUALITY DATA
H.4 SURFACE WATER RUN-OFF DATA
H.5 GEOTECHNICAL DATA NEW BOMB
H.6 WELL #2 ANALYTICAL DATA

APPENDIX I- SECTION 4 OF THE FINAL DATA PACKAGE (Tetra Tech 1996)

APPENDIX J- WEATHER/CLIMATE

APPENDIX J – WEATHER/CLIMATE HISTORY FOR HAWTHORNE AND SURROUNDING AREA

APPENDIX K – WASTE MINIMIZATION PLAN

APPENDIX L- HUMAN HEALTH & ECOLOGICAL RISK ASSESSMENT (HHREA)

APPENDIX M- UTM SAMPLE SITES

OMB# 2050-0024; Expires 12/31/2014

SEND COMPLETED FORM TO: The Appropriate State or Regional Office.	United States Environmental Protection Agency **RCRA SUBTITLE C SITE IDENTIFICATION FORM**

1. Reason for Submittal

MARK ALL BOX(ES) THAT APPLY

Reason for Submittal:

- ☐ To provide an Initial Notification (first time submitting site identification information / to obtain an EPA ID number for this location)
- ☐ To provide a Subsequent Notification (to update site identification information for this location)
- ☐ As a component of a First RCRA Hazardous Waste Part A Permit Application
- ☒ As a component of a Revised RCRA Hazardous Waste Part A Permit Application (Amendment #_____)
- ☐ As a component of the Hazardous Waste Report (If marked, see sub-bullet below)
  - ☐ Site was a TSD facility and/or generator of ≥1,000 kg of hazardous waste, >1 kg of acute hazardous waste, or >100 kg of acute hazardous waste spill cleanup in one or more months of the report year (or State equivalent LQG regulations)

2. Site EPA ID Number

EPA ID Number N V 5 2 1 0 0 9 0 0 1 0

3. Site Name

Name: New Bomb

4. Site Location Information

Street Address: SE 1/4, Section 33, Township 5 North, Range 30 East

City, Town, or Village: 22 miles south of Hawthorne **County:** Mineral

State: Nevada **Country:** USA **Zip Code:** 89415

5. Site Land Type ☐ Private ☐ County ☐ District ☑ Federal ☐ Tribal ☐ Municipal ☐ State ☐ Other

6. NAICS Code(s) for the Site (at least 5-digit codes)

A. 9 2 8 1 1 0 C. _____

B. _____ D. _____

7. Site Mailing Address

Street or P.O. Box: 1 South Maine Ave, Bldg 5

City, Town, or Village: Hawthorne

State: Nevada **Country:** USA **Zip Code:** 89415

8. Site Contact Person

First Name: Bausman **MI:** **Last:** Kirk

Title: Deputy to the Commander

Street or P.O. Box: 1 South Maine Ave

City, Town or Village: Hawthorne

State: Nevada **Country:** USA **Zip Code:** 89415

Email: kirk.l.bausman.civ@mail.mil

Phone: 775-945-7002 **Ext.:** **Fax:** 775-945-7948

9. Legal Owner and Operator of the Site

A. Name of Site's Legal Owner: U.S. Department of Army **Date Became Owner:** 10/27/1926

Owner Type: ☐ Private ☐ County ☐ District ☑ Federal ☐ Tribal ☐ Municipal ☐ State ☐ Other

Street or P.O. Box: 1 South Maine Ave

City, Town, or Village: Hawthorne **Phone:** 775-945-7002

State: Nevada **Country:** USA **Zip Code:** 89415

B. Name of Site's Operator: SOC Nevada LLC **Date Became Operator:** 01/01/2011

Operator Type: ☑ Private ☐ County ☐ District ☐ Federal ☐ Tribal ☐ Municipal ☐ State ☐ Other

10. Type of Regulated Waste Activity (at your site)
Mark "Yes" or "No" for all current activities (as of the date submitting the form); complete any additional boxes as instructed.

A. Hazardous Waste Activities; Complete all parts 1-10.

Y [✓] N [ ] **1. Generator of Hazardous Waste**
If "Yes", mark only one of the following – a, b, or c.

- [ ] a. LQG: Generates, in any calendar month, 1,000 kg/mo (2,200 lbs./mo.) or more of hazardous waste; or Generates, in any calendar month, or accumulates at any time, more than 1 kg/mo (2.2 lbs./mo) of acute hazardous waste; or Generates, in any calendar month, or accumulates at any time, more than 100 kg/mo (220 lbs./mo) of acute hazardous spill cleanup material.
- [ ] b. SQG: 100 to 1,000 kg/mo (220 – 2,200 lbs./mo) of non-acute hazardous waste.
- [✓] c. CESQG: Less than 100 kg/mo (220 lbs./mo) of non-acute hazardous waste.

If "Yes" above, indicate other generator activities in 2-4.

Y [ ] N [✓] **2. Short-Term Generator** (generate from a short-term or one-time event and not from on-going processes). If "Yes", provide an explanation in the Comments section.

Y [ ] N [✓] **3. United States Importer of Hazardous Waste**

Y [ ] N [✓] **4. Mixed Waste (hazardous and radioactive) Generator**

Y [✓] N [ ] **5. Transporter of Hazardous Waste**
If "Yes", mark all that apply.
- [✓] a. Transporter
- [ ] b. Transfer Facility (at your site)

Y [✓] N [ ] **6. Treater, Storer, or Disposer of Hazardous Waste** Note: A hazardous waste Part B permit is required for these activities.

Y [ ] N [✓] **7. Recycler of Hazardous Waste**

Y [ ] N [✓] **8. Exempt Boiler and/or Industrial Furnace**
If "Yes", mark all that apply.
- [ ] a. Small Quantity On-site Burner Exemption
- [ ] b. Smelting, Melting, and Refining Furnace Exemption

Y [ ] N [✓] **9. Underground Injection Control**

Y [✓] N [ ] **10. Receives Hazardous Waste from Off-site**

B. Universal Waste Activities; Complete all parts 1-2.

Y [ ] N [✓] **1. Large Quantity Handler of Universal Waste (you accumulate 5,000 kg or more) [refer to your State regulations to determine what is regulated]. Indicate types of universal waste managed at your site. If "Yes", mark all that apply.**

- a. Batteries [ ]
- b. Pesticides [ ]
- c. Mercury containing equipment [ ]
- d. Lamps [ ]
- e. Other (specify) _____ [ ]
- f. Other (specify) _____ [ ]
- g. Other (specify) _____ [ ]

Y [ ] N [✓] **2. Destination Facility for Universal Waste**
Note: A hazardous waste permit may be required for this activity.

C. Used Oil Activities; Complete all parts 1-4.

Y [ ] N [✓] **1. Used Oil Transporter**
If "Yes", mark all that apply.
- [ ] a. Transporter
- [ ] b. Transfer Facility (at your site)

Y [ ] N [✓] **2. Used Oil Processor and/or Re-refiner**
If "Yes", mark all that apply.
- [ ] a. Processor
- [ ] b. Re-refiner

Y [ ] N [✓] **3. Off-Specification Used Oil Burner**

Y [ ] N [✓] **4. Used Oil Fuel Marketer**
If "Yes", mark all that apply.
- [ ] a. Marketer Who Directs Shipment of Off-Specification Used Oil to Off-Specification Used Oil Burner
- [ ] b. Marketer Who First Claims the Used Oil Meets the Specifications

D. Eligible Academic Entities with Laboratories—Notification for opting into or withdrawing from managing laboratory hazardous wastes pursuant to 40 CFR Part 262 Subpart K

- You can **ONLY** Opt into Subpart K if:
  - you are at least one of the following: a college or university; a teaching hospital that is owned by or has a formal affiliation agreement with a college or university; or a non-profit research institute that is owned by or has a formal affiliation agreement with a college or university; AND
  - you have checked with your State to determine if 40 CFR Part 262 Subpart K is effective in your state

Y☐ N☐ 1. Opting into or currently operating under 40 CFR Part 262 Subpart K for the management of hazardous wastes in laboratories **See the item-by-item instructions for definitions of types of eligible academic entities. Mark all that apply:**

☐ a. College or University

☐ b. Teaching Hospital that is owned by or has a formal written affiliation agreement with a college or university

☐ c. Non-profit Institute that is owned by or has a formal written affiliation agreement with a college or university

Y☐ N☐ 2. Withdrawing from 40 CFR Part 262 Subpart K for the management of hazardous wastes in laboratories

11. Description of Hazardous Waste

A. Waste Codes for Federally Regulated Hazardous Wastes. Please list the waste codes of the Federal hazardous wastes handled at your site. List them in the order they are presented in the regulations (e.g., D001, D003, F007, U112). Use an additional page if more spaces are needed.

D003	D005	D006	D007	D008	D030	

B. Waste Codes for State-Regulated (i.e., non-Federal) Hazardous Wastes. Please list the waste codes of the State-Regulated hazardous wastes handled at your site. List them in the order they are presented in the regulations. Use an additional page if more spaces are needed.

EPA ID Number | N | V | 5 | 2 | 1 | 0 | 0 | 9 | 0 | 0 | 1 | 0 | OMB#: 2050-0024; Expires 12/31/2014

12. Notification of Hazardous Secondary Material (HSM) Activity

Y ☐ N ☑ Are you notifying under 40 CFR 260.42 that you will begin managing, are managing, or will stop managing hazardous secondary material under 40 CFR 261.2(a)(2)(ii), 40 CFR 261.4(a)(23), (24), or (25)?

If "Yes", you must fill out the Addendum to the Site Identification Form: Notification for Managing Hazardous Secondary Material.

13. Comments

9A. Site Contact: Kirk Bausman, Deputy to the Commander

1 South Maine Ave

Hawthorne, NV 89415

(775) 945-7002

9:B SOC Nevada LLC Contact: George Gram II, General Manager

2 South Maine Ave

Hawthorne, NV 89415

775-945-7660

Technical Point of Contact - Yvonne Downs, Manager, Env Svcs SOC Nevada LLC

2 South Maine Ave Bldg 39

Hawthorne, NV 89415

14. Certification. 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 gather and evaluate 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 fines and imprisonment for knowing violations. For the RCRA Hazardous Waste Part A Permit Application, all owner(s) and operator(s) must sign (see 40 CFR 270.10(b) and 270.11).

Signature of legal owner, operator, or an authorized representative	Name and Official Title (type or print)	Date Signed (mm/dd/yyyy)
	Kirk Bausman	20130528
	George Gram	5/29/13

EPA ID Number | N | V | 5 | 2 | 1 | 0 | 0 | 9 | 0 | 0 | 1 | 0 |

OMB#: 2050-0024; Expires 12/31/2014

United States Environmental Protection Agency

HARDOUS WASTE PERMIT INFORMATION FORM

1. Facility Permit Contact	**First Name:** Manolo	**MI:** B	**Last Name:** Bay
	Contact Title: Supervisory Environmental Protection Specialist		
	Phone: (775) 945-7340	**Ext.:**	**Email:** manolo.b.bay.civ@mail.mil
2. Facility Permit Contact Mailing Address	**Street or P.O. Box:** 1 South Maine Ave		
	City, Town, or Village: Hawthorne		
	State: Nevada		
	Country: USA	**Zip Code:** 89406	
3. Operator Mailing Address and Telephone Number	**Street or P.O. Box:** 2 South Maine Ave Bldg 2		
	City, Town, or Village: Hawthorne		
	State: Nevada	**Phone:** 775-945-7660	
	Country: USA	**Zip Code:** 89406	
4. Facility Existence Date	**Facility Existence Date (mm/dd/yyyy):** 06/01/1976		

5. Other Environmental Permits

A. Facility Type *(Enter code)*	B. Permit Number													C. Description
E	A	P	9	7	1	1	-	1	1	3	4			New Bomb Air Permit

6. Nature of Business: The mission of Hawthorne Army Depot is to support the major military services (Army, Navy, Air Force, Marines) with facilities to receive, load, maintain, store and issue ammunition, explosives, and related items. HWAD also has the responsibility to renovate, demilitarize, or dispose of unserviceable ammunition and explosives.

7. Process Codes and Design Capacities – Enter information in the section on Form Page 3

A. PROCESS CODE – Enter the code from the list of process codes below that best describes each process to be used at the facility. If more lines are needed, attach a separate sheet of paper with the additional information. For "other" processes (i.e., D99, S99, T04 and X99), describe the process (including its design capacity) in the space provided in Item 8.

B. PROCESS DESIGN CAPACITY – For each code entered in Item 7.A; enter the capacity of the process.

1. AMOUNT – Enter the amount. In a case where design capacity is not applicable (such as in a closure/post-closure or enforcement action) enter the total amount of waste for that process.
2. UNIT OF MEASURE – For each amount entered in Item 7.B(1), enter the code in Item 7.B(2) from the list of unit of measure codes below that describes the unit of measure used. Select only from the units of measure in this list.

C. PROCESS TOTAL NUMBER OF UNITS – Enter the total number of units for each corresponding process code.

Process Code	Process	Appropriate Unit of Measure for Process Design Capacity
	Disposal	
D79	Underground Injection Well Disposal	Gallons; Liters; Gallons Per Day; or Liters Per Day
D80	Landfill	Acre-feet; Hectares-meter; Acres; Cubic Meters; Hectares; Cubic Yards
D81	Land Treatment	Acres or Hectares
D82	Ocean Disposal	Gallons Per Day or Liters Per Day
D83	Surface Impoundment Disposal	Gallons; Liters; Cubic Meters; or Cubic Yards
D99	Other Disposal	Any Unit of Measure Listed Below
	Storage	
S01	Container	Gallons; Liters; Cubic Meters; or Cubic Yards
S02	Tank Storage	Gallons; Liters; Cubic Meters; or Cubic Yards
S03	Waste Pile	Cubic Yards or Cubic Meters
S04	Surface Impoundment	Gallons; Liters; Cubic Meters; or Cubic Yards
S05	Drip Pad	Gallons; Liters; Cubic Meters; Hectares; or Cubic Yards
S06	Containment Building Storage	Cubic Yards or Cubic Meters
S99	Other Storage	Any Unit of Measure Listed Below
	Treatment	
T01	Tank Treatment	Gallons Per Day; Liters Per Day
T02	Surface Impoundment	Gallons Per Day; Liters Per Day
T03	Incinerator	Short Tons Per Hour; Metric Tons Per Hour; Gallons Per Hour; Liters Per Hour; BTUs Per Hour; Pounds Per Hour; Short Tons Per Day; Kilograms Per Hour; Gallons Per Day; Metric Tons Per Hour; or Million BTU Per Hour
T04	Other Treatment	Gallons Per Day; Liters Per Day; Pounds Per Hour; Short Tons Per Hour; Kilograms Per Hour; Metric Tons Per Day; Short Tons Per Day; BTUs Per Hour; Gallons Per Day; Liters Per Hour; or Million BTU Per Hour
T80	Boiler	Gallons; Liters; Gallons Per Hour; Liters Per Hour; BTUs Per Hour; or Million BTU Per Hour
	Treatment (Continued)	**(for T81 – T94)**
T81	Cement Kiln	Gallons Per Day; Liters Per Day; Pounds Per Hour; Short Tons Per Hour; Kilograms Per Hour; Metric Tons Per Day; Metric Tons Per Hour; Short Tons Per Day; BTU Per Hour; Liters Per Hour; Kilograms Per Hour; or Million BTU Per Hour
T82	Lime Kiln	
T83	Aggregate Kiln	
T84	Phosphate Kiln	
T85	Coke Oven	
T86	Blast Furnace	
T87	Smelting, Melting, or Refining Furnace	
T88	Titanium Dioxide Chloride Oxidation Reactor	
T89	Methane Reforming Furnace	
T90	Pulping Liquor Recovery Furnace	
T91	Combustion Device Used in the Recovery of Sulfur Values from Spent Sulfuric Acid	
T92	Halogen Acid Furnaces	
T93	Other Industrial Furnaces Listed in 40 CFR 260.10	
T94	Containment Building Treatment	Cubic Yards; Cubic Meters; Short Tons Per Hour; Gallons Per Hour; Liters Per Hour; BTU Per Hour; Pounds Per Hour; Short Tons Per Day; Kilograms Per Hour; Metric Tons Per Day; Gallons Per Day; Liters Per Day; Metric Tons Per Hour; or Million BTU Per Hour
	Miscellaneous (Subpart X)	
X01	Open Burning/Open Detonation	Any Unit of Measure Listed Below
X02	Mechanical Processing	Short Tons Per Hour; Metric Tons Per Hour; Short Tons Per Day; Metric Tons Per Day; Pounds Per Hour; Kilograms Per Hour; Gallons Per Hour; Liters Per Hour; or Gallons Per Day
X03	Thermal Unit	Gallons Per Day; Liters Per Day; Pounds Per Hour; Short Tons Per Hour; Kilograms Per Hour; Metric Tons Per Day; Metric Tons Per Hour; Short Tons Per Day; BTU Per Hour; or Million BTU Per Hour
X04	Geologic Repository	Cubic Yards; Cubic Meters; Acre-feet; Hectare-meter; Gallons; or Liters
X99	Other Subpart X	Any Unit of Measure Listed Below

Unit of Measure	Unit of Measure Code	Unit of Measure	Unit of Measure Code	Unit of Measure	Unit of Measure Code
Gallons	G	Short Tons Per Hour	D	Cubic Yards	Y
Gallons Per Hour	E	Short Tons Per Day	N	Cubic Meters	C
Gallons Per Day	U	Metric Tons Per Hour	W	Acres	B
Liters	L	Metric Tons Per Day	S	Acre-feet	A
Liters Per Hour	H	Pounds Per Hour	J	Hectares	Q
Liters Per Day	V	Kilograms Per Hour	X	Hectare-meter	F
		Million BTU Per Hour	X	BTU Per Hour	I

7. Process Codes and Design Capacities (Continued)

EXAMPLE FOR COMPLETING Item 7 (shown in line number X-1 below): A facility has a storage tank, which can hold 533.788 gallons.

Line Number		A. Process Code (From list above)			B. PROCESS DESIGN CAPACITY (1) Amount (Specify)	(2) Unit of Measure	C. Process Total Number of Units	For Official Use Only					
X	1	S	0	2	533.788	G	001						
	1	X	0	1	15	N	001						
	2												
	3												
	4												
	5												
	6												
	7												
	8												
	9												
1	0												
1	1												
1	2												
1	3												

Note: If you need to list more than 13 process codes, attach an additional sheet(s) with the information in the same format as above. Number the line sequentially, taking into account any lines that will be used for "other" process (i.e., D99, S99, T04, and X99) in Item 8.

8. Other Processes (Follow instructions from Item 7 for D99, S99, T04, and X99 process codes)

Line Number (Enter #s in sequence with Item 7)		A. Process Code (From list above)			B. PROCESS DESIGN CAPACITY (1) Amount (Specify)	(2) Unit of Measure	C. Process Total Number of Units	For Official Use Only					
X	2	T	0	4	100.00	U	001						

9. Description of Hazardous Wastes - Enter information in the Sections on Form Page 5

A. EPA HAZARDOUS WASTE NUMBER – Enter the four-digit number from 40 CFR, Part 261 Subpart D of each listed hazardous waste you will handle. For hazardous wastes which are not listed in 40 CFR, Part 261 Subpart D, enter the four-digit number(s) from 40 CFR Part 261, Subpart C that describes the characteristics and/or the toxic contaminants of those hazardous wastes.

B. ESTIMATED ANNUAL QUANTITY – For each listed waste entered in item 9.A, estimate the quantity of that waste that will be handled on an annual basis. For each characteristic or toxic contaminant entered in item 9.A, estimate the total annual quantity of all the non-listed waste(s) that will be handled which possess that characteristic or contaminant.

C. UNIT OF MEASURE – For each quantity entered in item 9.B, enter the unit of measure code. Units of measure which must be used and the appropriate codes are:

ENGLISH UNIT OF MEASURE	CODE	METRIC UNIT OF MEASURE	CODE
POUNDS	P	KILOGRAMS	K
TONS	T	METRIC TONS	M

If facility records use any other unit of measure for quantity, the units of measure must be converted into one of the required units of measure, taking into account the appropriate density or specific gravity of the waste.

D. PROCESSES

1. PROCESS CODES:

For listed hazardous waste: For each listed hazardous waste entered in item 9.A, select the code(s) from the list of process codes contained in items 7.A and 8.A on page 3 to indicate all the processes that will be used to store, treat, and/or dispose of all listed hazardous wastes.

For non-listed waste: For each characteristic or toxic contaminant entered in item 9.A, select the code(s) from the list of process codes contained in items 7.A and 8.A on page 3 to indicate all the processes that will be used to store, treat, and/or dispose of all the non-listed hazardous wastes that possess that characteristic or toxic contaminant.

NOTE: THREE SPACES ARE PROVIDED FOR ENTERING PROCESS CODES. IF MORE ARE NEEDED:

1. **Enter the first two as described above.**
2. **Enter "000" in the extreme right box of item 9.D(1).**
3. **Use additional sheet, enter line number from previous sheet, and enter additional code(s) in item 9.E.**

2. PROCESS DESCRIPTION: If code is not listed for a process that will be used, describe the process in item 9.D(2) or in item 9.E(2).

NOTE: HAZARDOUS WASTES DESCRIBED BY MORE THAN ONE EPA HAZARDOUS WASTE NUMBER – Hazardous wastes that can be described by more than one EPA Hazardous Waste Number shall be described on the form as follows:

1. **Select one of the EPA Hazardous Waste Numbers and enter it in item 9.A. On the same line complete items 9.B, 9.C, and 9.D by estimating the total annual quantity of the waste and describing all the processes to be used to store, treat, and/or dispose of the waste.**
2. **In item 9.A of the next line enter the other EPA Hazardous Waste Number that can be used to describe the waste. In item 9.D.2 on that line enter "included with above" and make no other entries on that line.**
3. **Repeat step 2 for each EPA Hazardous Waste Number that can be used to describe the hazardous waste.**

EXAMPLE FOR COMPLETING item 9 (shown in line numbers X-1, X-2, X-3, and X-4 below) – A facility will treat and dispose of an estimated 900 pounds per year of chrome shavings from leather tanning and finishing operations. In addition, the facility will treat and dispose of three non-listed wastes. Two wastes are corrosive only and there will be an estimated 200 pounds per year of each waste. The other waste is corrosive and ignitable and there will be an estimated 100 pounds per year of that waste. Treatment will be in an incinerator and disposal will be in a landfill.

Line Number		A. EPA Hazardous Waste No. (Enter code)				B. Estimated Annual Qty of Waste	C. Unit of Measure (Enter code)	D. PROCESSES									
								(1) PROCESS CODES (Enter Code)									(2) PROCESS DESCRIPTION (If code is not entered in 9.D(1))
X	1	K	0	5	4	900	P	T	0	3	D	8	0				
X	2	D	0	0	2	400	P	T	0	3	D	8	0				
X	3	D	0	0	1	100	P	T	0	3	D	8	0				
X	4	D	0	0	2												Included With Above

Description of Hazardous Wastes ***(Continued. Use additional sheet(s) as necessary; number pages as 5a, etc.)***

Line Number		A. EPA Hazardous Waste No. (Enter code)				B. Estimated Annual Qty of Waste	C. Unit of Measure (Enter code)	D. PROCESSES (1) PROCESS CODES (Enter Code)									D. PROCESSES (2) PROCESS DESCRIPTION (If code is not entered in 9.D(1))
	1	D	0	0	3	2,250	T	X	0	1							
	2	D	0	0	5												weight included in line # 1
	3	D	0	0	6												weight included in line # 1
	4	D	0	0	7												weight included in line # 1
	5	D	0	0	8												weight included in line # 1
	6	D	0	3	0												weight included in line # 1
	7																
	8																
	9																
1	0																
1	1																
1	2																
1	3																
1	4																
1	5																
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2	9																
3	0																
3	1																
3	2																
3	3																
3	4																
3	5																
3	6																

10. Map

Attach to this application a topographical map, or other equivalent map, of the area extending to at least one mile beyond property boundaries. The map must show the outline of the facility, the location of each of its existing intake and discharge structures, each of its hazardous waste treatment, storage, or disposal facilities, and each well where it injects fluids underground. Include all spring, rivers, and other surface water bodies in this map area. See instructions for precise requirements.

11. Facility Drawing

All existing facilities must include a scale drawing of the facility (see instructions for more detail).

12. Photographs

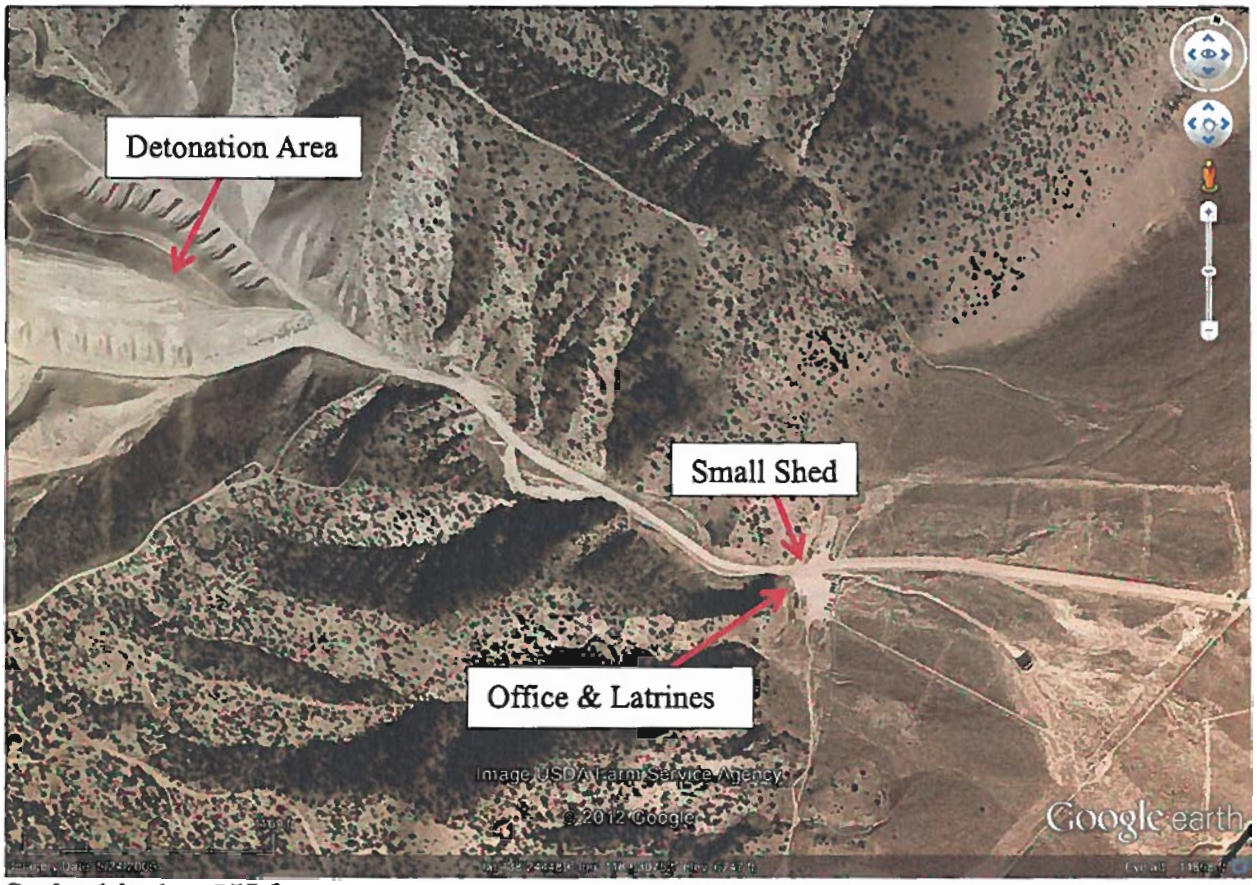
All existing facilities must include photographs (aerial or ground-level) that clearly delineate all existing structures; existing storage, treatment, and disposal areas; and sites of future storage, treatment, or disposal areas (see instructions for more detail).

13. Comments

APPLICATION PAGE 12

General Aerial of the New Bomb Facility

Aerial of New Bomb Buildings



Scale: 1 inch = 555 feet

Restroom Area at New Bomb

Office Building New Bomb

Storage Shed No Longer Used

Magazines for Primers (replaced storage sheds)

Treatment Cell

Overview of New Bomb Area

Loading and Unloading Area

Met Tower

Overview of Facility

Natural Terrain Around Rear of Facility

Inert Waste to be Shipped to HAD

Inert Waste to be Shipped to HAD

SECTION II A FACILITY DESCRIPTION

II A.1 GENERAL DESCRIPTION [40 CFR 270.14(b)(l)]

The New Bomb Facility (detonation unit) is associated with and staffed by the personnel of Hawthorne Army Depot (HWAD). The facility is located approximately 22 miles south of HWAD in Mineral County, Nevada and occupies approximately 3,183 acres of Army-owned land. This facility is not within the secure confines of the HWAD. The New Bomb facility is located west of state highway 359 in steep terrain accessed by a single dirt road.

The New Bomb facility is designed and operated as a detonation treatment unit. The facility treats waste munitions by detonation. The facility receives munitions that have been stored in magazines located at the HWAD Main Base. Explosive items typically detonated at New Bomb consist of cartridges, projectiles, bombs, rockets, artillery and mortar rounds. Personnel at HWAD make the determination that certain munitions have become unserviceable or obsolete and require disposal. Wastes munitions are then inventoried and scheduled for treatment. Wastes munitions moved to the New Bomb facility are treated directly upon arrival. No waste or treatment residue is stored at the New Bomb Facility. Additional information on the waste specifications is provided in Section B.

Treatment by detonation takes place in a 20-foot by 6 foot earthen cell. A total of 20 cell areas are available for detonation with 10 cells located at the northern base of a 185-foot high ridge and another 10 located at the southern base of the ridge. These cells are repaired after each treatment session and therefore no engineering drawings exist for them.

II A.2 TOPOGRAPHIC MAPS [40 CFR 270.14(b)(19)]

The map presented as Figure II-2 illustrates the general topography of New Bomb with a contour interval of 40 feet. As required by the various subparts of 40 CFR 270.14(b)(19), the figures illustrate the following features:

Map Scale and Date:

Figure II-2 shows New Bomb at a scale of 1 inch equal to ½ mile and at least a radius of 1,000 feet around the facilities. The reference map for the figure is the USGS Topographic 7.5 Minute Quadrangle, Anchorite Hills, dated September 23, 2003.

100-Year Floodplain Area:

There are no maps issued by the Federal Emergency Management Agency (FEMA) showing floodplains at New Bomb. A study conducted in November 1987 by the U.S. Army Environmental Hygiene Agency and titled "Groundwater Consultation No. 38-26-

0318-88" identified a 100-year sheet flood that would attain a maximum depth of 4.5 inches at the base of the detonation ridge.

Surface Waters Including Intermittent Streams:

There are no perennial surface water bodies within 15 miles of the detonation unit. Intermittent streams are located within the New Bomb area. Refer to Figure II-2.

Surrounding Land Uses (residential, commercial, agricultural, recreational, and open land):

Land use patterns for areas surrounding New Bomb are illustrated in Figure II-1.

Wind Rose:

The required information is in Figure II-3.

Orientation of the Map:

Orientation by means of a north arrow is provided on all maps associated with this section including:

Vicinity Map - Figure II-1
Topographic Map - Figure II – 2
Site Map - Figure II-6

Legal Boundaries of the Hazardous Waste Management (HWM) Facility Site:

Figure II-2 and Figure II-6 shows the boundaries of the detonation unit.

Access Control (fences, gates):

Refer to Figure II-2 for fences and warning signs at New Bomb.

Injection and Withdrawal Wells both On-Site and Off-Site:

There is one dry monitoring well in the detonation unit area that is located adjacent to the maintenance shed. No injection and withdrawal wells are associated with the detonation unit. The Monitoring Well will be inspected every five years to check for presents of ground water. The Monitoring Well Form is found in Table II-9

Buildings:

Ten structures exist within the New Bomb area. These structures include:

- 4 free standing structures
- One holds tools and equipment
- One has personnel lockers that are no longer use
- One is used for the range supervisor and holds the TV's used to monitor the detonations.
- One is the Office for the New Bomb Facility

- 2 lean to type structures open on one side but backed into the mountain and covered with soil exist
- One surrounds Portable latrines
- One was an equipment shed which now holds explosive magazines for blasting caps (right) and ¾ lb Boosters left (left) a third bay holds a table where safety fuse is tested and set ups for the detonation operation are pre assembled.

- 4 In ground structures
- Three (3) were used to store explosive, but have been decommissioned and stand empty
- One holds the flammable liquids locker.

Treatment, Storage, or Disposal Operations:

The New Bomb facility is only a treatment facility – there are no waste storage structures or disposal structures. The treatment structures are 20-foot by 6 foot earthen cells. A total of 20 cells exist at the facility. The locations of the cells are shown on Figure II-6

Other Structures (recreation areas, runoff control systems, access and internal roads, storm, sanitary, and process sewerage systems:

- The access and internal roads are shown on Figure II-6.
- Loading and unloading areas, are identified in Figure II –6 as material staging areas
- No recreational areas, storm, sanitary or process sewage systems exist on the New Bomb Facility.
- A pair of weather monitoring stations is located on the ridge just north east of the treatment pits.

Fire control facilities:

Tools used for fire control, shovels and rakes are kept in the storage sheds on site. Fire control is accomplished by removing brush prior to detonation events to prevent brush fires. Portable fire extinguishers are found in the vehicles and in the Facility Office.

Barriers for Drainage or Flood Control:

- Individual cells that make up the unit are bordered by two earthen berms on each side. In addition, the roads bordering the detonation cells are re-graded to minimize the potential for run-on.
- A runoff control structure is shown on Figure II-6.

Location of Operational Units:

The location of the 20 cells that constitute the detonation treatment unit is shown in Figure II-6.

II A.3 FACILITY LOCATION INFORMATION [40 CFR 270.14(b)(11) and 264.18]

The New Bomb facility is located in Mineral County of the state of Nevada, in the Great Basin Section of the Basin and Range physiographic province.

II A.3.1 Seismic Requirements [40 CFR 270.14(b)(11)(ii) and 264.18(a)]

The detonation unit is not a new facility. This facility dates back to 1947, when it was first leased from the U.S. Forest Service for use as a demolition area. Therefore, the requirements in 40 CFR 270.14(b)(II)(ii) are not applicable to HWAD detonation operations.

II A.3.2 Floodplain Requirements [40 CFR 270.14(b)(II)(iii)(iv) and 264.18(b)]

Surface water flows from the mountainous areas of the west side of New Bomb through a deep canyon (20 feet wide at the most narrow point), and debouches onto the alluvial fan on the east side of New Bomb Area. There are no perennial surface streams or ponds within the area or down-gradient on the valley floor. Once the drainage path reaches the valley floor, the gradient decreases abruptly and the stream becomes influent. Surface flooding occurs only after a major rainfall event or snowmelt in the spring.

Christensen, Rerlon, and Spar ("Flood potential of Tonopah Wash and Tributaries, eastern part of Jackass Flats, Nevada Test Site, Southern Nevada," USGS Open File Report 80-963, 1980) have developed empirical equations based on regression analysis of 71 gauged basins in southern Nevada for a 10-,50-, and 100-year flood event. The basis for the following equation is a 100-year flood event.

$$Q_{100} = (11{,}900A^{0.55}\ (ELEV)^{-1.28}(LAT)^{-1.16}$$

Where:
Q_{100} = Discharge in cfs;
A = Area in mi^2, range (0.2 - 100); and
Elev = Elevation in 1000s of feet, range (2 - 10); and

Lat = Latitude - 35 degrees, range (1 - 7).

The base of the Detonation ridge at New Bomb near the maintenance shed drains approximately 0.83 square miles. The width of the canyon floor at this point is approximately 100 feet. The average elevation of the drainage area is 7,400 feet. The New Bomb Area is near the 37th parallel. Using this information, the following discharge was estimated by the USAEHA (1987):

$Q_{100} = 11{,}900(0.83)^{0.55}(7\ .4)^{-1.28}(37\text{-}35)^{-1.16} = 370$ cfs
Knowing Q = VA = Vwh, or h = Q/Vw where:

Q = Discharge in cfs;
V =Velocity in feet/s, assume 8 feet/s, given that Williams (1995) believes a sheet flow velocity of 10 feet/s, plus or minus 3 feet/s, is reasonable for this area; and A = Area of channel = width (w) x height (h) in feet^2, we can estimate the height of a 100-year flood event:

h^{100} = 370 cfs/(8 feet/s)(100 feet) = 0.5 feet.

This suggests that a 100-year sheet flood will attain a maximum depth of approximately 6 inches at the base of the Detonation ridge nose. This is consistent with information presented by Rahn (1967), in which a depth of 3 to 6 inches was recorded during a sheet flood in southwestern Arizona. Using the Froude equation, (Froude number N_f = velocity/[gravity acceleration x depth]$^{0.5}$), a velocity of 8 feet/s and a depth of 0.5 feet yield an N_f value of 2. This N_f value is consistent with information presented in Rahn (1967) and is supported by Williams (1995).

If a 100 year sheet flood occurs, no adverse effects on human health and the environment are anticipated. New Bomb does not store hazardous waste. Wastes are treated the day they are brought to the facility and treatment residues are removed at the end of the treatment cycle. Treatment operations are not conducted during periods of a greater than 50% chance of precipitation and thunderstorms.

An earthen dike was located across the dry wash leading from the facility to act as a stilling basin to hold any debris, such as small rocks, that might be dislodge during a storm event.

II A.4 TRAFFIC PATTERNS [40 CFR 270.14(b)(10)]

II A.4.1 Traffic Volumes and Types of Vehicles

The New Bomb facility is accessed off State Highway 359, 22 miles south of Hawthorne, at east end of Toiyabe National Forest. The State of Nevada Department of Transportation has performed Annual Average Daily Volume (AADV) counts along State Highway 359 in 2008. There AADVs were 2,100 at the station located approximately 200 feet south of US 95 and 190 near the New Bomb Area entrance road. These numbers are consistent with the 1992 findings.

II A.4.2 Waste Transfer/Pick-Up Stations

All loading and unloading activities occur at the two Materials Staging Areas as located in Figure II-7. These areas are large enough and graded allowing easy access for semi-trailers. When explosive materials are delivered to the Materials Staging Area, Munitions Handler personnel inspect the load on the truck to assure the material identification matches the description of the shipping documents and to assure the material is actually scheduled for destruction.

Materials such as pallets, donnage or scrap metal from previous treatment operations are loaded on the semi-trailers before they are released back to HAWD. Containers of scrap metal are covered and marked "Contaminated Scrap Derived from Demil Range - Hold for Decontamination at WADF."

II A.4.3 Quantity of Waste Moved

Obsolete munitions are moved to New Bomb on semi-trailer trucks by trained personnel. Ammunition and projectiles are moved in containers placed on wooden pallets, and depending on the type of munitions, may range in weight from 1,500 pounds to nearly 3,000 pounds. Each truck normally carries six to eight pallets, totaling 9,000 to 24,000 pounds per truckload. After detonation operations, shrapnel is containerized. Six to eight containers, each weighing approximately 500 pounds, are loaded onto semi-trailer trucks for transport to the Main Base for decontamination at WADF.

II A.4.4 Traffic Control Measures

Traffic control procedures are conducted according to the Standard Operations Procedure (SOP) Operation 1 "Road Closure Procedures." SOPs are found in Appendix A.

Warning signs prevent entry of unauthorized personnel and warn of existence of safety hazards at the entrance gate located almost a mile from the detonation unit. There are no traffic signs within the New Bomb Area. Traffic is stopped along State Highway 359 at mile post Nos. 10 and 14 to address concerns for the public traveling in this area

because of the possibility of dust impairing the vision of motorists during and immediately following detonation events at New Bomb New Bomb is located at mile post No. 12.5. The traffic restrictions last approximately 20 minutes (Nevada Department of Transportation District Permit N0. T- 169-97; 12/9/97).

Traffic is also restricted during the transportation of munitions between HAWD and New Bomb.

II A.4.5 Road Surface Composition and Load-Bearing Capacity

All roads within New Bomb are constructed of soil and gravel which is routinely compacted, groomed, and graded. Construction materials for road surfaces along State Highway 359 are asphaltic-concrete. All roads are designed for a minimum load-bearing capacity of 18,000 pounds/axle.

II A.5 DOCUMENTATION OF COMPLIANCE WITH MANIFEST SYSTEM, RECORDKEEPING, AND REPORTING REQUIREMENTS [40 CFR 264.70]

The provisions of 40 CFR Part 264 Subpart E, Manifest System, Recordkeeping, and Reporting, are not specifically identified in the 40 CFR Part 270 as information requirements for a Part B permit. Permit applicants are not required to submit this material to demonstrate compliance with the Part B permit application. The regulations of Subpart E apply to owners and operators of both off-site and on-site facilities.

New Bomb only receives hazardous waste in the form of waste munitions from HWAD. The sections 264.71 "Use of the Manifest System", 264.72 "Manifest Discrepancies" and 264.75 "Un-manifested Waste Report" can apply to owners and operators of on-site facilities that do not receive any hazardous waste from offsite sources, or to owners and operators of off-site facilities with respect to waste military munitions exempted from manifest requirements under 40 CFR 266.203 (a) - Criteria for hazardous waste regulation of waste non-chemical military munitions in transportation.

(1) Waste military munitions that are being transported and that exhibit a hazardous waste characteristic or are listed as hazardous waste under 40 CFR part 261, are listed or identified as a hazardous waste (and thus are subject to regulation under 40 CFR parts 260 through 270), unless all the following conditions are met:

(i) The waste military munitions are not chemical agents or chemical munitions;
(ii) The waste military munitions must be transported in accordance with the Department of Defense shipping controls applicable to the transport of military munitions;
(iii) The waste military munitions must be transported from a military owned or operated installation to a military owned or operated treatment, storage, or disposal facility; and

(iv) The transporter of the waste must provide oral notice to the Director within 24 hours from the time the transporter becomes aware of any loss or theft of the waste military munitions, or any failure to meet a condition of paragraph (a)(1) of this section that may endanger health or the environment. In addition, a written submission describing the circumstances shall be provided within 5 days from the time the transporter becomes aware of any loss or theft of the waste military munitions or any failure to meet a condition of paragraph (a)(1) of this section.

(2) If any waste military munitions shipped under paragraph (a)(1) of this section are not received by the receiving facility within 45 days of the day the waste was shipped, the owner or operator of the receiving facility must report this non-receipt to the Director within 5 days.

(3) The exemption in paragraph (a)(1) of this section from regulation as hazardous waste shall apply only to the transportation of non-chemical waste military munitions. It does not affect the regulatory status of waste military munitions as hazardous wastes with regard to storage, treatment or disposal.

(4) The conditional exemption in paragraph (a)(1) of this section applies only so long as all of the conditions in paragraph (a)(1) of this section are met.

II A.5.1 Use of Manifest System [40 CFR 264. 71]

The New Bomb facility does not ship or generate hazardous wastes that are shipped off-site for treatment, storage, or disposal.

Wastes received at New Bomb are military munitions which are, as stated above. New Bomb receives these munitions on hazardous waste manifests which obtain munitions on the forms EPA Form 8700-22 and Ammunitions Transfer Record (ATR) included as examples in Appendix A and B.

II A.5.2 Manifest discrepancies [40 CFR 264.72]

Any discrepancy noted in the wastes received count or content would be handled as outlined in the SOP Operation 3 "Verify Documentation and Unload."

II A.5.3 Operation Records [40 CFR 264.73]

The Operation Record for New Bomb is kept at HWAD. The Environmental Department maintains an operating record for the New Bomb Facility. The following information is compiled and maintained as a part of the operating record:

1. Records of locations of wastes within the facility. - No hazardous waste is stored or kept untreated at the New Bomb Facility.

2. Records of waste analysis results. Records consist of verification of received munitions.
3. Records related to implementation of the contingency plan. The contingency plan is included in Appendix C.
4. Inspection records for hazardous waste units, monitoring and safety equipment.
5. Monitoring records.
6. Certification of waste minimization, as required by 40 CFR 264.73(b)(9).
7. For wastes subject to the land disposal restrictions of 40 CFR Part 268, all supporting data, waste analyses, notices, certifications, demonstrations, and other supporting documentation, as required by 40 CFR 268.7(a)(5).

II A.5.4 Availability, Retention, and Disposition of Records [40 CFR 264.74]

All records required as a part of the operating record (see discussion above) will be retained until the facility is closed, with the exception of inspection records. Inspection records are retained for a minimum of three years from the date of inspection, unless direction is received from regulatory authorities to retain them for a longer period. Records are available for regulatory agency inspection. Copies of the following records will be submitted to local land authorities upon closure of the facility:

1. Summary reports and details of all incidents that require implementation of the Hazardous Waste Contingency Plan.
2. Records and results of inspections for the final three years of operation before closure.
3. Records of monitoring, testing, or analytical data.
4. For wastes subject to the land disposal restrictions of 40 CFR Part 268, all supporting data, waste analyses, notices, certifications, demonstrations, and other supporting documentation, as required by 40 CFR 268.7(a)(5), will be retained for a minimum of five years from the date that the wastes that were the subject of such documentation were last routed to on-site or off-site treatment, storage, or disposal.

