

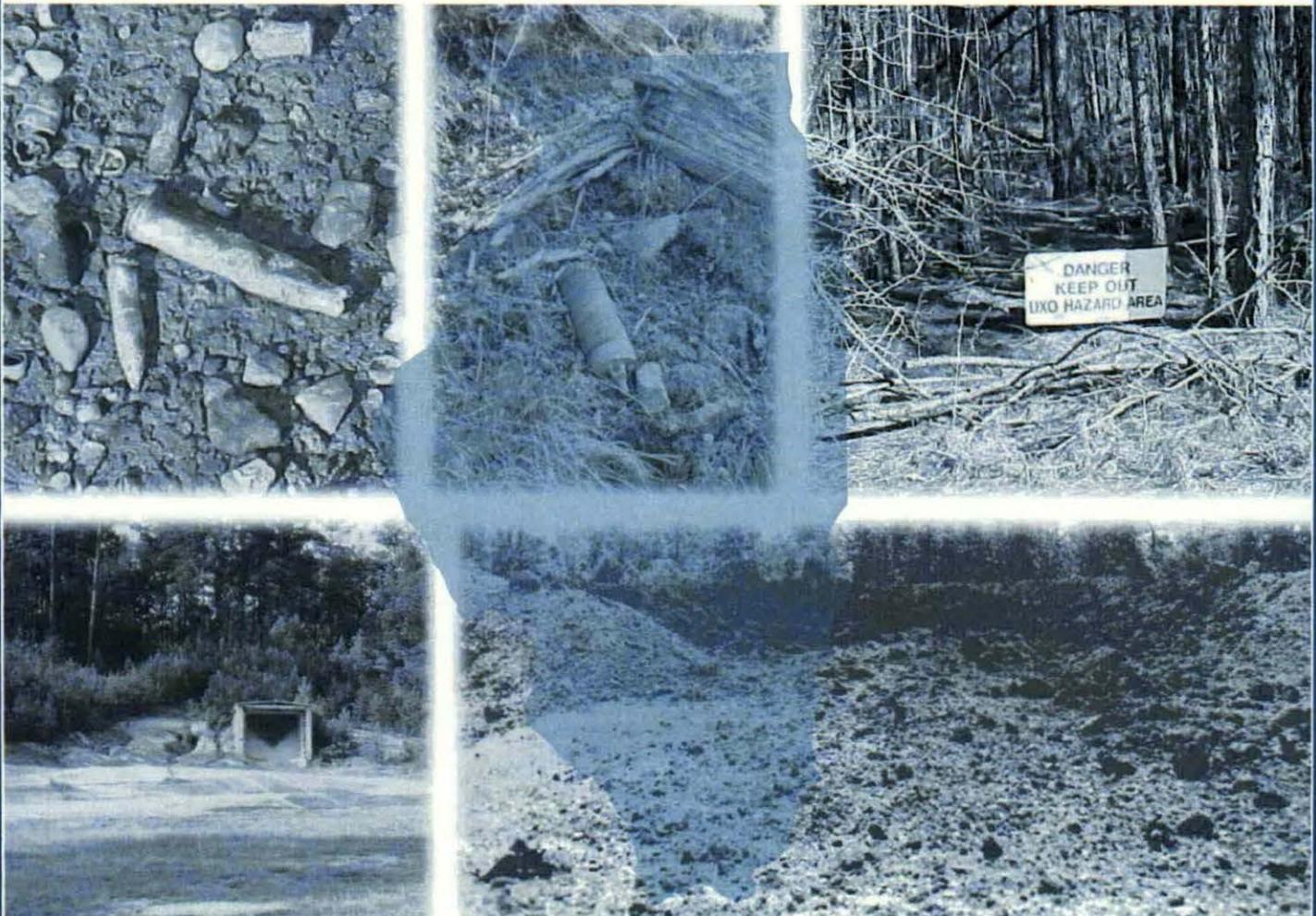
N00210.AR.000913
NSTC GREAT LAKES, IL
5090.3a

FINAL SITE INSPECTION REPORT MUNITIONS RESPONSE SITES FORT SHERIDAN IL
3/1/2007
USAEC



Final Site Inspection Report Fort Sheridan, Illinois

Military Munitions Response Program Site Inspection Munitions Response Sites



March 2007

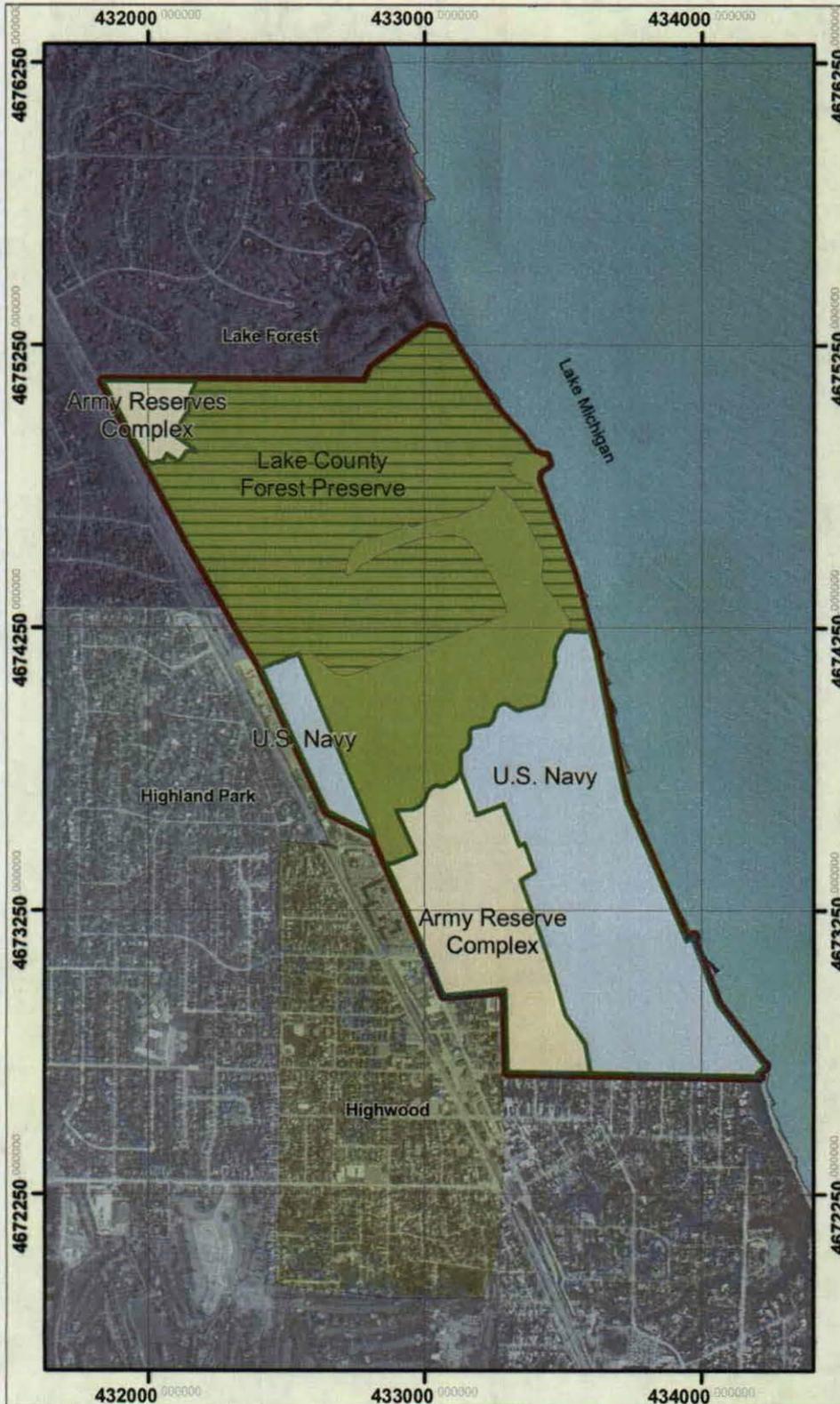


FORT SHERIDAN DoD PROPERTY BOUNDARY

Fort Sheridan, IL



Figure 3-2



- Forest Preserve
- Water
- Pre-BRAC Boundary

Area Status

- Surplus OU
- U.S. Army Reserve
- U.S. Navy

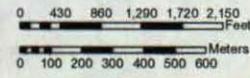
Municipality

- Highland Park
- Highwood
- Lake Forest

Data Source: e²M, Final Military Munitions Response Program Historical Records Review, Fort Sheridan, Illinois, December 2005, Figure 2-2.

Projection: UTM Zone 16
Datum: WGS 84
Units: Meters
Grid: 1,000 Meter

1:24,000



3.2 TPP 2 Meeting Conclusions and Recommendations

The TPP 2 Meeting for FTSH took place on 21 September 2005. The findings from the records review, which were summarized in the HRR (see **Appendix B**) and CSM, were presented at the meeting by e²M. Representatives from USAEC, IEPA; 88th RRC, IMA, and e²M discussed the findings, and made recommendations for the SI field work at the MRAs/MRSs. The TPP 2 Meeting Minutes are provided in **Appendix C**.

3.3 Recommended MRA/MRS Footprint Changes

Based on further document review and the results of the SI field work, it is recommended that the footprints of the Trench Warfare Range MRS, AAA Complex MRA, AAA Complex-Transferred MRS, and Small Arms Range Complex MRA be changed from the footprints that were originally presented going into the SI. The original names of the MRAs and MRSs are used to describe the original footprints, and the new revised naming conventions are used to describe the revised footprints. The recommendations for the revised MRS/MRA footprints are described in the following sections.

3.3.1 Trench Warfare Range MRS Footprint Change

During the SI field work, a fenced area posted with unexploded ordnance (UXO) warning signs was observed surrounding Building 384. Although the building itself is not included within the Trench Warfare Range MRS (since it was previously approved for NFA by the US Department of the Army and the US Department of the Navy, in consultation with both the EPA and IEPA), the fenced area around the building is located on both the Trench Warfare Range MRS and the AAA Firing Points "B" MRS. Because the fenced area has a different use history than the Trench Warfare Range MRS which is recommended for NFA, it is recommended that all of the fenced area around Building 384 be removed from the Trench Warfare Range MRS and added to the AAA Firing Points A and B MRS (new naming convention). Therefore, the acreage of the Trench Warfare Range MRS will be slightly decreased and this acreage will be added to the AAA Firing Points A and B MRS. Additionally, a portion of Landfill 5, an Installation Restoration Program (IRP) site not eligible for the MMRP, overlaps with the Trench Warfare Range MRS. Therefore, this overlapping area was removed from the Trench Warfare Range MRS footprint.

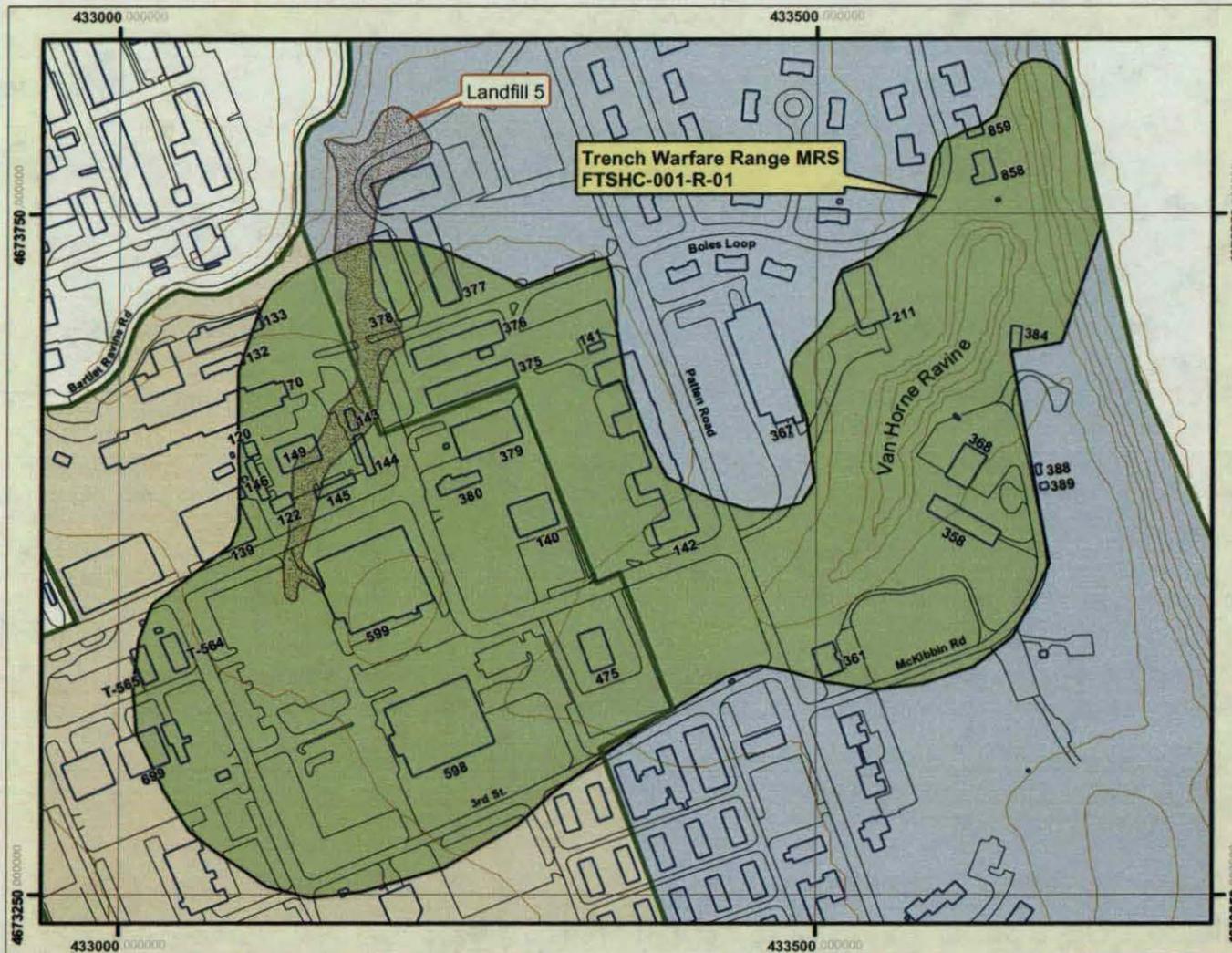
Based on the previously described conditions, the overall footprint of the Trench Warfare Range MRS as it was going into the SI (see **Figure 3-3**) will be decreased from 53.1 to 51.5 acres. The recommended revised Trench Warfare Range MRS footprint is shown on **Figure 3-4**. More specific information about the Trench Warfare Range MRS is presented in **Section 4.1**.



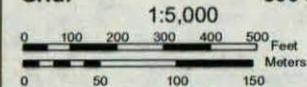
TRENCH WARFARE RANGE MRS FOOTPRINT GOING INTO SI Fort Sheridan, IL



Figure 3-3



- Contour
 - Road
 - U.S. Army Reserve
 - U.S. Navy
 - Building Outline
 - Landfill
- Area Status**
- MRS, Closed
- Projection:** UTM Zone 16
Datum : WGS 84
Units: Meters
Grid: 500 Meter

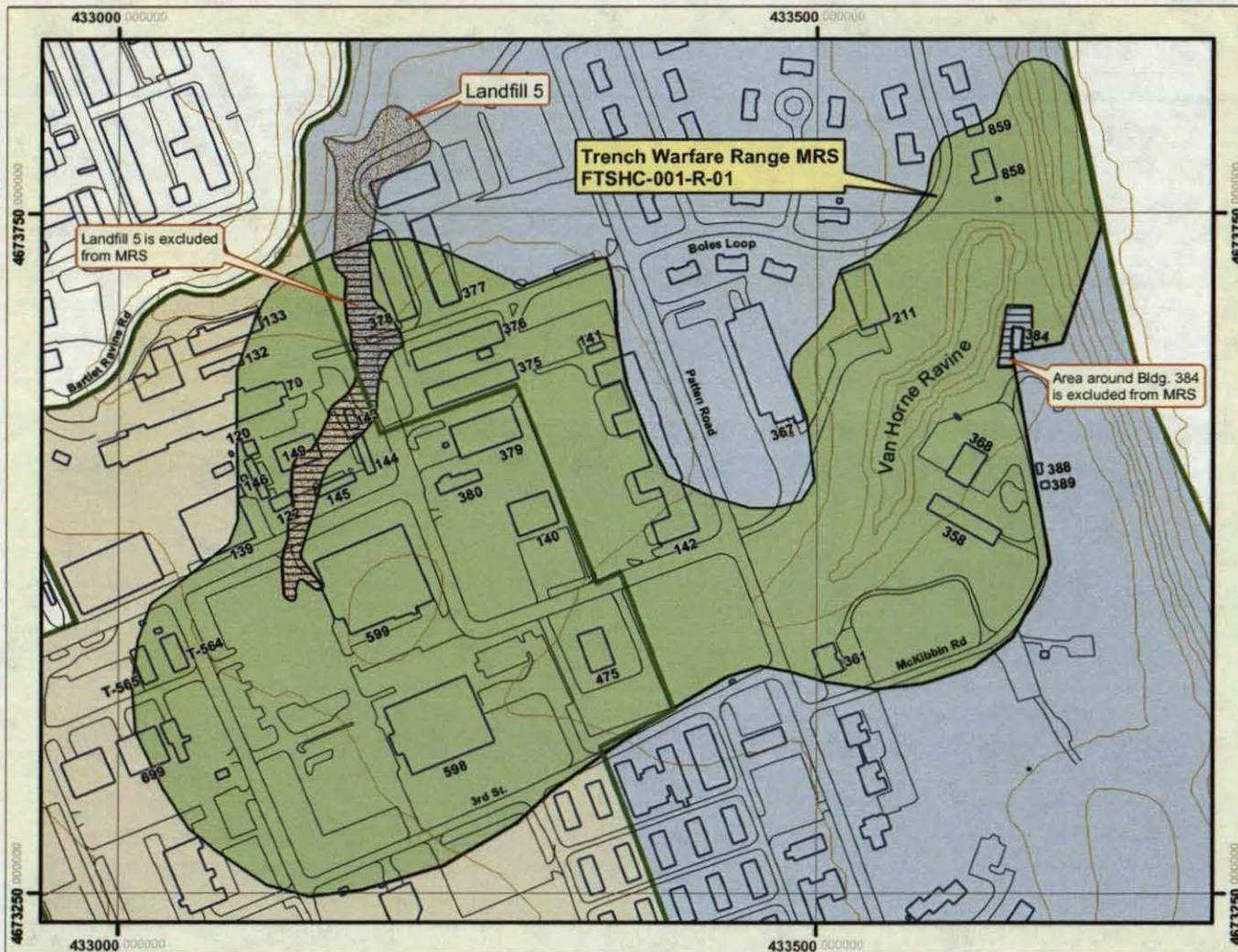




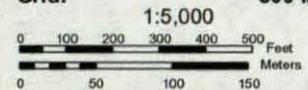
REVISED TRENCH WARFARE RANGE MRS FOOTPRINT Fort Sheridan, IL



Figure 3-4



- Contour
 - Road
 - U.S. Army Reserve
 - U.S. Navy
 - Building Outline
 - Landfill
 - Area Status**
 - MRS, Closed
 - Removed Portion
- Projection:** UTM Zone 16
Datum : WGS 84
Units: Meters
Grid: 500 Meter



Installation Location
Illinois

**SITE INSPECTION REPORT
FORT SHERIDAN, IL**

Source: Produced for the U.S. Army Corps of Engineers by engineering-environmental Management, Inc. (e²M)

Date: March 2007
Edition: Final

3.3.2 AAA Complex MRA Footprint Changes

A portion of the Southern Small Arms Range MRS and Southern Pistol Range MRS overlaps with the AAA Firing Point "A" MRS. Therefore, only the portions of the Southern Small Arms Range MRS and Southern Pistol Range MRS lying outside of the AAA Firing Point "A" MRS were counted in the total acreage for these MRSs in order to avoid duplicating acreages. The overlapping portions are considered part of the AAA Firing Point "A" MRS.

As previously described, it is recommended that the fenced area around Building 384 from the Trench Warfare Range MRS be added to the AAA Firing Point "B" MRS.

Because targets for the AAA Firing Points A and B were placed in Lake Michigan and because the associated range fans at the AAA Firing Points "A" and "B" MRSs did not contain MEC or MC, the range fan portions are recommended for removal from the original footprints.

A portion of Landfill 7 lays overlaps the AAA Firing Point "A" MRS. Landfill 7 is a capped landfill being addressed under the IRP; therefore, the overlapping portion was removed from the MRS footprint.

Based on the previously described conditions, the overall footprint of the AAA Complex MRA (see **Figure 3-5**) will be decreased from 14.7 to 6.2 acres. The revised AAA Complex MRA footprint with the new revised naming conventions is shown on **Figure 3-6**. More specific information about the AAA Complex MRA is presented in **Section 4.2**.



AAA COMPLEX MRA HRR FOOTPRINT GOING INTO SI Fort Sheridan, IL



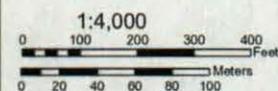
Figure 3-5



- Contour
- Road
- Water
- Pre-BRAC Boundary
- U.S. Navy
- Building Outline
- Landfill
- Area Status**
- MRA
- MRS, Closed

Data Source: e²M, Final Military Munitions Response Program Historical Records Review, Fort Sheridan, Illinois, December 2005, Figure 2-5 and 2-6.

Projection: UTM Zone 16
Datum: WGS 84
Units: Meters
Grid: 250 Meter



SITE INSPECTION PLAN
FORT SHERIDAN, IL

Source: Produced for the U.S. Army Corps of Engineers by engineering-environmental Management, Inc. (e²M)

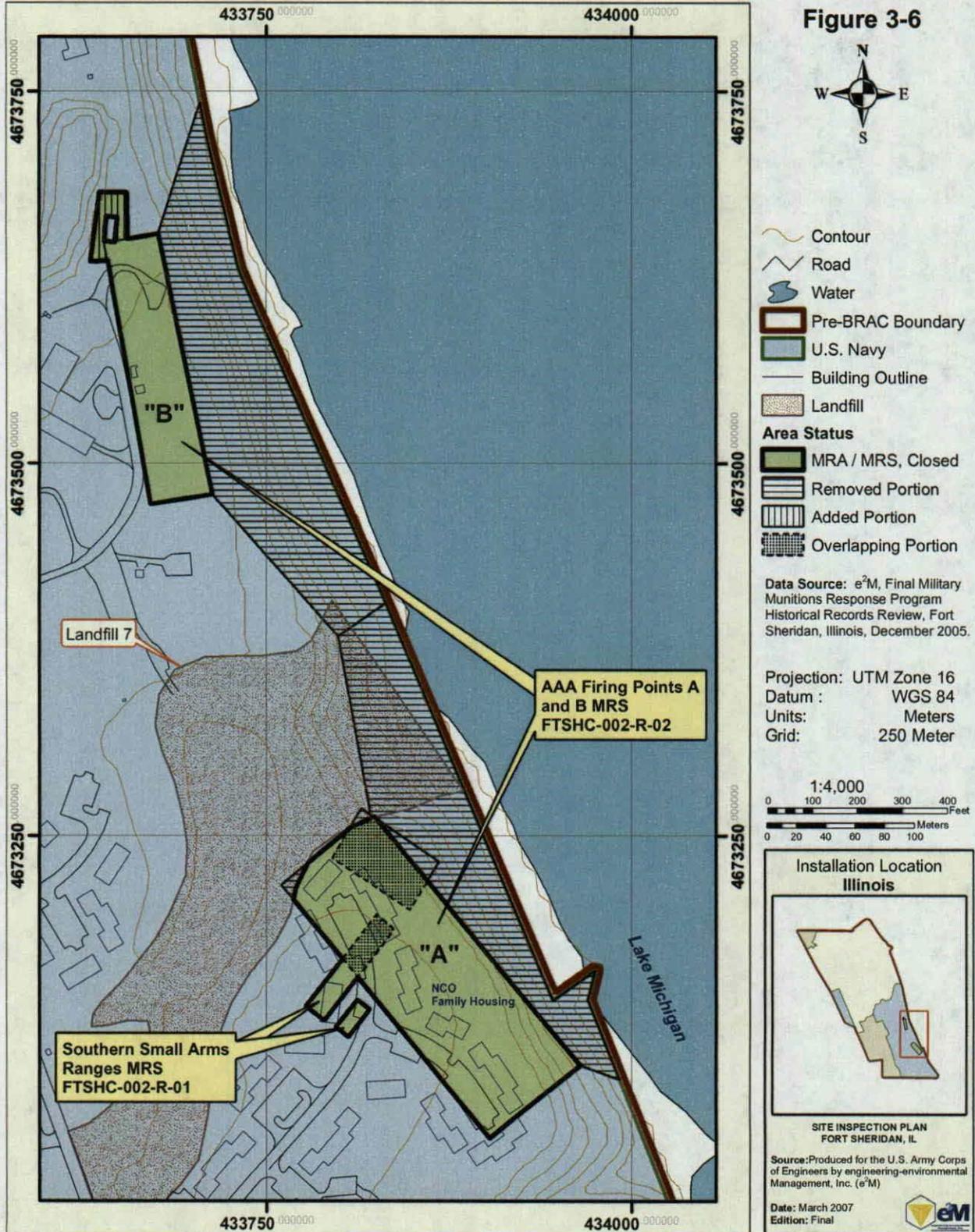
Date: March 2007
Edition: Final



REVISED AAA COMPLEX MRA FOOTPRINT Fort Sheridan, IL



Figure 3-6



March 2007

3-9

3.3.3 AAA Complex – Transferred MRS Footprint Change

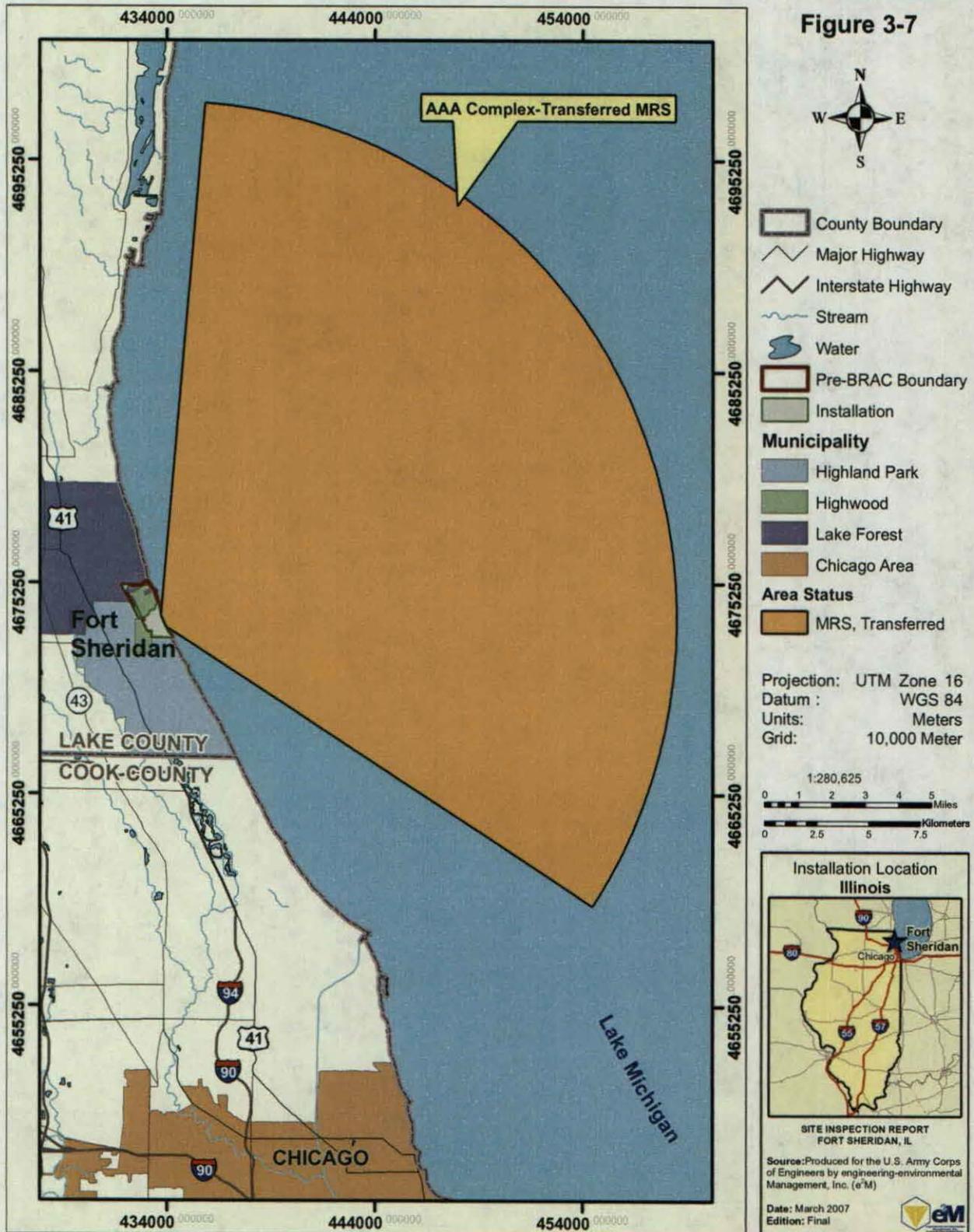
In March 2003, URS conducted the US Army CTT Range/Site Inventory for the BRAC property at Fort Sheridan. This inventory identified the AA Artillery Location C, the AA Artillery Location D, and the AA Artillery Location E, all of which were located on the BRAC property at Fort Sheridan (see **Figure I-2**). The firing fans for the AA Artillery locations over Lake Michigan have been removed from the AAA Complex – Transferred MRS for the purposes of this SI because this area was already counted under the BRAC program. For more details, refer to **Section 4.3**. **Figures 3-7** and **3-8** show the AAA Complex – Transferred MRS footprint going into the SI and the revised footprint, respectively. More specific information about the AAA Complex – Transferred MRS is presented in **Section 4.3**.



