

**REMEDIAL INVESTIGATION FOR
MUNITIONS AND EXPLOSIVES OF CONCERN**

**MIDDLESEX COUNTY COLLEGE
(AREA 17, AREA 17A, AREA H, AREA W, AREA X,
AND BUILDING 118)**

FORMER RARITAN ARSENAL

**FUDS Project Number C02NJ008403
Contract No. W912WJ-16-D-0002
Task Order W912WJ-17-F-0091**

January 2023

FINAL

Prepared for:



**United States Army Corps of Engineers
New England District
696 Virginia Road
Concord, Massachusetts 01742**

This page intentionally left blank.

TABLE OF CONTENTS

| | |
|--|-----|
| ACRONYMS AND ABBREVIATIONS | IV |
| 1.0 INTRODUCTION | 1-1 |
| 1.1 PURPOSE AND SCOPE | 1-1 |
| 1.2 PROPERTY DESCRIPTION | 1-2 |
| 1.3 HISTORICAL INFORMATION | 1-5 |
| 1.4 FUDS PROGRAM ELIGIBILITY | 1-5 |
| 1.5 MCC AREA HISTORY | 1-6 |
| 1.5.1 Areas 17 and 17A | 1-6 |
| 1.5.2 Areas H, X, and W | 1-7 |
| 1.5.3 Building 118 | 1-7 |
| 1.6 PREVIOUS INVESTIGATIONS | 1-7 |
| 2.0 CHARACTERISTICS OF THE STUDY AREA | 2-1 |
| 2.1 LAND USE | 2-1 |
| 2.2 SURFACE FEATURES | 2-1 |
| 2.3 GEOLOGY | 2-2 |
| 2.4 HYDROGEOLOGY | 2-2 |
| 2.5 ECOLOGY | 2-2 |
| 3.0 PRELIMINARY CONCEPTUAL SITE MODEL | 3-1 |
| 3.1 POTENTIAL SOURCE AREAS | 3-1 |
| 3.2 TRANSPORTATION PATHWAYS | 3-1 |
| 3.3 EXPOSURE PATHWAYS AND RECEPTORS | 3-2 |
| 4.0 RI DATA QUALITY OBJECTIVES | 4-1 |
| 5.0 SITE CHARACTERIZATION FOR MEC | 5-1 |
| 5.1 1963 - LETTERKENNY ARMY DEPOT REPORT: DECONTAMINATION OF THE AMMUNITION AREA AT RARITAN ARSENAL (LEAD, 1963) | 5-1 |
| 5.2 1989 - FINAL ENGINEERING REPORT, FORMER RARITAN ARSENAL, CONTAMINATION EVALUATION (O'BRIEN & GERE, 1989) | 5-1 |
| 5.3 1991 - ARCHIVES SEARCH REPORT FOR MIDDLESEX COUNTY COLLEGE AND THOMAS EDISON PARK (METCALF AND EDDY, INC., 1991) | 5-2 |
| 5.4 1992 - FINAL REPORT – FORMER RARITAN ARSENAL ORDNANCE REMOVAL ACTION (IT CORPORATION, 1992) | 5-3 |
| 5.4.1 1992 - UXO Removal After Action Report (EOD Technology, Inc., 1992) | 5-3 |
| 5.5 1992 - MILITARY ORDNANCE CLEANUP ACTIVITIES AT THE FORMER RARITAN ARSENAL (GAO, 1992) | 5-4 |
| 5.6 1993 - ARCHIVAL SEARCH REPORT, FORMER RARITAN ARSENAL, EDISON, NEW JERSEY (DAMES & MOORE, 1993) | 5-4 |
| 5.7 1993 - GEOPHYSICAL MAPPING AND SAMPLING OF AREAS 2, 3, 4, 6, 8, 9, 10, 11, 13, 14, 15, 16, 16A, 18B, 18C, 19, AND MCC AT THE FORMER RARITAN ARSENAL, EDISON, NEW JERSEY (EODT, 1993) | 5-4 |

| | | |
|--------|---|-----|
| 5.8 | 2000 - DRAFT FINAL ENGINEERING EVALUATION/COST ANALYSIS – FORMER RARITAN ARSENAL (FOSTER WHEELER ENVIRONMENTAL CORPORATION, 2000) | 5-5 |
| 5.9 | 2014 - REMEDIAL INVESTIGATIONS AND REMEDIAL ACTIONS SUMMARY REPORT FOR MIDDLESEX COUNTY COLLEGE PROPERTY (AVATAR ENVIRONMENTAL, 2014) | 5-6 |
| 5.10 | DISCOVERY OF SUSPECTED MUNITIONS IN OTHER MCC AREAS | 5-6 |
| 5.11 | 2016 INTERVIEWS | 5-7 |
| 5.11.1 | Roger Fitzpatrick, Ordnance and Explosives Representative with USACE Huntsville | 5-7 |
| 5.11.2 | Donald R. Drost Jr., Executive Director of Facilities Management at MCC | 5-8 |
| 6.0 | MEC EVALUATION | 6-1 |
| 6.1 | MEC SOURCE | 6-1 |
| 6.2 | MEC INTERACTION | 6-2 |
| 6.3 | UNCERTAINTY | 6-2 |
| 7.0 | MEC RISK MANAGEMENT METHODOLOGY AND REVISED CONCEPTUAL SITE MODEL | 7-1 |
| 7.1 | MEC RISK MANAGEMENT METHODOLOGY | 7-1 |
| 7.1.1 | Likelihood of Encounter | 7-1 |
| 7.1.2 | Severity of Incident | 7-3 |
| 7.1.3 | Likelihood of Detonation | 7-4 |
| 7.1.4 | Acceptable and Unacceptable Site Conditions | 7-4 |
| 7.2 | RISK ASSESSMENT FINDINGS | 7-5 |
| 7.3 | REVISED CONCEPTUAL SITE MODEL | 7-5 |
| 7.3.1 | Nature and Extent of MEC (MEC Source) | 7-5 |
| 7.3.2 | Media of Concern (MEC Interaction) | 7-5 |
| 7.3.3 | Potential Receptors | 7-6 |
| 8.0 | SUMMARY AND CONCLUSIONS | 8-1 |
| 8.1 | MEC INVESTIGATION SUMMARY | 8-1 |
| 8.2 | CONCLUSIONS | 8-1 |
| 9.0 | REFERENCES | 9-1 |

LIST OF TABLES

| | |
|---|-----|
| Table 1-1: Investigation Areas at the Former Raritan Arsenal | 1-2 |
| Table 1-2: Other Areas of Investigation at the Former Raritan Arsenal | 1-4 |
| Table 1-3: Summary of MCC Investigations, Removal Actions and Reports | 1-7 |
| Table 7-1: Matrix 1 - Likelihood of Encounter..... | 7-2 |
| Table 7-2: Matrix 2 – Severity of Incident | 7-3 |
| Table 7-3: Matrix 3 – Likelihood of Detonation..... | 7-4 |
| Table 7-4: Matrix 4 – Acceptable and Unacceptable Site Conditions | 7-5 |
| Table 7-5: Summary of Risk Management Matrices | 7-5 |

LIST OF APPENDICES

Appendix A Figures

| | |
|------------|--|
| Figure 1-1 | Installation Location |
| Figure 1-2 | Site Layout |
| Figure 3-1 | Preliminary MEC Conceptual Site Model |
| Figure 5-1 | Summary of Munitions Investigations and Finds at MCC |
| Figure 7-1 | Revised Conceptual Site Model for MEC |
| Figure 8-1 | Proposed MCC Sub-MRS |

Appendix B Supporting Documents

| | |
|---------------|--|
| Appendix B-1a | December 2011 Letter from New York District USACE PM |
| Appendix B-1b | Edison Township Dig Permit Process Information Package |
| Appendix B-2 | Building 118 Removal Action |
| Appendix B-3 | 1993 Geophysical Survey Coverage of MCC |
| Appendix B-4 | Detail of MCC Area |
| Appendix B-5 | MCC Email Regarding 500-lb Inert Bomb |

Appendix C MRSPW Worksheets

Appendix D New Risk Management Methodology Feedback Form

ACRONYMS AND ABBREVIATIONS

| | |
|--------|--|
| ARAR | applicable or relevant and appropriate requirements |
| Army | U.S. Army |
| ASR | Archival Search Report |
| Avatar | Avatar Environmental, LLC |
| bgs | below ground surface |
| CERCLA | Comprehensive Environmental Response, Compensation and Liability Act |
| CFR | Code of Federal Regulations |
| CHE | Chemical Warfare Material Hazard Evaluation |
| CSM | conceptual site model |
| DMM | discarded military munitions |
| DoD | U.S. Department of Defense |
| DSA | Dredge Spoils Area |
| EE/CA | Engineering Evaluation / Cost Analysis |
| EHE | Explosive Hazard Evaluation |
| EM | Engineer Manual |
| EOD | explosives ordnance disposal |
| EODT | EOD Technology Inc. |
| EPA | U.S. Environmental Protection Agency |
| ER | Engineer Regulation |
| ft | feet |
| FUDS | Formerly Used Defense Site |
| GAO | U.S. General Accounting Office |
| GPR | ground-penetrating radar |
| GSA | General Services Administration |
| HHE | Health Hazard Evaluation |
| HTRW | Hazardous, Toxic, and Radioactive Waste |
| IT | IT Corporation |
| JB MDL | Joint Base McGuire-Dix-Lakehurst |
| LEAD | Letterkenny Army Depot |
| lb | pound |
| MCC | Middlesex County College |
| MD | munitions debris |
| MEC | munitions and explosives of concern |
| mm | millimeter |
| MRS | munitions response site |
| MRSP | munitions response site prioritization protocol |
| NJDEP | New Jersey Department of Environmental Protection |
| OE | Ordnance and Explosives |
| RAO | remedial action objective |
| RI | remedial investigation |
| RMM | Risk Management Methodology |
| SLERA | Screening level ecological risk assessment |
| USACE | U.S. Army Corps of Engineers |
| USRADS | Ultrasonic Ranging and Data Acquisition System Survey |
| UST | underground storage tank |
| UXO | unexploded ordnance |
| Weston | Weston Solutions, Inc |

EXECUTIVE SUMMARY

Avatar Environmental, LLC (Avatar), with its subcontractor AECOM, has prepared this Remedial Investigation (RI) Report for Munitions and Explosives of Concern (MEC) for the Middlesex County College (MCC) Area at the former Raritan Arsenal (Formerly Used Defense Site [FUDS] Project Number C02NJ008403) located in Edison, New Jersey. This RI addresses the MCC's 169-acre portion of the 3,485-acre former Raritan Arsenal munitions response site (MRS). Chemical constituents including munitions constituents (MC) in soil and groundwater are addressed under separate RIs for Hazardous, Toxic, and Radioactive Waste (HTRW). As presented in Avatar (2014 and 2018), historical investigations determined there is unlikely probability for munitions constituents within the MCC Area and therefore these constituents are not addressed in this report. This RI used a weight-of-evidence approach to determine the potential presence of MEC in the MCC Area based on previous investigations and interim response actions.

The following Areas of Interest have been identified on MCC property and are the focus of this report:

- Area 17: Former salvage and property disposal area;
- Area 17A: Former burning grounds used for the destruction of small arms ammunition by non-explosive means;
- Areas H, W, and X: Former administrative and barracks area; and
- Building 118: Former hospital building used as a disposal area for adapter boosters.

Numerous MEC investigations and removal actions have been conducted at MCC. Investigations from 1963 through 2014, regarding the status of MEC at the MCC, have included:

- Archival searches to identify areas of potential contamination including MEC based on historical operations;
- Geophysical surveys across a large portion of MCC to identify subsurface anomalies including discarded military munitions (DMM), munitions debris (MD), and possibly unexploded ordnance (UXO);
- DMM removal and a geophysical survey at Building 118;
- An interim response action at the ball fields and tennis courts associated with Area 17A; and
- An interim response action at an area associated with Area W and follow-on studies.

Following the transfer of the Former Raritan Arsenal, the MCC Area has undergone the construction of parking lots, buildings and landscaping all of which required intrusive activities. Since approximately 2011, the Township of Edison has implemented a permit process that procedurally requires property owners (within the former Arsenal footprint) proposing site changes (e.g., new use, landscaping, paving, building modification and new construction) include measures to mitigate potential risk associated with encountering munitions during the proposed activity. These measures include, at a minimum, worker education/training (former arsenal history and 3Rs: recognize, retreat, report), with greater measures such as UXO avoidance required for large excavation projects in areas where the site history suggests a potential for MEC to be encountered. The Township permit process has proven successful in mitigating exposure risk during several construction projects on the MCC property and other properties within the former Arsenal footprint. Further, with regard to managing risk and their liability, permittees have noted their preference for, and confidence in, the Township's permitting process over implementing other land use and institutional controls.

During construction of campus facilities, DMM and MD have been encountered and removal actions have been completed. A magnetometer survey was conducted and test pits were excavated in 1991 at Area 17; no MEC was recovered. Additionally, from 1991 to 1992, a magnetometer survey and removal action was completed at Building 118 to discover and remove all DMM within the area; the removal action at Building 118 is complete and no munition items identified as MEC remain. A magnetometer survey was also conducted in 1993 on approximately 74 acres of undeveloped land within the MCC campus; MEC was not discovered in any of the areas surveyed. Additional investigations and removal actions, including large scale removal actions of HTRW contaminated soil from Area 17A and Area W have also not found MEC.

Potential site-specific human health risks from MEC were evaluated using the MEC Risk Management Methodology (RMM) at FUDS MMRP projects (USACE, 2017). The RMM (USACE, 2017) is a qualitative baseline risk assessment for hazards posed by MEC and was developed for Area 17, Area 17A, Area H, Area W, Area X, and Building 118 by reviewing each of the input factors for the RMM using data collected from previous investigations, historical reports, and prior studies. The RMM considers the following site conditions:

- Site access and frequency of use (e.g., open daily access, limited use/access limited)
- Likelihood of MEC encounter (e.g., frequent, occasional, seldom)
- Hazard associated with the specific MEC items (e.g., catastrophic, minor injury)
- Classification of MEC detected (e.g., sensitive, high explosive, propellant)
- Likelihood of detonation/to impart energy on a MEC item (e.g., development planned, not anticipated)

The MEC Risk Management Methodology concluded the human health risk due to the possible presence of MEC is “Acceptable,” where no additional response is required.

Based on the areal extent of previous investigations, removal actions, and subsequent relatively dense development of the area, the revised conceptual site model indicates an unlikely potential for MEC to remain at the surface or within the subsurface of the MCC. Therefore MEC exposure pathways for current and future receptors are incomplete and there is acceptable explosive risk at the MCC Area.

In summary, several investigations and removal actions have been conducted to find and remove known and suspected MEC at the MCC. The following input was used to complete the munitions risk evaluation using the RMM tool:

- Confirmed MEC has not been identified on the MCC property since 1992.
- The MCC is a former cantonment area and as such munitions use would not be expected.
- Many HTRW-related soil removal actions have been completed and no MEC was identified.
- MEC-related removal actions were completed (e.g., over 80,000 adapter boosters at Building 118, detonators adjacent to Main Hall, and other isolated items limited to munitions debris).
- Following completion of the Building 118 removal, the area was subdivided and each area was intrusively investigated horizontally and vertically until no more MEC was found and native soil was reached.
- Numerous geophysical investigations covering large areas of MCC have not identified MEC.
- Dense development (requiring intrusive activities) of the MCC campus have revealed no additional sources of MEC since the 1991-1992 removal action at Building 118.
- The Risk Management Methodology tool, used to evaluate risk associated with MEC, found acceptable risk under current and anticipated future site conditions.

Based on these findings, it is recommended that the 169-acre MCC Area (comprising the former Arsenal cantonment area) be distinguished from all other Areas of the former Arsenal with a unique sub-MRS designation (i.e., delineate the 169-acre MCC property portion of FUDS Project /MRS C02NJ008403). Additionally, a Feasibility Study for the MCC Area is not warranted and no additional investigations or removal actions are necessary at this time. A future and separate Proposed Plan and Decision Document will be prepared to support the No Action decision.

This page intentionally left blank.

1.0 INTRODUCTION

Avatar Environmental, LLC (Avatar), with its subcontractor AECOM, has prepared this Remedial Investigation (RI) Report for Munitions and Explosives of Concern (MEC) for the Middlesex County College (MCC) Area at the former Raritan Arsenal (Formerly Used Defense Site [FUDS] Project Number C02NJ008403) located in Edison, New Jersey (**Figure 1-1**; figures are presented in **Appendix A**). The former Raritan Arsenal is one munitions response site (MRS) totaling 3,485 acres and this RI addresses the MCC's 169-acre portion of the MRS. The former Raritan Arsenal has been divided into 14 Investigation Areas as shown in **Table 1-1** and each investigation area represents a portion of the total MRS. Chemical constituents including munitions constituents (MC) in soil and groundwater are addressed under separate RIs for Hazardous, Toxic, and Radioactive Waste (HTRW). This RI addresses potential MEC in the MCC Area and presents summaries of the previous investigations and interim response actions carried out at the MCC Area during the over 20-year investigation history of the site.

This RI was prepared under the Defense Environmental Restoration Program – FUDS program for the United States Army Corps of Engineers (USACE) New York and New England Districts under USACE Contract W912DR-13-D-0014, Delivery Order DB03. It was performed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986; the National Oil and Hazardous Substances Pollution Contingency Plan (Title 40 of the Code of Federal Regulations [CFR] Part 300), and applicable provisions of 29 CFR Section 1910.120, hazardous waste operations and emergency response.

The lead agency for this RI is the U.S. Army. The lead regulatory agency is the New Jersey Department of Environmental Protection (NJDEP). The USACE executes the FUDS program on behalf of the U.S. Army and the U.S. Department of Defense (DoD). This document was prepared using applicable components of the *Final Munitions Response Remedial Investigation/Feasibility Study Guidance* (U.S. Army, 2009), Chapter 4 of Engineer Regulation (ER) 200-3-1: *FUDS Program Policy for Environmental Quality* (USACE, 2004), and in accordance with the document *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA* (EPA, 1988).

1.1 PURPOSE AND SCOPE

The purpose of this RI is to gather sufficient historical information to assess potential presence of MEC, as a result of historical site use, which would warrant a Feasibility Study. Areas of interest in the MCC Area have undergone multiple investigations from 1963 through 2014. A comprehensive review and reassessment of historical documents that detail previous MEC investigations and removal activities were used to characterize the site. Sufficient historical data exist to evaluate the MCC Area for the presence of MEC using a desk-top, weight-of-evidence approach. As such, no additional field investigation activities were performed to complete this RI.

This report presents a weight-of-evidence evaluation of the available information for the MCC Area. It summarizes the findings of previous investigations and removal actions conducted at the MCC Area for MEC and results of a qualitative risk assessment using the MEC Risk Management Methodology (RMM) (USACE, 2017).

1.2 PROPERTY DESCRIPTION

The former Raritan Arsenal is located in Edison and Woodbridge Townships in Middlesex County, New Jersey, approximately 20 miles southwest of lower Manhattan, New York. The former Arsenal area is over 3,400 acres and is bordered on the southeast by the northern bank of the Raritan River, on the southwest by Mill Road, on the north and northwest by Woodbridge Avenue, and on the east by industrial properties (**Figure 1-1**). Most of the area within the site is developed as commercial or industrial property with the exception of the southeastern portion, which is predominantly undeveloped wetlands and the Beechwood property which is residential.

For investigation purposes, the former Raritan Arsenal has been divided into separate areas based on land use and property ownership. A separate site-wide investigation is being conducted for groundwater and vapor intrusion issues. A summary of the 14 Investigation Areas at the former Raritan Arsenal is provided in **Table 1-1** and each investigation area represents a portion of the total MRS. Other areas of investigation are summarized in **Table 1-2**.

The MCC Area is approximately 169 acres located in the western portion of the former Raritan Arsenal site (**Table 1-1**). MCC is bordered by Woodbridge Avenue on the north, the Lehigh Valley Railroad line and Investigation Area 10 on the south-southeast, and Mill Road to the west; the eastern border of the MCC Area abuts the following Investigation Areas: Beechwood Development, Area 18D, and a small portion of the U.S. EPA/General Services Administration (GSA) property. The MCC Area contains Areas 17, 17A, H, W, X, and Building 118, and the remaining property of the MCC (blue shaded area depicted on **Figure 1-2**).

Table 1-1: Investigation Areas at the Former Raritan Arsenal

| Area Name | Approximate Acreage | Areas of Interest | Description |
|-------------------------------|---------------------|---|---|
| Middlesex County College Area | 169 | Areas 17, 17A, H, W, X, Building 118 | Located in the western portion of the former Raritan Arsenal (excludes Building 229 and its parking lot, which are being evaluated as part of the standalone RI for Investigation Area 18D) |
| Commercial/Industrial Area | 1,233 | Areas 2, 3, 4, 7, 8, 15, and 20, the Owens Illinois Area, Building 151, the Inland Container Corporation, and the area in the far north of the former Arsenal referred to as the Exclusion Area | Located in the north central area of the former Arsenal. A remedy is in place for the 1.5-acre Area 4 Cap. |

Table 1-1: Investigation Areas at the Former Raritan Arsenal

| Area Name | Approximate Acreage | Areas of Interest | Description |
|---|----------------------------|---|--|
| Area 5 | 9.75 | Area 5 | Borders Capped Area 14 in the eastern portion of the former Raritan Arsenal and the Undeveloped/Wetlands Area |
| Areas 6, 6A, 6B, Dredge Spoils Area (DSA) #1, and Surrounding Areas | 236 | Areas 6, 6A, 6B, DSA#1, and Surrounding Areas | Located in the southeastern portion of the former Arsenal, this area comprises the Former Burning Ground and Impoundment Areas, as well as an area of additional dredge deposits/spoils referred to as DSA#1 |
| Areas 9 and 19 | 350 | Areas 9 and 19 | Located in the central western portion of the former Arsenal, this area comprises Area 9 (Former Magazine H-65 Explosion Area) and Area 19 (Former Magazine Area) |
| Area 10 | 143 | Area 10 | Located on the western side of the former Arsenal, this area comprises the Former Wastewater Treatment and Magazine Area |
| Area 11, DSA#2, and Surrounding Areas | 130 | Area 11, DSA#2, and Surrounding Areas | Located in the south central portion of the former Arsenal, this area comprises the Former Dredged Material and Explosives Disposal Area, as well as an area of additional dredge deposits/spoils referred to as DSA#2 |
| Area 12, OB/OD, DSA#3, and Surrounding Areas | 235 | Area 12, OB/OD, DSA#3, and Surrounding Areas | Located in the southwestern portion of the former Arsenal, this area comprises the Former Dredged Material and Explosives Detonation Area, an area referred to as OB/OD which presents the maximum “kick-out” distances of munitions from former explosive detonation operations, and an area of additional dredge deposits/spoils beyond the boundary of Area 12 referred to as DSA#3 |
| Area 13 | 23 | Area 13 | Located in the south central portion of the former Arsenal, this area comprises a thin strip of land alongside the dock, the Submerged Dock Area, and approximately 17 acres of the Raritan River adjacent to the dock |
| Areas 16, 16A, and Surrounding Areas | 352 | Areas 16, 16A, and Surrounding Areas | Located in the southwest portion of the former Arsenal, this area comprises the Former Magazine Area |

Table 1-1: Investigation Areas at the Former Raritan Arsenal

| Area Name | Approximate Acreage | Areas of Interest | Description |
|--|---------------------|--|---|
| Area 18D, Middlesex Interfaith Partners, and Beechwood Development | 104 | Area 18D, Middlesex Interfaith Partners, and Beechwood Development | Located in the northwest portion of the former Arsenal, between MCC and the EPA/GSA Property, this area comprises the Trench of Shell Casings and the Beechwood Trench, a condominium complex referred to as Beechwood Development, and a homeless shelter referred to as Middlesex Interfaith Partners |
| DSA#4 and DSA#6 | 94 | DSA#4 and DSA#6 | DSA#4 and DSA#6 are located in the center of the Raritan River, south of the former Arsenal; these areas comprise discontinuous islands where it was speculated that dredge deposits/spoils were placed |
| DSA#5 | 228 | DSA#5 | DSA#5 is also located to the south of the former Arsenal, and comprises the maximum extent of area permissible to dispose of dredge deposits/spoils on the southern shore of the Raritan River, and also comprises the “Spoils Area” an 8-acre parcel of spoils |
| U.S. EPA/GSA Property | 178 | Areas 1, 18A, 18B, 18C, 18E, 18F, and 18G | Located in the north central portion of the former Arsenal |
| Total Area | | 3,485 acres | |

Note: The current acreage in the FUDS Management Information System is 3,283.5 acres. The acreage difference will be addressed when the project is delineated.

Table 1-2: Other Areas of Investigation at the Former Raritan Arsenal

| Area Name | Approximate Acreage | Areas of Interest |
|----------------------------------|---------------------|---|
| Capped Area 14 (Ineligible) | 189 | Located in the eastern portion of the former Arsenal, this was former marshland and used for deposition of dredged material from the Raritan River. The landowner (Federal Business Centers) obtained NJDEP approval to construct a large package distribution complex on this site, with the backfilling, building, pavement, and landscaping serving to cap soil contamination. |
| Army Reserve Center (Ineligible) | 9 | Located to the west of the former Arsenal, these two non-contiguous areas are an active Army Reserve Center. |
| Total Area | | 198 acres |

1.3 HISTORICAL INFORMATION

According to the 1993 Archive Search Report (ASR; Dames & Moore, 1993), before the U.S. Army constructed the Arsenal in 1917, the property consisted of undeveloped tidal marsh, clay and sand pit quarries, several residences, and farmland. The location was chosen because of its proximity to other ports, its rural nature, and readily available connections to both ocean and railroad transportation facilities.

Raritan Arsenal was used by the U.S. Army from 1917 through 1963 for the storage, manufacture, renovation, maintenance, decommissioning, and transport of munitions, ordnance, and machinery. Additional structures included cantonment areas, a hospital, barracks, and various maintenance and storage buildings. During active use, ordnance and chemical agents were reportedly buried and disposed of on site. Explosive material and chemical agents have purportedly been disposed of by open burning, as well as in burn chambers and pits. Historically, two accidental explosions have occurred at different locations (Magazine E-31 [1919] and at Magazine H-65 [1943]) at the former Arsenal. These explosions reportedly scattered munitions debris and materials across a large area.

Active use of the Arsenal was phased out between 1961 and 1963. A decontamination process was conducted during this span of time by the Ordnance Corps Headquarters and Arsenal staff. This process subsequently resulted in classification of 17 areas of potential contamination (referred to as Areas of Interest 1 through 17). Upon closure, many of the identified areas were surface cleared of ordnance. Additional areas of concern, as noted in **Table 1-1**, were added throughout the years following subsequent investigations.

1.4 FUDS PROGRAM ELIGIBILITY

The eligibility of the former Raritan Arsenal for the FUDS Program is supported by the previous Federal government ownership/control of the property, specifically under the jurisdiction of the U.S. Secretary of Defense and the subsequent transfer of property control from the DoD before 17 October 1986. During the period of DoD control, the Raritan Arsenal was never subject to other than DoD use. Specific information regarding the property acquisition and subsequent transfer is detailed below.

Between 1915 and 1934 and in the early 1940s, a total of 3232.50 acres fee, 57.42 acres lease and 67.57 acres easements comprising the Raritan Arsenal was acquired by various deeds and condemnation proceedings.

With the exception of a small portion noted below, the entire former Raritan Arsenal has been excessed and conveyed from the DoD either to private corporations, various State of New Jersey instrumentalities or reassigned to other Federal agencies as follows:

- A lease for 56.21 acres of leased land with McFose Clay Company expired on 30 September 1947.
- On 21 August 1956, 12.40 acres fee was reported excess to the U.S. General Services Administration (GSA).
- By quitclaim deed dated 26 January 1960, 12.40 acres fee was conveyed to the Charles Equipment Company.
- In June 1961, 3.90 acres fee and 0.22 acres easements were reassigned to the U.S. Army Reserve and redesignated as the U.S. Army Reserve Center New Brunswick. This portion of the former Raritan Arsenal is not eligible under FUDS. Leases for 1.10 and 0.11 acres were terminated on 30 June 1961 and 15 July 1961 respectively.
- On November 1961, 3216.20 acres fee and 67.35 acres easements were reported excess to GSA.

- By quitclaim deed dated 21 June 1962, 110.10 acres fee were conveyed to the Township of Edison.
- By quitclaim deed dated 30 April 1964, 160.61 acres fee and 0.05 acres easements were conveyed to the County of Middlesex.
- By quitclaim deed dated 22 September 1964, 108.23 acres fee were conveyed to the State of New Jersey.
- By quitclaim deed dated 15 October 1964, 179.05 acres fee and 0.09 acres easements were conveyed to the County of Middlesex.
- By quitclaim deed dated 23 November 1964, 6.10 acres fee were conveyed to the Hertna Corporation.
- By quitclaim deed dated 11 November 1965, 66.0 acres fee were conveyed to the Township of Edison.
- On 24 February 1965, 1.95 acres fee were reassigned to US Department of Health Education and Welfare.
- By quitclaim deed dated 31 March 1965, 2325.49 acres fee and 67.12 acres easements were conveyed to Federal Storage Warehouses Inc.

Currently, most of the former Raritan Arsenal property is privately owned and predominantly zoned for industrial use. Most of the area has been developed into the Raritan Center Industrial Park, which is predominantly owned by Federal Business Centers and Summit Associates, Inc. Approximately 360 acres of land in the western area of the former Arsenal was conveyed to Middlesex County and is currently occupied by MCC and Thomas Edison County Park. Other landowners/tenants include EPA Region 2 and the U.S. GSA. The southern portion of the former Arsenal area remains tidal marsh and has not been developed or improved since closure of the Arsenal.

1.5 MCC AREA HISTORY

The MCC was constructed in 1966 on approximately 169 acres located in the western portion of the former Raritan Arsenal. The area contains of the following areas of concern: Areas 17, 17A, H, W, X, and Building 118, and the remaining property of the MCC (**Figure 1-2**). The majority of the current buildings on the site were built in the 1960s and 1970s by the county for the college. However, several buildings remain on site that were originally constructed and used by the Army; these original buildings are currently used by the college for administrative purposes. New roads, parking lots, lighting, athletic fields, and utilities have also been constructed on site since the county acquired the property.

According to the 1991 and 1993 ASRs (Metcalf and Eddy, 1991 and Dames & Moore, 1993), most of the MCC Area was historically used as a cantonment area and contained a hospital complex (Building 118). Historical munitions use in the area is not consistent with its cantonment area designation. A review of multiple site plans created throughout the Arsenal's period of active use revealed that additional structures and facilities included additional barracks, a golf course, a swimming pool, a school building, and other miscellaneous buildings, which have all since been demolished or repurposed for MCC use (Dames & Moore, 1993).

1.5.1 Areas 17 and 17A

Area 17 is approximately 2 acres in size and was identified on a 1943 site plan within the MCC as a "Future Salvage Yard." Although the subsequent 1954 site plan did not reference this area, an adjacent area was identified as a "burning ground." Area 17 is located in the center of the MCC Area. It was reportedly used

as a salvage yard for property disposal between the late 1940s and early 1960s, when Arsenal use was phased out. Ammunition components were reportedly among the scrap metal found at the site; however, no MEC has been discovered in the area.

Area 17A is approximately 0.5 acre located in the southeastern area of the MCC, in the outfield of a current campus baseball field. In 1993, an open burning area/pit was identified in historical aerial imagery from 1954. This location corresponded with the area designated as “burning ground” on the 1954 site plan and subsequently designated as Area 17A. It was reported that this burning ground was used primarily for decommissioning small arms by non-explosive means for sale as scrap.

1.5.2 Areas H, X, and W

Areas H, X, and W are located in the southern portion of the MCC; collectively, the area is approximately 25 acres. Area X is mostly undeveloped and covered by forest; Areas H and W are mostly paved and used by the MCC as parking lots. Historically, the collective area was the site of officers’ quarters, barracks, a mess hall, a guard house, an administration building, a recreation building, and open land (Metcalf and Eddy, 1991). The areas were identified by the USACE as areas of potential contamination after reviewing the findings of the 1991 and 1993 ASRs. No known munitions-related activities occurred in these areas.

1.5.3 Building 118

The Building 118 area is approximately 4 acres located in the northern section of the MCC. The building is currently used by the college as an administrative building. According to the original 1918 site plans for the Arsenal, the area was occupied by hospital ward buildings. These buildings were abandoned by the end of 1921 and assumed to have been demolished prior to 1931, when the current Building 118 was built for use as a hospital. The hospital was actively used between 1931 and 1954 (Metcalf and Eddy, 1991).

1.6 PREVIOUS INVESTIGATIONS

Investigations and reports pertaining to MCC or Investigation Areas of interest on its property are summarized in **Table 1-3** below. In depth discussions of the findings and MEC hazard evaluation of each study are provided in **Section 5**.

Table 1-3: Summary of MCC Investigations, Removal Actions and Reports

| Date | Name of Investigation | MCC Areas Covered |
|------|---|--------------------------|
| 1963 | Letterkenny Army Depot Report: Decontamination of the Ammunition Area at Raritan Arsenal (LEAD, 1963) | Area 17 |
| 1989 | Final Engineering Report, Former Raritan Arsenal, Contamination Evaluation (O’Brien & Gere, 1989) | Area 17 |
| 1991 | Archives Search Report for Middlesex County College and Thomas Edison Park (Metcalf & Eddy, Inc., 1991) | MCC |
| 1992 | UXO Removal After – Action Report (EOD Technology, Inc., 1992) | Area 17 and Building 118 |

Table 1-3: Summary of MCC Investigations, Removal Actions and Reports

| Date | Name of Investigation | MCC Areas Covered |
|-------------|---|---|
| 1992 | Final Report – Former Raritan Arsenal Ordnance Removal Action (IT Corporation, 1992) | Area 17 and Building 118 |
| 1992 | Military Ordnance Cleanup Activities at the Former Raritan Arsenal (GAO, 1992) | Area 17 and Building 118 |
| 1993 | Archival Search Report, Former Raritan Arsenal, Edison, New Jersey (Dames & Moore, 1993) | Area 17, 17A, Building 118, and Areas H and W (SW Corner Parking Lots 2 and 1A) |
| 1993 | Geophysical Mapping and Sampling of Areas 2, 3, 4, 6, 8, 9, 10, 11, 13, 14, 15, 16, 16A, 18B, 18C, 19, and MCC at the Former Raritan Arsenal, Edison, New Jersey (EOD Technology, Inc., 1993) | MCC |
| 2000 | Draft Final Engineering Evaluation/Cost Analysis – Former Raritan Arsenal (Foster Wheeler Environmental Corporation, 2000) | Area 17, 17A, Building 118, and remainder of MCC |
| 2014 | Remedial Investigations and Remedial Actions Summary Report for Middlesex County College Property (Avatar, 2014) | Area 17, 17A, Building 118, Areas H, X, and W |
| 2018 | Final Remedial Investigation Addendum, Area W, Middlesex County College Property, Former Raritan Arsenal (Avatar, 2018) | Area W |

2.0 CHARACTERISTICS OF THE STUDY AREA

This section presents the physical characteristics of the MCC Area and discusses the associated land use, surface features, geology, hydrogeology, and ecology.

2.1 LAND USE

The MCC Area is owned by Middlesex County and contains the majority of the MCC campus. Most of the area is developed with college facilities and infrastructure, including recreational areas (baseball fields and tennis courts) and a few campus residences in the northern area of the college campus.

As detailed below, a process for addressing hazards associated with potential MEC that may remain onsite currently exists for the entire former Raritan Arsenal area. This process is implemented through the Township of Edison construction permitting office. While this process is not supported by any Decision Document, it requires the landowner to obtain a permit when planning to conduct any subsurface activities. This process was initiated in response to unanticipated encounters with munitions debris (MD) during construction activities at another location within the former Raritan Arsenal. The Township coordinates with the Army to evaluate proposed maintenance/construction activities to determine if there are any concerns based on the Army's knowledge of the area and historical findings.

This permitting process was initially documented in a letter dated 21 December 2011 from the New York District USACE Project Manager for the former Raritan Arsenal. The letter noted an intent to "implement a process of periodic notification to all landowners within the boundary of the former Raritan Arsenal" in the form of a mass mailing distribution that encouraged "property owners to consider arranging for unexploded ordnance construction support during any earthmoving, land-clearing or in-water construction". This letter is included as supporting documentation in **Appendix B-1a**. Since that time, the Township has adopted a formal permitting process that requires property owners proposing site changes (e.g., new use, landscaping, paving, building modification and new construction) specify planned measures to mitigate potential risk associated with encountering munitions. These measures include, at a minimum, worker education/training (former arsenal history and 3Rs: recognize, retreat, report), with greater measures such as UXO avoidance required for large excavation projects in areas where the site history suggests a potential for MEC to be encountered. Further, with regard to managing risk and their liability, permittees have noted their preference for, and confidence in, the Township's permitting process over implementing other land use and institutional controls." **Appendix B-1b** includes further information regarding the current Township permitting process.

2.2 SURFACE FEATURES

The area is predominantly flat throughout the campus, with minor sloping toward the southeast. There is an approximate 50-foot drop in elevation from the northwest toward the southeast (Roy F. Weston, Inc., 1996). With the exception of portions of the small campus Ecological Park and Area X, the MCC Area is developed with landscaping managed by the college. Small portions of the Ecological Park, located in the center of MCC, and Area X, located in the southern portion of MCC, are wooded. All remaining open grassy areas and athletic fields are mowed and maintained by the college. Based on interviews with MCC personnel and a 2015 in person site-visit by project team members, a large portion of the Ecological Park was cleared for a new administrative building, named West Hall. The construction of West Hall was

completed in September 2016. Numerous campus buildings and facilities are present throughout the central portion of the area, including several large asphalt parking lots, athletic fields, and tennis courts.

2.3 GEOLOGY

The geology beneath the former Arsenal is characterized by an overburden layer composed of unconsolidated sediments and underlain by bedrock composed of shales, metamorphosed shales, and an igneous diabase sill. Weston (1996) created a geological conceptual site model (CSM) that subdivided the overburden and bedrock geology at the former Arsenal into six units—two bedrock and four overburden units. From oldest to most recent, the units are identified as the Passaic Formation, the Palisades Sill, the Weathered Bedrock Group, the Raritan Fire Clay, the Lower Sand, the Meadowmat Formation, and the Upper Sand (Roy F. Weston, Inc., 1996). The unconsolidated overburden ranges from approximately 20 to 70 feet (ft) in thickness at MCC. The overburden is comprised of upper and lower sandy layers that decrease in thickness toward the southeast.

2.4 HYDROGEOLOGY

The hydrogeology beneath the former Arsenal is characterized by separate aquifers in the overburden and bedrock. Groundwater within both the overburden and bedrock aquifers flows southeastward across the MCC Area toward the Raritan River. The depth to shallow groundwater in former Arsenal overburden ranges from 2 to 30 ft below ground surface (bgs) (Roy F. Weston, Inc., 1996).

According to a review by Weston in 2007, groundwater has not historically been used at the former Arsenal because groundwater does not meet drinking water standards, primarily because of its naturally occurring salinity, iron, manganese, and sulfate concentrations. Further evaluation of water use at the former Arsenal revealed no drinking water wells within the overburden aquifer in the vicinity of the Arsenal and one industrial user of the bedrock aquifer (an industrial laundry service). An evaluation of groundwater is not included as part of this RI because groundwater is being addressed under a separate investigation along with vapor intrusion issues. More information on groundwater can be found in the document, “*Final Remedial Investigations and Remedial Actions Summary Report, Middlesex County College Property (Area 17/17A, Building 118, Areas H, X, and W, and High Traffic Areas)*”, Former Raritan Arsenal, June 2014, prepared for: USACE-New England District, prepared by: Avatar Environmental.

2.5 ECOLOGY

There is minimal habitat for wildlife in the MCC Area. Small patches of wooded areas exist on site; however, they are fragmented and not considered suitable ecological habitat. A screening-level ecological risk assessment (SLERA) was conducted in 2004 and a baseline Ecological Risk Assessment was conducted in 2008 by Weston for HTRW over the entire former Raritan Arsenal area (Weston, 2004 & 2008). The MCC Area was considered in both assessments but was not evaluated due to the lack of suitable habitat and lack of contamination within the first 2 ft bgs, where terrestrial ecological exposure typically occurs. While potential MEC exposure is evaluated during this RI, a separate assessment of ecological risk is not.

3.0 PRELIMINARY CONCEPTUAL SITE MODEL

This section presents the preliminary CSM for potential MEC exposure at MCC. A CSM is used to conceptualize the relationship between MEC and receptors through consideration of potential or actual migration and exposure pathways. It presents the current understanding of the site and previous investigations. The preliminary CSM for MEC was used to develop the technical approach for the RI.

The CSM relates potentially exposed receptors with potential source areas based on physical site characteristics and complete exposure pathways. The following sections identify the potential source areas, transport pathways (i.e., methods of interaction), and receptor groups. Exposure pathways are considered complete when the following criteria are met: a source of MEC exists, a method of interaction with a medium via a transport pathway exists, and a receptor is present. The main goal of CSM development is to determine whether complete pathways exist between human receptors and MEC. The preliminary CSM is presented in **Figure 3-1** and discussed below.

3.1 POTENTIAL SOURCE AREAS

There are several potential MEC source areas. Area 17 is a former salvage yard; according to the 1991 ASR (Metcalf and Eddy, 1991) “ammunition items” and related munitions items/component parts may have been disposed of at this location during its period of active use. Inert MD, as well as unidentified “ammunition items,” have been recovered from the area; however, no MEC has been confirmed. Area 17A is the reported location of a former burning ground for the disposal of small arms by non-explosive means. MEC is not anticipated from the area’s use as a burning ground since expended small arms do not present an explosive hazard.

Numerous MEC items have been found buried in the vicinity of Building 118 (former hospital building) during past investigations and removal actions. These items include grenades and over 80,000 adapter boosters. It is theorized that such items were disposed of in the area following the demolition of the previous hospital ward buildings (between 1921 and 1931), prior to the construction of Building 118 in 1931. MEC removal was completed, as documented in reports listed in **Table 1-3** and detailed in **Section 5.0**.

Additionally, potential MEC and inert munitions items have been sporadically found throughout the remaining areas of the MCC. The locations of these items cannot be attributed to any specific historical site use. For example, an inert practice bomb was found at a depth greater than 20 ft bgs during excavation activities associated with an HTRW soil removal action (Foster Wheeler Environmental Corporation, 2000; **Section 5.8**).

3.2 TRANSPORTATION PATHWAYS

Transportation pathways are the mechanisms by which site contaminants may be transported from a source area to an exposure medium (i.e., surface soil) where receptor exposure/interaction may occur. Except for areas of steep terrain with high erosion potential, MEC does not typically migrate away from terrestrial source areas. However, MEC that is buried in the subsurface can be unearthed during excavation activities (such as utility or maintenance work) or exposed as a result of natural processes such as erosion and subsidence.