II A.5.5 Biennial Report [40 CFR 264.75]

A biennial report is prepared by HWAD on EPA Form 8700-13B and is submitted to the State of Nevada by March 1 of each even-numbered year. The biennial report includes the following information:

1. A description of facility activities during the previous calendar year, and an identification of the calendar year covered by the report.
2. The EPA ID Number, name, address, and telephone number of the facility and the name of the facility contact.
3. A description of wastes generated during the previous calendar year, including waste hazard ID number and quantities of wastes generated, the handling method for the wastes, and the units of measure for quantities of wastes.

4. The total waste in storage as of December 31 of the calendar year being reported.
5. Comments and additional information requested to be supplied by the regulatory agency.

The biennial report certification is signed and dated by an authorized representative of the facility.

II A.5.6 Additional Reports [40 CFR 264.77]

Additional reports to USEPA and the State of Nevada (Division of Environmental Protection) include reports of hazardous waste releases, fires, explosions, closures, or other reports as required by regulatory authority. HWAD submits any reports of hazardous waste releases, fires, explosions, and closures to EPA, or as directed by those agencies.

II A.6 DESCRIPTION OF TREATMENT UNITS [40CFR 270.23(a)1 &2)

The treatment units at the New Bomb facility are detonation cells. The cells are constructed from native soil and topography and are located in the central section of the New Bomb Area. The 20 cells have been located along the northern and southern base of a 1,300-foot-long ridge inside the restricted area of the New Bomb Facility. Figure II-6 shows the specific location of the detonation cells within the New Bomb Facility.

II A.6.1 Topography

The New Bomb Area exhibits arid mountainous terrain, typical of Nevada. Within the 3,000-acre New Bomb Area, the topography varies. On the western side of the New Bomb Area are the Anchorite Hills, which approach an elevation of 8,000 feet above mean sea level (MSL). The center of the treatment unit occupies a terrace remnant on the mountain pediment. The eastern portion of the New Bomb Area occupies an alluvial fan at an elevation of approximately 6,400 feet above MSL.

From west to east, there is a total change in relief of about 1,400 feet. The surface of the area is excised with east-trending deep ravines. They combine to form one canyon near the area entrance.

II A.6.2 Design and Operation

The New Bomb Facility treatment units are designed as follows:

20 cells constructed from native soil and taking advantage of the facility topography that have been located along the northern and southern base of a 1,300-foot-long ridge. A single cell measures 20 feet by 6 feet. The minimum distance between adjacent cells is 75 feet, to prevent sympathetic detonation.

The facility operations are designed to minimize the potential for adverse impacts on human health and the environment. No hazardous wastes are stored at the New Bomb Facility. Waste munitions are brought to the facility and treated that same day. Treatment residues are removed after the treatment cycle is complete.

Treatment through detonation involves placing waste munitions at the center of the detonation cell. Donor explosives (usually TNT) are placed in a cell along with the waste munitions. This donor material ensures that all shell casings are penetrated, thereby allowing all explosive materials to detonate (react) through thermal exposure. The maximum amount of items per cell is 4,000 pounds Net Explosive Weight (NEW).

The minimum length of blasting fuse for any charge is not less than 6 feet or 4 minutes. All charges are dual-primed. The list of equipment that is used to conduct thermal treatment includes:

Charge, Demolition Block M031
Cap, Blasting, non-electric, M-7
Tape, Plastic, Electrical
Fuse, Time Blasting, M670
Igniter Time Fuse, M2 or M60
Cord, Detonating, M455 and M456.

A plan view of a detonation cell is shown in Figure II-5.

Detonation activities at the New Bomb Area are strictly governed by several HWAD Standing Operating Procedures (SOPS). The general SOP that applies to New Bomb, Ammunition and Explosives: Demilitarization by Detonation, is included as Appendix A.

II A.6.3 Maintenance

Pre-detonation and post-detonation maintenance activities conducted at New Bomb and include:

Checking all areas for unexploded ammunition and explosives.

Picking up all metal scrap from road and pit area.

Removing all unused explosive devices from the range and return them to storage.

Grooming road network, pits, and areas around pits with grader and/or dozer as necessary.

Performing housekeeping in and around the vicinity of range buildings.

Clearing immediate and surrounding areas of vegetation and other combustible material to ensure minimization of fire hazards.

II A.6.4 Inspections

Residues that are generated during detonation operations include casings and shell fragments in the form of shrapnel. Following every detonation, personnel inspect the area for any possible misfires and low order/partial detonation.

The Range Supervisor is notified when personnel tasked to count the detonations determine that a misfire has occurred. In this case, a new firing system is attached and the pile is re-detonated. Low order/partial detonations are recognized through visual inspection and closed circuit television: a slow-burning fire, as opposed to a brief explosion, will consume the explosive reactants. If this occurs, the area is posted with an overnight guard to secure the area and communicate any further hazards.

The pits used for detonation are inspected for any standing water. Detonation operations would not take place in any cell in which precipitation had accumulated.

All scrap generated by detonation operations is required to have a 100% visual inspection to assure the absence of hazards, i.e., explosives. In a detonation operation, the presence of explosives is clearly visible, since shell casings are torn open by the nature of the treatment process. The Range Supervisor and Quality Control both verify and certify that the material is 100% inert. It is then transported to the Main Base, decontaminated at the Western Area Demilitarization Facility (WADF), then sold as a scrap metal.

II A.6.5 Monitoring

The operation of the detonation unit is monitored by facility personnel inside a safety bunker located approximately 2,700 feet from the detonation pit areas. Two closed circuit video cameras have been installed in the vicinity of the detonation cells to monitor detonation events from the personnel shelter. Operators are required to obtain site-specific data (i.e., wind speed data) from an on-site meteorological monitoring station. A backup meteorological station has been installed to provide critical data in the event the primary monitoring station is non-operational.

II A.6.6 Closure

Clean closure is intended for the New Bomb Facility. Specific closure activities are described in Section F, "Closure and Post-Closure Plans."

FIGURE II-1

LOCATION MAP / SURROUNDING LAND USE

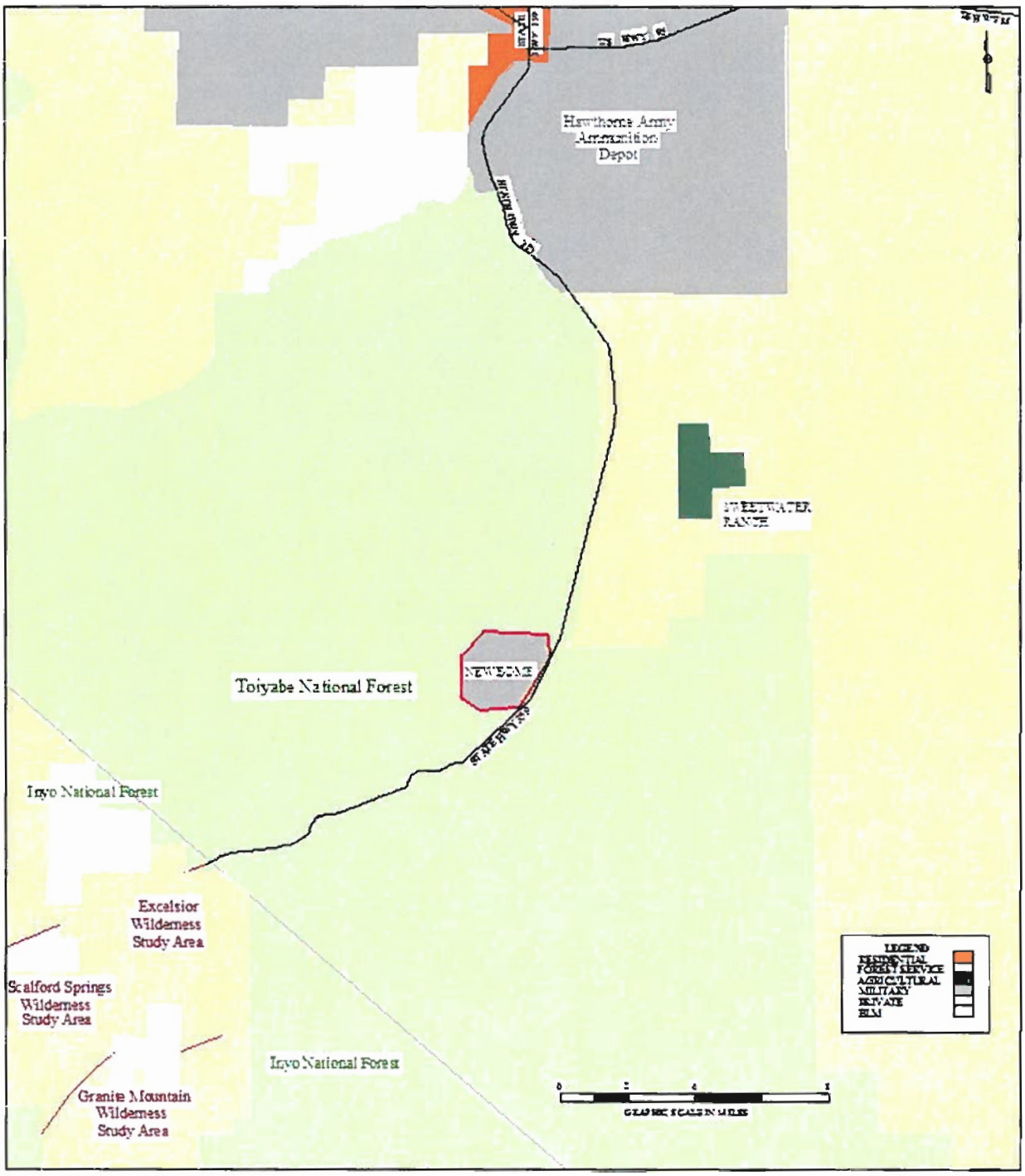
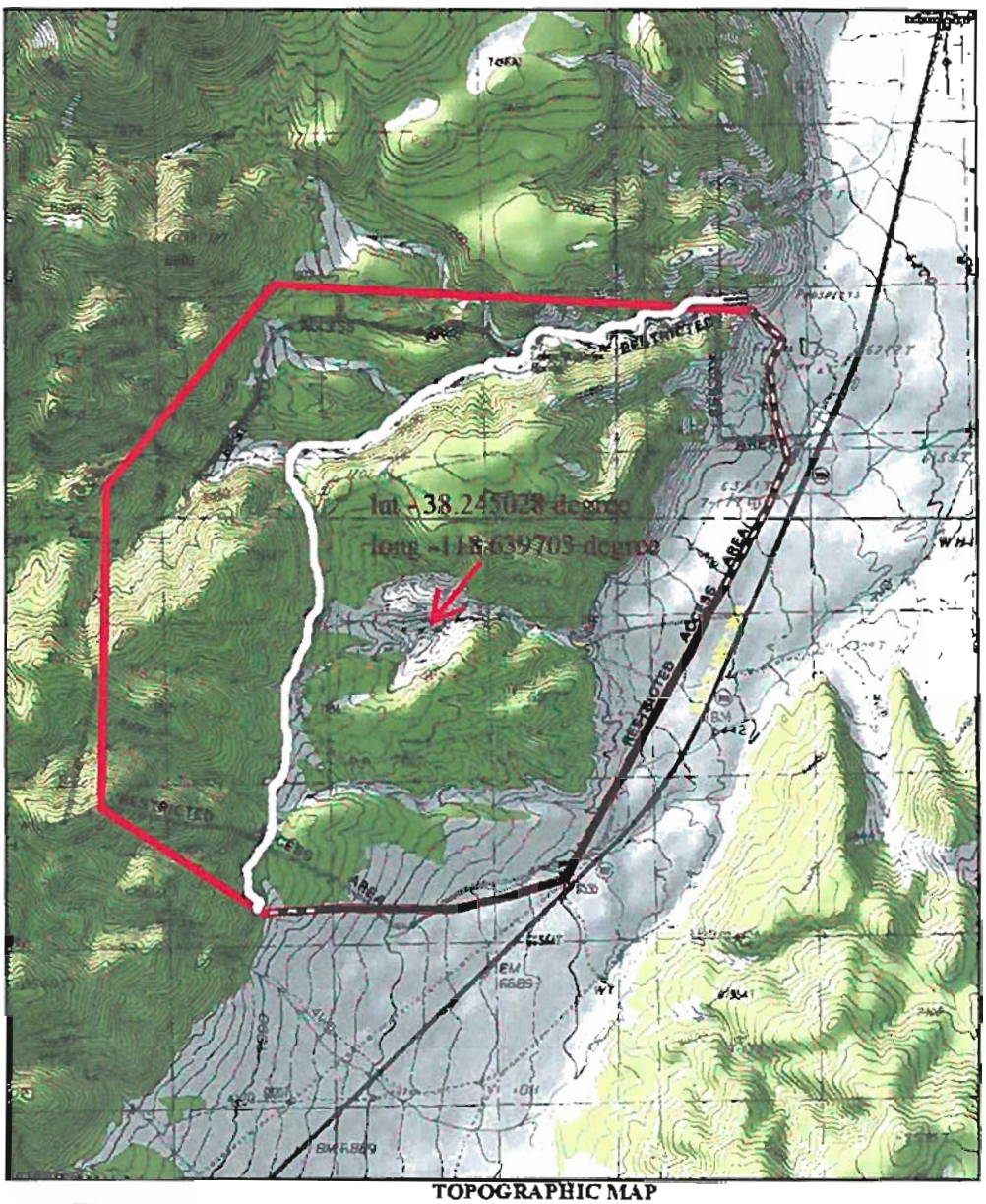


FIGURE II-2
TOPOGRAPHIC MAP



TOPOGRAPHIC MAP

Legend
— Warning_Signs
— Fence Line
Restricted Access Area

Revised December 2010

NEW BOMB
Hawthorne Army Depot
Mineral County, Nevada

Map Reference:
Hawthorne Hills
Date 9/23/2003

Converse Consultants

II-2

FIGURE II-3

WIND ROSE

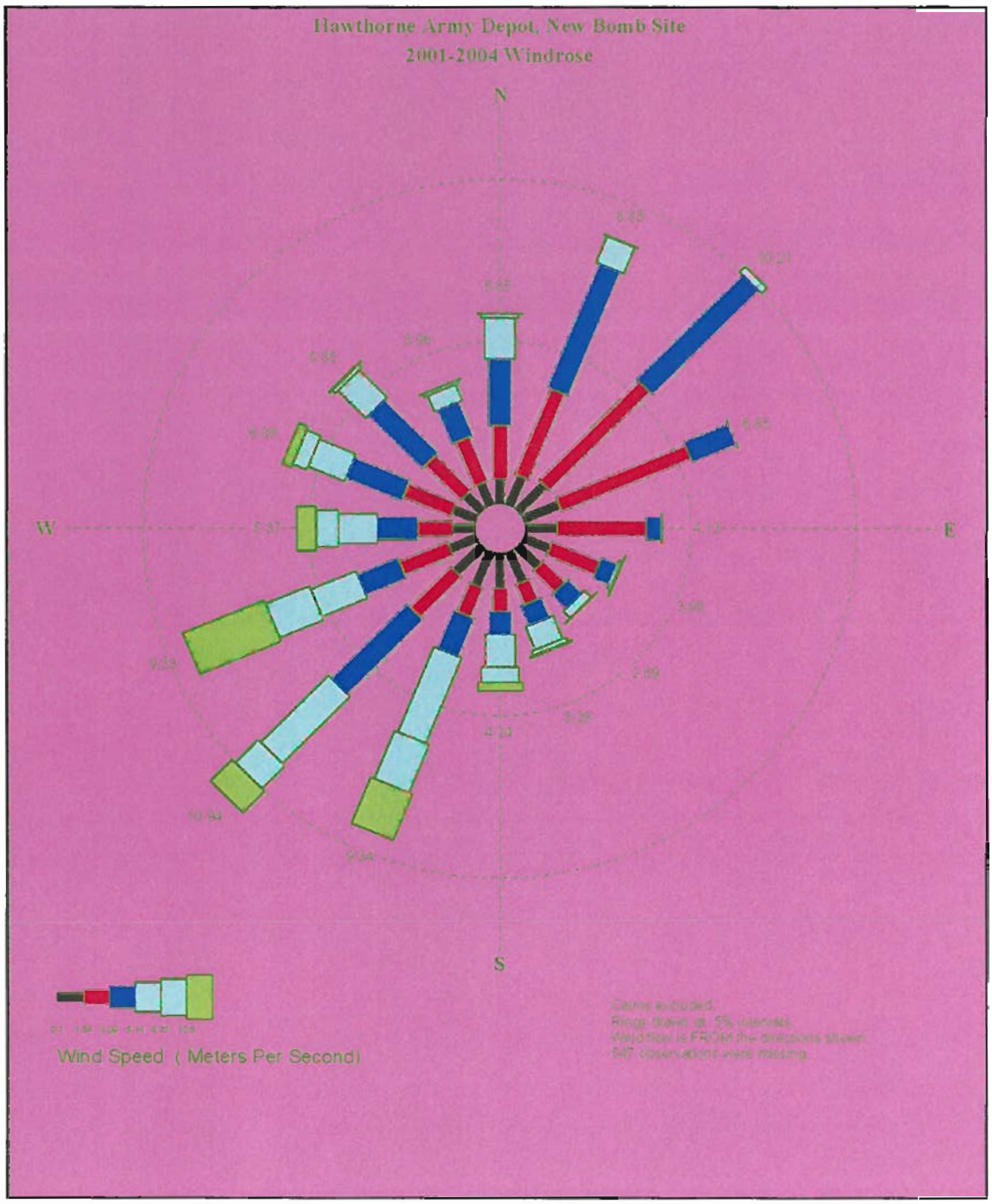


FIGURE II-4

TREATMENT CELL DESIGN

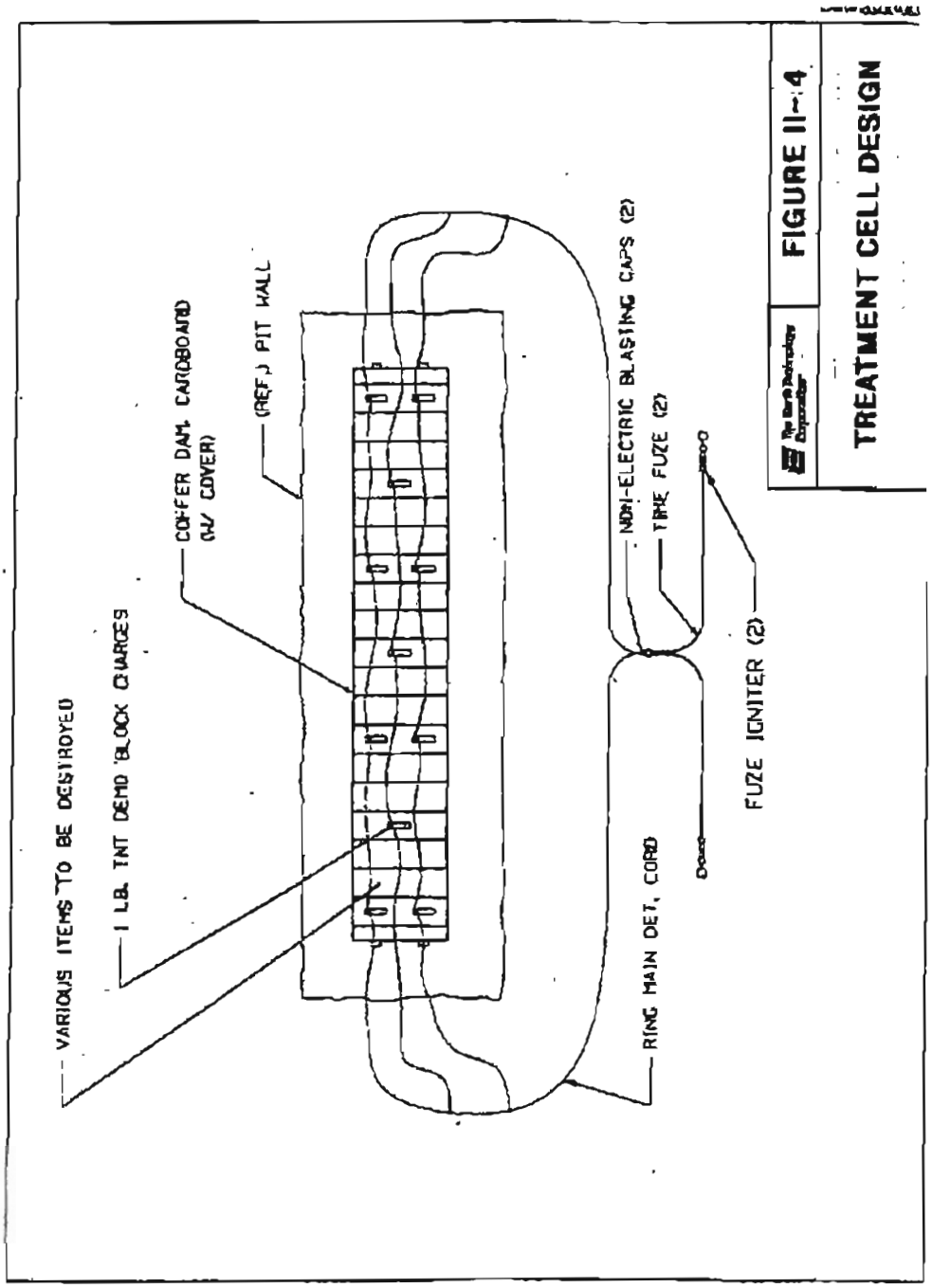
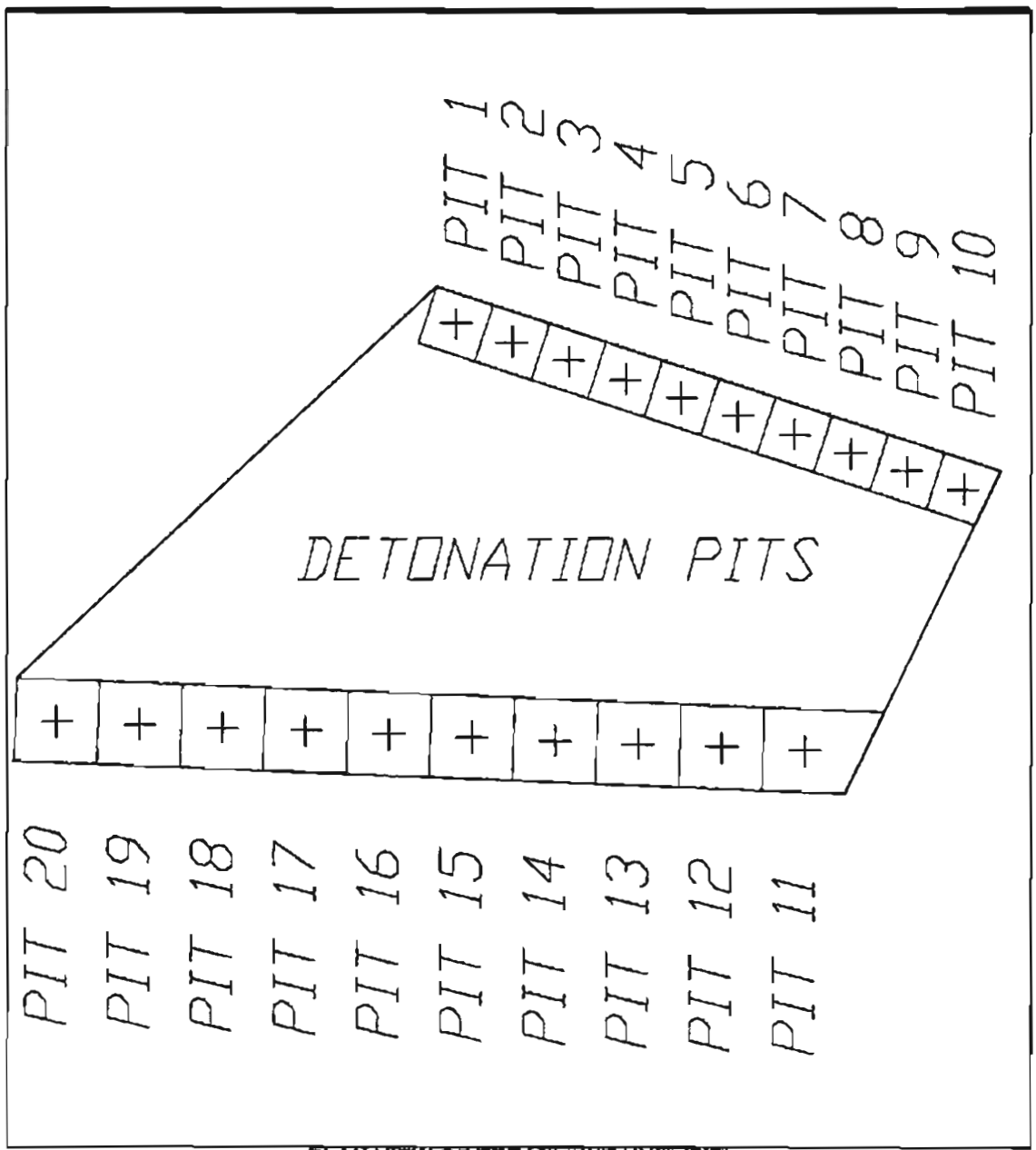


FIGURE II-5

PLAN VIEW OF TREATMENT UNIT OPERATION



PLAN VIEW OF TREATMENT UNIT (PIT)

NEW BOMB
Hawthorne Army Depot
Mineral County, Nevada

CONVERSE CONSULTANTS

Over 60 Years of Dedication in Engineering, Environmental & Groundwater Science, Inspection & Testing Services

Scale	NTS
Date	5/21/10
Drafted By	KIB
Checked By	LS
Approved By	
File No.	
Project No.	10-23107-01
Drawing No.	II-5

FIGURE II-6

SITE PLAN

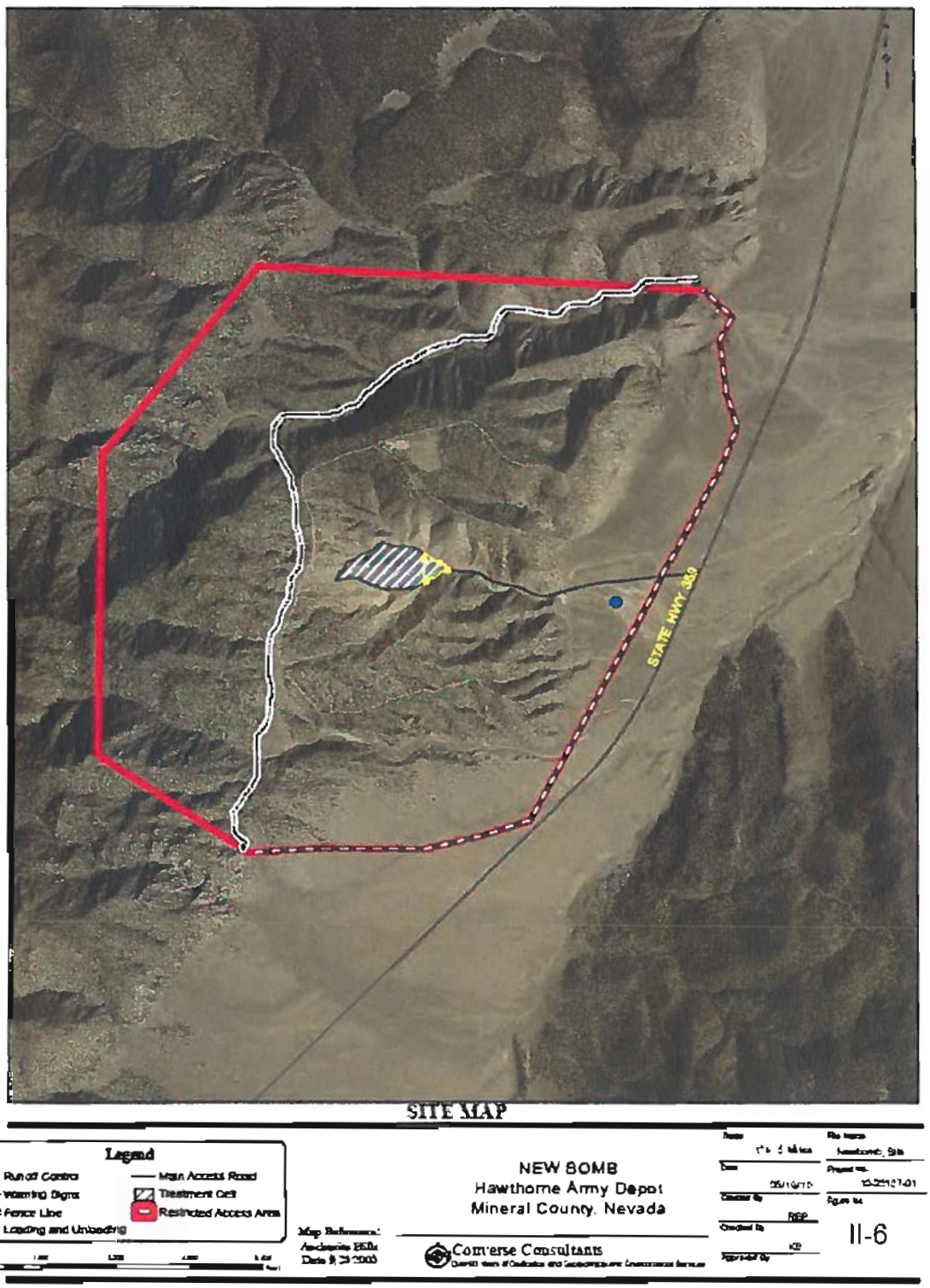
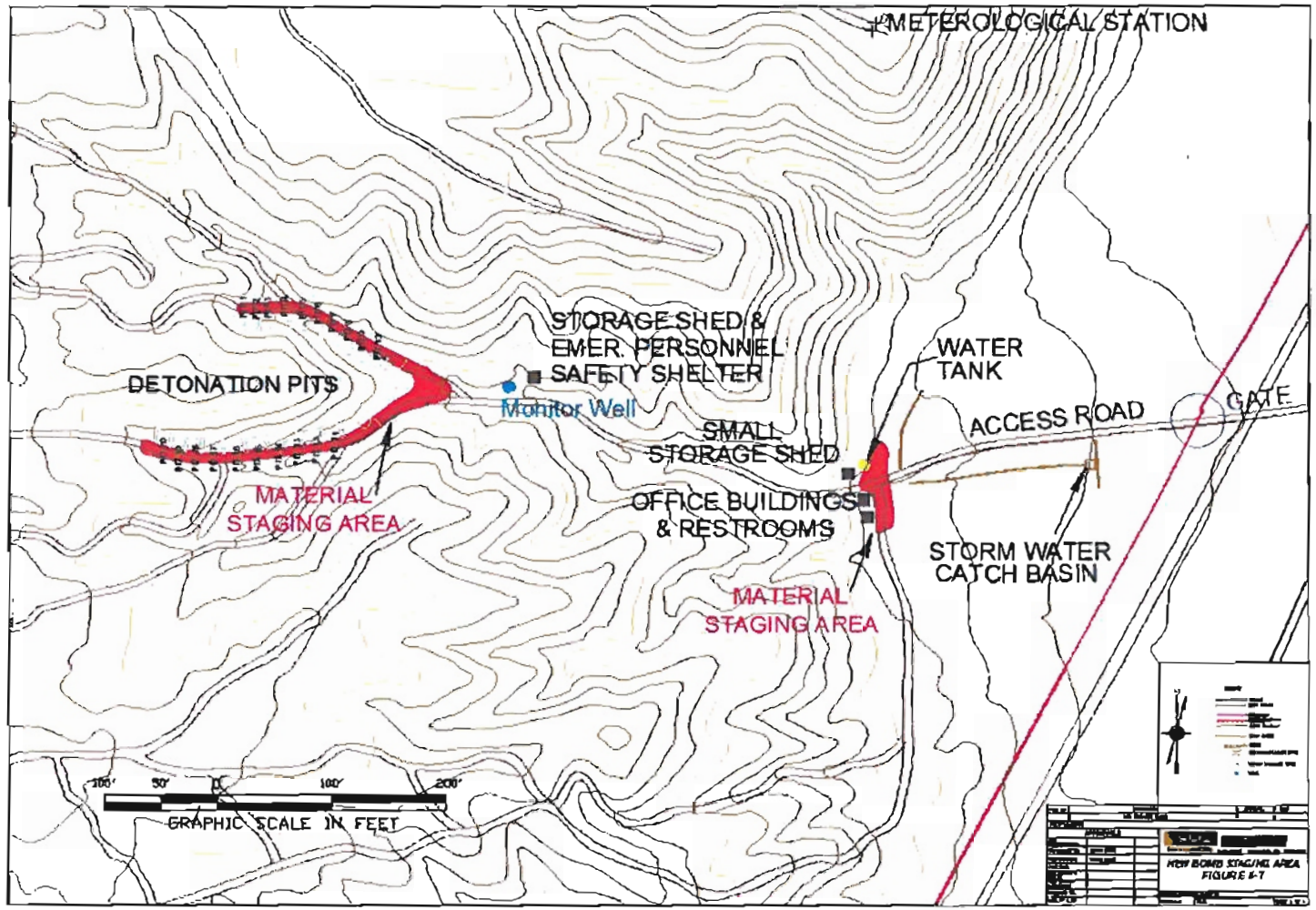


FIGURE II-7

MATERIAL STAGING AREA



SECTION II B – WASTE CHARACTERISTICS

II B.1 PHYSICAL AND CHEMICAL CHARACTERISTICS OF WASTES AND RESIDUES [40 CFR 270.14(b)(2) and 264.13(a)]

The wastes to be treated by detonation at The New Bomb Facility will consist of military energetic materials that have exceeded their shelf life, off-specification versions of these same materials, and those that cannot be treated at western Area Demilitarization Facility (WADF). The off-specification items generally are composed of the same raw material as the usable items, but for one or more reasons they do not meet some performance specification(s). For off-specification items, the same conclusions can be drawn regarding appropriate treatment based on published data. It is not likely that a difference in the composition of off-specification materials will render them unacceptable for detonation treatment, since in all cases they will be reactive. Nevertheless, information on off-specification items is reviewed, and if there is a question as to the suitability of a particular waste for detonation, other data are gathered to resolve the issue. A small-scale detonation test of this material, if possible, may provide adequate information on the applicability of detonation for materials for which little or no historical data exist. It is not feasible in the aforementioned cases to do a chemical analysis of off specification materials because of their hazardous (i.e., reactive) nature.

When ordnance items are demilitarized because shelf lives have been exceeded or because deterioration of the energetic compound or container (casing) has occurred, any change in chemical or physical characteristics of the energetic constituents would not affect the choice of treatment technique. The overall chemical composition and resulting combustion products will not be affected, because the energetic materials are composed chiefly of carbon, hydrogen, and nitrogen. Concentrations of inorganics such as metallic compounds also will not change, nor will the likely combustion products.

II B.1.1 Volume and Composition of Wastes

The detonation unit is used to thermally treat various explosives and ammunition, in order to render them demilitarized. Table II-1, located in Section B.2 shows the General Chemical Composition of Military Items. Table II-1A, located in Section B.2, presents the general composition of munitions casings and metal components. Table II-2, located in Section B.2 is the List of Munitions by Department of Defense Access (DODAC) Number] Treated by detonation at HWAD. Prior to treatment, historical data, specifications, and ordnance publications are used to obtain information regarding the nature of the waste to be detonated. The specific chemical composition of representative energetic materials contained in munitions/demolition items currently treated or to be treated by detonation at HWAD are given in Table II-3A, located between Section II.B.2 and Section II.B.3. Although additional energetic items may be treated by detonation in the future, the chemical composition of these items is not expected to be significantly different than the items presented in Table II-

3A. Table II-3A also lists the EPA hazardous waste codes of the waste munitions and ordnance treated at HWAD. Physical and chemical properties of the items, including properties of potential compounds formed during detonation are presented in Table II-3A. Table II-3B, located in Section B.2 presents representative munition class compositions for other items treated by detonation at HWAD. The format used in Table II-3B does not preclude HWAD from detonating and treating additional munitions in the future, as long as munitions can be placed in one of the munition classes shown in the table. Additional composition data are contained in the Munition Items Disposition Action System (MIDAS) database. This data is generated from the standard U.S. military technical manuals, field manuals, and various handbooks. The MIDAS database provides sufficient information to determine the suitability of the waste material for detonation and compliance with Environmental Performance Standards. The identification of specific munitions or ordnance items as unfit for use can be based on a number of reasons and is impossible to predict for any given period of time. Hence, HWAD needs to be permitted to treat ordnance containing any combination of the materials shown in Table II-1, Table II-3A and Table II-3B (found in Section B.2) within the limitations prescribed by this permit application.

Detonation procedures are based on the military properties (i.e., explosive properties) of the ordnance/propellant item being treated by detonation. The items listed in Table II-3A and II-3B located in Section B.2 are representative of the hazardous constituents present in any energetic items that will be treated by detonation. Should items be received for detonations that are not listed in Table II-2, their composition will be identified and reviewed to ensure safe handling and appropriateness for treatment.

A maximum of 3,000 tons NEW of the materials listed in Table II-2 may be treated by detonation in a single year. The operating limit is also 40,000 pounds NEW of materials detonated per day (4,000 pounds NEW per cell). Shrapnel, the main treatment residue, is collected, containerized, and decontaminated in accordance with the SOP Operation 10 "Disposition of Materials."

Explosive residues are defined as products of an incomplete explosive reaction, i.e., TNT powder, and shrapnel.

A preliminary design for a retention basin at the New Bomb area was developed to retain potential contaminants carried away from the detonation pits and the surrounding area during wet weather events and to facilitate the collection of soil samples along drainage ways. The basin was sized to collect both run-on and run-off from the immediate watershed area for the recommended design storm (25-year 24-hour event).

In order to more accurately access the need for a retention basin, additional soil samples have been collected along drainage ways and at the outer boundaries of the site where material is ejected. The 10 surface soil samples, including background were collected in early August 1996 following the NDEP approved sampling plan prepared by IT Corporation. Although results demonstrated that a few constituents in drainage ways

down-gradient of the site were above site specific background, concentrations were not above risk-based clean up goals. Based on this finding, NDEP has agreed that a retention basin is not necessary at the New Bomb Area, and the surface soil runoff sampling program performed has adequately addressed ejected material.

II B.1.2 Parameters and Rationale

Visual inspection screening is initially conducted to determine the size of scrap metals generated from the detonation and whether testing for explosivity is necessary. Large scrap materials (greater than 1.5 inch) derived from the detonation of explosives and/or explosive items will not he analyzed. This size material does not fit in the Bureau of Mines testing equipment. These items are transferred off site to the WADF located at the HWAD Main Base for decontamination as required by Army Regulation. The scrap is then transferred to Property Disposal for sale (recycling).

Soils/small residue (less than 1.5 inch) will be analyzed per the Sampling and Analysis Plan, located in Section B.3 at a frequency of twice per year. Results of this sampling will be compared to appropriate standards as outline in the Sampling and Analysis Plan. Soils/small residue may be analyzed using total concentrations.

Materials identified as hazardous waste residues per the Sampling and Analysis plan will be excavated and handles as dictated by the hazardous characteristic identified.

II B.1.3 Additional Requirements for Ignitable, Reactive, or Incompatible Wastes [40 CFR 264.13(b)(6) and 264.17]

All ordnance items treated at the detonation unit are reactive. Ignitable and corrosive wastes are not managed at the detonation unit unless they are primarily reactive, therefore, there is no need for additional requirements to handle ignitable, corrosive, or incompatible wastes.

Items requiring demilitarization are not usually sampled and analyzed. Sampling of items that contain energetic material is obviously very dangerous, because the energetic material is reactive and may be unstable. In addition, many munitions and ordnance items are designed to explode if attempts are made to disassemble them. Sampling and analysis is not required to gather sufficient chemical and physical data to treat the energetic items, because of the large amount of information available concerning the physical and chemical characteristics of these items. This information comes from historical data, military specifications, and ordnance publications. Military ordnance/propellant items generally have a unique configuration and/or identification number. The identification number and configuration are used to identify the item and gather the information needed for the items safe treatment.

Detailed chemical and physical analyses of the soil/residue are conducted. These tests determine possible contamination levels and also verify the degree of treatment. The detonation unit is visually inspected according to the SOP Operation 10, Operation 10

"Disposition of Materials" for shrapnel which is collected, containerized, decontaminated, if necessary, and shipped to HWAD for recycling.

II B.2 WASTE ANALYSIS PLAN [CFR 270.14(b)(3) and 264.13(b) and (c)]

II B.2.1 Purpose

This Waste Analysis Plan (WAP) has been developed by New Bomb, to comply with the regulatory requirements of 40 CFR 264.13 and CFR 270.14(b)(3) as adopted by the Nevada Division of Environmental Protection (NDEP). The plan describes the procedures employed by New Bomb to obtain the necessary waste information to treat, store or dispose of hazardous wastes in accordance with applicable state and federal requirements and the provisions of the renewed permit.

The New Bomb Facility treats waste by open detonation. All waste energetic materials treated by detonation at the New Bomb Facility must be reactive hazardous wastes.

Waste composition data are contained in the Munitions Items Disposition Action System (MIDAS) database. This data is generated from the standard U.S. military technical manuals, field manuals, and various handbooks. The MIDAS database provides sufficient information to determine the suitability of the waste material for detonation and compliance with Environmental Performance Standards.

Information found in MIDAS has been abbreviated in Tables II-1 through II-3B.

All of the waste accepted for thermal treatment is considered hazardous prior to treatment due to its explosive or reactive nature. Chemical and/or laboratory analyses are not performed as part of this Waste Analysis Plan to avoid the danger associated with excess handling of such materials.

II B.2.2 Waste Acceptance

Waste to be treated at the New Bomb facility is accepted from the Hawthorn Army Depot and the US Government. No other entities ship waste to the New Bomb facility.

Hazardous Waste to be treated at New Bomb must be approved for treatment by the Environmental Department. Information on the hazardous waste characteristics is obtained from the MIDAS data base. Military ordnance/propellant items generally have a unique configuration and/or identification number. The identification number and configuration are used to identify the item and gather the information needed for the items safe treatment. Once the waste is approved for treatment at New Bomb, it is scheduled into the facility by the project planner. The Range Supervisor of New Bomb receives a treatment schedule including the type and amount of material scheduled for treatment. The daily treatment schedule includes documentation listing all waste by

DODAC number and item name. Other information listed includes number of units scheduled for treatment, and number of subunits per unit (example: 25 grenades per box). Waste scheduled for treatment at the New Bomb Facility is shipped daily from HWAD.

II B.2.3 Waste Receiving

II B.2.3.1 Management of Waste Generated Off-Site [40 CFR 264.13(c)]

All hazardous wastes treated at the New Bomb detonation unit originate from HWAD. Waste received at HWAD is generated under US Government and military control. No wastes are accepted for treatment at New Bomb from other sources. No sampling or analysis will be used to identify waste accepted at New Bomb. The Range Supervisor is and his designees have been extensively trained to identify all military ordnance / propellant items, wastes that would be accepted at the New Bomb facility. Identification characteristics include markings, shape, configuration and possibly color. No special waste analysis provisions are required to properly manage wastes received at the New Bomb Area.

II B.2.4 Waste Inspection

Upon arrival at New Bomb each truck transporting the hazardous waste materials is inspected by the Range Supervisor. This inspection includes an item count, verification of items against the shipping paperwork and is cross referenced against the daily schedule. As stated in the "Standard Operations Procedure (SOP) Operation 3 - Verify Documentation and Unload," any discrepancy will halt all operations at the New Bomb facility until the issue has been resolved.

Hazardous waste material off loaded from the transport trucks is also visually inspected as it is placed in the treatment unit, in accordance with SOP Operation 4 "Preparation of Pit and Placement of Explosive Materials." This final inspection is to ensure that only appropriate wastes are subjected to thermal treatment.

Prior to detonation operations, a detailed waste analysis has been conducted by research of the available MIDAS database. Further inspection as wastes are removed from transportation packaging and placed in the treatment unit is conducted by individuals certified in the identification of all military ordnance / propellant items. No waste analyses by representative sampling will be conducted on explosive items to be treated because of safety concerns. The New Bomb facility is not expected to treat unidentifiable ordnance / propellant items because all items to be treated by detonation is under Army control and no waste is accepted from other sources. Therefore, the composition of the ordnance waste is readily identifiable.