AAA COMPLEX-TRANSFERRED MRS FOOTPRINT GOING INTO SI Fort Sheridan, IL



Figure 3-7





REVISED AAA COMPLEX-TRANSFERRED MRS FOOTPRINT Fort Sheridan, IL

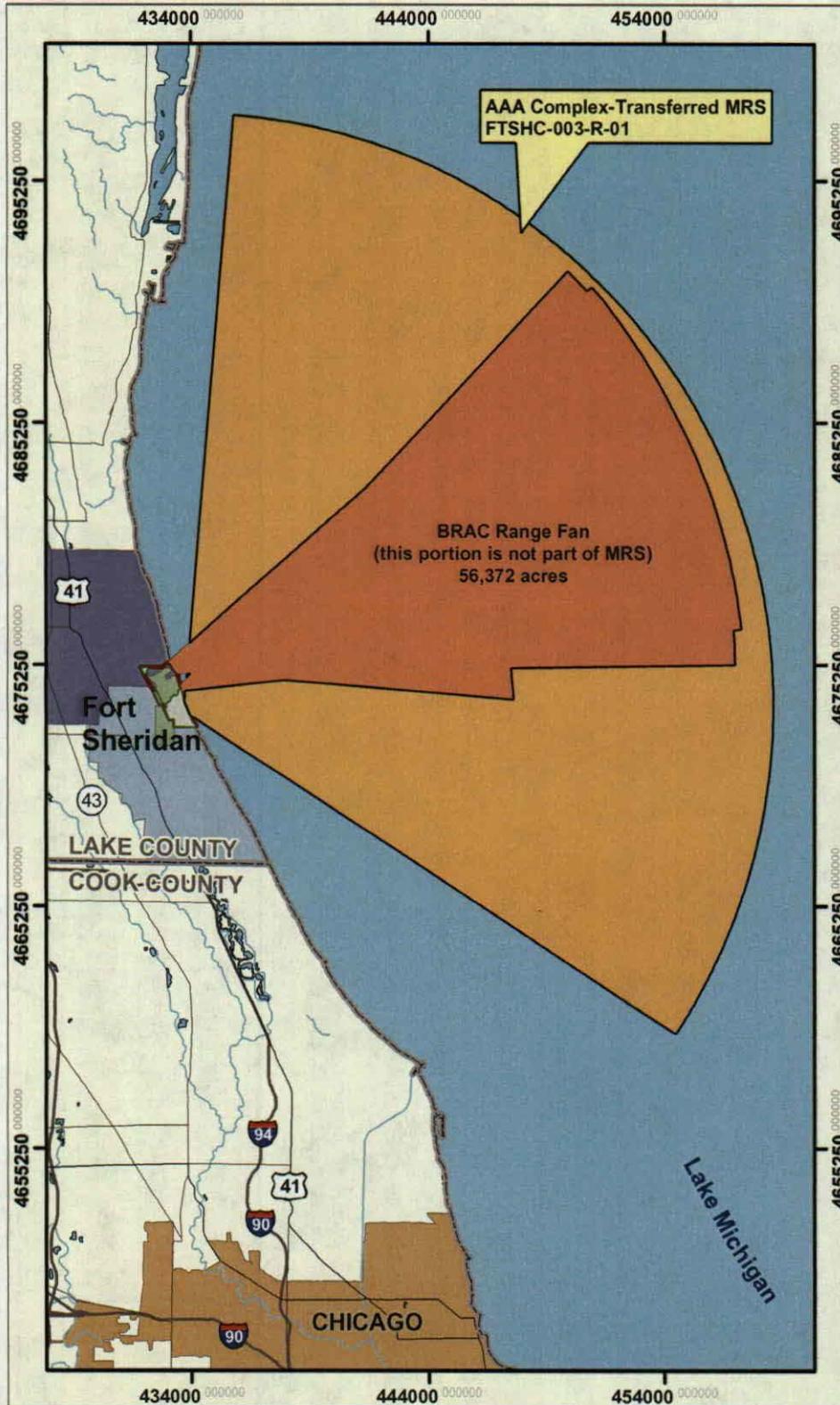
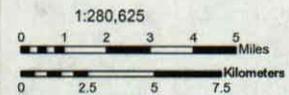


Figure 3-8



- County Boundary
- Major Highway
- Interstate Highway
- Stream
- Water
- Pre-BRAC Boundary
- Installation
- Municipality**
 - Highland Park
 - Highwood
 - Lake Forest
 - Chicago Area
- Area Status**
 - MRS, Transferred
 - BRAC Range Fan

Projection: UTM Zone 16
Datum: WGS 84
Units: Meters
Grid: 10,000 Meter



**SITE INSPECTION REPORT
FORT SHERIDAN, IL**

Source: Produced for the U.S. Army Corps of Engineers by engineering-environmental Management, Inc. (eM)

Date: March 2007
Edition: Final

3.3.4 Small Arms Range Complex MRA Footprint Change

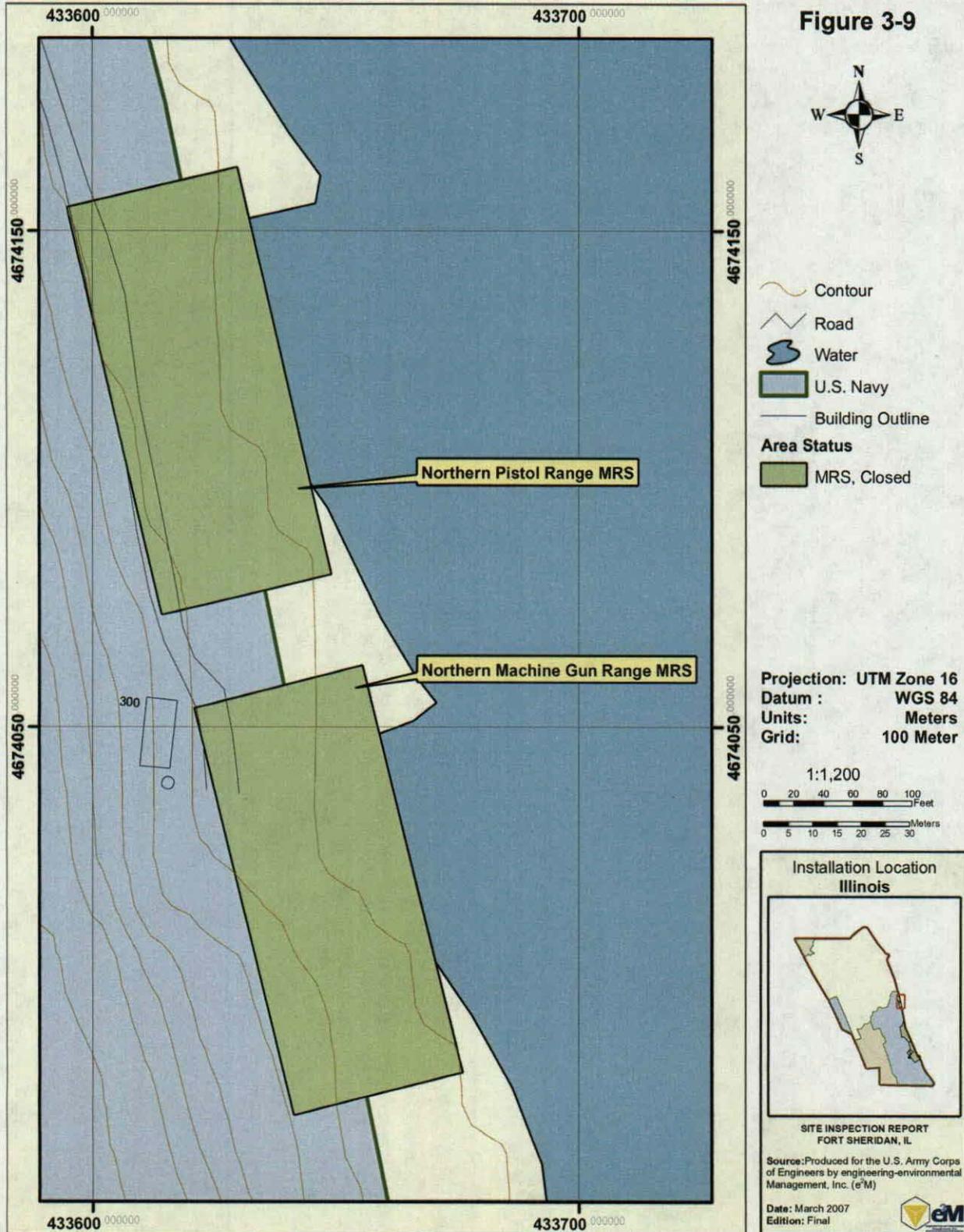
A portion of the Small Arms Range Complex MRA (Northern Pistol Range MRS) is overlapped by a firing fan identified during the US Army CTT Range/Site Inventory for BRAC properties. The overlapping portion has been removed from the Small Arms Range Complex MRA for the purposes of this SI because this area was already counted under the BRAC MMRP. **Figures 3-9 and 3-10** show the Small Arms Range Complex MRA footprint going into the SI and the revised footprint with the new naming conventions, respectively. More specific information about the Small Arms Range Complex MRS is presented in **Section 4.5**.



SMALL ARMS RANGE COMPLEX MRA GOING INTO SI Fort Sheridan, IL



Figure 3-9

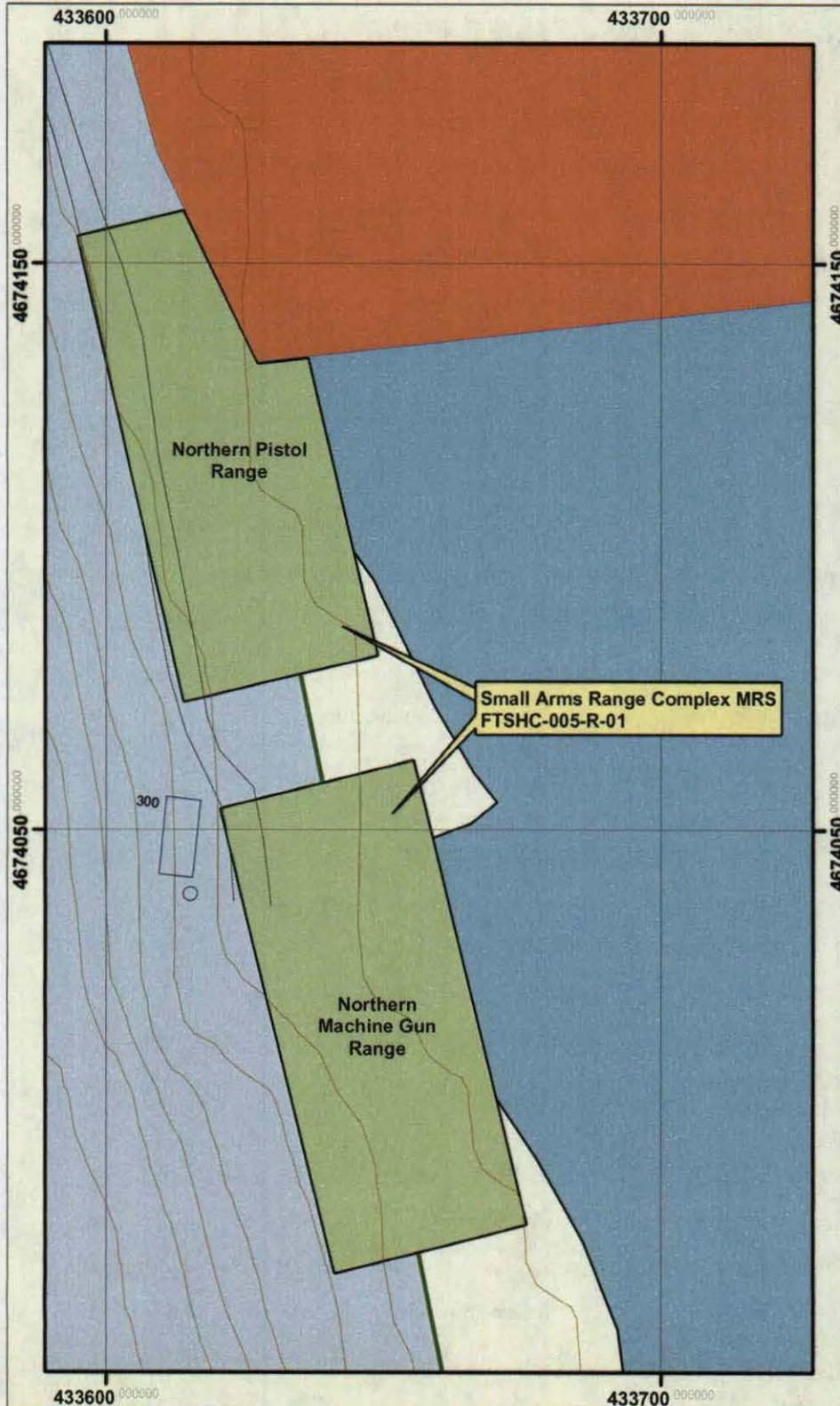




REVISED SMALL ARMS RANGE COMPLEX MRS Fort Sheridan, IL

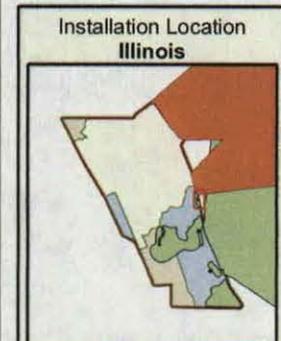
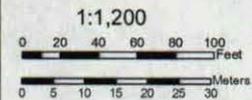


Figure 3-10



- Contour
- Road
- Water
- U.S. Navy
- Building Outline
- MRS, Closed
- BRAC Range Fan

Projection: UTM Zone 16
Datum : WGS 84
Units: Meters
Grid: 100 Meter



SITE INSPECTION REPORT
FORT SHERIDAN, IL

Source: Produced for the U.S. Army Corps of Engineers by engineering-environmental Management, Inc. (e²M)

Date: March 2007
Edition: Final



4.0 MRS/MRA HISTORICAL AND SITE LAYOUT SUMMARIES

4.1 Trench Warfare Range MRS (FTSHC-001-R-01)

The Trench Warfare Range MRS (FTSHC-001-R-01) is located in the southern half of FTSH south of Bartlett Ravine Road and surrounds Van Horne Ravine (see **Figure 4-1**). The Trench Warfare Range was used between 1917 and 1919 to train military personnel for trench warfare during World War I (WWI). The trenches were dug in and around Van Horne Ravine; however, all of the former trenches have since been backfilled with soil. The trenches were backfilled sometime after WWI, but the exact date is unknown (USACE, 1996). For this SI report, the area of concern is the entire Trench Warfare Range footprint, including both the US Army and US Navy properties. This includes the trench areas both east and west of Patten Road.

Landfill 5 is located in a light industrial area in the northwest corner of the Trench Warfare Range MRS solely within the USARC portion (see **Figure 4-1**). Landfill 5 covers 1.4 acres of the MRS and was used from approximately 1900 to the 1960s. As described in the Remedial Investigation/Baseline Risk Assessment (RI/BRA), the landfill contained construction debris with large concrete blocks, rebar, metallic debris, slag, bricks, ash, glass, bottles, copper pipes and wires, automotive parts, asphalt, wood, wire, nails, and coal fragments (SAIC, 1999a). Most of the site is fenced and approximately 70 percent of the landfill is overlain by concrete and asphalt (Kemron, 2003).

Mr. Eric Johnson, State Environmental Manager, Northern Illinois 88th RRC, stated during the construction of a landfill cap for Landfill 5, MEC was not discovered. He also indicated two new buildings were constructed in the area around Landfill 5 and their foundations were very deep, but MEC was not discovered during construction. The area over the landfill is currently used for vehicle and equipment storage and shop activities. During construction activities, a road was built over a part of Landfill 5 and there was no discovery of MEC.

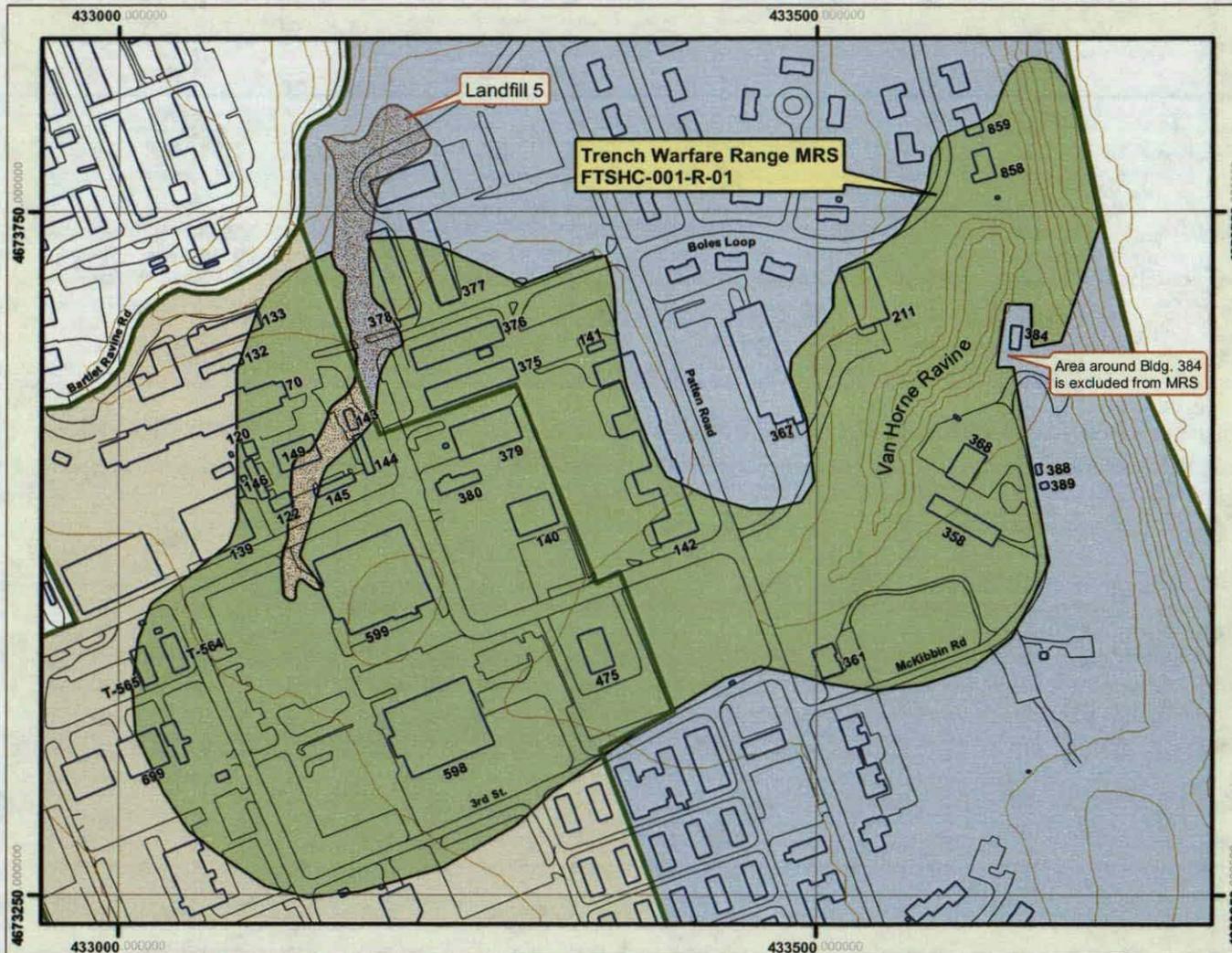
Results of historical sampling indicate the presence of explosives in groundwater near Landfill 5 at concentrations less than the IEPA Tiered Approach to Corrective Action Objectives (TACO) Class I Standards. Elevated concentrations of lead have also been reported in historical surface soil samples from Landfill 5. Landfill 5 is not classified as being MMRP eligible and will be addressed under the IRP, therefore, it has been removed from the MRS footprint.



FINAL TRENCH WARFARE RANGE MRS FOOTPRINT Fort Sheridan, IL



Figure 4-1



Contour
 Road
 U.S. Army Reserve
 U.S. Navy
 Building Outline
 Landfill
Area Status
 MRS, Closed

Projection: UTM Zone 16
Datum : WGS 84
Units: Meters
Grid: 500 Meter

1:5,000

Installation Location
Illinois

SITE INSPECTION REPORT
FORT SHERIDAN, IL

Source: Produced for the U.S. Army Corps of Engineers by engineering-environmental Management, Inc. (e²M)

Date: March 2007
Edition: Final

During the April 10, 2006 SI field work, e²M observed a previously undocumented area of concern in the eastern area of the Trench Warfare Range MRS. It was observed Building 384 had a perimeter fence with warning signs affixed in multiple locations stating, "DANGER: Unexploded Ordnance Restricted Area Fort Sheridan BRAC Office Tel. 708/926-4806" (see **Figure 4-1**). Because this area was not previously considered an area of concern, a visual survey and sampling were not included in the Work Plan (WP) and thus were not conducted. This fenced area straddles the boundary between the Trench Warfare Range MRS and the AAA Firing Points A and B MRS. As stated below, Building 384 itself (but not the fenced area surrounding it) received an NFA by the US Department of the Army and the US Department of the Navy, in consultation with both the EPA and IEPA (SAIC, 1999b). Because the fenced area has a different use history than the Trench Warfare Range MRS, it is recommended that all of the fenced area around Building 384 be removed from the Trench Warfare Range MRS and added to the AAA Firing Points A and B MRS. The acreage of the MRS has been reduced from 53.1 to 51.5 acres. The final footprint of the Trench Warfare Range MRS is shown on **Figure 4-1**.

4.1.1 Previous Investigations

According to the *Conclusions and Recommendations* section of the 1996 ASR, training munitions (including smoke grenades, flares, and blank ammunition) were used in the trenches. "At least one exercise involved the firing of three-inch mortars." The area suspected to contain MEC residue falls on the US Navy property (to the east of Patten Road) (USACE, 1996). "The portion of the trench system located on either side of the Van Horne Ravine east of Patten Road appears to be the portion of the trench system most likely to have been used in training exercises involving opposing forces. It is assumed that the ravine itself would represent the 'no man's land' between the two forces. This area, the ravine and trenches north and south of it, are the areas most likely to have ordnance and explosives (OE) residue (USACE, 1996)."

Previous geophysical investigations did not indicate the presence of MEC. The US Department of the Army and the US Department of the Navy, in consultation with USEPA and IEPA have determined that no actions are necessary at the following sites near the Trench Warfare Range MRS: VES Area #7, Building 137/139 Yard Area, Building 142 Administration, Building 361 Yard Area, Building 368 Yard Area, Building 377 Yard Area, Building 379 Yard Area, Building 564/565 Yard Area, and Ammunition Storage Buildings 384, 389, and 390. This determination can be found in the *Proposed Remedial Action Plan, No-Action Sites, DoD Operable Unit, Fort Sheridan, Illinois* (SAIC, 1999b) and the *Decision Document for the No Action Study Areas, DoD Operable Unit, Fort Sheridan, Illinois* (SAIC, 2002c). The results of the BRA indicate chemical constituents detected in the environmental media at these no action study areas on

the DoD OU do not pose significant risk to human health or the environment (SAIC 2002c). These investigations were done for hazardous, toxic, and radioactive waste (HTRW) under CERCLA. Please refer to the HRR, Section 4.2.1, in **Appendix B** for more details regarding this MRS.

4.2 AAA Complex MRA (FTSHC-002-R)

Going into the SI, the AAA Complex MRA consisted of five MRSs: the Southern Small Arms Range MRS, the Southern Machine Gun Range MRS, and the Southern Pistol Range MRS; and the AAA Firing Point "A" MRS and the AAA Firing Point "B" MRS. These MRSs were shown previously on **Figure 3-5**.

As part of the new revised naming conventions, the Southern Small Arms Range MRS, Southern Machine Gun Range MRS, and Southern Pistol Range MRS were combined into one MRS: Southern Small Arms Ranges MRS. Also, the AAA Firing Point "A" MRS and AAA Firing Point "B" MRS were combined into one MRS: AAA Firing Points A and B MRS.

Therefore, the AAA Complex MRA presently consists of the following two MRSs:

- Southern Small Arms Ranges MRS (FTSHC-002-R-01); and
- AAA Firing Points A and B MRS (FTSHC-002-R-02).

The Southern Small Arms Ranges MRS, comprised of the Small Arms, Pistol, and Machine Gun Ranges, totaled approximately 1.0 acre going into the SI. The ranges were used from approximately 1891 to 1950. Only small arms were used at the ranges (Malcolm Pirnie, 2003). During site reconnaissance, no evidence of small arms ammunition was found at the sites (USACE, 1996 and Malcolm Pirnie, 2003). The Southern Small Arms Ranges MRS is recommended for NFA because sufficient evidence exists indicating the lack of MEC and MC. Historical usage indicates the ranges were used only for small arms.

The AAA Firing Points A and B MRS, comprised of Firing Points "A" and "B," totaled approximately 13.7 acres going into the SI and is located on the bluff and in the ridges of the southeastern portion of FTSH. The firing points were used from approximately 1930 to 1950 by the 61st Coast Artillery to fire projectiles including: 40mm, 90mm, .50 caliber and Rocket Launcher 2.36-inch Anti-Tank (AT). Targets for artillery were located in Lake Michigan; therefore, the vast majority of the range fans were over water. The range fans over Lake Michigan are identified as a separate MRS, the AAA Complex – Transferred MRS, which is described in **Section 4.3**. In the ASR (USACE, 1996), there is a supposition that a "dud pit" would have been built at each firing point and a central collection pit would also exist. In addition, the ASR stated a 105mm cartridge case was found in the vicinity of AAA Firing Point "B". Therefore, further characterization is warranted at the AAA Firing Points A and B MRS.

Based on the results of the HRR and SI fieldwork discussed in **Section 5**, it is recommended that the footprint of the AAA Complex MRA be changed from the footprint that was originally presented going into the SI (see **Figure 3-5**).

As described previously in **Section 3.3.2**, only the portions of the Southern Small Arms Ranges MRS lying outside of the AAA Firing Points A and B MRS were counted in the total acreage recommended for NFA. The portions of the Southern Small Arms Ranges MRS overlapping the AAA Firing Points A and B MRS are considered part of the AAA Firing Points A and B MRS to avoid duplicating acreages.

During the SI field work, a fenced area posted with UXO warning signs was observed surrounding Building 384 at the Trench Warfare Range MRS. As described in **Section 4.1** above, it is recommended that all of the fenced area around Building 384 be removed from the Trench Warfare Range MRS and added to the AAA Firing Points A and B MRS.

A portion of Landfill 7, a capped landfill being addressed under the IRP, overlaps the northern corners of AAA Firing Point "A" as shown previously on **Figure 3-6**; therefore this area was excluded from the final footprint of the MRS (see **Figure 4-2**).

Because the associated range fans did not contain MEC or MC, these portions are recommended for removal from the footprint that was originally presented going into the SI (see **Figure 3-6**).

The new acreages are 0.21 acres for the Southern Small Arms Range MRS, and 6.2 acres for the AAA Firing Points A and B MRS. The final footprints of the Southern Small Arms Ranges MRS and the AAA Firing Points A and B MRS are shown on **Figure 4-2**.

4.2.1 Previous Investigations

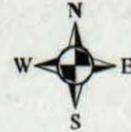
During site reconnaissance, no evidence of small arms ammunition was found at the Southern Small Arms Ranges MRS (USACE, 1996; and Malcolm Pirnie, 2003). Site reconnaissance conducted by Malcolm Pirnie in 2003 around the AAA Firing Points A and B MRS did not reveal any visible evidence of UXO, DMM, or munitions related debris. However, the 1996 ASR (USACE, 1996) indicated that OE was found in the vicinity of AAA Firing Point "B", including a 105mm cartridge case.



FINAL SOUTHERN SMALL ARMS RANGES MRS and AAA FIRING POINTS A and B MRS Fort Sheridan, IL



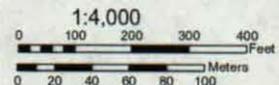
Figure 4-2



- Contour
- Road
- Water
- Pre-BRAC Boundary
- U.S. Navy
- Building Outline
- Landfill
- Area Status**
- MRS, Closed

Data Source: e²M, Final Military Munitions Response Program Historical Records Review, Fort Sheridan, Illinois, December 2005, Figure 2-5 and 2-6.

Projection: UTM Zone 16
Datum: WGS 84
Units: Meters
Grid: 250 Meter



SITE INSPECTION PLAN
FORT SHERIDAN, IL

Source: Produced for the U.S. Army Corps of Engineers by engineering-environmental Management, Inc. (e²M)

Date: March 2007
Edition: Final



The northern corners of the former AAA Firing Point "A" overlap with a small portion of Landfill 7 (see **Figure 3-6**). Landfill 7 was constructed within the former Wells Ravine and its tributaries and is one of the primary points of historical accumulation of municipal waste on the DoD OU. The landfill was used in the 1940s, 1960s, and 1970s, with all disposal operations ending in 1979 (SAIC, 1999a). Landfill 7 was capped in 1980-1982 (Kemron, 2003b). Cleanup of the landfill is covered under the IRP and the overlapping portion of the landfill has been removed from the footprint of the AAA Firing Points A and B MRS. Please refer to the HRR, Section 4.2.2, in **Appendix B** for more details regarding this MRS.