The following are potential transportation pathways for MCC:

- Exposure to MEC as a result of excavation activities
- Direct contact with MEC in subsurface soil during excavation activities
- Direct contact with MEC located at the surface or in surface soil

3.3 EXPOSURE PATHWAYS AND RECEPTORS

Exposure pathways are the ways in which receptors may come into contact with hazardous materials. Exposure can only occur where a complete exposure pathway exists.

Land use at MCC is not anticipated to change in the future. As such, receptors are considered the same for both current and future land uses and include the following:

- MCC Students/ Staff – may be exposed to MEC at the ground surface by direct handling or treading underfoot
- Construction/Maintenance Workers – may be exposed to surface and subsurface MEC when performing construction, routine maintenance such as groundskeeping or utility work that involves soil removal/excavation activities typically extending to approximate depths of 1 ft up to 4 ft bgs; new building construction activities may require deeper excavations which are based on the specific building design.

Since MEC has been found in the MCC Area, all exposure pathways at this preliminary stage of investigation are potentially complete for receptors to interact with MEC at the site. A revised CSM that incorporates the findings of the RI is presented in **Section 7.3**.

4.0 RI DATA QUALITY OBJECTIVES

The USACE scope of work for this RI did not require development or Stakeholder approval of a Work Plan / QAPP with data quality objectives (DQOs), since new field work was not performed as part of the effort. The RI is a summary of several historical field efforts that included investigations and removals. The historical field efforts would have included stakeholder involvement in the process. Stakeholders were not provided with a Work Plan or QAPP to review and comment as part of this desktop effort.

This page intentionally left blank.

5.0 SITE CHARACTERIZATION FOR MEC

At the commencement of the RI, a site visit was conducted to verify site conditions and search historical documents located on site. The site visit was conducted on 3-4 November 2015. In addition to the site visit, interviews were conducted with MCC personnel and former Arsenal staff familiar with the past investigations and removal actions. AECOM's munitions response safety program manager also contacted the Joint Base McGuire-Dix-Lakehurst (JB-MDL) and Naval Weapons Station Earle explosives ordnance disposal (EOD) detachment companies (local EOD units who historically responded to the former Arsenal) in hopes to review EOD records. Additional information from EOD unit staff was not available.

The project team conducted a comprehensive evaluation of the electronic repository for the former Raritan Arsenal to identify original source material relating to the MCC Area. This repository contains electronic copies of thousands of documents pertaining to historical activities conducted at the former Arsenal. This records search identified several principal reports that discuss the nature, extent, and removal of MEC at the MCC Area.

The RI assessed the results of field investigations and removal actions previously completed in the MCC Area as well as first-hand accounts obtained from interviews. **Table 1-3** presents the chronological order of investigations. **Figure 5-1** incorporates the munitions, MEC, and munitions-related debris findings identified in each of the reports summarized herein as well as the digitized locations of historical buildings present during active Arsenal use. The following summarizes the findings of each study and interview as it relates to the MCC Area.

5.1 1963 - LETTERKENNY ARMY DEPOT REPORT: DECONTAMINATION OF THE AMMUNITION AREA AT RARITAN ARSENAL (LEAD, 1963)

The Letterkenny Army Depot (LEAD) issues a report in October 1963 to document the decontamination of 17 ammunition areas at the former Raritan Arsenal. These 17 ammunition areas provided the basis for the soil Investigation Areas. The report gave a brief description of each area, the procedure for decontamination, the decontamination performed, and the suggested final recommendations for the release of each area (e.g., no restrictions, surface use only, etc.).

Area 17 is described in the report as having been a “property disposal storage area” that contained ammunition items. The area had been inspected prior to decontamination because “various types of ammunition” items had been found in the area. It was reported that all ammunition items were removed from Area 17 and the surface scarred with grader equipment to a depth of 4 inches bgs specifically to uncover buried ammunition items. It was concluded that the area was not contaminated with explosive items and recommended that the area be released without restriction.

5.2 1989 - FINAL ENGINEERING REPORT, FORMER RARITAN ARSENAL, CONTAMINATION EVALUATION (O'BRIEN & GERE, 1989)

In November 1987, O'Brien & Gere performed a “Contamination Evaluation” of the 17 areas identified in the LEAD report. The investigation evaluated each site and prioritized them for future study. Due to funding limitations, a field investigation was not conducted at Area 17 (and others) because it was ranked as low priority.

The evaluation reported that the area was partially covered by the MCC College Student Center Building. A review of the excavation and construction files indicated that no munitions-related articles were found during construction.

5.3 1991 - ARCHIVES SEARCH REPORT FOR MIDDLESEX COUNTY COLLEGE AND THOMAS EDISON PARK (METCALF AND EDDY, INC., 1991)

In 1991, Metcalf & Eddy conducted an archive search of the MCC and Thomas Edison Park areas. The objective of the study was to identify any other munition disposal areas that may have existed, in addition to the 17 areas identified in the 1963 LEAD report, through interviews and archive searches.

Former Arsenal employees were interviewed and confirmed that Area 17 was used as a disposal site for ammunition depriming, renovation, and salvage operations, but stressed that any ammunition material disposed of at the site would have been inert. MCC engineers reported no instances where ordnance material was discovered during construction of the buildings and roadways that currently overlie Area 17.

The ASR reported that at the time of its publication, a removal action was being conducted at Building 118 following the discovery of MEC in the area. According to interviews with former Arsenal employees, the first discovery of ordnance at Building 118 was during Arsenal closure in 1962 during trenching activities for the deactivation of water lines. Grenades were reportedly found at a depth greater than 3.5 ft bgs where waterlines entered the building under the southwest corner. Adapter boosters were also found in an adjacent hole dug near the waterline trench. The 1991 ASR also reported that several thousand adapter boosters were removed by Fort Monmouth personnel in 1987 following discovery during the installation of utility lines near Building 118. It was proposed that MEC was disposed of in the area between 1922 and 1930, following the demolition of previous hospital ward buildings and prior to the construction of the current Building 118.

The 1991 ASR also researched the southwest corner parking lots (Parking Lots 1A and 2; **Figure 5-1**). Parking Lot 2 encompasses most of Areas W and H in the MCC Area; Parking Lot 1A is located immediately northwest of Parking Lot 2/Area W. Interviews with MCC employees revealed several instances of ordnance being found in both areas during construction. Ordnance found includes the following:

- Two large objects described as “approximately 2.5-foot-long oval-shaped UXO” (reportedly demolition charges) discovered in the south end of Parking Lot 2 (Area H)
- One anti-personnel bomb (described as a pipe bomb) 100 ft east of the MCC police station in northwestern corner of Parking Lot 2 (Area W)
- One 0.50-caliber cartridge in the southern end of Parking Lot 1A
- A 75 lb oval piece of ordnance was removed from Parking Lot 1A in 1975 during construction according to MCC personnel

An area noted as “burning grounds” was mentioned on site plans from 1954. The 1991 ASR reported that there was a possibility that the area was used as burning grounds for ammunition, but this was possibly discounted by statements from former employees.

Additional information regarding MEC found in the MCC Area was also reported. The following MEC were found in the MCC Area at various times:

- Shells and machine gun components found between Lot 4 and Lehigh Valley rail line sometime between 1974 and 1976 according to MCC personnel

- A 50 lb projectile was found during construction of the Student Center.
- 100 to 200 detonators were discovered outside of the Main Hall building during utility-related excavation sometime during 1989
- An empty grenade was discovered behind the gym area in 1991. No subsequent MEC was found in an investigation of the surrounding 3,500-square-foot area.

Other removal operations have been conducted at the MCC by Fort Monmouth EOD; however, information on the type and location of ordnance removed was not available during the 1991 ASR.

5.4 1992 - FINAL REPORT – FORMER RARITAN ARSENAL ORDNANCE REMOVAL ACTION (IT CORPORATION, 1992)

IT Corporation (IT) was contracted to conduct UXO location and removal at the 17 areas identified in the 1963 LEAD report. IT subcontracted all ordnance-related work to EOD Technology Inc. (EODT) who reported their findings in an After Action report, which was included as Appendix E to their report. A summary of their findings follows in **Section 5.4.1**. During ordnance investigation/excavation, two underground storage tanks (USTs) were discovered and subsequently removed from the Building 118 area. IT also removed a concrete driveway behind Building 118 due to partial ordnance contamination.

5.4.1 1992 - UXO Removal After Action Report (EOD Technology, Inc., 1992)

EODT was contracted by IT to conduct a UXO removal action at the former Raritan Arsenal. Removal operations were conducted via handheld magnetometer survey to identify anomalies for investigation and removal. Several anomalies were found embedded in the roots of trees during the investigation. In such instances, the tree was removed and the roots and stump swept with a magnetometer until clear. All trees and tree roots that contained anomalies were removed.

Due to heavy pedestrian traffic surrounding Building 118, a phased approach was taken to investigate the area. Anomalies were initially surveyed using a magnetometer to identify “hot areas”. The area was then broken up into two separate phases of work. Phase I included the area south of Building 118, and Phase II the area north of the building. Due to the density of anomalies encountered, the Phase II area was further subdivided. Detailed maps and excerpts from the investigation depicting the findings within each subdivided area as well as a list of the items found are provided as supporting documents in **Appendix B-2**.

The following MEC were found in the Building 118 area. Each area was intrusively investigated horizontally and vertically until no more MEC was found and native soil was reached.

- Ten ordnance items, identified as non-explosive adapters for artillery projectiles, were removed from the northeast corner of the area surveyed. Munitions related items were recovered from a depth of 3 to 5 ft bgs.
- 83,873 adapter boosters were found throughout the Building 118 area, the majority of which were discovered in the vicinity of those found during the 1963 Letterkenny removal. Boosters were found within tree roots, agglomerated in a tar like substance, and embedded in concrete-encased utility lines and driveways. Where found in tree stumps/roots, the tree was removed and the roots and stump swept with a magnetometer until clear. Concrete that contained MEC was removed and discarded appropriately.
- One empty MKII hand grenade (unfuzed) was found in an area north of Building 118.

Area 17 was also surveyed with a magnetometer; however, the number of anomalies detected was too large to individually investigate (7,654 “hits”). Five 6 x 6 x 3 ft deep exploratory digs were excavated to investigate anomaly areas; no MEC was recovered, and only a single piece of MD (60mm mortar fins) was found.

During the investigation of Area 17 area, an empty hand grenade was reportedly found in a tree stump near the tennis courts on the MCC campus. Field teams conducted a surface sweep and magnetometer survey of the area and intrusively investigated the majority of anomalies found. No MEC or MD was recovered (**Appendix B-2**).

5.5 1992 - MILITARY ORDNANCE CLEANUP ACTIVITIES AT THE FORMER RARITAN ARSENAL (GAO, 1992)

The U.S. General Accounting Office (GAO) reviewed and reported on the status of ordnance cleanup activities at the former Arsenal as of 1992. The report summarized the previously completed work at the Arsenal, as discussed in prior sections, and noted that the USACE reported that the adapter boosters found were not fuzed, and thus “relatively stable.”

5.6 1993 - ARCHIVAL SEARCH REPORT, FORMER RARITAN ARSENAL, EDISON, NEW JERSEY (DAMES & MOORE, 1993)

Dames & Moore conducted an additional archives search in 1993 to identify historical land uses and locate potential ordnance or explosive waste disposal areas. In addition to researching historical documents and conducting interviews, the 1993 ASR included an analysis of historical maps, site plans, and historical and contemporary aerial imagery to track changes in site use over time.

The 1993 ASR confirmed the findings of the previous 1991 ASR and subsequent investigations (previously discussed here) for Area 17, Building 118, and the southwest corner Parking Lots 2 and 1A. A review of historical aerial imagery revealed a distinct pit and burning area in Area 17A, confirming previous reports. Dames & Moore noted that no known ordnance clearance activities had been conducted at Area 17A except for avoidance clearing during the 1992 HTRW soil investigation.

5.7 1993 - GEOPHYSICAL MAPPING AND SAMPLING OF AREAS 2, 3, 4, 6, 8, 9, 10, 11, 13, 14, 15, 16, 16A, 18B, 18C, 19, AND MCC AT THE FORMER RARITAN ARSENAL, EDISON, NEW JERSEY (EODT, 1993)

EODT conducted geophysical mapping and sampling activities at numerous areas of interest at the former Raritan Arsenal in 1993 to identify and record the location of anomalies. A survey of the MCC Area was conducted during this investigation using magnetometer coupled with Ultrasonic Ranging and Data Acquisition System Survey (USRADS®) data logger technology. Seventeen plots, equaling 73.87 acres, were chosen for geophysical survey by magnetometer. Specifically, the Building 118 and Area 17A areas were surveyed, as depicted on **Figure 5-1**. All anomalies discovered were reviewed by a committee to determine whether intrusive investigation was warranted. Committee members included MCC representatives, EODT Senior Site Supervisor, USRADS® Supervisor, and a USACE- Huntsville Division Site Safety Representative. In total, 12 anomalies were selected for investigation. No MEC was recovered. Survey maps are presented as supporting documents in **Appendix B-3**.

5.8 2000 - DRAFT FINAL ENGINEERING EVALUATION/COST ANALYSIS – FORMER RARITAN ARSENAL (FOSTER WHEELER ENVIRONMENTAL CORPORATION, 2000)

Foster Wheeler Environmental Corporation (Foster Wheeler) was contracted to perform an Engineering Evaluation/Cost Analysis (EE/CA) for ordnance removal actions at the former Raritan Arsenal. The purpose was to evaluate potential ordnance removal alternatives, select appropriate response actions, and document the decision-making process in selecting non-time-critical removal actions. Specifically, the EE/CA:

- Evaluated MEC removal actions to date;
- Compiled and summarized the data for MEC investigations and removal actions accomplished to date at the former Arsenal; and
- Developed, evaluated, compared, and selected final Ordnance and Explosives (OE) corrective action alternatives for ordnance contamination at the former Arsenal in accordance with applicable regulations.

In their description of the MCC Area, Foster Wheeler noted the following for each area (**see Appendix B-4**):

Area 17: ordnance avoidance activities were conducted during HTRW investigation activities in 1996. During this survey, the location of one soil boring was relocated due to the detection of a magnetic anomaly in the southeast corner of Area 17. The anomaly was not investigated.

Area 17A: an inert practice bomb was found in Area 17A by Dames & Moore at the bottom of an HTRW excavation conducted in 1993. The practice bomb was found at a depth greater than 20 ft bgs.

Building 118: ordnance avoidance activities were conducted during HTRW investigation activities in 1996. The locations of three soil borings were relocated due to the detection of magnetic anomalies near Building 118. The anomalies were not investigated.

Remainder of MCC (Area W): seven test pits/trenches were excavated to 10 ft bgs during an HTRW investigation in 1996. Numerous 5-, 10-, and 55-gallon drums were encountered during excavation. No MEC was reported. Additional ordnance avoidance activities were conducted in other areas of Area W. Three soil borings were relocated due to the detection of magnetic anomalies. The anomalies were not investigated at the time.

The risk of MEC exposure was qualitatively assessed for each area based on limited results of a quantitative assessment (using the Ordnance and Explosives Cost-Effectiveness Risk Tool) and a review of the site history, previous MEC discoveries, and current and future land uses. Risk was rated from “Low” to “High.” The risk of exposure to MEC for Areas 17, 17A, and the Remainder of the MCC was classified as Low due to the extent of previous investigations. For the Building 118 area, the risk of MEC exposure was classified as Low for the current land use. This rating was based on the completed clearance activities and the presence of the existing building. The risk of exposure to MEC for future land uses at Building 118 was classified by Foster Wheeler as High due to the potential for remaining subsurface MEC in currently inaccessible areas (i.e., beneath Building 118). However, review of Building 118 MEC removal reports (presented in **Section 5.4.1**) in combination with personnel interviews (presented in **Section 5.11**) indicate that there is no credible evidence of MEC remaining in this area.

The EE/CA evaluated the following remedial alternatives for Areas 17, 17A, Building 118, and the remainder of the MCC: No Further Action, Notification and Access Restriction, and Institutional Control/Notification. It was recommended that Institutional Control/Notification be implemented across the entire former Arsenal, including all areas of MCC. This alternative was to be implemented by the Township through the construction or building permit process. Permit application packages for work in affected areas would include a MEC information package.

5.9 2014 - REMEDIAL INVESTIGATIONS AND REMEDIAL ACTIONS SUMMARY REPORT FOR MIDDLESEX COUNTY COLLEGE PROPERTY (AVATAR ENVIRONMENTAL, 2014)

Avatar conducted an RI for HTRW contamination of soil in the MCC Area in 2014 that included a review of all previously completed investigations and removal actions for both HTRW and MEC. The findings of the previously discussed investigations were reiterated in the report; however, new information regarding removal actions for affected soil in several MCC Areas was also discussed. A brief summary of those removal actions follows. The locations of all removal areas are presented on **Figure 5-1**.

The HTRW RI investigation revealed that an interim response action for soil contamination was conducted at Area 17/17A between 1994 and 1995 by Weston Solutions, Inc. (Weston, 1996) based on the results of previous HTRW investigations. The response action included the excavation of 17,500 cubic yards of soil, at various depths over approximately 3 acres including from the baseball field (Area 17A) and tennis court areas of the MCC campus (**Figure 5-1**). The excavation was backfilled with clean soil from the excavation to within 2 ft of ground surface; clean fill was used to bring the excavation to surface grade. A smaller excavation was completed at Raritan Hall, located east of Building 118, to remove a 1,000-gallon UST and potentially contaminated soil. The completed excavation removed 35 cubic yards of soil to a depth of 9.5 ft. No MEC was reported to have been found in the UST removal area.

Avatar reported that an area of soil contamination was found between the eastern edge of Area W and the baseball field in 1994 during a Supplemental Investigation. During this investigation, a large area of anomalies was found around Boring #17112. Seven test pits were subsequently excavated in a second Supplemental Investigation to investigate the source of these anomalies and soil contamination. Evidence of buried drums, debris, and stained soil was found in the test pits. These findings resulted in an Interim Response Action conducted in 1998 to address subsurface contamination in the location associated with Area W. Numerous liquid and solid material filled drums were removed from the excavation along with 1,400 cubic yards of stained soil. A ground-penetrating radar (GPR) survey was conducted to identify additional areas of buried drums. An additional 606 cubic yards of affected material was removed from the area along with all stained soil observed above the perched water table (15 ft bgs). No MEC was recovered from the excavated areas. **Figure 5-1** presents the extent of removal.

5.10 DISCOVERY OF SUSPECTED MUNITIONS IN OTHER MCC AREAS

MEC has also been found on the MCC campus in limited instances, not in association with any current published reports. The following summarizes the most recently recorded instances.

On 19 June 2012, an MCC private contractor installing light pole base trenching in the southwest corner of Parking Lot 2 unearthed two landmines and one 3-ft-long shell. Explosive Ordnance Disposal MU 12 Detachment Earle removed the items and identified them as inert.

On 23 April 2015, Avatar was notified by the USACE that a World War II AN-M43 500 lb general purpose bomb was discovered during the construction of a new Student Services building in the southwest corner of the MCC Ecological Park. The item was reportedly 12 inches in diameter with an 8-inch diameter nose. An EOD unit from Joint Base McGuire Dix Lakehurst (JB-MDL) responded to the site and identified the item as an AN-M43 500 lb bomb that was not fuzed or filled with high explosives (confirmed MD). The item was subsequently transported to JB-MDL for final disposition.

5.11 2016 INTERVIEWS

5.11.1 Roger Fitzpatrick, Ordnance and Explosives Representative with USACE Huntsville

AECOM and Avatar conducted an interview with Mr. Roger Fitzpatrick on 10 February 2016. Mr. Fitzpatrick's involvement at the former Arsenal began in 1992. At that time, Mr. Fitzpatrick was with the OE Directorate at Huntsville USACE and served as the USACE OE representative stationed at Raritan until April 2003.

A previous version of **Figure 5-1** and table summarizing prior munitions investigations and removals at the college was given to Mr. Fitzpatrick for review before the interview. When asked about the accuracy of the locations of MEC found at MCC presented on the figure, he confirmed that the figure was correct and that he had no recollection of other munitions having been found on the campus.

Project team members had heard of adapter boosters having been found in the roots of trees during a prior removal action at Building 118. Mr. Fitzpatrick responded that a former colleague knew of one large oak tree that had adapter boosters in its roots (project team members attempted to contact this former colleague for follow up but were unsuccessful). MCC had reportedly requested that the tree be preserved; since removal of the adapter boosters would have compromised the health of the tree. The decision was made to leave them in place. Mr. Fitzpatrick recommended that the project team contact Mr. Donald R. Drost of MCC to confirm the status and location of the tree in question (see **Section 5.11.2**). Following this account, the project team thoroughly reviewed the 1992 – Final Report – Former Raritan Arsenal Ordnance Removal Action (IT Corporation, 1992, **Section 5.4**) and the 1992 - UXO Removal After Action Report (EOD Technology, Inc., 1992, **Section 5.4.1**) and confirmed that all trees that contained anomalies within their roots had been removed in their entirety (including roots). No notations regarding trees left in place were found.

Mr. Fitzpatrick noted that there were no other instances where munitions were left in place and that all munitions were removed from the Building 118 excavation. He believed that the boosters found in the vicinity had been collected from material scattered during an explosion that occurred south of the MCC Area and subsequently disposed in the vicinity of Building 118. This explosion was likely the explosion in 1919 of Magazine Building E-31 located in Area 9 south of MCC, in Thomas A. Edison County Park. The project team noted that historical records indicated that former hospital buildings in the area of Building 118 were demolished between 1929 and 1930, and suggested that disposal may have occurred as part of the demolition before the new hospital building was constructed on October 12, 1931.

5.11.2 Donald R. Drost Jr., Executive Director of Facilities Management at MCC

AECOM and Avatar conducted an interview with the Executive Director of Facilities Management, Donald R. Drost Jr. on 26 February 2016. Mr. Drost has worked at the college since 1988 and has first-hand knowledge of the past activities and investigations conducted on the campus.

A figure, similar to **Figure 5-1**, and table summarizing prior munitions investigations and removals at the college was given to Mr. Drost before the interview for review. When asked about the accuracy of the locations of MEC found at MCC presented on the figure, he confirmed that the figure was correct with the exception of the 100 to 200 detonators found in 1989 outside of Main Hall. The detonators were likely found in Parking Lot 5 because the Main Hall was built in 1966. A corrected version of this figure is presented herein as **Figure 5-1**.

Mr. Drost stated during the interview that all munitions found at MCC, including those found embedded in tree roots, were removed. He further stated that at one time the USACE conducted a GPR survey of the MCC campus that excluded parking and wooded areas. Recent MEC finds were in those areas that were excluded from the survey. He noted that past construction of the Science Building (located west of the Main Hall building) did not have any instances of MEC being encountered.

It was noted that the location of the historical building in the southwest corner of the Ecological Park was likely incorrect. Mr. Drost referred the AECOM and Avatar personnel to reference historical aerial imagery from 1954. A different building was previously located in this area. This is the location of the recent discovery of a 500 lb empty shell during construction of a new building (see **Section 5.10**). Mr. Drost noted that large shells were often used at the Arsenal as driveway ornaments with building numbers and that a driveway was formerly located in that area.

Mr. Drost stated that the college and their contractors have a strong history of successfully adopting the 3Rs (Recognize, Retreat, Report). Currently if a contractor finds a possible munition item, they notify the MCC and the MCC contacts the EOD unit for support. Previously the local police were notified; however it was found that local police were not equipped for such responses (they were not familiar with the EOD contact information). Subsequently, college personnel and contractors now call the MCC Police Department (the college has its own fully certified police department) who in turn notifies the EOD unit (Fort Dix or Earle) for support.

Figure 5-1 presents the location and extent of all known historical buildings, previously completed investigations, munitions finds, and response actions.

6.0 MEC EVALUATION

The following section presents the evaluation of potential MEC at MCC.

6.1 MEC SOURCE

The primary source of potential contamination at MCC is MEC resulting from DMM at several areas of interest: Area 17 (former salvage yard), Area 17A (former burning grounds for expended small arms munitions) and Building 118 (former hospital building). In addition, some anomalous munitions finds (e.g., munitions debris) have been identified at MCC. These munitions debris items and the primary MEC sources are all noted in **Figure 5-1**; and, such items have been removed. Further, historically, the MCC Area was used as a cantonment area for the former Raritan Arsenal and did not have a use directly associated with munitions. No MEC would result from expended small arms decommissioning by non-explosive means conducted in Area 17A. DMM may have resulted from different types of disposal activities at Area 17 which was used as a salvage yard for personal property between the 1940s and early 1960s. The area directly behind Building 118 was used as a disposal site by burying the MEC, possibly recovered from the 1919 explosion of Magazine Building E-31 in Area 10, south of MCC in Thomas A. Edison County Park.

Numerous geophysical investigations covering large areas of MCC and interim removal actions for HTRW-contaminated soil have been conducted across the area. The area-specific findings presented in detail in **Section 5.0** are summarized below and on **Figure 5-1**.

- Area 17 was a former salvage and property disposal yard. A magnetometer survey was conducted in 1991-1992, including five test pits (6 x 6 x 3 ft deep). A single piece of MD was recovered but no MEC was discovered.
- Area 17A was a former burning ground reportedly used for the destruction of expended small arms ammunition by non-explosive means in the 1950s. In the mid to late 1990s, HTRW soil removal actions in this and adjacent MCC areas covered a combined area of approximately 3 acres. A single piece of MD was recovered (at a depth greater than 20 ft bgs) but no MEC was discovered.
- Building 118 was historically used as a hospital and is now an administration building for the college. Two magnetometer surveys and several MEC removal actions were performed at this site to remove buried adapter boosters. The removal action is complete. Subsequent intrusive investigation extended vertically until reaching native soil, with no evidence of MEC remaining on site.
- In 1993, a magnetometer survey with USRADS® data logging was performed on the remaining landscaped areas of the college which surrounded Building 118 and Area 17A, selected anomalies were investigated. No MEC was recovered.
- Based on the 1993 ASR and available reports, there is no evidence to support disposal areas exist in the remaining undeveloped areas of the MCC property including wooded areas, and Areas H, W, and X.
- No confirmed MEC has been reported at MCC during site re-development activities since the 1991-1992 removal action at Building 118.

6.2 MEC INTERACTION

Primary factors affecting risk associated with interaction between MEC and receptors include:

- **MEC Contact Potential.** Based on depth, site stability (e.g., erosion), and receptor activity.
- **Potential Energy Application Causing MEC to Function.** Examples include manual (picking up, moving an item either accidentally or purposefully, striking with a shovel), mechanical (striking with a dozer blade, backhoe bucket, vehicle movement on the surface), and/or no force.
- **MEC Sensitivity and Potential Severity.** Based on type of MEC and classification of energetic materials used in the item.

MEC sensitivity and potential severity is related to the specific type of MEC. Since the Building 118 removal, no reports of MEC were noted during site development or geophysical investigation at MCC.

6.3 UNCERTAINTY

While previous MEC investigations/removal action beginning as early as 1963 have been conducted at MCC under USACE contract supervision and applicable quality standards, some factors contribute to the uncertainty of the MCC RI findings. Uncertainty exists with respect to historical investigation and removal methods and associated documentation, including ordnance detection technologies (analog, GPR, magnetometer with USRADS®, etc.), potentially uninvestigated anomalies, varied depths of detection, limited depths of investigation and possible inconsistent results. However, despite these uncertainties, the weight-of-evidence approach provides overall confidence in the RI conclusions.

7.0 MEC RISK MANAGEMENT METHODOLOGY AND REVISED CONCEPTUAL SITE MODEL

Results of evaluations of the MCC Area using the MEC RMM (USACE, 2017) and the revised CSM are presented below. For completeness the Munitions Response Site Prioritization Protocol (MRSPP) scoring worksheets for MEC at the MCC are presented in **Appendix C**.

7.1 MEC RISK MANAGEMENT METHODOLOGY

In accordance with *Trial Period for Risk Management Methodology at FUDS MMRP Projects* (USACE, 2017), a risk assessment was performed to evaluate if there are acceptable or unacceptable human health risks due to potential MEC presence at the MCC Area. The risk assessment was performed to satisfy the requirements of 40 CFR Section 300.175(d)(4).

The MEC RMM was applied to differentiate acceptable versus unacceptable site conditions. Using the site-specific CSM data summarized in **Section 6**, the risk assessment evaluated the likelihood of encounter, severity of encounter, and likelihood of detonation. This information was used to support the acceptable/unacceptable risk determination for a site. The risk assessment consists of four matrices:

- Matrix 1: Evaluates the likelihood of an MEC encounter based on access conditions and the amount of MEC;
- Matrix 2: Evaluates the severity of an incident based on the likelihood of encounter (determined in Matrix 1) and severity associated with unintentional detonation of the MEC items at the Site;
- Matrix 3: Evaluates the likelihood of detonation based on MEC sensitivity and the likelihood to impart energy on an item; and
- Matrix 4: Identifies acceptable or unacceptable site conditions, based on the results from Matrix 2 and 3.

The MEC RMM considered site-specific current or reasonably anticipated future land use scenarios.

7.1.1 Likelihood of Encounter

Matrix 1, the likelihood of an MEC encounter (see **Table 7-1**), is based on the access conditions and amount of MEC present.

Table 7-1: Matrix 1 - Likelihood of Encounter

| Likelihood of Encounter, Matrix 1: Amount of MEC vs Access Conditions | | Access Conditions | | | |
|---|---|---|---|---|--|
| | | <i>Regular</i> (e.g., daily use, open access) | <i>Often</i> (e.g., less regular or periodic use, some access) | <i>Intermittent</i> (e.g., some irregular use or access limited) | <i>Rare</i> (e.g., very limited use, access prevented) |
| Amount of MEC | <ul style="list-style-type: none"> MEC is visible on the surface and detected in the subsurface | Frequent | Frequent | Likely | Occasional |
| | <ul style="list-style-type: none"> The area is identified as a Concentrated Munitions Use Area (CMUA) where MEC is known or suspected to be present in surface and subsurface | Frequent | Likely | Occasional | Seldom |
| | <ul style="list-style-type: none"> MEC presence based on physical evidence (e.g., MD indicative of MEC) although the area is not a CMUA or MEC concentration is below a project-specific threshold to support this selection (e.g., less than 1.0/acre at 95% confidence) | Likely | Occasional | Seldom | Unlikely |
| | <ul style="list-style-type: none"> MEC presence is based on isolated historical discoveries (e.g., EOD report) prior to investigation or A DERP response action has been conducted to physically remove MEC and known or suspected hazard remains to support this selection (e.g., surface removal where subsurface not addressed) or The MEC concentration is below a project specific threshold to support this selection (e.g., less than 0.5/acre at 95% confidence) | Occasional | Seldom | Unlikely | Unlikely |
| | <ul style="list-style-type: none"> MEC presence is suspected based on historical evidence of munitions use only, or A DERP response action has been conducted to physically remove surface and subsurface MEC (evidence that some residual hazard remains to support this selection), or The MEC concentration is below a project specific threshold to support this selection (e.g., less than 0.25/acre at 95% confidence) | Seldom | Seldom | Unlikely | Unlikely |
| | <ul style="list-style-type: none"> Investigation of the MRS does not identify evidence of MEC presence, or A DERP response has been conducted that will achieve UU/UE | <u>UNLIKELY</u> | Unlikely | Unlikely | Unlikely |
| | | | | | |

Access Conditions: Access conditions are selected based on considerations of the access and frequency of use for the MRS. The current land use of the MCC Area consists of a mix of institutional (college) with associated residential and recreational uses. Future land use is anticipated to remain similar. No known access restrictions (fencing, signage, etc.) are in place at the MCC Area. Based on current and anticipated future land use and access conditions, the risk assessment assumed “Regular” access (e.g., daily use, open access).

Amount of MEC: The unlikely presence of MEC was determined using RI characterization data. As discussed in **Section 5**, numerous investigations and removal actions have been performed to support this finding. Therefore, the likelihood of encountering MEC is determined to be “Unlikely.”

7.1.2 Severity of Incident

Matrix 2, the severity of an unintentional MEC detonation (see **Table 7-2**), is based on the likelihood of encounter (discussed above) and the severity associated with specific munitions items.

Severity Associated with Specific Munitions Items: Areas of concern were fully investigated by final completed removal actions and documented by After Action Reports. Anomalous finds of MD have been identified (**Figure 5-1**) but no additional sources of MEC (i.e., munitions burial sites) have been found at the MCC over several decades despite redevelopment construction activities and large HTRW soil removals; therefore, a severity of “Improbable” was selected.

Based on the “Unlikely” finding for Matrix 1 (Likelihood of Encounter) and the selection of “Improbable” for the severity of specific munitions items at the MCC Area, the Matrix 2 Severity of Incident finding is “D.”

Table 7-2: Matrix 2 – Severity of Incident

| Severity of Explosive Incident Matrix 2: Severity vs Likelihood of Encounter | | Likelihood of Encounter | | | | |
|--|---|-------------------------|--------|------------|--------|----------|
| | | Frequent | Likely | Occasional | Seldom | Unlikely |
| Severity associated with specific MEC items | Catastrophic/Critical: may result in 1 or more deaths, permanent total or partial disability of hospitalization | A | A | B | B | D |
| | Modest: may result in 1 or more injury resulting in emergency medical treatment, without hospitalization | B | B | B | C | D |
| | Minor: may result in 1 or more injuries requiring first aid or medical treatment | B | C | C | C | D |
| | Improbable: no injury anticipated | D | D | D | D | <u>D</u> |

7.1.3 Likelihood of Detonation

Matrix 3, the likelihood detonation (see **Table 7-3**), is based on the sensitivity of munitions items and the likelihood for energy to be imparted on an item.

Sensitivity: Areas of concern were fully investigated by final completed removal actions and documented by After Action Reports. Anomalous finds of MD have been identified (**Figure 5-1**) but no additional sources of MEC (i.e., munitions burial sites) have been found at the MCC over several decades despite redevelopment construction activities and large HTRW soil removals; therefore the selected sensitivity of MEC was “Not Sensitive.”

Likelihood to Impart Energy: This factor takes into consideration the known activities at the site that may cause an interaction that result in energy being imparted on a munitions item by human activity. Based on the probability of continued site development, the selected likelihood to impart energy on a munitions item was “High.”

Based on the Sensitivity and Likelihood to Impart Energy factors, the Matrix 3 Likelihood of Detonation finding is “2”.

Table 7-3: Matrix 3 – Likelihood of Detonation

| Likelihood of Detonation, Matrix 3: Munitions Sensitivity vs Likelihood of Energy to be imparted | | Likelihood to Impart Energy on an Item | | |
|--|--|--|---|---|
| | | High (e.g., areas planned for development or seasonally tilled) | Modest (e.g., undeveloped wildlife refuge, parks) | Inconsequential (e.g., not anticipated, prevented, mitigated) |
| Sensitivity: Susceptibility to Detonation | High (e.g., classified as sensitive) | 1 | 1 | 3 |
| | Moderate (e.g., HE or pyrotechnics) | 1 | 2 | 3 |
| | Low (e.g., propellant or bulk secondary explosives) | 1 | 3 | 3 |
| | Not sensitive | <u>2</u> | 3 | 3 |

7.1.4 Acceptable and Unacceptable Site Conditions

Matrix 4 (see **Table 7-4**) provides the overall risk for the site and differentiates “Acceptable” from “Unacceptable” conditions. The results from Matrix 2 and Matrix 3 are used to determine acceptable or unacceptable site conditions.

Table 7-4: Matrix 4 – Acceptable and Unacceptable Site Conditions

| Acceptable and Unacceptable Site Conditions, Matrix 4 | | Results from Matrix 2 | | | |
|---|---|-----------------------|--------------|--------------|-------------------|
| | | A | B | C | D |
| Result from Matrix 3 | 1 | Unacceptable | Unacceptable | Unacceptable | Acceptable |
| | 2 | Unacceptable | Unacceptable | Acceptable | <u>Acceptable</u> |
| | 3 | Unacceptable | Acceptable | Acceptable | Acceptable |

Based on findings for Matrix 2 of “D” and Matrix 3 of “2”, MCC Area site conditions were determined “Acceptable.”

7.2 RISK ASSESSMENT FINDINGS

As summarized in **Table 7-5**, the human health risk due to the possible presence of MEC for the MCC Area is determined to be “Acceptable,” therefore, no FS is required.

Table 7-5: Summary of Risk Management Matrices

| Risk Management Methodology | MCC Area |
|-----------------------------|------------|
| Matrix 1 | Unlikely |
| Matrix 2 | D |
| Matrix 3 | 2 |
| Matrix 4 | D-2 |
| Risk Determination | Acceptable |

These findings are summarized in the New Risk Management Methodology Feedback Form included in **Appendix D**.

7.3 REVISED CONCEPTUAL SITE MODEL

Based on the RI findings, the revised CSM is summarized below.

7.3.1 Nature and Extent of MEC (MEC Source)

Based on the wide coverage of the previous investigations, removal actions, and subsequent dense development of the area, the probability for MEC to remain at the surface or within the subsurface of the MCC is unlikely.

7.3.2 Media of Concern (MEC Interaction)

Based on the weight-of-evidence approach, it is unlikely MEC remain at MCC. Therefore, there is no media of concern for this MRS.

7.3.3 Potential Receptors

Land use throughout MCC is not anticipated to change in the future. As such receptors are considered the same for both current and future land uses and include the following:

- MCC students, employees and visitors – may be exposed to potential surface MEC
- Construction/Maintenance Workers – may be exposed to potential surface and subsurface MEC during construction activities or during routine facility maintenance such as groundskeeping.

Since a remaining source of MEC is absent, all exposure pathways between MEC and current and future receptors is incomplete. **Figure 7-1** presents the revised CSM for MEC at the MCC.

8.0 SUMMARY AND CONCLUSIONS

The RI focused on the MCC Area located in the northwestern corner of the former Raritan Arsenal. The MCC Area contains the following areas of interest: Areas 17, 17A, H, W, and X, and Building 118. MCC was used by the former Arsenal as a cantonment area, and MEC has been removed from within the MCC Area.

8.1 MEC INVESTIGATION SUMMARY

The MCC Area has undergone many MEC investigations, MEC removal actions, and environmental investigations dating from 1963 to 2014. A review of historical documents revealed that several areas on the MCC campus were used as disposal sites for DMM. The combined effort of all past activity at MCC has sufficiently investigated and eliminated the potential for exposure to MEC such that no unacceptable residual risk remains. Historical data suggest that MEC has been removed from the area, and there is no longer an explosive risk at the MCC. As such, an MEC Hazard Assessment is not required.

8.2 CONCLUSIONS

In summary, several investigations and removal actions have been conducted to find and remove known and suspected MEC at the MCC.

The following evidence indicated that there is no unacceptable risk of exposure to MEC for both current and future receptors:

- Confirmed MEC has not been identified on the MCC property since 1992.
- The MCC is a former cantonment area and as such munitions use would not be expected.
- Many HTRW-related soil removal actions have been completed and no MEC was identified.
- MEC-related removal actions were completed (e.g., over 80,000 adapter boosters at Building 118, detonators adjacent to Main Hall, and other isolated items limited to munitions debris).
- Following completion of the Building 118 removal, the area was subdivided and each area was intrusively investigated horizontally and vertically until no more MEC was found and native soil was reached.
- Numerous geophysical investigations covering large areas of MCC have not identified MEC.
- Dense development (requiring intrusive activities) of the MCC campus have revealed no additional sources of MEC since the 1991-1992 removal action at Building 118.
- The RMM, used to evaluate risk associated with MEC, found acceptable risk under current and anticipated future site conditions.

Based on these findings, it is proposed that the 169-acre MCC Area be delineated from FUDS Project/MRS C02NJ008403 into a separate MRS (**Figure 8-1**) (project number to be determined), with a recommendation for No Action for MEC.

Because of these findings, a Feasibility Study for the MCC Area is not warranted and no further investigations or removal actions are necessary at this time. A future and separate Proposed Plan and Decision Document will be prepared to support the No Action remedy.

This page intentionally left blank.

9.0 REFERENCES

- Avatar Environmental (Avatar). 2014. *Remedial Investigations and Remedial Actions Summary Report, Middlesex County College Property (Area 17/17A, Building 118, Areas H, X, and W, and High Traffic Areas) Former Raritan Arsenal*. June 2014.
- Avatar. 2018. *Final Remedial Investigation Addendum, Area W, Middlesex County College Property, Former Raritan Arsenal*. October 2018.
- Dames & Moore, Inc. 1993. *Draft Archival Search Report, Former Raritan Arsenal, Edison, New Jersey*. Volume 1, Sections 1-13, Volume 2, Appendix A-K.
- Department of Defense. 2007. *Munitions Response Site Prioritization Protocol Primer*.
- EOD Technology, Inc. (EODT). 1992. *UXO Removal After-Action Report, UXO Remediation Support Services, Former Raritan Arsenal, Edison, New Jersey*. May 1992.
- EODT. 1993. *Final Report for the Geophysical Mapping and Sampling of Areas 2, 3, 4, 6, 8, 9, 10, 11, 13, 14, 15, 16, 16A, 18B, 18C, 18D, 19, and MCC at the Former Raritan Arsenal, Volumes I, II, and III*. November 1993.
- EPA (U.S. Environmental Protection Agency). 1988. *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA*. EPA/540/G-89/004. October 1988.
- EPA. 2006. *Guidance on Systematic Planning Using the Data Quality Objectives Process, EPA QA/G-4*. 2006.
- Foster Wheeler Environmental Corporation. 2000. *Draft Final Engineering Evaluation/ Cost Analysis, Former Raritan Arsenal*. Contract No. DACA 87-94-D-0020. Delivery Order 0002. April 2000.
- International Technology Corporation (IT). 1992. *Final Report, Former Raritan Arsenal, Edison New Jersey*. Contract No. DACA87-91-D-0009, Delivery Order No. 0001, 0002, 0003, 0006 PROJECT NOS. 305776, 305777, 305778, 305788. Prepared for U.S. Army Corps of Engineers, Huntsville Division.
- Letterkenny Army Depot (LEAD) Report. 1963. Letter from Hugh K. Warren, Ch, Amm. Surv. Div., to: Commanding Officer. Subject: *Decontamination of the Ammunition Area at Raritan Arsenal*, 21 October 1963.
- Metcalf and Eddy, Inc. 1991. *Archives Search Report for Middlesex County College and Thomas Edison Park, Former Raritan Arsenal, Edison, New Jersey*, 1 Volume.
- O'Brien and Gere Engineers, Inc. 1989. *Final Engineering Report, Former Raritan Arsenal, Contamination Evaluation, Edison, New Jersey*. Project No. C02NJ008400, Contract No. DACW41-87-D-0153. 4 Volumes.
- Roy F. Weston, Inc. 1996. *Final Site-Wide Hydrogeology Report, Former Raritan Arsenal, Phase 2 Remedial Investigation*. June.
- U.S. Army. 2009. *Munitions Response Remedial Investigation/Feasibility Study Guidance*. Military Munitions Response Program. November 2009.
- U.S. General Accounting Office (GAO). 1992. *Military Ordnance Cleanup Activities at the Former Raritan Arsenal*. August 1992.