II B.2.5 Items Prohibited from Treatment

Certain items will not be treated by detonation to the New Bomb Facility. These include military chemical or biological warfare agents or related compounds, or materials

contaminated with these agents. Typical military chemical/biological warfare agents and related compounds include, but are not limited to, the following classes of agents:

- Choking agents
- Nerve agents
- Blood agents
- Blister agents
- Incapacitating agents
- Vomiting compounds
- Tear-producing compounds
- Herbicides

A second group of compounds or mixtures will not be treated except under emergency conditions. These include the following smokes and incendiaries:

Smokes

- Titanium tetrachloride (FM)
- Sulfur trioxide - chlorosulfonic acid (FS)
- Hexachloroethane (HC) mixture (6.68% grained aluminum, 46.66% zinc oxide, and 46.66% hexachloroethane)
- White phosphorus (WP)
- Bulk red phosphorus (RP)
- Plasticized white phosphorus (PWP)
- Oil smoke
- Colored smokes (red, yellow, green, violet, white, etc.).

Incendiaries

- Eutectic white phosphorus (EWP)
- Napalm B (50% polystyrene, 25% benzene, and 25% gasoline by weight).

Identification of these items on any incoming load would require an immediate halt to operations according to the SOP, Operation 3 "Verify Documentation and Unload," until the discrepancy was resolved.

II B.2.6 Verification of Treatment Effectiveness

Treatment effectiveness is verified in the following ways:

- According to the SOP Operation 6 "Detonation Charge" Personnel count the number of detonations.

- According to the SOP Operation 7 "Inspection of Pit Area and Unexploded Munitions" personnel review the video recording that monitors the treatment units during detonation operations

- Visual inspection is conducted according to the SOP Operation 10, "Disposition of Materials" to determine the size of scrap metals generated. This inspection also is used to determine whether decontaminated and/or testing for explosivity is necessary.

- For smaller residues a twice yearly testing of the soil is conducted according the Sampling and Analysis Plan. These tests determine possible contamination levels and also verify the degree of treatment.

II B.2.7 Test Methods

The typical analytical methods used to determine residue characteristics are:

1. Total Metals by Method 6010

2. Toxicity Characteristic Leaching Procedure, Method 1311 of SW 846, (From Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846,3rd Edition, USEPA, 1986).

3. Gap Test for Determination of Explosive Reactivity, (From Procedures for Classification of Explosive Substances, U.S. Bureau of Mines, DOI, 1984

4. Internal Ignition Test for Determination of Explosive Reactivity, (From Procedure for Classification of Explosive Substances, U.S. Bureau of Mines, DOI, 1984

5. Analysis for Explosives in Soils, High Performance Liquid Chromatographic Method, (from Water Quality Information Paper No. 23 Military Unique Munitions Analytical Procedure, USAEHA, March 16, 1987)

6. Nitroaromatics and Nitramines by High Performance Liquid Chromatography (HPLC), (From Method 8330 of SW-846).

TABLE II-1

GENERAL CHEMICAL COMPOSITION OF MILITARY ITEMS THERMALLY TREATED BY DETONATION AT NEW BOMB

PROPELLANTS	
Name	**Chemical Formula**
Nitrocellulose	$C_{12}H_{16}(ONO_2)_4O_6$
Nitroglycerine	$C_3H_5N_3O_9$
Nitroguanidine	$CH_4N_4O_2$

These three primary constituents can be used singly or in various combinations along with metals, metallic salts, and organic polymer binders.

PRIMARY EXPLOSIVES	
Name	**Chemical Formula**
Lead Azide	H_6Pb (71% Pb)
Mercury Fulminate	$C_2HgN_2O_2$ (70.5% Hg)
Diazodinitrophenol (DDNP)	$C_6H_2N_4O_5$
Lead Styphnate	$C_6HN_3O_8Pb$ (44.2% Pb)
Tetracene	$C_2H_8N_{10}O$
Potassium Dinitrobenzofuroxane (KDNBF)	$C_6H_2N_4O_6K$
Lead Monomitroresorcinate (LMNR)	$C_6H_5NO_{4x}Pb$ (57.5% Pb)
Ingredients to Rocket Propellant:	
Copper Monobasic Salicylate	$C_{14}H_{12}Cu_2O_8$
Lead Salicylate	$C_{14}H_{10}O_6Pb$
Fuels:	
Lead Thiocyanate	$Pb(SCN)_2$ (64% Pb)
Antimony Sulfide	S_5Sb_2
Calcium Silicide	$CaSi_2$
Oxidizers:	
Potassium Chlorate	$KClO_3$
Ammonium Perchlorate	NH_4ClO_4
Barium Nitrate	N_2O_6Ba
Calcium Resinate	$Ca(C_{44}H_{62}O_4)_2$
Strontium Peroxide	SrO_2
Barium Peroxide	BaO_2
Strontium Nitrate	$Sr(NO_3)_2$
Potassium Perchlorate	$KClO_4$

Primary compositions include a mixture of primary explosive (as shown above), fuels, oxidizers and binders (e.g., paraffin wax).

TABLE II-1 (CONTINUED)
GENERAL CHEMICAL COMPOSITION OF MILITARY ITEMS THERMALLY TREATED BY DETONATION AT NEW BOMB

BOOSTER AND SECONDARY EXPLOSIVES (High Explosives)	
Name	**Chemical Formula**
Aliphatic Nitrate Esters:	
1,2,4-Butanetriol Trinitrate (BTN)	$C_4H_7N_3O_9$
Diethyleneglycol Dinitrate (DEGN)	$C_4H_8N_2O_7$
Nitroglycerine (NG)	$C_3H_5N_3O_9$
Nitrostarch (NS)	$C_6H_7(OH)_x(ONO_2)_y$ where X – Y = 3
Pentaerythritol Tetranitrate (PETN)	$C_5H_8N_4O_{12}$
Triethylene Glycol Dinitrate (TEGDN)	$C_6H_{12}N_2O_8$
1,1,1-Trimethylethane Trinitrate (TMETN)	$C_5H_9N_3O_9$
Nitrocellulose (NC)	$C_{12}H_{16}(ONO_2)_4O_6$
Nitramines:	
Cyclotetramethylene Tetranitramine (HMX)	$C_4H_8N_8O_8$
Cyclotrimethylene-Trinitramine (RDX)	$C_3H_6N_6O_6$
Ethylenedimine Dinitrate (EDDN, Haleite)	$C_2H_6N_4O_4$
Nitroguanidine (NQ)	$CH_4N_4O_2$
2,4,6-Trinitrophenylmethylnitramine (Tetryl)	$C_7H_5N_5O_8$
Nitroaromatics:	
Ammonium Picrate (Explosive D)	$C_6H_3N_3O_7H_3N$
1,3-Diamino-2,4,6-Trinitrobenzene (DATB)	$C_6H_4N_5O_6$
2,2'4,4'6,6'-Hexanitroazobenzene (HNAB)	$C_{12}H_4N_8O_{12}$
Hexanitrostilbene (HNS)	$C_{14}H_2N_6O_{12}$
1,3,5-Triamino-2,4,6-Trinitrobenzene (TATB)	$C_6H_6N_6O_6$
2,4,6-Trinitrotoluene (TNT)	$C_7H_5N_3O_6$
Ammonium Nitrate	HNO_3H_3N

TABLE II-1 (CONTINUED)
GENERAL CHEMICAL COMPOSITION OF MILITARY ITEMS THERMALLY TREATED BY DETONATION AT NEW BOMB

COMPOSITIONS
Binary Mixtures:
Amotols (ammonium nitrate + TNT)
Composition A (RDX + Desensitizer)
Composition B (RDX + TNT)
Composition C (RDX + Plasticizer)
Ednatols (Haleite + TNT)
LX-14 [HMX (95.5%) + Estane 5702-F1]
Octols (HMX +TNT)
Pentolite (PETN + TNT)
Picratol [Ammonium Picrate (52%) + TNT (48%)]
Tetrytols (TNT + Tetryl)
Tritonal [TNT (80%) + Flaked Aluminum (20%)]
Ternary Mixtures:
Amatex 20 [RDX (40%) + TNT (40%) + Ammonium Nitrate (20%)]
Ammonals (ammonium Nitrate + Aluminum and TNT, DNT, or RDX)
HBX – High Blast Explosives (TNT + RDX + AlD_2 Wax + Calcium Chloride)
HTA-3 (HMX + TNT + Al Mixture 3)
Minol-2 (TNT + Ammonium Nitrate + Aluminum)
Torpex [RDX (41.6%), TNT (39.7%), Al (18.0%) Wax (0.7%)]
Quaternary Mixtures:
DBX [TNT (40%), RDX (21%), Ammonium Nitrate (21%), Al (18%)
Plastic Bonded Explosives (PBX):
Basic Explosive [RDX, HMX, HNS, or PETN + Polymeric Binder (Polyester, Polyurethane, Nylon, Polystyrene, Rubbers, Nitrocellulose, Teflon)]

Pyrotechnics
Combination of:
Oxidizer-Oxygen or Fluorine
Fuel – Powdered Aluminum or Magnesium
Binding Agents – Resins, Waxes, Plastics, Oils, Retardants
Waterproofing, Color Intensifiers
Source: Military Explosives, Department of the Army, Technical Manual, TM9-1300-214, September 1984

TABLE II-1A

GENERAL COMPOSITION OF MUNITIONS CASINGS AND METAL COMPONENTS THERMALLY TREATED BY DETONATION AT NEW BOMB

Constituent	Average Composition Percentage
Copper	3.55
Zinc	0.45
Aluminum	2.0
Styrene	2.0
Manganese	0.55
Iron	91.45

Source: "Air Pathway Screening Assessment for Subpart X Permitting," U.S. Army Environmental Center, May 1995, Revision 0, Page 3.2.2-3.

TABLE II-2
LIST OF MUNITIONS (BY DODAC NUMBER)
TREATED BY DETONATION AT NEW BOMB

DODAC Number	Type of Munition[1]	Description[2]
1305-A974	CTG	25MM APDS-T M791 LNKD
1305-A975	CTG	25MM HEI-T M792 LNKD
1305-A976	CTG	25MM TP-T M793 LNKD
1305-A978	CTG	25MM TP PGU-23/U SNGL RD
1305-B112	CTG	30MM HEI MK3Z LNKD LHF
1305-B113	CTG	30MM TP MK4Z LNKD LHF
1305-B114	CTG	30MM HEI M3Z-1 LNKD RHF
1305-B115	CTG	30MM TP MK4Z LNKD RHF
1305-B124	CTG	30MM HEI M799 LNKD LHF
1305-B125	CTG	30MM HEI M799 LNKD RHF
1310-B470	CTG	40MM HE M384 SERIES LNKF
1310-B480	CTG	40MM TP M385 SERIES LNKD F/HELI LAUNCHER
1310-B534	CTG	40MM MP M576
1310-B542	CTG	40MM HEDP M430 LNKD
1310-B545	CTG	40MM BLANK SALUTING
1310-B549	CTG	40MM HEI-P M162
1310-B551	CTG	40MM AP M81A1 CLIPPED
1310-B552	CTG	40MM AP-T M81 SERIES CTN PACK
1310-B553	CTG	40MM HEP MK2
1310-B554	CTG	40MM HE-SD
1310-B555	CTG	40MM HEI-P MK2
1310-B556	CTG	40MM HEI-P-NP
1310-B557	CTG	40MM HEI-SD 4/CLIP
1310-B558	CTG	40MM HEI-T-NSD 4/CLIP
1310-B559	CTG	40MM HEI-T-SD 4/CLIP
1310-B560	CTG	40MM HEI-T-DI-SD
1310-B561	CTG	40MM HE-P
1310-B562	CTG	40MM HE-T-SD MK2
1310-B563	CTG	40MM BL-P

TABLE II-2
LIST OF MUNITIONS (BY DODAC NUMBER) TREATED BY DETONATION AT NEW BOMB

DODAC Number	Type of Munition[1]	Description[2]
1310-B564	CTG	40MM BL-T 4/CLIP
1310-B568	CTG	40MM HE M406
1310-B569	CTG	40MM HE M406
1310-B572	CTG	40MM HE M364 SERIES LNKD
1310-B576	CTG	40MM TP M385 LNKD
1310-B577	CTG	40MM TP M407A1
1310-B666	CTG	3 POUNDER BLNK MK1-1
1315-C025	CTG	75MM BLANK M337A2
1315-C139	CTG	3 IN 50 CAL BLANK
1315-C162	CTG	3 IN 50 CAL VT NON-FRAG MK33
1315-C164	CTG	3 IN 50 CAL VT NON-FRAG MK33
1315-C183	CTG	3 IN 50 CAL BLANK
1315-C262	CTG	90MM CANISTER APER M336
1315-C275	CTG	90MM APER-T M580 SERIES
1315-C319	CTG	3 IN 50 CAL VT NON-FRAG MK31
1315-C320	CTG	3 IN 50 CAL VT NON-FRAG MK31
1315-C373	CTG	3 IN 50 CAL VT NON-FRAG MK36 NFL
1315-C375	CTG	3 IN 50 CAL VT NON-FRAG MK36 NFL
1315-C513	CTG	105MM APERS-T M546
1315-C519	CTG	105MM APERS-T M494 SERIES
1315-C697	CTG	4.2 IN HE M329A2 W/O FUZE
1315-CX30	BAG	LOADING ASSY F/4.2 MORTAR
1320-D229	CTG	5 IN 38 CAL BLNK SALUTING MK5 MOD 0
1320-D249	PROJ	5 IN 38 CAL VT NON-FRAG MK35/31
1320-D260	PROJ	5 IN 38 CAL HE CVT RCKT ASST MK57 MOD 0
1320-D261	PROJ	5 IN 38 CAL HE CVT RCKT ASST MK57 MOD 1
1320-D262	PROJ	5 IN 38 CAL HE CVT RCKT ASST MK57 MOD 2
1320-D307	PROJ	5 IN 54 CAL BLANK SALUTING MK6
1320-D325	PROJ	5 IN 54 CAL HE-CVT RCKT ASST MK58
1320-D361	CHG	PROP 175MM WB M86A2/T58E1O

TABLE II-2
LIST OF MUNITIONS (BY DODAC NUMBER)
TREATED BY DETONATION AT NEW BOMB

DODAC Number	Type of Munition[1]	Description[2]
1320-D561	PROJ	155MM HE APER H449/449E1
1320-D579	PROJ	I55MM HE RAP M549 SERIES (COMP B)
1325-E173	DSP&BOMB	CBU MK20 MOD 2
1325-E174	DSP&BOMB	ACFT CBU-49
1325-E184	DSP&BOMB	ACFT CBU-24
1325-E463	BOMB	GP 250 LB MK81 MOD 1 H-6/TRITONAL
1325-E464	BOMB	GP 250 LB MK81 MOD 0 TRITONAL
1325-E465	BOMB	GP 250 LB MK81 MOD 1 H-6/TRITONAL
1325-E485	BOMB	GP 500 LB MK82 MOD 1 TRITONAL
1325-E506	BOMB	GP 1000 LB MK83 MOD 4
1325-E807	DSP&BOMB	ACFT LS FAE CBU 55/B
1325-E820	DSP&BOMB	ACFT CBU 59/B
1325-F372	ADAPTER	BOOSTER T45E7
1325-F387	ADAPTER	BOOSTER BOMB M147
1325-F390	ADAPTER	BOOSTER BOMB TAIL M150
1325-F392	ADAPTER	BOOSTER BOMB NOSE M148E1
1325-F525	BURSTER	BOMB MK4 MOD 0 F/FIREBOMB
1325-F679	FUZE	BOMB TAIL M990E1
1325-F681	FUZE	BOMB NOSE M904E3
1325-F720	FUZE	BOMB TAIL AN MK230 MOD 4A
1325-F724	FUZE	BOMB TAIL M990E4
1325-F837	FUZE	BOMB TAIL MK344 MOD 0
1325-G104	FUZE	BOMB TAIL MK376 MOD 0
1325-G109	FUZE	BOMB TAIL MK346
1330-G881	GRENADE	HAND FRAG M67
1330-G890	GRENADE	HAND FRAG MK2/M25 SERIES
1330-G892	GRENADE	HAND FRAG MK2A1
1330-G910	GRENADE	HAND OFFENSIVE MK3 SERIES
1330-G9111	GRENADE	HAND OFF MK3A2
1330-G970	GRENADE	RIFLE HEAT M28/M31

TABLE II-2
LIST OF MUNITIONS (BY DODAC NUMBER)
TREATED BY DETONATION AT NEW BOMB

DODAC Number	Type of Munition[1]	Description[2]
1336-VX75	ERD	ACCUMULATOR (HAWK)
1340-H305	RCKT MTR	M3 OR M3A2
1340-H342	RCKT MTR	JATO MK25 MOD 1
1340-H343	RCKT MTR	JATO MK7 MOD 2 W/O IGNITER
1340-H345	RCKT MTR	JATO MK7 MOD 1 W/O IGNITER
1340-H557	RCKT	66MM HEAT M72A2
1340-H923	WHD	HE MK29 MOD 0 WBD FUZE FI5 IN RCKT
1340-HX04	RCKT	83MM ASSAULT PRAC MK4 MOD 0 (SMAW)
1345-K090	MINE	AP M2 SERIES
1345-K092	MINE	APER M16 SERIES BOUNDING
1345-K121	MINE	APERS M14
1345-K143	MINE	APERS M18A1 WIM57 FIRING DEVICE
1345-K146	MINE	APERS M26 BOUNDING
1345-K181	MINE	AT HEAVY M21
1345-K250	MINE	AT HEAVY M19 NON-METALLIC
1370-L377	SIM	DETONATION EXPL MK2 MOD 0
1370-L5694	SIM	PROJ GRND BURST M115A1
1370-L596	SIM	FLASH ARTY M110
1370-L598	SIM	EXPL BOOBY TRAP FLASH M117
1370-L599	SIM	EXPL BOOBY TRAP ILLUM M118
1370-L600	SIM	BOOBY TRAP WHISTLING M119
1370-L621	STARTER	FIRE M2 NP-3
1375-M023	CHG	DEMO BLOCK M112 1 1/4 LB COMP C-4
1375-M026	DEMO KIT	BANGALORE TORP M1A1
1375-M029	CHG	DEMO SHAPED FLEX LINEAR
1375-M031	CHG	DEMO BLOCK TNT 1/2 LB
1375-M032	CHG	DEMO BLOCK TNT 1 LB
1375-M034	CHG	DEMO BLOCK TNT 8 LB
1375-M035	CHG	DEMO CHAIN MI 8 X 2 1/2 LB
1375-M040	CHG	DEMO MK2 & MODS 55 LB CRATERING

TABLE II-2
LIST OF MUNITIONS (BY DODAC NUMBER)
TREATED BY DETONATION AT NEW BOMB

DODAC Number	Type of Munition[1]	Description[2]
1375-M420	CHG	DEMO SHAPED M2 SERIES 15 LB
1375-M421	CHG	DEMO SHAPED M3 SERIES 40 LB
1375-M445	DEMO KIT	PROJ CHG AP M1/M1A1
1375-M456	CORD	DET PETN TYP 1 CL E (NEW-1000 FT)
1375-M485	CUTTER	HE MK3-1
1375-M591	DYNA	DYNAMITE MILITARY M1
1375-M7578	CHG	ASSY DEMO M183 COMP C-4 8 X 2 1/2 LB
1375-M791	CHG ASSY	DEMO MK133 MODS 0/1/2
1375-M792	CHG ASSY	DEMO MK135/137/138
1375-M792	CHG ASSY	DEMO MK135/137/138
1375-M976	CHG	DEMO BLOCK MK36 MOD 1
1375-M981	CHG	DEMO SHEET ROLL 25 FT
1375-M995	CHG	DEMO RIGID LINEAR MK86 MOD 0
1375-M996	CHG	DEMO RIGID LINEAR MK87 MOD 0
1375-M997	CHG	DEMO RIGID LINEAR MK88 MOD 0
1375-M998	CHG	DEMO RIGID LINEAR MK89 MOD 0
1377-M182	CTG	ACFT FIRE EXTINGUISHER
1377-M314	CATAPULT	ACFT EJECT SEAT MK8 MOD 0
1377-M316	CATAPULT	ACFT EJECT SEAT MK7 MOD 1
1377-M349	CATAPULT	ACFT EJECT SEAT
1377-M392	CTG	IMPULSE SDCP NO 3
1377-M499	CUTTER	CTG ACTUATED MK4 MOD 0
1377-M500	CUTTER	CTG ACT M21 FIREEFING LINE
1377-M504	CUTTER	CTC ACT M22 FIREEFING LINE
1377-M506	CTG	IMPULSE MK73 MOD 0
1377-M507	CTG	IMPULSE MK85 MOD 0
1377-M509	CTG	IMPULSE MK9 MOD 0
1377-M514	CTG	IMPULSE MK44 MOD 0
1377-M519	CTG	IMPULSE MK51 MODS 0/1
1377-M523	CTG	IMPULSE MK105 MOD 0

TABLE II-2
LIST OF MUNITIONS (BY DODAC NUMBER)
TREATED BY DETONATION AT NEW BOMB

DODAC Number	Type of Munition[1]	Description[2]
1377-M571	CTG	IMPULSE GAS GENERATOR
1377-M928	RCKT MTR	MK82 MOD 0
1390-N538	PRIMER	ELEC MK49 MOD 4
1390-N634	BOOSTER	FUZE M125A1
SPCF	SINGLE BASE	NAVAL PROPELLANT
SPCG	TRIPLE BASE	NAVAL PROPELLANT
SPD	SINGLE BASE	NAVAL PROPELLANT
SPDF	SINGLE BASE	NAVAL PROPELLANT
SPDN	SINGLE BASE	NAVAL PROPELLANT

[1] Abbreviations for "Type"

ACTVR	Activator	FLARE	Flare	PROJ	Projectile
CAN	Canister	FUZE or FUSE	Fuse	RCA	Riot control agent
CAP	Blasting cap	GM	Guided missile	RCKT	Rocket
CHG	Charge	GRENADE	Grenade	RCKT MTR	Rocket motor
CORD	Detonation cord	IGNITER	Igniter	REDUCER	Reducer
CTG	Cartridge	LCR&CTG	Launcher and cartridge	SIGNAL	Signal
DEMO KIT	Demolitions kit			SIM	Simulator
DYNA	Dynamite	MINE	Mine	SMK POT	Smoke pot
FD	Firing device	PRIMER	Primer		

[2] Abbreviations for "Description"

ACFT	Aircraft	GREN	Grenade	PERC	Percussion
AP	Armor piercing	GRN	Green	PKG	Package
APER	Anti-personnel	GRND	Ground	PRAC	Practice
API	Armor piercing incendiary	HC	Hexachloroethane-zinc	PROP	Propellant
API-T	Armor piercing incendiary - tracer	HE	High explosive	PROX	Proximity
		HEAT	High explosive antitank	RD	Round
ARTY	Artillery	HEDP	High explosive dual purpose	RHF	Right hand feed
ASSY	Assembly	HEI	High explosive incendiary	RP	Red phosphorus
AT	Antitank	HEI-T	High explosive incendiary – tracer	SEC	Second
BL-P	Blind loaded and plugged			SIM	Simulator
BL-T	Blind loaded tracer	HEP	High explosive plastic	SMK	Smoke
CAL	Caliber	ILLUM	Illuminating	SNGL	Single
CHEM	Chemical	IN	Inch	STD	Standard
CHG	Charge	INCD	Incendiary	SUB-CAL	Sub-caliber
CNTR	Container	LHF	Left hand feed	SURF	Surface
COMP	Composition	LNCHR	Launcher	TORP	Torpedo
CTN	Carton	LNKD	Linked	TOW	Tube launched, Optically sighted. Wire guided
DEMO	Demolition	MG	Minigun		
ELEC	Electric	MICLIC	Mine Clearing Line Charge	TP	Target practice

EXPL	Explosive
EXT	Extended
F/	For
FRAG	Fragmentation
GAGE	Gauge
GB	Green bag
MM	Millimeter
MOD	Model
MTL	Metal
MTSQ	Mechanical time, super quick
PARA	Parachute
PD	Point detonating
TP-T	Target practice - tracer
TPDS	Target practice discarding sabot
TR	Tracer
TRNR	Trainer
VIO	Violet
W/O	Without
W/	With
WB	White Bag
WDN	Wooden
WP	White phosphorus
WPNS	Weapons
WRBND	Wire bound
YLW	Yellow

TABLE II 3 A

CHEMICAL COMPOSITION OF ENERGETIC IN ITEMS TREATED BY DETONATION AT NEW BOMB

DODAC Number	Item	Energetic Constituent	Weight (lb)	Weight Percent	Hazardous Waste Code
1305-A974	Cartridge, 25-mm APDS-T Lnkd, M791	Nitrocellulose Dinitrotoluene Potassium Sulfate Diphenylamine Graphite	2.02E-1 1.54E-2 1.32E-3 1.98E-3 4.41E-4	91.4 7.0 0.6 0.9 0.2	D003, D030
1305-A975	Cartridge, 25-mm HEI-T Lnkd, M792	HMX Nylon Nitrocellulose Dinitrotoluene Potassium Sulfate Diphenylamine Graphite	5.20E-2 2.74E-3 1.90E-1 1.45E-2 1.25E-3 1.87E-3 4.16E-4	19.79 1.04 72.30 5.52 0.48 0.71 0.16	D003, D030
1305-A976	Cartridge, 25-mm TP-T Lnkd, M793	Nitrocellulose Dinitrotoluene Potassium Sulfate Diphenylamine Graphite	2.02E-1 1.54E-2 1.32E-3 1.98E-3 4.41E-4	91.4 7.0 0.6 0.9 0.2	D003, D030
1305-A978	Cartridge, 25-mm TP Sngl Rd, PGU-23/U	Nitrocellulose Dinitrotoluene Potassium Sulfate Diphenylamine Graphite	1.91E-1 1.47E-2 1.26E-3 1.89E-3 4.19E-4	91.4 7.0 0.6 0.9 0.2	D003, D030
1305-B112	Cartridge, 30-mm HEI Lnkd LHF, MK3Z	PETN TNT	1.1E-1 1.1E-1	50 50	D003, D030
1305-B113	Cartridge, 30-mm TP Lnkd LHF, MK4Z	Nitrocellulose Dinitrotoluene Potassium Sulfate Diphenylamine Graphite	9.25E-2 7.1E-3 6.0E-4 9.0E-4 2.0E-4	91.4 7.0 0.6 0.9 0.2	D003, D030
1305-B114	Cartridge, 30-mm HEI Lnkd RHF, M3Z-1	PETN TNT	1.4E-1 1.4E-1	50 50	D003, D030
1305-B115	Cartridge, 30-mm TP Lnkd RHF, MK4Z	Nitrocellulose Dinitrotoluene Potassium Sulfate Diphenylamine Graphite	9.25E-2 7.1E-3 6.08E-4 9.12E-4 2.03E-4	91.4 7.0 0.6 0.9 0.2	D003, D030
1305-B124	Cartridge, 30-mm HEI Lnkd LHF, M799	PETN TNT	1.0E-1 1.0E-1	50 50	D003, D030
1305-B125	Cartridge, 30-mm HEI Lnkd RHF, M799	PETN TNT	1.0E-1 1.0E-1	50 50	D003, D030
1310-B470	Cartridge, 40-mm HE Lnkd, M384 Series	RDX Wax Nitrocellulose Nitroglycerin Potassium Nitrate Lead Compounds Antimony Sulfide Barium Nitrate Ethyl Centralite Potassium Chlorate	1.18E-1 1.8E-3 7.92E-3 1.99E-3 8.1E-5 1.49E-4 1.3E-5 1.5E-4 6.1E-5 2.7E-5	90.63 1.38 6.08 1.53 0.06 0.11 0.01 0.12 0.05 0.02	D003, D005, D008

TABLE II 3 A CONTINUED
CHEMICAL COMPOSITION OF ENERGETIC IN ITEMS TREATED BY DETONATION AT NEW BOMB

DODAC Number	Item	Energetic Constituent	Weight (lb)	Weight Percent	Hazardous Waste Code
1310-B480	Cartridge, 40-mm TP Lnkd F/Heli Launcher, M385	Nitrocellulose	7.60E-3	77.27	D003, D005, D008
		Nitroglycerin	1.91E-3	19.46	
		Potassium Nitrate	7.43E-5	0.76	
		Antimony Sulfide	8.57E-6	Trace	
		Barium Nitrate	1.37E-4	1.39	
		Ethyl Centralite	5.86E-5	0.60	
		Lead Azide	2.86E-6	0.03	
		Potassium Chlorate	2.71E-5	0.28	
		Lead Thiocyanate	1.29E-5	0.13	
1310-B534	Cartridge, 40-mm MO, M576	Metal Pellets	5.28E-2	99.12	D003, D005, D008
		Antimony Sulfide	8.57E-6	0.02	
		Barium Nitrate	5.71E-6	0.01	
		Nitrocellulose	3.21E-4	0.60	
		Nitroglycerin	8.14E-5	0.15	
		Potassium Nitrate	2.86E-6	5.37E-3	
		Lead Azide	2.86E-6	5.37E-3	
		Graphite	1.43E-6	2.69E-3	
		Ethyl Centralite	2.86E-6	5.37E-3	
		Potassium Chlorate	2.71E-6	0.05	
		Lead Thiocyanate	1.29E-5	0.02	
1310-B542	Cartridge, 40-mm HEDP, M430	Lead Azide	2.68E-4	0.28	D003, D005, D008
		Antimony Sulfide	1.29E-5	0.01	
		Barium Nitrate	1.50E-4	0.16	
		Tetracene	1.43E-6	0.01	
		Nitrocellulose	7.92E-3	8.29	
		Nitroglycerin	1.99E-3	2.09	
		Potassium Nitrate	8.14E-5	0.08	
		RDX	8.24E-2	86.34	
		Tetryl	1.23E-3	1.30	
		Desensitizer	1.25E-3	1.31	
		Ethyl Centralite	6.14E-5	0.06	
		Potassium Chlorate	2.71E-5	0.03	
1310-B545	Cartridge, 40-mm Blank Saluting	Sodium Nitrate	5.78E-1	75	D003
		Charcoal	1.16E-1	15	
		Sulfur	7.71E-2	10	
1310-B551	Cartridge, 40-mm AP Clipped, M81A1	Potassium: Nitrate + Chlorate	6.85E-3	0.99	D003, D005, D008, D030
		Lead Thiocyanate	3.57E-5	Trace	
		Antimony Sulfide	2.43E-5	Trace	
		Nitrocellulose	5.52E-1	80.23	
		Dinitrotoluene	6.49E-2	9.44	
		Dibutylphthalate	3.25E-2	4.72	
		Diphenylamine	6.49E-3	0.94	
		Strontium Nitrate	1.12E-2	1.62	
		Magnesium	7.50E-3	1.09	
		Aluminum	3.80E-4	0.05	
		Polyvinyl Chloride	1.40E-3	0.20	
		Barium Peroxide	2.30E-3	0.33	

TABLE II 3 A CONTINUED
CHEMICAL COMPOSITION OF ENERGETIC IN ITEMS TREATED BY DETONATION AT NEW BOMB

DODAC Number	Item	Energetic Constituent	Weight (lb)	Weight Percent	Hazardous Waste Code
1310-B480	Cartridge, 40-mm TP Lnkd F/Heli Launcher, M385	Nitrocellulose	7.60E-3	77.27	D003, D005, D008
		Nitroglycerin	1.91E-3	19.46	
		Potassium Nitrate	7.43E-5	0.76	
		Antimony Sulfide	8.57E-6	Trace	
		Barium Nitrate	1.37E-4	1.39	
		Ethyl Centralite	5.86E-5	0.60	
		Lead Azide	2.86E-6	0.03	
		Potassium Chlorate	2.71E-5	0.28	
		Lead Thiocyanate	1.29E-5	0.13	
1310-B534	Cartridge, 40-mm MO, M576	Metal Pellets	5.28E-2	99.12	D003, D005, D008
		Antimony Sulfide	8.57E-6	0.02	
		Barium Nitrate	5.71E-6	0.01	
		Nitrocellulose	3.21E-4	0.60	
		Nitroglycerin	8.14E-5	0.15	
		Potassium Nitrate	2.86E-6	5.37E-3	
		Lead Azide	2.86E-6	5.37E-3	
		Graphite	1.43E-6	2.69E-3	
		Ethyl Centralite	2.86E-6	5.37E-3	
		Potassium Chlorate	2.71E-6	0.05	
		Lead Thiocyanate	1.29E-5	0.02	
1310-B542	Cartridge, 40-mm HEDP, M430	Lead Azide	2.68E-4	0.28	D003, D005, D008
		Antimony Sulfide	1.29E-5	0.01	
		Barium Nitrate	1.50E-4	0.16	
		Tetracene	1.43E-6	0.01	
		Nitrocellulose	7.92E-3	8.29	
		Nitroglycerin	1.99E-3	2.09	
		Potassium Nitrate	8.14E-5	0.08	
		RDX	8.24E-2	86.34	
		Tetryl	1.23E-3	1.30	
		Desensitizer	1.25E-3	1.31	
		Ethyl Centralite	6.14E-5	0.06	
		Potassium Chlorate	2.71E-5	0.03	
1310-B545	Cartridge, 40-mm Blank Saluting	Sodium Nitrate	5.78E-1	75	D003
		Charcoal	1.16E-1	15	
		Sulfur	7.71E-2	10	
1310-B551	Cartridge, 40-mm AP Clipped, M81A1	Potassium: Nitrate + Chlorate	6.85E-3	0.99	D003, D005, D008, D030
		Lead Thiocyanate	3.57E-5	Trace	
		Antimony Sulfide	2.43E-5	Trace	
		Nitrocellulose	5.52E-1	80.23	
		Dinitrotoluene	6.49E-2	9.44	
		Dibutylphthalate	3.25E-2	4.72	
		Diphenylamine	6.49E-3	0.94	
		Strontium Nitrate	1.12E-2	1.62	
		Magnesium	7.50E-3	1.09	
		Aluminum	3.80E-4	0.05	
		Polyvinyl Chloride	1.40E-3	0.20	
		Barium Peroxide	2.30E-3	0.33	

TABLE II 3 A CONTINUED
CHEMICAL COMPOSITION OF ENERGETIC IN ITEMS TREATED BY DETONATION AT NEW BOMB

DODAC Number	Item	Energetic Constituent	Weight (lb)	Weight Percent	Hazardous Waste Code
1310-B553	Cartridge, 40-mm HEP MK2	Nitrocellulose	6.11E-1	69.77	D003, D008, D030
		TNT	1.40E-1	15.99	
		Dinitrotoluene	7.19E-2	8.21	
		Dibutylphthalate	3.60E-2	4.11	
		Diphenylamine	7.19E-3	0.82	
		Potassium Nitrate + Chlorate	6.86E-3	0.78	
		Charcoal	1.43E-3	0.16	
		Sulfur	9.51E-4	0.11	
		Lead Azide + Thiocyanate	2.91E-4	0.03	
		Antimony Sulfide	4.57E-5	0.01	
1310-B555	Cartridge, 40-mm HEI-P MK2	Nitrocellulose	6.11E-1	69.77	D003, D008, D030
		TNT	1.40E-1	15.99	
		Dinitrotoluene	7.19E-2	8.21	
		Dibutylphthalate	3.60E-2	4.11	
		Diphenylamine	7.19E-3	0.82	
		Potassium Nitrate + Chlorate	6.86E-3	0.78	
		Charcoal	1.43E-3	0.16	
		Sulfur	9.51E-4	0.11	
		Lead Azide + Thiocyanate	2.91E-4	0.03	
		Antimony Sulfide	4.57E-5	0.01	
1310-B556	Cartridge, 40-mm HEI-P-NP	TNT	2.03E-1	100	D003, D030
1310-B557	Cartridge, 40-mm HEI-SD 4/Clip	TNT	2.03E-1	100	D003, D030
1310-B558	Cartridge, 40-mm HEI-T-NSD 4/Clip	TNT	2.03E-1	100	D003, D030
1310-B559	Cartridge, 40-mm HE-T-SD 4/Clip	Nitrocellulose	6.12E-1	70.38	D003, D008, D030
		Dinitrotoluene	7.20E-2	8.38	
		Diphenylamine	7.20E-3	0.83	
		Dibutylphthalate	2.88E-2	3.31	
		Potassium Chlorate	9.95E-5	0.01	
		Antimony Sulfide	4.81E-5	5.53E-3	
		Potassium Nitrate	6.86E-3	0.79	
		Charcoal	1.37E-3	0.16	
		Sulfur	9.14E-4	0.11	
		Lead	2.63E-4	0.03	
		TNT	1.4E-1	16.10	
		Carborundum	3.57E-6	4.11E-4	
		Lead Sulfocyanate	3.57E-5	4.11E-3	
1310-B560	Cartridge, 40-mm HEI-T-DI-SD	TNT	2.03E-1	100	D003, D030
1310-B561	Cartridge, 40-mm HE-P	TNT	2.03E-1	100	D003, D030
1310-B562	Cartridge, 40-mm HE-T-SD, MK2	TNT	2.03E-1	100	D003, D030
1310-B563	Cartridge, 40-mm BL-P	Nitrocellulose	6.04E-1	91.4	D003, D030
		Dinitrotoluene	4.62E-2	7.0	
		Potassium Sulfate	3.96E-3	0.6	
		Diphenylamine	5.95E-3	0.9	
		Graphite	1.32E-3	0.2	

TABLE II 3 A CONTINUED
CHEMICAL COMPOSITION OF ENERGETIC IN ITEMS TREATED BY DETONATION AT NEW BOMB

DODAC Number	Item	Energetic Constituent	Weight (lb)	Weight Percent	Hazardous Waste Code
1310-B564	Cartridge, 40-mm BL-T 4/Clip	Nitrocellulose	6.04E-1	91.4	D003, D030
		Dinitrotoluene	4.62E-2	7.0	
		Potassium Sulfate	3.96E-3	0.6	
		Diphenylamine	5.95E-3	0.9	
		Graphite	1.32E-3	0.2	
1310-B568	Cartridge, 40-mm, M406	RDX	4.23E-2	59.22	D003, D005, D008, D030
		Trinitrotoluene	2.75E-2	38.50	
		Wax	7.04E-4	0.99	
		Lead Compounds	1.49E-4	0.20	
		Antimony Sulfide	1.29E-5	0.02	
		Barium Nitrate	7.14E-6	0.01	
		Nitrocellulose	4.21E-4	0.59	
		Nitroglycerin	2.91E-4	0.41	
		Potassium Nitrate	1.14E-5	0.02	
		Potassium Chlorate	2.71E-5	0.04	
		Ethyl Centralite	5.71E-6	0.01	
1310-B569	Cartridge, 40-mm HE, M406	Antimony Sulfide	1.29E-5	0.02	D003, D005, D008, D030
		Barium Nitrate	7.14E-6	0.01	
		Tetracene	1.43E-6	Trace	
		Nitrocellulose	4.21E-4	0.59	
		Nitroglycerin	2.91E-4	0.41	
		Potassium Compounds	3.85E-5	0.05	
		Lead Compounds	1.49E-4	0.21	
		TNT	2.75E-2	38.52	
		Ethyl Centralite	5.71E-6	Trace	
		Wax	7.04E-4	0.99	
		RDX	4.23E-2	59.32	
1310-B572	Cartridge, 40-mm HE Lnkd, M384 Series	RDX	1.18E-1	90.63	D003, D005, D008
		Desensitizer	1.8E-3	1.38	
		Nitrocellulose	7.92E-3	6.08	
		Nitroglycerin	1.99E-3	1.53	
		Potassium Nitrate	8.1E-5	0.06	
		Lead Compounds	1.49E-4	0.11	
		Antimony Sulfide	1.3E-5	0.01	
		Barium Nitrate	1.5E-4	0.12	
		Ethyl Centralite	6.1E-5	0.05	
		Potassium Chlorate	2.7E-5	0.02	
1310-B576	Cartridge, 40-mm TP LNKD, M385	Nitrocellulose	7.6E-3	77.07	D003, D005, D008
		Nitroglycerin	1.91E-3	19.37	
		Potassium Nitrate	7.43E-5	0.75	
		Antimony Sulfide	8.57E-6	0.09	
		Barium Nitrate	1.37E-4	1.39	
		Graphite	3.0E-5	0.30	
		Ethyl Centralite	5.86E-5	0.59	
		Lead Azide	2.86E-6	0.03	
		Potassium Chlorate	2.71E-5	0.28	
		Lead Thiocyanate	1.29E-5	1.31E-3	
1310-B666	Cartridge, 3 Pounder BLNK, MK1-1	Potassium Nitrate	7.5E-1	75	D003
		Charcoal	1.5E-1	15	
		Sulfur	1.0E-1	10	
1315-C025	Cartridge, 75-mm Blank, M337A2	Potassium Nitrate	7.6E-1	75	D003
		Charcoal	1.5E-1	15	
		Sulfur	1.0E-1	10	
		Potassium Chlorate	7.5E-5	0.01	

TABLE II 3 A CONTINUED
CHEMICAL COMPOSITION OF ENERGETIC IN ITEMS TREATED BY DETONATION AT NEW BOMB

DODAC Number	Item	Energetic Constituent	Weight (lb)	Weight Percent	Hazardous Waste Code
1315-C162	Cartridge, 3-in 50 Cal VT Non-frag, MK33	Nitrocellulose	4.04E0	72.66	D003, D030
		Dinitrotoluene	3.10E-1	5.56	
		Potassium Sulfate	2.65E-2	0.47	
		Diphenylamine	3.98E-2	0.72	
		Graphite	8.84E-3	0.16	
		Potassium Nitrate	8.55E-1	15.35	
		Charcoal	1.71E-1	3.07	
		Sulfur	1.14E-1	2.05	
1315-C164	Cartridge, 3-in 50 Cal VT Non-frag, MK33	Nitrocellulose	4.04E0	72.53	D003, D030
		Dinitrotoluene	3.10E-1	5.57	
		Potassium Sulfate	2.65E-2	0.48	
		Diphenylamine	3.98E-2	0.72	
		Graphite	8.84E-3	0.16	
		Potassium Nitrate	8.55E-1	15.35	
		Charcoal	1.71E-1	3.07	
		Sulfur	1.14E-1	2.05	
1315-C183	Cartridge, 3-in 50 Cal Blank	Sodium Nitrate	1.51E0	75	D003
		Charcoal	3.01E-1	15	
		Sulfur	2.01E-1	10	
1315-C319	Cartridge, 3-in 50 Cal VT Non-frag, MK31	Nitrocellulose	4.04E0	72.53	D003, D030
		Dinitrotoluene	3.10E-1	5.57	
		Potassium Sulfate	2.65E-2	0.48	
		Diphenylamine	3.98E-2	0.72	
		Graphite	8.84E-3	0.16	
		Potassium Nitrate	8.55E-1	15.35	
		Charcoal	1.71E-1	3.07	
		Sulfur	1.14E-1	2.05	
1315-C320	Cartridge, 3-in 50 Cal VT Non-frag, MK31	Nitrocellulose	4.04E0	72.53	D003, D030
		Dinitrotoluene	3.10E-1	5.57	
		Potassium Sulfate	2.65E-2	0.48	
		Diphenylamine	3.98E-2	0.72	
		Graphite	8.84E-3	0.16	
		Potassium Nitrate	8.55E-1	15.35	
		Charcoal	1.71E-1	3.07	
		Sulfur	1.14E-1	2.05	
1315-C373	Cartridge, 3-in 50 Cal VT Non-frag, MK36 NFL	Nitrocellulose	5.99E0	77.85	D003, D030
		Dinitrotoluene	4.58E-01	5.96	
		Potassium Sulfate	3.93E-2	0.51	
		Diphenylamine	5.90E-2	0.77	
		Graphite	1.31E-2	0.17	
		Sodium Nitrate	8.55E-1	11.12	
		Charcoal	1.71E-1	2.22	
		Sulfur	1.14E-1	1.48	
1315-C375	Cartridge, 3-in 50 Cal VT Non-frag, MK36 NFL	Nitrocellulose	5.99E0	77.85	D003, D030
		Dinitrotoluene	4.58E-1	5.96	
		Potassium Sulfate	3.93E-2	0.51	
		Diphenylamine	5.90E-2	0.77	
		Graphite	1.31E-2	0.17	
		Sodium Nitrate	8.55E-1	11.12	
		Charcoal	1.71E-1	2.22	
		Sulfur	1.14E-1	1.48	