4.3 AAA Complex – Transferred MRS (FTSHC-003-R-01)

The AAA Complex-Transferred MRS is the range fan area over Lake Michigan associated with the AAA Complex MRA (see **Figure 4-3**). The AAA Complex – Transferred MRS is approximately 100,987.93 acres. This MRS was used by the 61st Coast Artillery as a fly-over target range for projectiles including: 37mm, 40mm, 90mm, 120mm, and Rocket Launcher 2.36-inch AT. Targets were usually towed over Lake Michigan (USACE, 1996). There was the possibility of projectiles being fired up to 15 miles from shore. Going into the SI, the MRS covered approximately 157,184 acres. However, newly acquired information regarding BRAC properties indicated a significant portion of the AAA Complex-Transferred MRS range fan coincided with the BRAC range fan. Therefore, the BRAC portion of the range fan was removed from the MRS footprint reducing the final acreage to approximately 100,988 acres (see **Figure 4-3**).

4.3.1 Previous Investigations

In the spring of 2000, UXB International provided UXO diving support in Lake Michigan as part of the “*Final Anti-Aircraft Artillery Ranges Site Investigation Report, Surplus Operable Unit, Fort Sheridan, Illinois*” (Harding ESE, 2001). There was no evidence of UXO discovered during the site investigation.

Sediment samples were collected offshore in 2001 near Landfill 7, offshore south of Shenck Ravine, and offshore near Bartlett and Van Horne Ravines (Harding ESE, 2001). Three surface water samples were also collected during offshore sediment sampling activities. Explosive constituents were not detected in the sediment or surface water samples.

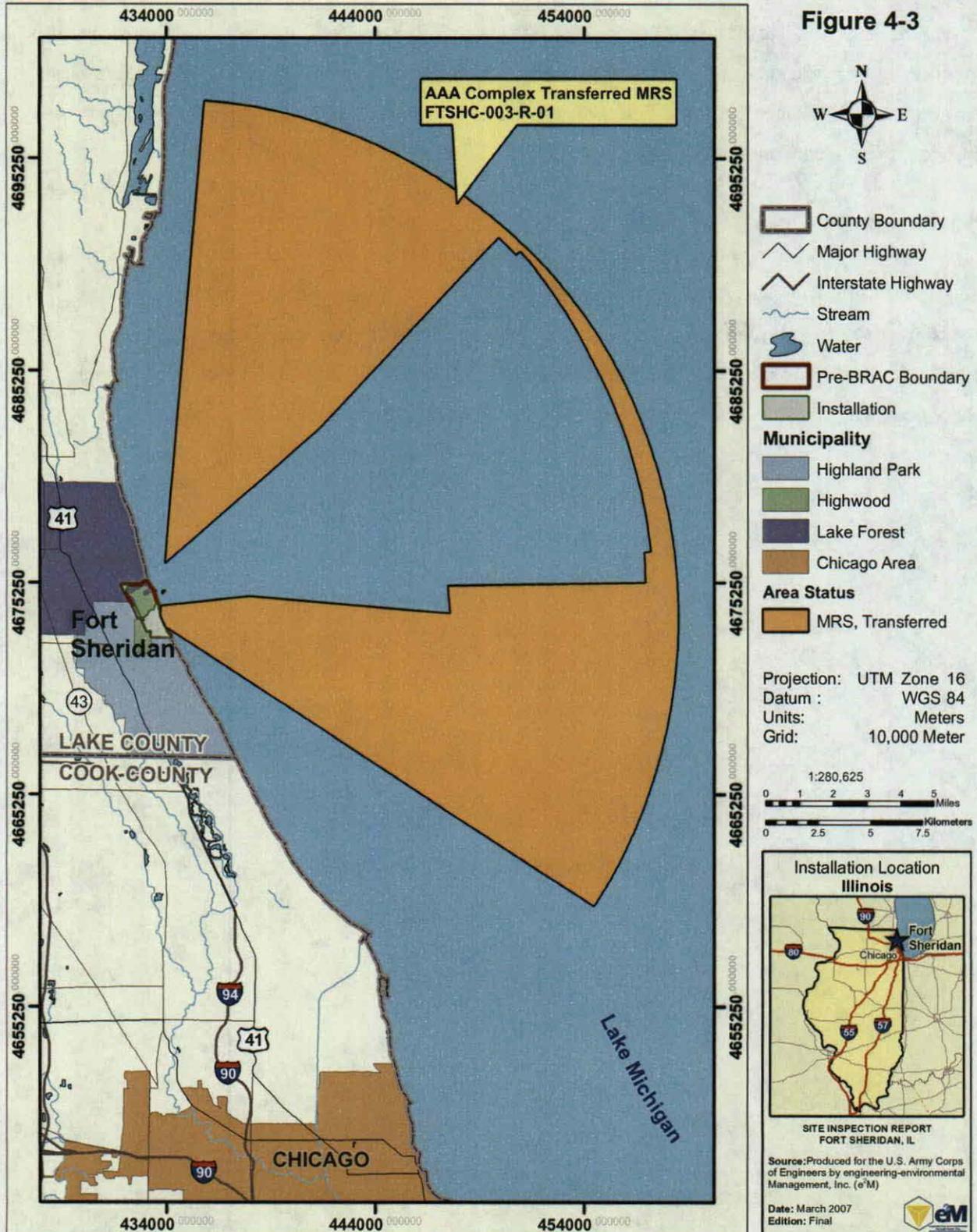
Please refer to the HRR, Section 4.2.3, in **Appendix B** for more details regarding this MRS.



FINAL AAA COMPLEX-TRANSFERRED MRS FOOTPRINT Fort Sheridan, IL



Figure 4-3



4.4 Grenade Course MRS (FTSHC-004-R-01)

The Grenade Course MRS is located in the southeast corner of FTSH in an area currently occupied by non-commissioned officer (NCO) housing (see **Figure 4-4**) and covers approximately 26 acres.

Historical records indicate the grenade course was in use from late 1943 to 1948. The course was used for training with rifle and hand grenades against fixed and moving targets (USACE, 1996). There were two Explosive Ordnance Disposal (EOD) response incidents in recent years regarding grenades in the suspected Grenade Course MRS area.

4.4.1 Previous Investigations

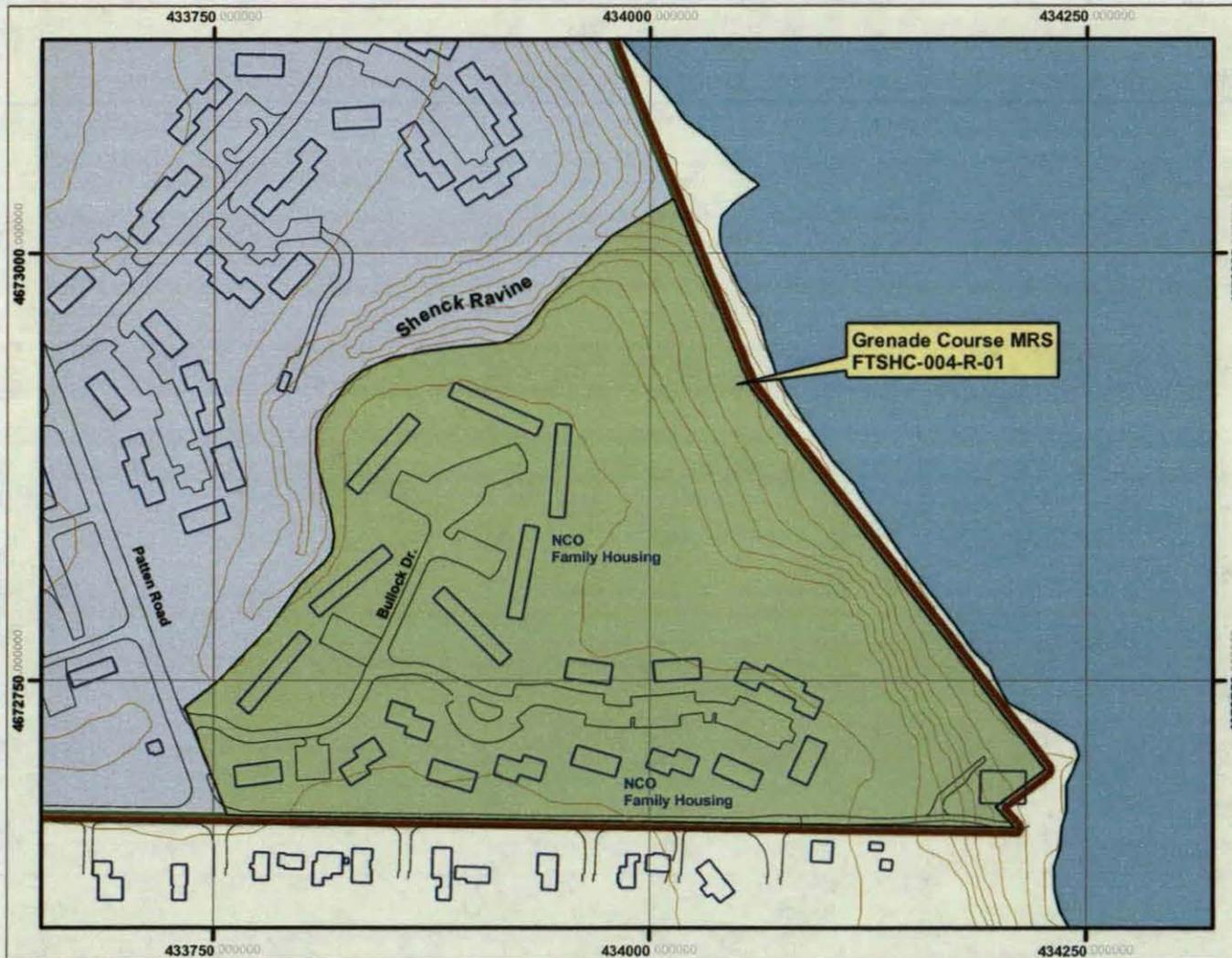
Metallic debris of unknown origin or type was located during the Phase II geophysical survey conducted during the RI/BRA (SAIC, 2001), but it is unknown if it is MEC-related. No surface MEC was encountered during the geophysical survey. Phase III sampling was conducted during the RI/BRA (SAIC, 2001) at Excavation Area #8 which is located within the Grenade Course MRS. Aluminum, arsenic, chromium, iron, nickel, and vanadium were detected at concentrations greater than background concentrations; however, explosives were not detected. Please refer to the HRR, Section 4.2.4, in **Appendix B** for more details regarding this MRS.



FINAL GRENADE COURSE MRS FOOTPRINT Fort Sheridan, IL

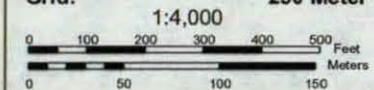


Figure 4-4



- Contour
- Road
- Water
- U.S. Navy
- Building Outline
- Area Status**
- MRS, Closed

Projection: UTM Zone 16
Datum : WGS 84
Units: Meters
Grid: 250 Meter



Installation Location
Illinois

SITE INSPECTION REPORT
FORT SHERIDAN, IL

Source: Produced for the U.S. Army Corps of Engineers by
engineering-environmental Management, Inc. (e²M)

Date: March 2007
Edition: Final

March 2007

4.5 Small Arms Range Complex MRS (FTSHC-005-R-01)

Going into the SI, the Small Arms Range Complex MRS consisted of the Northern Pistol Range MRS and the Northern Machine Gun Range MRS. During the SI, the Northern Pistol Range MRS and the Northern Machine Gun Range MRS were combined into one MRS: Small Arms Range Complex MRS (FTSHC-005-R-01). A portion of the Small Arms Range Complex MRS is overlapped by a firing fan identified during the US Army CTT Range/Site Inventory for BRAC properties. The overlapping portion has been removed from the Small Arms Range Complex MRS for the purposes of this SI because this area was already counted under the BRAC MMRP. The ranges are located along the beach of Lake Michigan and comprise approximately 1.4 acres (see **Figure 4-5**). The ranges are non-contiguous but were classified together by Malcolm Pirnie and the Navy during the PA and the US Navy MMRP. The ranges were used from approximately 1891 to 1950. Only small arms, .50 caliber or less, were used at the ranges (Malcolm Pirnie, 2003).

4.5.1 Previous Investigations

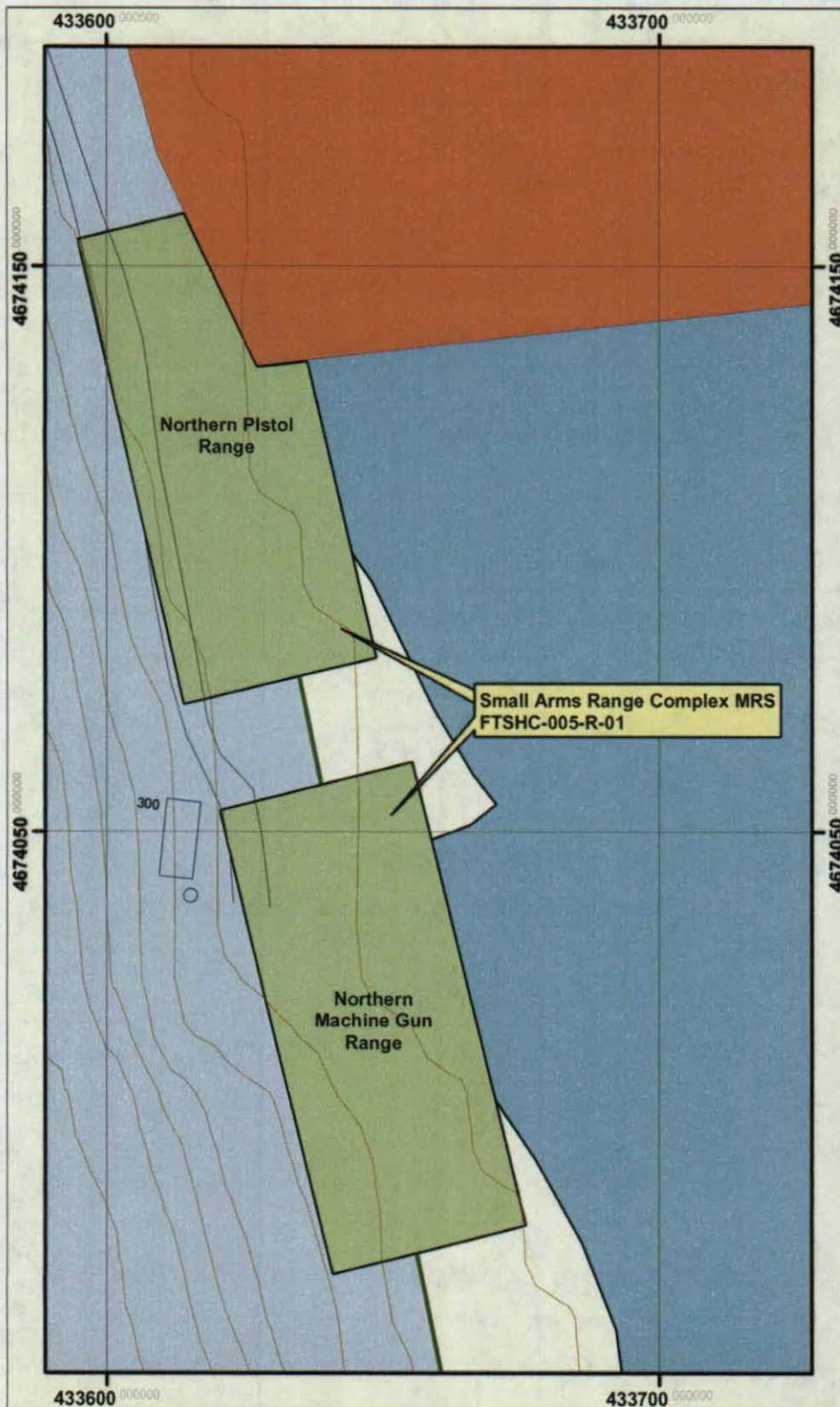
During site reconnaissance, no evidence of small arms ammunition was found at the ranges (USACE, 1996 and Malcolm Pirnie, 2003). Soil and sediment samples collected during the RI/BRA (SAIC, 2001) did not contain metals at concentrations exceeding background concentrations at the Small Arms Range Complex MRS. Additionally, no berms, ammunition cartridges, or lead fragments were observed (SAIC, 2001). Please refer to the HRR, Section 4.2.5, in **Appendix B** for more details regarding this MRS.



FINAL SMALL ARMS RANGE COMPLEX MRS Fort Sheridan, IL

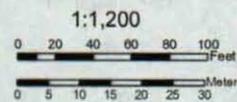


Figure 4-5



- Contour
- Road
- Water
- U.S. Navy
- Building Outline
- Area Status**
- MRS, Closed
- BRAC Range Fan

Projection: UTM Zone 16
Datum: WGS 84
Units: Meters
Grid: 100 Meter



Installation Location
Illinois

SITE INSPECTION REPORT
FORT SHERIDAN, IL

Source: Produced for the U.S. Army Corps of Engineers by engineering-environmental Management, Inc. (eM)

Date: March 2007
Edition: Final

5.0 SITE INSPECTION FIELD ACTIVITIES

SI field activities were conducted based on the naming convention and MRS footprints determined during the HRR. It should be noted that references to the various MRSs in the AAA Complex MRA are based on the naming and footprints of the MRSs at the time of the field investigation. **Table 5-1** provides a cross-reference of the original naming designations going into the SI and the revised designations determined for this final SI report.

Table 5-1: MRA/MRS Designations

MRA	MRS Designation Going into SI	MRS Designation - Final
Trench Warfare Range MRA (FTSHC-001-R)	Trench Warfare Range MRS	Trench Warfare Range MRS
AAA Complex MRA (FTSHC-002-R)	Southern Small Arms Range MRS	Southern Small Arms Ranges MRS
	Southern Pistol Range MRS	
	Southern Machine Gun Range MRS	
	AAA Firing Point "A" MRS	AAA Firing Points A and B MRS
	AAA Firing Point "B" MRS	
AAA Complex-Transferred MRA (FTSHC-003-R)	AAA Complex-Transferred MRS	AAA Complex-Transferred MRS
Grenade Course MRA (FTSHC-004-R)	Grenade Course MRS	Grenade Course MRS
Small Arms Range Complex MRA (FTSHC-005-R)	Northern Pistol Range MRS	Small Arms Range Complex MRS
	Northern Machine Gun Range MRS	

5.1 Visual/Magnetometer Survey Procedures

Visual/magnetometer surveys were conducted at the Trench Warfare Range MRS and the AAA Firing Point "A" portion of the AAA Complex MRA. The limited visual/magnetometer surveys of the MRAs/MRSs were performed with a goal of detecting surficial MEC. The visual/magnetometer surveys were performed by walking over the designated areas including developed, prairie grass, and wooded areas, as detailed in the WP.

The UXO Technician II was responsible for identifying potential MEC or munitions debris seen on the ground surface. A handheld Schonstedt GA-52B Magnetic Locator (magnetometer) was used to assist in identifying potential MEC or munitions debris in thick vegetation. The Global Positioning System (GPS) unit was used to determine track line positions and plot coordinates of any suspect materials found.

The Field Project Manager (FPM) served as an additional sweep team member and was responsible for informing interested parties of any suspect items found.

5.2 Surface Soil Sampling

Surface soil samples were collected to identify potentially elevated concentrations of MC. These data were also used to populate the ERIS database and to support completion of the MRS-PPs. The samples were collected using proper field quality control (QC) procedures and analyzed according to the procedures stated in the Quality Assurance Project Plan (QAPP) (Appendix C of the WP). Sampling protocols are discussed in detail in the Field Sampling Plan (Appendix B of the WP).

The surface soil samples were collected using a disposable scoop while wearing nitrile gloves. The 7-wheel soil sampling approach was employed to obtain composite samples at each sampling location. Composite samples were homogenized in a stainless steel mixing bowl prior to being placed directly into sample containers. New scoops and gloves were used at each sampling location. The soil samples were collected and placed directly into labeled glass sampling containers. The samples were then placed in a cooler chilled to a maximum temperature of 4 degrees Celsius (°C) with double bagged ice. After the samples were placed into the cooler, the chain-of-custody (COC) form was filled out. Prior to shipping, the cooler was repacked with ice, the original COC was signed, dated, placed in a sealed bag, and taped to the inside lid of the cooler. COC seals were placed on the cooler and the cooler was taped shut. The cooler was then shipped overnight to the laboratory. Coordinates for each sampling location were established using GPS.

A total of ten investigative composite surface soil samples were collected during the SI field work: five (5) from the Trench Warfare Range MRS, and five (5) from the AAA Firing Point "A" portion of the AAA Complex MRA. In addition, one (1) duplicate sample (FTSH-TRWR-R01) and one (1) split sample (FTSH-TRWR-R03) were collected from the Trench Warfare Range MRS. Surface soil samples were collected and analyzed for Target Analyte List (TAL) metals (EPA Method 6010B) and explosives (EPA Method 8330). Laboratory reports from STL and PEL can be found in **Appendix E**.

5.3 Field QA/QC Documentation

Field QC was accomplished for sample collection by using one time use, disposable sampling scoops and gloves. The 7-wheel soil sampling approach was employed to obtain composite samples at each sampling location. Composite samples were homogenized in a stainless steel mixing bowl and the field sample and any associated quality assurance (QA) samples were obtained from the homogenized

composite. The samples were then placed directly into pre-cleaned glass sampling containers. Field QA samples were collected and included both duplicate (analyzed by PEL) and split (analyzed by STL) soil samples. Refer to **Appendix E** for QA laboratory reports from STL and PEL.

Field documentation included field notebooks, Daily Quality Control Reports (DQCRs), sample labels, and COC forms. All field documentation was completed in indelible ink and corrections were made by drawing a single line through the text, initialing, dating, and legibly writing the correction. Field notes regarding all sampling and field activities were kept in a bound notebook with pre-numbered pages. Field notes were filled out for each day of field work, and include all of the information that is reported on the DQCR forms. Copies of the field notes are provided in **Appendix D**.

A DQCR was prepared by the FPM each day field work was performed and all workdays were documented by these reports throughout the duration of the field work. DQCRs document daily site conditions and all activities completed. DQCRs also identify any QC issues concerning site inspection activities. DQCRs were submitted to the USACE, Omaha District Project Manager and copies are provided in **Appendix D**.

Correct sample labeling and the corresponding notation of the sample identification (ID) numbers in the field notebook and on the COC forms was utilized to prevent misidentification of samples and their eventual results. All sample labels were completed legibly with indelible ink. The labels were affixed to each sample container and included the following information: project name, company name, name/initials of the collector, date and time of collection, sample identification, and analysis required.

COC procedures were completed in accordance with USACE Sample Handling Protocol and EPA procedures. COC procedures are used to document and track samples from collection through reporting of analytical results, and serve as permanent records of sample handling and shipment. Strict COC protocol was maintained for all samples collected during this project. The COC forms were filled out with indelible ink by the FPM, and any corrections were crossed out with a single line and initialed and dated. The information included on the COC form is provided in Appendix C of the WP. The completed COC form was sealed in a resealable bag and taped to the inside of the lid of the sample cooler. The FPM kept one copy of the COC form. The laboratory signed the COC upon accepting the samples for analysis. Copies of the COC forms are included in **Appendix E**.

6.0 SITE INSPECTION FIELD RESULTS

6.1 Trench Warfare Range MRS (FTSHC-001-R-01)

The Trench Warfare Range MRS is located in the southern half of FTSH, south of Bartlett Ravine Road, and surrounds Van Horne Ravine (see **Figure 6-1**). Surface soil samples were collected within the Van Horne Ravine (Navy owned) portion (see **Photograph 1**) of the Trench Warfare Range MRS based upon discussions which took place during the TPP 2 meeting and field conditions.



Photograph 1: A view of the Van Horne Ravine within the Trench Warfare Range MRS (April 2006)

6.1.1 Visual/Magnetometer Survey

A visual/magnetometer survey was performed in Van Horne Ravine within the Trench Warfare Range MRS on 10 April 2006 (see **Figure 6-1**). No evidence of MEC was found within Van Horne Ravine during the magnetometer survey. The fenced area surrounding Building 384 (see **Photograph 2**) with posted signs warning of UXO in the area did not have obvious MEC from the visual observations that were made outside the perimeter of the fence by the FPM. The remaining portion of the Trench Warfare Range MRS was not surveyed either visually for MEC or with the magnetometer.



TRENCH WARFARE RANGE MRS TRANSECT and SOIL SAMPLE LOCATIONS Fort Sheridan, IL

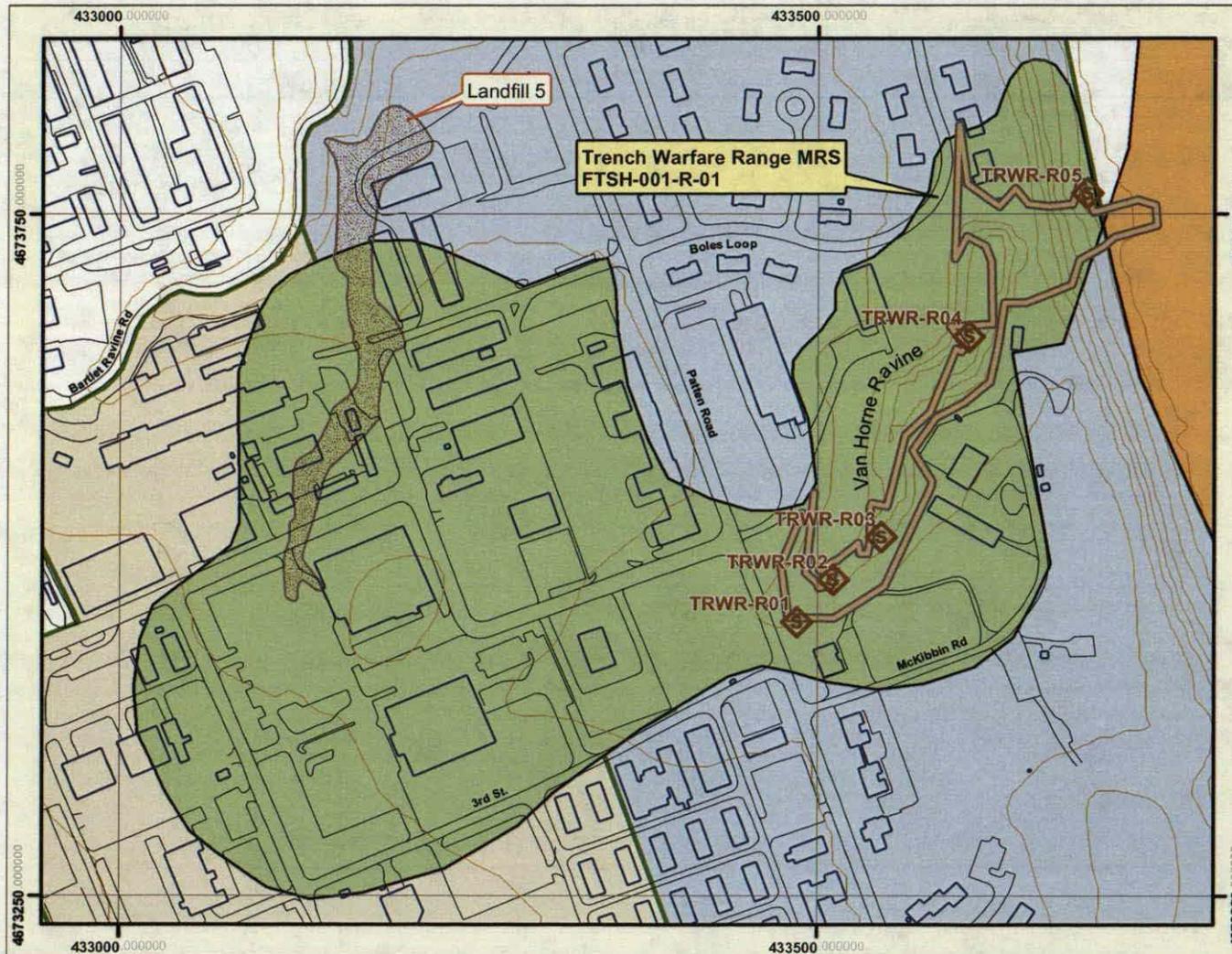
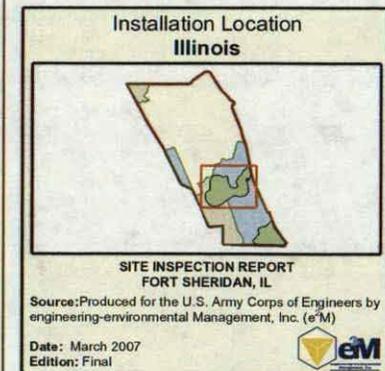
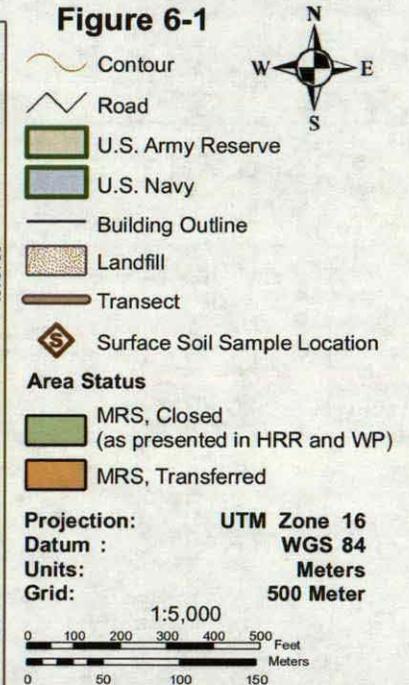


Figure 6-1





Photograph 2: Building 384 on the Trench Warfare Range MRS and the surrounding fence that partially covers the AAA Firing Point "B" (April 2006)

6.1.2 Surface Soil Sampling

Five (5) investigative composite surface soil samples were collected in Van Horne Ravine within the Trench Warfare Range MRS (see **Figure 6-1**). Soil samples were analyzed for metals and explosives. Both lead and mercury concentrations were well below the IEPA TACO Tier I standards of 400 mg/kg and 23 mg/kg, respectively. The IEPA TACO Tier I standards were exceeded in several samples for aluminum, calcium, iron, magnesium, potassium, and sodium. It is important to note, however, that although these constituents exceed the IEPA TACO Tier I standards, the concentrations were all below site background levels, except for magnesium. It should also be noted that calcium, magnesium, potassium, and sodium are naturally occurring elements in the environment and are thus not considered MC of concern. Analytical results for TAL metals are listed in **Table 6-1**. Explosives were not detected above reporting limits (see **Table 6-2**).