- USACE. 2004. Engineer Regulation (ER) 200-3-1, *Environmental Quality FORMERLY USED DEFENSE SITES (FUDS) PROGRAM POLICY*. May 2004.
- USACE, 2011. *Special language for Township of Edison's construction permit Unexploded Ordnance (UXO) construction awareness Former Raritan Arsenal FUDS site*. From Sandra L. Piettro. 21 December 2011.
- USACE, 2014. *Formerly Used Defense Sites Program, USACE Handbook on Delineation and Munitions Response Site Prioritization Protocol Implementation*. March 2014
- USACE, 2017. *Memorandum Trial Period for Risk Management Methodology at FUDS MMRP Projects*. 3 January 2017.
- USACE, 2019. *Memorandum: Trial Period Extension for Risk Management Methodology at FUDS MMRP Projects*. 7 February 2019.
- USACE, 2020a. *Risk Management Method Information Paper*. 8 January 2020.
- USACE, 2020b. *Memorandum: Trial Period Extension for Risk Management Methodology at FUDS MMRP Projects*. 18 March 2020.
- Weston Solutions, Inc. (Weston). 1996. *Final Remedial Action Report, Area 17 Remedial Construction*. Contract No. DACA-41-92-D-8002. Delivery Order 0009. February 1996.
- Weston. 2002. *Final Remedial Action Report, Remedial Construction – Areas 11, 12, 18A, 18C, and W*. Contract No. DACA-41-92-D-8002. Delivery Order 0014. March 2002.
- Weston. 2004. *Final Screening Level Ecological Risk Assessment (SLERA)*. March 2004.
- Weston. 2007. *Revised Draft Management Action Plan for the Former Raritan Arsenal, Edison, NJ*. January 2007.
- Weston. 2008. *Baseline Ecological Risk Assessment Report, Former Raritan Arsenal, Edison, New Jersey*. March 2008.

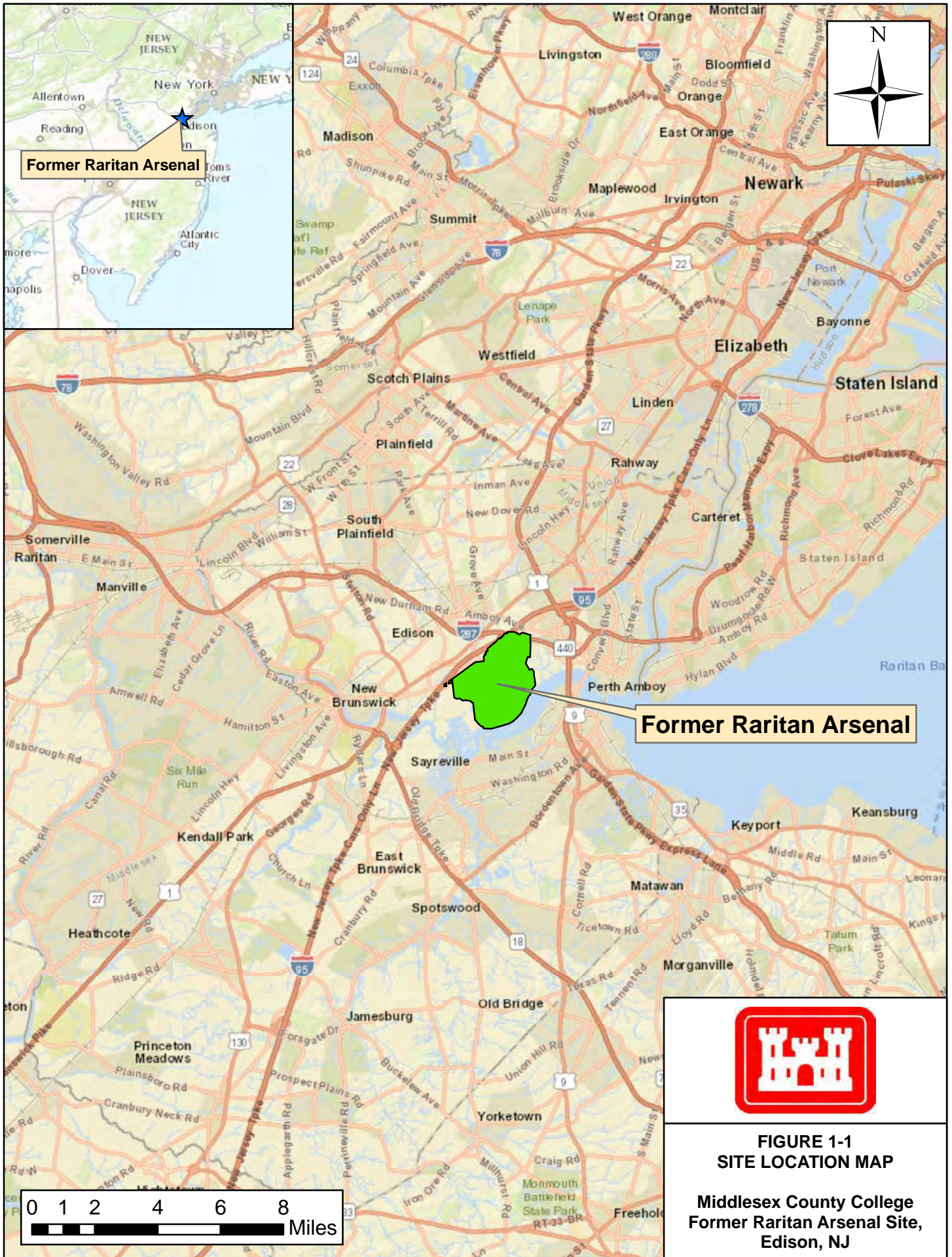
APPENDICES

This page intentionally left blank.

APPENDIX A

Figures

This page intentionally left blank.





Legend

- Boundary from FUDSMIS GIS (3,316 acres)
- Investigation Areas
- Dredge Spoils Area Boundary
- Remedial Investigation Areas**
 - Area 18D, Middlesex Interfaith Partners, & Beechwood Development (104 acres)
 - Commercial / Industrial, & Exclusion Area (1,233 acres)
 - Exclusion Area
 - U.S.EPA/GSA Property (178 acres)
 - Middlesex County College (169 acres)
 - Area 5 (9.75 acres)
 - Areas 6, 6A, 6B & DSA #1 (236 acres)
 - Areas 9 and 19 (350 acres)
 - Area 10 (143 acres)
 - Area 11 & DSA #2 (130 acres)
 - Area 12, OB/OD & DSA #3 (235 acres)
 - Area 13 (23 acres)
 - Areas 16, & 16A (352 acres)
 - DSA #4 & #6 (94 acres)
 - DSA#5 (228 acres)
- Other Areas**
 - Army Reserve Center - Ineligible (9 acres)
 - Capped Area 14 - Ineligible (189 acres)

0 1,500 3,000 Feet

1:20,694

Imagery Source: ESRI ArcGIS Online and data partner USDA FSA, NAIP, 7/7/2013.

FILE: G:\Projects\USACE\Raritan_Arsenal\Raritan_Site_Layout_2016_11x17.mxd
DATE: 11/18/2015 rev 10/4/2016
GIS: MS
CHK: SG
PM: SG



**Former Raritan Arsenal Site
Edison, New Jersey**

**Figure 1-2
SITE LAYOUT**

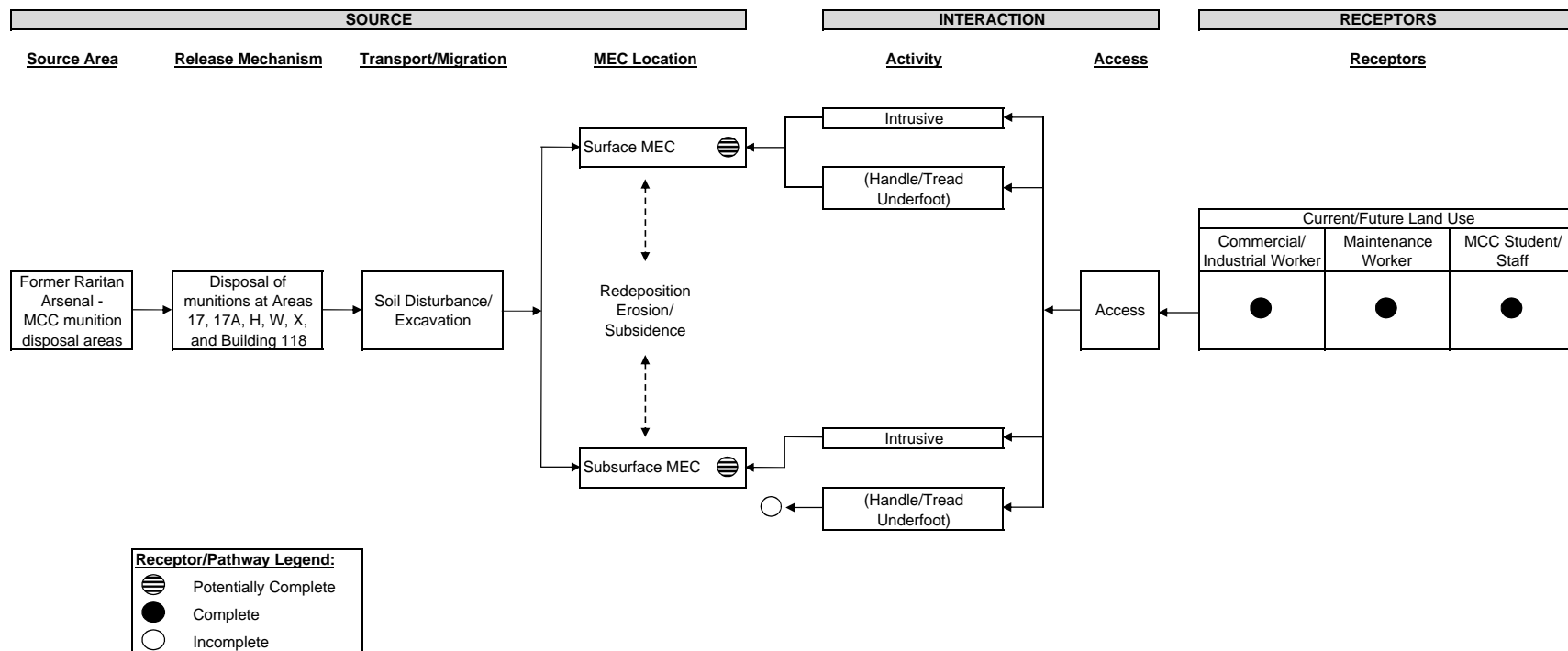
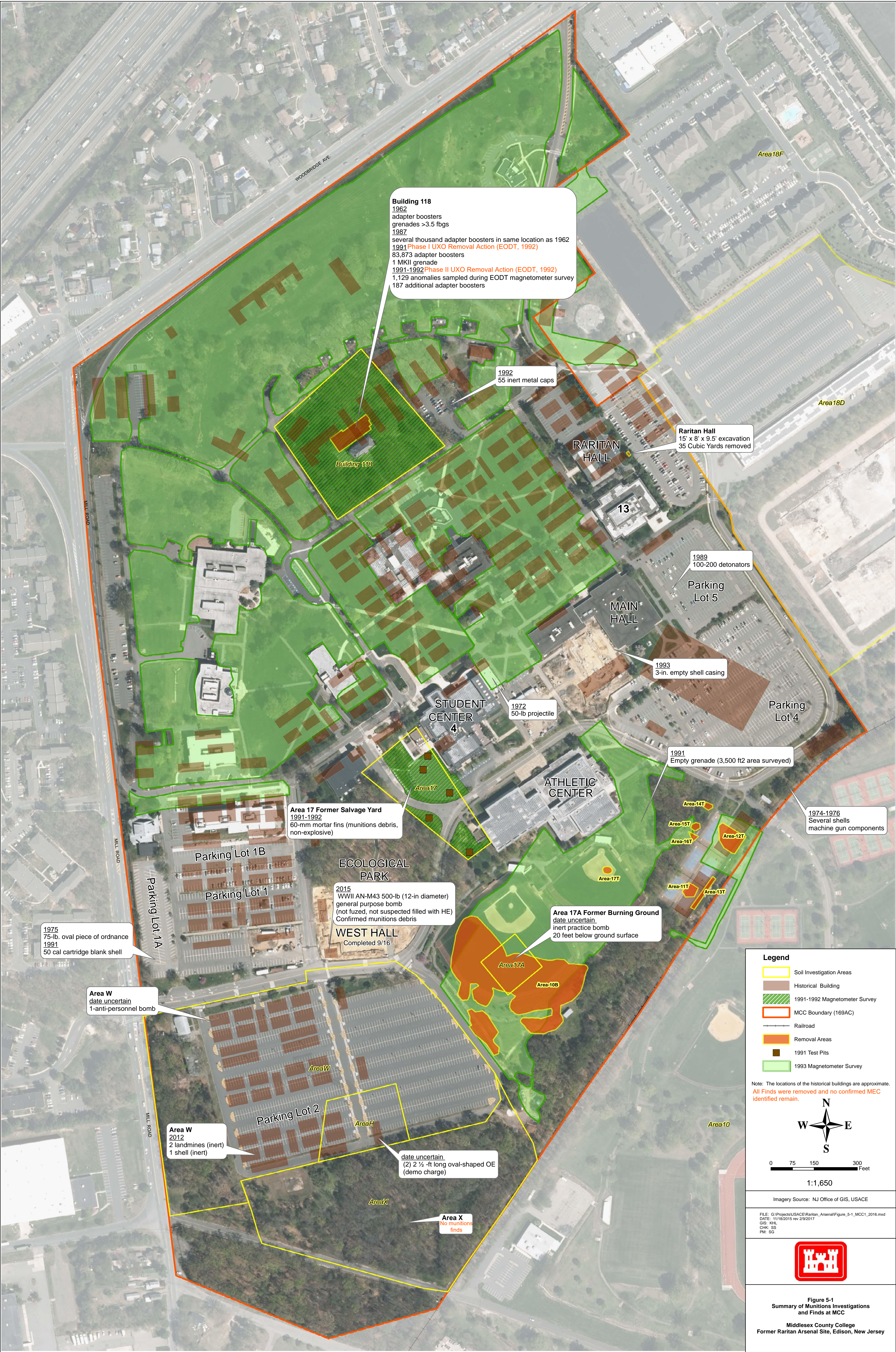


Figure 3-1
Preliminary MEC Conceptual Site Model
 Middlesex Community College MEC Remedial Investigation
 Former Raritan Arsenal, Edison, NJ



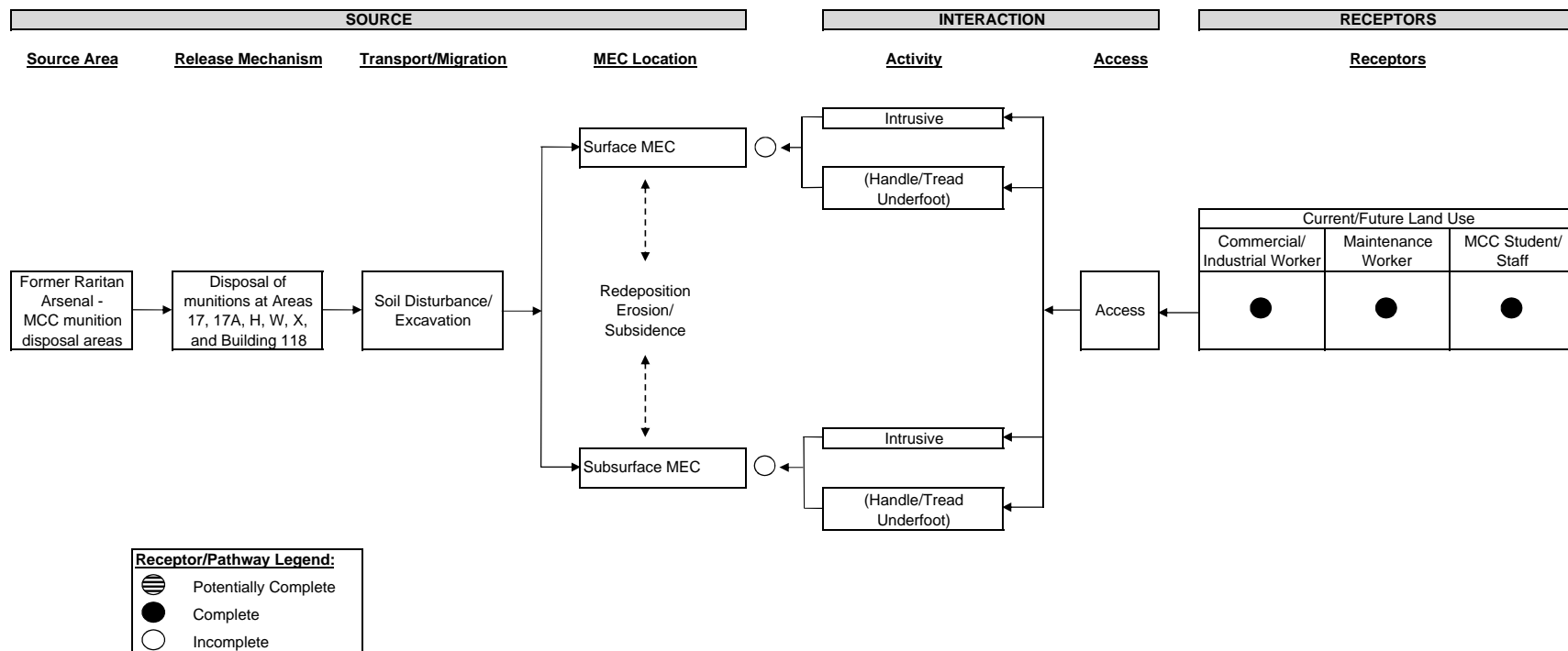


Figure 7-1
Revised MEC Conceptual Site Model
 Middlesex Community College MEC Remedial Investigation
 Former Raritan Arsenal, Edison, NJ



APPENDIX B

Supporting Documents

This page intentionally left blank.

APPENDIX B-1a
December 2011 Letter from New York District
USACE Project Manager

and

APPENDIX B-1b
Edison Township Dig Permit Process Information
Package

This page intentionally left blank.



DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
26 FEDERAL PLAZA, ROOM 1811
NEW YORK, N.Y. 10278-0090
21 December 2011

REPLY TO
ATTENTION OF

Programs and Project Management Division

Mr. Jay P. Elliot, Director of Health and Human Services
Edison Division of Health & Human Services
100 Municipal Boulevard
Edison, NJ 08817

SUBJECT: Special language for Township of Edison's construction permit
Unexploded Ordnance (UXO) construction awareness
Former Raritan Arsenal FUDS site
Edison, Middlesex County, New Jersey

Dear Mr. Elliot,

The New Jersey Department of Environmental Protection (NJDEP) recently raised concerns regarding the recent munitions findings at 30 Clearview Road (Area 15), part of the former Raritan Arsenal Formerly Used Defense Site (FUDS). In an effort to address NJDEP concerns, the US Army Corps of Engineers (responsible for administration and execution of the FUDS program) intends to implement a process of periodic notification to all landowners within the boundary of the former Raritan Arsenal. Following the recent munitions finding at 30 Clearview Avenue, we intend to generate a mass mailing distribution to landowners within the boundaries of the former Raritan Arsenal informing them that the property is located within the boundaries of the former Raritan Arsenal FUDS, and encouraging property owners to consider arranging for unexploded ordnance construction support during any earthmoving, land-clearing or in-water construction.

In response to your request for draft language for possible inclusion in Township of Edison construction permits as appropriate, we offer the enclosed language. In addition, we recommend that the Township implement a process of notification to construction permit applicants, as appropriate. The process of notification upon permit application is a mechanism to ensure awareness of property status by those in need of it without dependence on the individual knowledge or memory. It provides an additional safeguard for those future workmen, owners, and developers who may not have the benefit of familiarity with the local history.

If you have any questions or need additional information, please do not hesitate to contact me at (917) 790-8487.

Sincerely,



Sandra L. Piетро
Project Manager
Former Raritan Arsenal

Encls.

cc: USACE / Ms. Dorothy Richards
USACE / Ms. Betina Johnson
USACE / Ms. Ashley Roeske
USACE / Mr. James Kelly
USACE / Ms. Barbara Hebel
USACE / Mr. Gregory Goepfert
USACE / Mr. Allen Roos
NJDEP / Mr. Anthony Cinque

Construction Permit Application

Special Condition

Site History:

The former Raritan Arsenal (FRA) occupied approximately 3,200 acres and was bounded by Woodbridge Avenue and the Raritan River between Mill Road and Clearview Avenue in Edison, New Jersey. It was about 20 miles southwest of New York City. The arsenal operated from 1917 to 1963. During this time the operations at FRA included the receipt, storage, and maintenance of military munitions shipped from other facilities, or returned from overseas; the renovation of military munitions designated for long term storage; the salvage of outmoded or seriously deteriorated munitions; munitions research and development; and shipment and receipt of chemical weapons. During this period, waste materials, including military munitions (including chemical warfare materiel) were routinely buried in the ground.

Definition of residual unexploded ordnance (UXO) is military munitions that:

- have been primed, fused, armed, or otherwise prepared for action;
- have been fired, dropped, launched, projected or placed in such a manner as to constitute a hazard to operations, installations, personnel, or material; and
- remain unexploded either by malfunction, design, or any other cause.

Prior to its transfer, the Letterkenny Army Depot cleaned the site to the standards acceptable during that time period. Some areas were so contaminated, however, that they were fenced, and it was recommended that their use be restricted. The northern portion of the site is currently occupied by Middlesex County College, Thomas Edison Park, U.S. Environmental Protection Agency, and Raritan Center. The southern portion of the site has not been developed since the arsenal closed. However, it is still important for property owners to be aware of the former Raritan Arsenal military history, as there is still always the possibility of encountering residual unexploded ordnance (UXO) from the site's past. Please refer to the Raritan Arsenal website for more information: www.nan.usace.army.mil/business/buslinks/raritan/index.htm

Requirement: Prior to beginning any earthmoving, land clearing, or in-water construction work authorized by this permit, the permittee shall arrange for Unexploded Ordnance (UXO) construction support.

UXO contractors can be found on www.naoc.org. However, the Government does not recommend, nor guarantee the performance of any particular contractor. UXO Construction support will include the following:

- Presence of a UXO construction support safety specialist on site during any earthmoving, land clearing, or in-water construction work to identify any potential UXO found. (Refer to Engineer Pamphlet 75-1-2, dated August 2004 for personnel qualifications: <http://140.194.76.129/publications/eng-pamphlets/ep75-1-2/toc.htm>)
- UXO construction support will also include UXO awareness safety training of construction site personnel.

Permittee shall provide the name of the UXO support contractor to the Township of Edison's Building Official and Director of Health and Human Services and the US Army Corps of Engineers (USACE). Permittee shall coordinate with USACE with their munitions findings (providing GPS coordinates, photographic evidence, and general description of the munition or munition debris found).

In the event that an object resembling military munitions is discovered during construction activities, do not touch, move or disturb it, but immediately and carefully - do not run - leave the area following the same path on which you entered. UXO construction support personnel should stop work in the immediate vicinity of the discovery and immediately contact the local law enforcement - call 911. The local law enforcement personnel will investigate the item. Should a suspect discovery be confirmed to contain an explosive hazard, local law enforcement will remove or destroy the item, during which time UXO construction support contractor personnel will be required to maintain a safe distance from the item as specified by the local law enforcement personnel.

Information: US Army Corps of Engineers (USACE) does not provide this service (Unexploded Ordnance (UXO) construction support) to private entities performing work on their properties (Refer to Engineer Regulation 1110-1-8153, dated June 2010, paragraph 6 (c)(3) available at the following website: <http://140.194.76.129/publications/eng-regs/er1110-1-8153/toc.html>). It is also important to note that the Formerly Used Defense Site (FUDS) program regulation does not allow for reimbursement to private landowners for the costs related to contracting for UXO construction support. Furthermore, the Government shall not be responsible for any damage/injury to person or property resulting from an encounter with UXO at their property. Permittee proceeds with the work authorized by this permit at its own risk.

Safety is a top priority for the Department of Defense and the Township of Edison. To protect themselves, property owners on the former Raritan Arsenal should learn and follow the 3Rs of Explosives Safety. The 3Rs of explosives safety:

- ❖ Recognize—when you may have encountered a munition and the potential danger;
- ❖ Retreat—do not touch, move or disturb it;
- ❖ Report—notify local law enforcement of what you saw and where you saw it.

For more information on the 3R of Explosives Safety visit the UXO Safety Education Website at: <https://www.denix.osd.mil/uxosafety>

Munitions are dangerous and may not be easily recognizable. Never touch, move or disturb a munitions or suspect munitions.

USACE Point of Contact for the former Raritan Arsenal site is:
Sandra L. Piettro
Project Manager, U.S. Army Corps of Engineers - New York District
Telephone: 917-790-8487

Edison Township Dig Permit Process
for
Munitions and Explosives of Concern
on the
Footprint of the Former Raritan Arsenal

February 2020

This information package is provided to Edison Township permit applicants with projects located within the footprint of the former Raritan Arsenal (see attached map). The former Raritan Arsenal operated from 1917 to 1963 and was primarily utilized for storing, shipping, and maintenance of military munitions. Since it closed, the former Raritan Arsenal has undergone many studies and environmental cleanup activities managed by the US Army Corps of Engineers (USACE) under the Formerly Used Defense Site (FUDS) Program. Periodically, USACE hosts public meetings regarding continued work at the site. For more information, please visit the Raritan Arsenal website for updated information and notifications of upcoming public meetings: <https://www.nan.usace.army.mil/Missions/Environmental/Environmental-Remediation/Formerly-Used-Defense-Sites/Former-Raritan-Arsenal/>

In the interest of safety, Edison Township Health Department staff have prepared this package to communicate safety precautions that must be considered before any project requiring ground disturbance is initiated in the former Raritan Arsenal footprint and detail actions that must be taken if suspected military munition items or unexploded ordnance (UXO) are encountered during the project. The definition of UXO is military munitions that:

- have been primed, fused, armed, or otherwise prepared for action;
- have been fired, dropped, launched, projected or placed in such a manner as to constitute a hazard to operations, installations, personnel, or material; and
- remain unexploded either by malfunction, design, or any other cause.

More information about UXO and what to do if encountered is detailed in the 3Rs Educational Awareness Attachment.

In accordance with the Uniform Construction Code (NJAC 5:23) under the Department of Community Affairs, Edison Township has the authority to require a permit application be submitted and reviewed for all new construction/renovation projects which require a Certificate of Occupation (CO) as well as all projects which require a Certification of Continued Occupation (CCO). New projects (requiring a CO) must first undergo a Zoning Board Review before entering the permit process described below.

As detailed further on the Township Engineering and Code Enforcement Departments webpage http://www.edisonnj.org/departments/engineering_department/, the following is an overview of the **Edison Township Permit Process**:

Step 1: For CCO projects (and for CO projects which have completed a Zoning Board Review) the Township Zoning Officer completes the Zoning Review.

Step 2: After the Zoning approval, application packages are reviewed by the building, electrical, plumbing, and fire sub code officials for completeness and code conformance. This process may take up to twenty working days.

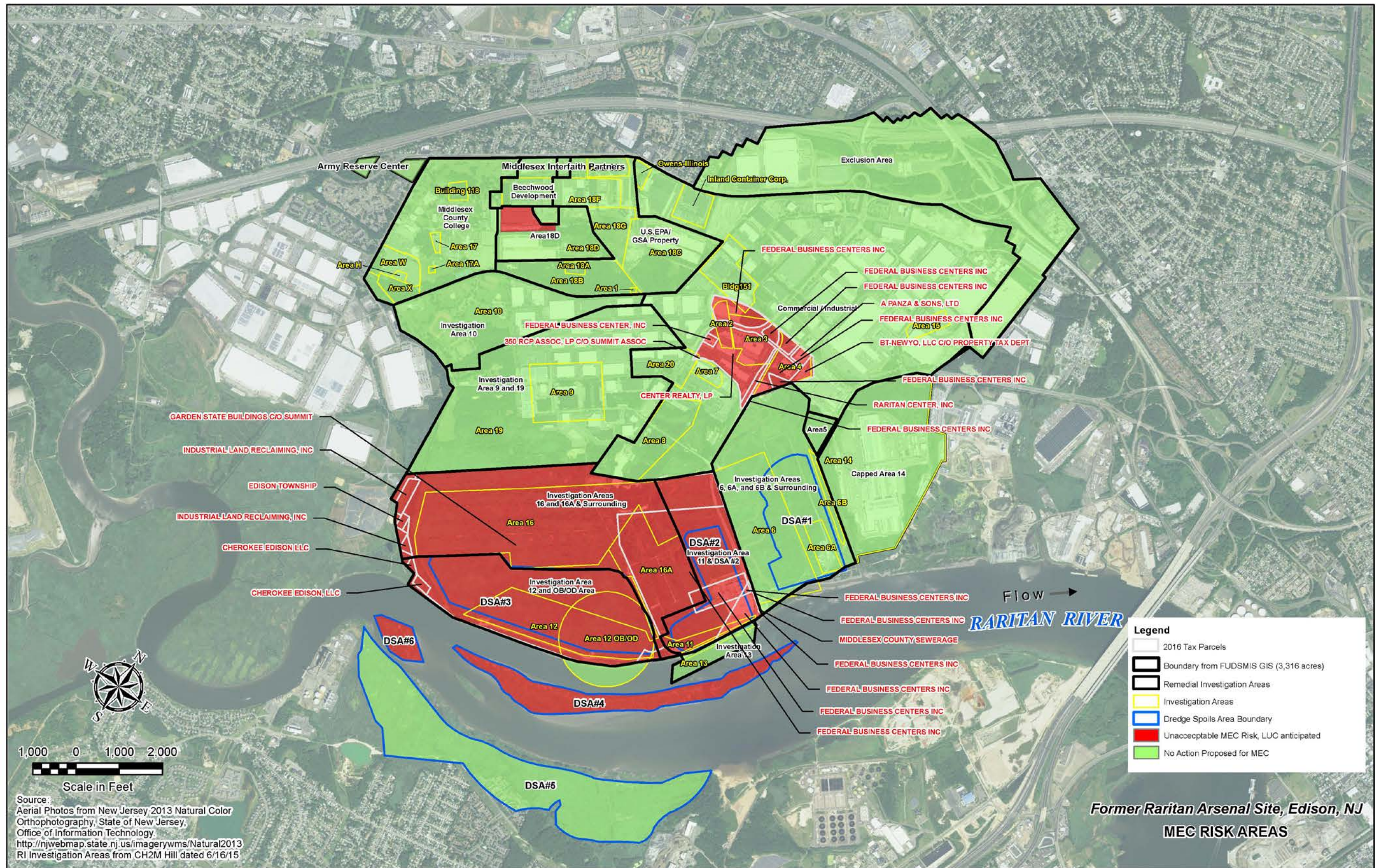
Step 3: Application package required documents are submitted to the Engineering Department, with all required prior approvals from State/County/Local agencies.

Step 4: The permit is issued indicating that legal approval has been given to begin the project.

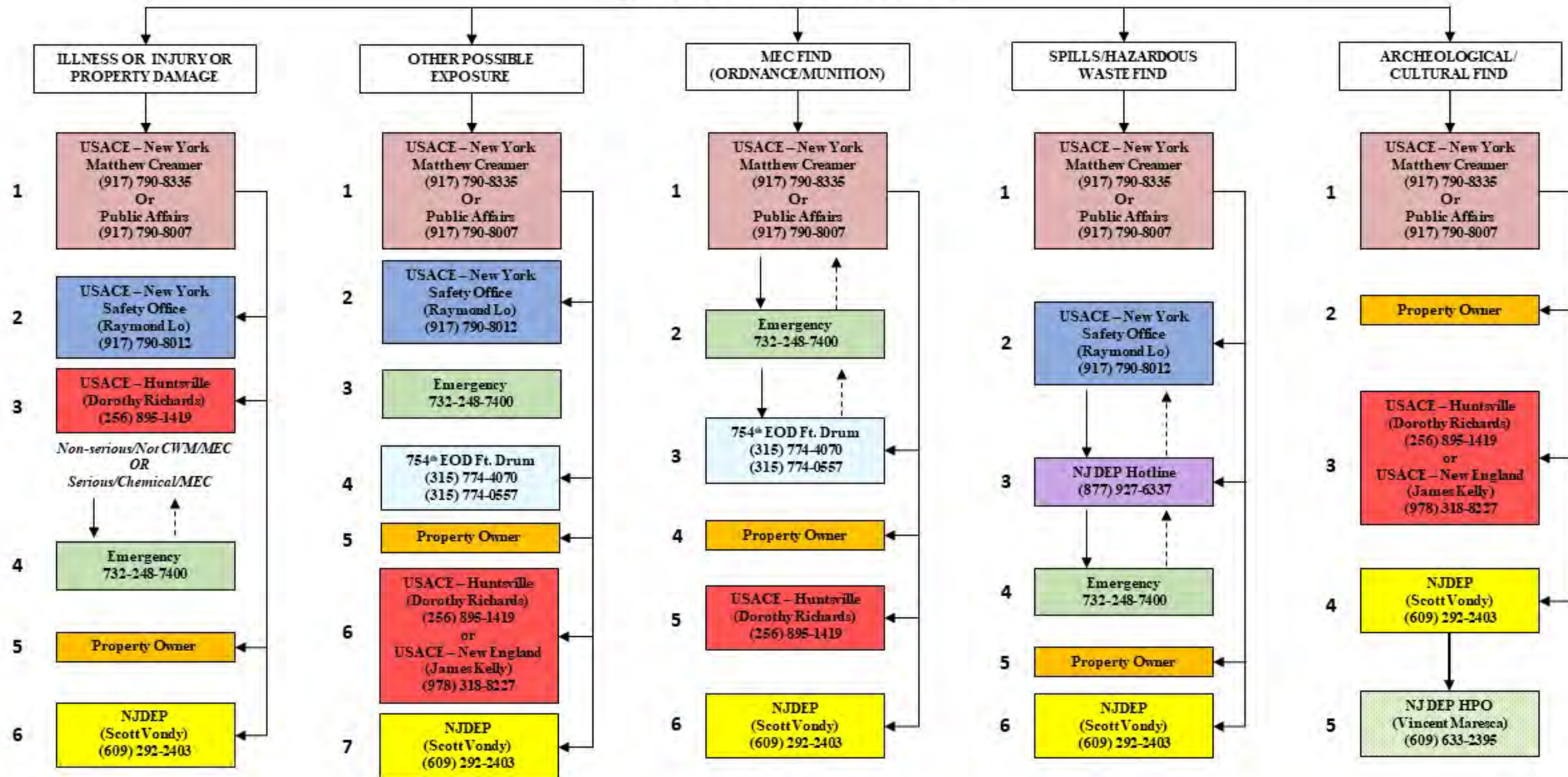
When reviewing permit applications, Edison Township Engineering Department staff will refer to the attached map of the former Arsenal footprint prepared by the USACE. Areas shown in red represent a higher potential for encountering UXO based on historical Arsenal operations and results of past investigations (See B below). Township staff may confer in more depth with the USACE regarding the potential for munitions to be encountered during projects within the Arsenal footprint that require ground disturbance, including landscaping, new utilities, and building renovations, as well as new construction where building foundation excavation is required. Depending on the specific location of the project (relative to known historical Arsenal operations) and degree of ground disturbance, various precautionary measures will be required to protect workers and property in the vicinity of the project site, as described further below.

During the Engineering Department review of the permit application and associated construction/plot plans required to be provided with the application (CO and CCO applications are attached), one of the following scenarios may apply to the permit application:

1. The Township will not require action by the applicant because intrusive work is not involved.
2. The Applicant must undergo a full Plan Review (Fire, Police and Health Departments) to evaluate the project, including the nature and location of the proposed intrusive work with respect to known historical Arsenal operations.
3. The Applicant must contact the Township for clarification regarding whether the proposed work has the potential for encountering munitions.



CONTINGENCIES



Educational Awareness Attachment

To protect property and personnel within the footprint of the former Raritan Arsenal, property owners and site workers are required to follow the **3Rs of Explosives Safety**:

- ❖ **RECOGNIZE** — when you may have encountered a munition and the potential danger;
- ❖ **RETREAT** — do not touch, move or disturb it;
- ❖ **REPORT** — notify local law enforcement of what you saw and where you saw it.

For more information on the 3Rs of Explosives Safety, visit the UXO Safety Education Website at: <https://www.denix.osd.mil/uxosafety>

Munitions are dangerous and may not be easily recognizable.

Never touch, move or disturb a munitions or suspect munitions.



Munitions can be clean or rusty and may be hard to recognize. Even old munitions can be very dangerous.



Munitions may be found both on land and in water.

CO/CCO Applications



APPLICATION FOR CERTIFICATE

Permit # _____
Date Issued _____
- or -
Control # _____
Certificate Application Received: _____
Certificate Issued: _____

IDENTIFICATION

Work Site Location _____ Block _____ Lot _____ Qualification Code _____

Owner in Fee _____ Contractor _____
Address _____ Address _____
Address _____ License No. _____ Tel. (____) _____
Tel. (____) _____ Federal Employee No. _____

ACTION

- ☐ CERTIFICATE OF OCCUPANCY
☐ CERTIFICATE OF CONTINUED OCCUPANCY
☐ LEAD HAZARD ABATEMENT CERTIFICATE OF CLEARANCE
☐ TEMPORARY CERTIFICATE OF OCCUPANCY

USE GROUP _____ Previous _____ Current _____

FINAL COST OF CONSTRUCTION: \$ _____

(Include value of any new structure, all on-site improvements, built-in furnishings and fixtures and all integral equipment exclusive of process or manufacturing equipment.)

Describe below any substantive deviation in dimension, lay out or appearance of the building or structure from the released plans and specifications filed with the construction permit application. Please note, a set of amended drawings may be required.

If you are requesting a Temporary Certificate of Occupancy, please explain why in the space below.

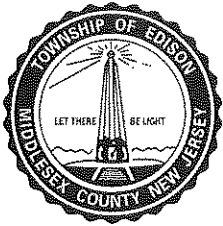
DESCRIPTION OF WORK/USE:

I hereby attest that to the best of my knowledge, the completed project meets the conditions of the construction permit and all prior approvals, and all work has been completed substantially in accordance with the code and with those portions of the plans and specifications controlled by the code, with any substantial deviations noted. Incomplete items listed on a Temporary Certificate of Occupancy will be completed by the date on the Certificate.

SIGNED: _____

OWNER/AGENT

☐ OWNER ☐ AGENT



TOWNSHIP OF EDISON

Division of Construction Code Enforcement

Thomas Lankey, Mayor

Edison Municipal Complex
100 Municipal Boulevard
Edison, NJ 08817

(732) 248-7257: Main Phone
(732) 248-1606: Main Fax

COMMERICAL CONTINUED CERTIFICATE OF OCCUPANCY APPLICATION

Per Ordinance No. 0.1867-2014 - Every change in occupancy or ownership requires a Certificate of Continued Occupancy to be issued by the Township of Edison, prior to the space being occupied.

****APPLICATION IS NOT FOR TENANT FIT OUT OR CHANGE OF USE****

SUBMISSION REQUIREMENTS:

- Site plan showing building location and parking (must be legible).
- Sealed Architectural Floor Plan, must include the following:
 1. Exits & Emergency exit lighting
 2. Offices & Corridors
 3. Bathroom (ADA or N/A)
 4. Occupant load
 5. Use group
- Copy of CCO or CO from existing tenant/owner.
- **Fees:** Two (2) separate checks, both payable to Township of Edison:
\$50.00 - Zoning Department / \$150.00 Building Department

| |
|------------------------|
| Office use only: |
| Inspection Date: _____ |
| CCO # _____ |

*****MUST BE FILLED OUT COMPLETELY, PLEASE PRINT CLEARLY AND LEGIBLY*****

APPLICATION DATE: _____

PROPERTY ADDRESS: _____ ZIPCODE: _____

SUITE OR UNIT #: _____ BLOCK: _____ LOT: _____

ZONE: _____ USE GROUP: _____ OCCUPANT LOAD: [] Less than 50 [] More than 50 [] More than 200

OWNER OR SELLER OF PROPERTY

NAME: _____

ADDRESS: _____

NO P.O. BOXES

CITY: _____ STATE: _____ ZIPCODE: _____

PHONE #: _____

NAME OF CURRENT OR PREVIOUS TENANT: _____

TYPE OF BUSINESS FOR CURRENT OR PREVIOUS TENANT: _____

TENANT OR BUYER CHECK ONE: < NEW TENANT < SALE OF BUILDING < SALE OF BUSINESS

BUSINESS NAME: _____

ADDRESS: _____ CITY: _____ STATE: _____ ZIPCODE: _____

CONTACT PERSON: _____ PHONE #: _____

TYPE OF BUSINESS: _____

DESCRIBE BUSINESS ACTIVITIES: _____

DESCRIBE IMPROVEMENTS THAT WILL BE MADE TO THE INTERIOR OR EXTERIOR OF THE PROPERTY.
PLEASE BE AS DETAILED AS POSSIBLE: _____

PROPOSED OCCUPANT LOAD: _____ USE GROUP: _____

| | | | |
|--|---------------------------------------|---------------|------------------------------|
| _____ PRINT NAME OF OWNER OR SELLER | _____ SIGNATURE OF OWNER OR SELLER | _____ DATE | <input type="checkbox"/> N/A |
| _____ PRINT NAME OF TENANT | _____ SIGNATURE OF TENANT | _____ DATE | <input type="checkbox"/> N/A |
| _____ PRINT NAME OF BUYER | _____ SIGNATURE OF BUYER | _____ DATE | <input type="checkbox"/> N/A |

*****BELOW IS FOR OFFICIAL USE ONLY*****

ZONING DEPARTMENT AUTHORIZATION
☐ APPROVED ☐ DENIED

COMMENTS: _____

ZONING OFFICER SIGNATURE DATE

Office Use Only

HEALTH DEPARTMENT AUTHORIZATION
☐ APPROVED ☐ DENIED ☐ HEALTH LICENSE REQUIRED

**Note: If there is a health department plan review required, there is a \$100 fee.

COMMENTS: _____

HEALTH DIRECTOR SIGNATURE DATE

BUILDING DEPARTMENT AUTHORIZATION
☐ APPROVED ☐ DENIED

COMMENTS: _____

CONSTRUCTION OFFICIAL SIGNATURE DATE

Under the above scenarios 2 and 3, the following construction planning and site safety activities may be required for the project:

- A. Green mapped areas (Lower UXO Potential): 3Rs training required for all site workers (initial and ongoing as new workers are assigned to the project) to ensure all understand response actions required in the event a potential munitions item is located during the project. If an UXO item is found in a green mapped area during the project, the applicant will be required to stop work until the additional safety precautions described below (B.) are implemented for the remainder of the project.
- B. Red mapped areas (Higher UXO Potential): 3Rs training required for all site workers (as described above), advance notification of emergency response personnel, and UXO avoidance performed before and throughout the project. Specifically, this highest level requires use of trained UXO technicians and remote sensing equipment during ground disturbance activities to clear areas before and during site excavation.

NOTE: In accordance with NJAC 5:23, the Township has the authority to inspect the project site. In the event non-compliance with requisite safety precautions is identified, the Township has authority to halt construction until Township permit requirements are met.