TABLE II 3 A CONTINUED
CHEMICAL COMPOSITION OF ENERGETIC IN ITEMS TREATED BY DETONATION AT NEW BOMB

DODAC Number	Item	Energetic Constituent	Weight (lb)	Weight Percent	Hazardous Waste Code
1315-C697	Cartridge, 4.2-in HE w/o Fuze, M329A2	RDX TNT Nitroglycerin Nitrocellulose Wax Potassium Nitrate Methylphthalate Charcoal Ethyl Centralite Sulfur	3.45E0 2.61E0 2.58E-1 3.13E-1 5.75E-2 2.66E-2 1.8E-2 3.75E-3 3.6E-3 2.5E-3	51.19 38.69 3.83 4.65 0.85 0.40 0.27 0.06 0.05 0.04	D003, D030
1315-F382	Bomb, Adapter Booster, Mod TA6E4	Tetryl	9.04E-1	100	D003
1320-D579	Projectile, 155-mm HE RAP, M549 Series (COMP B)	RDX TNT Wax Nitrocellulose Dinitrotoluene Diphenylamine Dibutylphthalate Lead Compounds Antimony Sulfide Potassium Sulfate Tetryl	9.6E0 6.6E0 1.6E-1 1.12E1 1.31E0 1.31E-1 5.25E-1 1.23E-3 7.0E-5 1E-3 4.95E-2	31.43 21.63 0.524 36.52 4.30 0.43 1.72 4.03E-3 2.30E-4 3.27E-3 0.16	D003, D008, ,D030
1325-E463	Bomb, GP 250 lb, MK81 Mod 1 (H-6/Tritonal)	TNT Powdered Aluminum	80.0 20.0	80 20	D003, D030
1325-E464	Bomb, GP 250 lb, MK81 Mod 0 (Tritonal)	TNT Powdered Aluminum	80.0 20.0	80 20	D003, D030
1325-E465	Bomb, GP 250 lb, MK81 Mod 1 (H-6, Tritonal)	TNT Powdered Aluminum	80.0 20.0	80 20	D003, D030
1325-E485	Bomb, GP 550 lb, MK82 Mod 1 (Tritonal)	TNT Powdered Aluminum	153.6 38.4	80 20	D003, D030
1325-E506	Bomb, GP 1000 lb, MK83 Mod 4	RDX TNT Powdered Aluminum Paraffin Nitrocellulose Calcium Chloride Lecithin	200.25 133.50 89.00 17.80 3.12 1.34 0.45	45.0 30.0 20.0 4.0 0.7 0.3 0.1	D003, D030
1325-E807	Dispenser and Bomb, ACFT LS FAE, CBU 55/B	Ethylene Oxide PETN	216.00 2.36	98.92 1.08	D001, D003
1325-E820	Dispenser and Bomb, ACFT, CBU 59/B	HMX Nylon	80.46 5.14	94 6	D003
1325-F372	Adapter, Booster, T45E7	Tetryl	NA	100	D003
1330-G881	Grenade, Hand Frag, M67	RDX TNT Wax	2.47E-1 1.58E-1 4.0E-3	60.39 38.63 0.01	D003, D030
1330-G890	Grenade, Hand Frag, MK2/ M26 Series	RDX TNT Wax Tetryl Pellets	2.06E-1 2.55E-1 3.0E-3 1.9E-2	42.04 54.04 0.01 3.88	D003, D030
1330-GB92	Grenade, Hand Frag, MK2A1	TNT	1.0E-1	100	D003, D030

TABLE II 3 A CONTINUED
CHEMICAL COMPOSITION OF ENERGETIC IN ITEMS TREATED BY DETONATION AT NEW BOMB

DODAC Number	Item	Energetic Constituent	Weight (lb)	Weight Percent	Hazardous Waste Code
1330-G911	Grenade, Hand Off, MK3A2	TNT Lead Compounds Barium Compounds RDX Zirconium Powder Nickel Powder Potassium Perchlorate	5.0E-1 7.4E-4 1.7E-3 1.9E-3 3.25E-4 4.17E-4 4.0E-4	99.0 0.14 0.34 0.38 0.06 0.08 0.08	D003, D005, D008, D030
1330-G970	Grenade, Rifle Heat, M28/M31	RDX TNT Wax Lead Azide PETN Tetryl	3.72E-1 2.41E-1 6E-3 2.57E-4 3.57E-4 1.2E-2	58.95 38.19 0.95 0.04 0.05 1.90	D003, D008, D030
1340-H342	Rocket Motor, JATO, MK25 Mod 1	Ammonium Nitrate	122.0	100	D003
1340-H343	Rocket Motor, JATO, MK7 Mod 2 w/o Igniter	Ammonium Perchlorate	117.5	100	D003
1340-H345	Rocket Motor, JATO, MK7 Mod 1 w/o Igniter	Ammonium Perchlorate	117.5	100	D003
1345-K090	Mine, AP, M2 Series	Potassium Nitrate Charcoal Sulfur Lead Azide Tetryl TNT	5.77E-3 1.15E-3 7.70E-4 5.83E-4 3.56E-2 3.4E-1	1.50 0.30 0.20 0.15 9.27 88.56	D003, D008, D030
1345-K092	Mine, APER Bounding, M16 Series	TNT Potassium Perchlorate Potassium Nitrate Charcoal Sulfur Barium Chromate Zirconium Nickel Alloy	1.3E0 1.46E-4 1.05E-3 2.23E-4 1.48E-4 6.26E-4 1.18E-4 1.53E-4	99.80 0.01 0.08 0.02 0.01 0.05 0.09 0.01	D003, D005, D030
1345-K121	Mine, APERS, M14	Tetryl	6.25E-1	100	D003
1345-K143	Mine, APERS w/M57 Firing Device, M18A1	RDX Lead Compounds PETN Barium Chromate	1.43E0 2.21E-3 7.71E-4 1.39E-4	99.79 0.15 0.05 0.01	D003, D005, D008
1345-K146	Mine, APERS, M26	RDX TNT Wax	NA	60 39 1	D003, D030
1345-K181	Mine, AT Heavy, M21	RDX Lead Azide TNT Powdered Aluminum Wax Nitrocellulose Calcium Chloride Lecithin	4.89E0 1.28E-3 3.24E0 2.16E0 4.32E-1 7.56E-2 3.24E-2 2.81E-4	45.15 0.01 29.9 19.9 3.099 0.70 0.10 2.60E-3	D003, D008, D030
1345-K250	Mine, AT Heavy Non-metallic, M19	RDX TNT Wax Potassium Chlorate Lead Compounds Antimony Sulfide	1.27E1 8.19E0 2.1E-1 1.23E-4 6.08E-4 4.0E-5	60.22 38.78 0.99 5.82E-4 2.88E-3 1.89E-4	D003, D008, D030

TABLE II 3 A CONTINUED

CHEMICAL COMPOSITION OF ENERGETIC IN ITEMS TREATED BY DETONATION AT NEW BOMB

DODAC Number	Item	Energetic Constituent	Weight (lb)	Weight Percent	Hazardous Waste Code
1370-L377	Simulator, Expl, MK2 Mod 0	Potassium Nitrate Charcoal Sulfur	9.90E-3 1.98E-3 1.32E-3	75 15 10	D003
1370-L594	Simulator, Proj Grnd Burst, M115A1	Aluminum Powder Magnesium-Type 1 Potassium Perchlorate Sodium Salicylate Red Gum	4.06E-2 5.30E-2 6.54E-2 1.23E-3 1.31E-4	25.37 33.12 40.87 0.77 0.08	D003
1370-L596	Simulator, Flash Artillery, M110	Potassium Nitrate Sulfur Charcoal Potassium Chlorate Diazodinitrophenol Charcoal Nitrostarch	NA	1.24 0.17 0.26 59.0 19.7 14.8 4.9	D003
1375-M023	Charge, Demo Block 1 1/4 Lb. Comp C-4, M112	RDX Non-explosive plasticizers, Teflon	3.41E1 3.38E0	91 9	D003
1375-M026	Demo Kit, Bangalore Torp, M1A1	Amatol TNT	81 9	90 10	D003, D030
1375-M031	Charge, Demo Block TNT 1/2 Lb.	TNT	5.0E-1	100	D003, D030
1375-M032	Charge, Demo Block TNT 1 Lb.	TNT	1.00E0	100	D003, D030
1375-M034	Charge, Demo Block TNT 8 Lb.	TNT	8.00E0	100	D003, D030
1375-M035	Charge, Demo Chain, M1 8 X 2 1/2 Lb.	Tetryl TNT	15.09 5.03	75 25	D003, D030
1375-M420	Charge, Demo Shaped, M2 Series	RDX TNT Wax	6.60E0 4.29E0 1.1E-1	60 39 1	D003, D030
1375-M421	Charge, Demo Shaped, 40 lb, M3 Series	RDX TNT PETN Lead Azide Cellulose	27.5E0 11.95E0 1.25E0 1.0E-3 1.0E-2	67.55 29.35 3.07 0.01 0.02	D003, D008, D030
1375-M445	Demo Kit, Proj Chg AP M1/ M1A1	PETN	4.60E1	100	D003
1375-M456	Cord, Type 1 Class E (PETN) @ 1000 ft.	PETN	2.48E0	100	D003
1375-M591	Military Dynamite, M1	RDX TNT Starch SAE No. 10 Oil Polyisobutylene	NA	75 15 5 4 1	D003, D030
1375-M757	Charge, Assy Demo Comp C-4 8x2 1/2 Lb., M183	RDX Sebacate Polyisobutylene Motor Oil	1.83E1 1.06E0 4.2E-1 3.2E-1	91 5.3 2.1 1.6	D003
1377-M500	Cutter, Ctg Act F/Reefing Line, M21	Nitrocellulose Diphenylamine	NA	50 50	D003
1390-N538	Primer, Elec, MK49 Mod 4	Potassium Nitrate Charcoal Sulfur	4.23E-2 8.91E-3 5.94E-3	74.0 15.6 10.4	D003

TABLE II 3 A CONTINUED

CHEMICAL COMPOSITION OF ENERGETIC IN ITEMS TREATED BY DETONATION AT NEW BOMB

DODAC Number	Item	Energetic Constituent	Weight (lb)	Weight Percent	Hazardous Waste Code
SPCF Single-Base (No DODAC No.)	Naval propellant	Nitrocellulose Ethyl centralite Butyl stearate Potassium sulfate Lead carbonate	NA	93.75 1.0 3.0 1.25 1.0	D003
SPCG Triple-Base (No DODAC No.)	Naval propellant	Nitrocellulose Nitroglycerine Nitroguanidine Ethyl centralite Potassium sulfate	NA	18.0 19.0 55.0 7.0 1.0	D003
SPD Single-Base (No DODAC No.)	Naval propellant	Nitrocellulose Diphenylamine	NA	99.0 1.0	D003
SPDF Single-Base (No DODAC No.)	Naval propellant	Nitrocellulose Diphenylamine Potassium sulfate	NA	97.0 1.0 2.0	D003
SPDN Single-Base (No DODAC No.)	Naval Propellant	Nitrocellulose Diphenylamine Dinitrotoluene Dibutyl Phthalate Potassium sulfate	NA	84.0 1.0 10.0 3.0 2.0	D003

Weights and percentages of energetics are estimates in some cases. Where percentages vary for a constituent, midpoints were chosen. Total percentage may not equal 100 percent.

Sources:

Department of the Army, Material Development and Readiness Command, DARCOM Pamphlet 700-32, Complete Round Charts, Ammunition through 20 mm, November 4, 1976.

U.S. Army, Environmental Hygiene Agency, Air Pollution Engineering Division, U.S. Army Propellant/Munition Compositions (Draft), August 1989/May 1990.

TM 43-0001-28, Technical Manual Army Ammunition Data Sheets, Artillery Ammunition Guns, Howitzers, Mortars, Recoilless Rifles, Grenade Launchers, and Artillery Fuzes, April 1977.

DARCOM-P 700-3-3, Logistics Complete Round Charts, Activity Ammunition and Fuzes, June 1980.

AMC Pamphlet 700-3-5, Logistics Complete Round Charts Grenades, Mines, Pyrotechnics, Rockets, Rocket Motors, Demolition Material, May 1975 and May 1970.

TM 43-0001-29, Technical Manual, Army Ammunition Data Sheets for Grenades, HQ Department of Army, October 1977.

FM 5-25, Department of the Army Field Manual, Explosives and Demolitions, HQ Department of the Army, February 1971.

TM 43-0001-36, Technical Manual, Army Ammunition Data Sheets for Land Mines (FSC 1345), HQ Department of the Army, February 1977.

NAVSEA SN060-AA-MMA-010 (formerly OP 2212) 0640-LP-285-9800, First Revision, Technical Manual Demolition Materials, September 1, 1989.

Rudolf Meyer, Explosives, Third, Revised and Extended Edition. VCH Verlagsgesellschaft mbH, Weinheim, 1987.

IHTR, Computer Predictions of Pollution Products from Open Burning and Open Detonation of Explosives and Propellants, Final Report, August 4, 1989. Indian Head, Maryland.

TABLE II-3B

REPRESENTATIVE MUNITION CLASS COMPOSITIONS FOR OTHER ITEMS TREATED BY DETONATION AT NEW BOMB

Munitions Class	Item		Constituents	Average Weight Percent[a]
	DODAC No.	Type[b]		
1a	1315-C139	CTG	Aluminum Powder	0.253
Small arms ammunition less than or equal to 50 caliber, all types			Antimony Sulfide	0.507
			Barium	4.185
			Barium Nitrate	1.854
			Calcium Carbonate	0.553
			Calcium Resinate	0.360
			Calcium Silicide	0.660
			Charcoal	15.000
			Chlorinated Rubber	0.790
			Dibutylphthalate	3.793
			Dinitrotoluene	3.347
			Diphenylamine	0.978
			Ethyl Centralite	1.627
			Ethylene Dimethylacrylate	3.000
			Graphite	0.420
			Lead Styphnate	1.413
			Magnesium Powder	3.505
			Magnesium/Aluminum Alloy	2.750
			Nitrocellulose	74.616
			Nitroglycerin	15.633
			PETN	0.223
			Polyvinyl Chloride	2.173
			Potassium	1.230
			Potassium Nitrate	15.600
			Potassium Sulfate	1.082
			Sodium Sulfate	0.333
			Sodium Sulfide	0.490
			Strontium	7.007
			Strontium Nitrate	7.200
			Strontium Peroxide	1.700
			Sulfur	10.000
			Tetracene	0.225

TABLE II-3B (CONTINUED)
REPRESENTATIVE MUNITION CLASS COMPOSITIONS FOR OTHER ITEMS TREATED BY DETONATION AT NEW BOMB

Munitions Class	Item		Constituents	Average Weight Percent[a]
	DODAC No.	Type[b]		
1b	1325-F679	FUZE	Aluminum	9.840
Fuzes, all types	1325-F681	FUZE	Aluminum Powder	0.120
	1325-F720	FUZE	Antimony Sulfide	0.596
	1325-F724	FUZE	Barium	2.925
	1325-F837	FUZE	Barium Chromate	5.066
	1325-G104	FUZE	Barium Nitrate	0.758
	1325-G109	FUZE	Boron Powder	0.020
	1390-N634	BOOSTER	Calcium Stearate	0.120
			Carborundum	0.010
			Charcoal	10.964
			Ferric Oxide	0.390
			Ground Glass	0.190
			Hexachlorobenzene	14.740
			Iron Oxide	5.765
			Lead	23.079
			Lead Azide	27.203
			Lead Styphnate	2.113
			Lead Thiocyanate	0.700
			Magnesium Powder	13.630
			Nickel Alloy	6.120
			Nickel Powder	0.490
			PETN	100.000
			Potassium Chlorate	0.530
			Potassium Nitrate	53.360
			Potassium Perchlorate	4.358
			Rareox	0.010
			RDX	71.748
			Silicon	16.885
			Sulfur	7.264
			Tetracene	0.286
			Tetryl	49.413
			Titanium	6.960
			Trinitrotoluene	0.075
			Vinyl Alcohol Acetate Resin	0.000
			Wax	1.480
			Zinc Powder	54.040
			Zirconium	4.720
			Zirconium Powder	1.112

TABLE II-3B (CONTINUED)
REPRESENTATIVE MUNITION CLASS COMPOSITIONS FOR OTHER ITEMS TREATED BY DETONATION AT NEW BOMB

Munitions Class	Item		Constituents	Average Weight Percent[a]
	DODAC No.	Type[b]		
1c	1325-F525	BURSTER	Aluminum Powder	8.583
Primers, squibs, detonators, and other devices used to initiate detonation or deflagration	1370-L621	STARTER	Ammonium Nitrate	75.000
			Antimony	50.000
			Antimony Sulfide	8.090
			Barium Nitrate	9.218
			Calcium Silicide	8.300
			Charcoal	13.791
			Diazodinitrophenol	20.000
			Dinitrocellulose	7.000
			Diphenylamine	25.450
			Ethyl Centralite	0.775
			Glass	10.250
			Graphite	0.200
			Ground Glass	10.500
			Gum Arabic	8.300
			Lead	60.000
			Lead Azide	41.120
			Lead Styphnate	4.675
			Lead Thiocyanate	31.673
			Magnesium	33.120
			Nitrocellulose	64.238
			Nitroglycerin	40.000
			Nitrostarch	5.000
			Pentaerythritol	0.140
			PETN	50.000
			Potassium Chlorate	34.367
			Potassium Nitrate	46.029
			Potassium Perchlorate	40.870
			Potassium Permanganate	50.000
			Potassium Sulfate	0.600
			RDX	56.667
			Red Gum	0.080
			Sodium Salicylate	0.770
			Sulfur	10.150
			Tetracene	4.452
			Tetryl	75.000
			Trinitrotoluene	14.912
			Wax	1.000

TABLE II-3B (CONTINUED)
REPRESENTATIVE MUNITION CLASS COMPOSITIONS FOR OTHER ITEMS TREATED BY DETONATION AT NEW BOMB

Munitions Class	Item		Constituents	Average Weight Percent[a]
	DODAC No.	Type[b]		
3	1370-L598	SIM	Acetone	0.000
Pyrotechnics	1370-L599	SIM	Aluminum Powder	13.750
	1370-L600	SIM	Antimony Sulfide	0.000
			Asphaltom	4.910
			Barium Chromate	3.700
			Barium Nitrate	20.645
			Binder	3.240
			Boron	0.410
			Calcium Phosphate	0.400
			Charcoal	2.732
			Cobalt Naphthanate	0.070
			Dextrin	0.020
			Diazodinitrophenol	6.567
			Dibutylphthalate	2.930
			Diethylphthalate	0.420
			Dinitrotoluene	9.860
			Diphenylamine	0.590
			First Fire	6.500
			Fuel Oil #6	7.860
			Hexachlorobenzene	0.030
			Lamanic	48.805
			Lead	0.015
			Lead Azide	0.000
			Lead Styphnate	0.000
			Lead Thiocyanate	0.010
			Linseed Oil	1.480
			Lupersol	0.070
			Magnesium	44.860
			Magnesium Powder	23.484
			Nitrocellulose	23.385
			Nitroglycerin	3.165
			Nitrostarch	1.633
			Potassium Chlorate	12.464
			Potassium Nitrate	1.278
			Potassium Perchlorate	0.040
			Sodium Nitrate	57.802
			Sodium Oxalate	0.050
			Strontium Nitrate	7.217
			Sulfur	0.207
			Trinitrotoluene	0.000
			Vinyl Alcohol Acetate Resin	0.990
			Wax	6.190

TABLE II-3B (CONTINUED)
REPRESENTATIVE MUNITION CLASS COMPOSITIONS FOR OTHER ITEMS TREATED BY DETONATION AT NEW BOMB

Munitions Class	Item		Constituents	Average Weight Percent[a]
	DODAC No.	Type[a]		
4B Gun ammunition greater than 50 caliber and less than or equal to 40 mm, all types except smoke, riot control agents, or chemical	1310-B549	CTG	Aluminum	0.050
	1310-B552	CTG	Aluminum Nitrate	1.670
	1310-B554	CTG	Aluminum Powder	4.903
	1310-B577	CTG	Antimony Sulfide	0.108
			Barium Nitrate	0.601
			Barium Peroxide	0.330
			Calcium	0.580
			Calcium Carbonate	0.900
			Calcium Resinate	0.030
			Charcoal	3.870
			Desensitizer	1.386
			Dibutylphthalate	6.121
			Dinitrotoluene	6.594
			Diphenylamine	0.962
			Ethyl Centralite	0.130
			Graphite	0.380
			HMX	10.370
			Lead	0.175
			Lead Azide	0.027
			Lead Styphnate	0.909
			Lead Thiocyanate	0.058
			Magnesium	1.090
			Magnesium Powder	1.010
			Magnesium/Aluminum Alloy	3.610
			Metal Pellets	99.120
			Nitrocellulose	63.726
			Nitroglycerine	8.649
			Nylon	1.040
			PETN	33.355
			Polyvinyl Chloride	0.200
			Potassium	3.074
			Potassium Chlorate	0.099
			Potassium Chloride	0.030
			Potassium Nitrate	0.921
			Potassium Perchlorate	2.357
			Potassium Sulfate	0.593
			RDX	46.136
			Sodium Nitrate	75.000
			Sodium Sulfate	0.450
			Strontium Nitrate	1.555
			Sulfur	2.583
			Tetracene	0.420
			Tetryl	1.300
			Tin	0.580
			Tin Dioxide	1.102
			Trinitrotoluene	55.673
			Wax	1.120

TABLE II-3B (CONTINUED)
REPRESENTATIVE MUNITION CLASS COMPOSITIONS FOR OTHER ITEMS TREATED BY DETONATION AT NEW BOMB

Munitions Class	Item		Constituents	Average Weight Percent[a]
	DODAC No.	Type[b]		
4b	1315-C262	CTG	Aluminum	0.008
Gun ammunition greater than 40 mm, all types except smoke, riot control agents, or chemical	1315-C275	CTG	Aluminum Powder	0.000
	1320-D229	CTG	Antimony	0.000
	1320-D561	PROJ	Antimony Sulfide	0.001
			Barium	0.009
			Barium Chromate	0.000
			Barium Nitrate	0.335
			Barium Peroxide	0.033
			Boron Powder	0.000
			Calcium Resinate	0.000
			Carborundum	0.000
			Charcoal	1.918
			Cryolite	0.430
			Desensitizer	1.410
			Dibutylphthalate	2.644
			Diethylphthalate	0.178
			Dinitrotoluene	5.120
			Diphenylamine	0.590
			Estane	5.010
			Ethyl Centralite	1.334
			Gasoline	84.040
			Graphite	0.150
			Lead	0.015
			Lead Azide	0.026
			Lead Styphnate	0.000
			Lead Thiocyanate	0.001
			Magnesium	0.070
			Magnesium Powder	0.093
			Methylphthalate	0.270
			Nitrocellulose	37.564
			Nitroglycerin	12.345
			Nitroguanidine	44.347
			Perchloropentacyclodecane	0.010
			PETN	7.450
			Potassium	0.768
			Potassium Chlorate	0.080
			Potassium Chloride	0.000
			Potassium Nitrate	6.580
			Potassium Sulfate	1.198

TABLE II-3B (CONTINUED)
REPRESENTATIVE MUNITION CLASS COMPOSITIONS FOR OTHER ITEMS TREATED BY DETONATION AT NEW BOMB

Munitions Class	Item		Constituents	Average Weight Percent[a]
	DODAC No.	Type[a]		
4b (cont.)			RDX	33.262
			Stearic Acid	0.218
			Strontium	0.030
			Strontium Nitrate	0.096
			Sulfur	1.470
			Tetracene	0.000
			Tetryl	0.555
			Trinitrotoluene	32.252
			Vinyl Alcohol Acetate Resin	0.000
			Wax	2.211
			White Phosphorous	41.510
5	1336-VX75	ERD	2-Nitrophenylamine	0.600
Rockets and missiles	1340-H305	RCKT MTR	Ammonium Nitrate	66.665
	1340-H557	RCKT	Ammonium Perchlorate	77.777
	1340-HX04	RCKT	Boron	0.100
	1377-M928	RCKT MTR	Candelilla Wax	0.100
			Carbon Black	1.050
			Charcoal	8.500
			Ethyl Centralite	0.767
			HMX	16.000
			Inert	2.000
			Lead Salicylate	0.850
			Lead-2-ethylhexolate	0.850
			Nitrocellulose	39.267
			Nitroglycerin	28.617
			Octol	60.000
			Potassium Chloride	33.330
			Potassium Nitrate	28.833
			Potassium Perchlorate	6.900
			RDX	50.600
			Silver	1.000
			Sulfur	5.500
			Triacetin	4.950
6	1325-E173	DSP&BOMB	Aluminum Powder	20.000
Bombs, torpedoes, and depth charges	1325-E174	DSP&BOMB	Calcium Chloride	0.300
	1325-E184	DSP&BOMB	Ethylene Oxide	98.920
	1325-F387	ADAPTER	HMX	94.000
	1325-F390	ADAPTER	Lecithin	0.100
	1325-F392	ADAPTER	Nitrocellulose	0.700
			Nylon	6.000
			Paraffin	4.000
			PETN	1.080
			RDX	45.000
			Tetryl	100.000
			Trinitrotoluene	63.333
			Wax	5.000

TABLE II-3B (CONTINUED)
REPRESENTATIVE MUNITION CLASS COMPOSITIONS FOR OTHER ITEMS TREATED BY DETONATION AT NEW BOMB

Munitions Class	Item		Constituents	Average Weight Percent[a]
	DODAC No.	Type[b]		
8	1340-H923	WHD	Aluminum Powder	17.400
Bulk explosives (except fuzes, detonators, and related items)	1375-M029	CHG	Amatol	90.000
	1375-M040	CHG	Ammonium Nitrate	75.000
	1375-M485	CUTTER	Barium Nitrate	0.200
	1375-M791	CHG ASSY	Barium Potassium Nitrate	1.000
	1375-M792	CHG ASSY	Calcium Chloride	1.900
	1375-M976	CHG	Calcium Stearate	1.500
	1375-M981	CHG	Cellulose	0.020
	1375-M995	CHG	Fuel Oil #6	1.600
	1375-M996	CHG	Glass	0.200
	1375-M997	CHG	Graphite	0.500
	1375-M998	CHG	Lead Azide	9.505
	1377-M499	CUTTER	Lead Styphnate	3.000
	1377-M504	CUTTER	Lead Thiocyanate	0.800
			Lecithin	0.100
			Motor Oil	2.800
			Nitrocellulose	2.750
			Nitroglycerin	3.100
			PETN	80.614
			Polyisobutylene	0.963
			Potassium Chlorate	0.800
			Potassium Perchlorate	0.700
			RDX	75.826
			Sebacate	5.300
			Starch	5.000
			Teflon	9.000
			Tetryl	75.000
			Trinitrotoluene	45.675
			Wax	1.733
9	1330-G910	GRENADE	Aluminum Powder	9.950
Grenades and mines (all types except smoke, riot control agents, chemical, or fuzes)			Antimony Sulfide	0.000
			Barium	0.337
			Barium Chromate	0.020
			Calcium Chloride	0.300
			Charcoal	0.160
			Lead	0.073
			Lead Azide	0.125
			Lead Styphnate	0.100
			Lecithin	0.100
			Nickel Alloy	0.010
			Nickel Powder	0.063
			Nitrocellulose	0.700
			PETN	0.050
			Potassium Chlorate	0.002
			Potassium Nitrate	0.790
			Potassium Perchlorate	0.048
			RDX	57.131

TABLE II-3B (CONTINUED)
REPRESENTATIVE MUNITION CLASS COMPOSITIONS FOR OTHER ITEMS TREATED BY DETONATION AT NEW BOMB

Munitions Class	Item		Constituents	Average Weight Percent[a]
	DODAC No.	Type[b]		
9 (cont.)			Sulfur	0.105
			Tetryl	24.993
			Trinitrotoluene	59.096
			Wax	1.025
			Zirconium	0.090
			Zirconium Powder	0.048
11	1320-D249	PROJ	Antimony Sulfide	0.000
Special function projectiles	1320-D260	PROJ	Barium Chromate	0.000
	1320-D261	PROJ	Barium Nitrate	0.000
	1320-D262	PROJ	Boron Powder	0.000
	1320-D307	PROJ	Calcium Silicate	0.130
	1320-D325	PROJ	Carborundum	0.000
			GB	69.910
			HD	93.000
			Lead Azide	0.010
			Lead Styphnate	0.000
			Potassium Chlorate	0.000
			RDX	16.300
			Tetryl	5.320
			Trinitrotoluene	7.650
			Wax	0.010
12b	1315-CX30	BAG	2-Nitrophenylamine	1.470
Propellant charges	1320-D361	CHG	Carbon Black	1.200
			Charcoal	2.637
			Cryolite	0.290
			Dibutylphthalate	3.090
			Dinitrocellulose	6.375
			Dinitrotoluene	9.580
			Diphenylamine	0.950
			Ethyl Centralite	0.593
			Graphite	0.187
			Lead	1.240
			Nitrocellulose	76.708
			Nitroglycerin	25.295
			Nitroguanidine	53.450
			Potassium Nitrate	17.872
			Potassium Perchlorate	7.800
			Potassium Sulfate	0.560
			Sulfur	1.760

TABLE II-3B (CONTINUED)
REPRESENTATIVE MUNITION CLASS COMPOSITIONS FOR OTHER ITEMS TREATED BY DETONATION AT NEW BOMB

Munitions Class	Item		Constituents	Average Weight Percent[a]
	DODAC No.	Type[b]		
14	1377-M182	CTG	Charcoal	15.000
Miscellaneous items	1377-M314	CATAPULT	Dibutylamine	0.900
primarily related to aircraft	1377-M316	CATAPULT	Dinitrotoluene	7.000
ejection systems)	1377-M349	CATAPULT	Graphite	0.200
	1377-M392	CTG	Nitrocellulose	91.400
	1377-M506	CTG	Potassium Nitrate	75.000
	1377-M507	CTG	Potassium Sulfate	0.600
	1377-M509	CTG	Sulfur	5.500
	1377-M514	CTG		
	1377-M519	CTG		
	1377-M523	CTG		
	1377-M571	CTG		

[a] Percentile (based on weight per item) averaged over all items in class identified.
[b] Abbreviations:

CTG	Cartridge
FUZE	Fuse
SIM	Simulator
PROJ	Projectile
RCKT	Rocket
RCKT MTR	Rocket Motor
CHG	Charge
CHG ASSY	Charge Assembly
ERD	Explosive Release Device
WHD	Warhead
DSP	Dispenser

Source: Air Pathway Screening Assessments for RCRA Subpart X Permitting, U.S. Army Environmental Center, June 1995, Revision 1, Appendix C-3.

II B.3 SAMPLING AND ANALYSIS PLAN [40 CFR 264, Subpart X and 40 CFR 268.48]

II B.3.1 Physical And Chemical Characteristics Of Wastes And Residues [40 CFR 270.14(b)(2) and 264.13(a)]

II B.3.1.1 Purpose

The purpose of this document is to describe in detail the sampling, maintenance, and analytical methodologies and procedures necessary to obtain consistent samples that will allow the facility employees to collect meaningful, representative samples for analysis. The collection of such samples and the review of the analytical data they provide will aid the facility in:

- Characterizing the soils/residue after detonation.
- Handling, storage, and disposal of any contaminated soils/residue.
- Identifying any waste constituents that have not been fully treated.
- Formulating a plan for remediation and/or closure.

This document has been prepared in compliance with the requirements of 40 CFR 264, Subpart X and 40 CFR 268.48.

II B.3.1.2 Applicability

This document is intended to outline the procedures for sampling of the soils within the New Bomb facility. Sampling is to be conducted by personnel trained in the performance of the specific task to which they are assigned.

Additionally visual inspection screening is conducted after each detonation event to determine the size of scrap metals generated from the detonation. Further, this screening inspection allows facility personnel to ascertain whether the detonation event has removed all explosive materials from the larger scrap items.

Large scrap items are defined as materials greater than 1.5 inch derived from the detonation of explosives and/or explosive wastes. Large residue and scrap metal remaining after detonation is not considered a hazardous waste. These are transferred to the Western Area Demilitarization Facility (WADF) for decontamination as required by Army Regulation. Decontamination is accomplished by flashing in a heated chamber. The scrap is then transferred to Property Disposal for sale/recycling.

Soils and small residue (less than 1.5 inch) will be analyzed twice yearly for toxic constituents, the presence of explosive chemicals, if analysis of the material shows explosives present at levels above those set by Table II-5, for explosive reactivity.

II B.3.1.3Sampling Frequency:

Sampling at the new Bomb Facility will occur twice a year or at a frequency directed by NDEP.

II B.3.1.4Sampling Locations:

The area surrounding the Treatment Units has been divided up into 939 grid squares measured at 50 feet square (See Map Figure II-7 Sampling Grid with UTM in Appendix M). Grid to be sampled will be identified by reviewing the meteorological data from the detonation events of the past six months. The sampler will select 30 grids that have been downwind from the majority of the detonation events for the past 6 months. The numbers of the grids selected will be recorded in a sampling log book. In addition Grids number 143, 481 & 656 will be sampled in each sampling event.

A Global Positioning System (GPS) unit will be used to physically locate the selected grids. A calibration of the GPS unit will be performed at Grid number 906. Grid number 906 is a known fixed benchmark grid, located on the southwest quadrant of the map.

II B.3.1.5Sampling Procedures:

II B.3.1.5.1 Equipment:

Equipment and material requirements are detailed in the following section. All sampling equipment and materials must be properly decontaminated as described in the decontamination section of this document. Sampling equipment will not require decontamination if it is provided in the original packaging from the manufacturer and certified to be free of contaminants.

The following equipment will be assembled for each sampling event:

- Sampling log book
- GPS unit
- 70 Clean sample containers with labels (Sample containers may be plastic zip lock bags, however proper laboratory labels must be attached to the bag)
- Sampling Trowel(s)
- Latex gloves
- De-ionized water and non-phosphate detergent – as needed to clean sample Trowels between uses
- Bucket – to collect water used for cleaning sampling equipment
- Brush – (if needed) used to clean shovels
- Indelible/water proof marker and pen
- Chain of Custody Sheets
- Transport/shipping container for samples

II B.3.1.5.2 Preparation

Prior to sample collection the sampler will:

- Select 30 grids that have been down wind from the majority of the detonation events for the past 6 months.
- Record the numbers of the grids selected in the sampling log book.
- Assemble and assure the cleanliness of the sampling equipment
  - Cleaned sampling equipment should be transported to the sampling location in a clean plastic bag or wrapped in aluminum foil to prevent sample contamination
- Assemble any items needed to decontaminated sample equipment to be used at multiple sample locations.

II B.3.1.5.3 Precautions

- Smoking is prohibited during a sampling event
- A new pair of gloves shall be warn when sampling each location
- Sampling equipment used at multiple locations shall be decontaminated between uses.

II B.3.1.5.4 Field activities

A surface will be collected from each pre-selected grid. Surface samples will be analyzed from explosives, 2, 4-Dinitrotoluene and RCRA 8 metals of Arsenic, Barium, Cadmium, Chromium, Lead, Mercury, Selenium and Silver. Samples will be analyzed as totals. Two duplicate samples will be collected per sampling event.

Sample labels will be filled out with waterproof ink and will include the following information: sample identification, sampling date, sample locations, and analysis to be performed. Upon completion of sample collection activities, a Chain-of-Custody (COC) form will be completed by the sampling team members.

II B.3.1.5.5 Documentation Of Field Activities

Identification and record keeping are as important as sound sampling techniques. This section addresses the documentation procedures required for sampling activities and transportation of the sample from the facility to the contract laboratory.

All information pertinent to sampling must be documented, regardless of the type of sample. The following information must be documented and maintained in operational records.

- Date and Time,
- Description of material being sampled, including waste stream number,
- Purpose of sampling (i.e., semiannual sampling),
- Name of sample collector(s),
- Grid number,
- Sample number,
- Sample location (specific GPS numbers and surface or sub surface), and
- Comments

Since sampling situations vary widely, no general rules are provided for the amount of information required. The best guideline is to record sufficient information so that anyone can reconstruct the sampling effort without reliance on the collector's memory. The Sample Log Book(s) should be protected and filed with a copy of the Sampling Plan in the Environmental Office.

II B.3.1.5.6 Sample Shipping

Sample containers should be packaged in a manner that will ensure that all containers arrive at the laboratory intact. Samples should be packed with a copy of the chain of custody. Any samples that will be out of the sampler's custody during the shipping process should be in a sealed transportation container.

II B.3.1.6Data Assessment

Sample results should be reviewed as soon as they are received from the laboratory. If the RCRA metals and 2 4-Dinitrotoluene have been analyzed as totals a factor of 20, that is the results are divided by 20, can be applied when comparing them to the tables below.

TABLE II-4

Maximum Allowable Contamination Levels
TCLP Constituents (40 CFR 261.24)

TCLP Constituents	Maximum Allowable (mg/L)
Arsenic (D004)	5.0
Barium (D005)	100.0
Cadmium (D006)	1.0
Chromium (D007)	5.0
Lead (D008)	5.0
Mercury (D009)	0.2
Selenium (D010)	1.0
Silver (D011)	5.0
2,4-Dinitrotoluene (D030)	0.13

Table II-5

Explosive Constituents : Concentration limits used by Bureau of Corrective Actions (EPS's RSL for Industrial Soil).

Constituent	Maximum Allowable (mg/kg)
2,4,6-trinitrotoluene	79
RDX	24
PETN	430
HMX	49,000
Nitroglycerin	62
Tetryl	1,200
Ammonium perchlorate	720
1,3,5-Trinitrobenzene	27,000
1,3-Dintrobenzene	62
Nitrobenzene	24
4-Amino-2,6-Dinitrotoluene	1,900
2-Amino-4,6-Dinitrotoluene	2,000
2,6-Dinitrotoluene	1.2
2,4-Dinitrotoluene	5.5
2-Nitrotoluene	13
4-Nitrotoluene	110
3-Nitrotoluene	62

II B.3.1.7Reporting

A written report detailing the sampling event and review of the sample results will be sent to NDEP within 45 days of the original sample date.

Sampling reports are to be sent to:
Nevada Division of Environmental Protection
Attn: RCRA Facilities Branch
901 South Stewart Street, Suite 4001
Carson City, NV 89701-5248

If the results of the chemical analysis indicate that contamination is potentially present in the surrounding area, that is analytical results are above the limits specified in Section 13, then confirmatory sampling will be performed. Confirmatory sampling for RCRA Metals and 2,4-Dinitrotoluene will be analyzed using the Toxic Characteristic Leaching Procedure. If analytical results are within 10 % above or below the specified levels the confirmatory sampling will be considered clean.

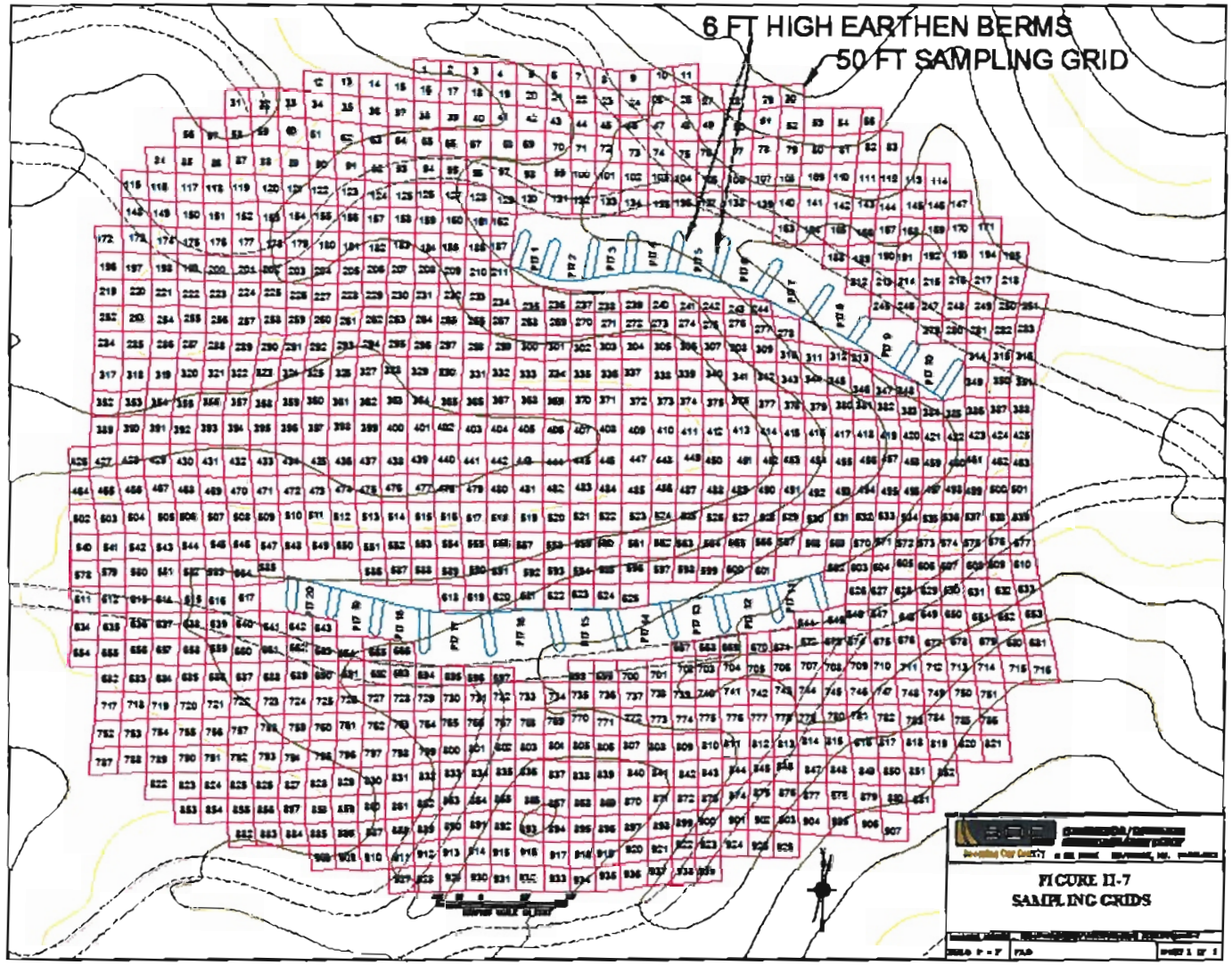
Sample results outside of the 10% + or - range will be flagged so that the areas (grids) sampled can be identified. The report sent to NDEP will detail the work plan, including the actions to be initiated to:

- Identify the extent of contamination
- Actions required to remove any contamination
- Plan for disposal of all contaminated soils.

The report should include the anticipated completion date and dates for any progress report submissions.

FIGURE II-7

SAMPLING GRIDS



SECTION II C PROCEDURES TO PREVENT HAZARDS

II C.I SECURITY PROCEDURES AND EQUIPMENT [40 CFR 270.14(b)(4) and 264.14]

The New Bomb Facility is located 22 miles south of the town of Hawthorne on U.S. Army owned Land. New Bomb is not within the secured confines of HWAD. The facility is comprised of approximately 3,183 acres. General security provisions at New Bomb include:

- Natural and artificial barriers;
- Warning signs posted along the fence-line perimeter of the New Bomb area and;
- Controlled entry to the area through two locked vehicle gates.

Personnel and visitor access to the area is controlled by HWAD Security Office.

II C.1.1 Description of Artificial and Natural Barriers [40 CFR 264.14(b)(2)(i)]

Steep terrain characterizes the New Bomb Area, a combination of fence and natural terrain are used to provide a barrier around the detonation area. Entrance to New Bomb from State Highway 359 is restricted by a five-strand barbed wire fence approximately four feet high that extends one-half mile on each side of the entrance gate. Intrusion along the rest of the perimeter is deterred by steep, mountainous terrain.

II C.1.2 Means to Control Entry [40 CFR 264.14(b)(2)(ii)]

Entry to the detonation unit is by a single dirt road connected to State Highway 359. Entry is controlled by two vehicle gates. A pole gate located approximately 200 feet from Highway 359 restricts entry to the New Bomb Area and a chain gate bars entry to the detonation unit. Vehicle gates are locked when the facility is unmanned and are opened by facility personnel on an as-needed basis.

During detonation operations, personnel access is limited to only persons having appropriate training and a legitimate need to enter the unit. Range personnel search for unauthorized personnel, and then monitor the gates to prevent entry into the area.

Military and civilian personnel at HWAD who have a continuing requirement to enter the New Bomb Area is issued security identification badges, which authorizes entry to the unit.

Subcontract personnel are issued security identification badges that have access limitations annotated on the face of the badge. Subcontract personnel must log in and out at the office located near the chain gate at the entrance to the detonation unit. Visitors not part of normal operations are required to report to the Security Office, where they are issued visitor badges and allowed limited access to the unit with an escort of authorized HWAD personnel.

A minimum of three persons are present at New Bomb during detonation operations.

II C.1.3 Warning Signs [40 CFR 264.14(c)]

Warning signs for restricted area (Figure II-8) are posted along the perimeter of New Bomb area. The signs, posted at 500-foot intervals, are approximately 18 inches by 24 inches and are legible at 25 feet. A large sign describing the "CONDITIONS OF ENTRY" is posted near the pole gate. Another sign warning of contaminated-dangerous area and prohibiting entry otherwise violators will be prosecuted is also present near the pole gate. This sign is approximately 4 feet high by 6 feet wide and is legible from a distance of at least 25 feet. During detonation operations, a 3footby 5-foot red flag is hoisted at the pole gate to warn of danger. The flag is not taken down until detonation is completed and the detonation pits have been determined secure.

HWAD has placed bilingual warning signs (Figure II-10) and additional restricted area signs (Figure II-9) at the perimeter of the 3,000-acre restricted access area and at a minimum of 250-foot intervals.