Table 6-1: Trench Warfare Range MRS Analytical Results for TAL Metals (mg/kg)

Analyte	EPA Region 9 Standards	IL EPA TACO Tier I Standards	Background Samples Fort Sheridan May 1997	FTSH-TRWR-R01	FTSH-TRWR-DUP	FTSH-TRWR-R02	FTSH-TRWR-R03	FTSH-TRWR-R04	FTSH-TRWR-R05
Aluminum	76000	9500	14413	10200	10300	5710	6510	4320	4480
Antimony	31	31	7.00	0.314U	0.275U	0.447	0.31U	0.264U	0.223B
Arsenic	22	13	8.96	6.05	5.89	2.5	1.55U	4.79	1.56U
Barium	5400	5500	1231	53.4	64.7	34.6	27.2	121	24.2
Beryllium	150	160	1.65	0.343	0.273B	0.26B	0.233B	0.118B	0.121B
Cadmium	37	78	1.00	0.0371B	0.115B	1.09	0.55	0.216B	0.439
Calcium	N/A	9300	160509	41400	40500	60200	110000	61700	86700
Chromium	210	230	22.5	16.2	15.7	14.4	12.2	11	
Cobalt	900	4700	19.3	11.1	10.8	6.76	6.83	7.23	4.93
Copper	3100	2900	25.7	21.2	18.8	25.2	19.3	21.2	16.2
Iron	23000	15900	30839	19400	18200	12600	14300	14500	11800
Lead	150	400	56.7	23.8	27.4	124	19.4	56.5	29.4
Magnesium	N/A	4820	38000	23900	24200	34100	57900	33700	45400
Mercury	23	23	1.50	0.0353	0.0392	0.0777	0.0252	0.0734	0.0225
Molybdenum	390	N/A	NA	2.7B	3.2	1.93B	2.38B	2.7	1.42B
Nickel	1600	1600	37.0	21.1	18.5	15.2	16.1	14.8	11.2
Potassium	N/A	1268	2072	1760	1560	1240	1680	1010	1000
Silver	390	390	NA	0.314U	0.275U	0.0605B	0.31U	0.264U	0.313U
Sodium	N/A	130	1300	268	255	106	179	212	242
Strontium	47000	N/A	NA	28.6	26.9	38.8	48.7	30.8	39.6
Tin	47000	7.62	NA	2.02	2.15	3.32	1.13B	1.32U	1.33B
Titanium	N/A	N/A	NA	96.5	83.6	88.4	92	78.9	126
Vanadium	550	550	40.7	23.7	23.6	15.7	15.8	14.2	15
Zinc	23000	23000	109	51.8	55.3	94.9	39.2	50.4	42.8

NOTES

NA = not applicable

U = The reported value obtained was either less than the method detection limit or was not detected.

Table 6-2: Trench Warfare Range MRS Analytical Results for Explosives (mg/kg)

Analyte	EPA Region 9 Standards	IL EPA TACO Tier I Standard	FTSH-TRWR-R01	FTSH-TRWR-DUP	FTSH-TRWR-R02	FTSH-TRWR-R03	FTSH-TRWR-R04	FTSH-TRWR-R05
2,4,6-Trinitrotoluene	16	N/A	1.5U	1.6U	1.9U	1.5U	1.5U	1.7U
2,4-Dinitrotoluene	120	0.9	1.5U	1.6U	1.9U	1.5U	1.5U	1.7U
RDX	4.4	N/A	1.5U	1.6U	1.9U	1.5U	1.5U	1.7U
4-Amino-2,6-dinitrotoluene	N/A	N/A	1.5U	1.6U	1.9U	1.5U	1.5U	1.7U
HMX	3100	N/A	1.5U	1.6U	1.9U	1.5U	1.5U	1.7U
2-Amino-4,6-dinitrotoluene	N/A	N/A	1.5U	1.6U	1.9U	1.5U	1.5U	1.7U
Tetryl	N/A	N/A	.31U	.31U	.38U	.31U	.3U	.34U
2,6-Dinitrotoluene	61	0.9	1.5U	1.6U	1.9U	1.5U	1.5U	1.7U
PETN	NA	NA	18U	19U	23U	18U	18U	21U
2-Nitrotoluene	370	N/A	1.5U	1.6U	1.9U	1.5U	1.5U	1.7U
Nitrobenzene	20	39	1.5U	1.6U	1.9U	1.5U	1.5U	1.7U
3-Nitrotoluene	370	N/A	1.5U	1.6U	1.9U	1.5U	1.5U	1.7U
1,3,5-Trinitrobenzene	1800	N/A	1.5U	1.6U	1.9U	1.5U	1.5U	1.7U
1,3-Dinitrobenzene	6.1	N/A	1.5U	1.6U	1.9U	1.5U	1.5U	1.7U
4-Nitrotoluene	370	N/A	1.5U	1.6U	1.9U	1.5U	1.5U	1.7U

NOTES:
 NA = Not Applicable
 U= The reported value obtained was either less than the method detection limit or was not detected.

6.2 AAA Complex MRA (FTSHC-002-R)

During the SI field investigation, the AAA Complex MRA consisted of five MRSs (see **Figure 6-2**) including the following:

- Southern Small Arms Range MRS;
- Southern Machine Gun Range MRS;
- Southern Pistol Range MRS;
- AAA Firing Point "A" MRS; and
- AAA Firing Point "B" MRS.

See **Table 5-1** for a cross-reference of the revised MRS designations.

A magnetometer assisted visual survey and soil sampling were performed at the AAA Firing Point "A" MRS portion of the AAA Complex MRA based on TPP 2 meeting discussions (**Photograph 3**).



Photograph 3: View from general location of the AAA Firing Point "A" looking east towards Lake Michigan (April 2006).

6.2.1 Visual/Magnetometer Survey

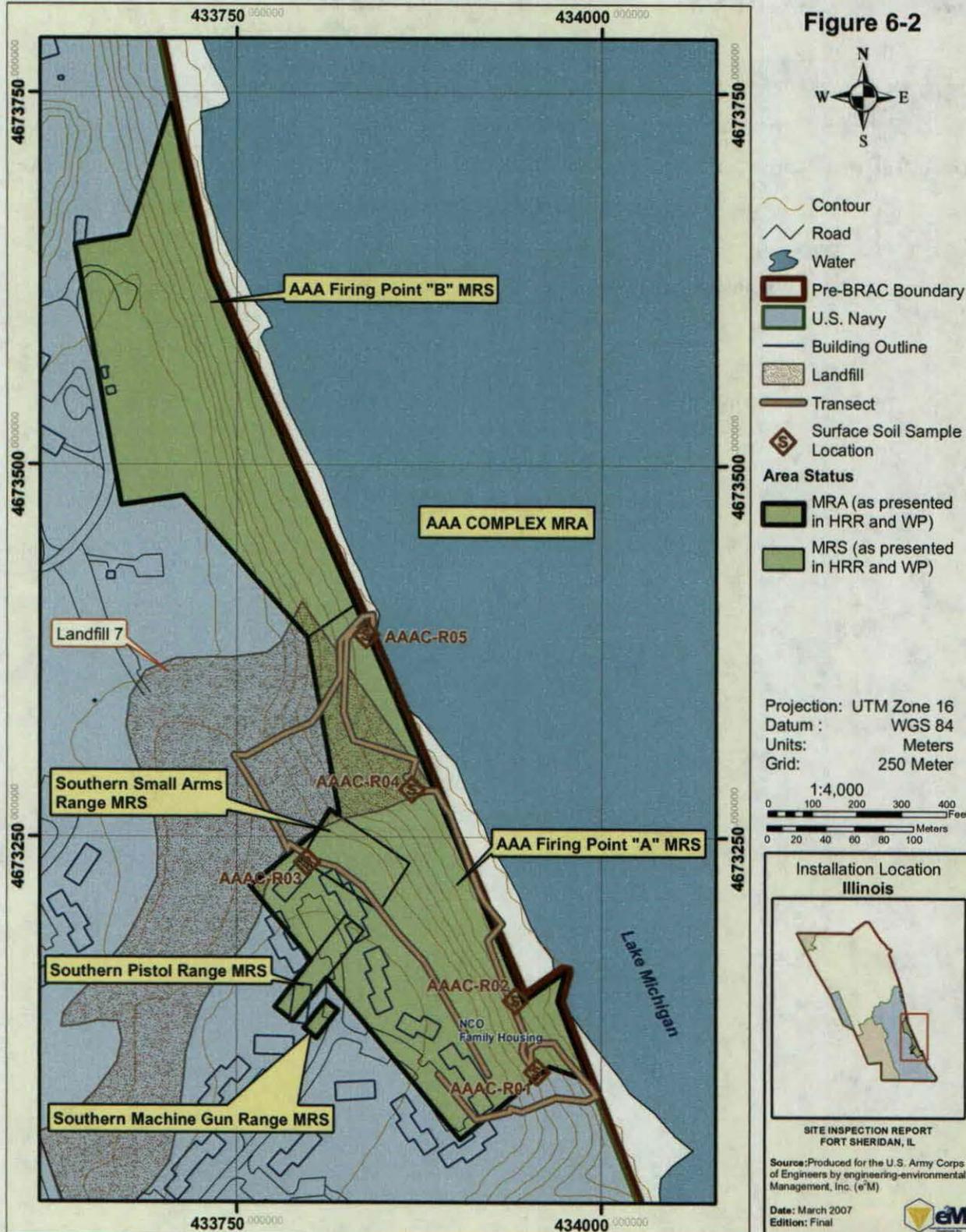
A visual/magnetometer survey was performed at the AAA Firing Point "A" on 10 April 2006 (see **Figure 6-2**). No evidence of MEC was found. In addition, the fenced area surrounding Building 384 did not have obvious MEC from the visual observations that were made outside the perimeter of the fence by the FPM. The remaining portion of the AAA Complex MRA was not surveyed either visually for MEC or with the magnetometer.



AAA COMPLEX MRA TRANSECT and SOIL SAMPLE LOCATIONS Fort Sheridan, IL



Figure 6-2



March 2007

6.2.2 Surface Soil

Five (5) investigative composite surface soil samples were collected from the AAA Firing Point "A" (see **Figure 6-2**). Soil samples were analyzed for metals and explosives. Both lead and mercury concentrations were well below the IEPA TACO Tier I standards of 400 mg/kg and 23 mg/kg, respectively. The IEPA TACO Tier I Standards were exceeded in several samples for aluminum, calcium, iron, magnesium, potassium, and sodium (see **Table 6-3**). However, it is important to note that although these constituents exceed the IEPA TACO Tier I standards, none were detected at concentrations greater than site background levels with the exception of potassium. It should also be noted that calcium, magnesium, potassium, and sodium are naturally occurring elements in the environment and are thus not considered MC of concern. Explosives were not detected above reporting limits (see **Table 6-4**).

Table 6-3: AAA Complex MRA Analytical Results for TAL Metals (mg/kg)

Analyte	EPA Region 9 Standards	IL EPA TACO Tier I Standards	Background Samples Fort Sheridan May 1997	FTSH-AAAC-R01	FTSH-AAAC-R02	FTSH-AAAC-R03	FTSH-AAAC-R04	FTSH-AAAC-R05
Aluminum	76000	9500	14413	11500	9540	2860	1430	13800
Antimony	31	31	7.00	0.348U	0.336U	0.192U	0.229U	0.336U
Arsenic	22	13	8.96	5.4	2.41	2.21	1.02	6.38
Barium	5400	5500	1231	56.4	37.3	10.2	5.24	75.8
Beryllium	150	160	1.65	0.353	0.296B	0.0908B	0.0766B	0.512
Cadmium	37	78	1.00	0.0678B	0.249B	0.283	0.294	0.0724B
Calcium	N/A	9300	160509	48200	73800	53200	45200	38800
Chromium	210	230	22.5	18.2	16.6	6.39	3.68	20
Cobalt	900	4700	19.3	8.97	10.1	4.51	1.98	9.59
Copper	3100	2900	25.7	25.2	23.8	11.6	3.71	24.5
Iron	23000	15900	30839	20500	18300	9060	5640	20300
Lead	150	400	56.7	18.2	15.7	12	5.54	19.4
Magnesium	N/A	4820	38000	26700	36900	29300	23000	22300
Mercury	23	23	1.50	0.0322	0.0154B	0.00352B	0.00335B	0.0338
Molybdenum	390	N/A	NA	2.22B	2.55B	0.993B	0.434B	1.95B
Nickel	1600	1600	37.0	22.8	25.3	9.14	4.27	23.8
Potassium	N/A	1268	2072	2210	2440	585	238	2240
Silver	390	390	NA	0.348U	0.336U	0.192U	0.229U	0.336U
Sodium	N/A	130	1300	114	136	110	138	96.7
Strontium	47000	N/A	NA	38.1	42.8	25.8	21.4	26.1
Tin	47000	7.62	NA	2.35	1.68U	0.589B	1.7	2.35
Titanium	N/A	N/A	NA	97.3	132	131	76.3	107
Vanadium	550	550	40.7	24.1	21.1	10.7	6.7	28
Zinc	23000	23000	109	53.1	52.3	52.3	17.2	55.8
NOTES:								
NA = Not Applicable								
U = The reported value obtained was either less than the method detection limit or was not detected.								

Table 6-4: AAA Complex MRA Analytical Results for Explosives (mg/kg)

Analyte	EPA Region 9 Standards	IL EPA TACO Tier I Standards	FTSH-AAAC-R01	FTSH-AAAC-R02	FTSH-AAAC-R03	FTSH-AAAC-R04	FTSH-AAAC-R05
2,4,6-Trinitrotoluene	16	N/A	1.9U	1.6U	1.3U	1.5U	1.6U
2,4-Dinitrotoluene	120	0.9	1.9U	1.6U	1.3U	1.5U	1.6U
RDX	4.4	N/A	1.9U	1.6U	1.3U	1.5U	1.6U
4-Amino-2,6-dinitrotoluene	N/A	N/A	1.9U	1.6U	1.3U	1.5U	1.6U
HMX	3100	N/A	1.9U	1.6U	1.3U	1.5U	1.6U
2-Amino-4,6-dinitrotoluene	N/A	N/A	1.9U	1.6U	1.3U	1.5U	1.6U
Tetryl	N/A	N/A	.37U	.32U	.26U	.3U	.32U
2,6-Dinitrotoluene	61	0.9	1.9U	1.6U	1.3U	1.5U	1.6U
PETN	NA	NA	22U	19U	16U	18U	19U
2-Nitrotoluene	370	N/A	1.9U	1.6U	1.3U	1.5U	1.6U
Nitrobenzene	20	39	1.9U	1.6U	1.3U	1.5U	1.6U
3-Nitrotoluene	370	N/A	1.9U	1.6U	1.3U	1.5U	1.6U
1,3,5-Trinitrobenzene	1800	N/A	1.9U	1.6U	1.3U	1.5U	1.6U
1,3-Dinitrobenzene	6.1	N/A	1.9U	1.6U	1.3U	1.5U	1.6U
4-Nitrotoluene	370	N/A	1.9U	1.6U	1.3U	1.5U	1.6U
NOTES:							
NA = Not Applicable							
U= The reported value obtained was either less than the method detection limit or was not detected.							

6.3 AAA Complex – Transferred MRS (FTSHC-003-R-01)

Results of previous investigations indicated that MEC and MC were not a concern in the range safety fans over Lake Michigan in the AAA Complex – Transferred MRS. Therefore, a MEC survey and analytical sampling were not conducted as part of this SI. Please refer to **Section 4.3.1** and the HRR located in **Appendix B** for more details regarding this MRS.

6.4 Grenade Course MRS (FTSHC-004-R-01)

Results of previous investigations indicate the presence of MEC and MC is likely at the Grenade Course MRS. Based on this information a visual/magnetometer survey and soil sampling were not conducted as part of this SI. Please refer to **Section 4.4.1** and the HRR located in **Appendix B** for more details regarding this MRS.

6.5 Small Arms Range Complex MRS (FTSHC-005-R-01)

Previous investigations at the Small Arms Range Complex MRS (identified as the Northern Pistol Range MRS and the Northern Machine Gun Range MRS going into the SI) did not find evidence of MEC or elevated levels of MC. Therefore, a visual/magnetometer survey and soil sampling was not conducted at this MRS as part of this SI. Please refer to **Section 4.5.1** and the HRR located in **Appendix B** for more details regarding this MRS.

6.6 Data Quality Review Summary

The laboratory data for the FTSH MRSs/MRAs were reviewed for data quality and usability of the data. The complete details of the data review are provided in **Appendix F**. It has been determined that the data are usable for their intended purpose of supporting the conclusion of the SI as well as for the population of the ERIS database and the MRS-PPs. Below is a summary of the findings of the data review and conclusions based upon interpretation of the case summaries as a whole using professional judgment in accordance with the EPA Contract Laboratory Program (CLP) Functional Validation Guidelines and the USACE Appendix I Shell for Analytical Chemistry Requirements (EM 200-1-3, *Requirements For The Preparation of Sampling And Analysis Plans, February 2001*) and the USACE General Chemistry Supplement to the Scope of Services Rev. 2, November 2002.

6.6.1 Explosives Analysis

Holding Times

Holding times were evaluated by comparing sampling dates, extraction dates, and analysis dates.

Holding times were within evaluation criteria specified in the National Functional Guidelines and the

USACE Appendix I Shell for Analytical Chemistry; therefore, qualification of data were not required based on holding times.

Shipping and Handling

Samples were received in proper condition and at appropriate temperatures. Therefore, no qualification of the data was deemed necessary based on delivery temperature.

Laboratory Blanks

Blank contamination was not found in the laboratory method blanks. Therefore, qualification of the data was not necessary based on the method blank analysis.

Matrix Spikes

Although matrix spike and matrix spike duplicate analyses are completed by the laboratory as part of good laboratory practice protocol, no site specific matrix spikes were designated for these delivery groups. In accordance with the EPA Functional Validation Guidelines, precision and accuracy are evaluated through the use of Laboratory Control Sample (LCS) and LCS duplicate (LCSD) analyses for this project.

Laboratory Control Samples (LCS)

The LCS percent recoveries were in control in accordance with the QAPP and USACE quality criteria. Therefore, qualification of the data was not deemed necessary based on LCS analyses.

Surrogates

A number of samples had surrogate recoveries above the control limits for explosives. However, because all analytes were non-detects for all samples, data qualification was not required.

6.6.2 Metals Analysis

Holding Times

Holding times were evaluated by comparing sampling dates, extraction dates, and analysis dates. Holding times were within evaluation criteria specified in the National Functional Guidelines and the USACE Appendix I Shell for Analytical Chemistry; therefore, qualification of data was not required based on holding times.

Shipping and Handling

Samples were received in proper condition and at appropriate temperatures. Therefore, qualification of the data was not deemed necessary based on delivery temperature.

Laboratory Blanks

Ten analyte detections were reported in calibrations blanks for metals analysis. Because most of the sample results were much greater than the blank contamination overall data are not significantly impacted.

Matrix Spikes

Matrix spikes and matrix spike duplicate analyses were not designated for these delivery groups as part of the SI investigation. Precision and accuracy were evaluated based on LCS and LCS duplicate analysis.

6.6.3 Precision, Accuracy, Representativeness, Comparability, Completeness, and Sensitivity (PARCCS) Parameters Summary

Precision and Accuracy

Precision and accuracy were quantitatively assessed by evaluating QC data, including LCS and surrogate data. Overall, it was concluded that the precision and accuracy results were satisfactory for this data set and will not impact the data for its intended use.

Representativeness

Representativeness expresses the degree to which data accurately and precisely represent the characteristic population. Representativeness was assessed by the use of duplicate samples. One surface soil duplicate sample was collected and analyzed for explosives and metals. The sample met the evaluation criteria outlined in the WP. The split sample also exhibited satisfactory representativeness. Therefore, it was concluded that representativeness for the dataset was satisfactory and determined to be representative for its intended use.

Comparability

Comparability expresses the confidence with which one data set can be compared to another. Data are comparable if collection techniques, analysis methods, and reporting procedures are equivalent. Throughout this investigation, appropriate procedures were implemented; therefore, it was concluded the results of the surface soil data were comparable to one another.

Completeness

Completeness is defined as the percentage of the total number of analytical results requested which are judged to be valid (including estimated J values). The overall dataset was considered to be complete for its intended use.

Sensitivity Reporting Limits

Reporting limits were reviewed to evaluate whether the level of sensitivity was achieved to meet the data quality objectives (DQOs). For the explosives analyses, no dilutions were required during the analyses and the data was satisfactory for its intended use. For metals analyses, due to matrix interference for certain analytes, dilutions were required. However, the resulting raised method detection limits were still below the original reporting limits. Therefore, the data are determined to be usable for their intended purpose. No qualifications were necessary based on sensitivity.

6.7 Magnetometer Calibration Procedures

The Schonstedt GA-52CX Magnetic Locator (handheld magnetic gradiometer [magnetometer]) was used by field personnel in the Van Horne Ravine area of the Trench Warfare MRS and the AAA Firing Point "A" MRS. The magnetometer alerted the field team to any potential surface and near surface MEC during the visual/magnetometer surveys and sample collection activities.

The Schonstedt magnetometer detects the magnetic field of any ferrous object even when covered by leaves, grass, soil, snow, etc. The instrument consists of two proton resonance magnetic field sensors approximately 0.5 meters (m) apart that balance out the effect of the earth's ambient magnetic field. As long as this balance exists, the frequency of the audio output signal remains at 40 Hertz. However, when the magnetic field becomes stronger at the lower sensor than it is at the upper sensor, the output signal frequency is increased. When the tip of the locator is positioned directly over the target (if the target magnetic dipole is oriented perpendicular to surface) the audio signal increases to its highest frequency where the magnetic field gradient is greatest.

During daily calibration, the Schonstedt magnetometer was swept across a known ferrous item (inert ordnance or surrogate item expected to be encountered on the range) within a known area free of subsurface anomalies to demonstrate consistent effectiveness. The inert ordnance or surrogate item was buried at the appropriate detection depths below the ground surface, which was predetermined as a function of the mass shape and orientation of the selected target item, and any documented expected depth for a specific UXO item that could be encountered on site.

The Schonstedt GA-52CX was tested with sufficient frequency and in such a manner as to ensure that accuracy and reproducibility of results were consistent with the manufacturer's specifications. This calibration also minimizes the influence of ambient background noise levels. To obtain maximum sweep area coverage (approximately 2.3m wide), the locator is swept from side to side with the sensor close to the ground.

6.8 MRS-PP Summaries

The MRS-PPs evaluate the following potential explosive safety and environmental hazards:

- Explosive hazards posed by UXO and DMM,
- Hazards associated with the effects of chemical warfare materiel (CWM), and
- The chronic health and environmental hazards posed by MC or other chemical constituents.

DoD recognizes the different hazards inherent to each class of materials. To address these differences, the Protocol has three hazard evaluation modules, each of which is specific to one type of hazard, specifically:

- Explosive hazards are evaluated using the Explosives Hazard Evaluation (EHE) module,
- CWM-related hazards are evaluated using the Chemical Warfare Materiel Hazard Evaluation (CHE) module, and
- Health and environmental hazards posed by MC are evaluated using the Health Hazard Evaluation (HHE) module.

Each hazard evaluation model is assigned a module rating consisting of a priority number. A "1" priority would represent the highest priority rating, and a "8" priority would represent the lowest priority. The CHE module is given more weight than the other two modules. An overall rating is then assessed consisting of the highest priority rating of the three modules. A conservative approach is applied when filling out the modules.

The module ratings and priority numbers along with overall ratings for each of the currently designated MRSs with the new naming conventions are stated in **Table 6-5**. The complete MRS-PPs are included in **Appendix G**.

Table 6-5: MRS-PP Summary

MRS-PP Scores	Trench Warfare Range MRS	Southern Small Arms Ranges MRS	AAA Firing Points A and B MRS	AAA Complex-Transferred MRS	Grenade Course MRS	Small Arms Range Complex MRS
EHE	8	8	5	7	2	8
CHE	No Known Hazard or Suspected CWM Hazard					
HHE	8	No Known or Suspected MC Hazard	6	No Known or Suspected MC Hazard	5	No Known or Suspected MC Hazard
Final Priority	8	8	5	7	2	8

7.0 CONCEPTUAL SITE MODEL

The primary purpose of the Conceptual Site Model (CSM) is to identify current or reasonably anticipated human and environmental exposure to MEC and MC by identifying potential human and ecological receptors and pathways. As such, this document provides a realistic conceptualization of the following on site conditions:

- Actual or reasonably anticipated presence of MEC and MC;
- Actual or reasonably anticipated points of exposure and exposure pathways; and
- Actual or reasonably anticipated future human and ecological receptors.

By identifying these on site conditions, it is the intent of this section to assist in determining effective and achievable future actions that are protective of human health and the environment.

The following CSM discussions are of the currently designated MRSs with the new naming conventions.

7.1 Trench Warfare Range MRS (FTSHC-001-R-01)

7.1.1 MRS Profile

7.1.1.1 Area and Layout

The recommended area of the Trench Warfare Range MRS encompasses approximately 51.5 acres. The area of the MRS is slightly less than what was presented in the HRR (53.1 acres) because a small fenced area around Building 384 is being recommended for inclusion in the AAA Firing Points A and B MRS. In addition, a portion of Landfill 5, an IRP site not eligible for the MMRP, overlaps with the Trench Warfare Range MRS. The overlapping area of the landfill was removed from the Trench Warfare Range MRS footprint. The boundaries of the USARC property are fenced and a fence will be reinstalled around Landfill 5 by the US Army (the fence was temporarily removed for the installation of the landfill cap).

7.1.1.2 Boundaries

The Trench Warfare Range MRS is surrounded mostly by buildings. Bartlett Ravine and Bartlett Ravine Road lie to the north of the site. The southern edge of the site follows 3rd Street on the USARC property and McKibbin Road on the US Navy property. A fenced area posted with UXO warning signs, around Building 384 is located near the eastern edge of the MRS. The fenced area around Building 384, a former storage building previously designated as NFA, overlaps with the AAA Firing Point "B" portion of the AAA Firing Points A and B MRS. Because of the UXO warning signs and the fact that a 105mm

cartridge was found in the area (USACE, 1996), it is being recommended that the fenced area only be removed from the Trench Warfare Range MRS and added to the AAA Firing Points A and B MRS.

7.1.1.3 Structures

The remaining structures at the Trench Warfare Range MRS include many buildings used by the US Army Reserve and the US Navy. Building 70 was previously used for pesticide storage. Buildings 122 and 143 served as storage areas for hazardous materials but were recently demolished (SAIC, 2002). Building 379 serves as an electronic equipment repair shop. Building 384, a former ammunition storage building, was previously designated as NFA by the US Department of the Army and the US Department of the Navy, in consultation with both the EPA and IEPA and is not included as part of the MRS. Building 564 is a former thrift shop and Building 565 is a former Army & Air Force Exchange Service (AAFES) service station (SAIC, 1999a).

7.1.1.4 Utilities

Utilities located within the confines of the Trench Warfare Range MRS include electricity, telephone, sewer, and water lines.

7.1.1.5 Security

FTSH is surrounded by a perimeter fence and is patrolled regularly by Great Lakes Security. Access to the installation is gained by passing through an unguarded entrance. Anyone can access the installation and once on site, individual movement is not restricted. There are no barriers or security system around the Trench Warfare Range MRS (e²M, 2002), but there is fencing around the USARC property and the fencing around Landfill 5 is being reinstalled.

7.1.2 Physical Profile

7.1.2.1 Climate

The climate at FTSH is continental characterized by cold winters, warm summers, and moderate amounts of rainfall. Based on meteorological data from Chicago-O'Hare International Airport between 1964 and 1993, the average summer temperature was 83.6 degrees Fahrenheit (°F) (July) and the average winter temperature was 13.5°F (January) with an average annual temperature of 49°F (SAIC, 1999a).

Annual precipitation at Chicago-O'Hare International Airport was 35.5 inches between 1964 and 1993 with monthly averages between 1.37 inches in February and 4.12 inches in August. Snowfall amounts at

O'Hare averaged 38.2 inches (1964-1993) with the highest monthly average in January with 10.7 inches. The greatest snowfall occurs between December and March (SAIC, 1999a).

Prevailing wind speed and direction in northeastern Illinois is south-southwest at about 10 miles per hour (mph) annually (ERD, 1989).

Changes in weather patterns at FTSH are subject to the "lake effect" caused by Lake Michigan. Snowfall is common in winter due to cold air masses moving over the warmer lake establishing moisture gradients that result in precipitation when the air is lifted over land (ERD, 1989).

7.1.2.2 Geology

The surficial geology in northern Illinois is predominantly the result of the Wisconsin glacialiation that occurred during the Pleistocene Age. FTSH is located within the Lake Border Morainic System of the Central Lowland Physiographic Province and is on the easternmost Highland Park Moraine in southern Lake County. This moraine trends from north-northwest to south-southeast for 30 miles between the Lake Chicago Plain and the Lake Michigan beach to Cook County (ERD, 1989; Ceres, 2004). The moraine is generally 50 to 100 feet thick and runs parallel to the lake shore (USACE, 1996).