The following Contingency Plan and contacts will apply to all construction projects to be performed within the former Raritan Arsenal footprint.

This page intentionally left blank.

APPENDIX B-2

Building 118 Removal Action

Excerpts from:

**EOD Technology, Inc. (EODT). 1992.
UXO Removal After-Action Report, UXO
Remediation Support Services,
Former Raritan Arsenal, Edison, New Jersey.
May 1992.**

This page intentionally left blank.

concentration of ordnance in this area was much less than at Building # 643. By August 2 we recovered 598 each 37MM APHE rounds.

On September 25, 1991 site work was completed. A total of 955 UXO items were recovered. This site activity and UXO logbooks are provided in Attachment (23).

2.3 Area 16, Building Sites # 645, # 646

A visual and magnetometer surface/subsurface survey was conducted at selected areas at Building # 645 and Building # 646 on August 8 and August 15, 1991 respectively. No UXO/OEW was discovered. Refer to Attachment (5).

2.4 Building # 118

Building 118 is currently utilized as an Administrative Building housing the staff and faculty of Middlesex County College, Division of Business Technologies. This building is commonly referred to as "NORTH HALL". The Dean of Business and Industry, Dr. Fishco, was provided with frequent briefings to inform him of any changes in our operations and to maintain his confidence. EODT maintained an excellent relationship with the faculty staff and they were content with the services being provided by EODT. This office performed business as usual during the entire remediation project. The site boundaries, underground utilities, and operational phases (work sectors) are identified on maps found in Attachment (7).

Specific safety procedures were formulated and utilized for the following unique circumstances encountered:

- Boosters within root system of live trees: Trees were cut approximately 3 ft. above ground. Major roots were cleared by hand and cut 360 degrees around remaining stump. Stump was removed by utilizing chain and backhoe. Soil removed from stump and entire root system was scanned with magnetometer.

- Unmarked utilities encountered: Excavation was stopped and college maintenance personnel were called to identify status of object (active/inactive) encountered and direction of burial. Unmarked utilities encountered included water lines, electrical cables, telephone cables and fuel storage tanks.

Major Activities Performed by Other Organizations:

- Ground penetrating radar and IRR survey of site conducted by a US Army Laboratory on August 21-22, 1991.
- Buried 155 gal. gasoline storage tank was removed by IT on August 27, 1991.
- Buried 1500 gal. Heating fuel tank was removed by IT Corporation on October 2, 1991.
- Concrete drive behind Building #118 was broken-up and removed by IT on December 16-18, 1991.

The initial subsurface UXO survey was conducted on June 20, 1991. The area was measured and marked off in 5 foot magnetometer sweep lanes. Each lane was surveyed utilizing a hand held magnetometer. All anomalies were flagged and plotted on site map. Due to the location and inhabitants of Building #118, several safety and operational factors were considered before commencement of excavation in this area. The entire work area around the site was fenced because of heavy pedestrian traffic. Traffic requirements made it necessary to fence in half of the area at a time, which facilitated entry/exit to Building #118 while maintaining restricted access to the excavation area. (i.e., rear entry to the building during Phase I and the front entry during Phase II).

The fence was constructed and EODT commenced operations on June 19, 1991. Ten ordnance related items were recovered at the northeast corner of the blacktop around Building # 118. Items recovered were non-explosive adaptors for artillery projectiles; the area was cleared to a depth of 6 ft., and UXO items were recovered at a depth of 3 to 5 ft. All other items recovered were a variety of metallic construction debris. All excavations were backfilled and

all operations ceased until placement of fence around Phase II area.

Construction of the fence in the next half of the area was completed and, on June 27, 1991, EODT commenced operations at the northwest edge of Building # 118. This area was previously identified as a hot area during the initial survey. Mk-IIA booster adaptors were found in this area. The operational plan was to expand excavation in all directions until no further boosters found. This plan was modified due to the large size and irregular shape of excavation. Attachment (7) shows the detailed area of major excavation. The density of boosters recovered, direction of burial and magnetometer readings indicated that excavation Area #1 (refer to Attachment (7), Map 4) was located on the edge of what proved to be a major trench burial site. Safety and operational factors called for a decision to limit further excavations to a 15 x 15 ft. grid. All further excavations were numbered, cleared and backfilled before starting on the next area. This system was utilized until encountering booster contaminated utility lines in Area # 7A.

All recovered explosive filled ordnance was transported daily (police escort) to the security staging area in Area 16 and locked in boxes. The initial requirement was to transport items in a woodlined steel box. This requirement limited the amount of boosters transported to a maximum of 900 per delivery, due to box capacity. Additionally, the loading and unloading of the box was very time consuming. Approval to transport items in sandbagged and wood lined truck bed was given by Mr. Wayne Galloway, USACE Safety Office, on June 16, 1991. This increased the number of boosters that could be transported by 50%.

Refer to Attachment (7), Map 4 regarding following discussions concerning Areas 1-17.

Area #1 boundaries were determined and the area was cleared and backfilled on July 9, 1991.

Area #2 excavation was started on July 10, 1991. This area contained a 30 ft. maple tree with a large number of boosters lodged within the root system. Another maple tree of approximately same size was located 15 to 20 ft. from this tree (Area #6). A hand dig was performed around

both trees to determine the degree of booster contamination. Exploration results lead to the decision to remove the trees for safety purposes. On July 11, excavations were backfilled to cover exposed boosters for safety purposes. Work in Area #2 and #6 was stopped until these trees were removed. Operations recommenced at Area #2 on August 5, 1991, when both stumps were removed and cleared of UXO. Area #2 was completed, cleared and backfilled on August 8, 1991.

Area #3 was started on July 11, 1991. Boosters in this area were glued together in a tar-like substance and had to be individually pried apart before removal. This area was cleared and backfilled on July 24, 1991.

Area #4 was started on July 24, 1991. Boosters found in this area were also glued together in same substance as found in Area #3. Several boosters in "Pristine" condition were found in this area with the stamped marking "Adaptor Mark II". This information was passed to the USACE. This area was cleared and backfilled on July 31, 1991.

Area #5 was started on July 31, 1991. Boosters found in this area were glued together in same manner as described in Area #3 and Area #4. This area was cleared and backfilled on August 5, 1991.

Area #6 was started on August 3, 1991. This area contains a large quantity of magnetic (ferrous oxide bearing) rock as fill material. Additionally, the root system of the tree which had been removed pushed boosters into a clay subsurface that had been clear in all previous excavations. This area was cleared and backfilled on Aug 15, 1991.

Area #7 was started on August 15, 1991. This area contained an old stump with booster contamination within the root system. Removal of this stump revealed boosters running beneath the asphalt apron of the drive area adjacent to Building #118. The filler tube of what proved to be a 115 gallon gasoline storage tank was also uncovered. The fuel tank was removed on August 27, 1991 by IT personnel. Boosters were then recovered beneath the tank area. A large

amount of magnetic rock and construction debris was found in this area. On August 29, 1991 concrete encased electrical and telephone cables were uncovered. These utilities were not on drawings provided to EODT. Boosters were found encased in the concrete with these cables. Area #7 was terminated at this point (September 6, 1991). The area was backfilled, while leaving the utilities uncovered.

An exploratory dig around North "I" building was started on September 6, 1991, per the request of Mr. Bob Nore, USACE Project Manager. The purpose was to ascertain if this building area required removal actions due to booster contamination. Four boosters were found along the front side of the building. This area was cleared and backfilled on September 11, 1991.

Area #8 was started on September 11, 1991. This area contained a buried 1500 gallon heating fuel tank, fuel contaminated soil and boosters (which were discovered under this tank on September 17, 1991). A large quantity of boosters was found within the root system of a large tree located adjacent to this area (Area #12). This area was backfilled on September 20, 1991 until a decision could be made by IT and the USACE regarding problems associated with the fuel tank and tree. Operations recommenced at Area #8 on October 9, 1991. The fuel contaminated soil was screened to a depth of nine feet and all located boosters were removed. Due to the depth of excavation, personnel were not allowed to enter the hole. Fuel contaminated soil was replaced, covered with polysheet and backfilled to a depth of 4 ft. on September 24, 1991. Due to depth of boosters in this area, a decision was made to leave all excavations open on the north side of the concrete encased utility lines. Excavations were limited to a depth of 4 ft., designated "LEVEL 1" of the numbered area. ("Note" Due to boosters being located at depths greater than 5 feet, these areas were separated into 2 levels. Zero to four feet depth is considered "Level 1" and beyond a depth of four feet is considered "Level 2". Once "Level 1" was cleared, the required sloping of the work areas was accomplished and then "Level 2" was cleared.) This procedure allowed for proper sloping of the excavation and provided future access to utilities. Additionally, proper sloping of Area #7A required removal of the concrete drive.

Excavation to expose the remainder of the utility lines between Building # 118 and North I Building began on September 20, 1991, at the request of LTC Poirrier, USACE. This portion of the utility lines proved to be clear of booster contamination and was backfilled on October 1, 1991.

Area #9 was started on October 1, 1991 and completed on October 2, 1991. This area contained a large quantity of magnetic rock.

Area #10 was started, cleared and backfilled on October 3, 1991. This area contains a large quantity of magnetic rock.

Area #11 was started on October 3, 1991, cleared and backfilled on October 7, 1991.

Excavation started on the area designated "street light cable" on October 7, 1991. Boosters were found along the cable to a distance of 50 ft. from the trench area. This area was cleared for a distance of 60 ft. from the trench and backfilled on October 9, 1991.

Area #12 started on October 10, 1991. The tree in this area was cut down on October 21, 1991, and the stump was removed on October 30, 1991. "Level 1" operations were completed on November 22, 1991. "Level 2" operations started on November 22, 1991 and were completed on November 27, 1991.

Area #13 started on October 15, 1991. An electrical cable for street lights running between Areas #12 and #13 was found to contain boosters within its concrete encasement. The electrical line and concrete were removed and transported to the demo range with the stump from Area #12. "Level 1" operations were completed on November 20, 1991. "Level 2" operations commenced November 20, 1991 and were completed on December 9, 1991.

Area #14 was started on November 13, 1991. "LEVEL 1" operations were completed on November 15, 1991. "LEVEL 2" operations were started and completed on December 10, 1991.

Area #15 "Level 1" operations were started and completed on November 13, 1991. "Level 2" operations were started on November 22, 1991 and completed on December 11, 1991. The boosters found in Areas #13, #14 and #15 were glued together in the same tar-like substance as previously discussed.

Area #16 "Level 1" operations were started and completed on November 19, 1991. "Level 2" operations started on December 10, 1991 and were completed on December 11, 1991.

Area #17 started on November 20, 1991 and was completed on February 18, 1992.

The "Drive Area" was started on December 16, 1991 with the breaking up and removal of the asphalt and concrete layers. These layers were removed on December 18, 1991. Excavation activities commenced on December 19, 1991, and boosters were located within the excavation.

The entire site was shut down from December 20, 1991 through January 6, 1992. Excavation resumed on January 7, 1992. The drive was excavated the entire length of the area. Shoring was placed along electrical line to prevent washout and possible collapse. The fill in this area contains high magnetic content. All areas of drive were cleared to a minimum of depth of 4 feet. This area was checked by Mr. Wayne Shaw (USACE Safety Office) and considered clear on March 3, 1992. The concrete encased utilities (Area 7A) running through this area were still contaminated with boosters.

Sector #1 (Attachment 7, map #5) was surveyed, marked and plotted beginning on December 3, 1991. All "Hot Spots" were exposed and left open for QA inspection by the USACE on December 6, 1991. No UXO/OEW items were found in this area. All items recovered were magnetic materials and construction debris.

Sector #2 (Attachment #7, map #5) was surveyed, marked and plotted beginning on December 12, 1991. Excavation on "Hot Spots" began on February 18, 1992. This area contained debris from old nurses quarters that had been torn down. Three boosters were found scattered in this

area. All "Hot Spots" were exposed and a QA check performed by Mr. Wayne Shaw on February 19, 1992, and then backfilled.

Sector #3 (Attachment #7, map #5) was surveyed, marked and plotted on February 25, 1992. All "Hot Spots" were exposed and inspected by Mr. Wayne Shaw on March 3, 1992. No ordnance items were found in this area. The area was backfilled on March 4, 1992.

Sector #4 (Attachment #7, map #5) survey, marking and plotting operations began on March 17, 1992. One empty MKII Hand Grenade, unfuzed, was discovered on March 18, 1992. An isolated pocket of boosters (167 each) was discovered on March 19, 1992.

Area #7A (Attachment #7, map #5). EODT placed additional bracing in the excavation to compensate for the removal of concrete from electrical cable. Concrete removal began on March 24, 1992. An electric jack hammer was originally used, however an air hammer was eventually needed due to the hardness and thickness of the concrete. Concrete was cut into four portable pieces. Two of these pieces contained boosters and were transported to the demolition range, where the encased boosters were detonated. This area was completed on April 8, 1992.

Drive Area (Attachment #7, map #5). Work was resumed in this area on March 30, 1992. The accumulated water in the excavation was pumped out and the area was sloped in order to gain safe access to the concrete encased utility lines. This area was completed on April 9, 1992.

New Electrical Cable (Attachment #7, map #5). Trenching for the new electrical cable began on March 5, 1992. An unprotected and unrecorded electrical line was hit. Trenching was completed on March 12, 1992 and backfilled on March 17, 1992.

The USACE QA Inspection was started on April 17, 1992 by Wayne Shaw. The stockpiled soil from numerous areas was checked. EODT had been directed not to back fill and this prevented area/soil re-inspection. When this fill was removed, a concrete walkway was uncovered. This walkway was then removed and several boosters were discovered. A total of 487 boosters were

recovered from this area. The QA Inspection resumed on April 27, 1992. No additional ordnance was located.

2.5 Area # 4

Area # 4 is a 2 acre section (see Attachment #11) completely fenced in by a six foot high chain link fence which was constructed by the USEPA. The entire area was deemed to be the Exclusion Zone for this project. This site was used as a high explosive salvage and melt-out area for demilitarization of various ordnance items. All personnel who worked in the Exclusion Zone were required to take a full physical prior to any soil excavation operations being conducted and an exit physical was required upon their departure.

Basic site preparation began on September 24, 1991 with the arrival of a five (5) man work crew, miscellaneous equipment and work trailer. The crew conducted a surface search for ordnance and found a 75mm projectile which contained some explosive residue. Also, at this time we marked all known explosive contaminated areas with stakes and day-glo tape to insure the areas were conspicuously marked and identified. The next phase included removal of all vegetation and trees 3 inches or less in diameter, all railroad ties, trash and debris which littered the entire work site, which was collected and placed in one area. This clean-up phase took two weeks to complete and was conducted concurrently with other tasks. Everything that was removed from the main area was stored along the east side of the site as a temporary measure. A 10' wide area along the western edge of the site was cleared of UXO/OEW and the debris was placed there, with the exception of the trees and large shrubs which were run through a chipper and spread out in designated areas.

On October 1, 1991, IT provided a Health and Safety class on Site # 4. Also, we were issued full-face masks and were fit tested. Tracy Estes presented the class for IT. On this date, we also installed the Geofabric material to the chain link fence for dust suppression.

On October 2, 1991, a magnetometer survey was conducted and all "hits" were cleared from the area that we used as the Contamination Reduction Zone (CRZ). The CRZ was located in the

only one major equipment failure, the problem always encountered was having to decontaminate the equipment to remove it from the area for repair work, which averaged out to 3 hours per occasion.

All heavy equipment was decontaminated and turned over to IT for removal and return to vendors. The trailers were emptied, cleaned and readied for return.

Exit physicals were accomplished on March 25, 1992 at Enviro-Care for Becker, Bucy, Die and Rodgers. We concluded all last minute details at Area # 4 and demobilized.

A Q/C Inspection of Area # 4 was performed by EODT on March 12, 1992, and no UXO/OEW was located. A subsequent QA check was performed by USACE personnel. Again, no UXO/OEW was located.

2.6 Area # 17

This area was used as a property disposal and salvage storage area. Presently, the area makes up part of the Middlesex County College campus. It is adjacent to a student center and is a hub of student activity.

On September 9, 1991 the crew arrived on site. Because of heavy pedestrian traffic and the general location, a decision was made to only locate and mark magnetometer "hits". No intrusive work would occur until decisions were made regarding the best way to proceed.

Sweep lanes were established and, as the survey began, it immediately became obvious we would have a tremendous amount of "hits". Initially, red flags were used to mark same. This was stopped due to the enormous number involved, and all barriers and signs had to be removed at the end of each work day. The decision was made to use nails with marking tape to designate "hits". This system worked very well. A total of 7,654 "hits" were recorded (see Attachment 6).

The determination was made that five exploratory digs would be made. The excavation would be 6' x 6' x 3' deep. On October 3, 1991 excavation began and continued until October 10, 1991. No UXO was discovered. One piece of OEW scrap (60MM mortar fins) was recovered.

During this operation, there was an additional tasking on September 17, 1991, when we returned from a four day break. During the break period, a hand grenade (empty) had been found on the Middlesex College campus in the general area of the tennis courts. The decision was made that the team from Area # 17 would surface sweep the area, check the area where the grenade was found and any other suspicious locations with a magnetometer. All "hits" would be recorded. (Attachment #7)

Operations began at 11 a.m. on September 17, 1991 and were completed at approximately 5:15 p.m. No UXO/OEW was located.

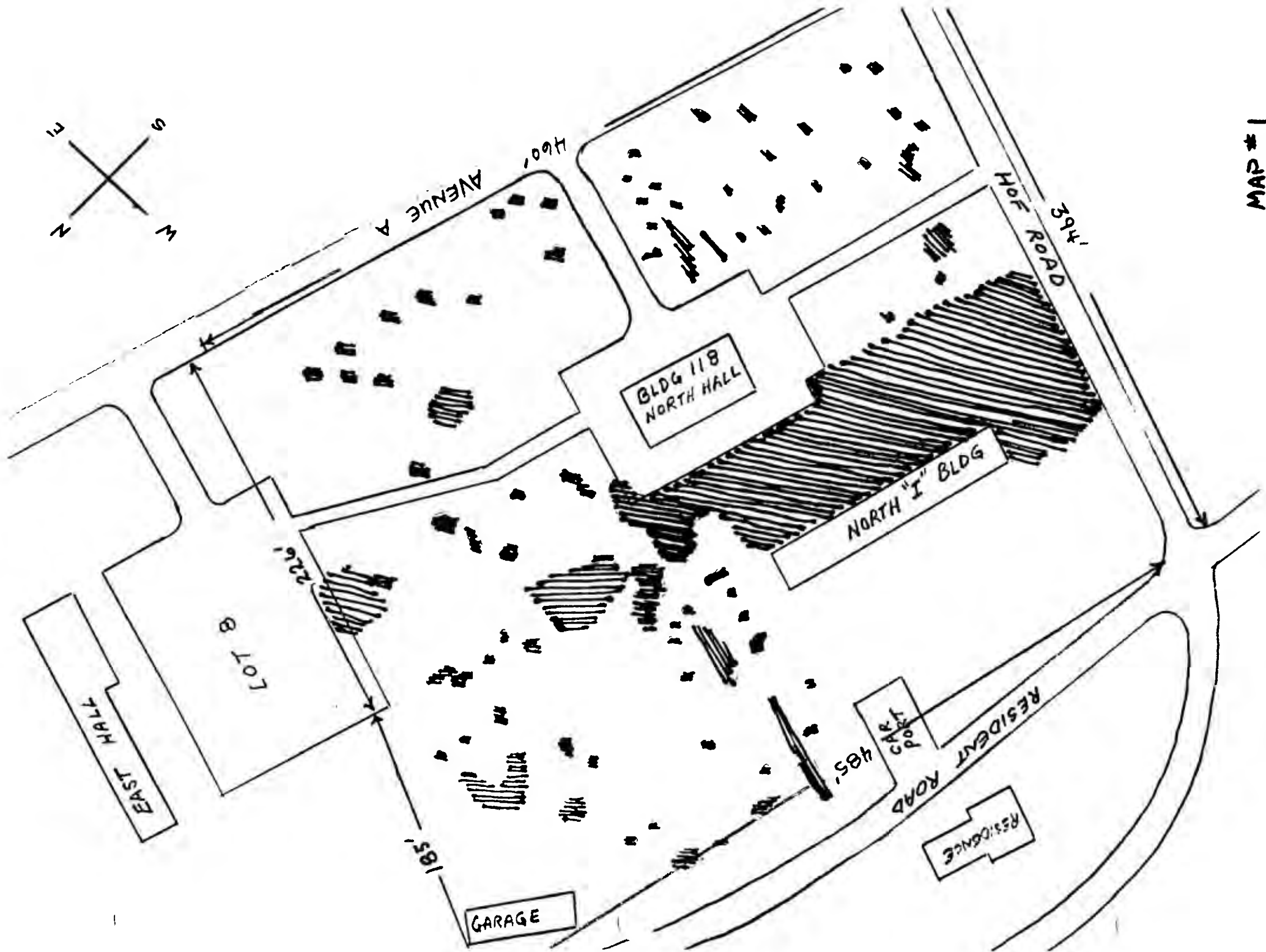
2.7 Area # 10

Area # 10 is located on what was the northeastern corner of the arsenal. This report covers only part 1 and 2, which are located in the south western corner of Area # 10. Original depot maps would show this area to have been in Magazine Rows E and F. This area is presently part of the Thomas A. Edison Park of Middlesex County. The terrain is generally flat with one portion being heavily vegetated, and the rest is grass and an asphalt parking lot. The parking lot has concrete curbs, access roads and a lighting system.

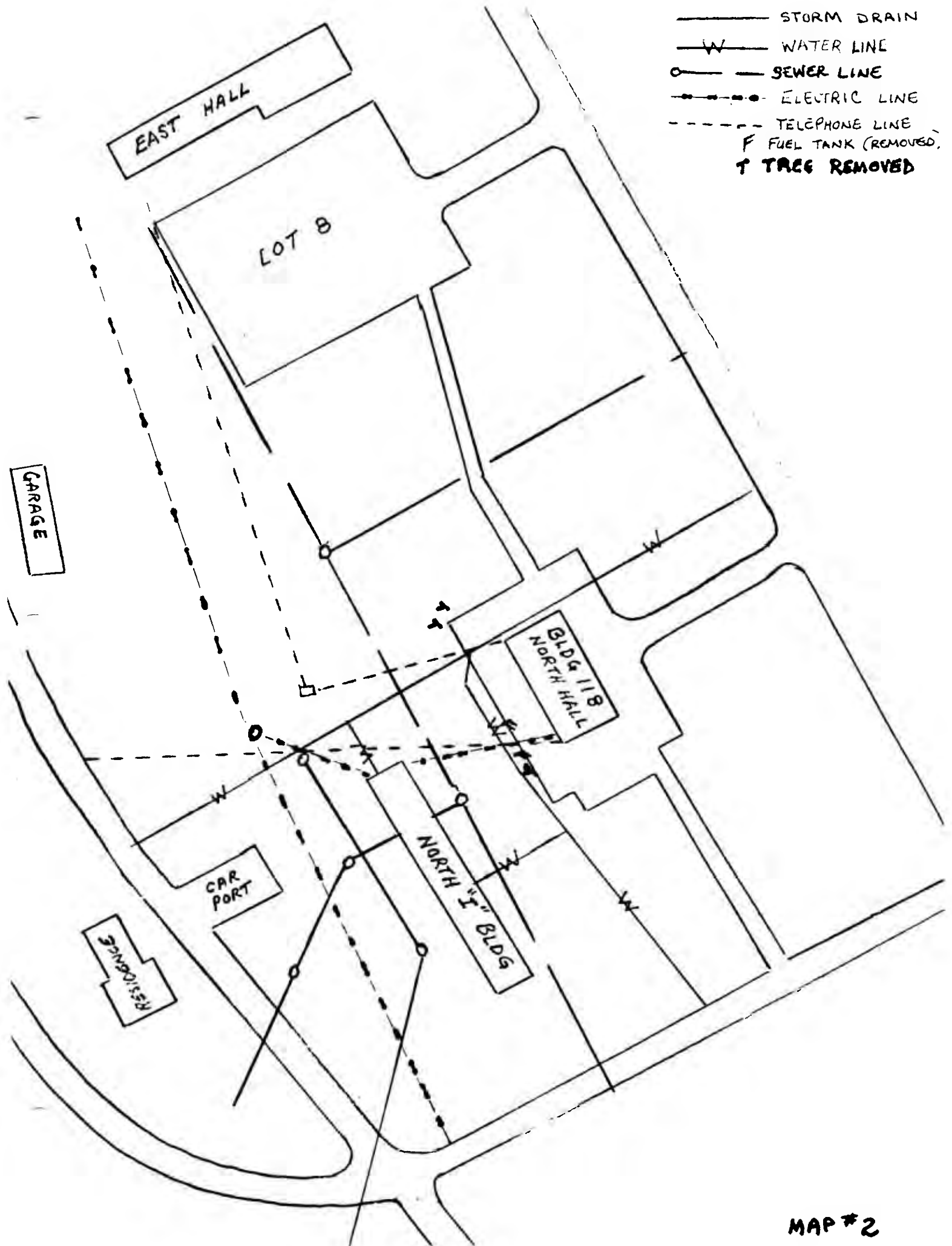
This area was known to have been in the "fan" of at least two magazine detonations. One of the magazines scattered several hundred thousand French Rifle Grenades throughout the area when it detonated. The other magazine contained MK II Grenades.

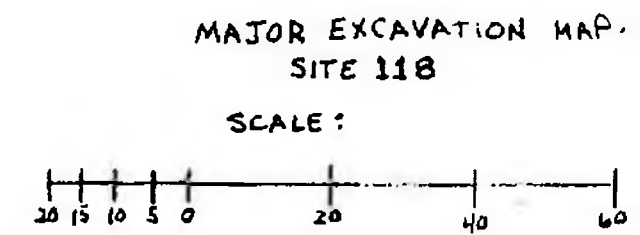
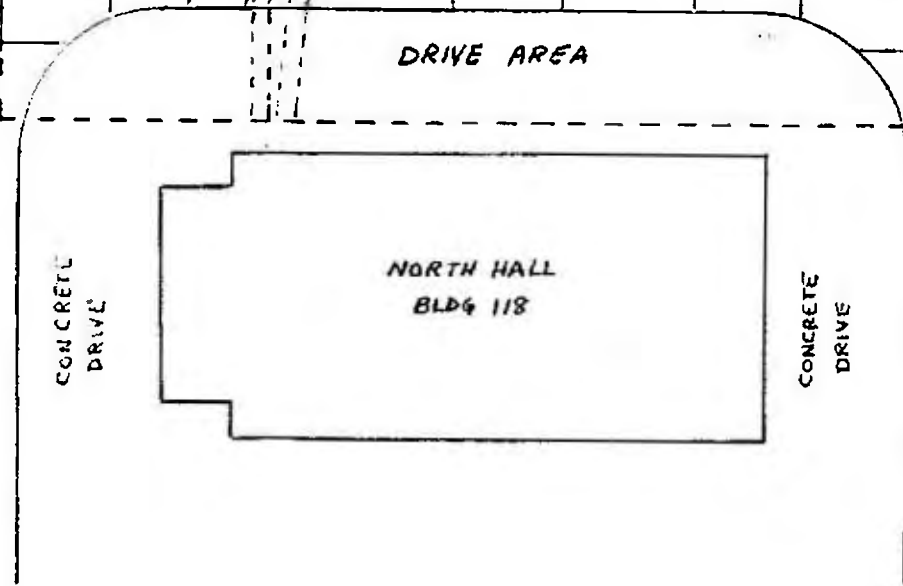
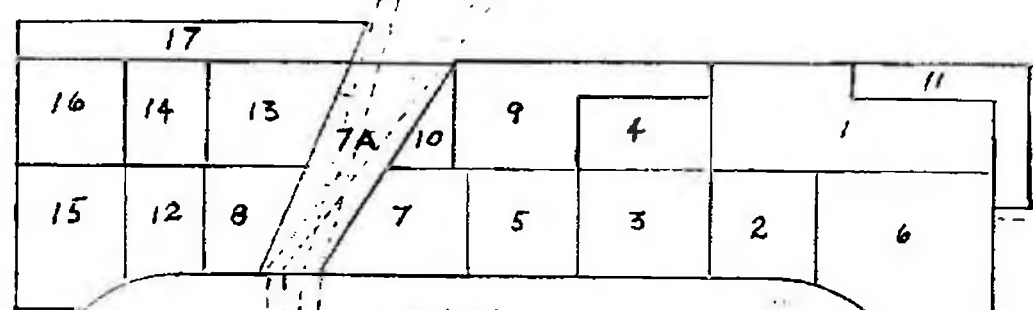
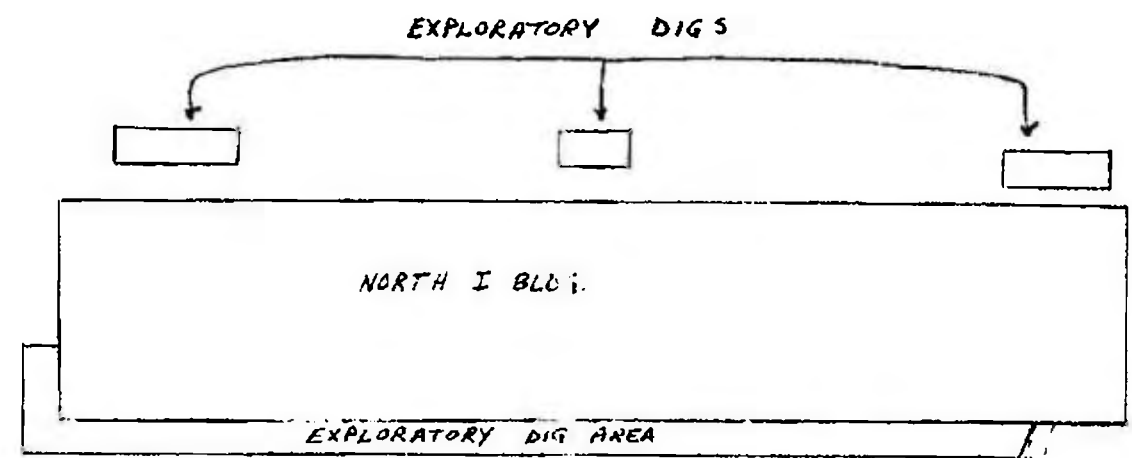
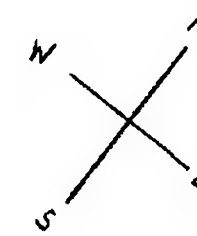
A three person crew started working at this area on October 1, 1991. The general plan was to:

1. Divide the designated area into manageable sub areas.
2. Lay out lanes for the magnetometer survey.
3. Mark all magnetometer "hits" and items found on a map.



- STORM DRAIN
- W— WATER LINE
- SEWER LINE
- ELECTRIC LINE
- - - TELEPHONE LINE
- F FUEL TANK (REMOVED)
- T TREE REMOVED





MAP #4

| DATE | ORDNANCE | LOCATION (REF ATTACHED MAP) | CONDITIONS | QUANTITY | REMARKS (REF DAILY LOG) |
|-----------|------------------------|--------------------------------|----------------|----------|----------------------------|
| 27 JUN 91 | MKIIA BOOSTER ADAPTOR | SITE # 1 | UNFUSED/RUSTED | 712 | |
| 01 JUL 91 | " " " | 1 | " " | 654 | |
| 02 JUL 91 | " " " | 1 | " " | 678 | |
| 03 JUL 91 | " " " | 1 | " " | 189 | |
| 05 JUL 91 | " " " | 1 | " " | 483 | |
| 08 JUL 91 | " " " | 1 | " " | 1130 | |
| 09 JUL 91 | " " " | 1 | " " | 135 | |
| 10 JUL 91 | " " " | 2 | " " | 870 | 100, 100 = ? |
| 11 JUL 91 | " " " | 2 | " " | 39 | TRAIL (2000) |
| 11 JUL 91 | " " " | 3 | " " | 1129 | |
| 16 JUL 91 | " " " | 3 | " " | 1220 | |
| 17 JUL 91 | " " " | 3 | " " | 432 | |
| 19 JUL 91 | " " " | 3 | " " | 1000 | |
| 22 JUL 91 | " " " | 3 | " " | 1578 | |
| 23 JUL 91 | " " " | 3 | " " | 1309 | |
| 24 JUL 91 | " " " | 3 | " " | 80 | FINISHED #3 |
| 24 JUL 91 | " " " | 4 | " " | 851 | TAK |
| 25 JUL 91 | " " " | 4 | " " | 1097 | |
| 30 JUL 91 | " " " | 4 | " " | 216 | |
| JUL 91 | BOOSTER- ADAPTOR | 4 | " " | 1 | MODEL UNK |
| 01 JUL 91 | MKIIA BOOSTER- ADAPTOR | 4 | " " | 29 | FINISHED #4 |
| 31 JUL 91 | " " " | 5 | " " | 307 | |
| 01 AUG 91 | " " " | 5 | " " | 1336 | |
| 02 AUG 91 | " " " | 5 | " " | 162 | |
| 05 AUG 91 | " " " | 5 | " " | 154 | FINISHED #5 |
| 05 AUG 91 | " " " | 2 | " " | 241 | |
| 06 AUG 91 | " " " | 2 | " " | 917 | |
| 07 AUG 91 | " " " | 2 | " " | 267 | |
| 08 AUG 91 | " " " | 2 | " " | 15 | FINISHED #2 |
| 08 AUG 91 | " " " | 6 | " " | 1189 | |
| 13 AUG 91 | " " " | 6 | " " | 632 | |
| 14 AUG 91 | " " " | 6 | " " | 148 | ROOTS |
| 15 AUG 91 | " " " | 6 | " " | 10 | FINISHED #6 |
| 15 AUG 91 | " " " | 7 | " " | 572 | |
| 16 AUG 91 | " " " | 7 | " " | 1804 | |
| 19 AUG 91 | " " " | 7 | " " | 326 | FUEL TANK |
| 20 AUG 91 | " " " | 7 | " " | 135 | SIDEWALK |
| 21 AUG 91 | " " " | 7 | " " | 271 | RADAR |
| 22 AUG 91 | " " " | 7 | " " | 729 | |
| 27 AUG 91 | " " " | 7 | " " | 222 | TANK REMOVED |
| 27 AUG 91 | " " " | 7 | " " | 949 | |
| 27 AUG 91 | " " " | 7 | " " | 527 | |
| 30 AUG 91 | " " " | 7 | " " | 1082 | |
| 03 SEP 91 | " " " | 7 | " " | 601 | |
| 24 SEP 91 | " " " | 7 | " " | 1008 | CABLES/CWIRTE |
| 25 SEP 91 | " " " | 7 | " " | 421 | TERMINATED |
| 25 SEP 91 | " " " | 7 | " " | 4 | EXP. D14 24 127X |

| DATE | ORDNANCE | LOCATION (REF. MAP) | CONDITION | QUANTITY | REMARKS (REF. DAILY LOG) |
|-----------|-------------------------|------------------------|---------------|----------|-----------------------------|
| 09 SEP 91 | MR II A BOOSTER ADAPTER | 8 | UNUSED/RUSTED | 206 | |
| 10 SEP 91 | " " " | 8 | " " | 619 | |
| 11 SEP 91 | " " " | 8 | " " | 225 | |
| 12 SEP 91 | " " " | 8 | " " | 1369 | |
| 17 SEP 91 | " " " | 8 | " " | 1267 | ACTIVE FUEL TANK |
| 18 SEP 91 | " " " | 8 | " " | 1074 | |
| 19 SEP 91 | " " " | 8 | " " | 1369 | |
| 20 SEP 91 | " " " | 8 | " " | 1290 | BACKFILL/INCOMPLETE |
| 23 SEP 91 | " " " | POWER LINE (7A) | " " | 73 | |
| 24 SEP 91 | " " " | " (7A) | " " | 11 | FINISHED |
| 26 SEP 91 | " " " | TEL CABLE (7A) | " " | 8 | FINISHED |
| 02 OCT 91 | " " " | 9 | " " | 101 | FINISHED |
| 04 OCT 91 | " " " | 8 | " " | 131 | FULL TANK TEST |
| 07 OCT 91 | " " " | 11 | " " | 23 | FINISHED |
| " " " | " " " | STREET LIFE | " " | 31 | |
| " " " | " " " | 8 | " " | 95 | PREP WORK |
| 08 OCT 91 | " " " | STREET LIFE | " " | 12 | FINISHED |
| " " " | " " " | 8 | " " | 208 | |
| 09 OCT 91 | " " " | 8 | " " | 609 | |
| 10 OCT 91 | " " " | 12 | " " | 1370 | |
| 15 OCT 91 | " " " | 8 | " " | 236 | |
| " " " | " " " | 12 | " " | 649 | |
| " " " | " " " | 13 | " " | 255 | |
| 16 OCT 91 | " " " | 12 | " " | 977 | |
| " " " | " " " | 13 | " " | 392 | |
| 17 OCT 91 | " " " | 12 | " " | 966 | |
| " " " | " " " | 13 | " " | 1035 | TRANSPORT X2 |
| 18 OCT 91 | " " " | 12 | " " | 1773 | TRANSPORT X2 |
| " " " | " " " | 13 | " " | 817 | |
| 21 OCT 91 | " " " | 12 | " " | 462 | TRANSPORT X2 |
| " " " | " " " | 13 | " " | 2192 | |
| 22 OCT 91 | " " " | 12 | " " | 1400 | AROUND STUMP |
| 23 OCT 91 | " " " | 12 | " " | 1403 | STUMP AGAIN |
| 24 OCT 91 | " " " | 8 | " " | 302 | UNDER/BEHIND FUEL TANK |
| 27 OCT 91 | MR III BOOSTER | 12 | " " | | SAME AS 30 JUL 91 |
| " " " | MR II A BOOSTER/ADAPTER | 12 | " " | 1596 | STILL AROUND STUMP |
| 30 OCT 91 | " " " | 12 | " " | 2443 | STUMP OUT |
| " " " | " " " | 13 | " " | 63 | |
| 31 OCT 91 | " " " | 12 | " " | 1313 | |
| 01 NOV 91 | " " " | 12 | " " | 1078 | |
| " " " | " " " | 13 | " " | 200 | |
| 04 NOV 91 | " " " | 12 | " " | 1305 | |
| 05 NOV 91 | " " " | 12 | " " | 3000 | TRANSPORT X2 |
| 16 NOV 91 | " " " | 12 | " " | 2500 | TRANSPORT X2 |
| " " " | " " " | 13 | " " | 644 | FINISHED |
| 27 NOV 91 | " " " | 12 | " " | 2856 | TRANSPORT X2 |
| " " " | " " " | 13 | " " | 124 | |

| DATE | ORDNANCE | LOCATION (REF MAP) | CONDITION | QUANTITY | REMARKS (REF DAILY LOG) |
|-----------|-------------------|-----------------------|-------------|----------|---|
| 13 NOV 91 | 11K11A B. 100/ADP | 13 | USED/UNUSED | 856 | FINISHED LEVEL #1 |
| " " " | " " " | 14 | " " | 487 | |
| 14 NOV 91 | " " " | 14 | " " | 2001 | TRANSPORT X2 |
| 15 NOV 91 | " " " | 14 | " " | 2022 | TRANSPORT X2 ^{LEVEL #1} FINISHED |
| 18 NOV 91 | " " " | 15 | " " | 1011 | FINISHED LEVEL #1 |
| 19 NOV 91 | " " " | 16 | " " | 841 | FINISHED LEVEL #1 |
| 20 NOV 91 | " " " | 13 (LVL 2) | " " | 373 | |
| " " " | " " " | 7A | " " | 103 | |
| " " " | " " " | 17 | " " | 79 | |
| 21 NOV 91 | " " " | 17 | " " | 9 | |
| " " " | " " " | 13 (LVL 2) | " " | 1122 | TRANSPORT X2 |
| 22 NOV 91 | " " " | 12 (LVL 2) | " " | 65 | FINISHED LVL #2 |
| " " " | " " " | 15 (LVL 2) | " " | 802 | |
| 25 NOV 91 | " " " | 7A | " " | 492 | |
| " " " | " " " | 13 (LVL 2) | " " | 300 | |
| 26 NOV 91 | " " " | 7A | " " | 2101 | SHORING TODAY |
| 27 NOV 91 | " " " | 7A | " " | 92 | |
| " " " | " " " | 12 (LVL 2) | " " | 11 | SWAMP DESTROYED |
| " " " | " " " | 13 (LVL 2) | " " | 14 | STREET LITE CONCRETE |
| 19 DEC 91 | " " " | 7A | " " | 113 | |
| " " " | " " " | 13 (LVL 2) | " " | 22 | FINISHED LEVEL #2 |
| 10 DEC 91 | " " " | 14 (LVL 2) | " " | 152 | FINISHED LEVEL #2 |
| " " " | " " " | 16 (LVL 2) | " " | 32 | |
| 11 DEC 91 | " " " | 15 (LVL 2) | " " | 71 | FINISHED LEVEL #2 |
| " " " | " " " | 16 (LVL 2) | " " | 28 | FINISHED LEVEL #2 |
| 19 DEC 91 | " " " | DRIVE | " " | 23 | ALONG UTILITY LINE |
| 08 JAN 92 | " " " | DRIVE | " " | 372 | " " " |
| 09 JAN 92 | " " " | DRIVE | " " | 33 | " " " |
| 10 JAN 92 | " " " | DRIVE | " " | 103 | " " " |
| 14 JAN 92 | " " " | DRIVE | " " | 40 | " " " |
| 15 JAN 92 | " " " | DRIVE | " " | 50 | " " " |
| 21 JAN 92 | " " " | DRIVE | " " | 5 | " " " |
| 22 JAN 92 | " " " | DRIVE | " " | 4 | SCATTERED |
| 23 JAN 92 | " " " | DRIVE | " " | 12 | " |
| 27 JAN 92 | " " " | DRIVE | " " | 5 | " |
| 28 JAN 92 | " " " | DRIVE | " " | 22 | " |
| 04 FEB 92 | " " " | DRIVE | " " | 29 | " |
| 05 FEB 92 | " " " | DRIVE | " " | 69 | " |
| 11 FEB 92 | " " " | DRIVE | " " | 132 | " |
| 12 FEB 92 | " " " | DRIVE | " " | 87 | " |
| 13 FEB 92 | " " " | DRIVE | " " | 266 | POCKET ADJACENT AREA #2 |
| 14 FEB 92 | " " " | DRIVE | " " | 18 | ALONG OLD TELE CABLE |
| 18 FEB 92 | " " " | 17 | " " | 110 | |
| " " " | " " " | SECTOR #2 | " " | 2 | SEE PLOT MAP |
| 19 FEB 92 | " " " | SECTOR #2 | " " | 1 | SEE PLOT MAP |
| " " " | " " " | 7A | " " | 9 | ALONG WASHBOAT |
| 21 FEB 92 | " " " | DRIVE | " " | 10 | |

| DATE | ORDNANCE | LOCATION (REF MAP) | CONDITION | QUANTITY | REMARKS |
|-----------|--------------------|-----------------------|-----------------|----------|-----------------|
| 25 FEB 92 | AKIA ADAPTOR/BOX | DRIVE | UNFUSED/RUSTY | 13 | RAIN WASHOUT |
| 03 MAR 92 | " " " | DRIVE | " " | 4 | |
| 05 MAR 92 | " " " | POWER LINE TRENCH | " " | 8 | SECTION #4 |
| 11 MAR 92 | " " " | TA | " " | 13 | RAIN WASHOUT |
| 18 MAR 92 | GRENADE, HAND MADE | SECTION #4 | UNFUSED/RUSTY | 1 | ***** |
| 19 MAR 92 | AKIA ADAPTOR/BOX | SECTION #4 | " " | 167 | |
| " " " | " " " | TA | " " | 64 | INSTANT BAKING |
| 26 MAR 92 | " " " | TA | " " | 3 | JACK HAMMER |
| 31 MAR 92 | " " " | TA | " " | 3 | UNDER DRIVE |
| " " " | " " " | SECTION #4 | " " | 2 | |
| 01 APR 92 | " " " | TA | " " | 18 | UNDER DRIVE |
| 03 APR 92 | " " " | TA | " " | 40 | UNDER DRIVE |
| 06 APR 92 | " " " | TA | " " | 138 | UNDER DRIVE |
| 07 APR 92 | " " " | SECTION #4 | " " | 4 | |
| " " " | " " " | TA | " " | 22 | UNDER DRIVE |
| 08 APR 92 | " " " | TA | " " | 1 | " " |
| 09 APR 92 | " " " | TA | " " | 2 | " " |
| 13 APR 92 | " " " | SECTION #4 | " " | 2 | |
| 14 APR 92 | ADAPTOR/BOX - EXPL | TA | 1 RESULT NET PL | 505 | |
| 16 APR 92 | AKIA ADAPTOR/BOX | TA | UNFUSED/RUSTY | 34 | WITHIN CONCRETE |
| 17 APR 92 | " " " | G.A. | " " | 15 | 12 IN FIL DIRT |
| 20 APR 92 | " " " | G.A. | " " | 285 | UNDER SIDEWALK |
| 21 APR 92 | " " " | G.A. | " " | 180 | " " |
| 22 APR 92 | " " " | " | " | 27 | " |
| 23 APR 92 | " " " | " | " | 17 | " |
| 24 APR 92 | " " " | " | " | 10 | " |
| 27 APR 92 | " " " | " | " | 3 | " |

Investigation of empty hand grenade discovered in the vicinity of tennis courts during the Area 17 investigation.