II C.2 INSPECTION SCHEDULE [40 CFR 270.14(b)(5) and 264.15]

II C.2.2.1 Inspection Schedule and Types of Problems [40 CFR 264.15(b)(I)(2)(3)]

Inspections are conducted for the detonation unit equipment malfunctions, unexploded ordnance (UXO), metal fragments, and other possible problems that could threaten human health or the environment. The purpose of the inspections is to detect potential problems and correct them before they affect human health or the environment. All inspections are performed in accordance with the New Bomb SOP provided in Appendix A of Volume II. Operations of the SOP that Contain inspection requirements include:

- Operation 2 - Open and Prepare New Bomb Demolitions Grounds
- Operation 3 - Verify Documentation and Unload
- Operation 7 - Inspection of Pit area and Unexploded Munitions

Personnel conducting explosive operations at New Bomb are responsible for inspecting necessary equipment for operational readiness prior to the beginning of detonation that day. If any vital equipment in the area is inoperative, deteriorated or not in compliance with permit condition, maintenance is initiated before operations commence. Table II-6 presents a schedule for inspecting safety and emergency equipment, security devices, operating equipment, and the detonation unit. This schedule is integrated with HWAD SOPs. The inspection frequency specified reflects an estimate of the probability of an undetected incident occurring between inspections, based on the expected rate of deterioration of the equipment. This schedule and listing of inspection locations may be periodically revised due to military requirements. The items listed in Table II-6 are

considered important because of their role in preventing, detecting, or responding to possible environmental problems.

As part of the preventative maintenance program, operational checks at the New Bomb meteorological monitoring station will be conducted. Operational checks will consist of visual and recorder inspections. Visual inspection will consist of looking at all tower and sensor equipment for evidence of physical damage or abnormal conditions. Table II-7 contains an example of the checklist that will be filled out daily when performing visual inspections. When a visual inspection is performed it will be noted in the monitoring log book, whether or not any problem was found. The inspector will list the site location, date, time, check appropriate inspection items, describe problems that were found, and any unusual activity in the vicinity of the tower.

After all detonations have been counted and accounted for, the Range Supervisor and one Munitions Destroyer inspect each cell pit for any smoldering embers, explosives, and unexploded munitions. If a misfire has occurred, a new fire system is attached and detonation is reactivated. If a low-order/partial detonation is suspected, the area will be secured until the Range Supervisor determines the action to be taken.

II C.2.2 Frequency of Inspections [40 CFR 264.15(b)(4)]

The frequency of inspections is listed in the inspection schedule in Table II-6 These frequencies (weekly or monthly) are based on the rate at which detonation could reasonably be expected to occur and the probability that health/safety risks or environmental contamination could result from the detonation.

II C.2.3 Inspection Recordkeeping [40 CFR 264.15(d)]

A copy of the inspection log used for detonation operations is included as Table II-8. A checklist for the meteorological monitoring station inspection is provided as Table II-7. Inspections may be conducted weekly, monthly, or based on a detonation event. An event is defined as the detonation of an item with similar chemical constituent profiles. The log will be maintained at HWAD. Completed records will be kept on file for a period of three years. Visual inspections of the meteorological instrumentation will be completed on a daily basis when treatment activities are being conducted at the meteorological monitoring location. Operations personnel will, on a daily basis during the operation of the station, visually check the monitoring towers and sensors and complete the checklist in Table II-7. During this check, the operators should observe that the wind speed and wind direction sensors are operating and that the wind speed sensor is pointing into the observed wind direction. During the non-operational season, personnel should attempt to visit the station once per week to conduct a similar visual check. Also during these checks, the operators should confirm that the tower and support system remain undamaged. These checks are meant to find obvious operational problems of the tower and sensors, but may not catch problems associated with worn or damaged bearings, etc. that may affect calibrations. The Monitoring Well

will be inspected every five years to check for presents of ground water. The Monitoring Well Form is found in Table II-9

II C.2.4 Schedule of Remedial Action [40 CFR 264.15(c)]

Repairs on deteriorating or malfunctioning equipment are initiated immediately to ensure that human health or the environment is not threatened. Schedules for implementing and completing remedial actions are established as soon as problems are identified. These records are maintained at HWAD. Imminent hazards or those that have already occurred requiring immediate remedial actions are addressed in the Contingency Plan in Appendix C, Volume II.

The New Bomb Facility is a treatment unit only; no hazardous waste is stored on site. No risk of spills or leaks of hazardous waste exist at the facility. Communications are accomplished through two-way radio and direct visual contact; no mechanical alarms are present at the site.

No shutdown controls exist in the detonation unit, since once a fuse is initiated, stopping the imminent reaction is not possible without posing a serious and unacceptable safety hazard to the personnel involved.

II C.3 PREPAREDNESS AND PREVENTION [40 CFR 270.14(b)(6) and 264(Subpart C)]

The New Bomb detonation unit is designed, operated, and maintained to minimize potential releases of hazardous waste materials. Shipments of hazardous explosives will not be allowed entry into the detonation area for unloading until they have been inspected and approved for safe detonation treatment.

Methods of operation and maintenance at the detonation unit which will minimize the potential for releases of hazardous materials include:

- Inspection of the site before and after detonation;
- Collection of explosive fragments left on the ground surface after detonations;
- Ground cleanup of detonation unit following four consecutive days of detonation activity; and
- Separation of waste explosives and detonation subunits to reduce the possibility of uncontrolled detonation or fire.

Waste munitions to be disposed of by detonation will be placed with a demolition charge in a cell. The New Bomb SOP contains all the operational measures being taken to minimize release of hazardous materials.

II C.3.1 Internal Communications [40 CFR 264.32(a)]

Communication at the New Bomb Facility is accomplished by hand-held or vehicular mounted radio. Personnel at New Bomb are also required by the SOP to use a line of site buddy system when handling energetic materials.

II C.3.2 External Communications [40 CFR 264.32(b)]

Hand held or vehicular radios at New Bomb are capable of reaching the Guard Operations Center (GOC), located at the Main Base, to request assistance if required. If an emergency situation develops at New Bomb, the first person to observe the situation will notify GOC through either his two-way radio (in the field) or telephone (in Range Office). The GOC will first notify the Emergency Response Coordinator (ERC), who is responsible for channeling the needs for emergency assistance to the appropriate Federal, State, or local agencies.

II C.3.3 Access to Communications [40 CFR 264.34]

Personnel conducting detonation operations are equipped with two-way, hand-held radios to maintain contact with the GOC and request assistance while out in the field, if required. The Range Office also holds a telephone which can gain access to outside telephone lines. A serviceable operating radio will also be available at the unit at all times that detonation operations are being performed.

II C.3.4 Fire Control, Spill, and Decontamination Equipment [40 CFR 264.32(c)]

Firefighting equipment such as fire extinguishers, axes, and shovels, are available for use at the detonation unit, and are maintained in a storage shelter located at New Bomb. Respirators, protective clothing and first aid kit are also maintained at the facility. Additional emergency equipment is available from the HWAD Fire Department, located at the Main Base. This equipment includes respirators, protective clothing, fire extinguishers, and first aid kits.

It should be noted that fires generally would not be fought at the detonation unit, but only at the boundary of the detonation unit. Fire fighting efforts are precluded by the presence of possible unexploded ordnance (UXO). The only exceptions would be if required as part of a rescue effort or if a small fire occurs during operations which could be easily put out by hand-held tools.

A description of available equipment and emergency response are available in the Contingency Plan (Appendix C, Volume II). Decontamination of equipment is accomplished by washing and rinsing or disposal of equipment.

To prevent fires from occurring, smoking is prohibited in the vicinity of explosives and flammable wastes, and all flame-producing devices such as matches are removed from the detonation unit. Only non-sparking tools are used when working in the vicinity of explosive material.

Telephone/radio communications are maintained at all times in the detonation unit with local emergency response teams at HWAD. A vehicle is available to transport casualties that may occur during detonation of munitions. Manned firefighting equipment is ordered to stand by when the fire hazard is high.

II C.3.5 Water for Fire Control [40 CFR 264.32(d)]

Two water storage tanks are present at New Bomb for firefighting purposes. The area around the detonation unit is cleared from all vegetation to eliminate the possibility of fires. Further, no combustible materials are stored at the detonation unit.

II C.3.6 Testing and Maintenance Schedule [40 CFR 264.33]

Preparedness and prevention equipment inspection schedules are given in Table II-6. Buildings within the New Bomb Area are sparse and roads are constructed to allow access to and from any area of the facility where an emergency situation involving humans could occur.

Cell pits at the detonation unit are spaced at 75 feet. This design allows the unobstructed movement of personnel, fire protection equipment, and heavy equipment to any area of facility operation during an emergency.

II C.3.7 Contingency Arrangements and Coordination Agreements [40 CFR 264.37]

Agreements are made with Hawthorne Fire Department in case of a fire emergency. In addition, a copy of HWAD and New Bomb Contingency Plans were provided to the County Sheriff's Department, Mount Grant General Hospital, County Fire Department, and County Office of Emergency Management. Documentation of the agreements is provided in the Contingency Plans. Local police are available to assist in controlling traffic on U.S. Highway 95 and State Highway 359 in the event of an emergency. Military support is also available by contacting the Commander of HWAD.

The initial assessment of the emergency is made by the ERC. The ERC determines the potential hazard to human health/safety and the environment and decides on the type of emergency response; i.e., firefighting equipment, traffic control, medical treatment, isolation/evacuation requirement (see Contingency Plan in Volume 2 Appendix C for further actions).

II C.4 GENERAL HAZARD PREVENTION [40 CFR 270.14(b)(8)]

II C.4.1 Loading/Unloading Operations [40 CFR 270.14(b)(8)(i)]

Motor vehicles and mobile heavy equipment used for transporting ammunition meet the vehicle unloading requirements in the New Bomb SOP. Appropriate DOT/DOD explosive placards are displayed on the trucks prior to loading ammunition.

Unloading and movement of the waste munitions is conducted according to New Bomb SOP Operation 3 "Verify Documentation and Unload."

Items received at New Bomb are transported in packaging with strength equal to or greater than those described in 49 CFR Part 173 Subpart C - Explosives and Blasting Agents; Definition and Preparation. Containers are off-loaded at the two Material Staging Areas. All containers will be securely stowed to prevent movement during transport. During transport, ammunition is handled with strict adherence to DOT motor courier, State, Army, and local regulations. Drivers are furnished with DD Form 836 (Special Instruction for Motor Vehicle Drivers) that describes the nature of the ammunition on the truck, the fire hazards, the methods to be used in fighting fires involving the truck or cargo, the missile distance in case of explosion, proper distance to maintain from other trucks, and any other information which will bring about safe delivery of the shipment to its destination. Army regulations require that the form be transferred to each subsequent driver and finally to consignee at destination. Transport vehicles are removed from the hazard area prior to opening the containers.

II C.4.2 Runoff [40 CFR 270.14(b)(8)(ii)]

No hazardous wastes are present at the detonation unit except during detonation operations. Detonation operations are not conducted during periods of precipitation or during flooding. There is no potential for runoff contacting hazardous wastes. Section III-B discusses impacts of residues on surface water.

II C.4.3 Water Supplies [40 CFR 270.14(b)(8)(iii)]

No known drinking water supplies are located near New Bomb. Protection of the groundwater is achieved through several mechanisms undertaken by HWAD personnel. No hazardous waste is stored at New Bomb. During periods of precipitation, detonation operations are canceled. Groundwater impact is addressed in detail in Section III-B, Environmental Performance Standards.

II C.4.4 Equipment and Power Failure [40 CFR 270.14(b)(8)(iv)]

Power outages and lightning strikes are not anticipated to be a cause of problems at the detonation unit. Detonation operations do not require a permanently-installed outside source of electric or other power; therefore, the facility is not subject to power failures. All detonation operations are halted or canceled during an electrical storm. Other natural weather phenomena, such as high winds, are potential problems and are closely

monitored. Detonation operations will only be conducted when the wind speed is between 3 and 15 mph. As described in Section III-A Process Information, detonation operations are only conducted within well-defined weather conditions. The meteorological monitoring station installed at New Bomb has been provided with solar power and a rechargeable battery, and would not be impacted in the event of a power outage. Detonation will not be performed if there is a power failure or cameras cannot function

In case a truck breaks down and cannot be towed to its destination, a two-man guard will be stationed at the truck site. HWAD will dispatch a truck at once with loading personnel to transfer the load to a replacement vehicle.

II C.4.5 Personnel Protection Procedures [40 CFR 270.14(b)(8)(v)]

The handling of waste explosives is conducted in a manner that minimizes the contact of involved personnel with the waste. All handling operations and requirements for protective clothing are in accordance with New Bomb SOPs. Protective clothing includes the following items:

- Flame resistant coveralls
- Respirators
- Steel-toed boots (loading and unloading)
- Head covering, flame retardant
- Safety glasses
- Leather or leather-palmed gloves
- Face Shields.

Additional equipment may be required by a specific SOP for a particular ordnance item. The use of respirators is determined by the Industrial Hygienist/Safety Office in case dusts, vapors, and gases are present.

Additional equipment may be required by a specific SOP for a particular ordnance item. All personnel at New Bomb will be inside a safety bunker prior to detonation of munitions.

II C.4.6 Releases to the Atmosphere [40 CFR 270.14(b)(8)(vi)]

Operations are only conducted when wind speed forecasts are between 3 and 20 mph. Air emissions and impact are further discussed in Section III-C, Air Quality Assessments.

II C.5 PREVENTION OF ACCIDENTAL IGNITION OR REACTION OF WASTES [40 CFR 264.17(a) and 270.14(b)(9)]

All hazardous materials and hazardous wastes handled at the New Bomb are assumed to be reactive, since they are military ordnance and only reactive wastes may be treated

at the site. Non-reactive wastes are not treated at this facility. All personnel working in the detonation operations must take all appropriate measures to prevent incidents that:

- Generate uncontrolled extreme heat or pressure, fire or explosions, or violent reactions;
- Produce uncontrolled toxic mists, fumes, dusts, or gases in sufficient quantities to threaten human health or the environment;
- Produce uncontrolled inflammable fumes or gases in sufficient quantities to pose a risk of fire or explosion; and
- Through any other means, threaten human health or the environment.

Detonation operations generate heat, pressure (shock waves), explosions, and violent reactions. The intent of the detonation operations is to initiate these phenomena in a controlled setting. The means to prevent unintended reactions is provided through the establishment of safety guidelines implemented through the HWAD New Bomb SOPs. As summarized below, the safety guidelines include, but are not limited to, the following:

- Unauthorized ignition sources such as flame producing devices are prohibited at New Bomb at any time.
- Sparking equipment and tools are prohibited from use near explosive materials unless specifically authorized by the Range Supervisor.
- All hand tools and mechanical devices are inspected prior to use to ensure their safety.
- Motor vehicles used to transport waste explosives, ammunition, or other materials meet the requirements of TM-9-1300-206.
- Detonation operations will not be initiated during electrical storms, snow storms, or rain.
- The material is protected against accidental ignition or explosion from fragments, grass fires, burning embers, or the impulse associated with materials being detonated.
- Dry grass, leaves, and flammable/combustible materials are removed from around the detonation unit.
- Initiators (e.g., blasting caps, primers) and explosives are packaged, transported and handled separately until placement for treatment.
- Engines of transport vehicles are turned off prior to unloading munitions at Material Staging Areas.
- Containers of explosives are not tumbled, thrown, dropped, rolled, or struck against each other.
- Explosives are not exposed to high temperatures and direct sunlight for any length of time.
- Non-static protective clothing is worn by handlers.

II C.6 DOCUMENTATION OF ADEQUACY [40 CFR 264.17(C)]

These SOPs are in use at numerous Army detonation facilities throughout the country. Decades of experience has shown that, when followed, the danger of accidental detonation or combustion is negligible.

FIGURE II -8

ACCESS CONTROL AT NEW BOMB

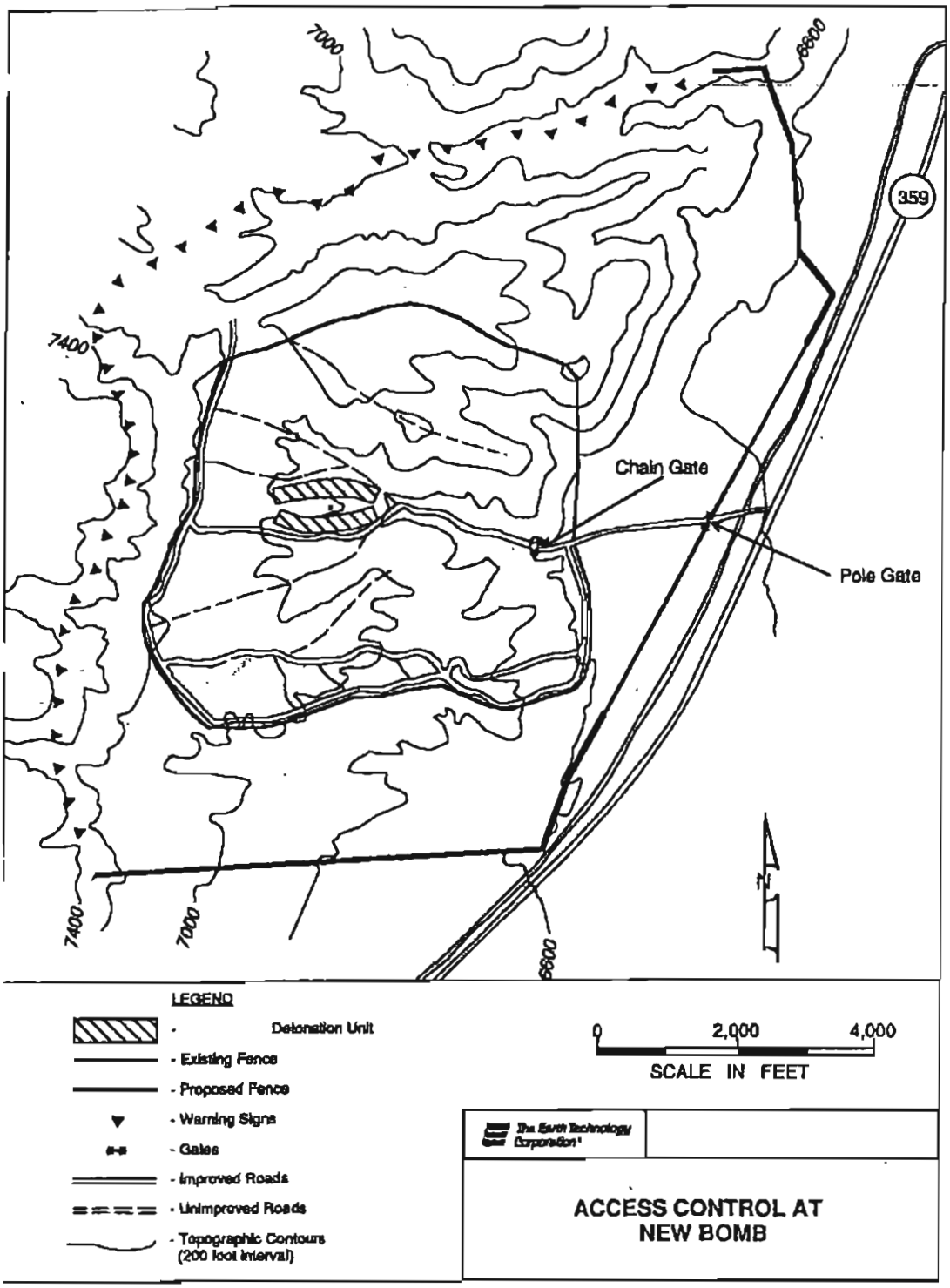


FIGURE II – 9

WARNING SIGN (EXAMPLE)

RESTRICTED AREA

THIS PLANT HAS BEEN DECLARED A RESTRICTED AREA BY AUTHORITY OF THE COMMANDING OFFICER IN ACCORDANCE WITH THE PROVISIONS OF THE DIRECTIVE ISSUED BY THE SECRETARY OF DEFENSE ON THE 20th OF AUG. 1954. PURSUANT TO THE PROVISIONS OF SECTION 21 INTERNAL SECURITY ACT OF 1950. UNAUTHORIZED ENTRY IS PROHIBITED. ALL PERSONS AND VEHICLES ENTERING HEREON ARE LIABLE TO SEARCH, PHOTOGRAPHING, MAKING NOTES, DRAWINGS, MAPS OR GRAPHIC REPRESENTATIONS OF THIS AREA OR ITS ACTIVITIES, IS PROHIBITED UNLESS SPECIFICALLY AUTHORIZED BY THE COMMANDING OFFICER. ANY SUCH MATERIAL FOUND IN THE POSSESSION OF UNAUTHORIZED PERSONS WILL BE CONFISCATED.

FIGURE II – 10

BILINGUAL WARNING SIGN (EXAMPLE)

Red Background with
1 1/2" High Black Letters

TABLE II – 6

INSPECTION SCHEDULE FOR DETONATION ACTIVITIES WHEN IN OPERATION

Inspection Item	Type of Inspection	Frequency
Immediate detonation Area	Unauthorized Personnel	Before detonation
	Misfires	After detonation
	Low Order/Partial Detonation	After detonation
	Shell Fragments	Before/After detonation
	Smoldering Embers	Before/After detonation
	Housekeeping	Before/After detonation
	Standing Water in Pits/Cells	Before detonation
	Vegetation	Before detonation
	Monitoring Well	Once every five years
Communication Equipment		
Two-Way Radio (vehicular & portable)	Operational	Weekly
Telephones	Operational	Monthly
Safety and Emergency Equipment		
Fire Extinguishers	Present/Operational	Weekly
First Aid Kit	Present	Weekly
Coveralls, Head Covering (fire retardant)	Present	Weekly
Safety Glasses	Present	Monthly
Respirators	Present	Monthly
Security Devices		
Gate	Integrity	After detonation
Lock	Operational	After detonation
Warning Signs	Present	Weekly
Scarlet Range Flag	Present	Weekly

TABLE II-7 METEOROLOGICAL WEATHER STATION

INSPECTION CHECKLIST

INSPECTOR	LOCATION	DATE	TIME
WEATHER CONDITIONS		WIND DIRECTION	

DAILY INSPECTION WHEN IN OPERATION

NOTE: INSPECTION WILL INITIAL EACH OF THE FOLLOWING DAILY. INITIALS

1. OBSERVE THE TOWER FOR STRUCTURAL DAMAGE. ☐
2. CHECK FOR MISSING OR DAMAGED CUPS. ☐
3. OBSERVE THAT THE WIND VANE IS POINTING IN THE DIRECTION FROM WHICH THE WIND IS BLOWING FROM. FROZEN OR WORN BEARINGS OR BRUSHINGS WILL PREVENT THE WIND VANE FROM SPINNING. NOTE IF ANY SNOW OR ICE HAS ACCUMULATED ON WIND VANE. ☐
4. ASSURE THE WIND VANE IS STRAIGHT. EXCESS WEIGHT ON THE WIND VANE WILL BEND THE METAL ROD CONNECTING THE TAIL WITH THE HEAD OF THE VANE. ☐
5. OBSERVE THE TEMPERATURE SENSOR ARM IS PERPENDICULAR TO TOWER AND THE TEMPERATURE SENSOR IS VERTICAL AND ABOVE THE ARM. SCREWS THAT FASTEN THE SENSOR TO THE ARMY MAY LOOSEN CAUSING THE SENSOR TO ROTATE UPSIDE DOWN. CHECK FOR ICE OR SNOW BUILDUP ON THE SENSOR. ☐
6. CHECK STRIP CHART RECORDER. DETERMINE THAT THE STRIP CHART IS OPERATIONAL. CHECK TO ENSURE PAPER HAS NOT RUN OUT. CHECK FOR EVIDENCE OF "LOW PAPER" MARK. ☐
7. TEN METER AREA AROUND THE TOWER SHOULD BE CLEARED OF OBSTRUCTIONS. LOOK FOR VEHICLES, DUMPSTERS AND OTHER MISCELLANEOUS ITEMS. ☐
8. CHECK SOLAR PANEL FOR CLEANLINESS, BIRD DROPPINGS, AND DIRT ON THE SOLAR PANEL WILL SIGNIFICANTLY REDUCE ITS RECHARCHING CAPABILITIES. ☐
9. OBSERVE THE HUMIDITY SENSOR IS RECORDING AND ARM IS PERPENDICULAR TO TOWER. ☐

TABLE II-8 NEW BOMB DEMOLITION GROUNDS CHECKLIST

The supervisor or designated representative at the New Bomb Demolition Grounds will use this checklist daily when in operation and comply with all requirements found in the New Bomb SOP.

PREOPERATION CHECKS

1. Notify Minden (775) 882-9187 and Bishop (760) 873-2405 Forest Services of the approximate time of detonation. ☐
2. Montoring Well head is locked and secured. ☐
3. Display red danger flag at Demolition Ground entrance and proper warning signs are present. ☐
4. Assure demolition area is clear of unauthorized personnel. ☐
5. Verify radio communications between vehicle and the Demolition Grounds office is functional. ☐
6. Assure firefighting Equipment, proper Respirator, Safety Glasses and first aid kits are available and serviceable. ☐
7. The fire truck is present and has its tanks full with water. ☐
8. The vegetation is cleared, debris is cleaned up and no standing water is in or around the demolition pits. ☐

PREDETONATION CHECKS

1. Conduct roll call and account for all personnel. ☐
2. Check personnel/visitor's logs and account for all personnel. ☐
3. Account for all equipment. ☐
4. Lock and guard gate at entrance to Demolition Grounds from Nevada State Highway 359 are present and operational. ☐
5. Assure red flags are displayed at entrance to Demolition Grounds and entrance to the canyon. ☐
6. Assure CCTV is on and operational. ☐
7. Assure both canyons are clear by driving up the canyon not in use and down the canyon in use looking for remaining personnel and/or equipment. ☐
8. Using remote camera and/or binoculars, assure no hikers or personnel are at the most exposed individual (MEI) Locations as shown on the New Bomb Demolition Grounds of SOP DZHC-0000-G-001. ☐
9. Assure traffic on Nevada State Highway 359 is blocked in accordance with Operation 1 of SOP DZHC-0000-G-001. ☐

POST-DETONATION CHECKS

1. Assure that there are no misfires, low order/ partial detonation, and smoldering embers in or near the Demolition Grounds. ☐
2. Shell Fragments and debris are disposed of properly in or near the Demolition Grounds. ☐

Supervisor's Signature _____ Date/Time _____/_____.

TABLE II – 9

GROUND WATER MONITORING WELL INSPECTIONS

Inspector: Lonnie Brown

Date Sampled: 7/19/12

Sample Event: Once every five years

	Top of Well Casement	Groundwater			
WELL #	Elevation	Elevation	Depth in Feet	Time	Temperature (°F)
NB Well	6742'	6694.5'	47.5'	0730	NA

Comments: This is a dry well

SECTION II D CONTINGENCY PLAN

The Contingency Plan for HWAD for New Bomb is in Volume II Appendix C-1. This is an Addendum only. The New Bomb Contingency Plan is not complete without the Main Base Contingency Plan accompanying this Plan. The complete plan will be located at the New Bomb Facility.

SECTION II E PERSONNEL TRAINING

II E.1 SUMMARY

The information contained in this section describes the personnel training program for personnel involved in detonation activities at New Bomb. The program consists of a combination of classroom and on-the-job training (OJT) that teaches personnel to perform their duties safely and in compliance with hazardous waste regulations. The training is designed to include all skills and techniques required for safe and effective demilitarization of ordnance items and energetic.

The HWAD contract operator personnel are responsible for conducting all detonation operations at New Bomb. Personnel assigned to this task are full-time specialists in the skills related to demilitarization of items containing explosives. They undergo extensive training both in the classroom and in the field. Their ability to perform munitions/explosive disposal/demilitarization operations are certified by the contract operator. Periodically, all New Bomb personnel are recertified.

II E.2 OUTLINE OF THE TRAINING PROGRAM [40 CFR 270.14(B)(12)]

Personnel that work on the New Bomb Facility are subject to the HWAD training program. The HWAD training program is designed to ensure that personnel managing hazardous wastes perform their duties safely, professionally, and in compliance with all applicable U.S. Army, State, and Federal regulations. The training program provided to all HWAD employees (including New Bomb Personnel) has been included in Volume II Appendix B.

II E.2.1 New Bomb Personnel Titles

All personnel who working on the New Bomb Facility or responsible for day to day activities have the following titles:

- Supervisor EDO/UXO Tech I & II
- Munitions Handler
- Munitions Destroyer
- Heavy Equipment Operators
- Heavy Equipment Mechanic
- Environmentalists
- Manager Environmental Services

It should be noted that these training levels are specific to hazardous waste management personnel; not all personnel with position titles will receive the indicated training. For example, the
Maintenance Equipment Operators responsible for detonation trench excavation at New Bomb receives Explosives Safety training. Other maintenance equipment operators typically would not receive the Explosives Safety training.

A list of the personnel occupying the above titles is kept at the Human Resources Office on HWAD.

All personnel at New Bomb receive the 24-hour Hazardous Materials training course within 6 months of beginning work. Employees work under the direct supervision of a trained employee until they have successfully completed the course.

The HWAD Training plan also provides required training for the personnel titles listed above.

II E.2.2 Annual Refresher Training

All personnel who receive the 24-hour Hazardous Material Training also receive 8 hours of refresher training each year. The refresher course covers the same basic materials as the 24-hour course.

II E.2.3 Explosive Safety Training

All personnel who work in close proximity to explosives receive an 8-hour training course in explosives safety. This course focuses on recognition of explosives hazards and proper procedures and reactions.

II E.2.4 Technical Ammunition Training

Personnel who work directly with explosives receive the 40-hour Technical Ammunition Training Course. This course covers the technical aspects of conventional ammunition, including function, operational limits and safe handling of all explosive items handled at HWAD.

II E.2.5 Incident Commander Training

Personnel who could potentially serve as Emergency Response Coordinator receive additional training on performing the duties of an on-scene incident commander. This training is obtained off-site from a variety of organizations with expertise in emergency response command and control procedures.

II E.3 COURSE CURRICULUM

Course titles and descriptions is given in Appendix B of the HWAD Training Program

SECTION II F CLOSURE AND POST-CLOSURE PLANS

II F.1 APPLICABILITY

This section is submitted in accordance with the requirements of 40 CFR 264, Subpart X and 40 CFR 270 to describe the activities that will be undertaken to close the detonation unit at the New Bomb Area Facility in compliance with risk-based or background levels. The detonation unit is not expected to undergo partial closure during its active life; therefore, partial closure actions are not specifically addressed in this Closure Plan. However, this Closure Plan is designed to be amenable to partial closure should the need arise. New Bomb is a Federal facility and is exempt from financial requirements; thus, closure cost estimates and financial assurance documents are not discussed in this section.

The New Bomb Facility will notify the U.S. Environmental Protection Agency (EPA) Region IX Administrator and the Nevada Division of Environmental Protection at least 180 days prior to the date closure is expected to begin. Closure activities will be carried out in accordance with this Closure Plan. Upon completion of closure, HWAD will submit a Certification of Closure, signed by an independent, registered professional engineer, to the EPA Region IX Administrator. The Environmental Office located at HWAD will maintain this Closure Plan until certification of closure completeness has been submitted and accepted by EPA Region IX. Any changes to the schedules and activities described in this Closure Plan will be approved by EPA prior to implementation. The Environmental Office will be responsible for plan amendment, if necessary. Closure activities will be conducted in phases.

Activities to be conducted during the first phase include the identification and removal of visible and/or readily identifiable metallic fragments or shrapnel. The shrapnel will be collected and transferred to the Main Base where it is decontaminated at WADF, then sold as scrap metal. Unexploded ordnance (UXO) will be detonated in place or in a pit.

The second phase of the Closure Plan involves the sampling and analysis of soils to determine background levels and if contamination that may be associated with detonation is present at concentrations above risk-based or background levels. Data collected per the Sampling and Analysis plan discussed in Section II-C will be used for this purpose.

Additional monitoring will be conducted if additional data are needed to determine if contamination within the detonation unit, or as a result of the detonation unit, is in exceedance of risk-based or background levels.

For the purposes of unit closure, background will be defined as the area outside the restricted area of 3,000 acres. The determination of risk-based or background levels is further discussed in Section III. Equipment that may have become contaminated will be

decontaminated if wipe sampling determines this is necessary. The analytical results from the equipment samples will be compared to appropriate performance standards and reactivity/explosivity standards. Should sample analysis indicate the presence of contaminants in the operational area and/or soils at concentrations above risk-based or background levels that are statistically significant, remediation will be required.

Contaminated materials will be classified, sorted, containerized, and sent off-site for treatment (if appropriate) and subsequently, for disposal. If surface contamination of equipment is found, an appropriate cleaning agent will be used. All decontamination residues will be containerized prior to off-site transport.

The third phase is verification sampling. Sampling is done to confirm that the remediation and decontamination as part of closure were adequate. If contamination above risk-based or background levels is still present, additional remediation and decontamination will be done followed by an additional round of verification sampling.

The wastes generated during closure will fall into one of four categories: (1) reactive, or explosive solids or soils contaminated with such materials, which must be treated by detonation; (2) solid materials or soils which are not reactive, or explosive, but which may be contaminated with constituents (e.g., lead, TNT, and RDX) remaining as a result of detonation and which require treatment to remove this contamination; (3) contaminated liquids resulting from closure activities, primarily equipment decontamination; and (4) solid, nonhazardous wastes that require no further treatment.

Any unstable materials detected will be detonated in-place. Following removal of contaminated soil (if determined to be appropriate to meet risk-based levels or background conditions) and UXO, the detonation units will be regarded using native soils to match the contours of the remainder of the surrounding area.

II F.2 CLOSURE PLAN

II F.2.1 Closure Performance Standard [40 CFR 264.111]

When the detonation operation at New Bomb is terminated, the detonation unit will be closed in a manner that eliminates the need for post-closure care. This Closure Plan has been designed to:

- Minimize the need for further maintenance of the detonation unit.
- Minimize post-closure escape of hazardous waste, hazardous constituents, waste degradation products, leachate, and contaminated run-off into surface water and groundwater to the extent necessary to protect human health and the environment.
- Comply with the environmental performance standards of 40 CFR Part 264, Subpart X. relative to closure activities and post-closure facility conditions.

Although significant surface contamination at closure is unlikely, given the operation and performance standards identified in Section III of this permit application, past and

current use of this unit for training exercises involving high explosives and other ordnance could result in localized soil contamination and UXO being present. Contamination caused by past detonation practices may also be present.

II F.2.2 Closure Goals for the Detonation Unit

At the time of closure, the goals are to achieve clean closure for the detonation unit and New Bomb area. All contaminants that are present above background levels or risk-based levels, whichever are higher, are to be removed. Contaminants that may be of concern and their action levels at closure are addressed in the following discussion.

A list of potential Contaminants of Concern (COCs) is presented in Table II-10 (Section II-F). This list has been adopted from the established base wide proposed closure goals (PCGs) for soils at HWAD from the document "Hawthorne Army Depot, Remedial Investigation, Group B Solid Waste Management Units, Final Data Package," (Final Data Package; Tetra Tech, 1996) Volume 1, January 1996.

The list of potential COCs takes into consideration historical activities at HWAD, residues detected at other DOD OB/OD sites, and potential transformation products of explosives. Also, data collected according to the Waste Analysis Plan for the New Bomb area were examined to ensure detected constituents were included as potential COCs. PCBs and dioxins were excluded from the constituents of concern as there is no reason to believe they are present at the New Bomb facility.

A list of the compositions of representative munitions items and munitions casing is presented in Tables II-I, II-1A, and II-3A and II-3B in Section II.B.2, Waste Analysis Plan. Table II-3A & 3B (Section II.B.2) provide summary weight percent compositions for representative classes of munitions items. The chemicals in the representative munitions classes have been evaluated and representative constituents have been included as potential COCs in Table II-10 (Section II-F). Explosive residues are represented by 2,4,6-TNT, 2,4-DNT, RDX, and metal shrapnel. These compounds are analyzed by reactivity (40 CFR 261.23) and RCRA 8 Metals under the current Sample and Analysis Plan. Analytical results of reactivity and RCRA Metals tests are summarized in Table II-I0. Polycyclic aromatic hydrocarbons (PABs) also have been included to account for products of an incomplete explosive reaction.

At the detonation unit primary routes of potential exposure are ingestion and dermal exposure. Groundwater is not a significant media of concern because the water table is more than 200 feet below ground surface at New Bomb and precipitation is less than 5 inches per year. Clean closure action levels for the soil COCs in soil media in the area of the detonation unit will be based on either background levels or risk-based levels, whichever are higher. The background levels of metals in the near-surface soils of the Hawthorne Valley at locations not likely to have been directly impacted by New Bomb operations have been established in the Environmental Impact Study.

Additional background samples at New Bomb have been collected (Monitoring Well Installation Report; IT, 1996; Appendix H-2 and Surface Runoff Drainage Area Sampling Results; IT, 1996; Appendix H-4). These additional background samples show that the Tetra Tech background data for the Hawthorne Valley are representative of the New Bomb area. At the time of closure for the detonation unit, updated risk-based concentrations for the COCs will be developed using the guidance provided in the NDEP contaminated soil and groundwater remediation policy, the U.S. EPA Region IX Preliminary Remediation Goals (PRGs), and the RCRA 40 CFR Subpart S levels. Actlev16, a modeling program for calculation of applicable action levels per the NDEP contaminated soil and groundwater remediation policy, will also be utilized to calculate risk-based concentrations, as appropriate. The action levels developed at the time of closure will take into consideration combined cumulative risk effects due to multiple contaminants, future land use, and use of updated toxicological (e.g., CSFs, RfDs, RfCs) information.

II F.2.3 Establishing Cleanup Goals

Cleanup goals will include risk-based and background levels and will be established through a series of screening steps and detailed evaluation. The analysis procedure to be used to establish cleanup goals for the New Bomb detonation unit is outlined as follows.

Step 1: Screening Process

Unit-specific concentrations will be contrasted with the environmental performance standards presented in Table III-I (Section III-B).

If unit-specific concentrations exceed the criteria listed in Table II–11 and updated risk-based concentrations, additional evaluations will be conducted. All constituents that exceed the criteria will be evaluated. If the concentrations do not exceed the screening criteria, the unit will be considered clean and no further evaluations will be completed.

Step 2: Background Soil Concentrations

Background concentrations for naturally occurring parameters in soil have been determined statistically using existing data as described in the following paragraphs. In an effort to establish background levels, soil samples were collected from locations near the New Bomb area that are unlikely to have been impacted by past facility activities. A statistical analysis was performed on a total of 54 background soil data that have been collected for HWAD to provide minimum and maximum concentrations and to calculate the means, standard deviations, and a range of one standard deviation from the mean. This statistical analysis assumed normal distribution of the data. In case of non-detect for any analytical parameter in the samples, a value of one-half of the detection limit was assigned to those samples. Thus background concentration study concluded that all background sample concentrations fall within the appropriate ranges published in the USGS Professional Paper 1270 for the Western United States, and all constituents appear to be indigenous to the Hawthorne Valley. The analytical results for background

soil samples are presented in Section 4 of the Final Data Package (Tetra Tech, 1996), refer to Volume II Appendix I (also available at HWAD Government Staff Library).

To determine the "statistically significant" level for any naturally occurring constituent, a tolerance interval approach has been used to determine the upper 95% tolerance limit (UTL) which contains at least 95% of the distribution of observations from background data. If any compliance concentration does not fall under the upper 95% tolerance limit, there is statistically significant evidence of contamination. The statistical method for determination of the 95% UTL is as follows:

$$UTL=X+KS$$

where, UTL = 95% upper tolerance limit (one-sided)
X = mean of background data
K = one-sided normal tolerance factor
S = Standard deviation of background data

Preliminary 95% UTLs for naturally occurring constituents in the background samples are presented in Table II-11.

Background soil samples were collected, with prior approval from the USACE and NDEP, at 54 locations throughout the Hawthorne Valley. Background soil data were presented in Section 4 of the Final Data Package (Appendix I). It was concluded that all background soil samples appear to be indigenous to the Hawthorne Valley. Additional background samples have been collected to show that the Hawthorne Valley background data are representative of the New Bomb area.

Step 3: Comparison with Background

If metals concentrations exceed the criteria in Table II-II, the results will be compared with background levels. If the concentrations of given metal exceeds the criteria, but not naturally occurring levels, that metal will be excluded from further analysis.

Step 4: Detailed Unit-Specific Analysis

If necessary, and especially if risk-based levels are higher than the background levels, detailed analysis of actual unit-specific risks based on contaminant fate and transport simulation, and unit-specific exposure assessment and risk characterization will be conducted to develop unit-specific cleanup goals. Such goals may indicate that the unit is closed-clean from a risk assessment and regulatory standpoint or may indicate that some additional action is necessary.

Step 5: Consideration of Buried Unexploded Ordnance (UXO)

After each treatment at New Bomb, an unexploded ordnance (UXO) team inspects the area to ensure treatment is complete. The inspection (cleanup) procedures are described in the Standing Operating Procedures (SOP) for New Bomb (Volume 2 Appendix A of this Part B Permit Application). Any UXO found is detonated in place or in a pit. At the time of closure for the New Bomb area, the same procedures will be followed to identify and remove any buried UXO and detonate them as appropriate. Similarly, materials other than waste explosives, such as shrapnel, from historical New Bomb operations will be identified and removed at the time of closure. The shrapnel will be transferred to the Main Base where it will be decontaminated at WADF, then sold as scrap metal. Effects on groundwater by any buried UXO and materials other than waste explosives from historical New Bomb operations are not expected. The existing groundwater monitoring well, which is screened at a depth of approximately 50 feet below ground, has historically been dry and has not yielded any water samples for analysis (Appendix H-1). In the unlikely event that contaminated groundwater is detected in the samples from this existing groundwater monitoring well, a contingency plan will be prepared to investigate the source of contamination and to propose corrective actions based on the conditions discovered. In June 1996, a boring located near State Route 359 was advanced to a depth of200 feet below the ground surface and did not encounter any groundwater (Appendix H-2). This information supports the conclusion that adverse effects on groundwater are not expected.

Step 6: Consideration of Soil Erosion

Soil erosion in the detonation area during active operations and after closure is addressed by a run-on and run-off management system in Section III A.2.2.2 of this permit application. As indicated above, any buried UXO and materials other than waste explosives from historical New Bomb operations will be removed and disposed of properly. In the unlikely event that soil erosion is causing the uncovering of unexploded ordnance, HWAD will mobilize to perform a survey of the situation. A contingency plan will be prepared to propose corrective actions based on the conditions discovered.

II F.2.4 Partial Closure Activities and Final Closure Activities

The detonation unit described in this permit application is expected to remain in service during the active life of the facility. No partial closure is anticipated. Closure of the detonation unit will proceed as described in this Closure Plan. In the event that future circumstances require HWAD to close a portion of the detonation unit, this Closure Plan will be amended.

II F.2.5 Maximum Waste Inventory [40 CFR 264.112(b)(3)]

Waste ordnance and munitions are neither stored nor accumulated at the detonation unit. Because these energetic materials are transported to the detonation unit on the day of treatment and treated on that day, there will be no inventory of such materials at this unit at closure. The maximum daily inventory of explosive material subject to detonation at the facility is also limited by the environmental performance standards

specified in Section III. A maximum of 40,000 pounds NEW of materials may be detonated per day. There are no hazardous wastes resulting from detonation activities. Shrapnel generated as a result of detonation activities is collected after each detonation event, then decontaminated at the Main Base and sold as scrap metal.

Soil contaminated above risk-based or background levels (whichever are higher), as described in Section III of the permit application, will be removed for off-site treatment (if necessary) and disposal.

II F.2.6 Sampling and Analysis Plan at Closure

A sampling and analysis plan (SAP) which is to be used at closure of the detonation area has been prepared and is presented in Volume II, Appendix G of this permit application. This plan includes the following sections:

(i) Sampling Plan Objectives
To determine if any residual contamination is present in the detonation area and to measure the concentrations of contaminants of concern.

(ii) Field Screening Techniques (phased sampling approach)
Field screening for UXO and other materials (such as shrapnel), resulting from New Bomb operations, is performed after each treatment event and will be repeated at the time of closure. Procedures for the field screening (cleanup) are described in the SOP for New Bomb. Screening for UXO will be performed prior to any field sampling activities.

(iii) List of Parameters to be Sampled and Analyzed
The list of potential COCs is adapted from the established basewide proposed closure goals (PCG) for soils at HWAD from the document "Hawthorne Army Depot, Remedial Investigation, Group B Solid Waste Management Units, Final Data Package," Tetra Tech, Vol . 1, January 1995.

(iv) Area of Concern and Point of Compliance
The area of concern (i.e., area to be sampled and ground water protection standard of 40 CFR 264.92 applies) includes the canyons where the detonation cells are located and the adjacent hill sides where the detonation residues may have been deposited. The area of concern covers approximately 1,000 feet by 2,000 feet and is shown on Figure II-7.