The glacial material deposited in the FTSH region is representative of the Wadsworth Till Formation of the Wedron Group. The Wadsworth till consists predominantly of illitic, calcareous, gray, fine textured clay matrix with lenses of sorted and stratified sand, gravel, or silt within the clay matrix. The Wadsworth Formation is interpreted to represent till and sediment that underwent re-deposition in an ice-marginal and possibly subaqueous environment, and deposition probably occurred as a result of fluctuations of the glacial ice margin 15,500 to 13,800 years ago (SAIC, 1999a). The Wadsworth Formation till underlying FTSH has a generally low permeability (SAIC, 2002a).

7.1.2.3 Topography

The topography of FTSH is relatively flat with a gentle slope of 2 to 4 degrees to the east terminating at a bluff line that runs along the lakeshore. Elevations at FTSH range from 650 feet (ft) above sea level at the bluff line up to 695 ft above sea level at the western boundary.

There are six deep ravines that run west to east within the installation perpendicular to the Lake Michigan shoreline. The topography of the ravines has been altered from their initial configurations

because some were used as waste disposal sites. The southern branch of Bartlett Ravine now supports a road.

Erosion is a continuous problem along the beaches and bluffs due to high lake levels. Groins and revetments have been installed and rip rap has been placed along areas of the beach and bluff. Erosion abatement efforts will continue at FTSH (ERD, 1989).

7.1.2.4 Soil

FTSH is included in the Morley-Beecher-Hennepin Soil Association according to the Soil Conservation Service of the US Department of Agriculture (USDA). This soil association occurs in a long narrow belt that extends from the southeastern corner of Lake County north to Waukegan, Illinois. Three major and two minor surface soil series have been identified at FTSH. The major series are the Morley Silt Loam, the Hennepin Loam, and beach sand. The Morley Series is the predominant soil type and covers most of the land at FTSH. The beach sand series is found along the shoreline of Lake Michigan. The Hennepin Series is located in parts of the northwest, northeast, and southeast areas and is found along the bluff overlooking Lake Michigan and in the deep ravines. The minor soil series which have been identified near the western boundary of FTSH include the Markham and Beecher Silty Clay Loams. The permeability of each soil series has qualitatively been described as moderately low due to the high clay content (USACE, 1996; ERD, 1989).

7.1.2.5 Hydrogeology

FTSH lies within the Wadsworth Formation which has a predominantly fine-grained texture and comprises a leaky aquitard for more permeable formations (buried sand aquifers, bedrock) underlying or overlying the till in a regional setting. The movement of groundwater within the till is through hydraulic conductivity variations caused by the presence of coarser deposits of silt, sand, and gravel with variable lateral and vertical continuity. Groundwater seepage through the till would be predominantly downward-directed except in the presence of more permeable and laterally connected lenses or geological discontinuities (fractures, joints). Groundwater movement through permeable units within and underlying the till (buried sand aquifers, bedrock) is expected to be predominantly lateral (SAIC, 1999a).

The geological materials underlying FTSH consist of clay to silty clay with occurrences of laterally discontinuous silt, sand, or gravel lenses that are generally 1 to 8 feet thick. The overall movement of groundwater beneath FTSH was investigated by Zimmer Howell Engineering, Ltd., in November 1984

using a network of 45 piezometers regularly distributed across the installation. The interpreted groundwater flow direction based on the observed water levels in the piezometers is east northeast toward Lake Michigan. Interpretive groundwater elevation mapping completed in 1997 confirmed the 1984 groundwater flow direction towards Lake Michigan. Groundwater elevations in the Zimmer Howell Engineering, Ltd. piezometer network ranged between 683.97 feet above mean sea level (msl) near the main truck gate and 581.38 feet above msl near the beach on the Surplus OU. The average horizontal hydraulic gradient calculated from the interpreted contours in the Phase I RI report is 0.008 ft/ft. These data indicate that local groundwater flow is influenced by the ravines and that shallow groundwater flow across the installation is toward Lake Michigan. Static water levels varied from 2 to 15 feet below land surface (SAIC, 1999a).

The bedrock unit immediately underlying the glacial deposits is dolomite of Silurian age consisting of the following formations: Racine, Sugar Run, Joliet, Kankakee, Elwood, and Wilhelmi. Together these formations comprise the "shallow dolomite aquifer". The Maquoketa Group (Ordovician age) underlies the Silurian dolomites and consists primarily of nonwater-bearing shales that separate the Silurian aquifer from deeper underlying water-bearing units. However, appreciable downward leakage through the Maquoketa shales to the deep bedrock aquifer system has been reported. Near FTSH, the Maquoketa shales are found at a depth of approximately 400 feet and are about 100 feet thick (ERD, 1989).

The Cambrian-Ordovician aquifer system underlies the Maquoketa shales in Lake County. This aquifer consists of a thick sequence of hydrologically connected rock formations whose ages range from middle Ordovician (Galena, Platteville, Glenwood, and St. Peter formations) to middle Cambrian (Eminence, Potosi, Franconia, Ironton, and Galesville formations). The major aquifers are the Glenwood-St. Peter and Ironton-Galesville aquifers, both consisting of fine- to coarse-grained sandstones. The Ironton-Galesville Sandstone is the most consistently permeable and productive formation of the Cambrian-Ordovician aquifer system in northeastern Illinois, producing approximately 50 percent of the total system yield. In southeastern Lake County, the Cambrian-Ordovician aquifer system extends in depth from approximately 500 ft to 1,500 ft (ERD, 1989).

The Eau Claire Formation, consisting of shales and siltstone, lies beneath the Ironton-Galesville aquifer. The upper part of the Eau Claire Formation hydrologically separates that aquifer from the deeper Elmhurst-Mt. Simon aquifer, which consists of the Elmhurst member of the Eau Claire Formation and the underlying Mt. Simon Formation. The Elmhurst-Mt. Simon aquifer consists of sandstones of early Cambrian age, and is the deepest fresh water aquifer in northeastern Illinois, extending in depth from

about 1,700 to 3,700 ft in southeastern Lake County. Water is only acceptable for drinking from the uppermost few hundred ft due to water being highly mineralized at greater depths. This Elmhurst-Mt. Simon aquifer lies unconformably on top of pre-Cambrian granitic crystalline rocks (ERD, 1989). FTSH obtains drinking water from Lake Michigan. The city of Highland Park currently provides water to the DoD OU (SAIC, 2002). Only one groundwater well is in use at FTSH and it is non-potable. The depth of this well is unknown (ERD, 1989). Local ordinances in the vicinity of FTSH prohibit the usage of groundwater for drinking (Kemron, 2003a).

7.1.2.6 Hydrology

FTSH is located in the Upper Illinois River Basin and has no perennial streams. The eastern boundary is the western shore of Lake Michigan. The shoreline is characterized by high (up to 80 ft) steep faced bluffs, exposing glacial deposits consisting predominantly of till. At the base of the bluffs, there is a sandy lake shore of variable width dependent on wind and wave action. The lake shoreline has been engineered with groins to reduce the erosive impact of longshore drift which degrades available beach area. The elevation of Lake Michigan is approximately 580 feet above msl. One unnamed pond is located at the north end of the installation in the Surplus OU and formerly was stocked for sport fishing for residents (SAIC, 2002a).

Surface water runoff flows either into the nearest ravine or into the storm sewer system discharging to Lake Michigan via direct pipeline to culverts at the lake shore, or through outfalls into one of the ravines. There are two main storm drains which run along the branches of Bartlett Ravine. The drain in the northern Ravine was installed prior to Landfill 3 and 4 filling this branch. The drain in the southern branch lies beneath the road in the bottom of the ravine. Numerous outfalls also exist along Bartlett Ravine, including the storm drain underneath Landfill 5 that drains into the ravine at the northern end of the Landfill. This drainage system also receives storm drainage from the town of Highwood. Surface ditches along roadways and branch storm sewers channel water into the main storm sewers (SAIC, 2002a).

Lake Michigan is a source of potable water, water for fire protection and general usage to the DoD OU and the surrounding municipalities. Water treatment facilities on site have been discontinued since storm sewer discharges, open ravine discharges, and surface runoff make the lake a potential receptor for chemical discharges from the facility and surrounding municipalities (SAIC, 2002a).

FTSH was connected to the North Shore Sanitary District in 1978. Prior to the connection, the installation operated a sewage treatment plant and was granted a National Pollutant Discharge Elimination System (NPDES) permit for discharging effluent into Lake Michigan. A former sludge bed associated with the plant is located on the beach. The plant's average daily capacity was 600,000 gallons per day (SAIC, 2002a).

7.1.2.7 Vegetation

FTSH lies within the Eastern Broadleaf Forest Province but due to continuing development in the area the historical forest of oak-hickory is limited. The forest produced a mosaic pattern with prairies grading between the oak-hickory-bluestem parkland. Formerly forested, FTSH has been developed for other uses. The remaining vegetation that dominates the Fort includes lawn among buildings and a golf course and mature shade trees of the oak species (*Quercus* spp.) (USACE, 1999).

Due to the unique location of FTSH there are a number of important vegetative species that are within its boundaries. FTSH Bluff has an area of very high quality eroding bluff with a relict assemblage of plants and is of state-wide ecological significance (ERD, 1989; USACE, 1996). The southern arm of Janes Ravine along its north facing slope and the bluff between Bartlett and Van Horne Ravine contains several state endangered or threatened plants (SAIC, 1996). These include the state threatened Ground Juniper (*Juniperus communis*), Pale Vetchling (*Lathyrus ochroleucus*), Black-seeded Rice Grass (*Oryzopsis racemosa*), Arbor Vitae (*Thuja occidentalis*), Star Flower (*Trientalis borealis*), and Dog Violet (*Viola conspersa*). State endangered species at FTSH include the Canadian Buffalo Berry (*Sherpherdia canadensis*), Small Solomon's Seal (*Polygonatum pubescens*), Grove Bluegrass (*Poa alsodes*), Eastern Prairie Fringed Orchid (*Platanthera psychoides*), Weak Bluegrass (*Poa languida*) and Purple Flowering Raspberry (*Rubus odoratus*) (USACE, 1999; ERD, 1989; SAIC, 1996; Plants Database, 2004; Earth Tech, 1995).

7.1.3 Site Specific Land Use and Exposure Profile

7.1.3.1 Current Land Use

The Trench Warfare Range MRS is believed to have been filled in sometime after WWI. Landfill 5 was used from approximately 1900 to the 1960s. The USARC and the US Navy now own the former Trench Warfare Range MRS property and they maintain buildings at the MRS. The current land use scenario includes current employees, recreational visitors to areas that are not fenced, trespassers into the fenced areas, and maintenance workers. Activities that could change the exposure potential include excavation, construction, and development (SAIC, 2002a).

7.1.3.2 *Current Human Receptors*

"Just before its closure, FTSH employed 4,525 military personnel and 1,650 civilian personnel. US Census data for 1990, before closure, indicated a resident population on the Fort of 2,405 persons. The Navy maintains 329 single and multiple-person housing units on the DoD OU (SAIC, 2002)." There are currently maintenance workers, US Army and Navy employees, trespassers, and recreational users who can access the MRS.

7.1.3.3 *Potential Future Land Use*

The DoD maintains ownership of the approximately 306 acres of the USARC and US Navy property at FTSH. The 2002 Feasibility Study (FS) evaluated both recreational and residential future land use. Because of contamination at Landfill 5, the FS determined there were unacceptable human health risks associated with recreational and residential use of a portion of the Trench Warfare Range MRS area, partially because of elevated lead levels (SAIC, 2002). The Final Phase III Technical Plan of the DoD OU RI states "Current engineering controls (e.g., pavement) cannot be entirely relied upon to prevent the excavation of contaminated soils, and construction and reworking of the land surface is possible (SAIC, 2000)."

7.1.3.4 *Potential Future Human Receptors*

The future land use at FTSH may include construction of new military housing. Potential future human receptors would include adult and child residential receptors and current use receptors including current employees at both USARC and US Navy sites, maintenance workers, trespassers, and recreational users.

7.1.3.5 *Zoning/Land Use Restrictions*

It is unknown whether there are formal zoning or deed restrictions at the Trench Warfare Range MRS.

7.1.3.6 *Site Specific Beneficial Resources*

Four wetlands have been identified at FTSH by the US Fish and Wildlife Service (SAIC, 2002). These wetlands are predominantly along the beach of Lake Michigan and none of the wetlands are located within the Trench Warfare Range MRS area. See **Section 7.1.4.1** for more details.

It is unknown whether FTSH implemented a Cultural Resources Management Plan.

Groundwater is not considered to be an important source of potable water at FTSH because local ordinances prohibit its usage for drinking (SAIC, 1999a) and the aquifer cannot act as a potable water source because it is unable to support adequate production (SAIC, 1999b). Shallow groundwater has been contaminated as a result of historic site operations, but there is uncertainty as to whether any training in the trenches led to this contamination (refer to the HRR, Section 4.2.1, in **Appendix B**). All of the shallow groundwater beneath FTSH should be classified as Class II groundwater, or general resource groundwater (ESE, 1994).

7.1.3.7 Demographics/Zoning

FTSH is located in Lake County, Illinois, approximately 30 miles north of Chicago, Illinois, and 18 miles south of the Wisconsin state line along the southwestern shore of Lake Michigan. The post is bordered by the City of Highwood to the west, Highland Park to the south and Lake Forest to the north. Highwood, population 4,143, lies immediately adjacent to the southwest corner of the Post. The urban center encompasses 0.6 square miles. Highland Park, population 31,365, covers 12.5 square miles and the city of Lake Forest, population 20,059, covers 17.1 square miles. These cities are relatively small and are comprised of mostly residential housing with some small shops and restaurants (www.census.gov; SAIC, 2002).

7.1.4 Ecological Profile

7.1.4.1 Habitat Type

FTSH lies within the Eastern Broadleaf Forest Province dominated by oak-hickory forests. The natural habitat areas that historically covered FTSH have slowly been replaced, as much of the installation was in use for more than a century. Much of the land has been used for barracks, officers' housing, administration buildings, stables, a hospital, a golf course, a cemetery, various weapons ranges, and an airfield. The natural areas are now primarily in the remaining ravines and some areas of the bluff and beach. The rest of the facility is of the suburban habitat type characterized by lawns among buildings and parking lots. Mature shade trees are in many of the open areas with the greatest number within the golf course. The northern portion of FTSH is bordered by the Lake County Forest Preserve.

Four wetlands have been identified at FTSH by the US Fish and Wildlife Service. Three of the wetlands are lacustrine and they occupy approximately 10 acres along the shore of Lake Michigan. Two of them are on the beach within the DoD OU extending south from Bartlett Ravine toward the Boles Loop drain. The third lacustrine wetland consists of the beach area located approximately between the former Wells Ravine and Shenck Ravine. The fourth wetland is a recreational fishing pond. It is

approximately 1 acre in size, is classified as a palustrine wetland, and is located in the northeast corner of the installation far from the MRSs (SAIC, 2002).

7.1.4.2 Degree of Disturbance

The current degree of disturbance at the Trench Warfare Range MRS is moderate. The trenches have not been used for training since WWI and operations at Landfill 5 ended in the 1960s. The western extension of Van Horne Ravine (the portion to the west of Patten Road) is believed to have been filled in between 1941 and 1943. Any current disturbance is the result of installation of a landfill cap at Landfill 5 and regular maintenance activities (e.g., mowing). The future use of the property is undecided.

7.1.4.3 Ecological Receptors

There are a number of threatened and endangered plants that live within unique habitats on FTSH. The ravine system supports a prairie-like habitat which supports 118 plant species with 6 state threatened species and 6 state endangered species (USACE, 1999; ERD, 1989; SAIC, 1996; Plants Database, 2004). No federally endangered or threatened plant species are present. Additionally, some migratory birds that pass through the area have federal status, but none of these birds have been observed nesting on the installation. The federally endangered peregrine falcon (*Falco peregrinus*) and piping plover (*Charadrius melodus*) are sometimes present at FTSH. The state-endangered common tern (*Sterna hirundo*), the brown creeper (*Certhia familiaris*), and Forster's tern (*Sterna forsteri*), and a state-threatened species, the Veery (*Catharus fuscescens*), have been spotted on FTSH during migratory periods of fall and spring (SAIC, 2002a; SAIC 1999; Earth Tech, 1995).

The predominantly suburban habitat at FTSH supports suburban wildlife species. The habitat is enhanced by the wooded ravines, the bluff, and beach areas. The adjacent nature preserve also enhances the FTSH habitat. Common birds include the American Robin (*Turdus migratorius*), house sparrow (*Passer domesticus*), and starling (*Sturnus vulgaris*). The most common mammals are the gray squirrel (*Sciurus carolinensis*) and raccoon (*Procyon lotor*). Mown lawns may limit normal populations of various mammals such as deer mouse (*Peromyscus maniculatus*), meadow vole (*Microtus pennsylvanicus*), and the short tailed shrew (*Blarina brevicauda*) (SAIC, 2002a; SAIC, 1999a).

There is only minimal vegetative cover located at the Trench Warfare Range MRS, none of which includes the state listed threatened or endangered plant species or those on the watch list. As such, these are not considered to be potential receptors. While fencing on part of the site may limit access

to some mammals, it would not preclude entry by birds or possibly burrowing animals. Consequently, these groups would represent the mostly likely target receptors at the Trench Warfare Range MRS.

7.1.5 Munitions/Release Profile

7.1.5.1 Types of Munitions and Release Mechanisms

The trenches were used for training beginning in 1917. The documentation of the training indicates signal flares, rockets, trench mortars firing aerial bombs, star shells, "Bengal" lights, and rifles were used by the soldiers (Adams, 1920). Interviews conducted with site personnel during e²M's site visit to FTSH also confirmed that no MEC was found during the heavy construction around the Trench Warfare Range MRS located on the USARC property. The 1996 ASR, however, indicated there may be MEC residue (munitions debris) within the area in and around Van Horne Ravine. MEC was not encountered in the Trench Warfare Range MRS during the SI field work.

7.1.5.2 Maximum Probable Penetration Depth

The maximum probable penetration depth at the Trench Warfare Range MRS is unknown. The trenches are believed to have been at least six feet deep. After they were filled in, construction took place over the top of them, raising the land surface. Mike Dace with the USACE, St. Louis District stated the bottom of the former trenches may be as deep as 20 feet bgs. The investigations of Landfill 5 have documented the waste ranges from 3 feet to 34 feet thick (SAIC, 2002).

7.1.5.3 MEC Density

MEC was not encountered in the Trench Warfare Range MRS during the SI field work. During a previous investigation, electromagnetic (EM) geophysical surveying was performed at Landfill 5, but no conclusions were made about the presence or absence of MEC. Anomalies detected in the area were attributed to overhead and buried utilities, fences, and vehicles in the parking area.

The ASR *Findings* states a "serious potential exists for these types of munitions to be found in the areas around the trench system (USACE, 1996)." However, the ASR *Conclusions and Recommendations* goes on to say "We do not recommend sampling the remainder of the trench system area" in regards to the area located on the USARC Property. "Extensive construction over this area would have uncovered any OE near the surface. We have found no evidence that OE was uncovered during this construction (USACE, 1996)."

7.1.5.4 Munitions Debris

Munitions debris was not encountered in the Trench Warfare Range MRS during the SI field work.

7.1.5.5 Associated Munitions Constituents (MC)

During the SI field work, surface soil samples collected from the Trench Warfare Range MRS contained aluminum, calcium, iron, magnesium, potassium, and sodium at concentrations greater than IEPA Tier I TACO standards; however, only magnesium was reported at a concentration greater than the site background level. It should also be noted that calcium, magnesium, potassium, and sodium are naturally occurring elements in the environment and are thus not considered MC of concern. Explosives were not detected above reporting limits.

Historical activities conducted in the Trench Warfare Range MRS in the vicinity of Landfill 5 have led to contamination of soil and groundwater with explosives and metals; however, contamination from Landfill 5 is being addressed under the IRP.

7.1.5.6 Transport Mechanisms/Migration Routes

The primary transport mechanisms evaluated for the MRS include the following:

Surface Soil

- handling/re-distribution by human or ecological elements
- surface water run-on and/or run-off

Subsurface Soil

- soil disturbance via excavation or intrusive soil sampling
- ecological elements (e.g., nesting/burrowing animals)

Migration routes would include the following:

Surface Soil

- surface soil to subsurface soil
- surface soil to surface water and/or sediment
- surface soil to groundwater

Subsurface Soil

- subsurface soil to surface soil (via ecological element)
- subsurface soil to groundwater

Surface Water

- surface water/sediment to subsurface soil and groundwater

Groundwater

- groundwater discharge to surface water (Lake Michigan)

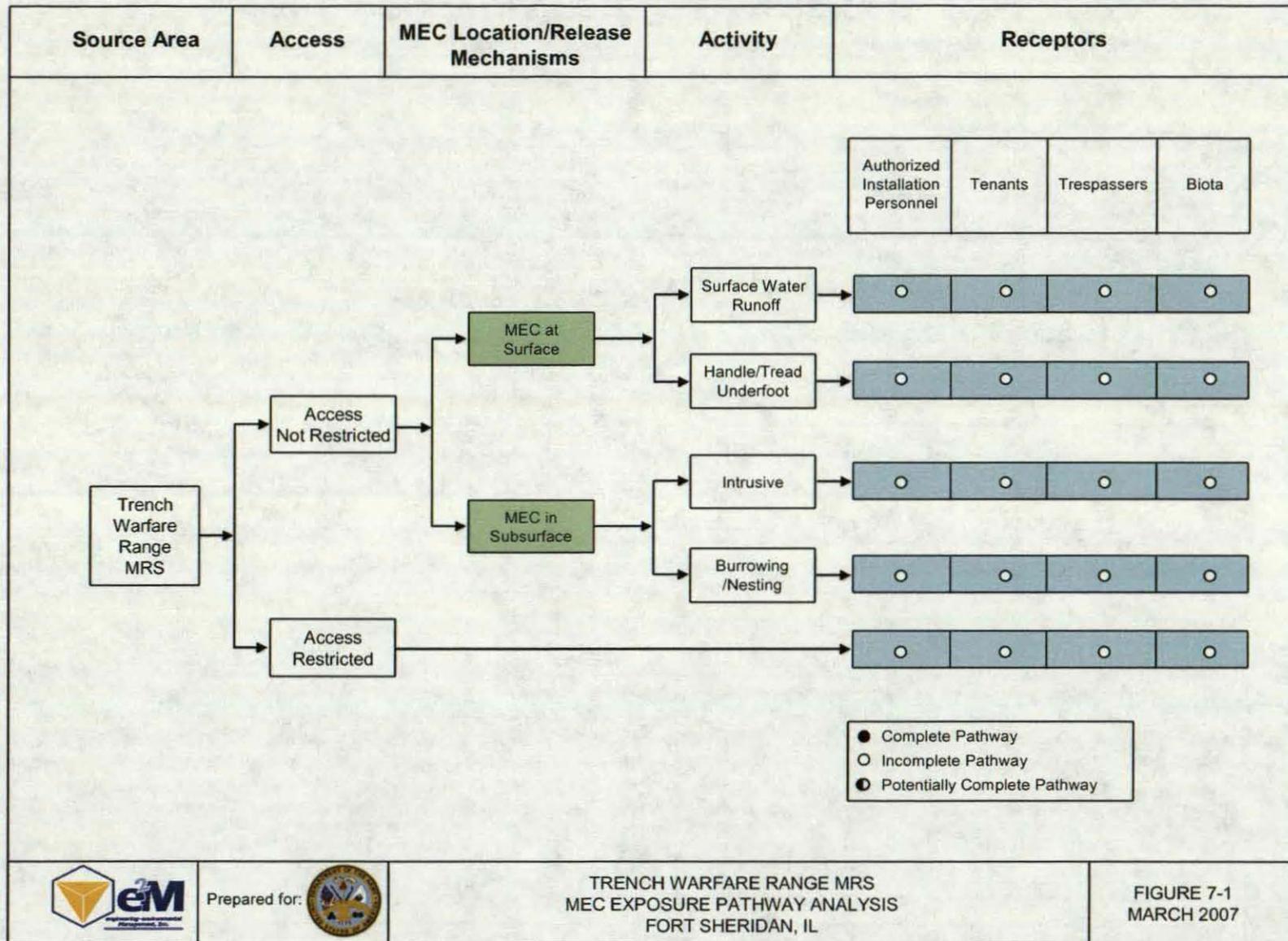
7.1.6 Pathway Analysis

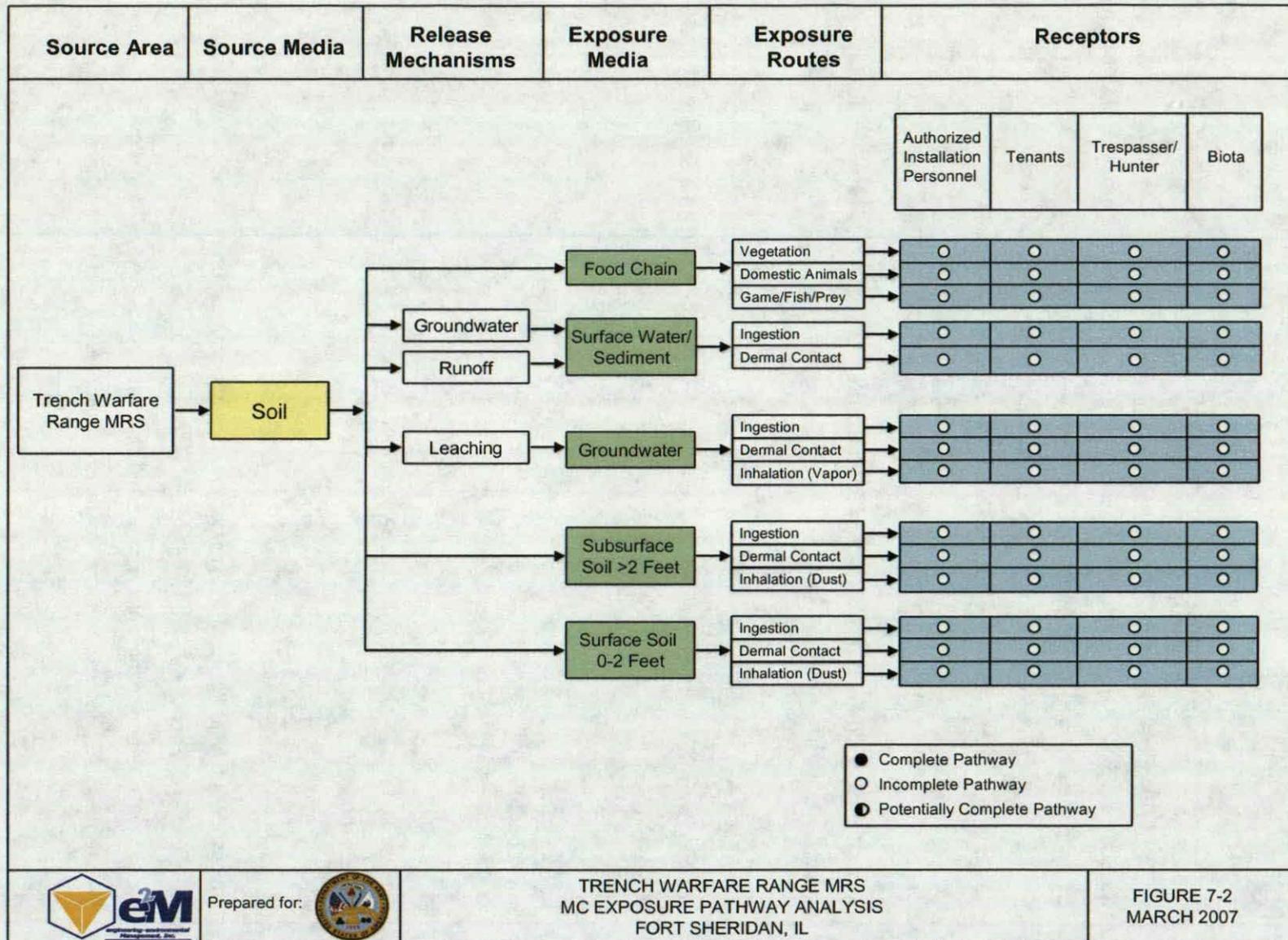
7.1.6.1 MEC

Activities at the Trench Warfare Range MRS were discontinued after WWI. Access to the site is currently limited by the presence of partial fencing around the site, but in the areas without fencing, access is unrestricted. MEC was not encountered during the SI field work and it is unlikely that MEC would be encountered in the future given the level of development of the area. Based on these factors, the Trench Warfare Range MRS is considered to have an incomplete pathway for MEC. The incomplete MEC exposure pathways are depicted in the flow chart provided in **Figure 7-1**.

7.1.6.2 MC

Based upon the findings of this SI field work, MC is not a concern at the Trench Warfare Range MRS. Surface soil samples contained aluminum, calcium, iron, magnesium, potassium, and sodium at concentrations greater than IEPA Tier I TACO standards; however, only magnesium was reported at a concentration greater than the site background level. It should also be noted that calcium, magnesium, potassium, and sodium are naturally occurring elements in the environment and are thus not considered MC of concern. Explosives were not detected above reporting limits. Therefore, all of the MC exposure pathways are considered incomplete. The MC exposure pathways for the Trench Warfare Range MRS are shown in **Figure 7-2**.





Prepared for:



TRENCH WARFARE RANGE MRS
MC EXPOSURE PATHWAY ANALYSIS
FORT SHERIDAN, IL

FIGURE 7-2
MARCH 2007

7.2 Southern Small Arms Ranges (FTSHC-002-R-01)

7.2.1 MRS Profile

7.2.1.1 Area and Layout

The Southern Small Arms Ranges MRS is part of the AAA Complex MRA. A portion of the Southern Small Arms Ranges MRS overlapped with the AAA Firing Points A and B MRS. Therefore, only the portions of the Southern Small Arms Ranges MRS lying outside of the AAA Firing Points A and B MRS were counted in the total acreage for the Southern Small Arms Ranges MRS in order to avoid duplicating acreages. The overlapping portions are considered part of the AAA Firing Points A and B MRS. Following the analyses of information obtained during the SI process, the final area of the MRS is approximately 0.21 acres.