**EOD TECHNOLOGY
FORMER RARITAN ARSENAL PROJECT**

18 September 1991

SUBJECT: Memorandum for Record (Gym Site)

On 17 Sep 91 we returned to work from a four day break. During the break, a hand grenade (empty) had been found on the Middlesex College Campus in the area of the tennis courts. As I was checking the sites, I received a call from Dr. Chan, the Project Manager for IT, stating that Mr. Bob Nore, ACE, Huntsville, wanted to visit the site of the hand grenade discovery. We met at approximately 1000 hrs.

The people present at the meeting on site (The Gym Site) were:

- Dr. L. Chan, IT Corp.
- Mr. F. Javorka, IT Corp.
- Mr. R. Nore, ACE, Huntsville, AL
- Mr. T. McLaren, EODT

Mr. Nore was concerned that the site get immediate appropriate attention. After walking the site, the plan presented by Mr. Nore was to:

- Surface Sweep the area.
- Check the immediate grenade location w/ magnatomiter.
- Check any other suspicious areas w/ magnatomiter.
- Record "Hits".

The team from Site # 17 (Hank Hubbard, et al) was given this mission. At approximately 1100 hrs the team commenced operation.

The area was checked as per the original plan presented by Mr. Nore. No type of explosive ordnance was discovered. The operation was completed at approximately 1715 hrs.

On the morning of 18 Sep 91 Dr. L. Chan and Mr. F.

18 September 1991

Javorka were briefed on the results of the sweep.

It is my opinion that we (EODT) responded in a rapid, professional manor and met the needs of ACE, IT and Middlesex College. The Crew conducted the operation in a rapid and skilled manor that met the very highest standards.

Prepared by:



THOS A. McLAREN

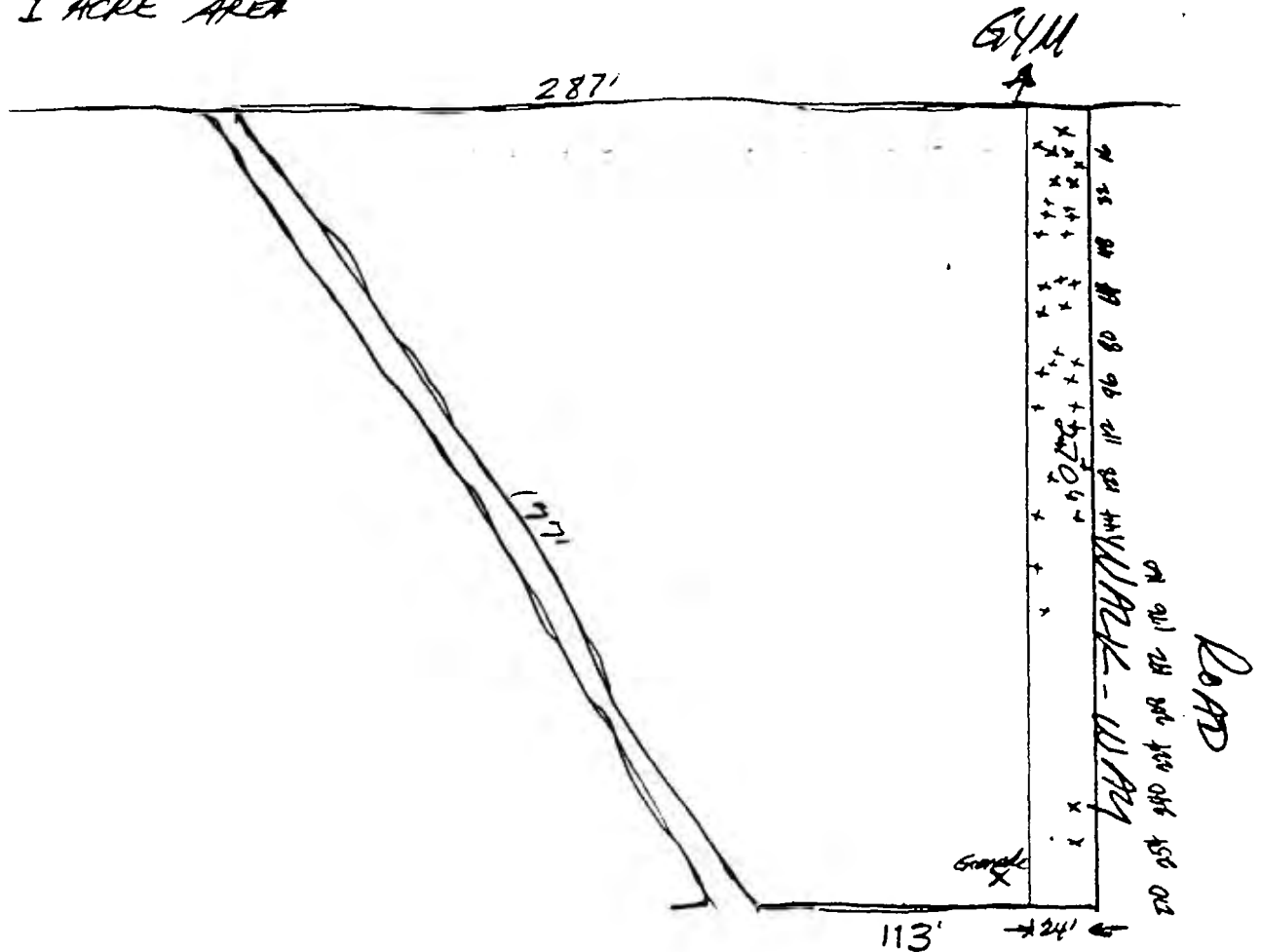
Senior Site Supervisor



By _____ Date _____ Subject GYM SITE Sheet No. _____ of _____

Chkd. By _____ Date EA GRID = 16' Proj. No. _____

APP 1 ACRE AREA



1. PERFORMED SURFACE SWEEP - NOTHING FOUND
2. MAGGED AREA AROUND WHERE GRENADE WAS FOUND (15' RADUS)
NOTHING - ORDNANCE RELATED FOUND
3. MAGGED APP 24' OF EASTERN EDGE ALONG (270') QUICK AND DIRTY,
44 HITS - DUG 25% OF THEM - ROCKS, WIRE, PIPE - NO
ORDNANCE RELATED ITEMS RECOVERED.
4. MAGGED APP 3500 SQ FT WITHIN THE AREA, APP 105 HITS,
DUG THEM ALL, ROCKS, PIPE, ETC. NO ORDNANCE RELATED
SCRAP FOUND.

SEP 16, 1991

MEMORANDUM FOR RECORD : EOOT RESPONSE TO MIDDLESEX
COMMUNITY COLLEGE, EDISON NEW JERSEY ON 14 SEP
1991.

PERSONNEL DISPATCHED : ED PINSON AND SAM NEWBERRY.

ORDNANCE RECOVERED : 1 EA., GRENADE, HAND, FRAGMENTATION
MK II. UNFUSED, WOODEN PLUG,
EMPTY.

SUMMARY : TEAM RESPONDED PER REQUEST OF DOUG
LAMONTHE, EOOT. TEAM DEPARTED MOTEL AT 1220 HRS
AND ARRIVED SITE AT 1245 HRS. SCENERY AND
CIRCUMSTANCES AT SITE AS DESCRIBED IN ATTACHED
OPERATIONS REPORT FROM CAMPUS POLICE. ITEM POSITIVE
I.D. AND DETERMINED SAFE TO HANDLE AND TRANSPORT.
DEPARTED SITE AT 1300 AFTER SEARCH OF IMMEDIATE
AREA FOR ADDITIONAL ITEMS. ITEM TAKEN TO MAG
STORAGE AREA IN SITE #16. WOODEN PLUG, REMOVED
AND ITEM FOUND TO BE EMPTY, ITEM SECURED IN
MAGAZINE AND TEAM DEPARTED SITE #16 AT
1350. ARRIVED MOTEL AT 1415.

AFTER ACTION : CALLED DOUG LAMONTHE TO REPORT ACTIONS TAKEN AND
ARRANGED MEETING BETWEEN CAMPUS POLICE, EDISON
POLICE AND LTC POIRIER, COE, FOR 0900 HRS

17 SEP 91 TO DISCUSS PROCEDURES AND PROPER
NOTIFICATION FOR EMERGENCY RESPONSE.

1 ATTACHMENT AS STATED.

Ed Pinson

ED PINSON

ECDI TEAM LEADER

OPERATIONS REPORT

DATE: SEPTEMBER 14, 1991

TIME OF INCIDENT: 1044 HOURS

LOCATION: WOODED AREA ON RIGHTSIDE OF WEST ROAD
BETWEEN GYM AND TENNIS COURTS.

INCIDENT: LIVE HAND-GRENADE
FOUND IN ~~TREE~~ STUMP.

ON THE ABOVE DATE AND TIME THIS OFFICER WAS DISPATCHED TO THE TENNIS COURTS AREA OFF WEST ROAD TO MEET A MAN IN REFERENCE TO A LIVE HAND-GRENADE HE HAD FOUND. AT 1045 HOURS THIS OFFICER ARRIVED AT THE LOCATION AND MET ALFRED BISPO AN EMPLOYEE OF SILAGY LANDSCAPING WHO LIVES AT 48 MEYER ROAD, EDISON, NJ (908) 819-8891 IN REFERENCE TO THE ABOVE MATTER. MR. BISPO DIRECTED THIS OFFICER TO THE WOODED AREA ON THE RIGHT SIDE OF WEST ROAD. MR. BISPO STATED THAT HE HAD WALKED INTO THE WOODS APPROXIMATELY 30 FEET FROM THE GRASS LINE HALF WAY BETWEEN THE TENNIS COURTS AND THE CURB OF THE STREET, WHILE LOOKING DOWN HE NOTICED WHAT APPEARED TO BE A GRENADE. MR. BISPO CALLED OVER HIS FELLOW WORKER AND BOTH MEN EXAMINED THE ITEM AND ONE EVEN KICKED IT ABOUT A FOOT FROM THE TREE STUMP IN WHICH IT WAS FOUND. THE TWO MEN NOTIFIED THIS DEPARTMENT.

AT THIS POINT THIS OFFICER AFTER LISTENING TO MR. BISPO CHECKED THE AREA AND FOUND WHAT APPEARED TO BE A HAND-GRENADE, THIS OFFICER THEN REQUESTED SGT. ELMYER FROM EDISON POLICE AT 1055 HOURS FOR ASSISTANCE. SGT. ELMYER ARRIVED AT 1112 HOURS AND ALSO EXAMINED THE AREA AND THE GRENADE.

SGT. ELMYER LEFT THE SCENE AND RESPONDED TO COLLEGE POLICE HEADQUARTERS TO TRY AND NOTIFY THE PERSONNEL WHO HAVE BEEN DIGGING UP THE MUNITIONS AT THE NORTH HALL AREA. THAT COMPANY IS E.O.D.T.. HOWEVER BEFORE DOING THAT SGT. ELMYER FIRST HAD TO CALL THE (I.T.) COMPANY FOR THEIR PHONE NUMBER AS WELL AS AUTHORIZATION TO HAVE THEM COME OUT.

AT 1132 THIS OFFICER REQUESTED OFFICER DIAKUNCZAK TO COME IN EARLY, ALSO FOR ASSISTANCE.

AT 1154 HOURS SGT. ELMYER MADE CONTACT WITH THE (I.T.) COMPANY REPRESENTATIVE WHO STATED THEY WOULD GET BACK TO HIM.

AT 1208 HOURS (I.T.) DID GET BACK AND E.O.D.T. WAS NOTIFIED AND STATED THEY WOULD BE OUT IN ABOUT A HALF HOUR. THEY ADVISED SGT. ELMYER TO SEAL OFF THE AREA WHICH WAS DONE PRIOR TO THEIR ARRIVAL.

AT 1246 HOURS ED PINSON OF E.O.D.T ARRIVED ON THE SCENE AFTER EXAMINING THE ITEM HE DETERMINED IT WAS A WORLD WAR II MK-II TYPE GRENADE. MR. PINSON ALSO STATED THAT IT DIDNOT HAVE A FUSE BUT APPEARED TO HAVE A SEALER PLUG WHICH MEANT IT COULD HAVE BEEN FILLED WITH ~~BLACK POWDER~~ BUT WAS NOT SURE AND FURTHER TESTING WOULD BE NEEDED TO PROVE THAT. *Explosive*

AT 1259 HOURS MR. PINSON LEFT THE AREA WITH THE GRENADE. THE AREA WAS TAPED OFF WITH POLICE LINE TAPE AND ALL OFFICERS CLEARED.

(615) 483-0007

FAX (615) 481-0653

EOD Technology, Inc.

UXO & Explosive Related
Services, Investigations, Remedial Actions

111 Robertsville Road
Oak Ridge, TN 37830

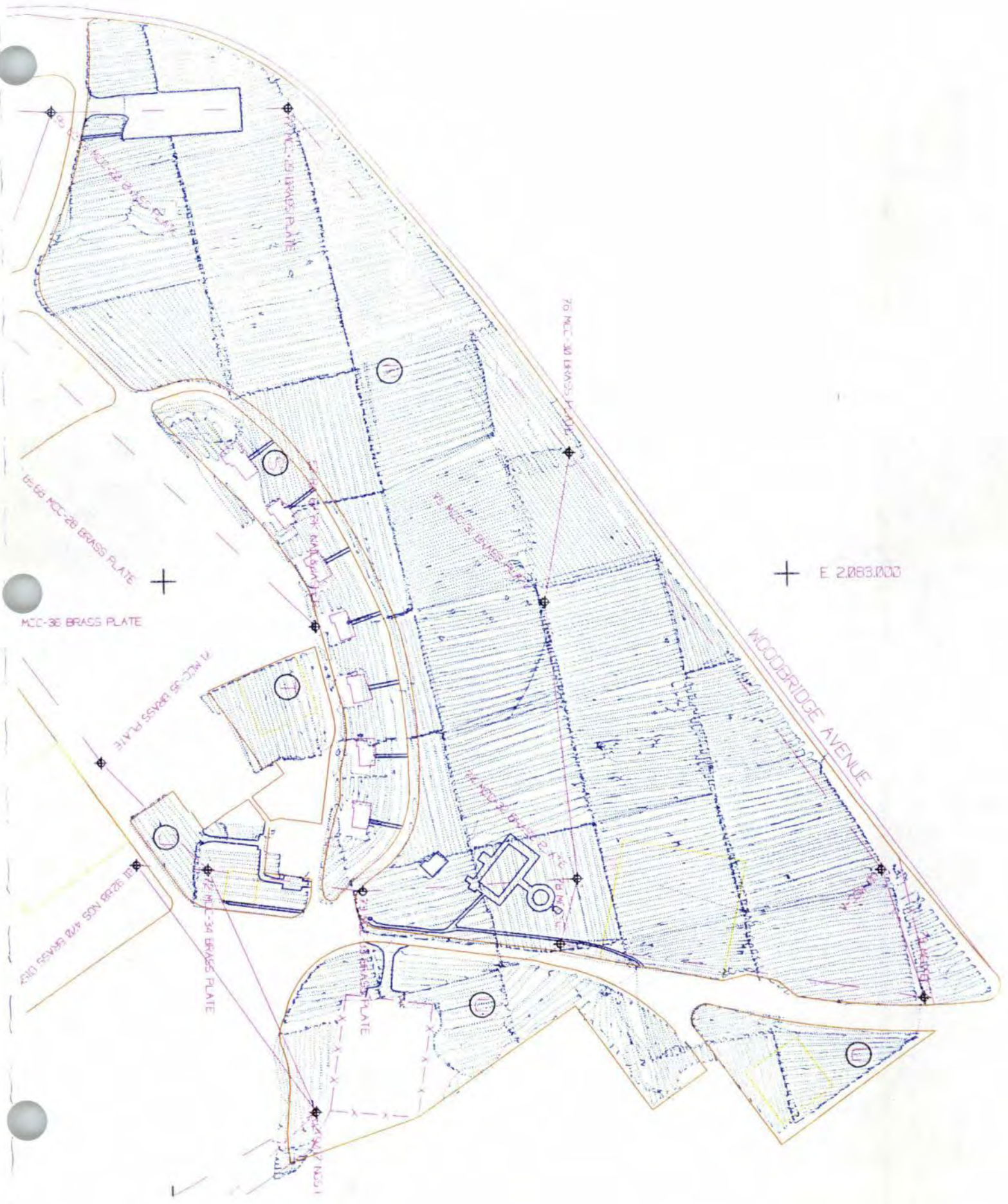
ED PINSON
Team Ldr. / Safety Supervisor
Master EOD Technician

Richard Chartier #117
PTL. RICHARD CHARTIER #117

APPENDIX B-3
1993 Geophysical Survey Coverage of MCC

Excerpts From:
EODT. 1993. Final Report for the Geophysical
Mapping and Sampling of Areas 2, 3, 4, 6, 8, 9,
10, 11, 13, 14, 15, 16, 16A, 18B, 18C, 18D, 19 and
MCC at the Former Raritan Arsenal,
Volumes I, II, and III.
November 1993

This page intentionally left blank.



E 2,052,000

E 2,053,000

WOODBRIDGE AVENUE

76 MCC-32 BRASS PLATE

75 MCC-24 BRASS PLATE

77 MCC-28 BRASS PLATE

86 BL-25 MCC-22 BRASS PLATE

87 BL-25 MCC-23 BRASS PLATE

78 MCC-36 BRASS PLATE

79 MCC-38 BRASS PLATE

72 MCC-54 BRASS PLATE

88 BL-25 NGS 472 BRASS DISK

74 MCC-34 BRASS PLATE

75 MCC-34 BRASS PLATE

76 MCC-34 BRASS PLATE

77 MCC-34 BRASS PLATE

78 MCC-34 BRASS PLATE

79 MCC-34 BRASS PLATE

80 MCC-34 BRASS PLATE

81 MCC-34 BRASS PLATE

82 MCC-34 BRASS PLATE

83 MCC-34 BRASS PLATE

84 MCC-34 BRASS PLATE

85 MCC-34 BRASS PLATE

86 MCC-34 BRASS PLATE

87 MCC-34 BRASS PLATE

88 MCC-34 BRASS PLATE

89 MCC-34 BRASS PLATE

90 MCC-34 BRASS PLATE

91 MCC-34 BRASS PLATE

92 MCC-34 BRASS PLATE

93 MCC-34 BRASS PLATE

94 MCC-34 BRASS PLATE

95 MCC-34 BRASS PLATE

96 MCC-34 BRASS PLATE

97 MCC-34 BRASS PLATE

98 MCC-34 BRASS PLATE

99 MCC-34 BRASS PLATE

100 MCC-34 BRASS PLATE

85 RA-65 PK NAILWASHER

85 RA-65 1/2" RS W/CAP

9 BRASS PLATE

20 BRASS PLATE

MCC-21 BRASS PLATE

(P)

ST. LOUIS PK. NAIL WASHING

(S)

85.68 MCC-28 BRASS PLATE

70 MCC-36 BRASS PLATE

98 MCC-26 BRASS PLATE

(D)

9 BRASS PLATE

20 BRASS PLATE

MCC-21 BRASS PLATE

85.68 MCC-28 BRASS PLATE

70 MCC-36 BRASS PLATE

98 MCC-26 BRASS PLATE



(P)

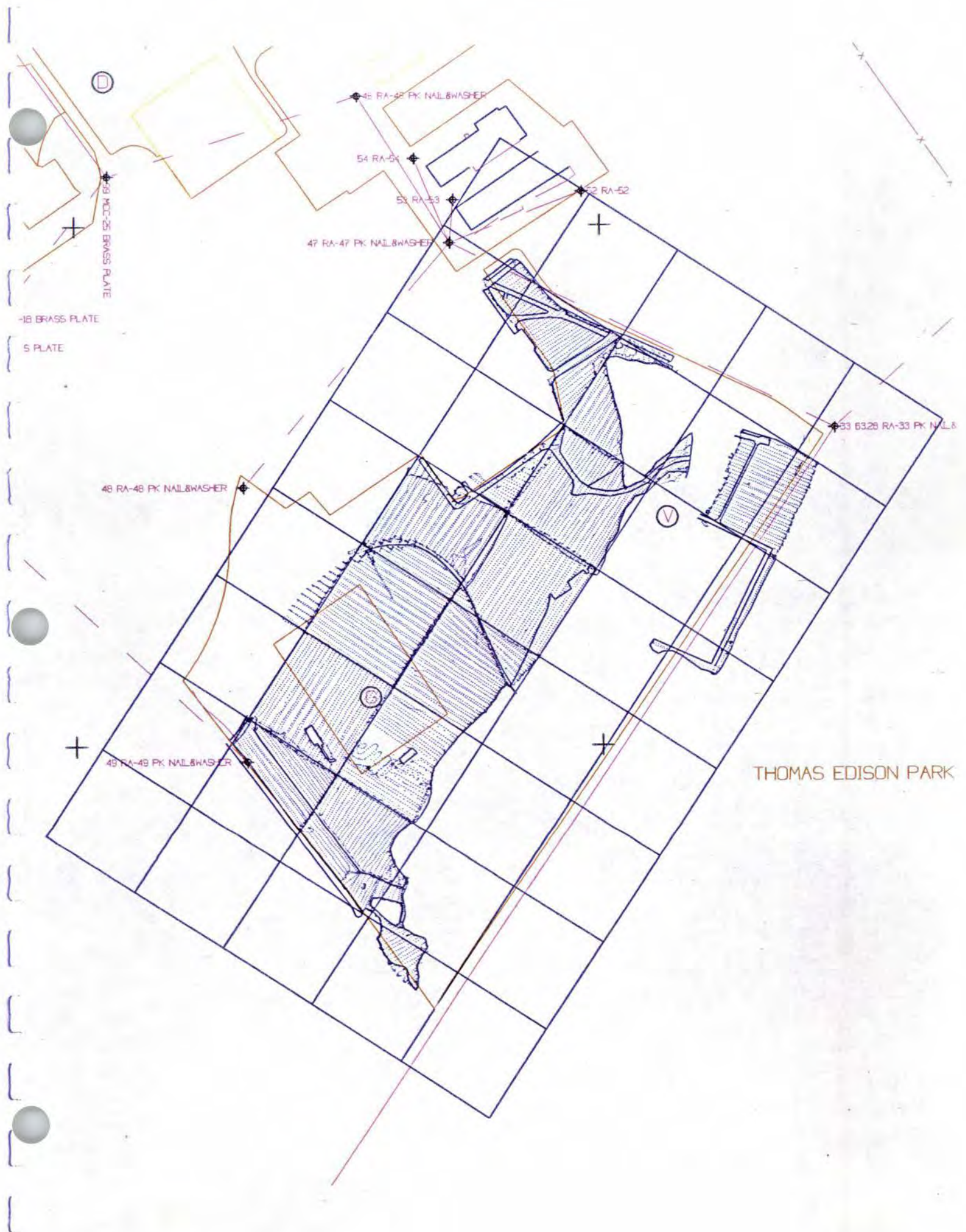
(Q)

(S)

(D)



ST. RAYD. FR. INAILGASHEN



THOMAS EDISON PARK

10



THOMAS EDISON PARK

57 RK-67 PK NAIL&WASHER

62 RA-62 PK NAIL&WASHER

T

72 MCC-34 BRASS PLATE

71 MCC-35 BRASS PLATE

J

+

67 MCC-28 BRASS PLATE

70 MCC-36 BRASS PLATE

98 MCC-29 BRASS PLATE

55 PK NAIL&WASHER

99 MCC-25 BRASS PLATE

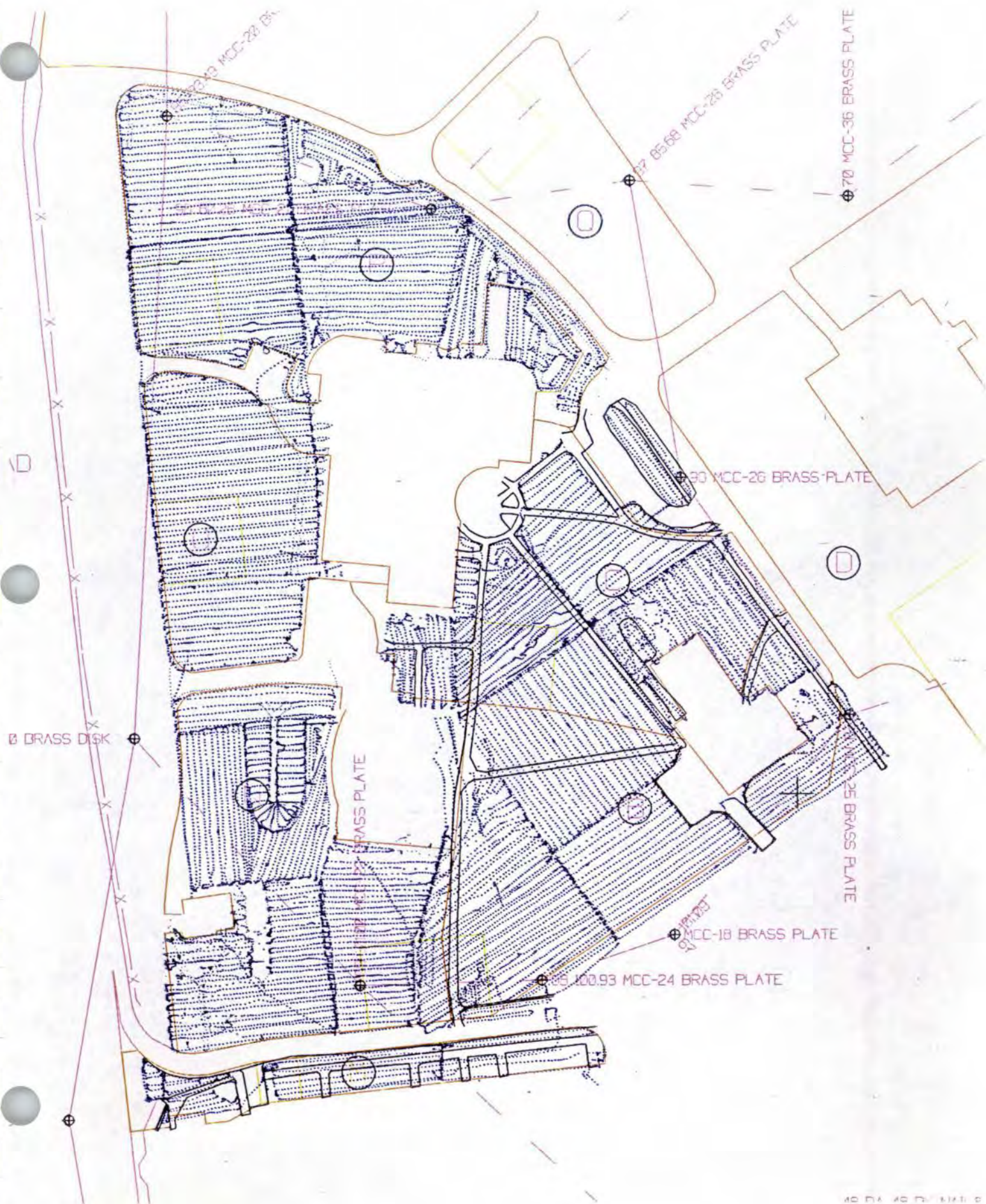
53 RA-53

47 RA-47 PK NAIL&WASHER

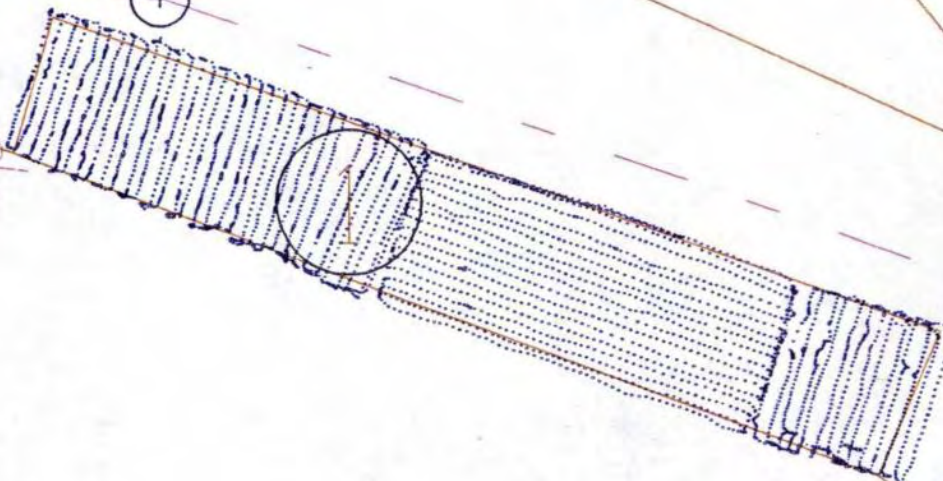
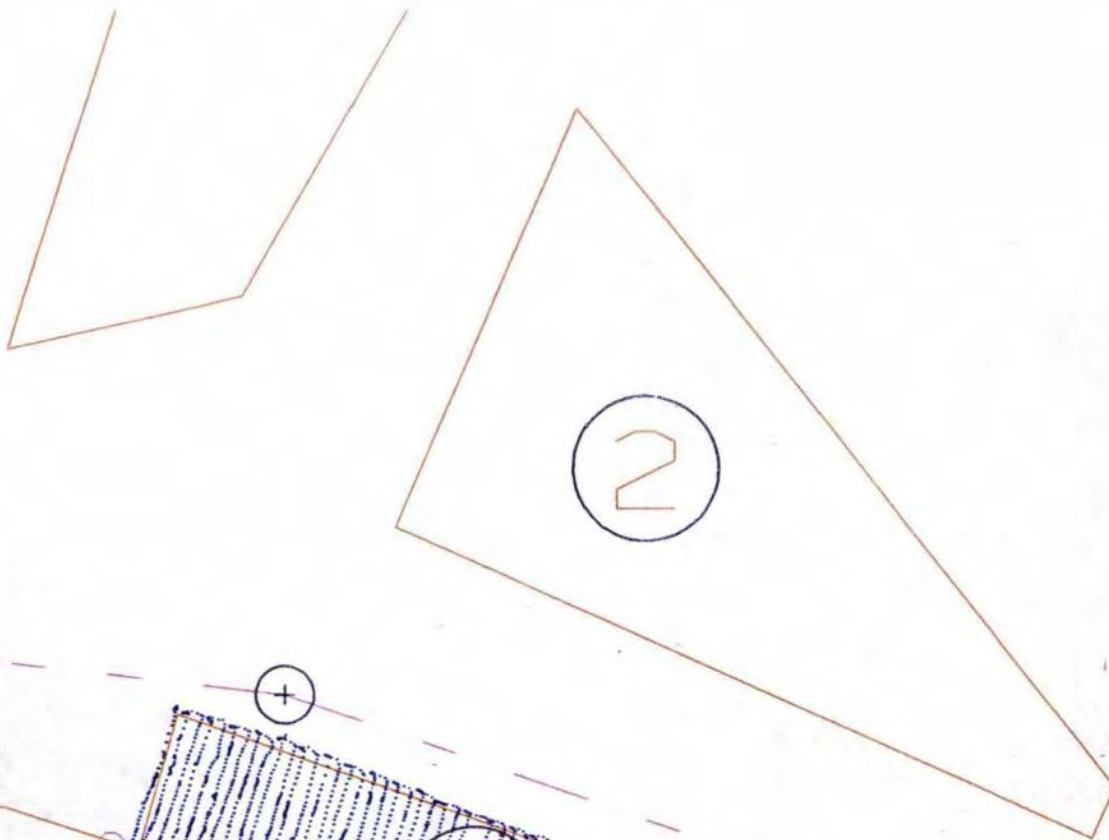
B