(v) Sampling Scheme and Methodology
A 200-by-200-foot grid system will be laid out over the area of concern for sampling purposes. Soil samples will be randomly collected from the surface (up to 6 inches) at each grid node over the entire grid system. Subsurface soil samples will be randomly collected at a depth of approximately 2 to 4 feet from the central locations of the detonation cells where underground

detonations have occurred. It is estimated that 50 surface soil samples and 20 subsurface soil samples will be randomly collected.

(vi) Sampling Methods
Sampling methods, including sampling procedures, equipment, containers, preservation techniques, chain-of-custody, decontamination, and QA/QC procedures and objectives, are presented in the SAP.

(vii) Analytical Methods
Analytical methods, including laboratory methods, detection limits, qualitative limits, QA/QC procedures, data validation procedures, and comparison to relevant action levels, are described in the SAP.

II F.2.7 Selection of Remedial Actions

The objective of closure at the detonation area is clean closure. If the results of any grid sample indicate the presence of contamination at levels above background and risk-based concentrations, additional samples will be collected at locations half way between the grid nod exhibiting contamination and the adjacent grid nod showing no contamination. The delineation process will continue until the boundary of the contaminated area is determined. It is possible that localized excavation may be needed to remove discrete contaminated soils in the immediate area of the sampling location where contamination is detected. In the case of discrete contamination, soil at the grid sampling location and a 5-feet radius will be excavated to at least 1 foot below the sample depth. Contaminated soils will be characterized and sent off-site for treatment, as needed, and disposal. Note that if contamination is found to be extensive and remediation is impractical, HWAD will evaluate options for leaving residuals in place combined with appropriate post-closure care. Upon completion of a verification sampling program as described below, the excavation area will be regraded or clean backfill materials will be brought in to restore the topography in the adjacent areas in order to minimize soil erosion. Due to uncertainties in the needs or extent of remedial actions, a detailed remedial action plan will be prepared based on the findings of the extent of contamination, if any, and submitted to NDEP for approval.

II F.2.8 Verification Sampling Plan

In the event that remedial actions are required at the detonation area, commercially available field sampling techniques (e.g., TNT in soil test kits) may be used to guide the excavation efforts by providing timely results for decision-making. Upon completion of the remedial actions, verification sampling will be performed in the areas of the excavation (including bottom, sidewall, and adjacent areas) to verify that all contamination has been removed. Random soil samples will be collected at previous 50 feet by 50 feet grid nod locations that fall within the excavation. All soil samples will be collected only from the surface (up to 6 inches) at verification sampling locations and sent to the analytical laboratory for analysis. The number of verification samples will depend upon the extent of excavation.

Sampling methods, including sampling procedures, equipment, containers, preservation techniques, chain-of-custody, decontamination, and QA/QC procedures and objectives, as presented in the Closure SAP (Volume 2 Appendix G), will be followed. It is also anticipated that the same analytical methods, detection limits, qualitative limits, QA/QC procedures, and data validation procedures as described in the SAP will be followed.

II F.2.9 Schedule for Closure [40 CFR 264.112(b)(6) and 264.113]

Closure is scheduled to occur 30 years from the day the permit is issued. It will proceed according to the schedule shown in Table II-12. No extension of closure time is requested at this time.

Throughout the detonation unit closure activity, all operations will be performed in a manner that will protect personnel, human health, and the environment. The necessary level of protection will be achieved by ensuring that various precautions are put in place and properly implemented during closure. The precautions will include:

Security: All existing security (e.g., signs, gates) will be maintained and, as necessary, supplemented.

Inspections: The facility inspection program will inspect areas where hazardous waste and residues are temporarily stored during remediation and decontamination.

Personnel Training: All personnel associated with facility closure will receive the training necessary to perform their duties.

Preparedness and Prevention: During closure activates, all equipment necessary to respond to potential emergencies at the facility will remain available. The facility will be maintained in such a manner as to minimize the potential for emergencies during closure.

Contingency Plan and Emergency Procedures: The facility contingency plan will be maintained, and, as necessary, augmented to describe proper responses in the event of emergencies during closure.

IIF.2.10 Closure Certification

Within 60 days of the completion of closure of the detonation unit, New Bomb will provide the EPA Region IX Administrator, by registered mail, that the unit has been closed in accordance with the specifications of the approved closure plan. The certification will be signed by the Installation Commander and by an independent, registered Nevada professional engineer who is also a Certified Environmental Manager. Documentation supporting the engineer's certification will be furnished in a closure certification report. The report will present the following information:

(i) Description of sampling plan implementation and decisions

(ii) Description of remediation decisions and activities, if any
(iii) Description of verification sampling plan implementation and decisions, if any
(iv) Data analysis and presentation (data posting on a map, contour plotting, tables), and, if any, figures showing location of remediation areas
(v) Sampling and analysis documentation
(vi) Statistical analyses performed, presentation of representative calculations
(vii) Certification by an independent registered professional engineer that closure is completed in accordance with approved closure plan, facility permit, and relevant regulations

At the time of unit closure, if contamination is left in place, a survey plat indicating the location and dimensions of the unit with respect to permanently surveyed benchmarks will be submitted to the local zoning authority and to the USEPA Regional Administrator. The plat will be prepared and certified by a professional land surveyor and will contain a note, prominently displayed, which states the owner/operator obligation to restrict disturbance of the disposal unit in accordance with applicable 40 CFR Subpart G regulations.

II F.3 POST-CLOSURE PLAN [40 CFR 264.117,264.118,264.603]

HWAD intends to perform clean closure for the detonation unit at the time of closure. During closure, UXO personnel will thoroughly inspect the detonation area to ensure that all buried UXO is removed and detonated, as appropriate. Similarly, materials other than waste explosives, such as shrapnel, from historical New Bomb operations will be identified and removed at the time of closure. The shrapnel will be transferred to the Main Base where it will be decontaminated at WADF, then sold as scrap metal.

A sampling and analysis plan (SAP) for closure has been prepared to be utilized at closure of the detonation area to determine if clean closure action levels are attainable (Appendix G). Clean closure action levels for the soil media in the detonation area will be based on either background levels or risk-based levels, whichever are higher. HWAD will remove or decontaminate all waste residues and contaminated soils, structures and equipment contaminated with waste at levels exceeding the to-be-determined clean closure action levels, and manage them as hazardous waste unless exemptions in 40 CFR 261 can be applied.

In the event that, after evaluation of results from the SAP at closure, US ARMY at HWAD determines that clean closure is not attainable, HWAD will prepare a post-closure plan for the NDEP in accordance with requirements in 40 CFR 264.118. The post-closure plan will be submitted within90 days from the date that HWAD or NDEP determines that the detonation unit will be closed as a landfill, subject to the requirements of 40 CFR 264.117 to 40 CFR 264.120. The plan will identify the activities that will be performed after closure of the detonation unit and the frequency of these activities, and include at least:

1. A description of the planned monitoring activities and frequencies at which they will be performed to comply with the applicable regulations in 40 CFR 264 during the post-closure care period.
2. A description of the planned maintenance activities, and frequencies at which they will be performed, to ensure:
    a. The integrity of the cap and final cover or other containment systems in accordance with the applicable requirements in 40 CFR 264; and
    b. The function of the monitoring equipment in accordance with the requirements in 40 CFR 264
3. The name, address, and phone number of the person or office to contact about the unit or facility during the post-closure care period.

After final closure has been certified, the person or office specified in the post-closure plan will follow the approved plan during the remainder of the post-closure period. If a change in the approved post-closure plan is needed at any time during the post-closure care period, HWAD will submit a written notification of or request for a permit modification in accordance with the applicable requirements of 40 CFR 124 and 40 CFR 270. The written notification or request will include a copy of the amended post-closure plan for review or approval by the NDEP. As indicated in 40 CFR 264.118, HWAD will submit a written request for a permit modification at least 60 days prior to the proposed change in facility design or operation, or no later than 60 days after an unexpected event has occurred which has affected the post-closure plan.

II F.4 CLOSURE AND POST-CLOSURE COST ESTIMATE [40 CFR 264.142,264.144, 270.14(b)(15) and (16)]

As stated in 40 CFR 264.140 (c), States and the Federal government are exempt from RCRA financial requirements. HWAD is a federally owned and operated facility and, therefore, qualifies for this exemption.

II F.5 FINANCIAL ASSURANCE MECHANISMS [40 CFR 264.143,264.145, and 264.146]

As stated in 40 CFR 264.140 (c), States and the Federal government are exempt from RCRA financial requirements. HWAD is a federally owned and operated facility and, therefore, qualifies for this exemption.

II F.6 NOTICE OF DEED [40 CFR 270.14(b)(14) and 264.119]

This notice only applies to disposal units, therefore this Section is not applicable.

II F.7 INSURANCE POLICY [40 CFR 264.147]

As stated in 40 CFR 264.140 (c), States and the Federal government are exempt from RCRA financial requirements. HWAD is a federally owned and operated facility and, therefore, qualifies for this exemption.

TABLE II-10

LIST OF POTENTIAL CONTAMINATES OF CONCERN NEW BOMB FACILITY

Contaminates	Chemicals Classification
1,3-Dinitrobenzene	Explosive
2,4-Dinitrotoluene	Explosive
2,6-Dinitrotoluene	Explosive
Nitrobenzene	Explosive
Nitrotoluene (2-,3-,4-)	Explosive
Octahydro-1357-tetranitro-1357-tetrazocine (HMX)	Explosive
RDX	Explosive
Tetryl	Explosive
1,3,5-Trinitrobenzene	Explosive
2,4,6-Trinitrotoluene	Explosive
Aluminum	Metal
Arsenic (cancer endpoint)	Metal
Barium and compounds	Metal
Beryllium and compounds	Metal
Cadmium and compounds	Metal
Total Chromium	Metal
Lead	Metal
Mercury and compounds (inorganic)	Metal
Selenium	Metal
Silver and compounds	Metal
Acenaphthene	PAH
Benzo(a)anthracene	PAH
Benzo(a)pyrene	PAH
Benzo(b)fluoranthene	PAH
Benzo(k)f1uoranthene	PAH
Chrysene	PAH
Dibenz(a h)anthracene	PAH
Fluoranthene	PAH
Fluorene	PAH
Indeno(1,2,3-cd),vrene	PAH
Naphthalene	PAH
Pyrene	PAH
Bis(2-ethylhexyl)phthalate (DEHP)	SVOC
Bromoform (tribromomethane)	SVOC
Butyl benzyl phthalate	SVOC
Dibromochloromethane	SVOC
Dibutyl-phthalate	SVOC
Diethyl phthalate	SVOC
Phenanthrene	SVOC
Phenol	SVOC
Acetone	VOC
Anthracene	VOC
Benzene	VOC
Bis(2-chloroisopropyl)ether	VOC
Bromomethane	VOC

TABLE II-10 (CONTINUED)
LIST OF POTENTIAL CONTAMINATES OF CONCERN NEW BOMB FACILITY

Carbon tetrachloride	VOC
Chlorobenzene	VOC
Chloroform	VOC
Chloromethane	VOC
1 2-Dibromomethane	VOC
1 2-Dichlorobenzene	VOC
1 4-Dichlorobenzene	VOC
Dichlorodifluoromethane	VOC
Ethylbenzene	VOC
Methylene bromide	VOC
Methylene Chloride	VOC
1,1,2,2-Tetrachloroethane	VOC
Tetrachloroethylene (PCE)	VOC
Toluene	VOC
1 1 1-Trichloroethane	VOC
Trichloroethylene (TCE)	VOC
Trichlorofluoromethane	VOC
1,2,3-Trichloropropane	VOC
Vinyl chloride	VOC
Xylene Total (m- o-,p-)	VOC

TABLE II-11
95% UPPER TOLERANCE LIMITS FOR NATURALLY OCCURRING CONSTITUENTS IN THE HAWTHORNE VALLEY BACKGROUND SAMPLES, NEW BOMB, HAWTHORNE, NEVADA

	Al mg/kg	As mg/kg	Ba mg/kg	Be mg/kg	Cd mg/kg	Sr mg/kg	Pb mg/kg	Hg mg/kg	Se mg/kg	Ag mg/kg
Max.	18,000	27	200	0.81	1.6	17.0	58.0	0.40	<5.0	<0.9
Min.	1,800	<4.0	35	0.11	<0.2	1.2	<5.0	<0.04	<5.0	<0.9
Mean	6,406	4.2	77	0.3	0.5	4.7	6.3	0.03	NA	NA
Stev.	2,979	5.3	31	0.1	0.3	2.9	7.2	0.09	NA	NA
95% UTL	12,558	15.2	141.0	0.51	1.12	10.7	21.2	0.22	NA	NA

Notes: (1) Mean values for background concentrations were calculated by summing the total concentrations and dividing by the sample population. Non detect values were included as half of the detect limit. No statistical evaluation was conducted if the total population was reported below the detection limit.

(2) Preliminary 95% UTLs were calculated based on a total of 54 background samples (K=2.065).

TABLE II-12

SCHEDULE FOR CLOSURE OF THE DETONATION UNIT*

Step	Description	Latest Cumulative Time (days)
1	Notify Director of intent to close	180 days prior to receipt of final waste volume
2	Receipt of final waste	Within 30 days prior to beginning closure
3	Begin closure	0
4	Process final volume of wastes and store residue in on-site interim status storage facilities	60
5	Complete sampling and testing of all samples; evaluate	120
6	Propose and perform remedial actions; conduct verification sampling	*
7	U.S. Army certifies that closure is completed in accordance with approved closure plan	150
8	Independent registered Nevada professional engineer and Certified Environmental Manager (CEM) certifies closure completed in accordance with approved closure plan	180

*-Note that should monitoring data available at the time of closure indicate that remediation will need to be conducted, an extension of the up to 180 days required for closure will be requested.

SECTION II G PROTECTION OF GROUNDWATER

II G.1 UNIT IS A REGULATED UNIT [40 CFR 264.90(A)(2), 270.14(C) AND 270.23(B)]

HWAD conducts thermal treatment of conventional energetic material items at the detonation unit. Treatment by detonation falls under the miscellaneous units provisions in Sections 264.600 through 264.603. detonation is used for treatment of energetic materials because it is the only safe and effective treatment processes currently available for most energetic material items.

II G.2 EXISTING GROUNDWATER MONITORING DATA [40 CFR 270.14(C) AND 270.23]

In 1984 a borehole was drilled at the New Bomb Area in the down-gradient direction for the detonation area, to a depth of 44.5 feet (Appendix H-I). At this depth, rocky material prevented further penetration of the hollow-stem auger. No water was encountered to this depth. A well was installed in the borehole. No water has been observed in the well during repeated observations since that time. A subsurface investigation performed in 1996 encountered no groundwater 200 feet below the ground surface (Appendix H-2). New Bomb has presented a Sampling and Analysis Plan sufficient to establish a soil monitoring for the detonation unit (Section II B.3).

At other U.S. military installations where a permit application has been submitted for Subpart X Open Detonation (OD) units, the nature and extent of current contamination of the groundwater, surface water, and soil have been carefully considered in the permitting process, and most of the data discussed have come from RCRA Facility Investigations (RFIs). At New Bomb, however, there has been no Remedial Investigation / Feasibility Study (RI/FS) or RFI conducted at the New Bomb Facility, so there are no data from which an evaluation of groundwater contamination can be made.

Surface soils have been collected at the detonation unit. The results summarized in Tables 1 and 2 in volume II, Appendix H-4 show low levels of metals and explosive compounds. Additional analytical results of tests for the RCRA eight toxic heavy metals and explosives are included in Appendix F.

II G.3 IDENTIFICATION OF UPPERMOST AQUIFER AND AQUIFERS HYDRAULICALLY INTERCONNECTED BENEATH THE FACILITY PROPERTY [40 CFR 270.14(C)(2) AND 270.23]

Limited data are available concerning groundwater below the detonation unit. Available data suggest the depth to groundwater is greater than 200 feet (IT, 1996; USAEHA, 1985; Everett, et al.,1967).

II G.4 GROUNDWATER FLOW, DIRECTION, RATE, AND SOURCE OF INFORMATION [40 CFR 270.14(C)(2) AND 270.23]

Limited data are available concerning local groundwater conditions. Available data suggest the depth to groundwater is greater than 200 feet (IT, 1996; USAEHA, 1985; Everett, et al., 1967).

II G.5 DESCRIPTION OF ANY PLUME OF CONTAMINATION THAT HAS ENTERED THE GROUNDWATER FROM A REGULATED UNIT [40 CFR 270.14(C)(4) AND 270.23]

No plume has been identified at the detonation unit because no sampling and analysis has been conducted since there was no water in the two boreholes drilled at the New Bomb Area in 1984 and 1996. Also, groundwater monitoring is not proposed for the detonation unit.

The results of an extensive field investigation conducted by USAEHA in 1984 to evaluate the impact of the selected OD units on groundwater quality under varying site-specific conditions indicated that no groundwater contamination was present where the annual evaporation exceeded annual precipitation by more than two feet. In arid areas like HWAD, there is no driving force to leach potential contaminants to the water table. At HWAD, the evaporation potential exceeds the precipitation rate by 44 inches per year and no wastes containing free liquids is detonated at the unit (EBASCO, 1988).

II G.6 PROPOSED GROUNDWATER MONITORING PROGRAM [40 CFR 264.97, 264.600, 270.14(C)(5) AND 270.23]

A groundwater monitoring program is not proposed for the detonation unit for several reasons. First, EBASCO (1988) hypothesized that considering the location of the unit along an alluvial fan and eastern fault trace, it is possible that the depth to groundwater at the New Bomb Area is greater than 200 feet (as confirmed by the 1996 boring [IT, 1996]). Second, as indicated in Section ill-D, the only residue resulting from detonation is shrapnel and if a visual examination indicates that there is some UXO it is redetonated in place or in a pit. Shrapnel that does not visibly contain unexploded materials is collected for subsequent recycling. Third, as indicated above the results of an extensive field investigation conducted by USAEHA in 1984 to evaluate the impact of the selected OD units on groundwater quality under varying site-specific conditions indicated that no groundwater contamination was present where the annual evaporation exceeded annual precipitation by more than two feet like in the case of HWAD (EBASCO, 1988).

As indicated earlier, in 1984 a borehole was drilled at the New Bomb Area in the down-gradient direction for the detonation area, to a depth of 44.5 feet. At this depth, rocky material prevented further penetration of the hollow-stern auger. No water was encountered to this depth. A well was installed in the borehole. No water has been observed in the well during repeated observations since that time. A subsurface investigation performed in 1996 encountered no groundwater 200 feet below the ground

surface (Appendix H-2). The soil monitoring data will be carefully evaluated to determine the need for additional information such as additional soil and if warranted a groundwater monitoring program.

Surface soils will be collected before and after treatment of any new items. A site-specific environmental monitoring program provides a means to define or confirm the extent of contamination, demonstrate compliance with regulatory requirements and performance standards, and to identify potential future releases. These data will also be used to define conditions for unit closure, as described in Section II-F, such that additional environmental sampling prior to closure to define contamination conditions may be unnecessary. It should be noted that a surface soil sampling program performed to evaluate the potential for off-site migration from runoff did not find concentrations of constituents above risk-based levels of concern (Appendix H-4).

II G. 7 SOIL SAMPLING

Soil sampling is addressed in detail in Section II B.3 Sampling and Analysis Plan. The most recent soil sampling data is included in Volume II Appendix E.

II G.7.1 Reporting

A report of the results of the soil sampling events will be summarized and sent to NDEP as outlined in the Sampling and Analysis Plan presented in Section II B. New Bomb will report to NDEP any evidence of soil contamination and the remedial actions taken.

II G.8 DETECTION MONITORING PROGRAM [40 CFR 264.98,264.600, 270.14(C)(6) AND 270.23]

No groundwater is expected to occur shallower than 200 feet below the surface; hence, no hazardous constituents are expected in groundwater at the detonation unit and this program is not applicable (IT, 1996; USAEHA, 1985; Everett, et al., 1967).

II G.9 COMPLIANCE MONITORING PROGRAM [40 CFR 264.94 AND 270.14(C)(7)]

No groundwater is expected to occur shallower than 200 feet below the surface; hence, no hazardous constituents are expected in groundwater at the detonation unit and this program is not applicable (IT, 1996; USAEHA, 1985; Everett, et al., 1967).

II G.10 CORRECTIVE ACTION PROGRAM OR DATA SHOWING THAT THE EXISTING LEVELS ARE NOT HARMFUL [40 CFR 270.14(C)(8)]

No groundwater is expected to occur shallower than 200 feet below the surface; hence, no hazardous constituents are expected in groundwater at the detonation unit and this program is not applicable (IT, 1996; USAEHA, 1985; Everett, et al., 1967).

II G.11 DETAILED PLANS AND ENGINEERING REPORT DESCRIBING THE CORRECTIVE ACTION TO BE IMPLEMENTED [40 CFR 270.14(C)(8)(III)]

No groundwater is expected to occur shallower than 200 feet below the surface; hence, no hazardous constituents are expected in groundwater at the detonation unit and this requirement is not applicable (IT, 1996; USAEHA, 1985; Everett, et al., 1967).

II G.12 DESCRIPTION OF USE OF THE GROUNDWATER MONITORING PROGRAM TO DEMONSTRATE THE ADEQUACY OF THE CORRECTIVE ACTION [40 CFR 264.101, 270.14(C)(8)(IV) AND 270.14(D)]

No groundwater is expected to occur shallower than 200 feet below the surface; hence, no hazardous constituents are expected in groundwater at the detonation unit and this program is not applicable (IT, 1996; USAEHA, 1985; Everett, et al., 1967).

SECTION II H PROTECTION OF SURFACE WATER

There are no perennial surface water bodies or streams near the detonation unit. The nearest water body is Walker Lake, 25 miles north of the site. The impact of the detonation unit on surface water is discussed in Section III-B.

SECTION II I OTHER FEDERAL LAWS

The requirements of the following federal laws must be met when they apply to the detonation unit at the New Bomb Area.

II I.1 THE WILD AND SCENIC RIVERS ACT [40 CFR 270.3(a)]

This act does not apply to the above facilities at HWAD because they are not part of, or related to, any water resources project. Therefore, this section is not applicable.

II I.2 THE NATIONAL HISTORIC PRESERVATION ACT OF 1966 [40 CFR 270.3(b)]

Operation of New Bomb does not have any effect on properties listed or eligible for listing in the National Register of Historic Places. Therefore, this section is not applicable.

II I.3 THE ENDANGERED SPECIES ACT [40 CFR 270.3(c)]

The New Bomb facility is not expected to affect or impair endangered or threatened species or their habitat.

II I.4 THE COASTAL ZONE MANAGEMENT ACT [40 CFR 270.3(d)]

This act does not apply to operations at New Bomb because it is not in the coastal zone. Therefore, this section is not applicable.

II I.5 THE FISH AND WILDLIFE COORDINATION ACT [40 CFR 270.3(e)]

Operation of New Bomb does not result in the impoundment, diversion, control, or modification of surface water bodies. Therefore, this section is not applicable.

SECTION III A PROCESS INFORMATION

III A.1 APPLICABILITY AS A MISCELLANEOUS UNIT [40 CFR 264.600 and 270.23]

New Bomb Facility conducts thermal treatment of energetic material. The mission of New Bomb is to receive, and treat munitions that have been declared waste by the US Military. Items that become unserviceable and cannot be safely demilitarized at the Western Area Demilitarization Facility (WADF) are treated by open detonation at the New Bomb Facility. The location of the detonation unit is illustrated in Section II-A, Figure II-I, Vicinity Map. Treatment by detonation falls under the miscellaneous units provisions in Sections 264.600 (through 264.603).

Detonation is used for treatment of energetic materials because it is the only safe and effective treatment processes currently available for most energetic material items. The selection of detonation is based on energetic material item-specific information, developed by the U.S. Army, based on energetic material type and content, explosion potential, and historical experience. As discussed in the following sections, the U.S. Army is continuing to evaluate alternative treatment processes which may be used in the future, rather than detonation, to treat appropriate energetic materials.

Because the detonation treatment process is a non-continuous (i.e., batch) process, the facility is not subject to steady-state or "normal" operating conditions. Wastes are treated according to HWAD SOPs. The SOPs detail the handling of the explosives from storage to unloading, the tools to be used, setting the charge, and ultimately, burning or detonation.

Detonation takes place at New Bomb in an area of approximately 743 acres and is located about 22 miles south of Hawthorne (see Section II-A, Figure II-I). The area is in a secure zone which has limited access.

There are major advantages for using open detonation disposal practices. These include the following:

- Safety is the most important consideration. Strict observance of proven detonation procedures has resulted in an excellent safety record being earned by the personnel who have helped to treat the many millions of pounds of waste military energetic materials safely over the last four decades at numerous DOD installations.

- Versatility. These types of operations are extremely versatile; large or small quantities of the myriad types of materials can easily and safely be treated.

- Reliability. Because of its inherent simplicity, detonation is an extremely reliable process not subject to equipment downtime.

- Treatment Efficiency. Detonation is a very efficient treatment as demonstrated by testing. This is discussed in further detail in Section II-B.

III A.1.1 The Western Area Demilitarization Facility (WADF)

WADF at HWAD was built to deactivate, break down, and render inert ammunition items, to recycle explosives and propellants, and to recycle contaminated water recovered from various processes. A portion of the facility is currently non-operational due to upgrades needed to improve safety and efficiency to the demilitarization processes. WADF consists primarily of mechanical disassembly of ordnance and munitions; mechanical removal of explosive using hole cutting, sawing, pressing, shearing, and hold-punching techniques; hot water washout and steam-out of meltable, soluble, and press-loaded explosives; autoclave heating of projectiles; decontamination of ammunition using rotary furnaces, a tray-flashing furnace, and a hot-gas chamber; incineration of bulk explosives and propellants; and a water treatment facility to treat contaminated water generated by various processes at WADF. All of these processes have operational limitations depending on the size and type of munitions that can be processed. For instance, the mechanical disassembly process handles gun-type ammunition of 6 inches or less. The process of biodegradation uses microorganisms or fungus to consume energetic materials and thus produce a less hazardous or inert material. This method is useful for the treatment of wastewater generated from other demilitarization operations.

III A.2 DESCRIPTION OF DETONATION UNIT [40 CFR 270.23(A)]

The detonation cells are located in the central part of New Bomb, West of State Highway 359. The detonation unit consists of approximately 743 acres. There are a total of 20 cells where detonation takes place. A footprint within a single cell that is used for detonation is typically 20 feet by 6 feet and the distance between pits is approximately 75 feet. There are no engineered features at this detonation unit to detect or prevent releases. Due to the nature of detonation, engineered features would be destroyed.

The placement of the initiating charges and the amount of initiating charge are determined by the amount and nature of material being treated and are specified in Army manuals. Munitions are detonated by non-electrical methods. The only residues generated as a result of detonation operations are metallic materials such as shell fragments (shrapnel).., occasional pieces of energetic materials which were not completely treated during detonation, *and* the constituents listed in Section II-F Table II-10 and Appendix E. The detonation unit is inspected for these materials following detonation. Any remaining energetic material is either detonated in place if unstable (i.e., fuzed) or is returned to a pit and immediately detonated. Shrapnel visually identified as inert material is collected, then demilitarized at the Main Base WADF and sold as scrap metal.

A maximum of 4,000 pounds, Net Explosive Weight (NEW), will be treated per detonation at the detonation unit. Influencing factors depend on demilitarization requirements when weapon systems and ordnance items become obsolete, are phased out by international treaty, or reach their shelf-life limits.

A description of the physical characteristics, materials of construction, and dimensions of the detonation cells is also provided in Section II-A.6, Description of the Treatment Units.

The detonation unit is inspected before and after use. Prior to any detonation operations, the detonation unit is inspected to ensure that it is:

- Free of standing water
- Free of ordnance fragments, unexploded ordnance, blasting caps, detonation cords, or other detonation operational debris
- Free of glass, wood fragments, metal scraps, and debris, trash, obstacles, or tripping hazards
- Free from plant matter or other potentially combustible material.

After detonation activities are completed, the immediate area surrounding the crater is inspected visually for any possible kick-outs. If unexploded ordnance is discovered, it is subsequently destroyed in place by another round of detonation or is returned to a pit and detonated. The inspection, monitoring, and maintenance plan for the detonation unit are discussed in Section II- C.

III A.2.1 Residue Management

Any UXO is re-detonated either in place or in the pit. Shrapnel, identified as inert, is collected after each detonation event, decontaminated at the Main Base and sold as scrap metal. Soil samples are collected every six months. Sampling and testing of soils are addressed in Section II.B.3.

III A.2.2 Run-On and Run-Off Management

At the detonation unit, the process of detonation disrupts several feet of soil to a great extent. After each detonation event, the surface of the land is re-graded to ensure that any blast craters are leveled out to minimize ponding of water. Berms between each cell prevent runoff from entering the cells. HWAD has re-graded the road leading to the cells and has constructed a drainage ditch to drain water away from the cells.

There were initial concerns regarding the ability of a proposed basin to retain potential contaminants carried away from the detonation pits and the surrounding area during wet weather events, including potential wash out during flash floods. The purpose of this basin was to retain potential contaminants carried away from the detonation pits and the surrounding area during wet weather events. The basin was sized to collect both run-on and run off from the immediate watershed area for the recommended design storm (25-

year 24-hour event). The design did not include separation of run-on from run-off because a storm water discharge permit will not be required from NDEP, thus the minimization of water storage volume was not a design priority. In order to more accurately assess the need for a retention basin, additional soil samples have been collected along drainage ways and at the outer boundaries of the site where material is ejected. The 10 surface soil samples, including background, were collected in early August 1996 following the NDEP approved sampling plan prepared by IT Corporation. Although results demonstrated that a few constituents in drainage ways down-gradient of the site were above site-specific background, concentrations were not above risk-based cleanup goals (see report in Volume II, Appendix H-4 for details). Based on this finding, NDEP has agreed that a retention basin is not necessary at the New Bomb area.

No waste is stored at New Bomb and detonation operations are not conducted during periods of precipitation.

III A.2.3 Operations

Operations are conducted in accordance with New Bomb and HWAD SOPs. These SOPs are periodically reviewed and updated. The most current are found in Volume 2 Appendix A of this Part B Application.

III A.2.3.1 Open Burning (Ob) In Containment Devices Where Unit Incorporates Soil as Part of the Unit [40 CFR 270.23(and 270.32]

New Bomb does not treat waste by OB; therefore these requirements are not applicable.

III A.2.3.2 OB on the Ground Surface Where Unit Incorporates Soil as Part of the Unit [40 CFR 270.23 and 270.32]

New Bomb does not treat waste by OB; therefore these requirements are not applicable.

III A.3 DETONATION [40 CFR 270.23 and 270.32]

III A.3.1 Appropriateness of Treatment Technology [40 CFR 270.32(b)]

Open detonation of hazardous wastes is prohibited under 40 CFR 264.17(b). Nonetheless, EPA has allowed exceptions to this prohibition as part of the interim status standards (40 CFR 264.382), which allows the open detonation of waste explosives. Waste explosives are defined as "waste which has the potential to detonate and cannot safely be disposed of through other forms of treatment." Inherent in this definition is a requirement by the permit applicant to demonstrate the lack of other currently available treatment technologies for the safe disposition of waste explosives.

The energetic material items treated by detonation at New Bomb, which are listed in Section II.B Table II-2, clearly exhibit the characteristics of reactivity. This classifies

them as a hazardous waste (assuming that the intent is to discard a given item, making it a solid waste). Reactive hazardous waste is classified as a D003 waste (40 CFR 261.23). Propellants, energetic, and pyrotechnics typically exhibit explosive characteristics ranging from deflagration (very rapid pressure-rate-of-rise fires) to detonation. Both deflagration and detonation can cause extensive structural damage and loss of life. The inherent safety problems with handling explosives, as reflected by accidents that have occurred at explosive manufacturing and demilitarization facilities, emphasizing the need for detonation capabilities to routinely demilitarize outdated energetic material items. The detonation operation at HWAD serves an important purpose by allowing Military Services to dispose of ordnance in an effective and efficient manner that is more environmentally sound than other methods such as land disposal and is less threatening to human health than if the explosive material in each item were reclaimed following deactivation of the item. Energetics may also contain toxics (40 CFR 261.24) such as metals for coloration in pyrotechnics or for enhanced heating characteristics. These toxics in energetics complicate the technologies available for treatment.

The U.S. Army and other branches of the U.S. military have been actively involved in several investigations of alterative treatment technologies for the safe disposition of waste explosives. These include literature searches and subsequent evaluation of possible technologies and investigation of possible waste explosive use and reuse alternatives. In addition, the U.S. Army is actively conducting programs in alternative treatment and reuse technologies.

The goal of past and ongoing efforts has been to investigate alternatives to open detonation that are protective of human health and the environment, effective in reducing the reactive and toxic hazards of waste explosives, and do not pose a threat to worker health and safety. A summary of DOD-wide efforts in this area is given in the following subsections. While some of the alternatives discussed below have progressed past the conceptual or laboratory scale, most are still years away from significant application. Also, many of these technologies have been developed for specific applications only, and few of the fully-developed technologies have emphasized the needs of a varied waste stream or general disposal. For these reasons, it is the view of the U.S. Army that, at the present time, there is no single technology that could be an alternative to detonation operations and would be suitable for disposing of the wide range of waste explosives now treated at HWAD and at other DOD installations around the country.

The US Army has determined that the demilitarization of energetic material items, presented in Section II.B Table II-2 by detonation is the best available control technology (Demilitarization Alternatives' to Open Burning/Open Detonation Technology Compilations Volume II US Army Armament Munitions and Chemical Command, Savanna, Illinois, Tune 1990), as discussed in the draft Position Paper for RCRA Subpart X NOD (IISATFIAMA, 1991)

HWAD determines the disposition of items needing treatment on a case-by-case basis. At the present time, treatment options at HWAD include open detonation, open burning, or reclaim, recover, recycle and reuse (R4) at the Western Area Demilitarization Facility (WADE) and other facilities and processed at HWAD. An alternative option also includes treatment at the deactivation incinerator (RF-9 Unit) and future Plasma Ordinance Demilitarization System (PODS), etc. Items are generally treated at WADF unless design considerations, small quantities, or safety concerns dictate an alternate treatment option. All of the technologies being utilized, researched, and developed are for the sole purpose of treatment of unusable, unsafe, or obsolete munitions in an environmentally safe manner as an alternative to open burning/open detonation. One of the most environmentally sound approaches to waste treatment is waste reduction by Resource, Recovery, Recycling, and Reutilization (R-4). HWAD and across DOD, R-4 is first utilized whenever possible.

Following is a summary of evolving treatment technologies for energetic material items. As new treatment technologies become available, a "best available control" technology analysis will be conducted by the U.S. Army on a munition-by-munition and energetic material case-by-case basis to determine whether detonation or some alternative disposal process should be applied.

III A.4 ALTERNATIVE METHODS CURRENTLY IN USE AT HWAD:

HWAD'S current operating permit contains conditions that allow the following processes to remove and recover explosives.

III A.4.1 Separation and Disassembly

Several separation and disassembly technologies are presented. Although, this approach is not feasible from the logistical or safety standpoint for all the types of ordnance treated at HWAD. In addition, this approach is labor and energy intensive and results in the generation of large amounts of hazardous waste. Extensive upgrade is needed to bring the technology into compliance with today's environmental and safety standards.

HWAD utilizes the first and most obvious approach, when it is feasible to do so. This approach is to physically disassemble each munitions item into its mechanical and energetic material components and reclaim the explosives for reuse and then determine the best method for disassembling the mechanical components or restoring them pending reuse in future munitions assemblies.

III A.4.2 Wash-Out/Steam-Out Process

The Wash-Out/Steam-Out Process is a process utilized by HWAD for explosives removal. Explosives from larger explosives devices such as mines and depth charges are removed by utilizing this process. Steam and/or hot water are injected into the open end of the explosive device via a hollow lance that is inserted into the explosive device. The molten explosive is drained through an opening in the lance and returned back to a separation tank. Explosive material from the separation tank flows to a melt kettle where water is separated by vacuum dehydration. The explosives are then transferred onto a belt flaker where it is cooled, solidified, and flaked. The flaked explosive material is then packaged for reuse.

Particulate emission from the Wash-Out/Steam-Out Process are collected by a single wet scrubber ducted to the separation tank, melt kettle, Kernelling machine. The belt flaker uses a stream or jet of low- or high-pressure hot water to separate energetic materials from munitions cases. It has generally been employed to remove TNT or similar semi-meltable explosives from projectile bodies.

III A.4.3 High Pressure Ambient Temperature Water Wash-Out

The High Pressure Ambient Temperature Water Wash-Out Process is utilized to remove pressed loaded and gelled explosives from explosives projectiles. Water at ambient temperature and a minimum pressure of 10,000 PSI is injected into the open end of the projectile to remove the explosive material with a high pressure water jet. The projectiles are placed in a rotating fixture or wash-out turntable. Explosives are evacuated by the high pressure water stream. The mixture of water and explosive material is then directed to a dewatering screen to separate the explosive particles from the water. The recovered explosive is put through a drying conveyor, dried, and packaged for reuse. Underflow material from the screen which contains small explosive particles is passed through a filter press for separating the explosive material from the water. The recovered explosive is weighed and packaged for reuse.

Particulate emissions from the wash-out turntable and drying conveyor are collected and controlled by a single wet scrubber.

III A.4.4 Low Pressure Hot Water Wash-Out Process

The Low Pressure Hot Water Wash-Out Process is similar to the High Pressure Ambient Temperature Water Wash-Out Process. Instead of high pressure, this method employs low pressure hot water for explosives removal. The type of explosive materials and the process for removal are the same as those shown for the high-pressure process above; only the pressure and temperature of the water are different. Particulate emissions are collected and controlled by a single wet scrubber.

III A.4.5 Autoclave

The autoclave is a melt-out process utilized by HWAD for explosives removal. Main charge explosives from gun ammunition, rocket warheads, depth charges, mortar rounds and other ordnance items are removed and recovered by applying steam to the outer surface of the ordnance and melting the explosives out of the ordnance. Ordnance items are mounted in a fixture, open-end down. The fixture is lowered into one of eight pressurized steam autoclaves for exposure to the steam. Once the explosive becomes molten, it drains from the ordnance into one of two kettles where the explosive is dehydrated under vacuum. Following dehydration, the explosive material is poured onto an enclosed water-cooled stainless steel conveyor belt where the material cools and solidifies. The solidified explosive is flaked into small pieces by a belt flaker and conveyed to a vibratory feeder for weighting and final packaging.

III A.4.6 Plasma Ordnance Demilitarization Systems (PODS)

Plasma Arc Technology uses a plasma (electrons flowing in an ionized gas) torch to create high temperatures in an enclosed chamber in order to melt inorganic constituents of munitions items into a homogeneous slag while fully oxidizing organic components. The process is started by feeding soil and steel into the chamber where it is melted by the heat of the torch, providing a molten pool into which the ordnance to be demilled is fed. Gases generated from the combustion of the ordnance flow to a secondary combustion chamber and are then drawn through pollution abatement equipment prior to release to the atmosphere. Molten slag is periodically poured from the chamber, cooled and collected as a low-leachable, homogeneous solid which should meet EPA requirements for a non-hazardous waste. This technology is focused on the destruction of small caliber and hand held completely assembled pyrotechnic, smoke and dye ordnance which can not be processed in a conventional deactivation furnace because of high heat and smoke generation.

III A.4.7 RF9 Rotary Kiln Incinerators

RF9 Rotary Kiln is a deactivation furnace designed with internal spiral flights that advance the waste through the kiln as it rotates. The DZHC rotary kiln is also referred to as a retort or as having retort sections. The incinerator is based on the APE 2210 kiln that the US Army developed specifically to incinerate configured munitions and bulk explosives. The Rotary Kiln uses five retort sections in lieu of the APEI 236 kiln design of only four sections in order to increase the material residence time by 25 percent. In addition, the middle retort section has an enlarged inside diameter to enhance materials residence time. The DZHC rotary kiln has a single burner assembly at the discharge end of the kiln, which is the opposite end from where the wastes are fed. The Rotary Kiln is used for the destruction of small arms ammunition and ordnance items that contain less than 600 grains of confined explosive material in each item. The APE 1236 is the U.S. Army's standard unit and has been upgraded to meet environmental regulatory standards. The U.S. Army has one APE 2210 incinerator and one APE 1236 at the Main Base here at HWAD. One of these incinerators is in the current APE

upgrade program. There are 18 APE 1236 incinerators located at various U.S. Army installations. Twelve of these are in the current APE upgrade program, of which one is a prototype not used for routine disposal. In addition, the Pine Bluff Arsenal in Arkansas has an incinerator with the same basic design as the APE 1236. This unit has been upgraded independently of the APE 1236 upgrade program.

III A.5 ALTERNATIVE METHODS PLANNED FOR THE NEAR FUTURE AT HWAD:

III A.5.1 Slurry Gel

The process will convert propellants to a blasting gel that will be used in the mining industry. This process will provide HWAD with an environmentally safe capability to immediately convert unstable propellant to a useable product thus eliminating open burning or transporting for off station treatment.

III A.5.2 Bulk Energetics Demilitarization System (BEDS) (Bulk Slurry)

The objective of BEDS is to destroy energetic materials emerging from demilitarization operations in an environmentally acceptable and safe manner. Primary feedstock will be bulk propellants in the form of fine powders, grains, extrusions, sticks, rolls, and other shapes. Propellants may be single-based (nitrocellulose only) or multi-based (nitrocellulose with nitroglycerine and/or nitroguanidine). Additional propellants that are currently loaded in munitions which might later be demilitarized could also be included as feedstock. The slurry feed system is used to reduce the size of explosive/propellant pieces and prepare a water-based slurry for feeding to the rotary kiln incinerator. This system is designed to meet the Maximum Achievable Control Technology (MACT) emissions criteria of the US-EPA's Hazardous Waste Combustor standards for incinerators.

III A.6 ALTERNATIVE METHODS TO BE CONSIDERED AT HWAD:

III A.6.1 Cryofracture

Cryofracture involves the cooling of small, fully assembled, energetic-loaded munitions items in a liquid nitrogen bath followed by fracturing the resulting brittle items into many pieces using hydraulic press. The fractured pieces can then be subjected to controlled thermal deactivation (e.g., conventional incineration or plasma combustion) at increased throughputs without fear of detonation. As an added feature, separation of valuable or material that cannot be incinerated from the fractured debris can be carried out. The technology is being developed by conducting tests on an existing full-scale system originally built for chemical munitions demil at Dugway Proving Ground and then adapting this system to the specific needs of conventional ammunition items such as grenades, CEM sub-munitions and landmines. Successful testing of M42/M46/M77 sub-munitions grenades, M61 and M67 hand grenades, M16A2 and ADAM antipersonnel

land mines and Rockeye sub-munitions has been completed. The operating experience and information gathered during testing has been used to design and upgrade an optimized system that has been installed and is currently being started up and demonstrated at McAlester Army Ammunition Plant (MCAAP). The process at McAlester will also employ state-of-the-art robotic equipment to disassemble and download the sub-munitions containing projectiles.

III A.7 ALTERNATIVE METHODS IN THE RESEARCH AND DEVELOPMENT PHASE BY THE ARMY:

The following approaches are not feasible from the standpoint that either they are still under research or have not been fully demonstrated.

III A.7.1 Donovan Blast Chamber

The Donovan Chamber is a transportable and contained detonation chamber that destroys ordnance without damaging the environment by quenching and cooling the blast with water and controlled expansion, capturing particles as small as one-half micron generated by the blast, and filtering gases from the blast through an air pollution control system before they are released into the air.

It is also designed for rapid and repetitive unexploded ordnance disposal as it permits detonation every five minutes or less of munitions equivalent to two 81-millimeter mortar rounds and the donor charge used to initiate detonation.

The chamber is used at locations where it is possible to safely move the ordnance a short distance for detonation and contain the explosion due to special circumstances. In some cases items will be so unstable that it will not be safe to transport the item and make use of the chamber. In those cases the item must be blown in place using approved safety procedures.

III A.7.2 Fluidized Bed Incinerator

The fluidized bed incinerator uses air to entrain solids in a highly turbulent combustion chamber. This equipment is not used for incineration of explosive materials but has been used for incineration of riot control agents and non-explosive munitions fillers. The U.S. Army has a fluidized bed incinerator at Pine Bluff Arsenal, Arkansas, which is RCRA permitted, and is operational.

III A.7.3 Molten Salt Oxidation Technology Application

Molten Salt Oxidation (MSO) is a flameless thermal oxidation process that converts the organic constituents of wastes to carbon dioxide, nitrogen and water. The waste stream is injected along with air into a reactor containing a molten pool of salt material (e.g., sodium, potassium or lithium carbonate) at a temperature between 600-900 degrees C at atmospheric pressure. Acidic elements such as Cl, F, S and P are neutralized and captured by the salt. MSO operates at temperatures several hundred degrees less than incineration, requires no supplemental fuel, and thus generates less gaseous

emissions. MSO can treat many different waste streams such as chlorinated solvents and PCB-contaminated oils. A pilot plant designed and built by Lawrence Livermore National Laboratory has been installed and tested at the Defense Ammunition Center (DAC). This system will be optimized and then transported and re-installed at Blue Grass Army Depot for testing and demonstration of TNT sludge destruction. The data from these tests will then be used to design, build, demonstrate and validate a large-scale prototype MSO system to process a variety of munitions waste at Blue Grass.