The MRS is located in the southeastern portion of FTSH adjacent to the NCO Family Housing Area, close to the beach of Lake Michigan.

7.2.1.2 Boundaries

The Southern Small Arms Ranges MRS is bordered by the AAA firing Points A and B MRS and the NCO Family Housing Area to the north, and the NCO Family Housing Area to the south, east, and west.

7.2.1.3 Structures

The structures at the MRS include the NCO Family Housing Area.

7.2.1.4 Utilities

Utilities located within the confines of the MRS are unconfirmed, but due to the presence of military family housing in the area, it is likely utilities exist.

7.2.1.5 Security

FTSH is surrounded by a perimeter fence and is patrolled regularly by Great Lakes Security. Access to the installation is gained by passing through an unguarded entrance. Anyone can access the installation and once on site, individual movement is not restricted. The Southern Small Arms Ranges MRS is located adjacent to the NCO Housing Area and residents and recreational users can access the site.

7.2.2 Physical Profile

The general physical profile (i.e., climate, topography, geology, soil, hydrogeology, hydrology, and vegetation) of the MRS is analogous to the conditions described for the installation and at the Trench Warfare Range MRS. Descriptions of each profile can be found in **Sections 7.1.2.1 through 7.1.2.7.**

7.2.3 Land Use and Exposure Profile

The general land use and exposure profiles (i.e., current land use, current human receptors, potential future land use, potential future human receptors, zoning/land use restrictions, beneficial resources, and demographics/zoning) at the MRS are in general similar to the conditions found at the Trench Warfare Range MRS and throughout FTSH. Descriptions of each profile can be found in **Sections 7.1.3.1 through 7.1.3.7.** In addition, the MRS is in the NCO Family Housing Area and is surrounded by the housing area; therefore, residents access the site.

7.2.4 Ecological Profile

The general ecological profile (habitat type, degree of disturbance, and ecological receptors) at the MRS is analogous to the conditions throughout FTSH. Descriptions of each profile can be found in **Section 7.1.4.** Regarding the degree of disturbance at the MRS, housing units and roads were built over the Southern Small Arms Ranges MRS sometime after 1950.

7.2.5 Munitions/Release Profile

7.2.5.1 Types of Munitions and Release Mechanisms

Only small arms (less than .50 caliber) were used at the Southern Small Arms Ranges MRS. Release mechanisms include mishandling/loss, abandonment, burial, firing and dropping.

7.2.5.2 Maximum Probable Penetration Depth

The maximum probable penetration depth at the Southern Small Arms Ranges MRS is unknown.

7.2.5.3 MEC Density

Historical usage does not indicate the use of MEC. Site reconnaissance conducted during previous investigations also did not reveal the presence of MEC in the three ranges (USACE, 1996; and Malcolm Pirnie, 2003). Because MEC has not been encountered at the ranges and because only small arms were used at the sites, MEC is not considered a concern at the MRS.

7.2.5.4 Munitions Debris

Previous investigations indicate no munitions debris is visible at the three ranges (USACE, 1996).

7.2.5.5 Associated Munitions Constituents (MC)

At the Southern Small Arms Ranges MRS, MC is not considered a concern based on previous investigation and discussions which took place during the TPP 2 meeting. The area has been extensively developed since the ranges were used and no evidence of small arms ammunition has been reported.

7.2.5.6 Transport Mechanisms/Migration Routes

The transport of MC will largely depend on the type(s) of release mechanisms that took place at a particular site; that is, the release mechanism will determine the potential source areas (i.e., where the items are physically located in the environment) and possibly their physical state. As there are no MC chemicals of concern at the Southern Small Arms Ranges MRS, there are no release mechanisms identified. Therefore, there are no transport mechanisms or migration routes identified for the MRS.

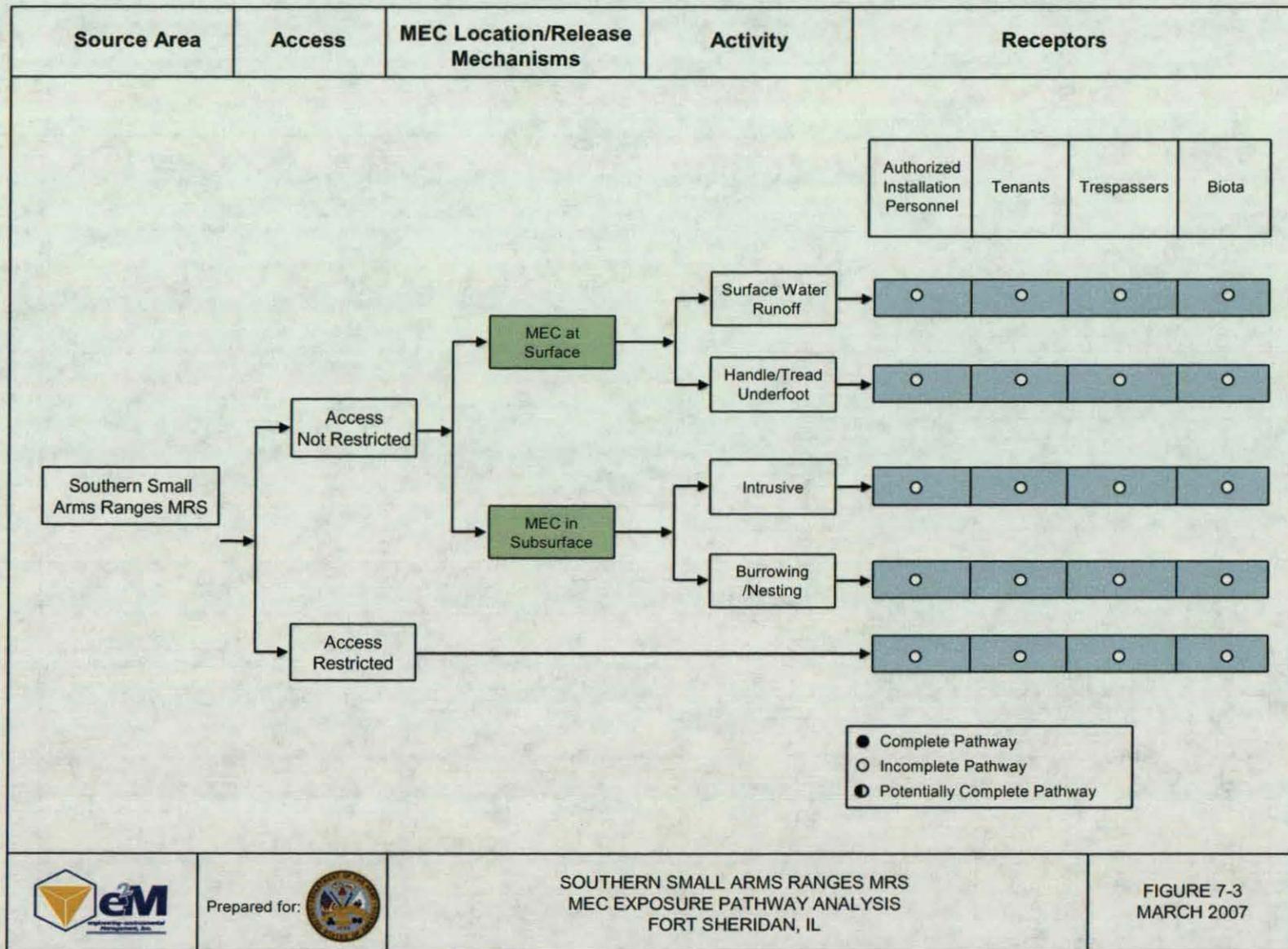
7.2.6 Pathway Analysis

7.2.6.1 MEC

MEC is not a concern at the Southern Small Arms Ranges MRS because only small arms were used at the sites and MEC was not encountered during previous investigations and the SI field work. The incomplete exposure pathways are depicted in the flow chart provided in **Figure 7-3**.

7.2.6.2 MC

The area occupied by the former ranges has been extensively developed since the sites were removed from service around 1950. Pathways are incomplete for these sites and MC is not considered a concern based on previous investigations and discussions which took place during the TPP 2 meeting. The incomplete exposure pathways are depicted in the flow chart provided in **Figure 7-4**.

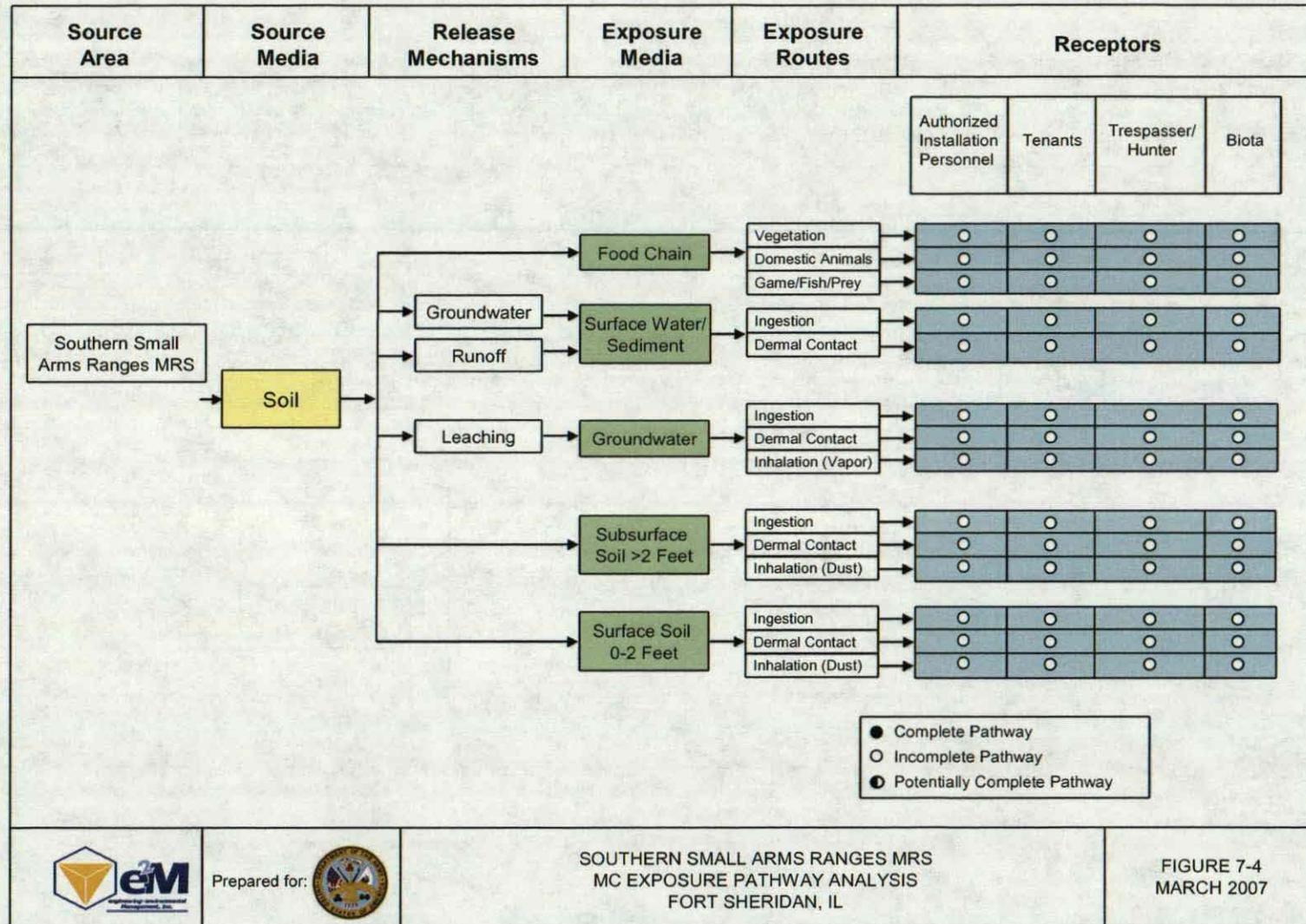


Prepared for:



SOUTHERN SMALL ARMS RANGES MRS
MEC EXPOSURE PATHWAY ANALYSIS
FORT SHERIDAN, IL

FIGURE 7-3
MARCH 2007



Prepared for:



SOUTHERN SMALL ARMS RANGES MRS
MC EXPOSURE PATHWAY ANALYSIS
FORT SHERIDAN, IL

FIGURE 7-4
MARCH 2007

7.3 AAA Firing Points A and B MRS (FTSHC-002-R-02)

7.3.1 MRS Profile

7.3.1.1 Area and Layout

The AAA Firing Points A and B MRS is part of the AAA Complex MRA. Following the analyses of information obtained during the SI process, the final area of the MRS is approximately 6.2 acres.

The MRS is located in the southeastern portion of FTSH close to the beach of Lake Michigan. The AAA Firing Point "A" portion is located approximately 800 feet south of the AAA Firing Point "B" portion of the MRS. Buildings exist on both portions of the MRS with the NCO Family Housing Area located on the Firing Point "A" portion of the MRS. A site walk of the area was conducted by Malcolm Pirnie on March 19, 2003 and there were no physical indications of where the firing points had been located.

7.3.1.2 Boundaries

The MRS is bordered by open land to the north and south, by Lake Michigan to the east, and by buildings to the west.

Based on the TPP 2 meeting, the SI field work, and further review of historical documents, modifications to the footprint of the MRS were made. The overall area reduction at the AAA Firing Points A and B MRS is due primarily to the exclusion of the range fan portions at each firing point. In addition, a small section of Landfill 7, an IRP site, overlaps the northern edge of AAA Firing Point "A" in the AAA Firing Points A and B MRS. This overlapping portion of the capped landfill was removed from the MRS footprint. Also, the land surrounding building 384 was removed from the Trench Warfare Range MRS and added to the AAA Firing Points A and B MRS.

7.3.1.3 Structures

The structures at the MRS include the NCO Housing Area at the Firing Point "A" portion of the MRS. Buildings 384, 388, and 389 overlap with the AAA Firing Point "B" portion of the MRS. These buildings were used for storage.

7.3.1.4 Utilities

Utilities located within the confines of the MRS are unconfirmed, but due to the presence of military family housing in the area, it is likely utilities exist.

7.3.1.5 Security

FTSH is surrounded by a perimeter fence and is patrolled regularly by Great Lakes Security. Access to the installation is gained by passing through an unguarded entrance. Anyone can access the installation and once on site, individual movement is not restricted. The AAA Firing Point "A" portion of the AAA Firing Points A and B MRS is located adjacent to the NCO Housing Area and residents and recreational users can access the sites. The 1996 ASR indicates that a fence surrounds the AAA Firing Point "B" portion of the AAA Firing Points A and B MRS.

7.3.2 Physical Profile

The general physical profile (i.e., climate, topography, geology, soil, hydrogeology, hydrology, and vegetation) of the MRS is analogous to the conditions described for the installation and at the Trench Warfare Range MRS. Descriptions of each profile can be found in **Sections 7.1.2.1 through 7.1.2.7.**

7.3.3 Land Use and Exposure Profile

The general land use and exposure profiles (i.e., current land use, current human receptors, potential future land use, potential future human receptors, zoning/land use restrictions, beneficial resources, and demographics/zoning) at the MRS are in general similar to the conditions found at the Trench Warfare Range MRS and throughout FTSH. Because the Firing Point "A" portion of the AAA Firing Points A and B MRS is located in the NCO Family Housing Area, there is the potential for residents to access the site. Descriptions of each profile can be found in **Sections 7.1.3.1 through 7.1.3.7.**

7.3.4 Ecological Profile

The general ecological profile (habitat type, degree of disturbance, and ecological receptors) at the MRS is analogous to the conditions throughout FTSH. Descriptions of each profile can be found in **Section 7.1.4.** Regarding the degree of disturbance at the MRS, housing units and roads were built over the AAA Firing Point "A" portion of the AAA Firing Points A and B MRS sometime after 1950. Buildings and roads were also constructed over the AAA Firing Point "B" portion of the AAA Firing Points A and B MRS sometime after 1950.

7.3.5 Munitions/Release Profile

7.3.5.1 Types of Munitions and Release Mechanisms

For a brief history of the AAA Firing Points at FTSH, refer to the HRR, Section 4.2.2, in **Appendix B.** Various gun battalions (semi-mobile) and automatic weapons battalions (semi-mobile) were stationed at FTSH between 1930 and 1944. **Table 7-1** shows the "Typical Anti-Aircraft Artillery Battalions" and is taken from the 1996 ASR.

Table 7-1: Typical AAA Battalions

	Gun (Semi-mobile)	Automatic Weapons (Semi-mobile)
40mm AA Gun	0	32
90mm AA Gun	16	0
Multi-Carriage .50 Cal MG	16	32
.50 Cal MG HB	14	5
Rocket Launcher 2.36-inch AT	8	32

(AA=Anti-Aircraft; MG=Machine Gun; HB=Heavy Barrel; AT=Anti-Tank.)

Anti-Aircraft guns were being phased out in favor of guided missiles in the mid 1950s.

Release mechanisms at the site include mishandling/loss, abandonment, burial, firing and dropping.

7.3.5.2 Maximum Probable Penetration Depth

The firing points were located along the top of the bluff of Lake Michigan (Ceres, 2004). The maximum probable penetration depth at the MRS is unknown.

7.3.5.3 MEC Density

During the SI field work and during surveys conducted at the MRS under the OE Removal & Sampling Action (HFA, 1996), MEC was not discovered. However, based on the potential presence of "dud pits" containing misfired ammunition and the discovery of a 105mm cartridge near AAA Firing Point "B" (USACE, 1996), there is potential for MEC remaining at the AAA Firing Points A and B MRS. Density of MEC is unknown.

7.3.5.4 Munitions Debris

Munitions debris was not encountered at the MRS during SI field work. Previous investigations indicate no munitions debris is visible at the MRS (USACE, 1996).

7.3.5.5 Associated Munitions Constituents (MC)

Because MEC potentially exists in the AAA Firing Points A and B MRS, MC cannot be ruled out. During the SI field work, surface soil samples collected from AAA Firing Point "A" contained aluminum, calcium, iron, magnesium, potassium, and sodium at concentrations greater than IEPA Tier I TACO standards; however, only potassium was reported at a concentration greater than the site background level. It should also be noted that calcium, magnesium, potassium, and sodium are naturally occurring elements

in the environment and are thus not considered MC of concern. Explosives were not detected above reporting limits.

The MC potentially associated with the MRS includes metals and explosives. The projectiles used at the site consisted primarily of machined iron or steel casings and contained explosive fillers. Explosive fillers for the sizes of ordnance used at the site include tetryl, trinitrotoluene (TNT), black powder, or 50/50 ammonium nitrate. Small amounts of brass, aluminum or zinc-lead alloy may have been used in the fuses of these projectiles (Harding ESE, 2001). High explosives were possibly used with the 2.36-inch AT Rocket Launcher.

Groundwater beneath and surrounding Landfill 7, a small portion of which overlaps with the northern edge of the AAA Firing Point "A", contained metals exceeding background concentrations, including aluminum, iron, lead, and zinc. Aluminum, lead, and zinc were also detected above background concentrations in surface soil and the underlying till at Landfill 7. Iron also exceeded background in the underlying till. Iron, lead, and zinc also exceeded background in beach sediments (SAIC, 1999a). However, cleanup of the landfill is covered under the IRP.

7.3.5.6 *Transport Mechanisms/Migration Routes*

The primary transport mechanisms evaluated for the MRS include the following:

Surface Soil

- handling/re-distribution by human or ecological elements
- surface water run-on and/or run-off

Subsurface Soil

- soil disturbance via excavation or intrusive soil sampling
- ecological elements (e.g., nesting/burrowing animals)

Migration routes would include the following:

Surface Soil

- surface soil to subsurface soil
- surface soil to surface water and/or sediment
- surface soil to groundwater

Subsurface Soil

- subsurface soil to surface soil (via ecological element)
- subsurface soil to groundwater

Surface Water

- surface water/sediment to subsurface soil and groundwater

Groundwater

- groundwater discharge to surface water (Lake Michigan)

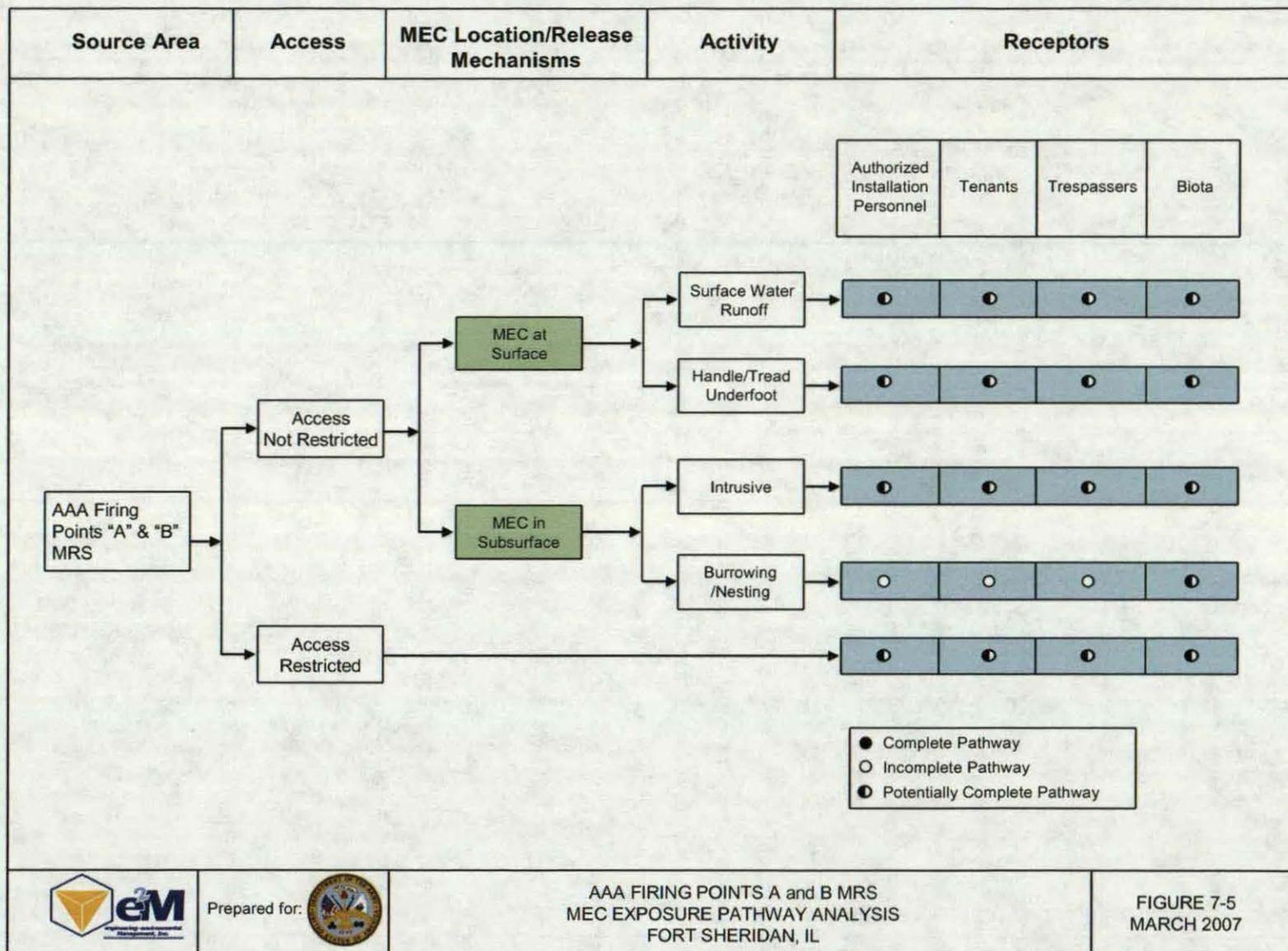
7.3.6 Pathway Analysis

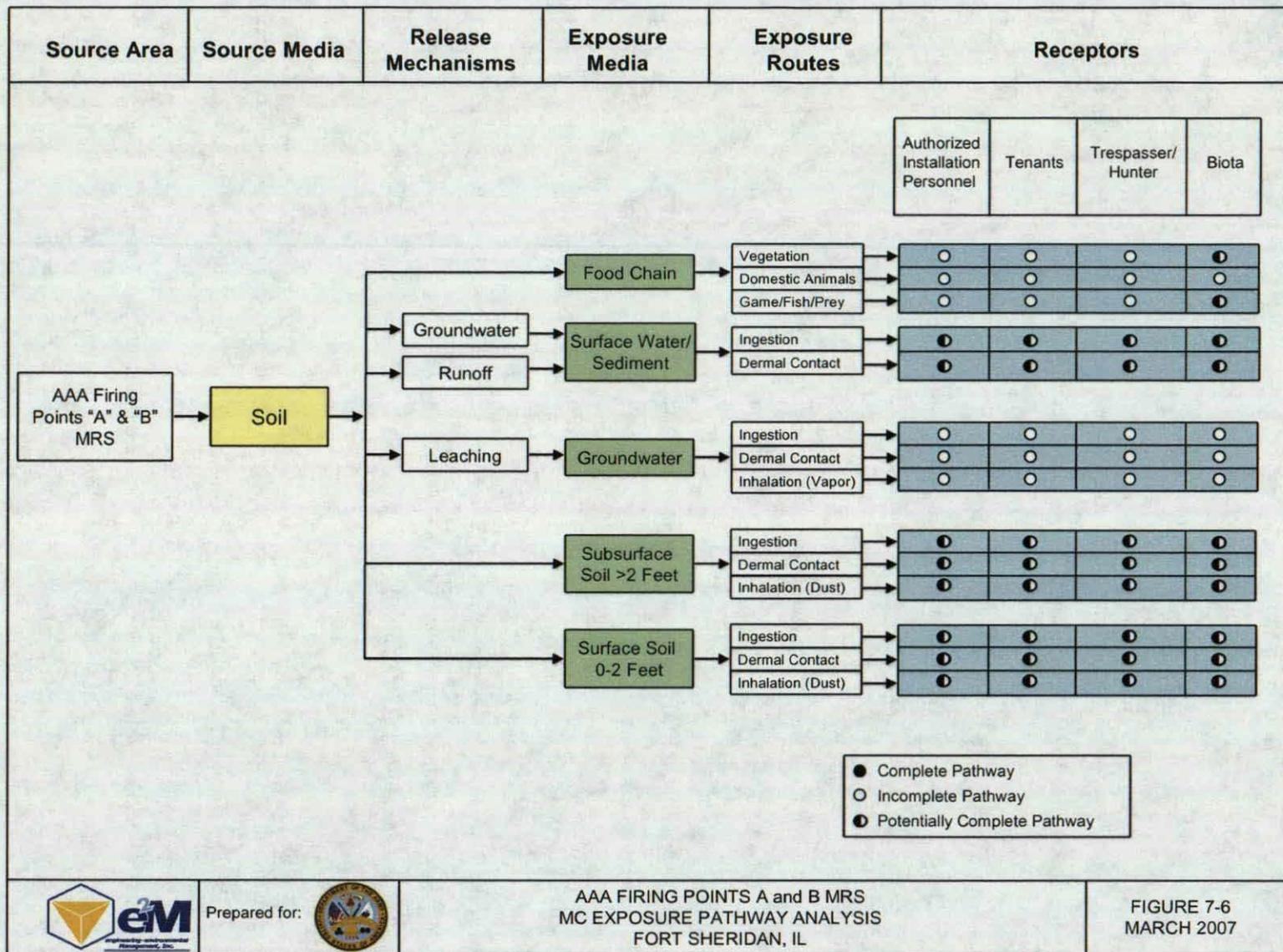
7.3.6.1 MEC

Activities at the MRS were discontinued around 1950. AAA Firing Point "A" is easily accessible because of its proximity to the housing area. Access to AAA Firing Point "B" is currently limited by a security fence and only authorized personnel are allowed access to the site. The ASR expresses concern regarding the potential for buried MEC at the site to become a hazard to the public because of the close proximity to a housing area. USACE more specifically states that "there is a high likelihood of unsupervised digging by children in this area..." (USACE, 1996). MEC are potentially present in the surface and subsurface soils. Potential points of exposure include the handling of or treading on MEC. Based on these factors, a potentially complete exposure pathway for human receptors would exist in the event of a chance encounter with exposed MEC on the surface and/or during the disturbance (e.g., excavation) of subsurface soils. A potentially complete subsurface pathway may exist for ecological receptors that may nest or burrow at the site and come into contact with MEC. The potential exposure pathways are depicted in the flow chart provided in **Figure 7-5**.

7.3.6.2 MC

At the AAA Firing Points A and B MRS, MC may be encountered in surface soil, subsurface soil, sediment, or surface water. Based on these factors, a potentially complete exposure pathway for human receptors would exist. A potentially complete subsurface pathway may exist for ecological receptors that may nest or burrow at the site and come into contact with MC. The potential exposure pathways are depicted in the flow chart provided in **Figure 7-6**.





Prepared for:



AAA FIRING POINTS A and B MRS
MC EXPOSURE PATHWAY ANALYSIS
FORT SHERIDAN, IL

FIGURE 7-6
MARCH 2007

7.4 AAA Complex– Transferred MRS (FTSHC-003-R-01)

7.4.1 MRS Profile

7.4.1.1 Area and Layout

The AAA Complex – Transferred MRS is located in Lake Michigan and makes up just over 100,988 acres. There is the potential for rounds to have been fired up to 15.4 miles offshore.

7.4.1.2 Boundaries

The AAA Complex – Transferred MRS is bordered to the north, south, and east by open water and to the west by the beach along Lake Michigan and FTSH.

7.4.1.3 Structures

Because the firing fans are over water, there are no structures at the MRS.

7.4.1.4 Utilities

Utilities located within the confines of the AAA Complex -Transferred MRS are unknown.