95 MCC-18 BRASS PLATE



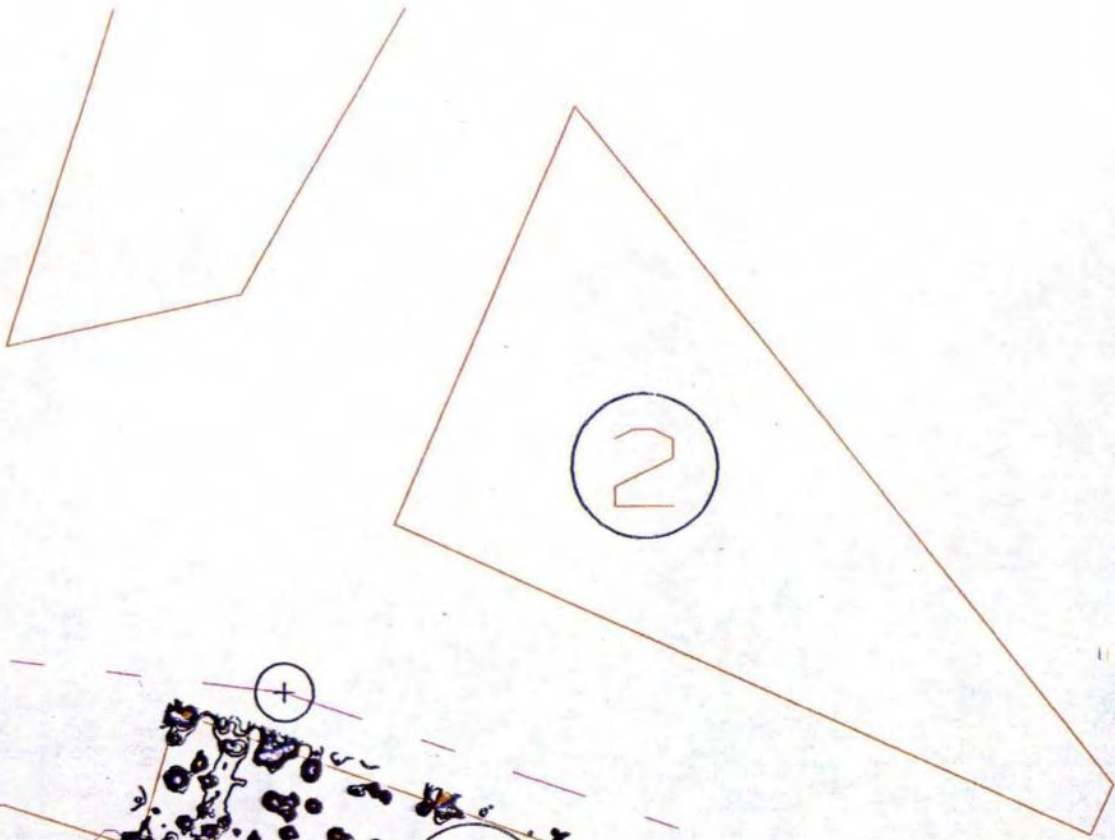






IL & WASHER

1572 RA-29A RR SPIKE



1572 RA-29A RR SPIKE

rt2

6

2

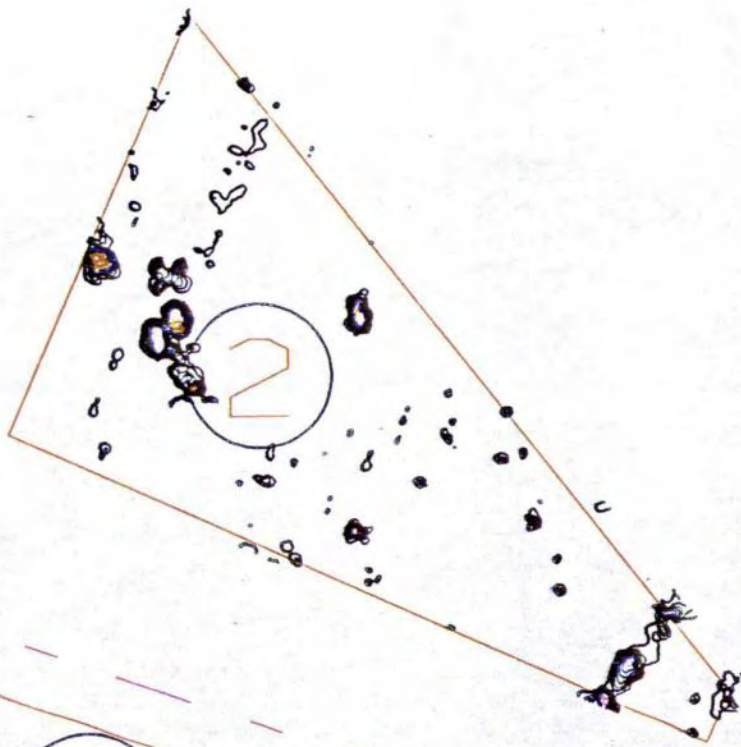
1



2 SPIKE

OTHER

6



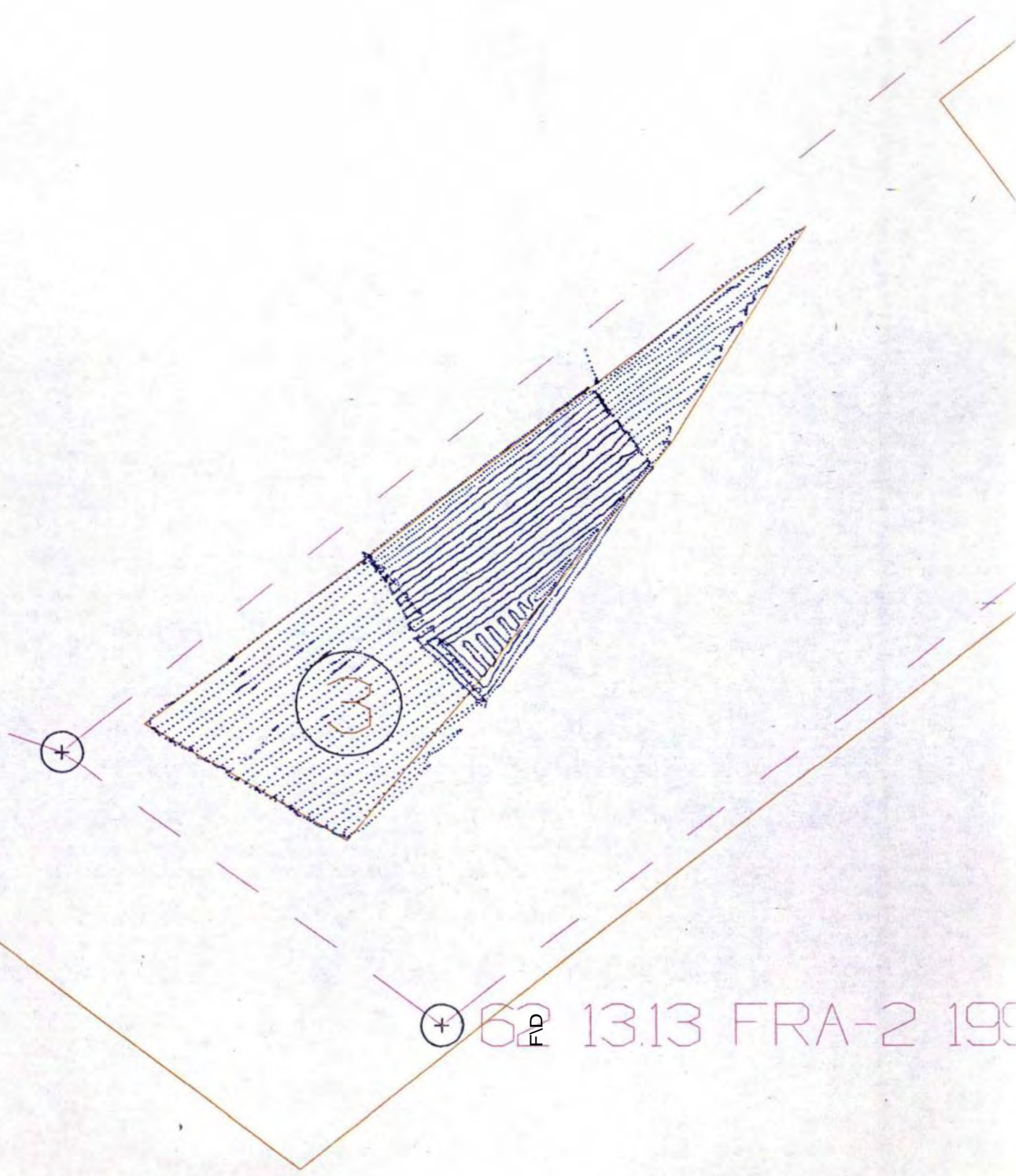
1



2 SPIKE

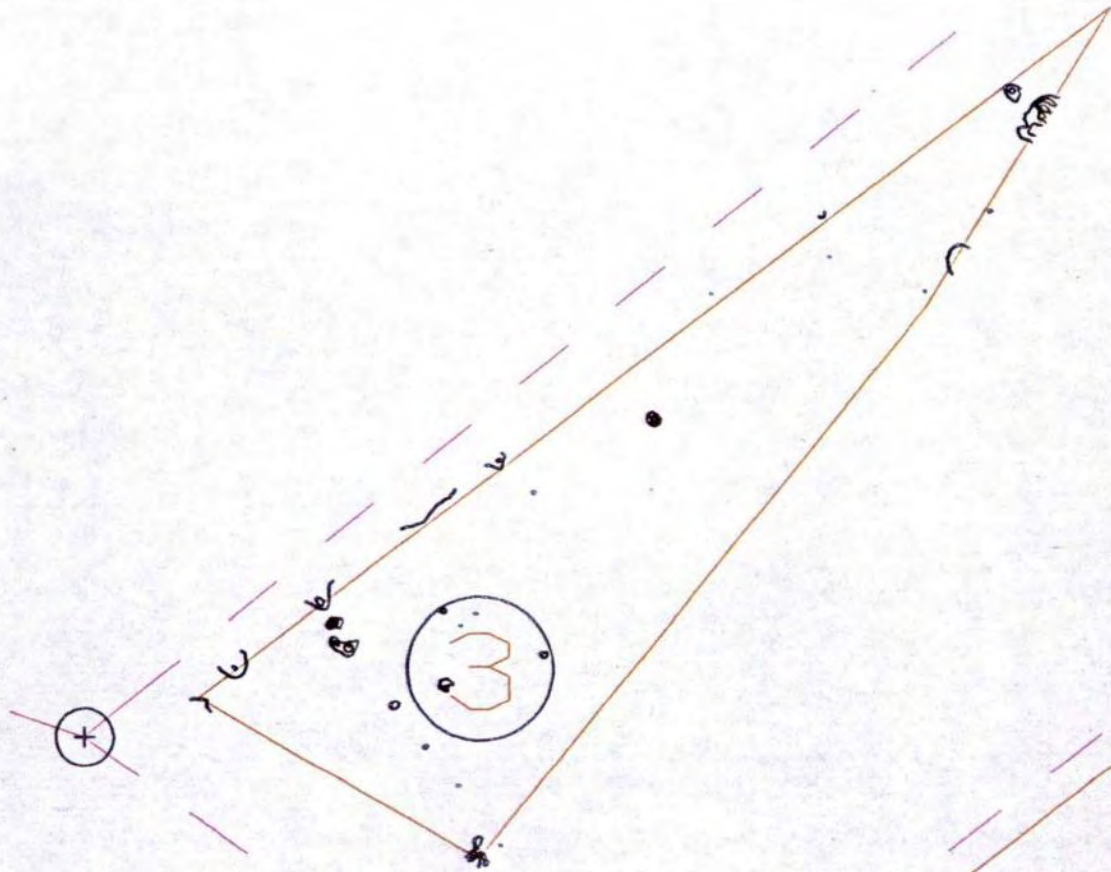
OTHER

42 RA-42 PK NAIL & WASHER



62 13.13 FRA-2 19C

42 RA-42 PK NAIL & WASHER



62 13.15 FRA-2 190

5

AIL & WASHER

+

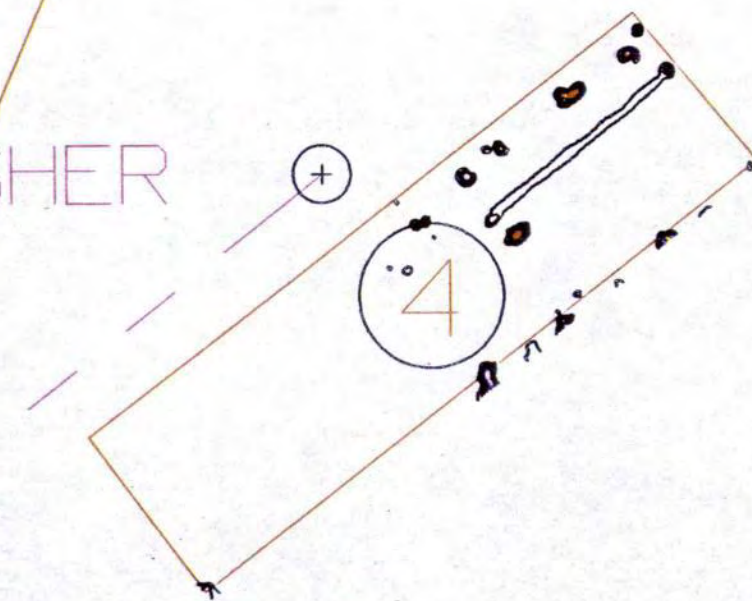
4

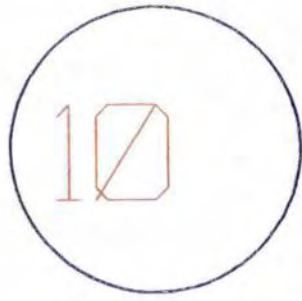
5

AIL&WASHER

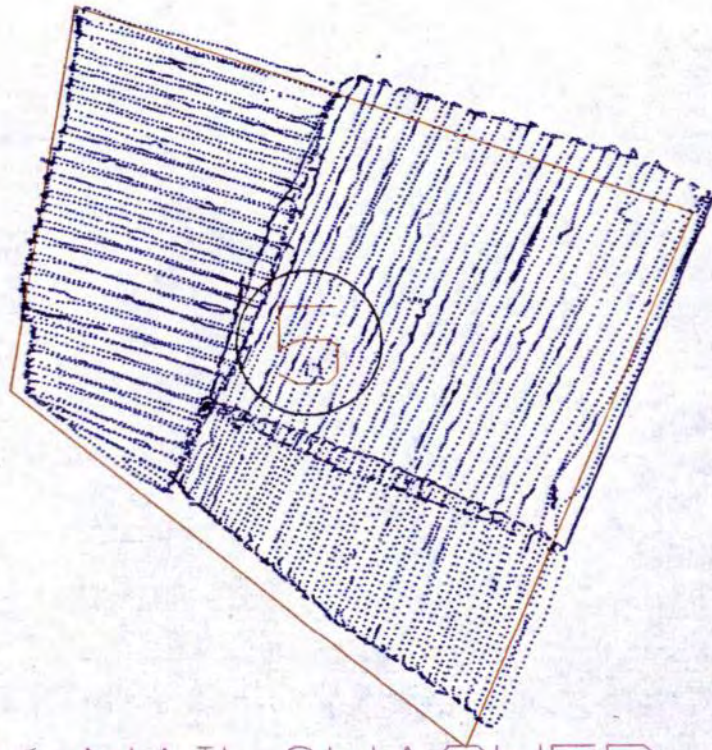
+

4



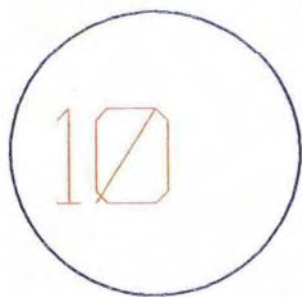


THOMAS EDISON PARK

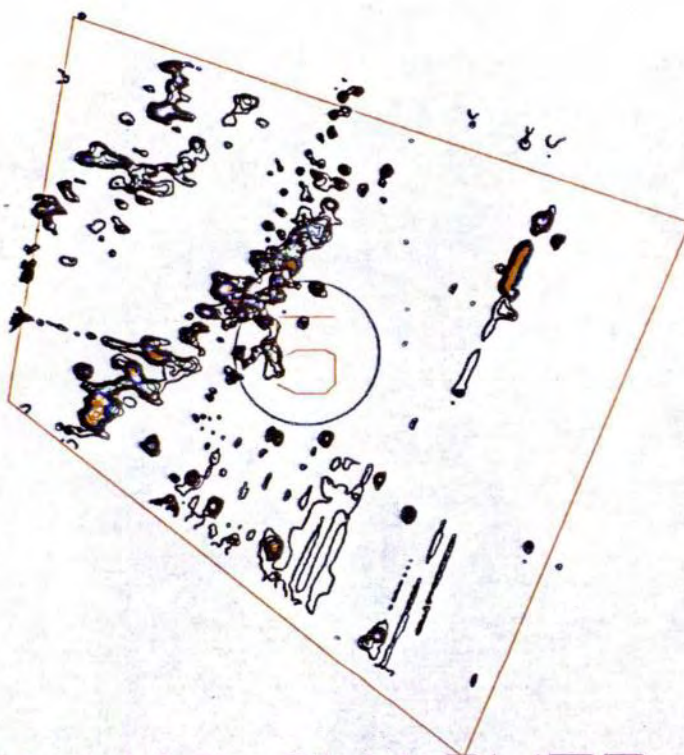


42 RA-42 PK NAIL & WASHER





THOMAS EDISON PARK



42 RA-42 PK NAIL & WASHER



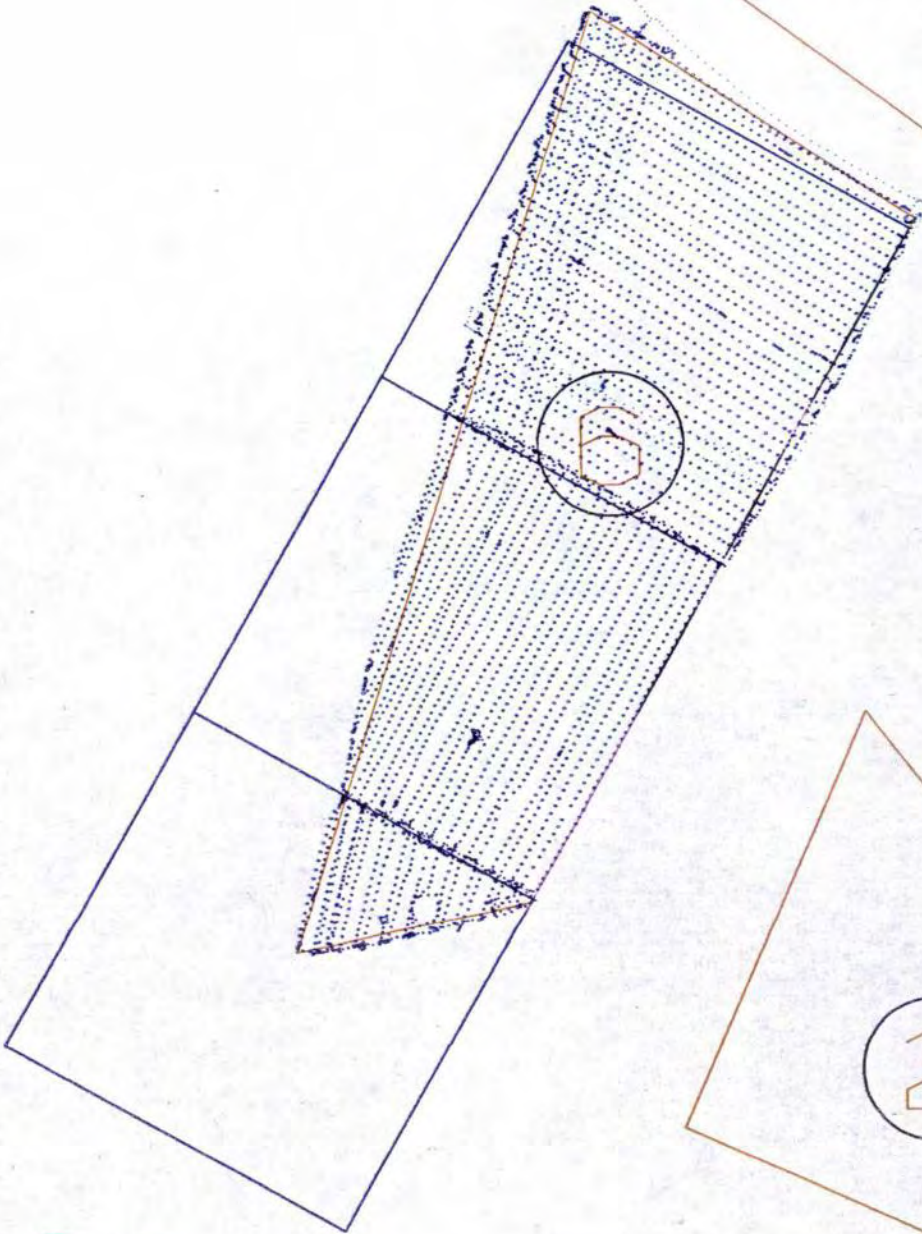
7

6

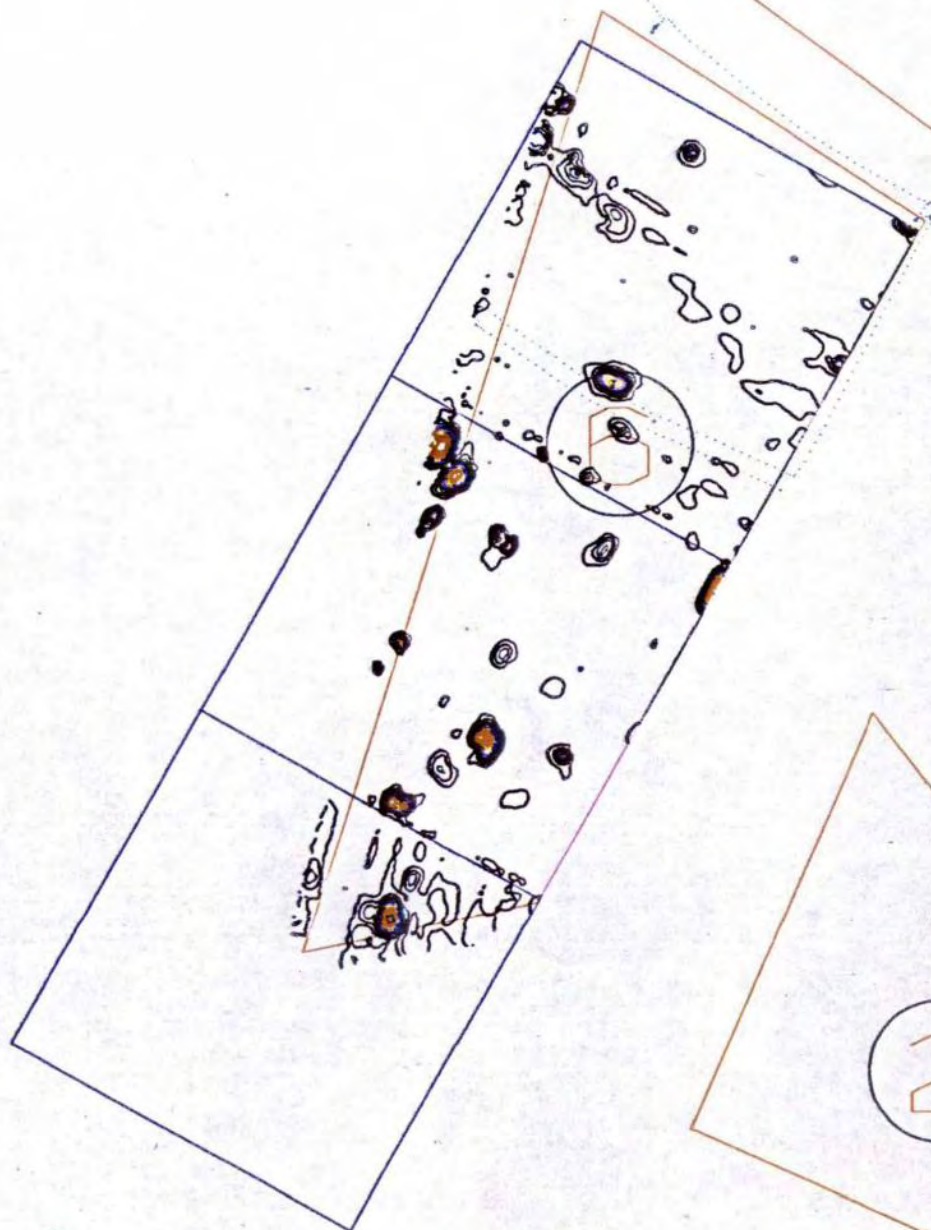
2

1

+

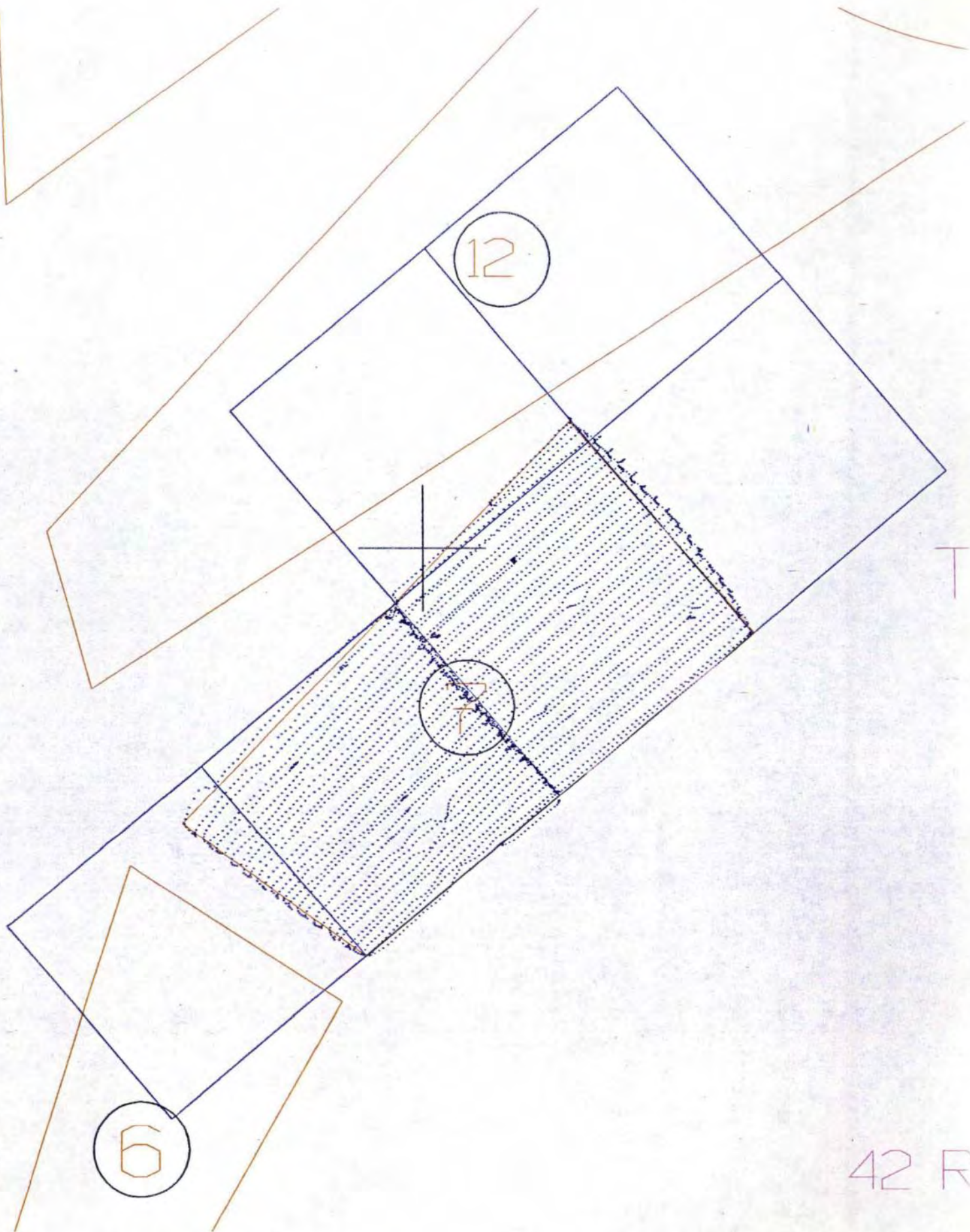


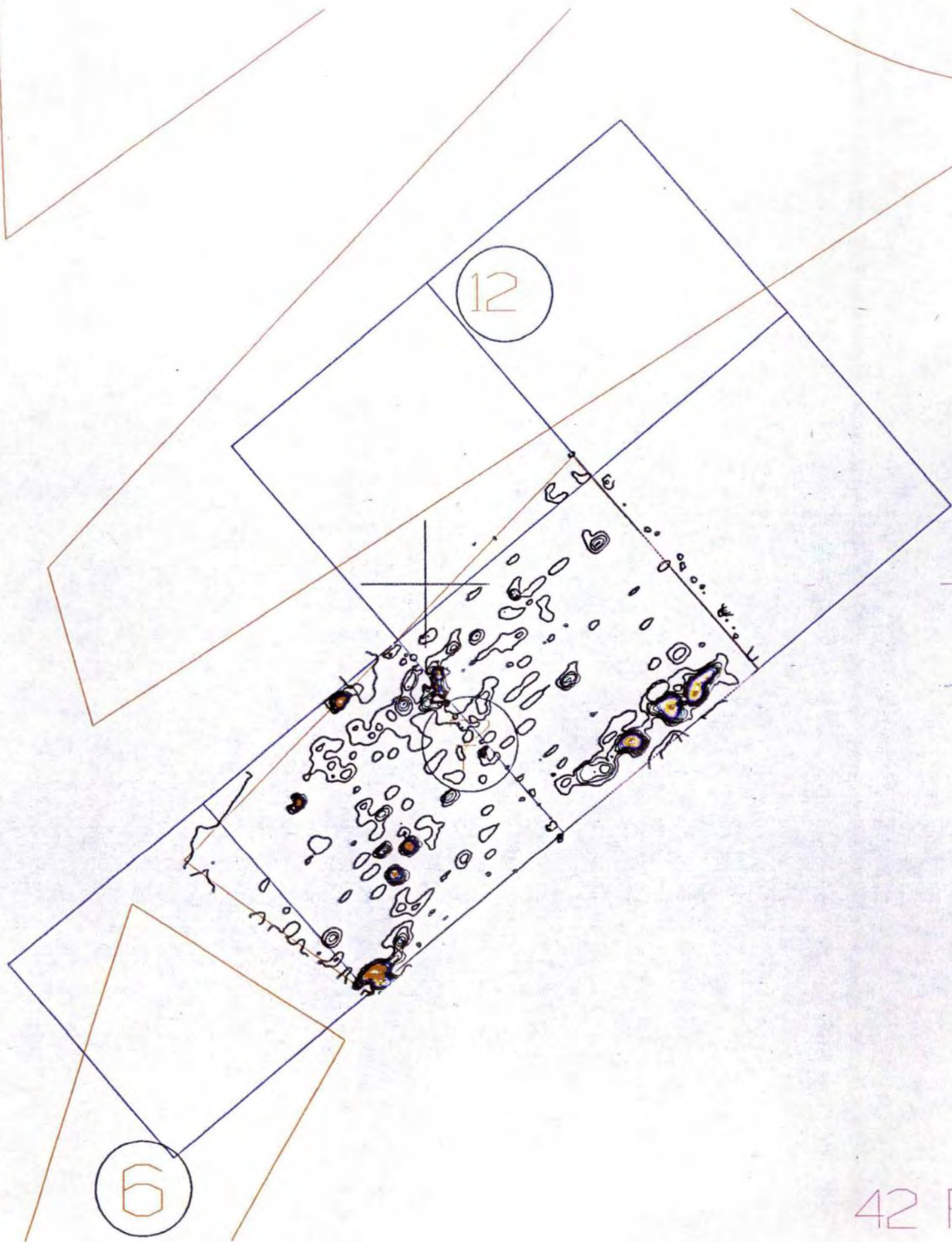
7

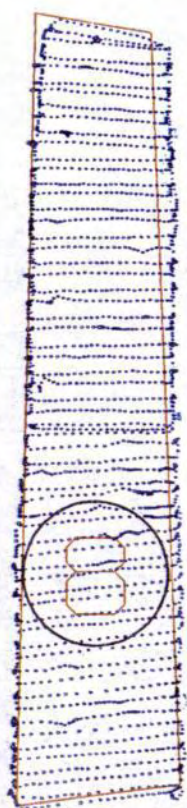


2

1

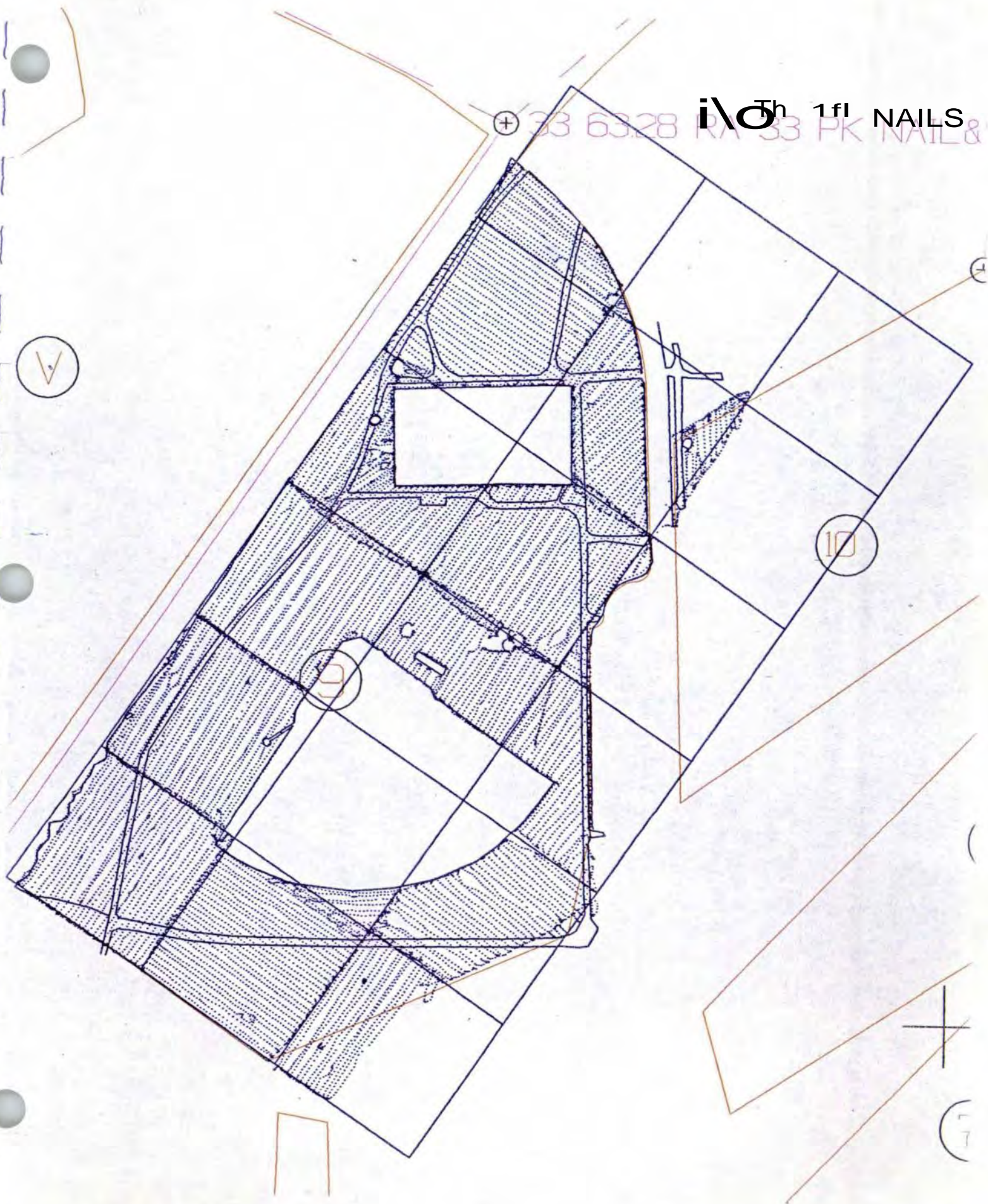








10th 1st NAILS

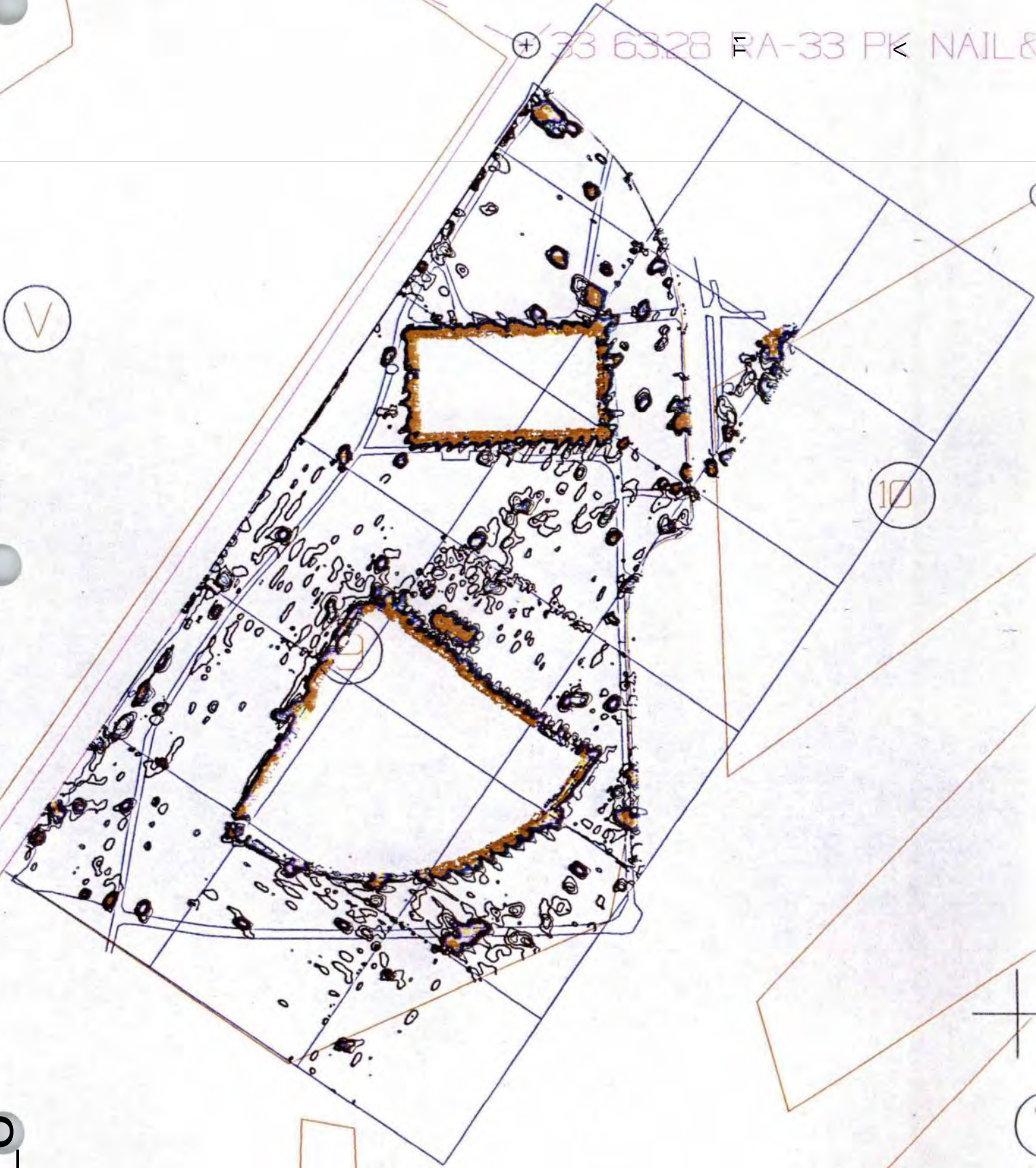


33 63.28 RA-33 PK NAIL 8

V

10

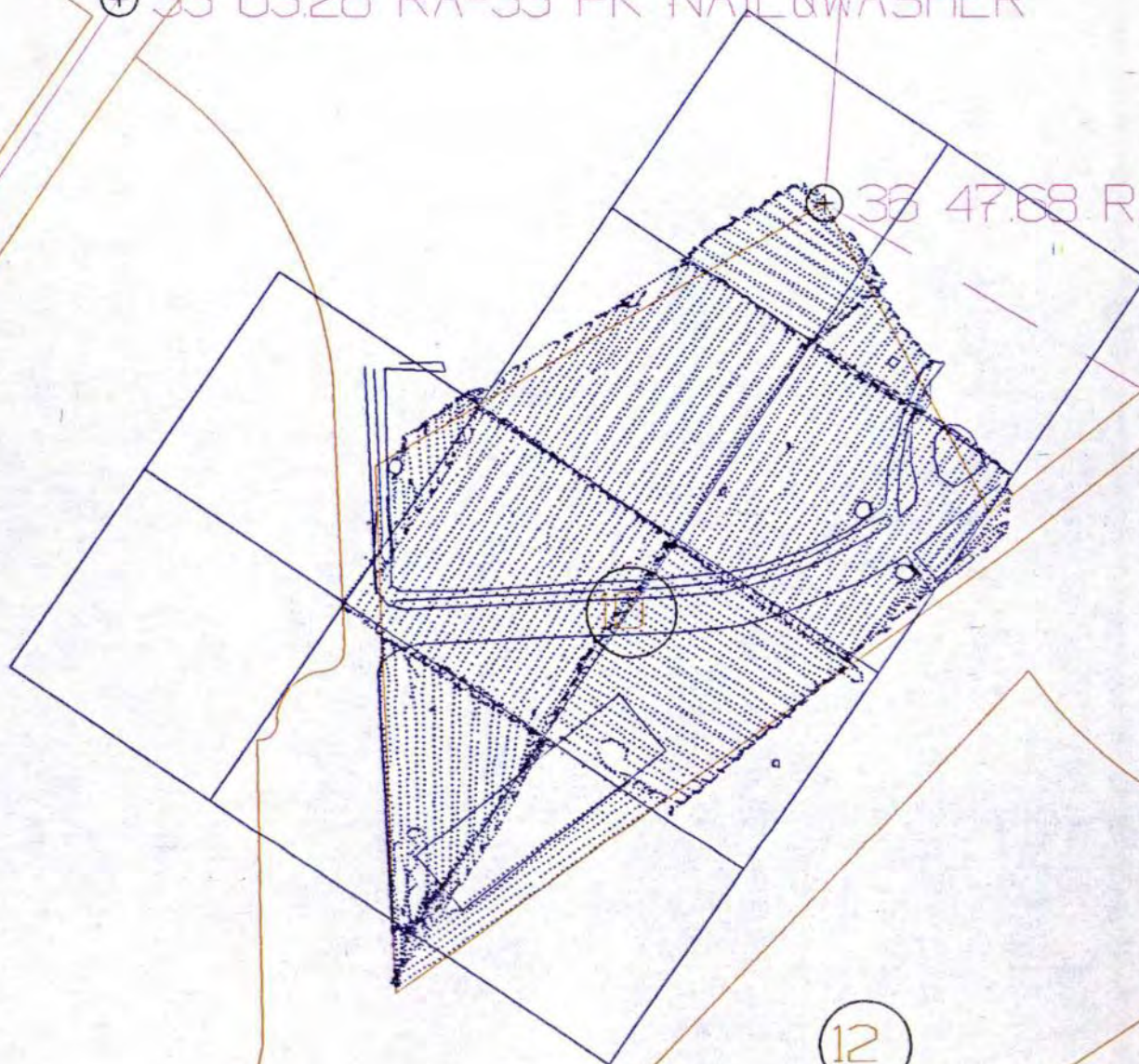
0



-34 60P NAIL W/LAP (+)

(+) 33 63.28 RA-33 PK NAIL&WASHER

(+) 36 47.68 RA-36



12

-34 60P NAIL W/CAP



+ 33 63.28 RA-33 PK NAIL & WASHER



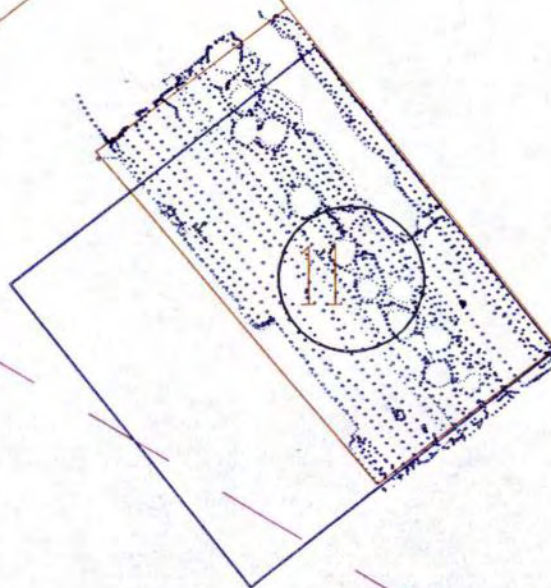
36 47.68 RA-36

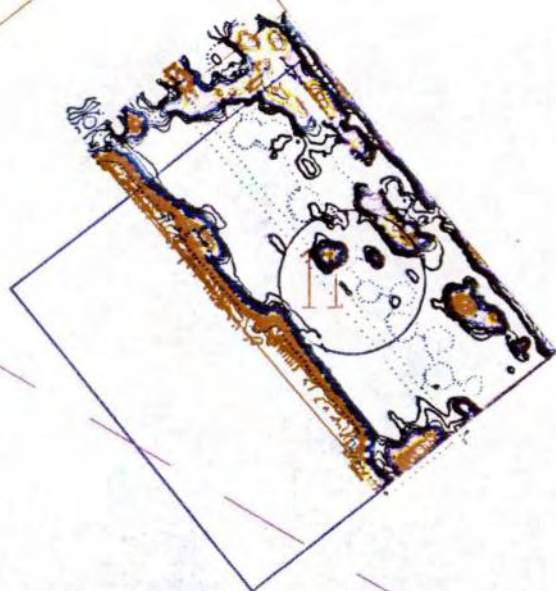


12



58 RA-36 1/2" RB W/ CAP





⊕ 36 47.68 RA-36 1/2" RB W/ C

11

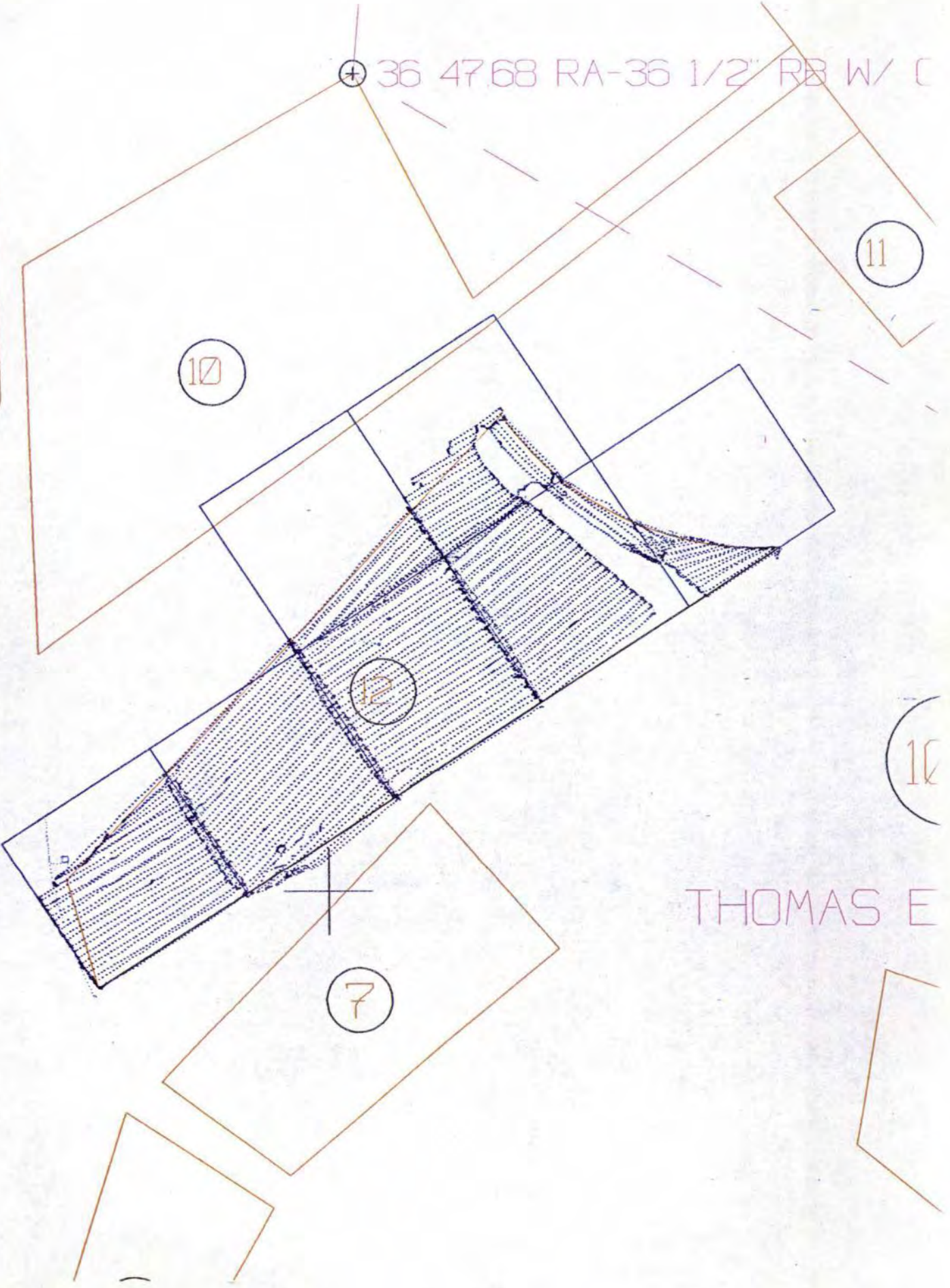
10

12

16

THOMAS E

7





36 47.68 RA-36 1/2" RB. W/ C

10

11

12

16

7

THOMAS E

⊕ bb b.