III A.7.4 Supercritical Water Oxidation

Supercritical water oxidation (SCWO) involves subjecting an aqueous solution of slurry of a bulk organic chemical compound to temperatures and pressures in the supercritical region of water (above 374 degrees C and 3205 psi) where organic chemicals become completely soluble and are rapidly oxidized. Because the temperature of SCWO is much lower than conventional incineration, there is no accompanying generation of NOx or SOx and much less energy is required to operate the system. In addition, there is no solid waste produced and the effluent liquid will be a solution of inorganic salts that can be discharged into a conventional plant waste treatment facility. This technology is focused on the destruction of carcinogenic/toxic smoke and dye compounds and riot control agents downloaded from obsolete munitions for which no other acceptable procedures currently exist.

III A.7.5 Confined Burn Facility

The Confined Bum Facility (CBF) technology is an alternative to the DoD practice of Open Burning (OB) for the safe disposal of propellant, explosive, and pyrotechnic (PEP) hazardous wastes. The CBF process concept consists of a number of burn chambers sequentially exhausting into a single surge accumulation tank. Exhaust gas is withdrawn from the surge tank by a conventional and modularly configured pollution control gas cleaning system. The CBF produces ash residues, as does open burning, requiring disposal as solid waste as appropriate. The CBF solution is a practical, simple, safe, and complete OB replacement. NSWC, Indian Head has completed RDT & E field studies of CBF. An inaugural full scale CBF military construction project is proposed for NSWC, Indian Head.

III A.7.6 Femto-Second Laser

To safely dispose of munitions containing high explosives (HE's) and other hazardous materials, it is necessary to gain access to the interior of the munitions so that the contents may be removed. A safe method is needed to cut open munitions casings and components that are likely to be in contact or close proximity to HE or other energetic materials. Using conventional machining techniques, there may be a significant risk of an explosive reaction. Other techniques have been developed which may safely cut the explosive but produce an undesirable hazardous waste stream.

Ablation of energetic material by Femto-Second Laser pulses is potentially an attractive alternative to conventional machining. Absorption of these ultra-short laser pulses

occurs on such a short time scale that the material is ablated with virtually no heat transfer to the surrounding material, resulting in a "cold" laser cutting process and, hence, a safe process. In contrast, laser cutting techniques which use laser pulses longer than approximately 10 fs first melt, then vaporize the material with significant heat transfer to material outside of the cutting region. Cutting with laser pulses on the order of approximately 100-150 fs, multi-photon ionization and plasma formation occurs on a time scale on the order of the lattice vibration period of the explosive. Because this time is short, energy cannot be effectively coupled into the lattice of the material and is carried away from the surface by hydrodynamic expansion and cooling of the plasma.

Each laser pulse removes only a few microns of material. For explosives, the resultant products are mostly carbon and benign gases. The laser footprint can be made very small, on the order of tens of microns, so that very little material is removed during the cut. This combination of mostly benign material and very little of it in the cutting by-products makes the technique very clean relative to other methods used. The small laser footprint also makes it an attractive tool when precision cutting operations are needed.

The project will result in a safe and environmentally acceptable process in dismantling munitions. The technique will be particularly valuable in those cases where reuse of a portion of the munitions is necessary or where dismantling the weapon makes it necessary to cut directly into the energetic material.

III A.7.7 Carbon Dioxide Blastout

This technology addresses the problem of removing and recovering press-loaded energetic material from medium and large caliber munitions without incurring the material loss and pollution burdens associated with currently available high pressure water washout methods. The technology involves a two step process in which most of the energetic material in the munitions item is first removed using a contour drill and vacuum system which is employed while the item is turning on a lathe. This is followed by the introduction of small, high velocity pellets of carbon dioxide to essentially "grit blast" the interior surfaces of the item in order to remove any residual energetic material that remains after drilling. After impacting the interior surfaces, the carbon dioxide sublimes and is vented to the atmosphere while the removed energetic materials is collected under vacuum filtration. Two methods of carbon dioxide introduction have been developed: compressed air transport and centrifugal acceleration. A production prototype unit has been designed and installed at Crane Army Ammunition Activity and continues to be refined and optimized, while at the same time being available for use in ongoing demil stockpile reduction activities in support of JMC demil contract requirements.

III A.7.8 Advanced Removal Technologies for Cast-Loaded Munitions

In parallel with autoclave process improvement efforts, new technologies are being investigated as potential replacements for the autoclave process currently in use. The autoclave process is seen as being in need of replacement because of a number of

shortcomings including: slow processing time, contamination of melted out explosives, maintenance downtime and operating cost. Various technology alternatives are being sought under this project. A prime candidate is the use of ultrasonic energy to fragment the explosive in conjunction with a pumping/filtration removal and recovery system. This process is currently in an early state of development. Laboratory-scale tests on inert simulates for TNT and Comp B have been completed and have shown that ultrasonic energy when transmitted to the solid surface through an appropriate sound wave carrying liquid can fragment the surface. The technology development efforts continue.

III A.7.9 Recovery/Reuse of Energetic Materials from Multi-Base Propellants

A process is being developed to recover nitrocellulose (NC), nitroguanidine (NQ) and possibly nitroglycerin (NG) from obsolete/unserviceable bulk double and triple base propellant or propellant downloaded from obsolete munitions items. Such a process will be based on a combination of solvent extraction and/or other applicable separation and reaction technologies. If the NG fraction of the propellant is not recovered for reuse, then environmentally acceptable procedures will be used for its disposal. Recovered NQ and NC will be evaluated for reuse in new propellant formulations or other applications (NC is being evaluated for conversion into a lacquer precursor for the coatings industry). A staged development effort is planned which will result in a prototype process being installed at an Army demil site. Current efforts are being executed under an SBIR-funded program.

III A.7.10 Recovery/Reuse of Energetic Materials from Single Base Propellants

Technology will be developed to recover nitrocellulose (NC) from bulk single base propellant or from single base propellant downloaded from obsolete munitions items. Chemical extraction or some other means of physical separation will be investigated. This effort differs from the multi-base recovery project because the absence of nitroglycerin in the formulation will allow more aggressive approaches such as supercritical fluid extractions to be employed. Also, processing of the non-recovered fraction of the propellant does not have the material handling safety concerns that exist with multi-base propellant, again due to the absence of nitroglycerin. The recovered NC will be evaluated for use in the manufacture of ball powder. A stage development effort is planned which will result in a prototype process being installed at an Army demil site.

III A.7.11 Advanced Cutting Technology for Munitions Demilitarization

New, environmentally acceptable advanced cutting technologies such as cryogenic fluid jet cutting and laser cutting will be developed to replace existing mechanical cutting methods (e.g., sawing and water jet). Cutting is necessary in order to carry out the size reduction of larger obsolete munitions items prior to energetic material removal, incineration or ingredient reclamation. Current methods contaminate the energetic material with oil, metal drops and filings which prevents recycle.

Existing methods also produce a solvent stream which requires subsequent treatment. A staged development effort is planned which will result in a prototype process to be installed at an Army depot site.

III A.8 WASTE MINIMIZATION

The U.S. Army has recognized waste minimization as a vital part of environmental compliance and has mandated reduction in hazardous waste generation at all of its installations. In order to identify other areas where reductions in the generation of energetic material wastes can be made, the U.S. Army is conducting waste minimization or HAZMIN audits at its production plants and plants involved in loading, assembling, and packing munitions items. These audits focus on all hazardous waste streams including propellants and explosives. Technical recommendations for completed audits are under review for possible implementation.

III A.8.1 Recycling and Reuse

One of the main methods for disposal of military ammunition and ordnance and/or components of munitions items is recycling and reuse. The U.S. Army is currently operating a White Phosphorous Conversion Plant at Crane AAP, Indiana. The white phosphorous contained in munitions is converted to phosphoric acid which is then sold to commercial industries for the manufacturing of fertilizer. This program at Crane AAP is very successful, and nearly all of these munitions have been demilitarized. Another method of reuse of munitions items is sales to North Atlantic Treaty Organization (NATO) member countries and other countries allied to the United States.

III A.8.2 Chemical Stabilization

This approach involves the use of chemicals to neutralize the energetic material filler. It is not feasible from a technical standpoint for the types of ordnance treated by detonation at New Bomb. Chemical stabilization approaches are described below.

III A.8.2.1 Electrochemical Reduction

Electrochemical reduction is a disposal process based on the chemical reaction caused by an electric current that converts energetic materials to less reactive materials, inert and/or other use products. This process is only applicable to very select (few) munitions fillers. Efforts to date utilizing this technology have achieved limited success.

III A.8.2.2 Chemical Conversion

Currently, the U.S. Army is disposing of sulfur trioxide-chlorosulfonic acid solution (FS), a bulk smoke-producing mixture, by chemical neutralization. This process involves combining FS with lime slurry in a 4 million-gallon vat. The chemically neutralized product is then discharged to the sanitary sewer system.

III A.9 OTHER ONGOING ACTIVITIES TO SUPPLEMENT AND/OR REPLACE DETONATION TECHNOLOGIES

III A.9.1 Army Production Base Modernization Activity (PBMA)

In order to identify alternate technologies for treating propellant and explosive production wastes, PBMA has completed a technological review of available commercial incinerator technologies for military adaptation. Concept designs have been investigated which include material feed systems, burner parameters, and pollution control equipment. A project has been submitted for funding to develop a pilot unit and demonstrate adaptable technologies.

III A.9.2 Joint Army, Navy, National Aeronautics and Space Administration, and Air Force (JANNAF) Inter-Agency Committee

The Safety and Environmental Protection Subcommittee of JANNAF is addressing technologies for ordnance demilitarization and disposal or reclamation of energetic materials. The Subcommittee conducts workshops which provide a forum for government, scientific, and industry representatives to meet and exchange technology and related information. The topics include extraction and ingredient recovery, incineration, chemical and biological treatment methods, and alternate uses.

Some of the demilitarization/disposal technologies discussed include high-pressure washout of energetic materials from ordnance hardware, critical fluid extraction, incineration, wet air oxidation, super-critical fluid oxidation, biodegradation, co-firing as supplemental fuels, and materials reuse. The technologies presented range from laboratory to pilot-scale.

III A.9.3 Large Rocket/Missile Motor (LRM) Demilitarization Program

By 1996, there were over 83.9 million pounds of LRM solid propellant that needed to be demilitarized as a result of managing the Intercontinental Ballistic Missile's (ICBM's) normal life cycle support programs as well as proposed disarmament treaties. Long-term storage of these items is expensive, but more importantly, it will pose an explosive safety hazard. Therefore, a Joint Service LRM ad hoc working group has been organized and has conducted a disposal technology review. Several technologies that encompass the steps involved in LRM disposal have been identified. These technologies, available in associated industries, are being reviewed and studied for their status and applicability.

III A.9.4 Demilitarization Equipment Upgrade Programs

The U.S. Army is implementing a program to upgrade 12 APE 1236 incinerators, 3 EWIs, and 1 APE 2210 incinerator which are used to demilitarize ammunition items and bulk explosive wastes. The APE upgrade program includes modifying the feed system to accommodate a computerized automatic waste feed cutoff, installing a high-

temperature afterburner, a shroud to trap fugitive emissions, and other air pollution control equipment.

Incinerators at the following 15 U.S. Army installations were included in the APE upgrade program: The EWIs at Iowa AAP, Kansas AAP, and Lake City AAP; an APE 2210 incinerator at HWAD, and APE 1236 incinerators at Anniston, Letterkelmy, Lexington-Blue Grass, Red River, Seneca, Sierra, Tooele Army Depot (two APE I236s), Savanna Army Depot Activity, McAlester AAP, Crane AAP, and Fort Richardson. The second incinerator at Tooele Army Depot was used to develop ammunition feed rates, to perform test burn projects, and to provide operator certification training.

Utilization of these facilities would require shipment of the energetic materials, with the attendant safety problems associated with unstable ordnance.

FIGURE III A 1

FLOOD PROTECTION FOR NEW BOMB SITE PLAN SHEET 1

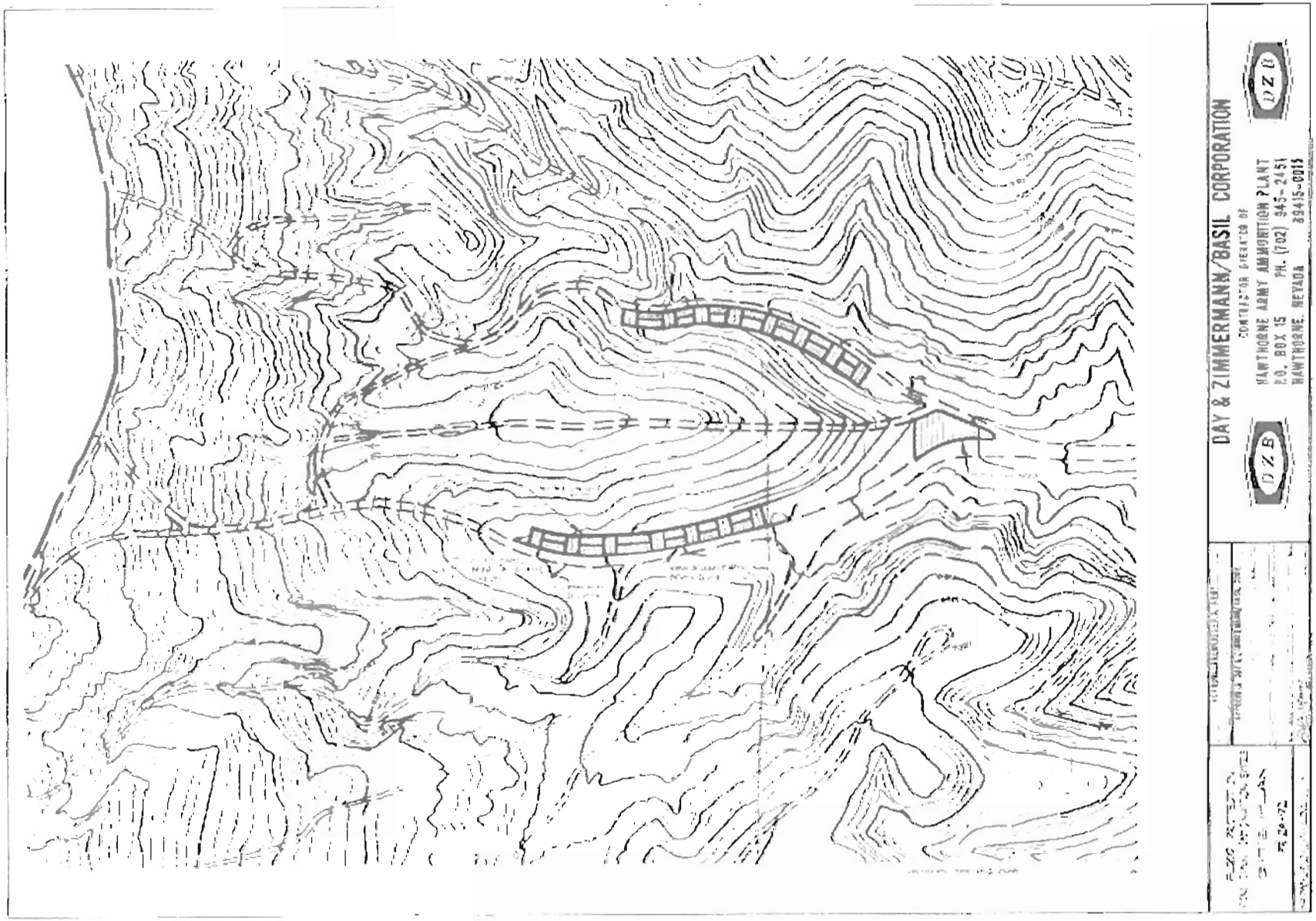
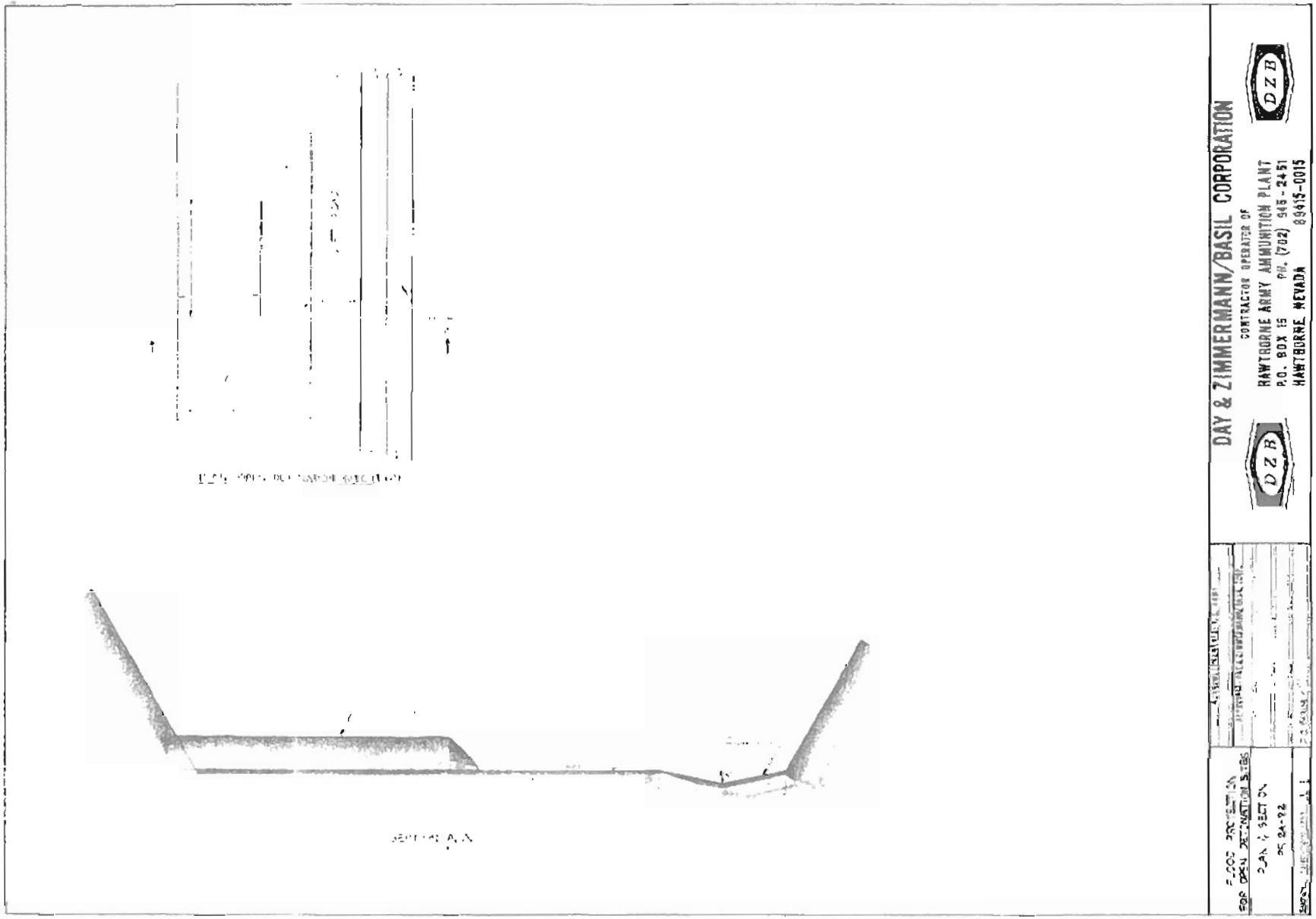


FIGURE III A 2

FLOOD PROTECTION FOR NEW BOMB SITE PLAN

FIGURE III A 3

FLOOD PROTECTION FOR NEW BOMB



III B ENVIRONMENTAL PERFORMANCE STANDARDS

III B.1 APPLICABILITY

Environmental performance standards are summarized in Section III-B Table III-I. These standards were developed to demonstrate compliance with the environmental performance standards described in 40 CFR 264 Subpart X. The performance standards address protection of ground water, surface water and the air. Methods used to protect these media include

- Proper waste characterization, addressed in Section II. B
- Adhering to Standard operating procedures, found in Volume 2 Appendix A
- Allowable treatment quantities, Section III. A
- Groundwater monitoring, if applicable
- Personnel training addressed in Section II. E
- Residue collection, found in Section II. C and SOP in Volume 2 Appendix A
- Prevention and control of releases
- Closure of the detonation unit.

Studies available from the Army and Navy that are referenced in Sections III-B and III-C address open detonation (OD).

III B.2 VOLUME, AND PHYSICAL AND CHEMICAL CHARACTERISTICS OF THE WASTE TREATED AT NEW BOMB

No wastes are stored or held at the New Bomb Facility. The wastes treated, their composition, and waste codes are described in Section II-B. The maximum amount of materials treated is 4,000 NEW (Net Explosive Weight) per pit, 10 pits per day, 40,000 pounds NEW per day, and 3,000 tons NEW per year (6,000,000 pounds NEW per year).

All items treated are solids. Donor material is not included in the previous discussion. The potential migration of representative constituents is discussed in Section III-D of this permit application.

The primary air emissions from detonation operations are products of combustion, which typically include the following:

- Ammonia;
- Carbon dioxide;
- Carbon monoxide;
- Methane;
- Nitrogen and nitrogen oxides;
- Sulfur dioxide; and
- Water.

Secondary air emissions include various products of incomplete combustion, which can include energetic materials, organics, and trace metals. A list of the potential OD products of combustion and incomplete combustion is given in Table III-2. This list represents a compilation of potential emission constituents (based on U.S. Army studies) considering the wide range of ordnance, munitions, and propellants which are treated by the Military Services. HWAD currently treats a subset of these energetic materials items.

Reports prepared by the U.S. Army Environmental Command (AEC), such as *Air Pathway Screening Assessment for Subpart X Permitting* (AEC, 1995) present air emission factors for volatiles and semi volatiles (e.g., benzene, benzo(a) anthracene, phenol, and dibenzofuran) based on actual emission test data (i.e., Army *OB/OD* BangBox tests). The AEC emission factors were used to evaluate typical emissions of these constituents during detonation operations at New Bomb.

Potential impacts to human health and the environment were quantitatively evaluated in the health risk assessment (HRA) using these emission factors.

A compilation of short-term and long-term detonation air emission factors for all items is presented in Table III-3. These emission factors are based on information presented for open detonation in Air Pathway Screening Assessment for Subpart X Permitting *(AEC,* 1995). The AEC (1995) document presents maximum and average emission estimates from BangBox testing at Dugway Proving Ground from a total of 501 items for all 14 munitions families combined. AEC (1995) states that "this extensive data base can be considered representative of the thousands of items which are candidates for OB/OD treatment."

Physical and chemical properties of constituents modeled for subsurface pathways are included in the MEPAS model used for that analysis.

III B.3 HYDROGEOLOGICAL CHARACTERISTICS OF THE SITE

III B.3.1 Depth to Water Beneath the Unit [40 CFR 264.601 (a)(2) and 270.23(b)]

There is a single observation well at the New Bomb Area which is located down-gradient to the maintenance shack shown in Figure II-2, the topographic map. USAEHA installed the well in 1984, which was dry at the time of construction. The well was measured on December 1, 1987 and found to be dry. Because the well was dry, USAEHA did not assess the hydraulic characteristics of the flow regime. EBASCO (1988) hypothesized that considering the location of the unit along an alluvial fan and eastern fault trace, it is possible that the depth to groundwater at the New Bomb Area is greater than 200 feet. Based on the boring log contained in Volume II, Appendix H, the depth to groundwater at the New Bomb Area is at least 45 feet (USAEHA, 1985). A stock well located approximately 5 miles from the site reported a groundwater level 304.65 feet below the ground (Everett, et al., 1967).

A monitoring well work plan was prepared by IT Corporation (IT) and submitted to NDEP on May 14, 1996. NDEP supplied review comments in a letter dated June 3, 1996 and conditionally approved the work plan contingent upon IT implementing the additional procedures outlined in two attachments to the letter. IT prepared a revised work plan (Revision 1.0) addressing agency comments and submitted the plan to NDEP June 20, 1996. The monitoring well borehole was drilled to a depth of 200 feet in early August 1996. No groundwater was encountered. During retrieval of the drill auger, the auger was lost. With approval from NDEP, the monitoring well was abandoned. Details on lithology, subsurface characteristics, and soil cutting analytical results are presented in Volume II, Appendix H-2. Groundwater at New Bomb, if any, is deeper than 200 feet below the ground surface, and adverse effects on groundwater resources are not expected.

Although isolated springs exist in the general New Bomb area, none have ever been found discharging from the detonation pit area. Soil samples from one of the spring areas (Appendix H-4) did not show any energetic constituents or inorganics above background upper tolerance limits (UTL).

III B.3.2 Estimate of Net Recharge Rate [40 CFR 264.601(a)(2) and 270.23(b)]

The characteristic climate at HWAD is cool mountain desert conditions and is arid. According to the USAEHA 1988 report the average annual precipitation is 3.95 inches. The average temperatures range from 34°F in January to 75°F in July. The maximum potential evaporation rate (based on pan evaporation measurements) is approximately 48 inches per year (Everett, et al., 1967).

The estimated average annual evapo-transpiration rate for Whiskey Flat-Hawthorne Sub-area of Walker Lake Valley is 5.52 inches (Everett, et al., 1967). This large difference between precipitation and potential evaporation severely limits groundwater recharge to the aquifer. The amount of water reaching the aquifer equals the total infiltration minus the amount of water absorbed by the surficial deposits in the saturated zone. In arid regions such as HWAD, rainfall is seldom sufficient to exceed the storage capacity of the subsurface materials.

III B.3.3 Description of Uppermost Aquifer [40 CFR 264.601(a)(2) and 270.23(b)]

A well located approximately 5 miles from the site reported a groundwater elevation 304.65 feet below the ground surface (Everett, et al., 1967). No other descriptive information is available regarding this well. An onsite well installed to a depth of 45 feet was found to be dry.

III B.3.4 Topography of the Unit Area [40 CFR 264.601(a)(2) and 270.23(b)]

The detonation unit is located in the area known as Box Canyon or New Bomb Area, and is considered part of the Anchorite Hill area. The entire area is steeply sloped with runoff directed east onto the southern drainage area of Whiskey flats (ESE, 1985). The New Bomb Area exhibits arid mountainous terrain, typical of Nevada. Within the 3,000 acre area, the topography varies. On the western edge of the area are the Anchorite Hills which approach an elevation of 8,000 feet above mean sea level (msl). The center of the detonation unit occupies a terrace remnant on the mountain pediment. The eastern portion of the area occupies an alluvial fan at an elevation of approximately 6,400 feet above mean sea level. From west to east there is a total change in relief of about 1,600 feet. The surface of the New Bomb Area is excised with east-trending deep ravines. They combine to form one canyon near the entrance (EBASCO, 1988). The maximum approximate elevation of the detonation unit is 6,925 feet.

III B.4 PROTECTION OF GROUNDWATER AND SUBSURFACE ENVIRONMENT

III B.4.1 Potential for Migration Through Soil, Liners, and Containing Structures [40 CFR 264.601(a)(l)]

Detonation is conducted in surface pits. The residues resulting from detonation are shrapnel and the constituents identified in Table II-10, and Appendix F. If a visual examination indicates the pits contain some unexploded ordnance (UXO) and are unsafe or fuzed, the UXO are re-detonated in place. Other items are returned to the pits to be re-detonated. Shrapnel that does not visibly contain unexploded materials is collected for subsequent recycling. Prior to recycling, the shrapnel is decontaminated on-site at WADF to ensure that the shrapnel is free of explosive materials.

III B.4.2 Groundwater Quality and All Possible Sources of Contamination [40 CFR 264.601(a)(3)]

According to RAI (1992), records of groundwater quality data showed that the groundwater at various locations in the basin is generally similar, with relatively high sulfate and total dissolved solids (TDS) concentration. These levels frequently exceed the U.S. EPA National Secondary Standards for drinking water. Several wells in the area also have concentrations of nitrates and fluorides that exceed the standards. Also, the quality of the water did not deteriorate or change significantly between 1946 and 1966.

The RAI (1992) report indicates that the chemical quality of the groundwater found at the edge of a closed basin such as Walker valley is usually of better quality than the groundwater in the central part of the basin. Well Water sample analysis from the western part of the valley has TDS of approximately 400 to 500 mg/l whereas the wells closer to Walker Lake were reported to have even higher TDS. The sources of the poor water quality in the basin are unknown, but several natural sources are possible. The

most important of these sources would be presence of the evaporite deposits in the valley fill material.

One suspect solid waste management unit (SWMU) has been identified and addressed at the detonation unit (see Section IV). There is no evidence of resulting groundwater contamination.

The town of Hawthorne has developed two wells, each with a capacity of 600 gallons per minute (gpm), in the Whiskey Flat area 15 miles south of town (township 6, range 31, section 20). The water supply to the town from these two wells comes through a gravity pipeline. The depth to groundwater at these two wells is 100 to 110 feet (Hawthorne Utility, personal communication, 1996). Recent groundwater quality summary tables for these two wells have been provided in Appendix H-3.

The results of an extensive field investigation conducted by USAEHA in 1984 to evaluate the impact of the selected OB/OD units on groundwater quality under varying site-specific conditions indicated that no groundwater contamination was present where the annual evaporation exceeded annual precipitation by more than two feet. In arid areas like HWAD, there is no driving force to leach potential contaminants to the water table. At HWAD, the evaporation potential exceeds the precipitation rate by about 44 inches and no wastes containing free liquids are open detonated at the unit (EBASCO, 1988).

III B.4.3 Groundwater Flow and Rate [40 CFR 264.601(a)(4) and (b)(5)]

Limited data are available concerning groundwater in the region of New Bomb (USAEHA,1985; Everett, et al., 1967). Available information suggests the depth to groundwater is greater than 200 feet.

III B.4.4 Proximity to and Withdrawal Rates of Current and Potential Groundwater Users [40 CFR 264.601(a)(5)]

There is no resident population near the New Bomb Area. The closest wells to the New Bomb Area are on a ranch approximately 9 miles northeast and down-gradient. It is not anticipated that groundwater in the vicinity of the New Bomb Area contributes to this well to any significant degree (EBASCO, 1988). In addition, Mineral County installed two wells near Whiskey Spring on Whiskey Flats approximately 12 miles northeast of New Bomb Area. Mineral County has tested the water quality. Volume II, Appendix H-2 provides the analytical results for Well Nos. 1 and 2. The quality of the water is within the normal limits for the Basin and Range physiographic province (EBASCO,1988).

The closest resident population is about 22 miles to the north at the town of Hawthorne. There is no commercial, agriculture, silviculture, or livestock production in the immediate area of the source. The HWAD resident/worker population, approximately 700 people, obtains a fraction of its drinking water from the underlying groundwater (RAJ, 1992).

III B.4.5 Potential for Damaging Unsaturated Zone [40 CFR 264.601(b)(8)]

Detonation is conducted on the surface of the land. The potential for damaging the unsaturated zone is minimized through the following:

- There is no ash or similar residue to collect or that would contaminate rain water, the only path for contaminates into the Unsaturated Zone.
- The negative recharge rate of -40 inches a year
- The detonation unit is inspected for both UXO and shrapnel and both are removed and retreated as necessary.

III B.5 LAND USE PATTERNS IN THE AREA [40 CFR 264.601(A)(6) AND (B)(9)]

The detonation unit is located in an area known as the New Bomb Area. The land surrounding the detonation unit is U.S. Forest Service Land, which is designated as part of the Toiyabe National Forest. The Bureau of Land Management (BLM) owns land northeast and north of the detonation unit and leases much of it for private grazing (EBASCO, 1988). Other privately owned land lies on the outskirts and southwest of the town of Hawthorne. There are also isolated private parcels 4 to 5 miles northwest of the detonation unit (EBASCO, 1988).

Land use in Mineral County is primarily related to cattle grazing, mining and recreation, with limited agriculture.

III B.6 POTENTIAL FOR DEPOSITION OR MIGRATION OF WASTE CONSTITUENTS INTO SUBSURFACE

III B.6.1 Physical Structures, and Into Root Zone of Food Chain Crops and Other Vegetation [40 CFR 264.601(a)(7)]

The treatment effectiveness of OD is addressed in the U.S. Army Armament, Munitions and Chemical Command OB/OD Study (U.S. Army, 1992). This study indicated that treatment by OD is about 99.9996 percent effective. A copy of the study is provided in: Volume II, Appendix F Treatment effectiveness has been defined for this permit application as per the AEC (1995) document: short term destruction and removal efficiency (DRE) (worst-case) for OD is estimated at 99.96 percent, while long-term DRE (average) is estimated at 99.99 percent (Table 4.1.2.2-3 in AEC document).

Therefore the potential for deposition or migration of waste constituents into the subsurface structures and into the root zone of the food chain crops and other vegetation is minimized because there is little residue after treatment.

III B.7 EFFECTS OF EXPLOSION ON GEOLOGIC UNITS AND GROUNDWATER FLOW UNDER THE UNIT [40 CFR 264.601(A)(1), AND (B)(2) AND 270.23(E)]

The blast resulting from detonation for the most part transforms the original explosive material to its basic elements and decomposition products. The residues generated as a result of detonation operations are metallic materials such as shell fragments (shrapnel), occasional pieces of energetic materials or UXO which were not completely treated during detonation and constituents identified in Section II.F Table II-I0, and Appendix E. The detonation unit is inspected for these materials following detonation. Any remaining energetic material or UXO is subsequently detonated in pits or detonated in place due to safety hazards associated with moving it. Shrapnel that does not visibly contain unexploded materials is collected for decontamination and subsequent recycling after is certified free of explosives material. Also, as stated previously open detonation is about 99.99 percent effective in the treatment of the munitions therefore the effects of explosion on geologic units and groundwater flow under the unit are minimized.

III B.7.1 Potential Impacts on Human Health [40 CFR 264.601(a)(8) and (b)(10)J

The potential impacts on human health are discussed in Human Health and Ecological Risk Assessment (HHERA) will be included in Volume Appendix L.

III B.7.2 Potential for Damage to Flora, Fauna, and Physical Structures Due to Exposure [40 CFR 264.601(a)(9) and (b)(I1)]

Potential damage to flora and fauna has been addressed as part of a supplemental risk assessment for the detonation unit. There is limited potential for damage to physical structures due to exposure because no physical structures are located in the immediate vicinity of the New Bomb area.

III B.8 PROTECTION OF SURFACE WATER, WETLANDS, AND SOIL SURFACE

III B.8.1 Effectiveness and Reliability of Containing, Confining, and Collecting Systems and Structures in Preventing Migration [40 CFR 264.601(b)(2)]

Due to the nature of thermal treatment, no systems or structures are applied to the detonation unit to prevent air emissions. Detonation is inherently an effective treatment process with a DRE of about 99.9996 percent shown in Army tests (US. Army,1992).

III B.8.2 Precipitation Patterns in the Area [40 CFR 264.601(b)(4)]

Annual precipitation varies from approximately 4 inches in the valley, where HWAD is located to approximately 25 inches in the mountains. The two-year, 24 hour rainfall observation was reported to be just over two inches. Snow is common in the mountain

areas during the winter, and localized thundershowers provide much of the summer precipitation (RAJ, 1992).

III B.8.3 Proximity of Units to Surface Waters [40 CFR 264.601(b)(6)]

According to EBASCO (1988) there are no perennial surface water bodies close to the New Bomb Area. The nearest, Rough Creek is located 15 miles west of the New Bomb Area. Walker Lake is located approximately 25 miles north of the New Bomb detonation unit. Detonation unit runoff will not reach Rough Creek as the intermittent drainage from the New Bomb Area flows east to Whiskey Flats. There are two intermittent streams, one to the south and the other to the east, within 1/2 mile of the unit. Neither of these streams contributes to a perennial surface water body.

III B.8.4 Water and Surface Soil Quality Standards, Quality Data, and Uses [40 CFR 264.601(b)(7) and (8)]

There is no surface water in the vicinity of New Bomb only intermittent streams.

III B.9 SOIL, GROUNDWATER, AND SURFACE WATER PATHWAYS ASSESSMENT [40 CFR 264.601(a)(8) and (b)(10)]

III B.9.1 Modeling Approach

Environmental modeling assessments can be used to evaluate the potential impact from future activities at New Bomb for the soil, groundwater, and surface water pathways. Impacts are based on the assumption that 100 percent of air emissions that would be associated with the maximum annual quantity of waste that could be treated by detonation are available for hydrologic and re-suspension transport. The screening approach followed will therefore tend to overestimate the impacts from future activities at New Bomb. The Multimedia Environmental Pollutant Assessment System (MEPAS) was used.

III B.9.1.1 General

The modeling of the transport of metals, and energetic compounds through the environment at New Bomb was performed using MEPAS. This model was selected over several other candidates due to its flexibility and the potential for modeling multiple transport pathways in a sequential manner. For example, MEPAS simulates the leaching of surface contamination downward through unsaturated soil to an aquifer, then allows that aquifer to reach any designated well in the area down gradient from the sources. Moreover, the aquifer can be made to recharge any nearby stream, river, or lake, and then the model provides estimates of contaminant concentrations at any point in surface waters downstream of the site. The model can track nearly 400 different contaminants. Modeling at HWAD emphasized nine contaminants, all of which have been identified as the primary potential metal and energetic releases for the energetic material items treated by detonation at HWAD. The contaminants include:

Representative metals:

- Antimony (Sb)
- Barium (Ba)
- Lead (Pb)
- Potassium (K).

Representative energetic compounds:

- Cyclo-l ,3,5-trimethylene-2,4,6-trinitramine (RDX)
- 2,4,6-Tlinitrotoluene (TNT)
- Cyclotetramethylene tetranitramine (HMX)
- 1,3-Dinitrobenzene (DNB)
- 2,4-Dinitrotoluene (DNT).

The MEPAS methodology uses empirical and analytical methods to predict the potential for contaminant migration from any site to receptors of concern using pathway analysis. Four major pathways of contaminant migration are considered in MEPAS modeling:

- Groundwater leaching;
- Overland run -off;
- Surface water recharge; and
- Atmospheric deposition.

These transport pathways can be linked to form a chain of environmental media specific to the site being assessed. MEPAS considers:

- Specific site information and constituent characteristics associated with the pathways being modeled;
- Metals and energetic compounds;
- The potential direction of contaminant movement;
- Pollutant mobility and persistence;
- Population distribution of potentially exposed receptors;
- Various routes of exposure;
- Contaminant toxicities;
- Duration of exposure to contaminants; and
- Contaminant arrival times to sensitive receptors.

III B.9.2 Source Term Calculations

Modeling of the impacts of detonation operations on human health and the environment requires estimating a source term for contaminants. The following is a discussion of the process used to estimate source terms for the various pathways.

III B.9.2.1 Source Term

The mass of each contaminant available for release at the detonation unit was calculated by multiplying the proposed annual treatment rate (3,000,000 pounds of waste and 3,000,000 pounds of TNT donor) by the maximum air emissions factor. The

approach followed to calculate a source term was conservative and will tend to overestimate the impacts from future activities at HWAD.

The overall source term was calculated for 10 years of detonation operations.

The contaminant mass for energetics was assumed to be evenly divided among RDX, HMX, TNT, DNT, and DNB because these are the only five energetics available in MEPAS. The source term concentrations were calculated by dividing the annual mass available for release by a soil volume typifying the operation. The soil volume was estimated as a 743-acre unit to a depth of 20 inches. For overland run-off and atmospheric deposition pathways, the top 6 inches of soil was assumed to be available. The soil concentrations, given in Table III-4, were calculated by dividing the annual mass available for release by a soil volume typifying the operation. The health criteria used for potential contaminants are listed in Table III-5.

III B.9.3 Potential for Migration, Groundwater Flow/Environmental Parameters

Three hydrologic pathways were identified for transport of contaminants from the detonation area: groundwater, groundwater to surface water (unnamed stream), and overland run-off (to unnamed stream). The hydrogeologic parameters were based on default values supplied by MEPAS (which are a function of soil type).

The soil above the detonation groundwater is sand (EBASCO, 1988), the thickness of which is assumed to be 100 feet. The bulk density of this soil is assumed to be 1.64 g/cc. The saturated zone is also sand with an assumed pore water velocity of 115.2 feet/day. Groundwater travel distance from the detonation unit to the installation boundary is about 5,615 feet to the east. The distance from the edge of the detonation unit to the intermittent unnamed stream is about 2,640 feet east and the stream was assumed to be flowing at 5 feet/second in a 4-foot-deep, 5-foot-wide channel.

III B.9.3.1 Potential for Migration

Partially saturated zone and saturated zone adsorption coefficients (K_D values) for the energetic contaminants were default values supplied by MEPAS based on the soil type input, while the K_D values for the metals were set to zero as a conservative assumption. Surface K_D values were adjusted to ensure that all contaminants were not leached out prior to 10 years of detonation unit operations. Ten years of operations was the basis for the source term calculations. K_D values reflect a contaminant's tendency to bind to soil rather than to water. A contaminant with a higher K_D value has a greater affinity for soil than for water, so such a contaminant is not likely to migrate from soil into groundwater. Table III-6 lists the partially saturated zone and saturated zone K_D values used. The surface K_D values were adjusted so that the overland transport value of 0.0488 was used for all constituents except RDX for which model value was used. Also the surface K_D value was adjusted so that for infiltration to groundwater to a stream and to a well, a transport value of 0.397 was used for all constituents except RDX for which the model value was used.

The K_d values used in the MEPAS model were calculated from Koc values in the MEPAS data base. This data base currently contains data on 576 referenced organic and inorganic chemicals and radionuclides. The K_d values were adjusted, based on transport pathway, during model calibration to prevent the constituents from leaching completely out of the soil before the end of the 10 year simulation period. The final K_d values assume that the organic content of the soil ranges from 0.057 to 0.57 percent over the entire 743 acre area simulated. It should be noted that the higher elevations of this area include pines and other vegetation that contribute to the organic character of the soil.

III B.9.3.2 Potential Impacts / Environmental Concentrations

Because of the low source terms (i.e., moderately contaminated soil) and relatively arid climatology, MEPAS predicts that the receptor concentrations of most contaminants from the detonation unit is low, in the parts per billion range or less for all four environmental pathways modeled, groundwater leaching, overland run-off, surface water recharge, and atmospheric deposition. The contaminant from detonation which MEPAS predicts will appear at the highest level is lead (3 ppb) in the intermittent unnamed stream located 2,640 feet east of the detonation unit which results from runoff.

MEPAS model results (Table III-7A) represent the maximum predicted constituent concentrations for each modeled scenario. These results assume that the simulated loading rate continues until the maximum concentration occurs. The values in the time column of Table III-7A represent the length of time required for the maximum concentration to occur. Environmental criteria are presented in Table III-7B. As shown, none of the modeled constituent concentrations, except lead, exceed available environmental criteria. The exceedence for lead is not significant because while the maximum modeled lead concentration (3.37E-3 ppm) exceeds the chronic ambient water quality criteria (AWQC) for the protection of aquatic life (i.e., 3.2E-3 ppm), chronic exposure is not expected in the intermittent stream. The acute AWQC for lead is 8.2E-2 ppm and is not exceeded by the maximum modeled MEPAS result.

III B.9.3.3 Proximity To Groundwater Users

There are no users of groundwater within 1,000 feet of the detonation unit.

III B.9.3.4 Sensitivity Analysis of the Results

As is the case with most types of environmental transport models, MEPAS is more sensitive to certain types of input parameters than others. Of primary influence is the average concentration of contaminants used as input to the model. The mass of each contaminant available for release at the detonation unit was calculated by multiplying the maximum annual treatment rate (3,000,000 pounds of waste and 3,000,000 pounds of TNT donor) by the maximum air emissions factor.

Environmental concentrations are directly proportional to these source concentrations. The quantity (i.e., flow rate) into which the contaminant is dispersed is also a parameter with which the calculated concentrations are directly proportional. The unnamed stream flow rate is such a parameter.

For groundwater scenarios, the travel times through the partially saturated and unsaturated layers of soil, together with the adsorption coefficients, are the most sensitive input parameters. These values to a large extent determine the rates of transport of contaminants as well as the total amounts of contaminants which can reach the accessible environment. The values of the adsorption coefficients for the metals and energetic materials were sufficiently low, except for RDX, that they were transported through the soils un-retarded. RDX coefficients were sufficiently high to effectively retard its migrations. Adsorption coefficient values for energetics were based on soil characteristics; typical values supplied by MEPAS were used. The values for metals were conservatively chosen as zero. Changes in travel times would result in corresponding changes in the time at which environmental concentrations appear at various locations. The concentrations, however, would not change significantly.