7.4.1.5 Security

Access to Lake Michigan from FTSH is not prohibited. Boating, fishing, and swimming access to the lake is available immediately north and south of FTSH.

7.4.2 Physical Profile

7.4.2.1 Climate

The climate at the AAA Complex – Transferred MRS is analogous to the conditions described for the installation and at the Trench Warfare Range MRS, and can be found in **Section 7.1.2.1**; however, Lake Michigan may have its own micro-climate.

7.4.2.2 Geology

FTSH is located on the southwestern shore of Lake Michigan and the AAA Complex – Transferred MRS is an over-water range extending over Lake Michigan. This portion of Lake Michigan is the largest and deepest basin of the lake (Chippewa Basin). The basin extends north from the southern shore to the mid-lake plateau. It is so named because it is the main site of the former Lake Chippewa. Depths in excess of 275 meters, the deepest of Lake Michigan, are reached near the southern end of this basin, where a large segment of the floor of Lake Michigan extends below sea level. Bedrock geology of the

Chippewa Basin probably consists of a dip slope of resistant Silurian dolomites forming the western boundary, with the deeper eastern two-thirds of the basin having been eroded in less resistant upper Silurian redbeds. Evaporites occur within the upper Silurian section, and dissolution of these evaporites may have contributed to the collapse and stripping away of the overlying Devonian strata. North-south trending ridges on the floor of the basin may coincide with erosional remnants of moderately resistant strata within the upper Silurian section. Escarpments forming the eastern boundary of the Chippewa Basin probably are underlain by the eroded edges of the resistant Devonian carbonates. Whereas the main Chippewa Basin may have been eroded in less resistant upper Silurian strata, the smaller South Chippewa was probably eroded mostly in upper Devonian shales, with a dip slope on the west formed partly on more resistant middle Devonian limestones. Depths in this smaller basin do not extend below sea level (maximum depth in excess of 165 meters), but this basin was deep enough to contain lake water even during the lowest lake levels of the Chippewa lowstand (National Oceanic and Atmospheric Administration [NOAA], 2004).

7.4.2.3 Topography

Specific information on the topography of Lake Michigan within the AAA Complex – Transferred MRS was unavailable. For information regarding the general topography of the lake bottom refer to **Section 7.1.2.2, Geology**.

7.4.2.4 Soil

Specific information on the soils of the Lake Michigan bottom is unavailable; however, in general, the lake bottom is typically sediments composed of sand and silt.

7.4.2.5 Hydrogeology

Information regarding the hydrogeology of Lake Michigan in the AAA Complex- Transferred MRS is unavailable; however, information regarding the hydrogeology of FTSH can be found in **Section 7.1.2.5**.

7.4.2.6 Hydrology

Information regarding the hydrology at the AAA Complex – Transferred MRS is unavailable; however information regarding the hydrology of FTSH can be found in **Section 7.1.2.6**.

7.4.2.7 Vegetation

Several species of submerged aquatic vegetation (SAV) inhabit Lake Michigan. See below for a list of SAV species.

- Stonewort (*Chara* spp.)
- Duck Weed (*Lemna minor*)
- Floating-leaf Pondweed (*Potamogeton natans*)
- Large-leaf Pondweed (*Potamogeton amplifolius*)
- Claspingleaf Pondweed (*Potamogeton richardsonii*)
- Sago Pondweed (*Potamogeton pectinatus*)
- Common Naiad (*Najas flexilis*)
- Wild Celery (*Vallisneria spiralis*)
- American Elodea (*Elodea canadensis*)
- Coontail (*Ceratophyllum demersum*)
- Bladderwort (*Utricularia* spp.)

Additionally, one aquatic invasive species is becoming a nuisance: Eurasian water milfoil (*Myriophyllum spicatum*). This invasive species is prolific and grows in thick mats in shallow areas. Mats of Eurasian water milfoil can displace native SAV species and can wrap around boat propellers. Once the SAV becomes established in a water body it is nearly impossible to eradicate the pest.

7.4.3 Land Use and Exposure Profile

7.4.3.1 Current Land Use

The current use of Lake Michigan includes boating, fishing, swimming, and general recreation.

7.4.3.2 Current Human Receptors

Current human receptors include recreational users who can access the site.

7.4.3.3 Potential Future Land Use

Potential future land use will most likely be the same as current land use (boating, fishing, swimming, and general recreation).

7.4.3.4 Potential Future Human Receptors

Potential future human receptors will include recreational users of the lake.

7.4.3.5 Zoning/Land Use Restrictions

It is unknown whether there are formal zoning or deed restrictions at the AAA Complex – Transferred MRS.

7.4.3.6 Beneficial Resources

Lake Michigan supplies drinking water to FTSH and the Chicago metropolitan area.

7.4.3.7 Demographics/Zoning

See **Section 7.1.3.7** above.

7.4.4 Ecological Profile

7.4.4.1 Habitat Type

The AAA Complex – Transferred MRS is an aquatic freshwater lake habitat.

7.4.4.2 Degree of Disturbance

The degree of disturbance within Lake Michigan is unknown.

7.4.4.3 Ecological Receptors

There are a variety of ecological receptors within Lake Michigan. Species that were extirpated in some or all of the Great Lakes include lake trout, Atlantic salmon, blue pike, and several species of ciscoes. Species whose populations have dramatically declined include American eel, lake sturgeon, lake trout, lake whitefish, lake herring, coaster brook trout, deepwater sculpin, pugnose shiner, blacknose shiner, and several species of native unionid clams (ESE, 1992). Several of these species were historically used by Native American tribes for subsistence and ceremonial purposes. The chinook salmon (*Oncorhynchus tshawytscha*) population in Lake Michigan supports a highly valuable recreational fishery (USGS, 2004). The zebra mussel (*Dreissena polymorpha*) is considered a nuisance species in Lake Michigan.

7.4.5 Munitions/Release Profile

7.4.5.1 Types of Munitions and Release Mechanisms

For a brief history of the AAA Firing Points at FTSH, and the AAA Complex-Transferred MRS refer to the HRR, Sections 4.2.2 and 4.2.3, in **Appendix B**. Various gun battalions (semi-mobile) and automatic weapons battalions (semi-mobile) were stationed at FTSH between 1930 and 1944.

As stated in **Section 2.2.3**, this MRS was used by the 61st Coast Artillery as a fly-over target range for projectiles including: 37mm, 40mm, 90mm, 120mm, and Rocket Launcher 2.36-inch AT. Targets were usually towed over Lake Michigan (USACE, 1996).

7.4.5.2 *Maximum Probable Penetration Depth*

The maximum probable penetration depth into the sediment at the bottom of Lake Michigan is unknown.

7.4.5.3 *MEC Density*

In the spring of 2000, UXB International provided unexploded ordnance diving support for investigative work in Lake Michigan. There was no evidence of MEC discovered during the investigation (Harding ESE, 2001). Refer to the HRR, Section 4.2.3, in **Appendix B** for more details.

7.4.5.4 *Munitions Debris*

Refer to **Section 7.4.5.3** above.

7.4.5.5 *Associated Munitions Constituents (MC)*

The MC associated with the AAA Complex – Transferred MRS include metals (lead is likely), explosives, and propellants. The projectiles used at the site consisted primarily of machined iron or steel casings and contained explosive fillers. Explosive fillers for the sizes of ordnance used at the site include tetryl, TNT, black powder, or 50/50 ammonium nitrate and TNT. “Small amounts of brass, aluminum or zinc-lead alloy may have been used in the fuses of these projectiles (Harding ESE, 2001).” High explosives were possibly used with the 2.36-inch Anti-Tank Rocket Launcher. However, results of sediment sampling in Lake Michigan did not indicate the presence of MC (Harding ESE, 2001).

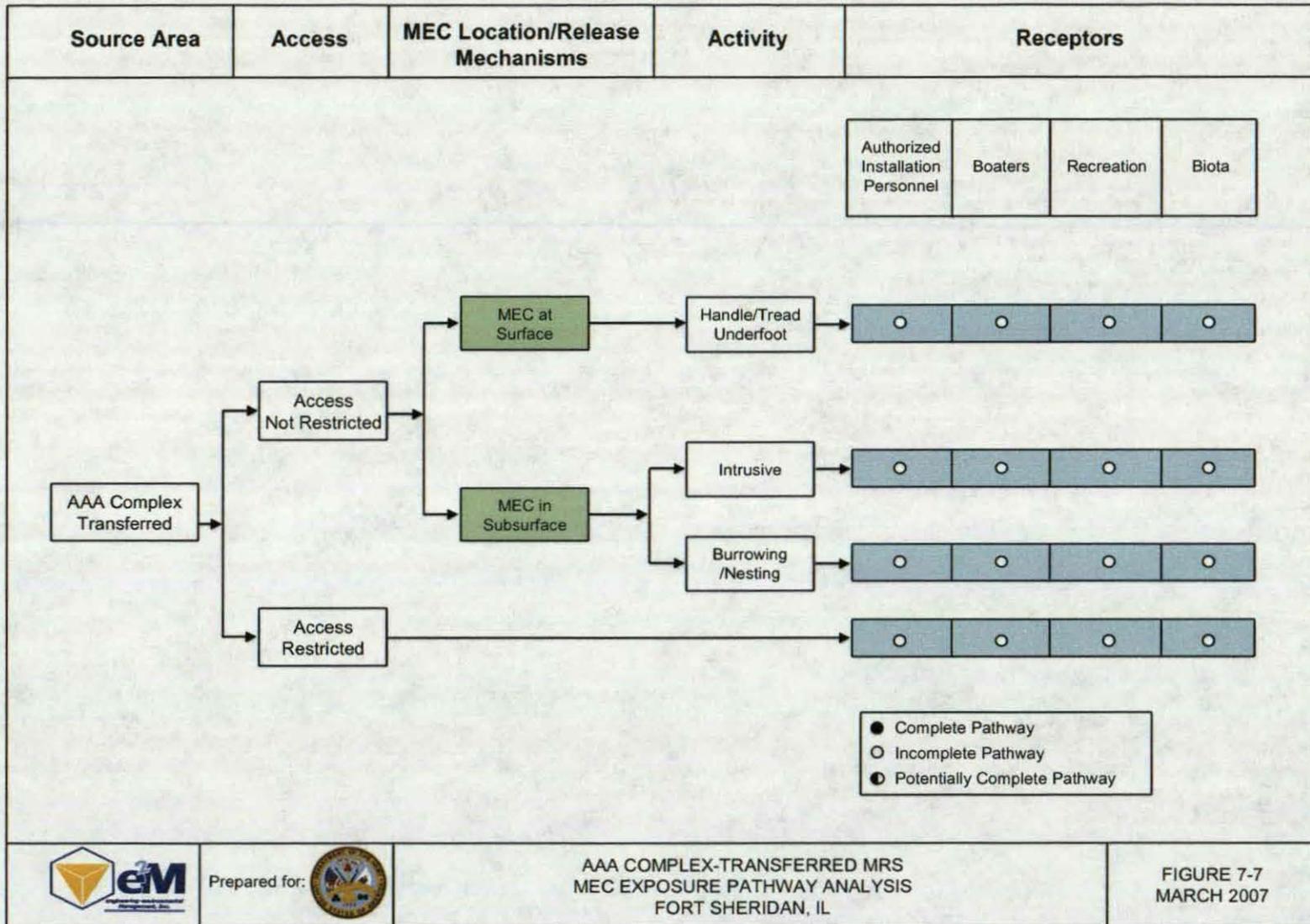
7.4.5.6 *Transport Mechanisms/Migration Routes*

The transport of MEC and MC will largely depend on the type(s) of release mechanisms that take place at a particular site; that is, the release mechanism will determine the potential source areas (i.e., where the items are physically located in the environment) and possibly their physical state. There are no release mechanisms identified for the AAA Complex – TD MRS and MEC has not been found at the site. Therefore, there are no source areas or transport mechanisms identified for this MRS.

7.4.6 **Pathway Analysis**

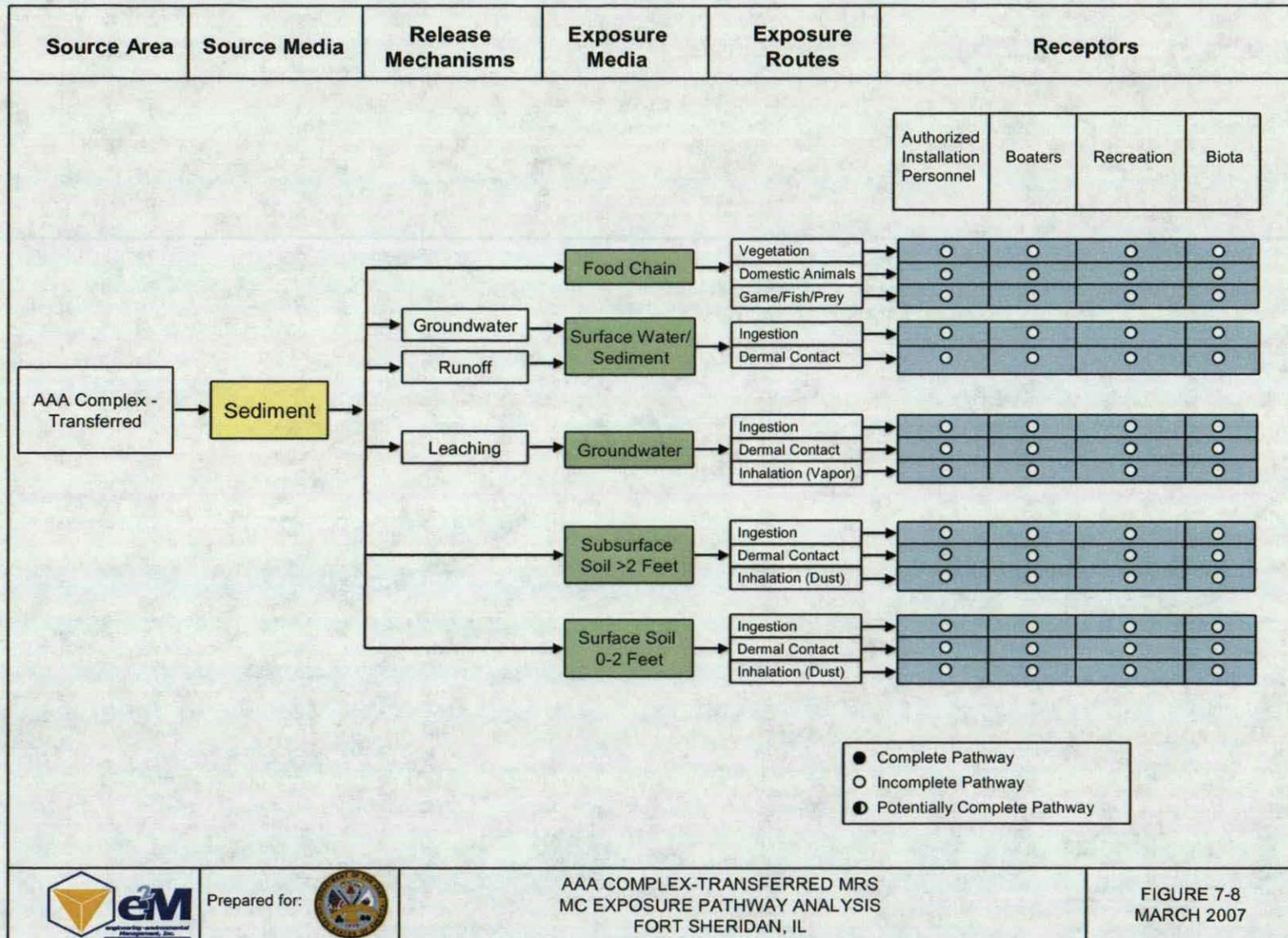
7.4.6.1 *MEC*

MEC has not been found at the site. Therefore, the exposure pathways for both human and ecological receptors are incomplete. The exposure pathways are depicted in the flow chart provided in **Figure 7-7**.



7.4.6.2 MC

Elevated levels of MC have not been detected at the site. Therefore, the exposure pathways are incomplete for both human and ecological receptors. The exposure pathways are depicted in the flow chart provided in **Figure 7-8**.



Prepared for:



AAA COMPLEX-TRANSFERRED MRS
MC EXPOSURE PATHWAY ANALYSIS
FORT SHERIDAN, IL

FIGURE 7-8
MARCH 2007

7.5 Grenade Course MRS (FTSHC-004-R-01)

7.5.1 MRS Profile

7.5.1.1 Area and Layout

The Grenade Course is suspected to have been located south of Shenck Ravine in the current NCO Family Housing area. It would have covered approximately 26 acres (Malcolm Pirnie, 2003).

7.5.1.2 Boundaries

The Grenade Course MRS is bordered to the north by Shenck Ravine and to the south by the installation boundary. The beach and Lake Michigan are located to the east and the US Army Reserve property is to the west.

7.5.1.3 Structures

The structures at the Grenade Course MRS include the NCO Family Housing Area. There are approximately 42 units in the housing area and they were built directly on top of the suspected Grenade Course.

7.5.1.4 Utilities

Utilities located within the confines of the Grenade Course MRS are unconfirmed, but due to the presence of military family housing in the area, it is likely utilities exist.

7.5.1.5 Security

FTSH is surrounded by a perimeter fence and is patrolled regularly by Great Lakes Security. Access to the installation is gained by passing through an unguarded entrance. Anyone can access the installation and once on site, individual movement is not restricted. Since the Grenade Course MRS is located in the same location as the current NCO Housing Area, residents and recreational users can access the MRS.

7.5.2 Physical Profile

The general physical profile (i.e., climate, topography, geology, soil, hydrogeology, hydrology, and vegetation) of the Grenade Course MRS is analogous to the conditions described for the installation and at the Trench Warfare Range MRS. Descriptions of each profile can be found in **Sections 7.1.2.1 through 7.1.2.7**.

7.5.3 Land Use and Exposure Profile

The general land use and exposure profiles (i.e., current land use, current human receptors, potential future land use, potential future human receptors, zoning/land use restrictions, beneficial resources, and demographics/zoning) at the Grenade Course MRS are in general similar to the conditions found at the Trench Warfare Range MRS and throughout FTSH. Descriptions of each profile can be found in **Sections 7.1.3.1 through 7.1.3.7.**

7.5.4 Ecological Profile

The general ecological profile (habitat type, degree of disturbance, and ecological receptors) at the Grenade Course MRS is analogous to the conditions throughout FTSH. Descriptions of each profile can be found in **Section 7.1.4.** Regarding the degree of disturbance at the Grenade Course MRS, the NCO Housing area was built sometime after 1950.

7.5.5 Munitions/Release Profile

7.5.5.1 Types of Munitions and Release Mechanisms

Rifle and hand grenades used against fixed and moving targets are thought to have been used at the Grenade Course MRS. Release mechanisms include mishandling/loss, abandonment, burial, firing and dropping. Grenade fuses and grenades have been found at the site (USACE, 1996).

7.5.5.2 Maximum Probable Penetration Depth

The maximum probable penetration depth is unknown.

7.5.5.3 MEC Density

The density of MEC at the Grenade Course MRS is unknown. An area known as Excavation Area #8 overlaps with the northeastern portion of the Grenade Course MRS. An EM survey was conducted over the area during the Phase II RI because of earlier photographic evidence between 1952 and 1985 that the ground was disturbed. It was concluded that there was the potential for fill material to be present beneath the bluff and the "mapped EM-61 instrument response indicates that metallic debris is present beneath the bluff (SAIC, 2000)", but the origin of the metallic debris is unknown.

Refer to the HRR, Section 4.2.4, in **Appendix B** for descriptions of previous EOD responses at the Grenade Course.

7.5.5.4 Associated Munitions Constituents (MC)

The MC associated with the Grenade Course MRS may potentially include TNT, RDX, and pentaerythrite tetranitrate (PETN). These explosives were typically used in grenades after WWI and during WWII.

Investigations of Shenck Ravine (which formed the northern boundary of the Grenade Course) conducted during the RI/BRA for FTSH revealed lead levels that exceeded background in both surface water and ravine sediments. Iron also exceeded background in ravine sediments. During the Phase III sampling at Excavation Area #8, aluminum, arsenic, chromium, iron, nickel, and vanadium were detected in soil above background concentrations. No explosives were detected at Excavation Area #8 during the Phase III sampling.

7.5.5.5 Transport Mechanisms/Migration Routes

The primary transport mechanisms evaluated for the MRS include the following:

Surface Soil

- handling/re-distribution by human or ecological elements
- surface water run-on and/or run-off

Subsurface Soil

- soil disturbance via excavation or intrusive soil sampling
- ecological elements (e.g., nesting/burrowing animals)

Migration routes would include the following:

Surface Soil

- surface soil to subsurface soil
- surface soil to surface water and/or sediment
- surface soil to groundwater

Subsurface Soil

- subsurface soil to surface soil (via ecological element)
- subsurface soil to groundwater

Surface Water

- surface water/sediment to subsurface soil and groundwater

Groundwater

- groundwater discharge to surface water (Lake Michigan)

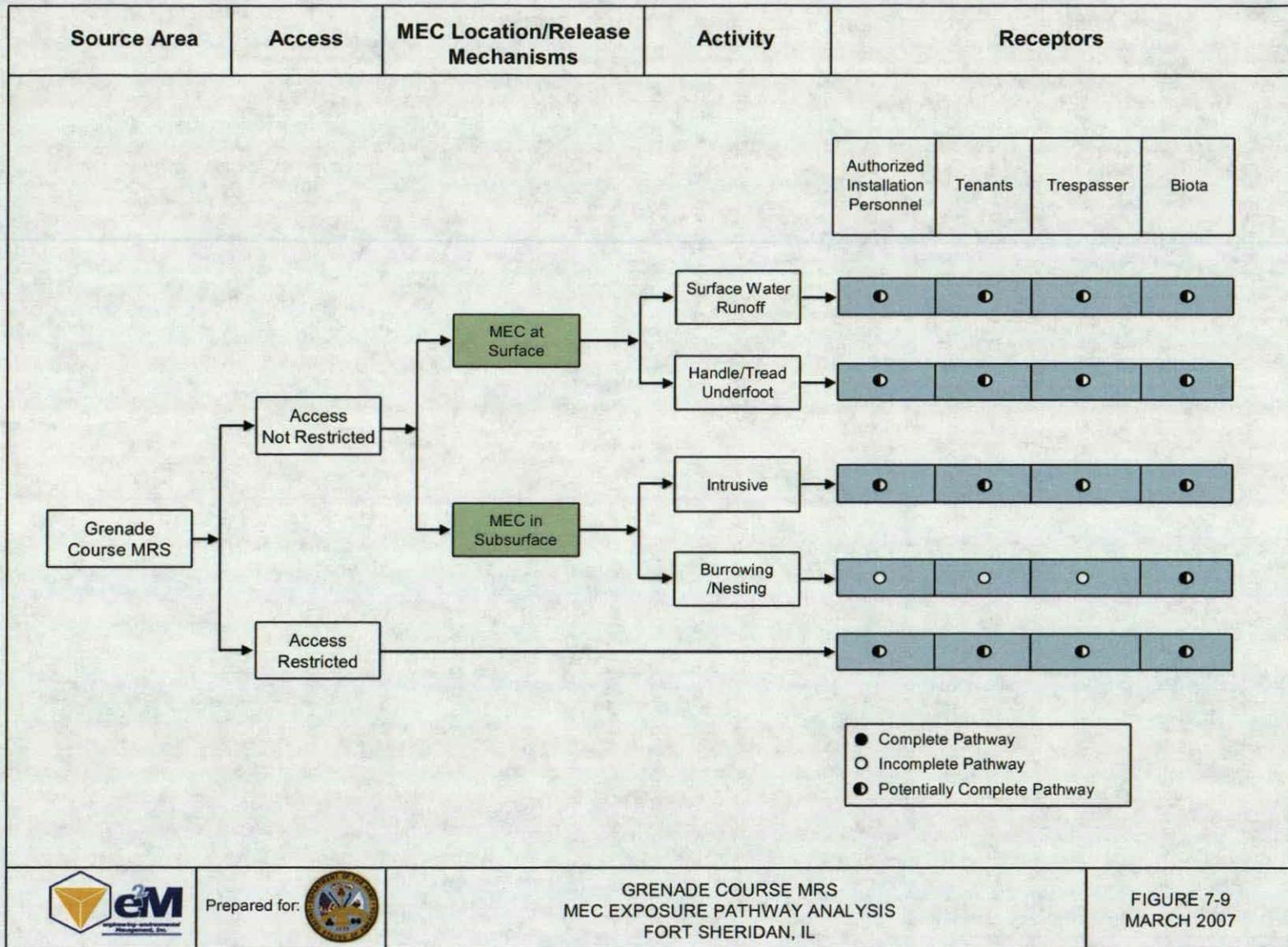
7.5.6 Pathway Analysis

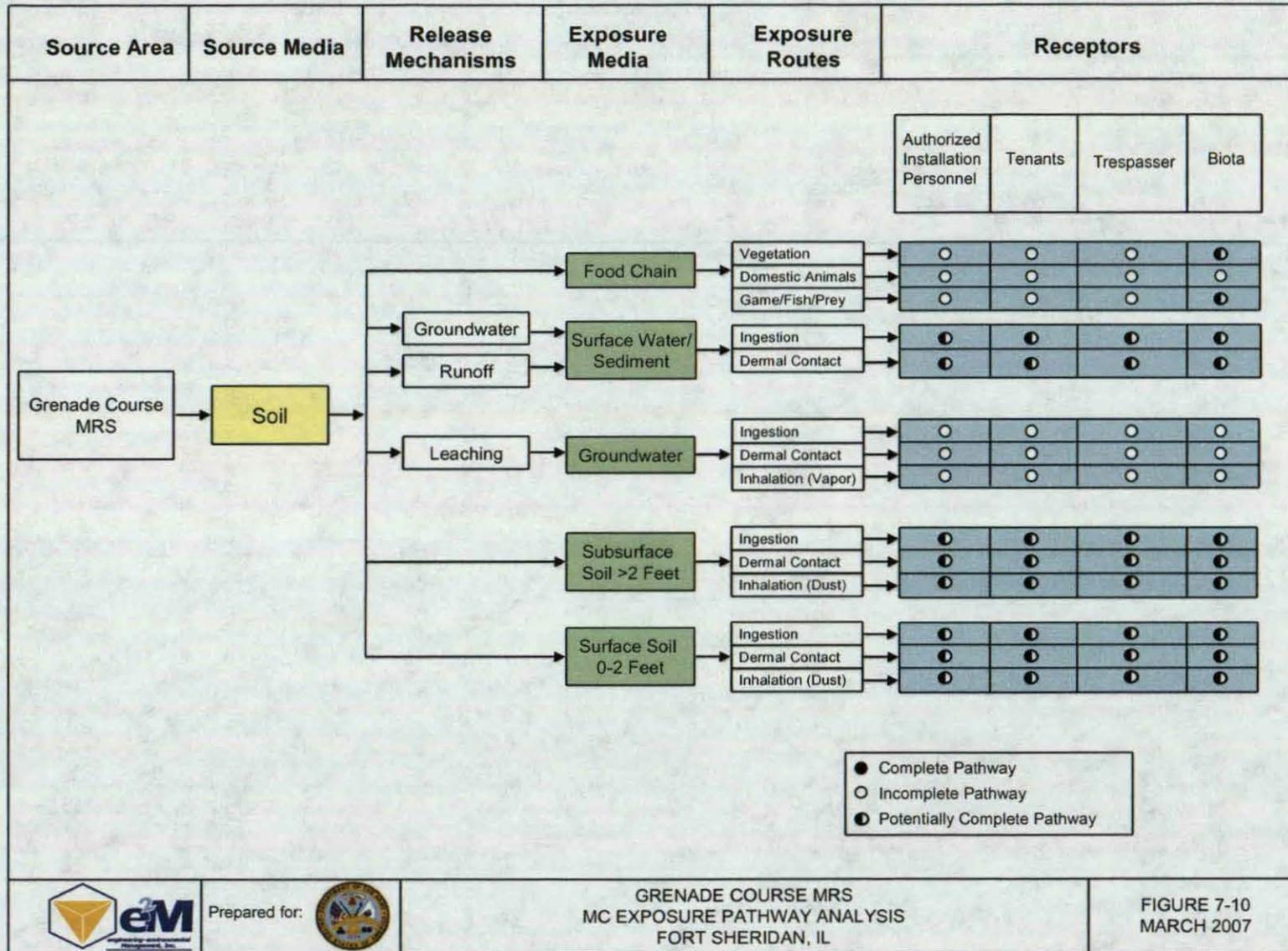
7.5.6.1 MEC

Activities at the Grenade Course MRS were discontinued around December 1948. The site is easily accessible because it is currently a Navy housing area. MEC are potentially present in the surface and subsurface soils. Potential points of exposure include the handling of or treading on MEC. Based on these factors, a potentially complete exposure pathway for human receptors would exist in the event of a chance encounter with exposed MEC on the surface and/or during the disturbance (e.g., excavation) of subsurface soils. A potentially complete subsurface pathway may exist for ecological receptors that may nest or burrow at the site and come into contact with MEC. The potential exposure pathways are depicted in the flow chart provided in **Figure 7-9**.

7.5.6.2 MC

MC may be encountered in surface soil, subsurface soil, sediment, or surface water. Based on these factors, a potentially complete exposure pathway for human receptors would exist in the event of a chance encounter with exposed MC on the surface and/or during the disturbance (e.g., excavation) of subsurface soils. A potentially complete subsurface pathway may exist for ecological receptors that may nest or burrow at the site and come into contact with MC. The potential exposure pathways are depicted in the flow chart provided in **Figure 7-10**.