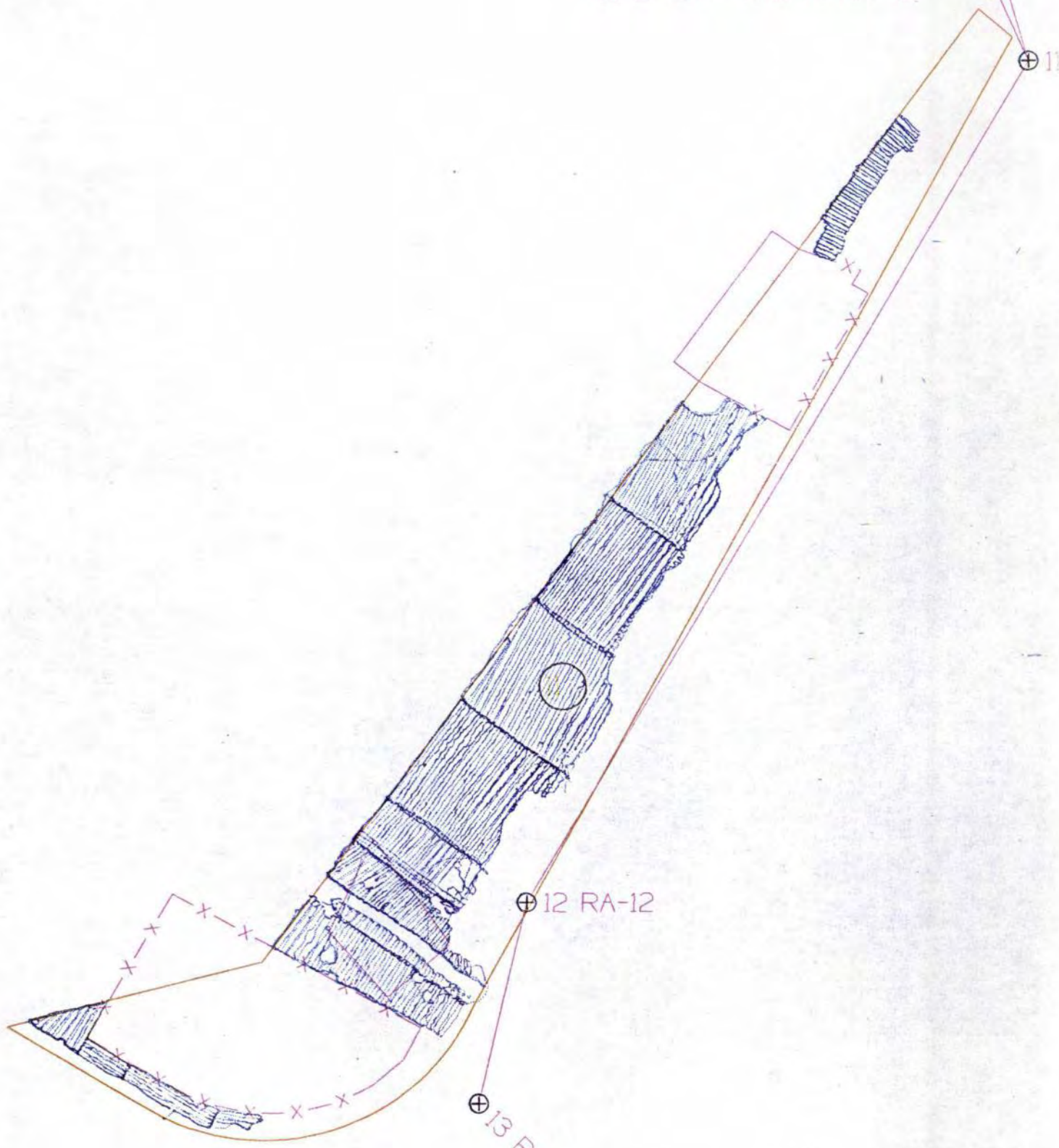
40 SPUR PT. 11-A/RA-40

⊕ 10-1

⊕ 11

⊕ 12 RA-12

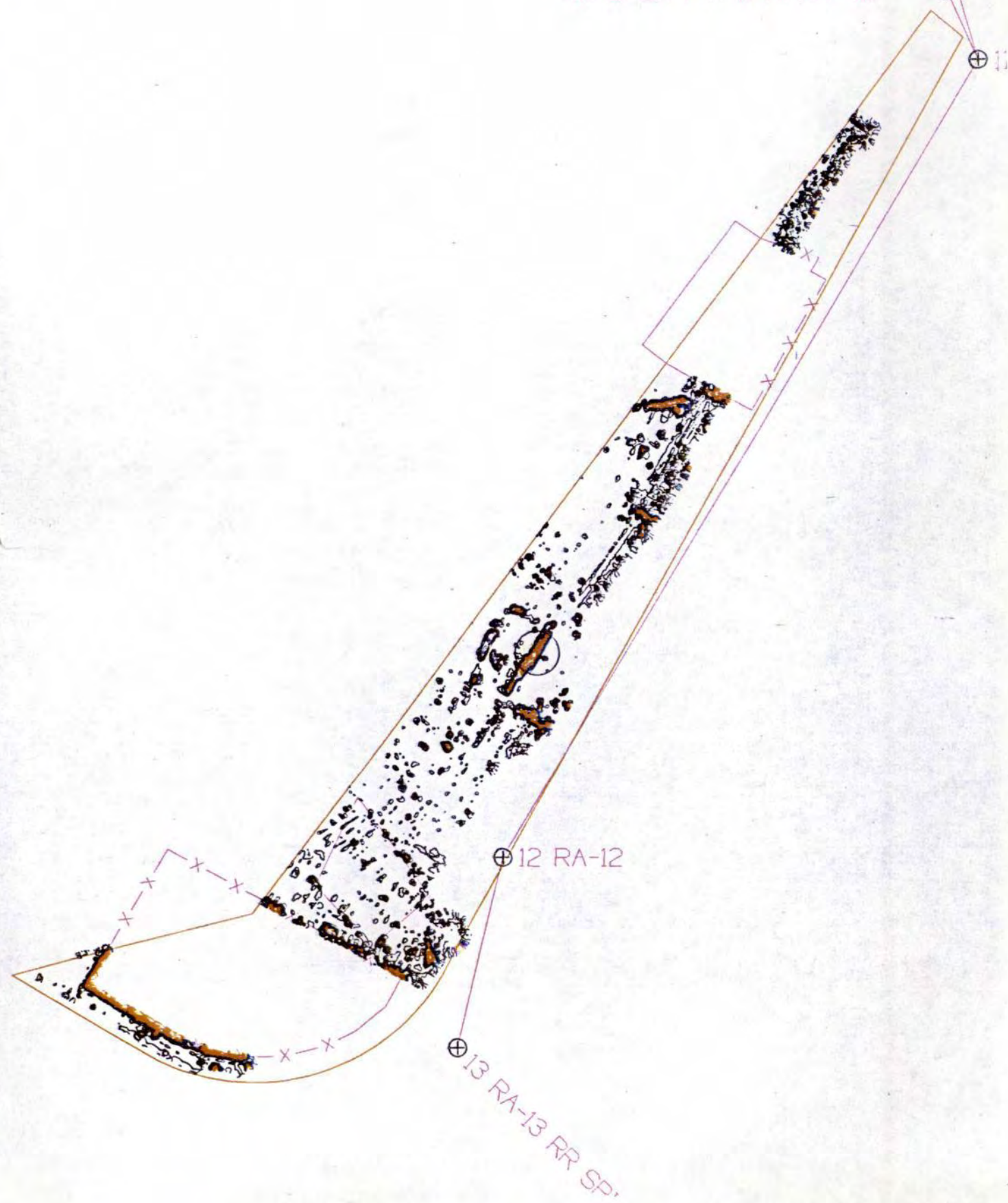
⊕ 13 RA-13 RR SP.



⊕ bb b

40 SPUR PT. 11-A/RA-40

⊕ 10
⊕ 11



APPENDIX B-4

Detail of MCC Area

Excerpt from:

**Foster Wheeler Environmental Corporation. 2000.
Draft Final Engineering Evaluation/Cost Analysis,
Former Raritan Arsenal.
Contract No. DACA 87-94-D-0020.
Delivery Order 0002.
April 2000.**

This page intentionally left blank.



Red annotations of Building 118 area from:
EOD Technology, Inc. (EODT). 1992. UXO Removal After-
Action Report, UXO Remediation Support Services, Former
Raritan Arsenal, Edison, New Jersey. May 1992.

LEGEND

----- AREA BOUNDARY
- - - - - AREA SUB-BOUNDARY

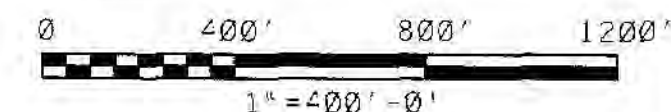
| AREA | TOTAL NO. OF ANOMALIES | NO. OF ANOMALIES SAMPLED | ORDNANCE FOUND |
|--------------------|------------------------|--------------------------|----------------|
| BLDG. 118 SECTOR 1 | 71 | 71 | NONE |
| BLDG. 118 SECTOR 2 | 128 | 128 | 3 |
| BLDG. 118 SECTOR 3 | 47 | 47 | NONE |
| BLDG. 118 SECTOR 4 | 883 | 883 | 184 |

(SEE TABLES 2-1, 2-2)

| AREA | TOTAL NO. OF ANOMALIES | NO. OF ANOMALIES SAMPLED | ORDNANCE FOUND |
|------|------------------------|--------------------------|--------------------------------|
| 17 | 7654 | * | 1 EA. SET OF 60MM MORTAR FIRMS |

MAG SURVEY IN 17 EXCEPT FOR PORTION BENEATH STUDENT CENTER
* EXPLORATORY TEST PITS INSTALLED TO ESTIMATE QUANTITY OF
OE IN AREA. EACH PIT 6x6x3 FT DEEP.

SCALE



CONSTRUCTION OF LOT 1A
1 EA 50 CAL CARTRIDGE FOUND

CONSTRUCTION OF LOT 2
1 EA ANTI-PERSONNEL BOMB FOUND

CONSTRUCTION OF SOFTBALL FIELD
NO OE ENCOUNTERED. LEAD
CONTAMINATION IN SOIL. SITE UNDER
REMEDICATION.

CONSTRUCTION OF PARKING LOT
2 EA 2.5 FT LONG OVAL-SHAPED
UXO FOUND (DEMO CHARGES)

THIS DRAWING PRODUCED ON MICROSTATION
DO NOT REVISE IT MANUALLY

US ARMY CORPS OF ENGINEERS

FORMER RARITAN ARSENAL
EDISON, NEW JERSEY

FIGURE 2-15
DETAILS OF MCC



FOSTER WHEELER ENVIRONMENTAL CORPORATION
LIVINGSTON, NEW JERSEY

This page intentionally left blank.

APPENDIX B-5:
MCC Email Regarding 500-lb Inert Bomb

This page intentionally left blank.

-----Original Message-----

From: Drost, Donald [<mailto:DDrost@middlesexcc.edu>]

Sent: Friday, April 24, 2015 9:30 AM

To: Sam Campanella

Cc: Dan Delmar; Henry Ossi; William Coyne; Carl Hillmann; Pietro, Sandra L NAN02; Goldfarb, Ronald; La Perla-Morales, Joann; Madama, Patrick; McCormick, Mark; Perkins, Susan

Subject: [EXTERNAL] UXO Finding

Confirming our conversation from earlier this morning, do not allow any further work in the retention basin area until we receive direction from the Army Corps of engineers. The item removed last night from the bottom of the retention basin has been identified as a WWII era 500 lb. general purpose bomb. It was not fused and the Air Force EOD specialists from the Air Force indicated last night that it did not pose a threat. They transported it to Fort Dix in a pickup truck. Media reports indicate that once at Fort Dix, it was determined to detonate the item last night.

dd

Donald R. Drost, Jr.

Executive Director, Facilities Management

Adjunct Instructor, Mathematics

MIDDLESEX COUNTY COLLEGE

2600 Woodbridge Avenue, Edison, New Jersey 08818-3050

732-906-2568 (v) 732-906-4199 (f)

DDrost@Middlesexcc.edu

This page intentionally left blank.

APPENDIX C

MRSPW Worksheets

This page intentionally left blank.

Table A

MRS Background Information

DIRECTIONS: Record the background information below for the MRS to be evaluated. Much of this information is available from Service and DoD databases. If the MRS is located on a FUDS property, the suitable FUDS property information should be substituted. In the **MRS Summary**, briefly describe the UXO, DMM, or MC that are known or suspected to be present, the exposure setting (the MRS's physical environment), any other incidental non munitions-related contaminants (e.g., benzene, trichloroethylene) found at the MRS, and any potentially exposed human and ecological receptors. If possible, include a map of the MRS.

Munitions Response Site Name: Former Raritan Arsenal

Component: U.S. Army Engineering and Support Center, Huntsville

Installation/Property Name: FUDS Project Number: C02NJ008403

Location (City, County, State): Edison, New Jersey

Name/Project Name (Project No.): Former Raritan Arsenal – Middlesex County College (Area 17, Area 17A, Area H, Area W, Area X, and Building 118) MEC Remedial Investigation (Contract: W912DR-13-D-0014, Delivery Order: DB03)

Date Information Entered/Updated: Friday, September 30, 2022

Point of Contact (Name/Phone): Jim Kelly (USACE, New England District) / (978) 318-8227

Project Phase (check only one):

| | | | | |
|-------------------------------|------------------------------|--|-----------------------------|------------------------------|
| <input type="checkbox"/> PA | <input type="checkbox"/> SI | <input checked="" type="checkbox"/> RI | <input type="checkbox"/> FS | <input type="checkbox"/> RD |
| <input type="checkbox"/> RA-C | <input type="checkbox"/> RIP | <input type="checkbox"/> RA-O | <input type="checkbox"/> RC | <input type="checkbox"/> LTM |

Media Evaluated (check all that apply):

| | |
|---|--|
| <input checked="" type="checkbox"/> Groundwater | <input type="checkbox"/> Sediment (human receptor) |
| <input checked="" type="checkbox"/> Surface soil | <input type="checkbox"/> Surface Water (ecological receptor) |
| <input type="checkbox"/> Sediment (ecological receptor) | <input type="checkbox"/> Surface Water (human receptor) |

MRS Summary:

The Middlesex County College (MCC) Area has been substantially redeveloped for use as college campus facilities since the land was used for activities associated with the former Arsenal. Based on numerous previous investigations and removal actions for Munitions and Explosives of Concern (MEC) at MCC, minimal potential exists for MEC exposure from the identified Investigation Areas (Areas 17, 17A, H, W, and X, and Building 118). The historical data also suggest that there is no longer an explosive risk at the MCC Area. Consequently, no action has been recommended for MEC.

Current and future receptors include Industrial/ Commercial Workers, Maintenance Workers, and MCC Students/ Staff. There is minimal habitat for wildlife in the MCC Area. Small patches of wooded areas exist on site; however, they are fragmented and not considered suitable ecological habitat.

MRS Description: Describe the munitions-related activities that occurred at the installation, the dates of operation, and the UXO, DMM, or MC known or suspected to be present. When possible, identify munitions, CWM, or MC by type:

General

The former Raritan Arsenal is located in Middlesex County, New Jersey, on the north bank of the Raritan River. Most of the land area of the former Arsenal lies within Edison Township and a smaller portion within Woodbridge Township. The former Arsenal was initially developed to facilitate military shipments during World War I with a principal function to store, handle, and ship various classes of ordnance and military supplies. The War Department assumed control of the land in December 1917, and arsenal construction was underway by the beginning of 1918. In March 1961, the DoD announced the proposed disposition of the former Arsenal, and in 1964, the General Services Administration began selling off the Arsenal property.

Currently, most of the former Raritan Arsenal property is privately owned and predominantly zoned for industrial use. The MCC was constructed in 1966 on approximately 169 acres located in the western portion of the former Raritan Arsenal. The area consists of the

Table A

MRS Background Information

DIRECTIONS: Record the background information below for the MRS to be evaluated. Much of this information is available from Service and DoD databases. If the MRS is located on a FUDS property, the suitable FUDS property information should be substituted. In the **MRS Summary**, briefly describe the UXO, DMM, or MC that are known or suspected to be present, the exposure setting (the MRS's physical environment), any other incidental non munitions-related contaminants (e.g., benzene, trichloroethylene) found at the MRS, and any potentially exposed human and ecological receptors. If possible, include a map of the MRS.

following areas of concern: Areas 17, 17A, H, W, X, and Building 118, and the remaining property of the MCC. The majority of the current buildings on the site were built in the 1960s and 1970s by the county for the college. However, several buildings remain on site that were originally constructed and used by the Army. These original buildings are currently used by the college for administrative purposes. New roads, parking lots, lighting, athletic fields, and utilities have also been constructed on site since the county acquired the property. The MCC area is currently highly developed with college campus facilities and infrastructure.

According to the 1991 and 1993 Archival Search Reports (ASRs) (Metcalf and Eddy, 1991¹ and Dames & Moore, 1993²), most of the MCC Area was historically used as a cantonment area and contained a hospital complex (Building 118). Historical munitions use in the area is not consistent with its cantonment area designation. A review of multiple site plans created throughout the Arsenal's period of active use revealed that additional structures and facilities included additional barracks, a golf course, a swimming pool, a school building, and other miscellaneous buildings, which have all since been demolished or repurposed for MCC use (Dames & Moore, 1993).

Munitions-Related Activities and Dates of Operation

Summary of the history of each area, presented in Section 1.3 of this MEC RI Report, is as follows:

Area 17: Area 17 is approximately 2 acres in size and was identified on a 1943 site plan within the MCC as a "Future Salvage Yard." Although the subsequent 1954 site plan did not reference this area, an adjacent area was identified as a "burning ground." Area 17 is located in the center of the MCC Area. It was reportedly used as a salvage yard for property disposal between the late 1940s and early 1960s, when Arsenal use was phased out. Ammunition components were reportedly among the scrap metal found at the site; however, no MEC has been discovered in the area.

Area 17A: Area 17A is approximately 0.5 acre located in the southeastern area of the MCC, in the outfield of a current campus baseball field. In 1993, an open burning area/pit was identified in historical aerial imagery from 1954. This location corresponded with the area designated as "burning ground" on the 1954 site plan and subsequently designated as Area 17A. It was reported that this burning ground was used primarily for decommissioning small arms by non-explosive means for sale as scrap.

Areas H, W, and X: Areas H, X, and W are located in the southern portion of the MCC; collectively, the area is approximately 25 acres. Area X is mostly undeveloped and covered by forest; Areas H and W are mostly paved and used by the MCC as parking lots. Historically, the collective area was the site of officers' quarters, barracks, a mess hall, a guard house, an administration building, a recreation building, and open land (Metcalf and Eddy, 1991). The areas were identified by the USACE as areas of potential contamination after reviewing the findings of the 1991 and 1993 ASRs. No known munitions-related activities occurred in these areas.

Building 118: The Building 118 area is approximately 4 acres located in the northern section of the MCC. The building is currently used by the college as an administrative building. According to the original 1918 site plans for the Arsenal, the area was occupied by hospital ward buildings. These buildings were abandoned by the end of 1921 and assumed to have been demolished prior to 1931, when the current Building 118 was built for use as a hospital. The hospital was actively used between 1931 and 1954 (Metcalf and Eddy, 1991).

MEC Investigations, Removal Actions, and MEC Type

- 1963 – LEAD issued a letter that described the decontamination of 17 ammunition areas at the former Raritan Arsenal. It was reported that all ammunition items were removed from Area 17 and the surface scarred with grader equipment to a depth of inches bgs specifically to uncover buried ammunition items. It was concluded that the area was not contaminated with explosive items and recommended that the area be released without restriction (Section 5.1 of the MEC RI Report).
- 1989 – O'Brien & Gere performed a "Contamination Evaluation" of the 17 Areas identified in the LEAD report. The evaluation included a review of the excavation and construction files from MCC campus construction activities and reported that no munitions-related articles were found during construction (Section 5.2 of the MEC RI Report).
- 1991 – Metcalf and Eddy, Inc. conducted an ASR of the MCC Area. It confirmed the use of Area 17 as a disposal site for ammunition and noted an area described as "burning grounds" on site plans from 1954. The ASR reported the following munitions related items having been found and removed from the MCC area (Section 5.3 of the MEC RI Report):
 - Building 118:
 - 1962 - Grenades at a depth > 3.5 ft bgs, Adapter boosters
 - 1987 – Several thousand adapter boosters

Table A

MRS Background Information

DIRECTIONS: Record the background information below for the MRS to be evaluated. Much of this information is available from Service and DoD databases. If the MRS is located on a FUDS property, the suitable FUDS property information should be substituted. In the **MRS Summary**, briefly describe the UXO, DMM, or MC that are known or suspected to be present, the exposure setting (the MRS's physical environment), any other incidental non munitions-related contaminants (e.g., benzene, trichloroethylene) found at the MRS, and any potentially exposed human and ecological receptors. If possible, include a map of the MRS.

- Southwest corner parking lots (Areas H, W, and X):
 - Area H: 2 large approximately 2.5 ft long oval shaped UXO (likely demolition charges)
 - Area W: 1 antipersonnel bomb (described as a pipe bomb)
 - Southern end of Parking Lot 1A: 1 - 0.50 caliber cartridge blank shell
 - Parking Lot 1A: 75 lb oval piece of ordnance (in 1975)
- Surrounding MCC Area:
 - Between Lot 4 and Lehigh Valley rail line between 1974 and 1976: Shells and machine gun components
 - Adjacent to Area 17: a 50 lb projectile found during construction of the Student Center
 - Outside of Main Hall in 1989: 100-200 detonators
 - Behind the gym area in 1991: an empty grenade
- 1992 – EOD Technology, Inc. (EODT) conducted a UXO removal action as part of the 1992 Final Report Former Raritan Arsenal Ordnance Removal Action by IT Corporation. The following MEC was removed (Section 5.4.1 of the MEC RI Report):
 - Building 118 Area:
 - 10 – non-explosive adapters for artillery projectiles recovered from 3 to 5 ft bgs.
 - 83,873 – adapter boosters
 - 1 – empty MKII hand grenade (unfuzed)
 - Area 17:
 - 60mm mortar fins (confirmed munitions debris)
 - Near MCC tennis courts:
 - 1 – empty hand grenade
- 1993 – EODT conducted geophysical mapping and sampling activities at MCC using Ultrasonic Ranging and Data Acquisition System Survey (USRADS®) technology. No MEC was recovered. (Section 5.7 of the MEC RI Report)
- 2000 – Foster Wheeler Environmental Corporation (Foster Wheeler) was contracted to perform an Engineering Evaluation/Cost Analysis (EE/CA) for ordnance removal actions at the former Raritan Arsenal. This report noted that an inert practice bomb was found in Area 17A at a depth greater than 20 ft bgs by Dames & Moore at the bottom of an HTRW excavation conducted in 1993. A qualitative risk evaluation was conducted for the MCC Area. All areas were classified as Low risk for current and future land use except for Building 118. Future land use for Building 118 was classified as High due to the potential for remaining subsurface MEC in currently inaccessible areas (i.e., beneath Building 118). Note: Information available from the Building 118 MEC removal reports in combination with the interviews presented in Section 5.11 of the MEC RI Report indicates that there is no credible evidence of MEC remaining in this area, and the EE/CA is deemed to be overly conservative. (Section 5.8 of the MEC RI Report).
- 2012 – Two landmines and one 3-ft long shell, both inert, were found and disposed of during construction of a light pole in the southwest corner of Parking Lot 2. (Section 5.10 of the MEC RI Report).
- 2014 – Avatar reviewed historical removal actions for Hazardous, Toxic, and Radioactive Waste (HTRW) contamination of soil in the MCC Area. The report revealed the following removal actions for soil (Section 5.9 of the MEC RI Report):
 - 17,500 cubic yards soil was removed from Area 17A and adjacent areas. No MEC was found.
 - 35 cubic yards of soil was removed to a depth of 9.5 ft bgs from an area outside of Raritan Hall during the removal of an underground storage tank was removed. No MEC was found.
 - 1,400 cubic yards of stained soil was removed along with numerous liquid and solid material filled drums from an area associated with Area W. An additional 606 cubic yards of affected material was removed from the area along with all stained soil observed above the perched water table (15 ft bgs). No MEC was found.
- 2015 – an inert World War II AN-M43 500 lb general purpose bomb was found during construction of a Student Services building in the southwest corner of the MCC Ecological Park (Section 5.10 of the MEC RI Report). The item was likely used as a driveway ornament during use of the area as cantonment (Section 5.11.2 of the MEC RI Report).

Interviews with MCC and Huntsville USACE personnel as well as geophysical investigations confirmed that all removal actions had been completed at MCC and no munitions were left in place. In summary, extensive efforts to find and remove known and suspected MEC have been conducted at the MCC. The above removals indicate that there is no realistic risk of exposure to MEC for both current

Table A

MRS Background Information

DIRECTIONS: Record the background information below for the MRS to be evaluated. Much of this information is available from Service and DoD databases. If the MRS is located on a FUDS property, the suitable FUDS property information should be substituted. In the **MRS Summary**, briefly describe the UXO, DMM, or MC that are known or suspected to be present, the exposure setting (the MRS's physical environment), any other incidental non munitions-related contaminants (e.g., benzene, trichloroethylene) found at the MRS, and any potentially exposed human and ecological receptors. If possible, include a map of the MRS.

and future receptors. Based on these findings, the MEC RI Report proposed that the MCC Area be carried forward as a single sub-MRS within the former Raritan Arsenal MRS, with a recommendation for No Further Action for MEC (Section 8 of the MEC RI Report).

¹ Metcalf and Eddy, Inc. 1991. *Archives Search Report for Middlesex County College and Thomas Edison Park, Former Raritan Arsenal, Edison, New Jersey*, 1 Volume.

² Dames & Moore, Inc. 1993. *Draft Archival Search Report, Former Raritan Arsenal, Edison, New Jersey. Volume 1, Sections 1-13, Volume 2, Appendix A-K.*

Table 1

EHE Module: Munitions Type Data Element Table

DIRECTIONS: Below are 11 classifications of munitions and their descriptions. Circle the score(s) that correspond with all munitions types known or suspected to be present at the MRS.

Note: The terms *practice munitions*, *small arms*, *physical evidence*, and *historical evidence* are defined in Appendix C of the Primer.

| Classification | Description | Score |
|--|---|----------|
| Sensitive | <ul style="list-style-type: none"> All UXO that are considered likely to function upon any interaction with exposed persons [e.g., submunitions, 40mm high-explosive (HE) grenades, white phosphorus (WP) munitions, high-explosive antitank (HEAT) munitions, and practice munitions with sensitive fuzes, but excluding all other practice munitions]. All hand grenades containing energetic filler. Bulk primary explosives, or mixtures of these with environmental media, such that the mixture poses an explosive hazard. | 30 |
| High explosive (used or damaged) | <ul style="list-style-type: none"> All UXO containing a high-explosive filler (e.g., RDX, Composition B), that are not considered "sensitive." All DMM containing a high-explosive filler that have: <ul style="list-style-type: none"> Been damaged by burning or detonation Deteriorated to the point of instability. | 25 |
| Pyrotechnic (used or damaged) | <ul style="list-style-type: none"> All UXO containing pyrotechnic fillers other than white phosphorous (e.g., flares, signals, simulators, smoke grenades). All DMM containing pyrotechnic fillers other than white phosphorous (e.g., flares, signals, simulators, smoke grenades) that have: <ul style="list-style-type: none"> Been damaged by burning or detonation Deteriorated to the point of instability. | 20 |
| High explosive (unused) | <ul style="list-style-type: none"> All DMM containing a high explosive filler that: <ul style="list-style-type: none"> Have not been damaged by burning or detonation Are not deteriorated to the point of instability. | 15 |
| Propellant | <ul style="list-style-type: none"> All UXO containing mostly single-, double-, or triple-based propellant, or composite propellants (e.g., a rocket motor). All DMM containing mostly single-, double-, or triple-based propellant, or composite propellants (e.g., a rocket motor) that are: <ul style="list-style-type: none"> Damaged by burning or detonation Deteriorated to the point of instability. | 15 |
| Bulk secondary high explosives, pyrotechnics, or propellant | <ul style="list-style-type: none"> All DMM containing mostly single-, double-, or triple-based propellant, or composite propellants (e.g., a rocket motor), that are deteriorated. Bulk secondary high explosives, pyrotechnic compositions, or propellant (not contained in a munition), or mixtures of these with environmental media such that the mixture poses an explosive hazard. | 10 |
| Pyrotechnic (not used or damaged) | <ul style="list-style-type: none"> All DMM containing a pyrotechnic fillers (i.e., red phosphorous), other than white phosphorous filler, that: <ul style="list-style-type: none"> Have not been damaged by burning or detonation Are not deteriorated to the point of instability. | 10 |
| Practice | <ul style="list-style-type: none"> All UXO that are practice munitions that are not associated with a sensitive fuze. All DMM that are practice munitions that are not associated with a sensitive fuze and that have not: <ul style="list-style-type: none"> Been damaged by burning or detonation Deteriorated to the point of instability. | 5 |
| Riot control | <ul style="list-style-type: none"> All UXO or DMM containing a riot control agent filler (e.g., tear gas). | 3 |
| Small arms | <ul style="list-style-type: none"> All used munitions or DMM that are categorized as small arms ammunition [Physical evidence or historical evidence that no other types of munitions (e.g., grenades, subcaliber training rockets, demolition charges) were used or are present on the MRS is required for selection of this category.]. | 2 |
| Evidence of no munitions | <ul style="list-style-type: none"> Following investigation of the MRS, there is physical evidence that there are no UXO or DMM present, or there is historical evidence indicating that no UXO or DMM are present. | <u>0</u> |
| MUNITIONS TYPE | DIRECTIONS: Record <u>the single highest score</u> from above in the box to the right (maximum score = 30). | <u>0</u> |

DIRECTIONS: Document any MRS-specific data used in selecting the *Munitions Type* classifications in the space provided.

Table 1

EHE Module: Munitions Type Data Element Table

DIRECTIONS: Below are 11 classifications of munitions and their descriptions. Circle the score(s) that correspond with all munitions types known or suspected to be present at the MRS.

Note: The terms *practice munitions*, *small arms*, *physical evidence*, and *historical evidence* are defined in Appendix C of the Primer.

| Classification | Description | Score |
|----------------|--|-------|
| | <p><i>The primary source of potential contamination at MCC is MEC resulting from DMM at several areas of interest: Area 17 (former salvage yard), Area 17A (former burning grounds for small arms munitions) and Building 118 (former hospital building). While some anomalies have been identified, historically, the MCC Area was used as a cantonment area for the former Raritan Arsenal and did not have a use directly associated with munitions. No MEC would result from small arms decommissioning by non-explosive means conducted in Area 17A. DMM may have resulted from different types of disposal activities at Area 17 which was used as a salvage yard for personal property between the 1940s and early 1960s. The area directly behind Building 118 was used as a disposal site for MEC, possibly recovered from the 1919 explosion of Magazine Building E-31 in Area 10, south of MCC in Thomas A. Edison County Park.</i></p> <p><i>Numerous geophysical investigations covering large areas of MCC and interim removal actions for HTRW-contaminated soil have been conducted across the area. The area-specific findings presented in detail in Section 5.0 are summarized below and on Figure 5-1.</i></p> <ul style="list-style-type: none"> <i>Area 17 was a former salvage and property disposal yard. A magnetometer survey was conducted in 1991-1992, including five test pits (6 x 6 x 3 feet deep). A single piece of MD was recovered but no MEC was discovered.</i> <i>Area 17A was a former burning ground reportedly used for the destruction of small arms ammunition by non-explosive means in the 1950s. In the mid to late 1990s, HTRW soil removal actions in this and adjacent MCC areas covered a combined area of approximately 3 acres. A single piece of MD was recovered (at a depth greater than 20 ft bgs) but no MEC was discovered.</i> <i>Building 118 was historically used as a hospital and is now an administration building for the college. Two magnetometer surveys and several MEC removal actions were performed at this site to remove buried adapter boosters. The removal action is complete, with no evidence of MEC remaining on site.</i> <i>In 1993, a magnetometer survey with USRADS® data logging was performed on the remaining landscaped areas of the college which surrounded Building 118 and Area 17A, selected anomalies were investigated. No MEC was recovered.</i> <i>Based on the 1993 ASR and available reports, there is no evidence to support disposal areas exist in the remaining undeveloped areas of the MCC property including wooded areas, and Areas H, W, and X.</i> <i>No reports of MEC or MD were reported during previous MCC site development activities.</i> | |

Table 2

EHE Module: Source of Hazard Data Element Table

DIRECTIONS: Below are 11 classifications describing sources of explosive hazards. Circle the score(s) that correspond with all sources of explosive hazards known or suspected to be present at the MRS.

Note: The terms *former range*, *practice munitions*, *small arms*, *physical evidence*, and *historical evidence* are defined in Appendix C of the Primer.

| Classification | Description | Score |
|--|---|----------|
| Former range | ♦ The MRS is a former military range where munitions (including practice munitions with sensitive fuzes) have been used. Such areas include: impact or target areas, associated buffer and safety zones, firing points, and live-fire maneuver areas. | 10 |
| Former munitions treatment (i.e., OB/OD) unit | ♦ The MRS is a location where UXO or DMM (e.g., munitions, bulk explosives, bulk pyrotechnic, or bulk propellants) were burned or detonated for the purpose of treatment prior to disposal. | 8 |
| Former practice munitions range | ♦ The MRS is a former military range on which only practice munitions without sensitive fuzes were used. | 6 |
| Former maneuver area | ♦ The MRS is a former maneuver area where no munitions other than flares, simulators, smokes, and blanks were used. There must be evidence that no other munitions were used at the location to place an MRS into this category. | 5 |
| Former burial pit or other disposal area | ♦ The MRS is a location where DMM were buried or disposed of (e.g., disposed of into a water body) without prior thermal treatment. | 5 |
| Former industrial operating facilities | ♦ The MRS is a location that is a former munitions maintenance, manufacturing, or demilitarization facility. | 4 |
| Former firing points | ♦ The MRS is a firing point, where the firing point is delineated as an MRS separate from the rest of a former military range. | 4 |
| Former missile or air defense artillery emplacements | ♦ The MRS is a former missile defense or air defense artillery (ADA) emplacement not associated with a military range. | 2 |
| Former storage or transfer points | ♦ The MRS is a location where munitions were stored or handled for transfer between different modes of transportation (e.g., rail to truck, truck to weapon system). | 2 |
| Former small arms range | ♦ The MRS is a former military range where only small arms ammunition was used [There must be evidence that no other types of munitions (e.g., grenades) were used or are present to place an MRS into this category.]. | 1 |
| Evidence of no munitions | ♦ Following investigation of the MRS, there is physical evidence that no UXO or DMM are present, or there is historical evidence indicating that no UXO or DMM are present. | <u>0</u> |
| SOURCE OF HAZARD | DIRECTIONS: Record <u>the single highest score</u> from above in the box to the right (maximum score = 10). | <u>0</u> |

DIRECTIONS: Document any MRS-specific data used in selecting the **Source of Hazard** classifications in the space provided.

Based on the wide coverage of the previous investigations, removal actions, and subsequent dense development of the area, the probability for MEC to remain at the surface or within the subsurface of the MCC is unlikely. Since a remaining source of MEC is absent, all exposure pathways between MEC and current and future receptors is incomplete. See Table 1 response for additional details.

Table 3

EHE Module: Location of Munitions Data Element Table

DIRECTIONS: Below are eight classifications of munitions locations and their descriptions. Circle the score(s) that correspond with all locations where munitions are located or suspected of being found at the MRS.

Note: The terms *surface*, *subsurface*, *physical evidence*, and *historical evidence* are defined in Appendix C of the Primer.

| Classification | Description | Score |
|--|--|----------|
| Confirmed surface | <ul style="list-style-type: none"> Physical evidence indicates that there are UXO or DMM on the surface of the MRS Historical evidence (e.g., a confirmed incident report or accident report) indicates there are UXO or DMM on the surface of the MRS. | 25 |
| Confirmed subsurface, active | <ul style="list-style-type: none"> Physical evidence indicates the presence of UXO or DMM in the subsurface of the MRS, and the geological conditions at the MRS are likely to cause UXO or DMM to be exposed, in the future, by naturally occurring phenomena (e.g., drought, flooding, erosion, frost, heat heave, tidal action), or intrusive activities (e.g., plowing, construction, dredging) at the MRS are likely to expose UXO or DMM. Historical evidence indicates that UXO or DMM are located in the subsurface of the MRS and the geological conditions at the MRS are likely to cause UXO or DMM to be exposed, in the future, by naturally occurring phenomena (e.g., drought, flooding, erosion, frost, heat heave, tidal action), or intrusive activities (e.g., plowing, construction, dredging) at the MRS are likely to expose UXO or DMM. | 20 |
| Confirmed subsurface, stable | <ul style="list-style-type: none"> Physical evidence indicates the presence of UXO or DMM in the subsurface of the MRS and the geological conditions at the MRS are not likely to cause UXO or DMM to be exposed, in the future, by naturally occurring phenomena, or intrusive activities at the MRS are not likely to cause UXO or DMM to be exposed. Historical evidence indicates that UXO or DMM are located in the subsurface of the MRS and the geological conditions at the MRS are not likely to cause UXO or DMM to be exposed, in the future, by naturally occurring phenomena, or intrusive activities at the MRS are not likely to cause UXO or DMM to be exposed. | 15 |
| Suspected (physical evidence) | <ul style="list-style-type: none"> There is physical evidence (e.g., munitions debris, such fragments, penetrators, projectiles, shell casings, links, fins), other than the documented presence of UXO or DMM, indicating that UXO or DMM may be present at the MRS. | 10 |
| Suspected (historical evidence) | <ul style="list-style-type: none"> There is historical evidence indicating that UXO or DMM may be present at the MRS. | 5 |
| Subsurface, physical constraint | <ul style="list-style-type: none"> There is physical or historical evidence indicating that UXO or DMM may be present in the subsurface, but there is a physical constraint (e.g., pavement, water depth over 120 feet) preventing direct access to the UXO or DMM. | 2 |
| Small arms (regardless of location) | <ul style="list-style-type: none"> The presence of small arms ammunition is confirmed or suspected, regardless of other factors such as geological stability [There must be evidence that no other types of munitions (e.g., grenades) were used or are present at the MRS to place an MRS into this category.]. | 1 |
| Evidence of no munitions | <ul style="list-style-type: none"> Following investigation of the MRS, there is physical evidence that there are no UXO or DMM present, or there is historical evidence indicating that no UXO or DMM are present. | <u>0</u> |
| LOCATION OF MUNITIONS | DIRECTIONS: Record <u>the single highest score</u> from above in the box to the right (maximum score = 25). | <u>0</u> |

DIRECTIONS: Document any MRS-specific data used in selecting the **Location of Munitions** classifications in the space provided

Based on the wide coverage of the previous investigations, removal actions, and subsequent dense development of the area, the probability for MEC to remain at the surface or within the subsurface of the MCC is unlikely. Since a remaining source of MEC is absent, all exposure pathways between MEC and current and future receptors is incomplete. See Table 1 response for additional details.

Table 4

EHE Module: Ease of Access Data Element Table

DIRECTIONS: Below are four classifications of barrier types that can surround an MRS and their descriptions. The barrier type is directly related to the ease of public access to any explosive material. Circle the score that corresponds with the ease of access to the MRS.

Note: The term *barrier* is defined in Appendix C of the Primer.

| Classification | Description | Score |
|---|---|-----------|
| No barrier | ♦ There is no barrier preventing access to any part of the MRS (i.e., all parts of the MRS are accessible). | <u>10</u> |
| Barrier to MRS access is incomplete | ♦ There is a barrier preventing access to parts of the MRS, but not the entire MRS. | 8 |
| Barrier to MRS access is complete but not monitored | ♦ There is a barrier preventing access to all parts of the MRS, but there is no surveillance (e.g., by a guard) to ensure that the barrier is effectively preventing access to all parts of the MRS. | 5 |
| Barrier to MRS access is complete and monitored | ♦ There is a barrier preventing access to all parts of the MRS, and there is active, continual surveillance (e.g., by a guard, video monitoring) to ensure that the barrier is effectively preventing access to all parts of the MRS. | 0 |
| EASE OF ACCESS | DIRECTIONS: Record the single highest score from above in the box to the right (maximum score = 10). | <u>10</u> |

DIRECTIONS: Document any MRS-specific data used in selecting the **Ease of Access** classification in the space provided.

The current land use of the MCC Area consists of a mix of institutional (college) with associated residential and recreational uses. Future land use is anticipated to remain similar. No known access restrictions (fencing, signage, etc.) are in place at the MCC Area. Based on current and anticipated future land use and access conditions, the risk assessment assumed "Regular" access (e.g., daily use, open access).

Table 5

EHE Module: Status of Property Data Element Table

DIRECTIONS: Below are three classifications of the status of a property within the Department of Defense (DoD) and their descriptions. Circle the score that corresponds with the status of property at the MRS.

| Classification | Description | Score |
|---|--|----------|
| Non-DoD control | ♦ The MRS is at a location that is no longer owned by, leased to, or otherwise possessed or used by DoD. Examples are privately owned land or water bodies; land or water bodies owned or controlled by state, tribal, or local governments; and land or water bodies managed by other federal agencies. | <u>5</u> |
| Scheduled for transfer from DoD control | ♦ The MRS is on land or is a water body that is owned, leased, or otherwise possessed by DoD, and DoD plans to transfer that land or water body to the control of another entity (e.g., a state, tribal, or local government; a private party; another federal agency) within 3 years from the date the rule is applied. | 3 |
| DoD control | ♦ The MRS is on land or is a water body that is owned, leased, or otherwise possessed by DoD. With respect to property that is leased or otherwise possessed, DoD must control access to the MRS 24 hours per day, every day of the calendar year. | 0 |
| STATUS OF PROPERTY | DIRECTIONS: Record <u>the single highest score</u> from above in the box to the right (maximum score = 5). | <u>5</u> |

DIRECTIONS: Document any MRS-specific data used in selecting the **Status of Property** classification in the space provided.

The MCC Area is owned by Middlesex County and contains the majority of the MCC campus. Most of the area is developed with college facilities and infrastructure, including recreational areas (baseball fields and tennis courts) and a few campus residences in the northern area of the college campus.

Table 6

EHE Module: Population Density Data Element Table

DIRECTIONS: Below are three classifications of population density and their descriptions. Determine the population density per square mile in the vicinity of the MRS and circle the score that corresponds with the associated population density.

Note: If an MRS is located in more than one county, use the largest population density value among the counties. If the MRS is within or borders a city or town, use the population density for the city or town, rather than that of the county.

| Classification | Description | Score |
|---------------------------------|---|----------|
| > 500 persons per square mile | ♦ There are more than 500 persons per square mile in the county in which the MRS is located, based on U.S. Census Bureau data. | <u>5</u> |
| 100–500 persons per square mile | ♦ There are 100 to 500 persons per square mile in the county in which the MRS is located, based on U.S. Census Bureau data. | 3 |
| < 100 persons per square mile | ♦ There are fewer than 100 persons per square mile in the county in which the MRS is located, based on U.S. Census Bureau data. | 1 |
| POPULATION DENSITY | DIRECTIONS: Record <u>the single highest score</u> from above in the box to the right (maximum score = 5). | <u>5</u> |

DIRECTIONS: Document any MRS-specific data used in selecting the **Population Density** classification in the space provided.

<https://nj.gov/health/fhs/primarycare/documents/Rural%20NJ%20density2015-revised%20municipalities.pdf>

Table 7

EHE Module: Population Near Hazard Data Element Table

DIRECTIONS: Below are six classifications describing the number of inhabited structures near the MRS. The number of inhabited buildings relates to the population near the hazard. Determine the number of inhabited structures within two miles of the MRS boundary and circle the score that corresponds with the associated population near the known or suspected hazard.

Note: The term *inhabited structures* is defined in Appendix C of the Primer.

| Classification | Description | Score |
|---------------------------------|--|----------|
| 26 or more inhabited structures | ♦ There are 26 or more inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both. | <u>5</u> |
| 16 to 25 inhabited structures | ♦ There are 16 to 25 inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both. | 4 |
| 11 to 15 inhabited structures | ♦ There are 11 to 15 inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both. | 3 |
| 6 to 10 inhabited structures | ♦ There are 6 to 10 inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both. | 2 |
| 1 to 5 inhabited structures | ♦ There are 1 to 5 inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both. | 1 |
| 0 inhabited structures | ♦ There are no inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both. | 0 |
| POPULATION NEAR HAZARD | DIRECTIONS: Record <u>the single highest score</u> from above in the box to the right (maximum score = 5). | <u>5</u> |

DIRECTIONS: Document any MRS-specific data used in selecting the **Population Near Hazard** classification in the space provided.