The sensitivity of the input parameters varies from pathway to pathway. For the overland run-off pathway, the most sensitive parameter used in the modeling is the Soil Conservation Service (SCS) Curve number. This number is developed based on known or assumed soil conditions at the site. It is this number which determines the fraction of precipitation run-off at the installation. In the case of the detonation unit at New Bomb, this number was assigned a relatively high value for the unit conditions of 68. This value was selected in order to err on the high side relative to the modeling results, due to the minimal amount of information available on the soils in the detonation unit. Even with such a high degree of run-off from the area, the model predicted minimal concentrations at the unnamed stream.

TABLE III -1

ENVIRONMENTAL PERFORMANCE STANDARDS SUMMARY FOR DETONATION AT HWAD

Item	Permit Section	Performance Standards
Soil, Groundwater, and Surface Water Pathways	II-G	Soil Monitoring Program
	III-A	Collection/Treatment of UXO
	III-A	Standing Operating Procedures
	II-C	Release Prevention
	II-E	Training of Personnel
	II-D	Release Control
Noise	III-A	Quantity Limits, Earth Cover
Air Pathway	III-C	Restrict Treatment During Unfavorable Meteorological Conditions
	III-C	Treatment Quantity Restrictions
	III-C	Qualification Procedure for New Energetic Material Items
	III-B	Prohibited Items
	III-A	Standing Operating Procedures
	II-C	Release Prevention
	II-E	Training of Personnel
	II-D	Release Control
Safety	III-F	Minimum Protective Distance
	III-A	Time Limits After Treatment Before Approaching Unit
	II-E	Training of Personnel
Closure	II-F	Close to Risk-Based or Background Levels

TABLE III-2

MAJOR CHEMICAL COMPONENTS ASSOCIATED WITH DETONATION OPERATIONS

Energetic Materials	Paraffins	Olefins	Semivolatiles
Ammonium Picrate	i-Butane	Acetylene	Benzo(a)anthracene
Ammonium Nitrate	n-Butane	1,3-Butadiene	Benzo(a)pyrene
Barium Nitrate	Cyclopentane	1-Butene	Benzo(c)acridine
Boric Acid	2,2-Dimethylbutane	i-Butene	Biphenyl
Calcium Stearate	2,3-Dimethylbutane	Cis-2-Butene	Dibenz(a,h)anthracene
Cyclotetramethylene Tetranitramine (HMX)	2,3-Dimethylhexane	Trans-2-Butene	Dibenzofuran
Cyclo-1,3,5-Trimethylene-2,4,6-Trinitramine (RDX)	2,4-Dimethylhexane	Cyclopentene	Diepoxide
Diethylhexylsebacate	2,4-Dimethylpentane	Ethylene	Diethylenetriamine
Diisopropylmethyl-Phosphonate	1,3-Dinitrobenzene	1-Hexene	1,6-Dinitropyrene
Hexachloroethane	Dinitrotoluene	Cis-2-Hexene	2,5-Diphenyloxazole
Lead Styphnate	Ethane	Trans-2-Hexene	5-Ethyl-1,3-diglycidyl-5-methylhydantoin
Lead Azide	Ethylcyclohexane	Isoprene	Isophorone Diisocyanate
Mercury Fulminate	3-Ethylhexane	2-Methyl-1-Butene	2,2-Methylene bis(4-methyl)-6-t-butylphenol-
Monoethylamine	n-Heptane	2-Methyl-2-Butene	1-Methylnaphthalene
Nitrocellulose	n-Hexane	3-Methyl-1-Butene	2-Methylnaphthalene
Nitroglycerine	Methylcyclohexane	2-Methyl-1-Pentene	N-Nitrosodiphenylamine
Nitroguanidine	Methylcyclopentane	2-Methyl-2-Pentene	Naphthalene
Nitromethane	2-Methylheptane	4-Methyl-1-Pentene	2-Naphthaleneamine
Pentaerythritol Tetranitrate (PETN)	3-Methylhexane	Myrcene	2-Naphthylamine
Polystyrene	2-Methylpentane	1-Pentene	2-Nitrodiphenylamine
Potassium Nitrate	3-Methylpentane	Cis-2-Pentene	4-Nitrodiphenylamine
Sodium Nitrate	n-Nonane	Trans-2-Pentene	2-Nitronaphthalene
Sulfur	n-Octane	Propane	4-Nitrophenol
Trinitroanisole	i-Pentene		1-Nitropyrene
Trinitro-2,4,6-Phenylmethylnitramine	Propane		4-Nitrosodiphenylamine
Trinitrotoluene	2,2,3-Trimethylpentane		Phenanthrene
White Phosphorus	2,3,4-Trimethylpentane		Phenyl Ciisodecyl Phosphite
	Trinitroglycerol		di-n-Propyl Adipate
			Pyrene
			Resorcinol
			Salicylic Acid
			Triacetin
			1,1,3-Trimethyl-3-Phenylindane
			1,3,5-Trinitrobenezne

TABLE III-2 (CONTINUED)

MAJOR CHEMICAL COMPONENTS ASSOCIATED WITH DETONATION OPERATIONS

Aromatics	Terpenes/Miscellaneous	Metals and Inorganics	Gaseous Constituents
Benzene	δ-3-Carene	Aluminum	Ammonia
sec-Butylbenzene	Dioctyl Sebacate	Antimony	Carbon Disulfide
Dinitrobenzenes	δ-Limonene	Arsenic	Carbon Monoxide
2,4-Dinitrophenol	Phthalic Anhydride	Barium	Chlorine
Dinitrotoluenes	α-Pinene	Bromine	Hydrogen Sulfide
Diphenylamine	ß-Pinene	Cadmium	Hydrogen Cyanide
Ethylbenzene	α-Terpinene	Calcium	Hydrogen Chloride
1-Ethyltoluene	δ-Terpinene	Chromium	Nitric Oxide
2-Ethyltoluene	Terpinolene	Copper	Nitrogen Dioxide
3-Ethyltoluene		Gallium	Ozone
Nitrobenzene		Germanium	Particulates (PM10)
Phenol		Iodine	Sulfur Dioxide
n-Propylbenzene		Iron	
1-Propylbenzene		Lead	
Styrene		Magnesium	
Toluene		Molybdenum	
1,2,4-Trimethylbenzene		Nickel	
1,3,5-Trimethylbenzene		Potassium	
o-Xylene		Selenium	
m-Xylene		Silicon	
p-Xylene		Silver	
		Strontium	
		Tin	
		Titanium	
		Uranium	
		Vanadium	
		Zinc	
		Zirconium	

TABLE III-3

CHEMICALS OF CONCERN EMISSION FACTORS FOR THE NEW BOMB OPERATIONS

(Pound of Contaminant per Pound of Material Treated)[a]

	Exposure Period	
Emission Contaminant	Short (≤24 hours)	Long (>24 hours)
Criteria Pollutants		
Carbon Monoxide	7.2E-2	3.9E-2
Nitrogen Dioxide	3.2E-3	1.3E-3
Sulfur Dioxide	2.2E-4	2.2E-4
PM10 (product of combustion)	6.3E-1	2.4E-1
PM10 (dust cloud)[b]	2.3E+1	2.3E+1
Lead	8.1E-1	1.2E-2
Metals		
Aluminum	2.0E-1	9.5E-3
Antimony	2.2E-2	2.0E-4
Barium	4.1E-1	3.6E-3
Boron	5.5E-3	7.0E-5
Calcium	3.5E-2	5.2E-4
Iron	7.0E-2	3.9E-4
Magnesium	4.5E-1	9.2E-3
Nickel	6.1E-2	2.4E-4
Potassium	7.5E-1	4.6E-2
Sodium	1.0E+0	1.9E-2
Strontium	1.1E-1	1.0E-3
Tin	1.3E-2	3.8E-4
Titanium	7.0E-2	2.4E-4
Zinc	5.4E-1	7.9E-3
Shell Casing (Aluminum)	1.3E-2	4.8E-3
Shell Casing (Copper)	2.2E-2	8.5E-3
Shell Casing (Iron)	5.8E-1	2.2E-1
Shell Casing (Manganese)	3.5E-3	1.3E-3
Shell Casing (Styrene)	1.3E-2	4.8E-3
Shell Casing (Zinc)	2.8E-3	1.1E-3
Energetics		
RDX	4.0E-4	4.5E-5
HMX	3.8E-4	3.0E-5
TNT	4.0E-4	1.5E-5
TNG	1.6E-4	2.6E-6
DNT	4.0E-5	2.2E-6
HCE	1.8E-4	5.8E-7
NG	2.2E-4	2.8E-6
White Phosphorus	4.0E-4	2.8E-6
Tetryl	4.0E-4	2.6E-6
TNB	9.1E-7	1.8E-7

Table III-3 (CONTINUED)
CHEMICALS OF CONCERN EMISSION FACTORS FOR THE NEW BOMB OPERATIONS

	Exposure Period	
Emission Contaminant	Short (≤24 hours)	Long (>24 hours)
Other Combustion Products		
1-Nitropyrene	8.4E-8	2.7E-8
1,3-Butadiene	2.4E-5	6.6E-6
2-Methylnaphthalene	3.1E-6	8.3E-7
2-Methylphenol	1.0E-6	6.2E-7
2-Nitrodiphenylamine	2.9E-7	8.4E-8
2-Nitronaphthalene	2.0E-7	5.8E-8
4-Nitrophenol	1.2E-6	1.8E-7
Acenaphthylene	6.4E-7	2.6E-7
Acetophenone	2.0E-7	1.5E-7
alpha, alpha-Dimethylphenethylamine	9.9E-7	9.9E-7
Ammonia	2.9E-4	2.9E-4
Anthracene	2.7E-7	1.6E-7
Aromatics (VOs including benzene)	3.2E-3	7.2E-4
Benzene	5.1E-4	1.3E-4
Benzo(a)pyrene	2.8E-7	8.2E-8
Benzo(b)fluoranthene	6.0E-7	6.0E-7
Benzyl alcohol	1.2E-7	1.1E-7
Benzo(k)fluoranthene	4.8E-7	4.8E-7
Benzo(a)anthracene	1.5E-7	4.7E-8
Butyl benzyl phthalate	1.2E-6	5.1E-7
Chrysene	2.3E-7	2.3E-7
Dibenzofurans	1.2E-6	2.4E-7
Dibenz(a,h)anthracene	4.3E-7	4.3E-7
Di-n-butyl phthalate	3.8E-5	9.8E-6
Diethyl phthalate	5.5E-7	2.7E-7
Dimethyl phthalate	4.7E-7	2.4E-7
Di-n-octyl phthalate	5.4E-6	1.7E-6
Diphenylamine	2.3E-7	6.0E-8
Di(2-ethylhexyl)phthalate	3.5E-6	1.9E-6
Ethyl benzene	4.1E-5	1.0E-5
Fluoranthene	1.2E-6	4.2E-7
Fluorene	3.6E-7	2.5E-7
Hexane	3.2E-5	8.0E-6
Hydrogen cyanide	5.2E-3	2.3E-3
Methane	5.9E-3	2.0E-3
Naphthalene	1.7E-5	3.0E-6
Nitric oxide	9.2E-3	2.4E-3
N-Nitrosodiethylamine	1.2E-7	1.2E-7
N-Nitrosodiphenylamine	2.6E-6	4.2E-7
Phenanthrene	2.0E-6	5.4E-7
Phenol	7.9E-6	1.8E-6

Table III-3 (CONTINUED)
CHEMICALS OF CONCERN EMISSION FACTORS FOR THE NEW BOMB OPERATIONS

	Exposure Period	
Emission Contaminant	Short (≤24 hours)	Long (>24 hours)
Pyrene	1.3E-6	3.6E-7
Styrene	1.8E-3	4.3E-4
TNMHC	3.7E-3	1.6E-3
Toluene	2.7E-4	6.7E-5
Xylenes (isomers and mixtures)	2.3E-4	5.4E-5

[a] Emission factors from AEC (1995), unless otherwise noted.
[b] Estimated site-specific factor based on crater volume and PM10 size fraction measured in cover soil.

TABLE III-4
SOIL CONCENTRATIONS PREDICTED FOR FUTURE OPERATIONS AT HWAD

Constituent	Soil Concentration Within detonation Unit (g/cm^3)
RDX	1.4E-8
HMX	1.4E-8
TNT	6.2E-7
DNT	1.4E-8
DNB	1.4E-8
Sb	4.6E-7
Pb	1.3E-5
Ba	8.0E-6
K	5.0E-6

TABLE III- 5

HEALTH CRITERIA FOR POTENTIAL CONTAMINANTS

Constituent	Criteria (mg/L)
RDX	0.4[a]
HMX	20[a]
TNT	0.02[a]
DNT	0.00005[b]
DNB	0.004[b]
Sb	--
Pb	0.05[b]
Ba	2.0[b]
K	--

[a]Drinking Water Health Advisory
[b]RCRA Action Level

TABLE III-6

DETONATION UNIT ADSORPTION COEFFICIENT (K_D VALUES) AT HWAD

Contaminant	K_D in Partially Saturated Zone	K_D in Saturated Zone
RDX	0.5732	0.5732
HMX	0.001362	0.001362
TNT	0.0101	0.0101
DNT	0.02554	0.02554
DNB	0.01084	0.01084
Sb	0.0	0.0
Pb	0.0	0.0
Ba	0.0	0.0
K	0.0	0.0

Source: Calculated by MEPAS.

TABLE III-7A

MEPAS MODEL RESULTS

Constituent Number	Constituent	Scenario 1		Scenario 2		Scenario 3	
		Concentration (ppm)	Time (years)	Concentration (ppm)	Time (years)	Concentration (ppm)	Time[a] (years)
1	DNT	–	–	6.41E-07	1153.6	3.59E-06	0
2	Antimony	8.31E-06	792.6	3.12E-05	792.7	1.20E-04	0
3	Barium	1.33E-04	792.6	5.00E-04	792.7	1.92E-03	0
4	HMX	2.42E-07	813.8	9.05E-07	813.8	3.59E-06	0
5	Lead	2.34E-04	792.6	8.75E-04	792.7	3.37E-03	0
6	DNB	2.09E-07	945.1	7.81E-07	945.1	3.59E-06	0
7	Potassium Ion	9.15E-05	792.6	3.44E-04	792.7	1.32E-03	0
8	RDX	9.32E-09	7001.0	3.42E-08	7001.0	6.08E-07	0
9	TNT	9.68E-06	936.0	3.64E-05	936.0	1.65E-04	0

Scenario 1: Vadose zone flow > groundwater > stream > receptor
Scenario 2: Vadose zone flow > groundwater > well > receptor
Scenario 3: Overland surface flow > stream > receptor

Note: [a] For the surface runoff scenario, the maximum concentration occurs very quickly once runoff occurs.

TABLE III – 7B

ENVIRONMENTAL CRITERIA (PPM)

Constituent	MCL[a]	RCRA Action Level[b]	Ambient Water Quality Criteria[c]	Health Advisory[d]	Other
DNT	NA	5E-05	0.23	0.04	0.2[e]
Antimony	0.006	1E-02	1.6	0.003	NA
Barium	2.0	NA	NA	2.0	NA
HMX	NA	NA	NA	NA	1.7[f]
Lead	NA	NA	0.0032	NA	0.015[g]
DNB	NA	4E-03	NA	0.001	NA
Potassium	NA	NA	NA	NA	NA
RDX	NA	NA	NA	NA	0.013[h]
TNT	NA	NA	NA	0.002	0.04[i]

[a,d]Drinking water regulations and health advisories (USEPA, 1996).
[b]Subpart S Action Levels, FR55, No. 145, 7/27/90, 30798.
[c]EPA, 1986 (chronic value, water hardness of 100 ppm assumed).
[e]Chronic water quality criterion for the protection of aquatic life (Etnier, 1987).
[f]Ambient water quality criterion for the protection of human health (Bausam, 1989).
[g]Action level at tap.
[h]Ambient water quality criteria for the protection of human health (Etnier, 1986).
[i]Chronic water quality criteria for the protection of aquatic life (tentative) (Ryon, 1987).

SECTION III C AIR QUALITY

Operations of air pollution emitting sources at the New Bomb facility are regulated under the Class II Operating Permit Number AP9711-1134.01 (Appendix D). According to the requirements of this permit, air emissions from the twenty open detonation pits at the New Bomb must be minimized by utilizing best operational practices. Best operational practices will consist, at a minimum, of the following:

a. Detonations will occur only during times when the wind speed is between 3 and 20 miles per hour, with gusts up to 30 miles per hour.
b. Detonations are not allowed when the cloud cover is greater than 80% and the cloud ceiling is less than 2,000 feet.
c. Detonations are not allowed when visibility is less than one mile.
d. Detonations are not allowed during precipitation events, electrical storms or thunder storms, or days when the chance of precipitation, electrical storms or thunderstorms exceeds 50 percent based on a current daily weather report from a Department of Defense weather station or National Weather Service office.

The operating permit also includes emission limits, operating parameters, monitoring and reporting requirements. For details please refer to Volume II, Appendix D. Volume II, Appendix J presents historical climate and weather information for Hawthorne and surrounding areas.

SECTION III D POTENTIAL PATHWAYS OF EXPOSURE AND POTENTIAL EXPOSURE MAGNITUDE

III D.1 APPLICABILITY

Air, surface water, and groundwater are potential pathways of exposure to waste explosives and their byproducts. No Waste explosives or the byproducts are stored in the detonation unit. Therefore, the potential for exposure is low.

There are no perennial surface water bodies or streams. Groundwater, if any, is greater than 200 feet below the ground surface. The closest drinking water wells are 9 miles down-gradient. The town of Hawthorne is north approximately 22 miles down-gradient.

The public would not be exposed to the waste explosives on the New Bomb Facility since the items are not stored on site and are treated only when no unauthorized persons are on site. Wastes are treated with-in hours of arrival on site.

The procedures that protect air, surface water, ground water human health and the environment are described in the:

- SOP – Volume 2 Appendix A
- Section II A.
- Section II B.
- Section II C.
- Section III B and
- Section III C

III D.2 POTENTIAL HUMAN AND ENVIRONMENTAL RECEPTORS [40 CFR 270.23(c)]

Maximum concentrations were calculated to occur just outside the installation boundary to the west and southwest. That area is generally inaccessible mountainous terrain (Figure III-1A). No sensitive populations are expected in this remote area.
In June 2006, HWAD submitted a Human Health and Ecological Risk (HHERA) for the New Bomb to NDEP and EPA Region IX. The purpose of the risk assessment was to further support HWAD's RCRA permit application by providing an analysis of the magnitude and probability of adverse human health and ecological impacts from open detonation operations at the New Bomb facility. The risk assessment is intended to provide a sound technical basis to evaluate and reduce the risks by employing additional operational or risk management activities at the facility.
EPA initially reviewed the 2006 document and provided comments to NDEP in March 2007, which were forwarded to HWAD. Day & Zimmerman, HWAD's contractor, provided response in June 2007 to the EPA comments and committed to modify the HHERA. In June 2008, HWAD submitted a revised HHERA analysis in response to comments and uncertainties articulated initially by the EPA. In May 2010, EPA has

provided additional comments to NDEP and has requested additional explanation of the HHERA results. Presently, HWAD is reviewing the comments and will respond to those comments expeditiously see Volume II Appendix L.

III D.3 POTENTIAL EXPOSURE PATHWAYS [40 CFR 270.23(c)]

The air pathway assessment was described in Section III-C and the soil, surface water, and groundwater pathway assessments were described in Section III-B. The fate and transport of the constituents was described in Section III-B.

The most probable route of exposure is the air pathway. The air pathway assessment showed that detonation operations can be conducted in compliance with the environmental performance standards, and that the maximum concentrations occur just outside the installation boundary in generally inaccessible mountainous terrain. The human risk assessment (HRA) showed that under the most probable exposure scenario, detonation operations can be conducted without adverse impacts to human health, and under the worst-case exposure scenario, detonation operations will not have an adverse effect on ecological receptors.

The potential for exposure is low. There are no perennial surface water bodies or streams, and groundwater; if any, is greater than 200 feet below the ground surface. The closest drinking water wells are 9 miles down-gradient. The town of Hawthorne is north approximately 22 miles down-gradient.

III D.4 POTENTIAL MAGNITUDE AND NATURE OF EXPOSURE [40 CFR 270.23(c)]

Exposure concentration and risk from detonation are minimal. The air pathway assessment showed that a detonation operation only lasts for about 10 minutes. The waste is destroyed with about 99.99% efficiency, and under the most probable exposure scenario detonation operations do not result in exceedances of any air standards, except for PM-10. PM-10 impacts was evaluated under a separate site-specific PM-10 monitoring and evaluation program (IT,1996). Results of this program were used to mitigate adverse impacts predicted to be associated with detonation treatment operations at the New Bomb Area. MEPAS predicted very low levels of contamination in groundwater, surface water, and soil.

SECTION III E EFFECTIVENESS OF THE TREATMENT [40 CFR 270.23(d)]

The treatment effectiveness of OB and OD is addressed in the *U.S. Army Armament, Munitions and Chemical Command OB/OD Study* (U.S. Army, 1992). This study indicated that treatment is about 99.9996% effective (refer to Volume II, Appendix F). The AEC (1995) document presents an OD destruction and removal efficiency (DRE) of 99.96% over the short term (24 hours) and 99.99% over the long term.

SECTION III F ADDITIONAL INFORMATION

III F.1 NOISE CONSIDERATIONS

The potential noise impacts of detonation operations at HWAD have been evaluated. Potential noise impacts can be attributed to high-energy impulsive sounds associated with the detonation unit.

The Noise Control Act (NCA) of 1972 states that "... it is the policy of the United States to promote an environment for all Americans free from noise that jeopardizes their health or welfare." However, there are no established Federal noise impact criteria that are applicable to detonation operations.

The U.S. Army, in compliance with the requirements of the Quiet Communities Act of 1978 (PL 95-609) and the NCA of 1972 (PL 92-574), has developed an environmental noise abatement program (U.S. Army, 1990). The goal of this program "is to control noise produced by Army activities to protect the health and welfare of its members and the public within, adjacent to, and surrounding Army installations." A major feature of the overall noise abatement program is the Installation Compatible Use Zone (ICUZ) program. The ICUZ program is used to determine the compatibility of noise-sensitive land uses adjacent to or near Army activities which produce noise. Incompatible uses are discouraged. The U.S. Army Construction Engineering Research Laboratory (USACERL), in cooperation with other agencies, has performed significant research to determine appropriate noise levels for each zone. ICUZ zones have been defined in terms of the annual average day/night noise level (DNL) as defined by U.S. EPA. This descriptor applies a 10-decibel penalty to night time noise levels between 10 p.m. and 7 a.m. to account for the increased sensitivity of people to noise at night. Also, a separate frequency-weighting network is used to account for the different way people perceive blast noise as compared with normal everyday noises such as from aircraft and traffic. The A-weighted frequency network is used for typical sounds and the C-weighted frequency network is used for large-amplitude impulse noise. The corresponding DNLs are denoted by ADNL and CDNL, respectively. The acceptability of the three ICUZ zones for noise sensitive land uses such as housing, schools, and hospitals is as follows:

- Zone I - Acceptable;
- Zone II - Normally unacceptable; and
- Zone III - Unacceptable.

The corresponding noise levels in decibels used to delineate the zones are as follows:

ICUZ Noise Zone	CDNL (decibels)
I	62
II	62 to 70
III	70

III F.2 DETONATION NOISE IMPACTS

The primary noise source for the New Bomb Area consists of demolition of cartridges, projectiles, and rocket motors. Computer-predicted noise levels were found to be "unacceptable" as defined by the Department of Housing and Urban Development in areas outside the installation property. This finding is not an issue because the noise levels are compatible with any land uses of the areas impacted. The nearest noise-sensitive receptor is the Sweetwater Ranch located 7 to 10 miles northeast of the detonation unit.

HWAD controls noise impacts from detonation activities by restricting explosive ordnance demolition to charges which do not exceed 4,000 lb NEW each, and not more than 40,000 lb in a single day. Noise impacts are further controlled by treating items in pits, and by scheduling detonation activities to occur only during daylight hours on weekdays.

An ICUZ analysis was conducted in November 1988 by the U.S. Army Corps of Engineers (USCOE). At that time, the greatest amount of explosive material expected to be detonated at HWAD during a single day was slightly greater than 12,000 lb.

The present daily demolition rate per charge is expected to generate comparable noise impacts. The analysis conducted in 1988 as well as subsequent analyses have not identified the detonation unit as a source of noise problems at HWAD (USAEHA, 1991).

The USCOE used the NOISEMAP, INM, and BNOISE computer models to calculate the noise contours presented in Figure III-F-1. Data from the surveillance of noise sources at HWAD were input to these models to provide the bases for the calculations. The contours define the outer boundaries of the ICUZ Zones II and III. All areas outside these contours are ICUZ Zone I and are rated "clearly acceptable" for noise-sensitive land uses. Zone II extends a distance of 2.75 miles from the detonation area for the annual average ICUZ noise contours, but because of the more than 7 mile distance to the nearest noise-sensitive receptor, noise levels are predicted to be clearly acceptable at all noise-sensitive locations based on the annual average CDNL.

While no unavoidable noise impacts exist due to residential development because of the U.S. Bureau of Land Management owned land surrounding the New Bomb Area, HWAD maintains an active involvement in community planning to preclude any incompatible land uses in the future.

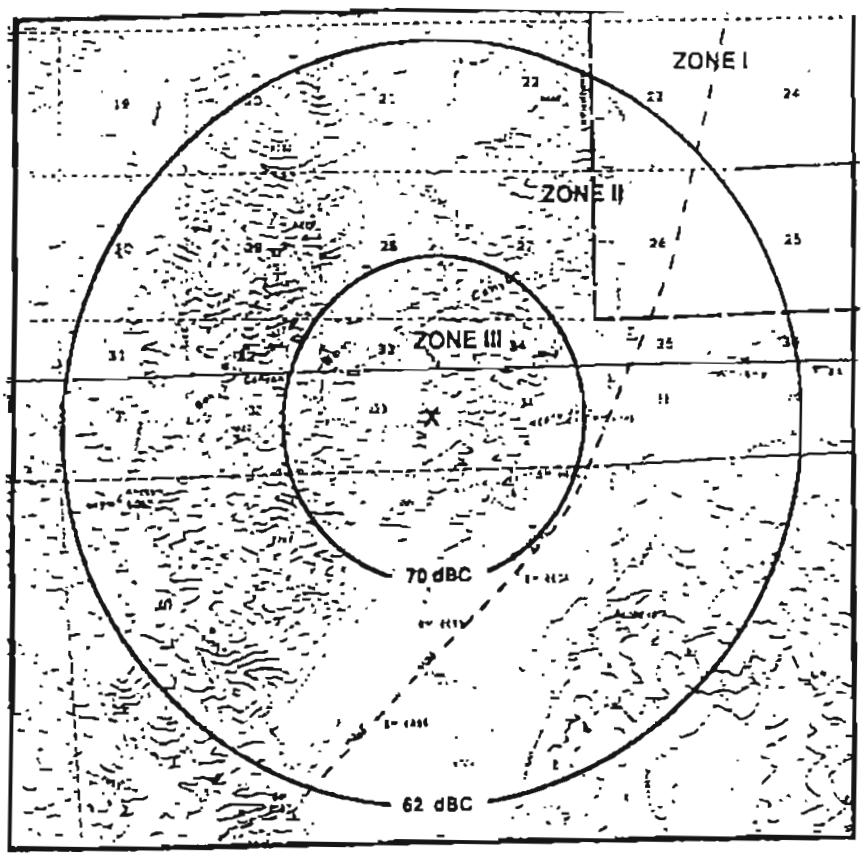
Impulsive noise from detonation activities may have some effect on wildlife, including the startling of animals and birds, resulting in birds taking flight and animals running. Few data are available on the long-term effects of impulsive noise such as explosions or sonic booms on wildlife, and there is little evidence that occasional impulsive sounds that produce no physical damage will produce any long-term effects (DNA, 1981).

III F.3 MINIMUM PROTECTIVE DISTANCE [40 CFR 265.382 and 270.23(e)]

The minimum allowable safe distances for detonation activities is specified in 40 CFR 265.382. The maximum quantity of explosives detonated during anyone day at the detonation unit will be ten impulses of 4,000 pounds, each impulse being separated by one (1) minute interval. According to 40 CFR 265.382, detonation of these quantities (up to 10,000 pounds) of explosives requires a minimum distance of 1,730 feet from the property of others. As shown in Figure II-2, this distance does not reach any property not part of the New Bomb Area. The closest inhabited building is located seven miles away at Sweetwater Ranch.

The shortest allowable distance from the detonation unit from all inhabited buildings, public traffic routes, and operating buildings is 2,400 feet (AMC R 385-100). The distances from the personnel safety shelter, security office, and State Highway 359 exceed this minimum distance.

FIGURE III – F-1
NOISE CONTOURS



FACILITY BOUNDARY

N

0 10,000 FEET

SCALE 1: 62,500

CONTOUR INTERVAL 40 FEET

Source: EBASCO, 1988.

The Earth Technology Corporation

NOISE CONTOURS

SECTION IV SOLID WASTE MANAGEMENT UNITS

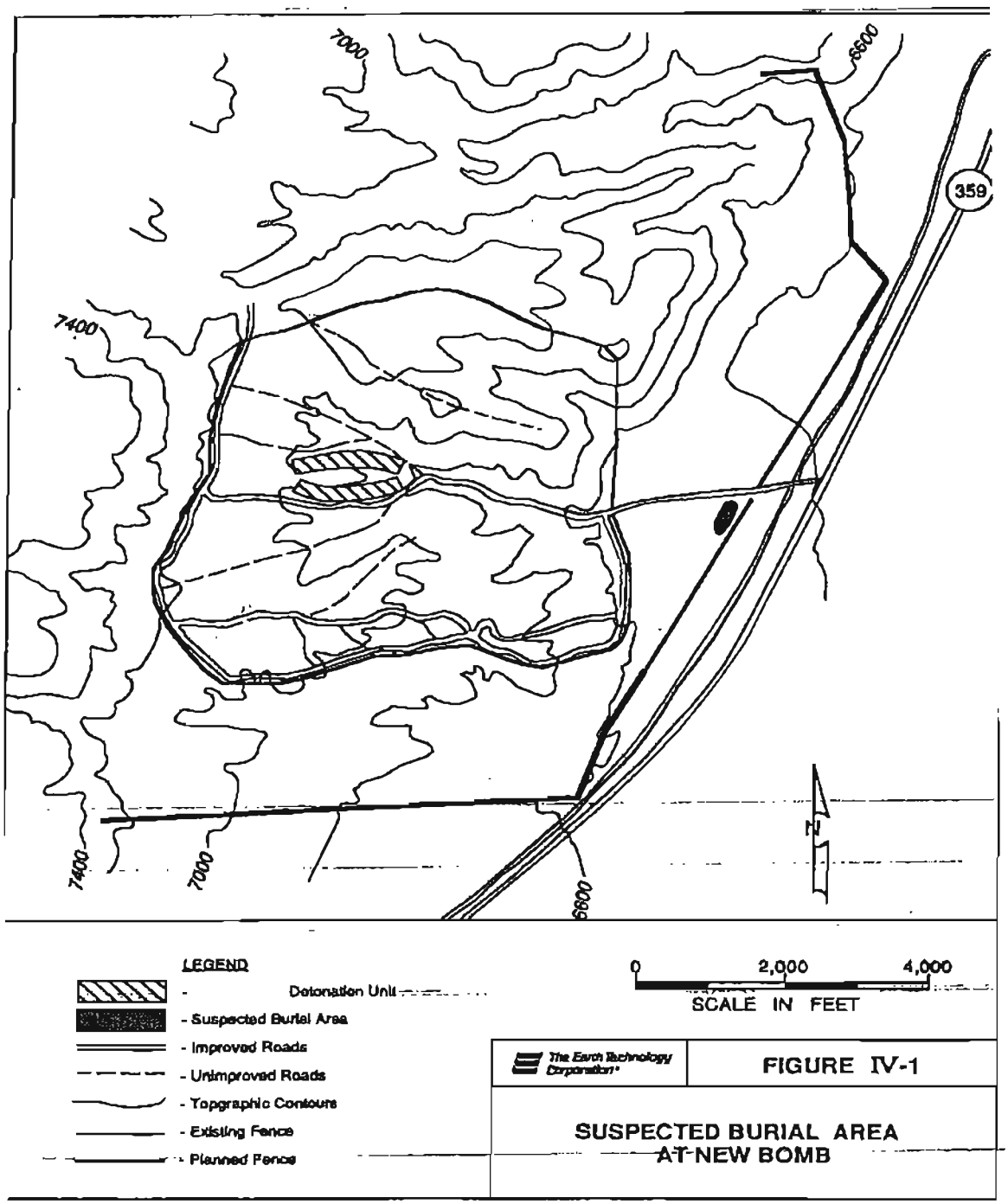
A suspected waste burial area was identified by HWAD and NDEP at New Bomb. The burial area was approximately 150 feet by 300 feet in size and contained various concrete-filled inert munitions items. These items were excavated and disposed in 1986. The area of suspected burial is shown in Figure IV-1.

It should be noted that three previously identified burial pits (ESE, 1985) were excavated during July 2 through August 5, 1986. The location of these pits was shown on a figure presented in the draft New Bomb RCRA permit application prepared by Earth Technologies in 1993. Records show 974 inert antisubmarine rocket warheads were removed from the three pits. The inert warheads posed no environmental or human health risk. After removal, restoration of the excavated areas to their original condition was accomplished.

Other potential SWMUs discussed in the draft 1993 application are believed to be previously used detonation sites or borrow areas. The *Groundwater contamination Survey and Evaluation of SWMUs* report *(HWAAP,* 1988) that identified potential sources of groundwater contamination, including SWMUs, does not identify New Bomb as a source of potential SWMUs. It would appear based on removal of buried inert warheads, studies performed concerning SWMUs (HWAAP, 1986) and personal interviews with individuals knowledgeable of historical operations at New Bomb (Shankle, 1997), that the issue of additional SWMUs at New Bomb have been adequately addressed for RCRA permitting purposes.

HWAD will, based on any new evidence, conduct investigations of potential SWMUs outside the detonating cell areas shown in the current permit application.

FIGURE IV-1
AREA OF SUSPECTED BURIAL



SECTION V REFERENCES

ACGIH (American Conference of Governmental Industrial Hygienists), 1991. Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices, Cincinnati, Ohio.

AMC Pamphlet 700-3-5, May 1975 and May 1970. Logistics Complete Round Charts Grenades, Mines, Pyrotechnics, Rockets, Rocket Motors, Demolition Material.

Bausum, H. T., 1989, "***Recommended Water Quality Criteria for HMX,***" Technical Report 8812 prepared by the U.S. Army Biomedical Research and Development Laboratory, Fort Detrick, Maryland, March.

Blair, Lynda M., and Heindl, Alex L., 1992. A Cultural Resource Investigation of the Proposed New Bomb Demilitarized Area and Old Bomb Fence Line, University of Nevada, Las Vegas.

Cowherd, C., et al., 1984. Rapid Assessment of Exposure to Particulate Emissions from Surface Contamination Sites, U.S. EPA, Research Triangle Park, NC.

DARCOM-P 700-3-3, 1980. Logistics Complete Round Charts, Activity Ammunition and Fuzes.

DNA (Defense Nuclear Agency), 1981. High Explosives Field Tests.

DZB (Day & Zimmermann/Basil Corporation), 1989-1992. Soil/Ash Sampling Data.

DZB (Day & Zimmermann/Basil Corporation), 19923. Underground Detonation of Ammunition and Explosives, Standard Operating Procedure for New Bomb, Serial No. HW-0000-G-001.

EBASCO (Ebasco Services Incorporated), 1988. RCRA Part B Permit Application for Open Burning/Open Detonation at HWAAP, Prepared for U. S. Army Corps of Engineers.

ESE (Environmental Science and Engineering), 1985. Closure Methods for OB/OD Sites Final Engineering Report. Prepared for U.S. Army Corps of Engineers.

ESE (Environmental Science and Engineering), 1985, "Draft Report for Closure Methods for HWAAP OB/OD Site at New Bomb, January.

Etnier, E. L., 1986, "***Water Quality Criteria for RDX,***" Final Report Prepared by Oak Ridge National Laboratory, Report No. ADA 169506, ORNL-6178, June.

Etnier, E. L. 1987, "***Water Quality Criteria for 2,4- and 2,6-Dinitrotoluene,***" Final Report prepared by Oak Ridge National Laboratory, Report No. AD-ORNL-9312, August.

Everett, D.E. and F. E. Rush, 1967. A Brief Appraisal of the Water Resources of the Walker Lake Area, Mineral, Lyon, and Churchill Counties, Nevada, Water Resources - Reconnaissance Series, Report 40.

Fairfield, J., 1996, personal communication between James Fairfield, DZHC and Mark Weisberg, IT Corporation, July.

FM 5-25, 1971. Department of the Army Field Manual, Explosives and Demolitions, HQ Department of the Army.

Hawthorne Utilities, 1996, personal communication between Thomas DeMars-Foreman and Mark Weisberg, IT Corporation, July 25.

HWAAP, 1986, "Report DACA87-85-C-0107, Final Technical Report on the HWAAP New Bomb OB/OD Grounds Clearance Operations", August.

HWAAP, 1988, "Final Report Groundwater Contamination Survey No. 38-26-0850-88, Evaluation of Solid Waste Management Units," Hawthorne Army Ammunition Plant, 12-19 May 1987 and 1-5 August 1988.

IHTR, Computer Predictions of Pollution Products from Open Burning and Open Detonation of Explosives and Propellants, August 4, 1989. Indian Head, Maryland.

IT Corporation), 1989. Ordnance and Environmental Investigation, HWAAP, Final Report. Submitted to U.S. Army Engineer Division.

IT Corporation, 1996, "Surface Runoff Drainage Area Sampling Results, New Bomb Area," prepared for Lockheed Martin Energy Systems, Inc. and Hawthorne Army Depot, October 2,

IT Corporation, 1996, "Monitoring Well Installation Report, New Bomb Area," prepared for Lockheed Martin Energy Systems, Inc. and Hawthorne Army Depot, November 27.

IT Corporation, 1996, "Air Dispersion Modeling Protocol, New Bomb and Old Bomb Areas," Prepared for Lockheed Martin Energy Systems, Inc. and Hawthorne Army Depot, October 14.

IT Corporation, 1996, "PM_{10} Evaluation Program Protocol, New Bomb Area," prepared by IT Corporation for Lockheed Martin Energy Systems, Inc. and Hawthorne Army Depot, September 4.

IT Corporation, 1996, "Meteorological Monitoring Plan for Hawthorne Army Depot," prepared by IT Corporation for Lockheed Martin Energy Systems, Inc. and Hawthorne Army Depot, October 11.

Little, Lyn, 1995, facsimile transmittal from L. Little, U.S. Army Explosives Safety Test Management Division, Savanna Illinois to M. Weisberg, IT Corporation, May 24, 1995.

NAVSEA SN060-AA-MMA-010 (formerly OP 2212) 0640-LP-285-9800, 1989. First Revision, Technical Manual Demolition Materials.

Nevada Special Report, 1991, submitted by the Departments of the Air Force, Navy, and Interior in accordance with Public Law 99-606, prepared by SAIC and the Desert Research Institute, DE-AC08-88NV10715, September.

NIOSH (National Institute for Occupational Safety and Health), 1991. NIOSH Pocket Guide to Chemical Hazards, Washington, D.C.

PNL (Pacific Northwest Laboratories), 1989. Supplemental Mathematical Formulations: The Multimedia Environmental Pollutant Assessment System (MEPAS).

Pratt, William L., 1992. Threatened and Endangered Species Survey of the "New Bomb" Site, University of Nevada, Las Vegas.

Rahn, P.H., 1967, "Sheetfloods, Streamflows, and the Formation of Pediments," **Annals Assoc. Amer. Geograph.**, 57: 593-604.

RAI (Resource Applications, Inc.), 1992. Site Screening Inspection (SSI) for the Hawthorne Army Ammunition Plant, Hawthorne, Nevada. Prepared for U.S. Army Corps of Engineers.

Ryon, M.G., 1987, "Water Quality Criteria for 2,4,6-Trinitrotoluene (TNT)," final report prepared by Oak Ridge National Laboratory, Report No. AD-ORNL-6304, August.

Shankle, V. L., 1997, letter from V. L. Shankle, Chief, HWAD Operations Review Division to M. Weisberg, IT Corporation, February 18.

Soil Conservation Service (SCS), 1991. Soil Survey of Mineral County Area, Nevada (Volume I); United States Department of Agriculture, Soil Conservation Service and Forest Service, United States Department of the Interior, and University of Nevada.

Tetra Tech, 1996, "Hawthorne Army Depot, Remedial Investigation, Group B Solid Waste Management Units, Final Data Package," Volume 1, January 1996.

TM 43-0001-28, April 1977. Technical Manual Army Ammunition Data Sheets, Artillery Ammunition Guns, Howitzers, Mortars, Recoilless Rifles, Grenade Launchers, and Artillery Fuzes.

TM 43-0001-29, October 1977. Technical Manual, Army Ammunition Data Sheets for Grenades, HQ Department of Army.

TM 43-0001-36, February 1977. Technical Manual, Army Ammunition Data Sheets for Land Mines (FSC 1345), HQ Department of the Army.

U.S. Army, 1976. DARCOM Pamphlet 700-32, Complete Round Charts, Ammunition through 20 mm, Material Development and Readiness Command.

U.S. Army, 1992. Development of Methodology and Technology for Identifying and Quantifying Emission Products from OB and OD Thermal Treatment Methods, U.S. Army Armament, Munitions and Chemical Command, Rock Island, Ill. Volume 1, Test Summary.

U. S. Army Environmental Center (AEC), 1995, "Air Pathway Screening Assessments for RCRA Subpart X Permitting, Revision 1, July, prepared by Halliburton NUS Corporation.

USAEHA, 1985, Groundwater Consultation No. 38-26-0535-85, Hawthorne Army Ammunition Plant, Hawthorne, Nevada.

USAEHA (U.S. Army Environmental Hygiene Agency), 1987. Groundwater Consultation No. 38-26-031888.

USAEHA (U.S. Army Environmental Hygiene Agency), 1988. Evaluation of Solid Waste Management Units, HWAAP, Ground-Water Contamination Survey No. 38-26-0850-88.

USAEHA (U.S. Army Environmental Hygiene Agency), 1989/1990. U.S. Army Propellant/Munition Compositions (Draft), Aberdeen Proving Ground, MD.

USAEHA (U.S. Army Environmental Hygiene Agency), 1991. Environmental Noise Contours for Hawthorne Army Ammunition Plant, Environmental Noise Study No. 52-34-0672-91.

USATHAMA (U.S. Army Toxic and Hazardous Materials Agency), "Draft Position Paper, RCRA Subpart X Notice of Deficiency," prepared by NUS Corporation for HAZWRAP.

U.S. EPA (U.S. Environmental Protection Agency), 1972. Mixing Heights, Wind Speeds, and Potential for Urban Air Pollution throughout the Contiguous United States, Research Triangle Park, N.C.

U.S. EPA (U.S. Environmental Protection Agency), August 1986. INPUFF 2.0 - A Multiple Source Gaussian Puff Dispersion Algorithm User's Guide. Environmental Sciences Research Laboratory, Research Triangle Park, NC.

U.S. EPA (U.S. Environmental Protection Agency), November 1986. Test Methods for Evaluating Solid Waste, SW-846.

U.S. EPA (U.S. Environmental Protection Agency), 1986, ***Quality Criteria for Water***, Office of Water Regulations and Standards, EPA 440/5-86-001.

U.S. EPA (U.S. Environmental Protection Agency), 1989. Risk Assessment Guidance for Superfund: Volume I - Human Health Evaluation Manual (Part A) - Interim Final, EPA 540/1-89/002, U.S. Environmental Protection Agency, Washington, D.C.

U.S. EPA (U.S. Environmental Protection Agency), 1990. Guideline on Air Quality Models (Revised), Office of Air Quality Planning and Standards. Research Triangle Park, NC, July 1986; July 1987; and September 1990.

U.S. EPA (U.S. Environmental Protection Agency), 1995, "User's Guide for the Industrial Source Complex (ISC3) Dispersion Models," Office of Air Quality Planning and Standards, EPA-454-B-95-003A.

U.S. EPA (U.S. Environmental Protection Agency), 1996, "Drinking Water Regulations and Health Advisories," Office of Water, EPA/822-R-96-001, Washington, D. C.

USFS (U.S. Forest Service), 1994, Toiyable National Forest Map, Bridgeport Ranges District.

Williams, 1995, personal communication between Rhea Williams, Nevada USGS and Mark Weisberg, IT Corporation, May 12, 1995.

APPENDIX A

EPA FORM 8700-22

Please print or type. (Form designed for use on elite (12-pitch) typewriter.)

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UNIFORM HAZARDOUS WASTE MANIFEST

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DESIGNATED FACILITY

EPA Form 8700-22 (Rev. 3-05) Previous editions are obsolete.

DESIGNATED FACILITY TO DESTINATION STATE (IF REQUIRED)

APPENDIX B

AMMUNITIONS TRANSFER RECORD (ATR)

AMMUNITION TRANSFER RECORD

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