As seen on Figures 1-2 and 5-1 of the MEC RI, there are well over 26 buildings within the MRS and 2 miles of the MRS boundary.

Table 8

EHE Module: Types of Activities/Structures Data Element Table

DIRECTIONS: Below are five classifications of activities and/or inhabited structures near the hazard and their descriptions. Review the types of activities that occur and/or structures that are present within two miles of the MRS and circle the score(s) that correspond with all the activities/structure classifications at the MRS.

Note: The term *inhabited structure* is defined in Appendix C of the Primer.

| Classification | Description | Score |
|---|--|----------|
| Residential, educational, commercial, or subsistence | <ul style="list-style-type: none"> Activities are conducted, or inhabited structures are located up to two miles from the MRS's boundary or within the MRS's boundary, that are associated with any of the following purposes: residential, educational, child care, critical assets (e.g., hospitals, fire and rescue, police stations, dams), hotels, commercial, shopping centers, playgrounds, community gathering areas, religious sites, or sites used for subsistence hunting, fishing, and gathering. | <u>5</u> |
| Parks and recreational areas | <ul style="list-style-type: none"> Activities are conducted, or inhabited structures are located up to two miles from the MRS's boundary or within the MRS's boundary, that are associated with parks, nature preserves, or other recreational uses. | 4 |
| Agricultural, forestry | <ul style="list-style-type: none"> Activities are conducted, or inhabited structures are located up to two miles from the MRS's boundary or within the MRS's boundary, that are associated with agriculture or forestry. | 3 |
| Industrial or warehousing | <ul style="list-style-type: none"> Activities are conducted, or inhabited structures are located up to two miles from the MRS's boundary or within the MRS's boundary, that are associated with industrial activities or warehousing. | 2 |
| No known or recurring activities | <ul style="list-style-type: none"> There are no known or recurring activities occurring up to two miles from the MRS's boundary or within the MRS's boundary. | 1 |
| TYPES OF ACTIVITIES/STRUCTURES | DIRECTIONS: Record <u>the single highest score</u> from above in the box to the right (maximum score = 5). | <u>5</u> |

DIRECTIONS: Document any MRS-specific data used in selecting the **Types of Activities/Structures** classifications in the space provided.

The MCC Area is owned by Middlesex County and contains the majority of the MCC campus. Most of the area is developed with college facilities and infrastructure, including recreational areas (baseball fields and tennis courts) and a few campus residences in the northern area of the college campus.

Table 9

EHE Module: Ecological and/or Cultural Resources Data Element Table

DIRECTIONS: Below are four classifications of ecological and/or cultural resources and their descriptions. Review the types of resources present and circle the score that corresponds with the ecological and/or cultural resource classifications at the MRS.

Note: The terms *ecological resources* and *cultural resources* are defined in Appendix C of the Primer.

| Classification | Description | Score |
|---|---|----------|
| Ecological and cultural resources present | ♦ There are both ecological and cultural resources present on the MRS. | 5 |
| Ecological resources present | ♦ There are ecological resources present on the MRS. | 3 |
| Cultural resources present | ♦ There are cultural resources present on the MRS. | 3 |
| No ecological or cultural resources present | ♦ There are no ecological resources or cultural resources present on the MRS. | <u>0</u> |
| ECOLOGICAL AND/OR CULTURAL RESOURCES | DIRECTIONS: Record <u>the single highest score</u> from above in the box to the right (maximum score = 5). | <u>0</u> |

DIRECTIONS: Document any MRS-specific data used in selecting the *Ecological and/or Cultural Resources* classification in the space provided.

There is minimal habitat for wildlife in the MCC Area. Small patches of wooded areas exist on site; however, they are fragmented and not considered suitable ecological habitat. A screening-level ecological risk assessment (SLERA) was conducted in 2004 and a baseline Ecological Risk Assessment was conducted in 2008 by Weston for HTRW over the entire former Raritan Arsenal area (Weston, 2004¹ & 2008²). The MCC Area was considered in both assessments but was not evaluated due to the lack of suitable habitat and lack of contamination within the first 2 ft bgs, where terrestrial ecological exposure typically occurs.

1 Weston. 2004. *Final Screening Level Ecological Risk Assessment (SLERA)*. March.

2 Weston. 2008. *Baseline Ecological Risk Assessment Report, Former Raritan Arsenal, Edison, New Jersey*. March.

Table 10
Determining the EHE Module Rating

| | Source | Score | Value | |
|---|--|--|-------|------------------|
| <p>DIRECTIONS:</p> <p>From Tables 1–9, record the data element scores in the Score boxes to the right.</p> <p>Add the Score boxes for each of the three factors and record this number in the Value boxes to the right.</p> <p>Add the three Value boxes and record this number in the EHE Module Total box below.</p> <p>Circle the appropriate range for the EHE Module Total below.</p> <p>Circle the EHE Module Rating that corresponds to the range selected and record this value in the EHE Module Rating box found at the bottom of the table.</p> <p>An alternative module rating may be assigned when a module letter rating is inappropriate. An alternative module rating is used when more information is needed to score one or more data elements, contamination at an MRS was previously addressed, or there is no reason to suspect contamination was ever present at an MRS.</p> | Explosive Hazard Factor Data Elements | | | |
| | Munitions Type | Table 1 | 0 | 0 |
| | Source of Hazard | Table 2 | 0 | |
| | Accessibility Factor Data Elements | | | 15 |
| | Location of Munitions | Table 3 | 0 | |
| | Ease of Access | Table 4 | 10 | |
| | Status of Property | Table 5 | 5 | |
| | Receptor Factor Data Elements | | | 15 |
| | Population Density | Table 6 | 5 | |
| | Population Near Hazard | Table 7 | 5 | |
| | Types of Activities/ Structures | Table 8 | 5 | |
| | Ecological and /or Cultural Resources | Table 9 | 0 | |
| | EHE MODULE TOTAL | | | <u>30</u> |
| | EHE Module Total | EHE Module Rating | | |
| | 92 to 100 | A | | |
| | 82 to 91 | B | | |
| | 71 to 81 | C | | |
| | 60 to 70 | D | | |
| | 48 to 59 | E | | |
| | 38 to 47 | F | | |
| | less than 38 | G | | |
| | Alternative Module Ratings | Evaluation Pending | | |
| | | No Longer Required | | |
| | | <u>No Known or Suspected Explosive Hazard</u> | | |
| | EHE MODULE RATING | <u>No Known or Suspected Explosive Hazard</u> | | |
| An alternative module rating of “No Known or Suspected Explosive Hazard” is selected. Based on the wide coverage of the previous investigations, removal actions, and subsequent dense development of the area, the probability for MEC to remain at the surface or within the subsurface of the MCC is unlikely. | | | | |

Table 11

CHE Module: CWM Configuration Data Element Table

DIRECTIONS: Below are seven classifications of CWM configuration and their descriptions. Circle the score(s) that correspond to all CWM configurations known or suspected to be present at the MRS.

Note: The terms *CWM/UXO*, *CWM/DMM*, *physical evidence*, and *historical evidence* are defined in Appendix C of the Primer.

| Classification | Description | Score |
|---|--|----------|
| CWM, explosive configuration either UXO or damaged DMM | The CWM known or suspected of being present at the MRS is: <ul style="list-style-type: none"> Explosively configured CWM that are UXO (i.e., CWM/UXO). Explosively configured CWM that are DMM (i.e., CWM/DMM) that have been damaged. | 30 |
| CWM mixed with UXO | <ul style="list-style-type: none"> The CWM known or suspected of being present at the MRS are explosively configured CWM/DMM that have not been damaged, or nonexplosively configured CWM/DMM, or CWM not configured as a munition, that are commingled with conventional munitions that are UXO. | 25 |
| CWM, explosive configuration that are undamaged DMM | <ul style="list-style-type: none"> The CWM known or suspected of being present at the MRS are explosively configured CWM/DMM that have not been damaged. | 20 |
| CWM, not explosively configured or CWM, bulk container | The CWM known or suspected of being present at the MRS is: <ul style="list-style-type: none"> Nonexplosively configured CWM/DMM. Bulk CWM/DMM (e.g., ton container). | 15 |
| CAIS K941 and CAIS K942 | <ul style="list-style-type: none"> The CWM/DMM known or suspected of being present at the MRS is CAIS K941-toxic gas set M-1 or CAIS K942-toxic gas set M-2/E11. | 12 |
| CAIS (chemical agent identification sets) | <ul style="list-style-type: none"> Only CAIS, other than CAIS K941 and K942, are known or suspected of being present at the MRS. | 10 |
| Evidence of no CWM | <ul style="list-style-type: none"> Following investigation, the physical evidence indicates that CWM are not present at the MRS, or the historical evidence indicates that CWM are not present at the MRS. | 0 |
| CWM CONFIGURATION | DIRECTIONS: Record <u>the single highest score</u> from above in the box to the right (maximum score = 30). | <u>0</u> |

DIRECTIONS: Document any MRS-specific data used in selecting the **CWM Configuration** classifications in the space provided.

There is no historical or current evidence of CWM use associated with the MCC Area.

Tables 12 through 19 are intentionally omitted according to Army Guidance.

Table 20
Determining the CHE Module Rating

| | Source | Score | Value | |
|---|---|--|--------------------------|------------|
| <p>DIRECTIONS:</p> <ol style="list-style-type: none"> From Tables 11–19, record the data element scores in the Score boxes to the right. Add the Score boxes for each of the three factors and record this number in the Value boxes to the right. Add the three Value boxes and record this number in the CHE Module Total box below. Circle the appropriate range for the CHE Module Total below. Circle the CHE Module Rating that corresponds to the range selected and record this value in the CHE Module Rating box found at the bottom of the table. <p>Note: An alternative module rating may be assigned when a module letter rating is inappropriate. An alternative module rating is used when more information is needed to score one or more data elements, contamination at an MRS was previously addressed, or there is no reason to suspect contamination was ever present at an MRS.</p> | CWM Hazard Factor Data Elements | | | |
| | CWM Configuration | Table 11 | 0 | N/A |
| | Sources of CWM | Table 12 | N/A | |
| | Accessibility Factor Data Elements | | | |
| | Location of CWM | Table 13 | N/A | N/A |
| | Ease of Access | Table 14 | N/A | |
| | Status of Property | Table 15 | N/A | |
| | Receptor Factor Data Elements | | | |
| | Population Density | Table 16 | N/A | N/A |
| | Population Near Hazard | Table 17 | N/A | |
| | Types of Activities/Structures | Table 18 | N/A | |
| | Ecological and/or Cultural Resources | Table 19 | N/A | |
| | CHE MODULE TOTAL | | | <u>N/A</u> |
| | CHE Module Total | | CHE Module Rating | |
| | 92 to 100 | | A | |
| | 82 to 91 | | B | |
| | 71 to 81 | | C | |
| | 60 to 70 | | D | |
| | 48 to 59 | | E | |
| | 38 to 47 | | F | |
| less than 38 | | G | | |
| Alternative Module Ratings | | Evaluation Pending | | |
| | | No Longer Required | | |
| | | <u>No Known or Suspected CWM Hazard</u> | | |
| CHE MODULE RATING | | <u>No Known or Suspected CWM Hazard</u> | | |

***Tables 21 through 28 present chemical
contaminant evaluation for munitions constituents
in media***

Table 21

HHE Module: Groundwater Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the **maximum concentrations** of all contaminants in the MRS's groundwater and their **comparison values** (from Appendix B) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the **ratios** for each contaminant by dividing the **maximum concentration** by the **comparison value**. Determine the **CHF** by adding the **ratios** for each medium together, including additional contaminants recorded on Table 27. Based on the **CHF**, use the **CHF Scale** to determine and record the **CHF Value**. If there is no known or suspected MC hazard present in the groundwater, select the box at the bottom of the table.

Note: Use dissolved, rather than total, metals analyses when both are available.

| Contaminant | Maximum Concentration (µg/L) | Comparison Value (µg/L) | Ratios |
|---------------------------|---|--|--------|
| ARSENIC, TOTAL | 15.1 | 4.5 | 3.3556 |
| ANTIMONY, TOTAL | 4.1 | 6 | 0.6833 |
| MANGANESE, TOTAL | 92.4 | 320 | 0.2888 |
| NICKEL, TOTAL | 30.7 | 300 | 0.1023 |
| IRON, TOTAL | 690 | 11000 | 0.0627 |
| CHF Scale | CHF Value | Sum The Ratios | 4.620 |
| CHF > 100 | H (High) | $CHF = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$ | |
| 100 > CHF > 2 | M (Medium) | | |
| 2 > CHF | L (Low) | | |
| CONTAMINANT HAZARD FACTOR | DIRECTIONS: Record <u>the CHF Value</u> from above in the box to the right (maximum value = H). | | |

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the groundwater migratory pathway at the MRS.

| Classification | Description | Value |
|--------------------------|---|----------|
| Evident | Analytical data or observable evidence indicates that contamination in the groundwater is present at, moving toward, or has moved to a point of exposure. | H |
| Potential | Contamination in groundwater has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined. | M |
| Confined | Information indicates a low potential for contaminant migration from the source via the groundwater to a potential point of exposure (possibly due to geological structures or physical controls). | <u>L</u> |
| MIGRATORY PATHWAY FACTOR | DIRECTIONS: Record <u>the single highest value</u> from above in the box to the right (maximum value = H). | <u>L</u> |

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the groundwater receptors at the MRS.

| Classification | Description | Value |
|-----------------|---|----------|
| Identified | There is a threatened water supply well downgradient of the source and the groundwater is a current source of drinking water or source of water for other beneficial uses such as irrigation/agriculture (equivalent to Class I or IIA aquifer). | H |
| Potential | There is no threatened water supply well downgradient of the source and the groundwater is currently or potentially usable for drinking water, irrigation, or agriculture (equivalent to Class I, IIA, or IIB aquifer). | M |
| Limited | There is no potentially threatened water supply well downgradient of the source and the groundwater is not considered a potential source of drinking water and is of limited beneficial use (equivalent to Class IIIA or IIIB aquifer, or where perched aquifer exists only). | <u>L</u> |
| RECEPTOR FACTOR | DIRECTIONS: Record <u>the single highest value</u> from above in the box to the right (maximum value = H). | <u>L</u> |

Table 21

HHE Module: Groundwater Data Element Table

Contaminant Hazard Factor (CHF)

No Known or Suspected Groundwater MC Hazard ■

Groundwater munitions constituent data was queried from the following report:

Avatar Environmental (Avatar). 2014. Remedial Investigations and Remedial Actions Summary Report, Middlesex County College Property (Area 17/17A, Building 118, Areas H, X, and W, and High Traffic Areas) Former Raritan Arsenal. June 2014.

1 The metals and explosives data were collected in 1994 and 1996 and were removed from further HTRW-related groundwater monitoring since no unacceptable risk was determined for all receptors for these constituents (potential groundwater impacts related to non-munitions related sources and vapor intrusion). These results were included with the HHE module since this scoring has not been previously performed. A rating of "L" was selected since the concentrations included represent a high bias on current concentrations (MNA determined to an effective remedy for contaminated groundwater, non-vapor intrusion sources). Additionally, the referenced report attributes arsenic (analyte driving CHF > 2) levels at MCC to background levels and not historical DOD activities or sources.

An "L" Migratory Pathway Factor rating was chosen since current exposure is restricted to only the vapor intrusion pathway for potential receptors. As stated below, there is no complete exposure pathway from the groundwater source for constituents related to past munitions activities and are not evaluated at the MRS for vapor intrusion.

An "L" Receptor Factor rating was chosen because site receptors (industrial/commercial workers, maintenance workers, and MCC staff/students) are not exposed to groundwater constituents related to munitions. This area is supplied by the Edison water utility. Additionally, the Site has been part of an NJDEP Classification Exception Area (CEA) with a well restriction area (WRA) since December 2009.

According to the Site-Wide Hydrogeology Report Phase II Remedial Investigation (Weston, 1996²), the Contaminants of Potential Concern includes VOCs. Other analytes detected were determined to not be COPCs and did not require further evaluation. Therefore, "No Known or Suspected MC Hazard" was chosen. As stated in the May 2019 Decision Document, Groundwater Vapor Intrusion Operable Unit (USACE, 2019³), the selected remedy for VOC contaminants in groundwater is Monitored Natural Attenuation, with land use controls.

2 Weston (Weston Solutions, Inc.). 1996. Final Site-Wide Hydrogeology Report, Former Raritan Arsenal Phase II Remedial Investigation. June 1996.

3 USACE. 2019. Final Decision Document, Groundwater and Vapor Intrusion Operable Unit. May.

Table 22

HHE Module: Surface Water – Human Endpoint Data Element Table Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the **maximum concentrations** of all contaminants in the MRS's surface water and their **comparison values** (from Appendix B) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the **ratios** for each contaminant by dividing the **maximum concentration** by the **comparison value**. Determine the **CHF** by adding the **ratios** for each medium together, including additional contaminants recorded on Table 27. Based on the **CHF**, use the **CHF Scale** to determine and record the **CHF Value**. If there is no known or suspected MC hazard for human endpoints present in the surface water, select the box at the bottom of the table.

Note: Use dissolved, rather than total, metals analyses when both are available.

| Contaminant | Maximum Concentration (µg/L) | Comparison Value (µg/L) | Ratios |
|--|---|--|--------------|
| | | | |
| No Data Available – See Footnote | | | |
| | | | |
| CHF Scale | CHF Value | Sum The Ratios | NA |
| CHF > 100 | H (High) | $CHF = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$ | |
| 100 > CHF > 2 | M (Medium) | | |
| 2 > CHF | L (Low) | | |
| CONTAMINANT HAZARD FACTOR | DIRECTIONS: Record <u>the CHF Value</u> from above in the box to the right (maximum value = H). | | NA |
| Migratory Pathway Factor | | | |
| DIRECTIONS: Circle the value that corresponds most closely to the surface water migratory pathway at the MRS. | | | |
| Classification | Description | | Value |
| Evident | Analytical data or observable evidence indicates that contamination in the surface water is present at, moving toward, or has moved to a point of exposure. | | H |
| Potential | Contamination in surface water has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined. | | M |
| Confined | Information indicates a low potential for contaminant migration from the source via the surface water to a potential point of exposure (possibly due to presence of geological structures or physical controls). | | L |
| MIGRATORY PATHWAY FACTOR | DIRECTIONS: Record <u>the single highest value</u> from above in the box to the right (maximum value = H). | | NA |
| Receptor Factor | | | |
| DIRECTIONS: Circle the value that corresponds most closely to the surface water receptors at the MRS. | | | |
| Classification | Description | | Value |
| Identified | Identified receptors have access to surface water to which contamination has moved or can move. | | H |
| Potential | Potential for receptors to have access to surface water to which contamination has moved or can move. | | M |
| Limited | Little or no potential for receptors to have access to surface water to which contamination has moved or can move. | | L |
| RECEPTOR FACTOR | DIRECTIONS: Record <u>the single highest value</u> from above in the box to the right (maximum value = H). | | NA |
| No Known or Suspected Surface Water (Human Endpoint) MC Hazard | | | ■ |
| Surface water has not been impacted by historical activities associated with the MRS and was not investigated at the MRS during this RI or any previous investigation. | | | |

Table 23

HHE Module: Sediment – Human Endpoint Data Element Table Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the **maximum concentrations** of all contaminants in the site's sediment and their **comparison values** (from Appendix B) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the **ratios** for each contaminant by dividing the **maximum concentration** by the **comparison value**. Determine the **CHF** by adding the **ratios** for each medium together, including additional contaminants recorded on Table 27. Based on the **CHF**, use the **CHF Scale** to determine and record the **CHF Value**. If there is no known or suspected MC hazard for human endpoints present in the sediment, select the box at the bottom of the table.

| Contaminant | Maximum Concentration (mg/kg) | Comparison Value (mg/kg) | Ratios |
|---|--|--|--------------|
| No Data Available – See Footnote | | | |
| CHF Scale | CHF Value | Sum The Ratios | NA |
| CHF > 100 | H (High) | $CHF = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$ | |
| 100 > CHF > 2 | M (Medium) | | |
| 2 > CHF | L (Low) | | |
| CONTAMINANT HAZARD FACTOR | DIRECTIONS: Record <u>the CHF Value</u> from above in the box to the right maximum value = H). | | NA |
| Migratory Pathway Factor | | | |
| DIRECTIONS: Circle the value that corresponds most closely to the surface water migratory pathway at the MRS. | | | |
| Classification | Description | | Value |
| Evident | Analytical data or observable evidence indicates that contamination in the sediment is present at, moving toward, or has moved to a point of exposure. | | H |
| Potential | Contamination in sediment has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined. | | M |
| Confined | Information indicates a low potential for contaminant migration from the source via the sediment to a potential point of exposure (possibly due to presence of geological structures or physical controls). | | L |
| MIGRATORY PATHWAY FACTOR | DIRECTIONS: Record <u>the single highest value</u> from above in the box to the right (maximum value = H). | | NA |
| Receptor Factor | | | |
| DIRECTIONS: Circle the value that corresponds most closely to the surface water receptors at the MRS. | | | |
| Classification | Description | | Value |
| Identified | Identified receptors have access to sediment to which contamination has moved or can move. | | H |
| Potential | Potential for receptors to have access to sediment to which contamination has moved or can move. | | M |
| Limited | Little or no potential for receptors to have access to sediment to which contamination has moved or can move. | | L |
| RECEPTOR FACTOR | DIRECTIONS: Record <u>the single highest value</u> from above in the box to the right (maximum value = H). | | NA |
| No Known or Suspected Surface Water (Human Endpoint) MC Hazard | | | ■ |
| Sediment has not been impacted by historical activities associated with the MRS and was not investigated at the MRS during this RI or any previous investigation. | | | |

Table 24

HHE Module: Surface Water – Ecological Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the **maximum concentrations** of all contaminants in the MRS's surface water and their **comparison values** (from Appendix B) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the **ratios** for each contaminant by dividing the **maximum concentration** by the **comparison value**. Determine the **CHF** by adding the **ratios** for each medium together, including additional contaminants recorded on Table 27. Based on the **CHF**, use the **CHF Scale** to determine and record the **CHF Value**. If there is no known or suspected MC hazard for ecological endpoints present in the surface water, select the box at the bottom of the table.

Note: Use dissolved, rather than total, metals analyses when both are available.

| Contaminant | Maximum Concentration (µg/L) | Comparison Value (µg/L) | Ratios |
|--|---|--|--------------|
| | | | |
| No Data Available – See Footnote | | | |
| | | | |
| | CHF Value | Sum the Ratios | NA |
| CHF > 100 | H (High) | $CHF = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$ | |
| 100 > CHF > 2 | M (Medium) | | |
| 2 > CHF | L (Low) | | |
| CONTAMINANT HAZARD FACTOR | DIRECTIONS: Record <u>the CHF Value</u> from above in the box to the right (maximum value = H). | | NA |
| <u>Migratory Pathway Factor</u> | | | |
| DIRECTIONS: Circle the value that corresponds most closely to the surface water migratory pathway at the MRS. | | | |
| Classification | Description | | Value |
| Evident | Analytical data or observable evidence indicates that contamination in the surface water is present at, moving toward, or has moved to a point of exposure. | | H |
| Potential | Contamination in surface water has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined. | | M |
| Confined | Information indicates a low potential for contaminant migration from the source via the surface water to a potential point of exposure (possibly due to presence of geological structures or physical controls). | | L |
| MIGRATORY PATHWAY FACTOR | DIRECTIONS: Record <u>the single highest value</u> from above in the box to the right (maximum value = H). | | NA |
| <u>Receptor Factor</u> | | | |
| DIRECTIONS: Circle the value that corresponds most closely to the surface water receptors at the MRS. | | | |
| Classification | Description | | Value |
| Identified | Identified receptors have access to surface water to which contamination has moved or can move. | | H |
| Potential | Potential for receptors to have access to surface water to which contamination has moved or can move. | | M |
| Limited | Little or no potential for receptors to have access to surface water to which contamination has moved or can move. | | L |
| RECEPTOR FACTOR | DIRECTIONS: Record <u>the single highest value</u> from above in the box to the right (maximum value = H). | | NA |
| No Known or Suspected Surface Water (Ecological Endpoint) MC Hazard ■ | | | |
| Surface water has not been impacted by historical activities associated with the MRS and was not investigated at the MRS during this RI or any previous investigation. | | | |

Table 25

HHE Module: Sediment– Ecological Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the **maximum concentrations** of all contaminants in the MRS's sediment and their **comparison values** (from Appendix B) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the **ratios** for each contaminant by dividing the **maximum concentration** by the **comparison value**. Determine the **CHF** by adding the **ratios** for each medium together, including additional contaminants recorded on Table 27. Based on the **CHF**, use the **CHF Scale** to determine and record the **CHF Value**. If there is no known or suspected MC hazard for ecological endpoints present in the sediment, select the box at the bottom of the table.

| Contaminant | Maximum Concentration (mg/kg) | Comparison Value (mg/kg) | Ratios |
|----------------------------------|---|--|-----------|
| | | | |
| No Data Available – See Footnote | | | |
| | | | |
| CHF Scale | CHF Value | Sum the Ratios | NA |
| CHF > 100 | H (High) | $CHF = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$ | |
| 100 > CHF > 2 | M (Medium) | | |
| 2 > CHF | L (Low) | | |
| CONTAMINANT HAZARD FACTOR | DIRECTIONS: Record the CHF Value from above in the box to the right (maximum value = H). | | <u>NA</u> |

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface water migratory pathway at the MRS.

| Classification | Description | Value |
|---------------------------------|--|-----------|
| Evident | Analytical data or observable evidence indicates that contamination in the sediment is present at, moving toward, or has moved to a point of exposure. | H |
| Potential | Contamination in sediment has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined. | M |
| Confined | Information indicates a low potential for contaminant migration from the source via the sediment to a potential point of exposure (possibly due to presence of geological structures or physical controls). | L |
| MIGRATORY PATHWAY FACTOR | DIRECTIONS: Record the <u>single highest value</u> from above in the box to the right (maximum value = H). | NA |

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface water receptors at the MRS.

| Classification | Description | Value |
|------------------------|---|-----------|
| Identified | Identified receptors have access to sediment to which contamination has moved or can move. | H |
| Potential | Potential for receptors to have access to sediment to which contamination has moved or can move. | M |
| Limited | Little or no potential for receptors to have access to sediment to which contamination has moved or can move. | L |
| RECEPTOR FACTOR | DIRECTIONS: Record <u>the single highest value</u> from above in the box to the right (maximum value = H). | NA |

No Known or Suspected Sediment (Ecological Endpoint) MC Hazard ☐

Sediment has not been impacted by historical activities associated with the MRS and was not investigated at the MRS during this RI or any previous investigation.

Table 26

HHE Module: Surface Soil – Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the **maximum concentrations** of all contaminants in the MRS's surface soil and their **comparison values** (from Appendix B) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the **ratios** for each contaminant by dividing the **maximum concentration** by the **comparison value**. Determine the **CHF** by adding the **ratios** for each medium together, including additional contaminants recorded on Table 27. Based on the **CHF**, use the **CHF Scale** to determine and record the **CHF Value**. If there is no known or suspected MC hazard present in the surface soil, select the box at the bottom of the table.

| Contaminant | Maximum Concentration (mg/kg) | Comparison Value (mg/kg) | Ratio | | | |
|---|--|--|--------------|--|--|--|
| THALLIUM, TOTAL | 0.26 | 0.78 | 0.3333 | | | |
| IRON, TOTAL | 17000 | 55000 | 0.3091 | | | |
| COBALT, TOTAL | 5.4 | 23 | 0.2348 | | | |
| LEAD, TOTAL | 54.1 | 400 | 0.1353 | | | |
| MANGANESE, TOTAL | 168 | 1800 | 0.0933 | | | |
| CHF Scale | CHF Value | Sum the Ratios | 1.434 | | | |
| CHF > 100 | H (High) | $CHF = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$ | | | | |
| 100 > CHF > 2 | M (Medium) | | | | | |
| 2 > CHF | L (Low) | | | | | |
| CONTAMINANT HAZARD FACTOR | DIRECTIONS: Record the CHF Value from above in the box to the right (maximum value = H). | | <u>L</u> | | | |
| <u>Migratory Pathway Factor</u> | | | | | | |
| DIRECTIONS: Circle the value that corresponds most closely to the surface soil migratory pathway at the MRS. | | | | | | |
| Classification | Description | Value | | | | |
| Evident | Analytical data or observable evidence indicates that contamination in the surface soil is present at, moving toward, or has moved to a point of exposure. | H | | | | |
| Potential | Contamination in surface soil has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined. | M | | | | |
| Confined | Information indicates a low potential for contaminant migration from the source via the surface soil to a potential point of exposure (possibly due to presence of geological structures or physical controls). | <u>L</u> | | | | |
| MIGRATORY PATHWAY FACTOR | DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H). | | <u>L</u> | | | |
| <u>Receptor Factor</u> | | | | | | |
| DIRECTIONS: Circle the value that corresponds most closely to the surface soil receptors at the MRS. | | | | | | |
| Classification | Description | Value | | | | |
| Identified | Identified receptors have access to surface soil to which contamination has moved or can move. | <u>H</u> | | | | |
| Potential | Potential for receptors to have access to surface soil to which contamination has moved or can move. | M | | | | |
| Limited | Little or no potential for receptors to have access to surface soil to which contamination has moved or can move. | L | | | | |
| RECEPTOR FACTOR | DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H). | | <u>H</u> | | | |
| No Known or Suspected Surface Soil MC Hazard | | | ■ | | | |

Table 26

HHE Module: Surface Soil – Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the **maximum concentrations** of all contaminants in the MRS's surface soil and their **comparison values** (from Appendix B) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the **ratios** for each contaminant by dividing the **maximum concentration** by the **comparison value**. Determine the **CHF** by adding the **ratios** for each medium together, including additional contaminants recorded on Table 27. Based on the **CHF**, use the **CHF Scale** to determine and record the **CHF Value**. If there is no known or suspected MC hazard present in the surface soil, select the box at the bottom of the table.

Surface soil munitions constituent data was queried from the following report:

Avatar Environmental (Avatar). 2014. Remedial Investigations and Remedial Actions Summary Report, Middlesex County College Property (Area 17/17A, Building 118, Areas H, X, and W, and High Traffic Areas) Former Raritan Arsenal. June 2014.

The metals and explosives data were collected in 1994 and no unacceptable risk was determined for all receptors for these constituents. These results were included with the HHE module since this scoring has not been previously performed.

An "L" Migratory Pathway Factor rating was chosen since the maximum detected concentrations used in the HHE scoring and risk assessment for metals and explosives were located either beneath or at the edge of an asphalt parking lot. In other locations, where soil transport could occur, concentrations of metals and explosives either did not exceed risk-based screening levels or result in unacceptable risk.

An "H" Receptor Factor rating was chosen because site receptors (construction workers, maintenance workers, and MCC students/staff) may be exposed to MC in surface soil as part of typical activities on-site.

Per the MCC Area Hazardous and Toxic Waste (HTW) Decision Document (USACE, 2020¹), MC (including explosives and metals) in soil were determined to not be a site risk; therefore, "No Known or Suspected MC Hazard" was chosen.

1 USACE. 2020. Final Decision Document, Middlesex County College Soils. August.

Table 27

HHE Module: Supplemental Contaminant Hazard Factor Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Only use this table if there are more than five contaminants present at the MRS. This is a supplemental table designed to hold information about contaminants that do not fit in the previous tables. Indicate the **media** in which these contaminants are present. Then record all **contaminants**, their **maximum concentrations** and their **comparison values** (from Appendix B) in the table below. Calculate and record the **ratio** for each contaminant by dividing the **maximum concentration** by the **comparison value**. Determine the **CHF** for each medium on the appropriate media-specific tables.

Note: Remember not to add ratios from different media.

| Media | Contaminant | Maximum Concentration | Comparison Value | Ratio |
|--------------|------------------|-----------------------|------------------|--------|
| Groundwater | ARSENIC, TOTAL | 15.1 | 4.5 | 3.3556 |
| Groundwater | ANTIMONY, TOTAL | 4.1 | 6 | 0.6833 |
| Groundwater | MANGANESE, TOTAL | 92.4 | 320 | 0.2888 |
| Groundwater | NICKEL, TOTAL | 30.7 | 300 | 0.1023 |
| Groundwater | IRON, TOTAL | 690 | 11000 | 0.0627 |
| Groundwater | SELENIUM, TOTAL | 4 | 78 | 0.0513 |
| Groundwater | ALUMINUM, TOTAL | 661 | 16000 | 0.0413 |
| Groundwater | BARIUM, TOTAL | 47.1 | 2900 | 0.0162 |
| Groundwater | ZINC, TOTAL | 47.7 | 4700 | 0.0101 |
| Groundwater | COPPER, TOTAL | 4.5 | 620 | 0.0073 |
| Groundwater | CHROMIUM, TOTAL | 20.9 | 16000 | 0.0013 |
| Surface Soil | THALLIUM, TOTAL | 0.26 | 0.78 | 0.3333 |
| Surface Soil | IRON, TOTAL | 17000 | 55000 | 0.3091 |
| Surface Soil | COBALT, TOTAL | 5.4 | 23 | 0.2348 |
| Surface Soil | LEAD, TOTAL | 54.1 | 400 | 0.1353 |
| Surface Soil | MANGANESE, TOTAL | 168 | 1800 | 0.0933 |
| Surface Soil | ALUMINUM, TOTAL | 6520 | 77000 | 0.0847 |
| Surface Soil | ARSENIC, TOTAL | 2.3 | 34 | 0.0676 |
| Surface Soil | VANADIUM, TOTAL | 26.1 | 390 | 0.0669 |
| Surface Soil | ANTIMONY, TOTAL | 1 | 31 | 0.0323 |
| Surface Soil | COPPER, TOTAL | 57.5 | 3100 | 0.0185 |
| Surface Soil | MERCURY, TOTAL | 0.28 | 23 | 0.0122 |
| Surface Soil | CHROMIUM, TOTAL | 17.6 | 1600 | 0.0110 |
| Surface Soil | CADMIUM, TOTAL | 0.64 | 70 | 0.0091 |
| Surface Soil | NICKEL, TOTAL | 13.5 | 1500 | 0.0090 |
| Surface Soil | ZINC, TOTAL | 186 | 23000 | 0.0081 |
| Surface Soil | BERYLLIUM, TOTAL | 0.63 | 160 | 0.0039 |
| Surface Soil | BARIUM, TOTAL | 38.7 | 15000 | 0.0026 |
| Surface Soil | SILVER, TOTAL | 0.75 | 390 | 0.0019 |

Table 27

HHE Module: Supplemental Contaminant Hazard Factor Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Only use this table if there are more than five contaminants present at the MRS. This is a supplemental table designed to hold information about contaminants that do not fit in the previous tables. Indicate the **media** in which these contaminants are present. Then record all **contaminants**, their **maximum concentrations** and their **comparison values** (from Appendix B) in the table below. Calculate and record the **ratio** for each contaminant by dividing the **maximum concentration** by the **comparison value**. Determine the **CHF** for each medium on the appropriate media-specific tables.

Note: Remember not to add ratios from different media.

| Media | Contaminant | Maximum Concentration | Comparison Value | Ratio |
|-------|-------------|-----------------------|------------------|-------|
|-------|-------------|-----------------------|------------------|-------|

Notes:

Munitions constituent data was queried from the following report:

Avatar Environmental (Avatar). 2014. Remedial Investigations and Remedial Actions Summary Report, Middlesex County College Property (Area 17/17A, Building 118, Areas H, X, and W, and High Traffic Areas) Former Raritan Arsenal. June 2014.

Table 28
Determining the HHE Module Rating

DIRECTIONS:

1. Record the letter values (H, M, L) for the **Contaminant Hazard, Migration Pathway, and Receptor Factors** for the media (from Tables 21–26) in the corresponding boxes below.
2. Record the media's three-letter combinations in the **Three-Letter Combination** boxes below (three-letter combinations are arranged from Hs to Ms to Ls).
3. Using the reference provided below, determine each media's rating (A–G) and record the letter in the corresponding **Media Rating** box below.

| Media (Source) | Contaminant Hazard Factor Value | Migratory Pathway Factor Value | Receptor Factor Value | | Three-Letter Combination (Hs-Ms-Ls) | | Media Rating (A-G) |
|---|---------------------------------|--|-----------------------|---|-------------------------------------|----------|--------------------|
| Groundwater (Table 21) | L | L | L | | LLL | | <u>G</u> |
| Surface Water/Human Endpoint (Table 22) | N/A | N/A | N/A | | N/A | | N/A |
| Sediment/Human Endpoint (Table 23) | N/A | N/A | N/A | | N/A | | N/A |
| Surface Water/Ecological Endpoint (Table 24) | N/A | N/A | N/A | | N/A | | N/A |
| Sediment/Ecological Endpoint (Table 25) | N/A | N/A | N/A | | N/A | | N/A |
| Surface Soil (Table 26) | L | L | H | | HLL | | <u>E</u> |
| DIRECTIONS (cont.): 4. Select the single highest Media Rating (A is highest; G is lowest) and enter the letter in the HHE Module Rating box below. Note: An alternative module rating may be assigned when a module letter rating is inappropriate. An alternative module rating is used when more information is needed to score one or more media, contamination at an MRS was previously addressed, or there is no reason to suspect contamination was ever present at an MRS. | | | | HHE MODULE RATING | | <u>E</u> | |
| | | | | HHE Ratings (for reference only) | | | |
| | | | | Combination | Rating | | |
| | | | | HHH | A | | |
| | | | | HHM | B | | |
| | | | | HHL | C | | |
| | | | | HMM | C | | |
| | | | | HML | D | | |
| | | | | MMM | D | | |
| | | | | HLL | E | | |
| MML | E | | | | | | |
| MLL | F | | | | | | |
| LLL | G | | | | | | |
| Alternative Module Ratings | | Evaluation Pending | | | | | |
| | | No Longer Required | | | | | |
| | | <u>No Known or Suspected MC Hazard</u> | | | | | |

Table 28

Determining the HHE Module Rating

DIRECTIONS:

1. Record the letter values (H, M, L) for the **Contaminant Hazard, Migration Pathway, and Receptor Factors** for the media (from Tables 21–26) in the corresponding boxes below.
2. Record the media's three-letter combinations in the **Three-Letter Combination** boxes below (three-letter combinations are arranged from Hs to Ms to Ls).
3. Using the reference provided below, determine each media's rating (A–G) and record the letter in the corresponding **Media Rating** box below.

Per the MCC Area Hazardous and Toxic Waste (HTW) Decision Document (USACE, 2020¹) and May 2019 Decision Document, Groundwater Vapor Intrusion Operable Unit (USACE, 2019²), MC (metals) were determined to not be a site risk; therefore, "No Known or Suspected MC Hazard" was chosen.

1 USACE. 2020. Final Decision Document, Middlesex County College Soils. August.

2 USACE. 2019. Final Decision Document, Groundwater and Vapor Intrusion Operable Unit. May.

Table 29
MRS Priority

DIRECTIONS: In the chart below, circle the letter **rating** for each module recorded in Table 10 (EHE), Table 20 (CHE), and Table 28 (HHE). Circle the corresponding numerical **priority** for each module. If information to determine the module rating is not available, choose the appropriate alternative module rating. The MRS priority is the single highest priority; record this number in the **MRS or Alternative Priority** box at the bottom of the table.

Note: An MRS assigned Priority 1 has the highest relative priority; an MRS assigned Priority 8 has the lowest relative priority. Only an MRS with CWM known or suspected to be present can be assigned Priority 1; an MRS that has CWM known or suspected to be present cannot be assigned Priority 8.

| EHE Rating | Priority | CHE Rating | Priority | HHE Rating | Priority |
|---|----------|---|----------|--|----------|
| | | A | 1 | | |
| A | 2 | B | 2 | A | 2 |
| B | 3 | C | 3 | B | 3 |
| C | 4 | D | 4 | C | 4 |
| D | 5 | E | 5 | D | 5 |
| E | 6 | F | 6 | E | 6 |
| F | 7 | G | 7 | F | 7 |
| G | 8 | | | G | 8 |
| Evaluation Pending | | Evaluation Pending | | Evaluation Pending | |
| No Longer Required | | No Longer Required | | No Longer Required | |
| <u>No Known or Suspected Explosive Hazard</u> | | <u>No Known or Suspected CWM Hazard</u> | | <u>No Known or Suspected MC Hazard</u> | |
| MRS or ALTERNATIVE PRIORITY | | | | <u>No Known or Suspected Hazard</u> | |

Per the MCC Area Hazardous and Toxic Waste (HTW) Decision Document (USACE, 2020¹) and May 2019 Decision Document, Groundwater Vapor Intrusion Operable Unit (USACE, 2019²), MC (metals) were determined to not be a site risk; therefore, "No Known or Suspected MC Hazard" was chosen.

1 USACE. 2020. Final Decision Document, Middlesex County College Soils. August.

2 USACE. 2019. Final Decision Document, Groundwater and Vapor Intrusion Operable Unit. May.

APPENDIX D

New Risk Management Methodology Feedback Form

This page intentionally left blank.

NEW RISK MANAGEMENT METHODOLOGY FEEDBACK FORM

Decision Logic to Assess Risks Associated with Explosive Hazards, and to Develop Remedial Action Objectives (RAOs) for Munitions Response Sites

FUDS Property/Project Number: FUDS Project Number CO2NJ008403

Property Name: Former Raritan Arsenal, Middlesex Community College (MCC) Area

Project Name: Remedial Investigation

MRSPP Overall Score: No known/suspected EHE, CWM or HHE hazards

1. List historically known or suspected munitions and specify what evidence of MEC was found during characterization.

Amount of MEC Justification: *Amount of MEC was determined using the RI characterization data. As discussed in Section 5 of the RI report, several investigations and removal actions have been performed to physically remove items characterized as inert munitions debris.*

MCC Area:

- *“Investigation of the MRS did not identify evidence of MEC presence”*
- *For portions where munitions debris was identified, “DERP response action has been conducted that will achieve Unrestricted Use/Unrestricted Exposure.”*

Sensitivity Justification:

MCC Area: *Based on all historical munitions finds characterized as inert, the selected sensitivity of MEC was “Not Sensitive.”*

Severity Justification:

MCC Area: *“Improbable” based on all historical munitions finds being characterized as inert munitions debris.*

2. Specify Land Use and Site Receptors. (If multiple Land Use/Receptors exist as different areas, these areas may be identified separately):

Access Condition Justification: *“Regular – daily use/open access” based on the current institutional land use (college) with associated residential and recreational uses. Future land use is anticipated to remain similar. No known access restrictions (fencing, signage, etc.) are in place at the MCC Area.*

Likelihood to Impart Energy Justification: *“High” was selected for MCC Area based on the probability of further site development in the future.*

3. The resulting RMM results are as follows:

| MCC Area | |
|-----------------------|------------|
| Matrix 1 | Unlikely |
| Matrix 2 | D |
| Matrix 3 | 2 |
| Matrix 4 | D-2 |
| Risk Determination | Acceptable |

4. Other Comments, (Please identify limitations or suggestions, if any.): *N/A*
5. Compare of use of RAO methodology to MEC HA, if applied: *MEC HA not conducted.*