Prepared for:



GRENADE COURSE MRS
MC EXPOSURE PATHWAY ANALYSIS
FORT SHERIDAN, IL

FIGURE 7-10
MARCH 2007

7.6 Small Arms Range Complex MRS (FTSHC-005-R-01)

7.6.1 MRS Site Profile

7.6.1.1 Area and Layout

The Small Arms Range Complex MRS is located along the beach of Lake Michigan. There are two ranges, the Northern Pistol Range and the Northern Machine Gun Range, comprising the approximately 1.4 acre MRS.

7.6.1.2 Boundaries

The Small Arms Range Complex MRS is bordered by Lake Michigan to the east, Officer Family Housing to the west, Bartlett Ravine to the north, and Van Horne Ravine to the south.

7.6.1.3 Structures

There are no structures at the Small Arms Range Complex MRS. The MRS is mostly undeveloped beach area along Lake Michigan.

7.6.1.4 Utilities

Utilities located within the confines of the Small Arms Range Complex MRS are unknown.

7.6.1.5 Security

FTSH is surrounded by a perimeter fence and is patrolled regularly by Great Lakes Security. Access to the installation is gained by passing through an unguarded entrance. Anyone can access the installation and once on site, individual movement is not restricted. Residents and recreational users can access the sites.

7.6.2 Physical Profile

The general physical profile (i.e., climate, topography, geology, soil, hydrogeology, hydrology, and vegetation) of the Small Arms Range Complex MRS is analogous to the conditions described for the installation and at the Trench Warfare Range MRS. Descriptions of each profile can be found in **Sections 7.1.2.1 through 7.1.2.7.**

7.6.3 Land Use and Exposure Profile

The general land use and exposure profiles (i.e., current land use, current human receptors, potential future land use, potential future human receptors, zoning/land use restrictions, beneficial resources, and demographics/zoning) at the Small Arms Range Complex MRS are in general similar to the conditions

found at the Trench Warfare Range MRS and throughout FTSH. Descriptions of each profile can be found in **Sections 7.1.3.1 through 7.1.3.7.**

7.6.4 Ecological Profile

The general ecological profile (habitat type, degree of disturbance, and ecological receptors) at the Small Arms Range Complex MRS is analogous to the conditions throughout FTSH. Descriptions of each profile can be found in **Section 7.1.4.**

The eastern half of the Small Arms Range Complex MRS, located along the beach of Lake Michigan south of Bartlett Ravine near Boles Loop, is considered to be a sensitive environment. This beach area is considered to be one of the best remaining examples of open prairie-like vegetation that once occurred along the Lake Michigan bluffs. The sensitive environment area is approximately 4 acres and supports 118 plant species including a number of State endangered or threatened species (SAIC, 2002).

7.6.5 Munitions/Release Profile

7.6.5.1 Types of Munitions and Release Mechanisms

Only small arms (less than 0.50 caliber) were used at the Small Arms Range Complex MRS. Release mechanisms include mishandling/loss, abandonment, burial, firing and dropping.

7.6.5.2 Maximum Probable Penetration Depth

The maximum probable penetration depth is unknown.

7.6.5.3 MEC Density

MEC is not a concern at the Small Arms Range Complex MRS because only small arms were used at the MRS.

7.6.5.4 Munitions Debris

During a site inspection conducted by USACE in October 1995, no evidence was found at the MRS of MEC or munitions debris. During the Phase III sampling, no visual evidence was observed of former firing ranges at the site.

7.6.5.5 Associated Munitions Constituents (MC)

The Phase III sampling analysis did not reveal lead levels exceeding background in either the beach sediment or the composite samples collected from the bluff face.

7.6.5.6 Transport Mechanisms/Migration Routes

The transport of MC will largely depend on the type(s) of release mechanisms that took place at a particular site; that is, the release mechanism will determine the potential source areas (i.e., where the items are physically located in the environment) and possibly their physical state. As there are no MC chemicals of concern at the site, there are no release mechanisms identified at the Small Arms Range Complex MRS. Therefore, there are no transport mechanisms or migration routes identified for this MRS.

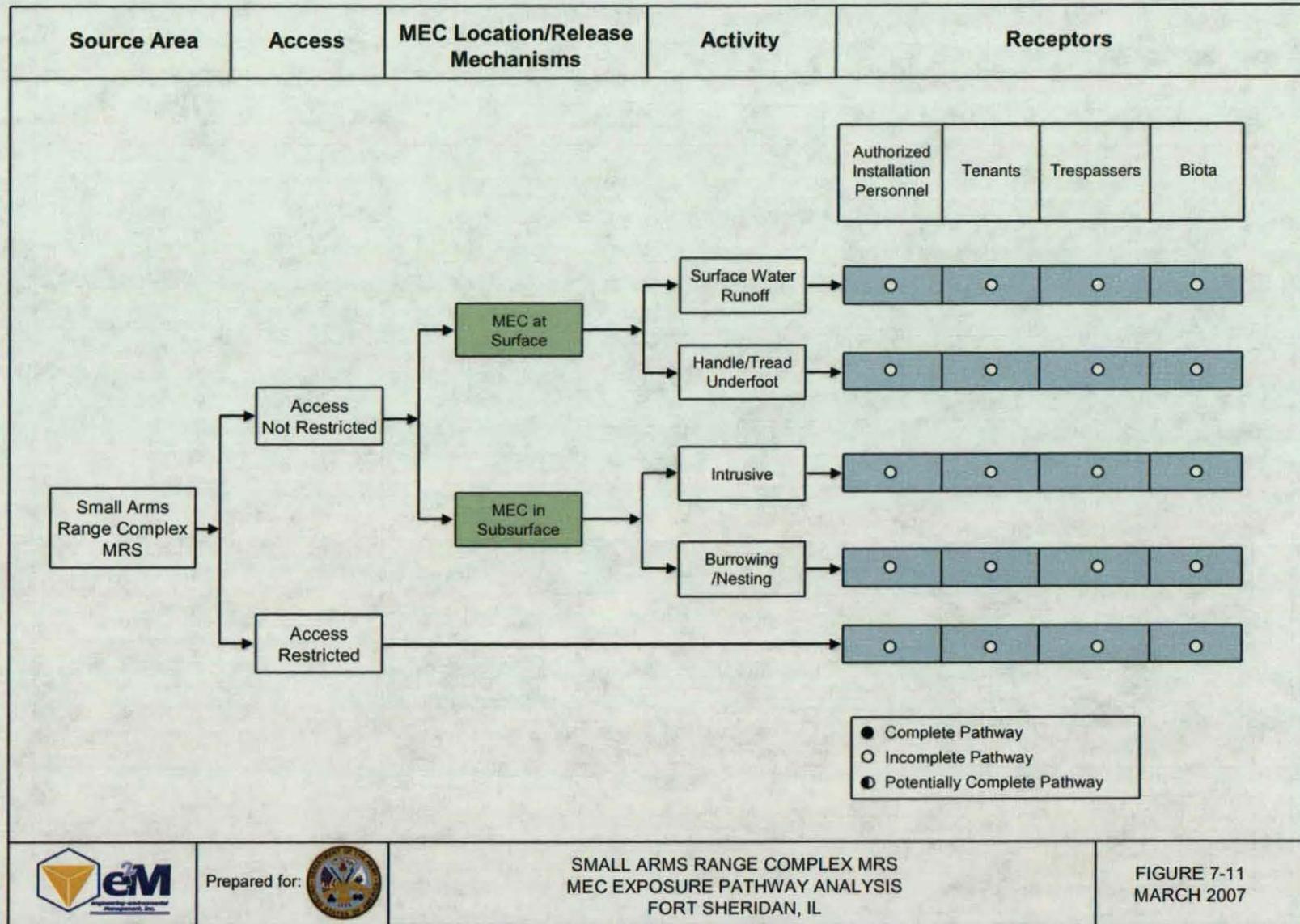
7.6.6 Pathway Analysis

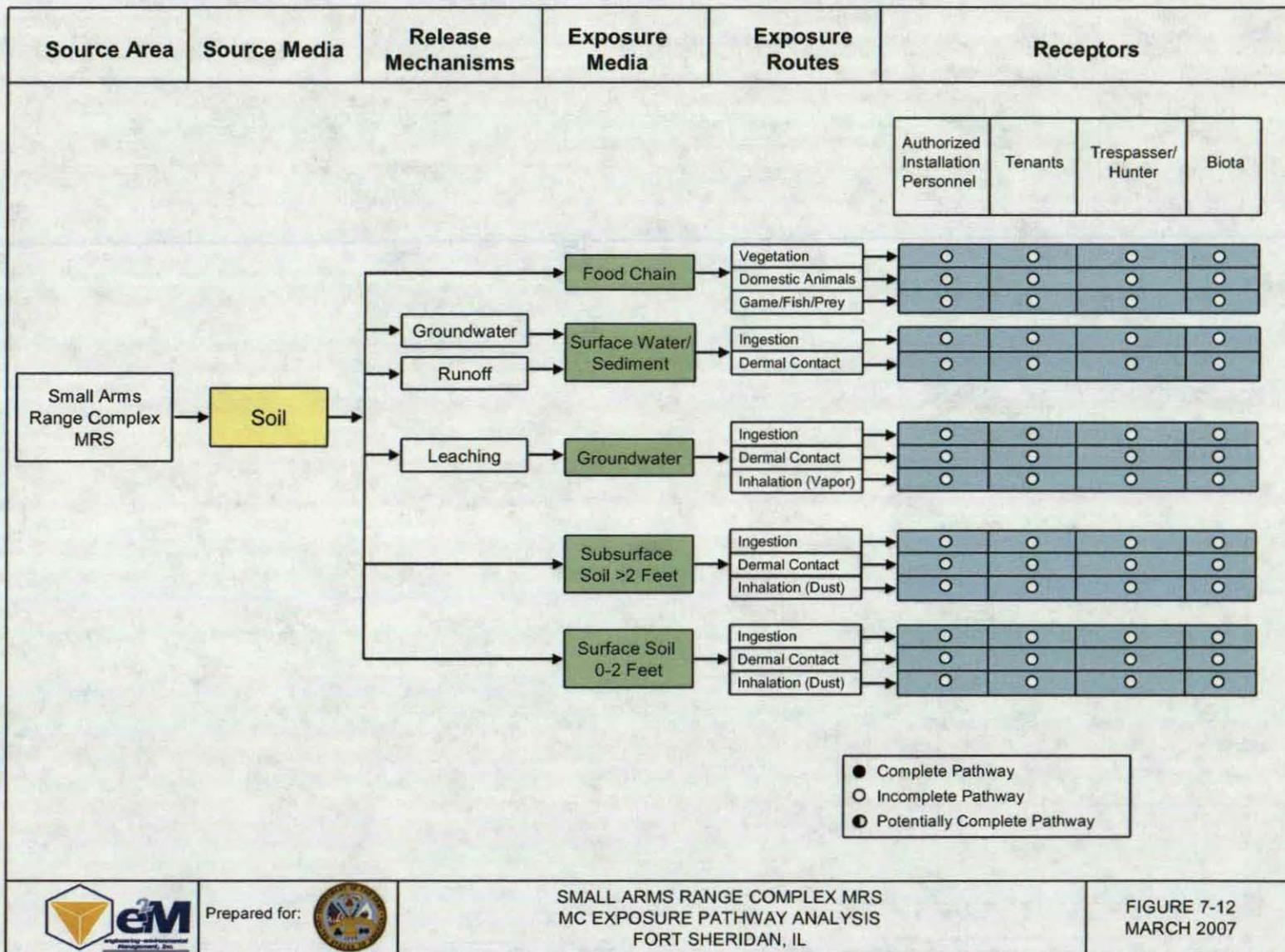
7.6.6.1 MEC

MEC is not a concern at the Small Arms Range Complex MRS because only small arms were used at the site. Because of this, the exposure pathways are incomplete for human and ecological receptors in regards to MEC. The incomplete exposure pathways are depicted in the flow chart provided in **Figure 7-11**.

7.6.6.2 MC

MC contamination is not present at the site. Therefore, the exposure pathways for both human and ecological receptors are incomplete. The exposure pathways are depicted in the flow chart provided in **Figure 7-12**.





8.0 CONCLUSIONS

The Conclusions use the currently designated MRSs with the new naming conventions.

8.1 Trench Warfare Range MRS (FTSHC-001-R-01)

The Trench Warfare Range MRS includes both US Army and US Navy properties. A portion of Landfill 5 overlaps with the Trench Warfare Range MRS. The landfill is an IRP site and is not eligible for the MMRP; therefore, this overlapping area was removed from the MRS footprint. Based on further review of historical documents and the results of the SI field work, a small fenced area was discovered located around Building 384 (0.17 acre) on the eastern edge of the MRS. Building 384 was previously approved for NFA by the US Department of the Army and the US Department of the Navy, in consultation with both the EPA and IEPA. Because of its close proximity to the AAA Firing Point "B" and potentially related historical uses, the fenced area, not including Building 384, was removed from the MRS and added to the AAA Firing Point "B" portion of the AAA Firing Points A and B MRS.

8.1.1 MEC

No MEC were observed at the Trench Warfare Range MRS during the SI field work. Based on the surveys performed for this SI, historical records, and the fact that this MRS is extensively developed, encountering MEC is unlikely.

8.1.2 MC

Analytical results of surface soil sampling during the SI field work indicate that concentrations of metals (aluminum, calcium, iron, magnesium, potassium, sodium) exceed IEPA Tier I TACO standards; however, only magnesium was reported at a concentration greater than the site background level. It should also be noted that calcium, magnesium, potassium, and sodium are naturally occurring elements in the environment and are thus not considered MC of concern. Explosives were not detected above reporting limits. Therefore, MC is not a concern at this MRS.

8.1.3 CSM Summary

Based on the findings, no complete or potentially complete exposure pathways for MEC or MC are determined to exist at the Trench Warfare Range MRS.

8.2 Southern Small Arms Ranges MRS (FTSHC-002-R-01)

The Southern Small Arms Ranges MRS is part of the AAA Complex MRA. A portion of the Southern Small Arms Ranges MRS overlaps with the AAA Firing Points A and B MRS. Therefore, only the portions of the Southern Small Arms Ranges MRS lying outside of the AAA Firing Points A and B MRS

were counted in the total acreage for the Southern Small Arms Ranges MRS in order to avoid duplicating acreages. The overlapping portions are considered part of the AAA Firing Points A and B MRS.

8.2.1 MEC

Based on historical use, previous investigations, and development of the area, encountering MEC is considered to be unlikely at the Southern Small Arms Ranges MRS.

8.2.2 MC

At the Southern Small Arms Ranges MRS, MC is not considered a concern based on previous investigations and discussions which took place during the TPP 2 meeting. The area has been extensively developed since the ranges were operational and no evidence of small arms ammunition has been reported.

8.2.3 CSM Summary

Based on the findings, all of the MEC and MC exposure pathways at the Southern Small Arms Ranges MRS are considered incomplete.

8.3 AAA Firing Points A and B MRS (FTSHC-002-R-02)

The AAA Firing Points A and B MRS is part of the AAA Complex MRA. During the SI, the final disposition of the MRS resulted in the removal of the range fan portions of the AAA Firing Points A and B MRS, and the addition of the fenced area around Building 384 (originally part of the Trench Warfare Range MRS) to the AAA Firing Points A and B MRS. In addition, a portion of capped Landfill 7, an IRP site, overlaps with the AAA Firing Point "A". Because the landfill is not eligible for the MMRP, the overlapping portion of the landfill was removed from the AAA Firing Points A and B MRS.

8.3.1 MEC

At the AAA Firing Points A and B MRS, "dud pits" may exist and a 105mm cartridge was found near the AAA Firing Point "B" (USACE, 1996). Additionally, the fenced area with UXO warning signs was observed around Building 384 during the SI field work. Therefore, the potential exists for MEC to be present in these areas.

8.3.2 MC

Because MEC potentially exists in the AAA Firing Points A and B MRS, MC may also be present. During the SI field work, surface soil samples collected from AAA Firing Point "A" contained aluminum, calcium, iron, magnesium, potassium, and sodium at concentrations greater than IEPA Tier I TACO standards; however, only potassium was reported at a concentration greater than the site background level. It

should also be noted that calcium, magnesium, potassium, and sodium are naturally occurring elements in the environment and are thus not considered MC of concern. Explosives were not detected above reporting limits.

8.3.3 CSM Summary

At the AAA Firing Points A and B MRS, potentially complete exposure pathways exist for MEC and MC.

8.4 AAA Complex – Transferred MRS (FTSHC-003-R-01)

The AAA Complex – Transferred MRS consists of the range safety fans over Lake Michigan that extend from the AAA Complex Firing Points. The area of the AAA Complex – Transferred MRS is approximately 100,988 acres. A portion of the AAA Complex – Transferred MRS range fan has been removed where overlapping range fans exist from a previously identified BRAC area.

8.4.1 MEC

Previous investigation in Lake Michigan did not indicate the presence of MEC in the AAA Complex – Transferred MRS. Based on historical records, encountering MEC is unlikely.

8.4.2 MC

MC were not detected in Lake Michigan sediment samples collected during a previous investigation. Therefore, MC is not a concern at this MRS.

8.4.3 CSM Summary

Based on the findings, no complete or potentially complete exposure pathways for MEC or MC are determined to exist at the AAA Complex – Transferred MRS.

8.5 Grenade Course MRS (FTSHC-004-R-01)

The Grenade Course MRS is located in an area currently occupied by NCO housing and covers approximately 25.7 acres.

8.5.1 MEC

MEC may exist in the Grenade Course MRS based upon previous investigations.

8.5.2 MC

Although soil samples were not collected during the SI field work, previous studies indicate the presence of MC in soil at the Grenade Course MRS, thus the presence of MC in the MRS is considered likely.

8.5.3 CSM Summary

Based upon the findings, MEC and MC exposure pathways at the Grenade Coarse MRS are considered potentially complete.

8.6 Small Arms Range Complex MRS (FTSHC-005-R-01)

The Small Arms Range Complex MRS consists of two range areas, the Northern Pistol Range and the Northern Machine Gun Range. The MRS is located along the beach of Lake Michigan and comprises approximately 1.4 acres.

8.6.1 MEC

Based on the historical investigations and usage as small arms ranges, the potential for MEC in the Small Arms Range Complex MRS is considered to be unlikely.

8.6.2 MC

MC was not detected at concentrations greater than the IEPA TACO Tier I Standards in soil samples collected during previous investigations at the Small Arms Range Complex MRS. Therefore, MC is not a concern at this MRS.

8.6.3 CSM Summary

Based upon the findings, all of the MEC and MC exposure pathways at the Small Arms Range Complex MRS are considered incomplete.

9.0 RECOMMENDATIONS AND FINAL ACREAGES

Recommendations for the MRA/MRSs and summaries of the acreage changes are presented below. The Recommendations use the currently designated MRAs/MRSs with the new naming conventions.

9.1 Recommendations

As a result of historical records review, stakeholder discussions during the TPP 2, and the results of the SI field work, the following recommendations for the MRS/MRAs at FTSH are being made.

- **Trench Warfare Range MRA (FTSHC-001-R)**
 - **Trench Warfare Range MRS (FTSHC-001-R-01):** NFA is recommended because results of the SI and previous investigations did not show evidence of MEC or MC.
- **AAA Complex MRA (FTSHC-002-R):**
 - **Southern Small Arms Ranges MRS (FTSHC-002-R-01):** NFA is recommended. This recommendation is based upon extensive development of the area without reports of MEC, and the lack of MEC and MC observed during previous investigations.
 - **AAA Firing Points A and B MRS (FTSHC-002-R-02):** This MRS is recommended for Further Characterization. Based on knowledge that artillery munitions were fired from these points, and given the possibility misfires may have been placed in "dud pits" near the firing points, potential buried MEC may be present.
- **AAA Complex – Transferred MRA (FTSHC-003-R)**
 - **AAA Complex – Transferred MRS (FTSHC-003-R-01):** NFA is recommended for this MRS because previous investigations in Lake Michigan did not indicate the presence of MEC or MC.
- **Grenade Course MRA (FTSHC-004-R)**
 - **Grenade Course MRS (FTSHC-004-R-01):** Further Characterization is recommended for this MRS due to possible MC contamination, previous EOD responses at the site, and lack of a comprehensive UXO sweep of the MRS. Results of previous investigations indicate the potential presence of MEC and MC.
- **Small Arms Range Complex MRA (FTSHC-005-R):**
 - **Small Arms Range Complex MRS (FTSHC-005-R-01):** NFA is recommended based upon historical usage and results of previous investigations that did not find evidence of MEC or MC.

Table 9-1 below summarizes the recommendations and basis of the recommendations for the MRAs/MRSs.

March 2007

9-1

Table 9-1: MRA/MRS Recommendations

MRA	MRS	Recommendation	Basis for Recommendation	
			MEC	MC
Trench Warfare Range MRA (FTSHC-001-R)	Trench Warfare Range MRS (FTSHC-001-R-01)	No Further Action	MEC was not identified during the SI field work or during previous investigations at the site.	Surface soil samples collected during SI field work contained aluminum, calcium, iron, magnesium, potassium, and sodium at concentrations above the IEPA TACO standards; however, only magnesium was reported at a concentration greater than the site background level. It should also be noted that calcium, magnesium, potassium, and sodium are naturally occurring elements in the environment and are thus not considered MC of concern. Explosives were not detected above reporting limits.
AAA Complex MRA (FTSHC-002-R)	Southern Small Arms Ranges MRS (FTSHC-002-R-01)	No Further Action	MEC is not suspect because of historical usage; in addition, MEC has not been identified during previous investigations or the SI field work.	MC is not considered a concern based on previous investigations and discussions from the TPP 2 meeting, and no elevated levels were found during the SI field work.
	AAA Firing Points A and B MRS (FTSHC-002-R-02)	Further Characterization	MEC may exist in potential "dud pits" located near the firing points. A 105mm cartridge case was found in the vicinity of the AAA Firing Point "B". It was also observed during the SI field work the fenced area around Building 384 is posted with UXO warning signs.	Surface soil samples collected during SI field work contained aluminum, calcium, iron, magnesium, potassium, and sodium at concentrations above the IEPA TACO standards; however, only potassium was reported at a concentration greater than the site background level. It should also be noted that calcium, magnesium, potassium, and sodium are naturally occurring elements in the environment and are thus not considered MC of concern. Explosives were not detected above reporting limits.

Table 9-1: MRS/MRA Recommendations (continued)

MRA	MRS	Recommendation	Basis for Recommendation	
			MEC	MC
AAA Complex – Transferred MRA (FTSHC-003-R)	AAA Complex – Transferred MRS (FTSHC-003-R-01)	No Further Action	MEC was not found during ordnance diving support conducted by UXB International at the site during the spring of 2000.	A Site Investigation Report (Harding ESE, 2001) concluded explosive constituents were not present in the sediment samples collected in Lake Michigan. The Report also concluded that chemical constituents contained in artillery fired from the AAA ranges have not impacted Lake Michigan. IEPA has reviewed these report findings and determined the risk at this site is acceptable.
Grenade Course MRA (FTSHC-004-R)	Grenade Course MRS (FTSHC-004-R-01)	Further Characterization	Previous field work at this MRS has confirmed the presence of MEC.	Metals have been detected at concentrations greater than background levels and metallic debris of unknown origin has been located at the MRS during previous field work.
Small Arms Range Complex MRA (FTSHC-005-R)	Small Arms Range Complex MRS (FTSHC-005-R-01)	No Further Action	MEC is not suspect at this MRA because it was historically used for small arms only.	Results of Phase III Remedial Investigation/Baseline Risk Assessment (RI/BRA) sampling analysis indicate lead concentrations at the site do not exceed background levels.

9.2 Final Acreages

Some acreage changes have occurred to the MRAs/MRSs from the Phase 3 Inventory through the HRR and to the final acreages as presented now in the SI. The following section explains the acreage changes. The final boundaries of the Fort Sheridan MRAs and MRSs are shown on **Figure 9-1** and **Figure 9-2**, respectively.

- **Trench Warfare Range MRA (FTSHC-001-R)**

- **Trench Warfare Range MRS (FTSHC-001-R-01)**

During the April 10, 2006 SI field work, e²M observed a previously undocumented area of concern in the eastern area of the Trench Warfare Range MRS. It was observed Building 384 had a perimeter fence with warning signs affixed in multiple locations stating, "DANGER: Unexploded Ordnance Restricted Area Fort Sheridan BRAC Office Tel. 708/926-4806."

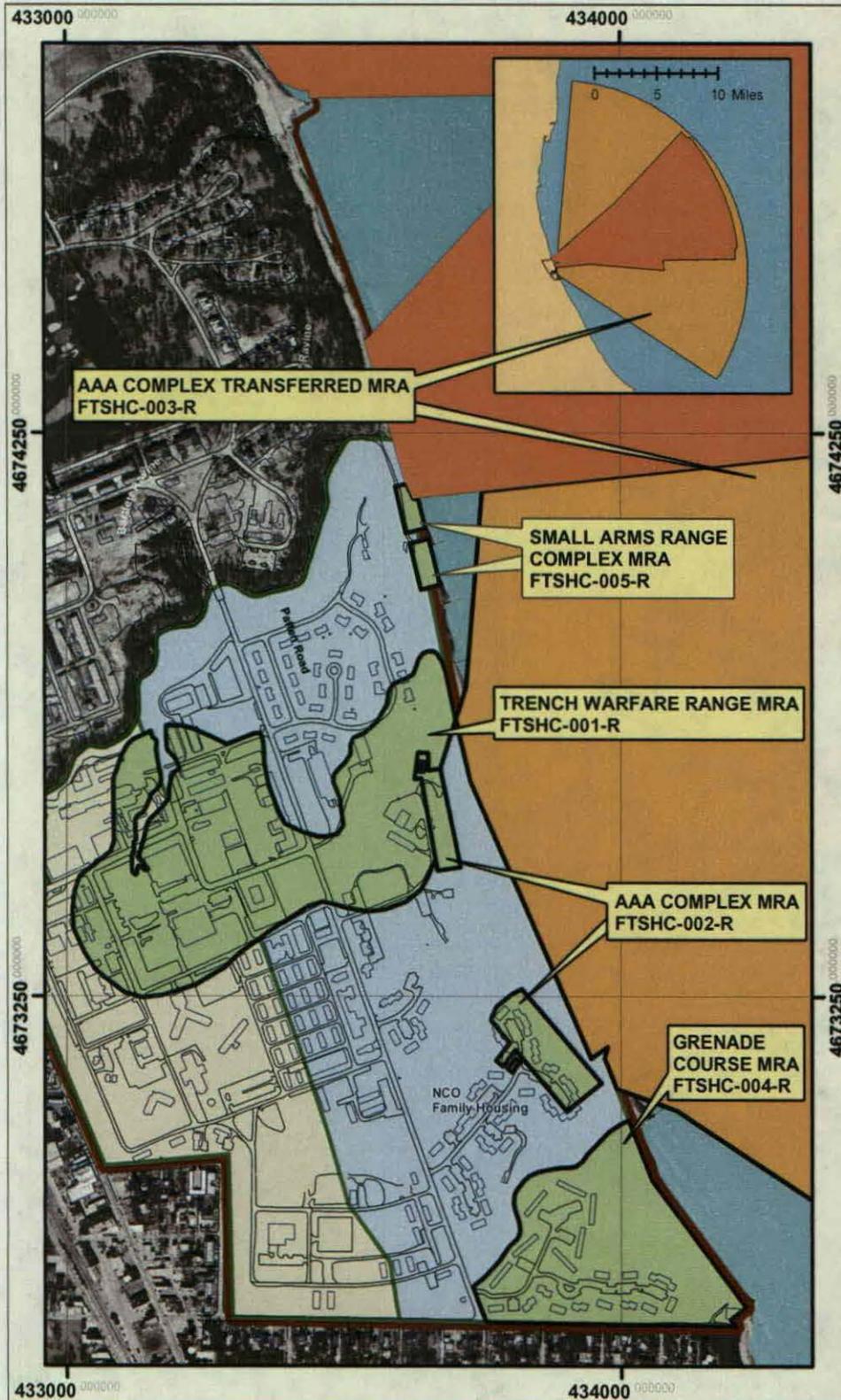
Because this area was not previously considered an area of concern, a visual survey and sampling was not included in the Work Plan (WP) and thus were not conducted. The fenced area straddles the boundary between the Trench Warfare Range MRS and the AAA Firing Points A and B MRS. Building 384 (but not the fenced area surrounding the building) received an NFA by the US Department of the Army and the US Department of the Navy, in consultation with both the EPA and IEPA (SAIC, 1999b). Because the fenced area has a different use history than the Trench Warfare Range MRS, it is recommended that all of the fenced area around Building 384 be included in the AAA Firing Points A and B MRS. Therefore, the area of the Trench Warfare Range MRS is slightly decreased and this area has been added to the AAA Firing Points A and B MRS. In addition, Landfill 5, an IRP site not eligible for the MMRP, partially overlaps the Trench Warfare Range MRS. Therefore, this overlapping area was removed from the Trench Warfare Range MRS footprint. As a result of these changes, the acreage of the Trench Warfare Range MRS has been reduced from 53.1 acres to 51.5 acres. The final Trench Warfare Range MRS footprint is shown on **Figures 4-1** and **9-2**.



FINAL MRA BOUNDARIES Fort Sheridan, IL

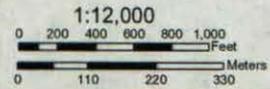


Figure 9-1



- Road
 - Water
 - Pre-BRAC Boundary
 - U.S. Army Reserve
 - U.S. Navy
 - Building Outline
- Area Status**
- MRA, Closed
 - MRA, Transferred
 - BRAC Range Fan

Projection: UTM Zone 16
Datum : WGS 84
Units: Meters
Grid: 1,000 Meter



**Installation Location
Illinois**

**SITE INSPECTION REPORT
FORT SHERIDAN, IL**

Source: Produced for the U.S. Army Corps of Engineers by engineering-environmental Management, inc. (eM)

Date: March 2007
Edition: Final



FINAL MRS BOUNDARIES Fort Sheridan, IL

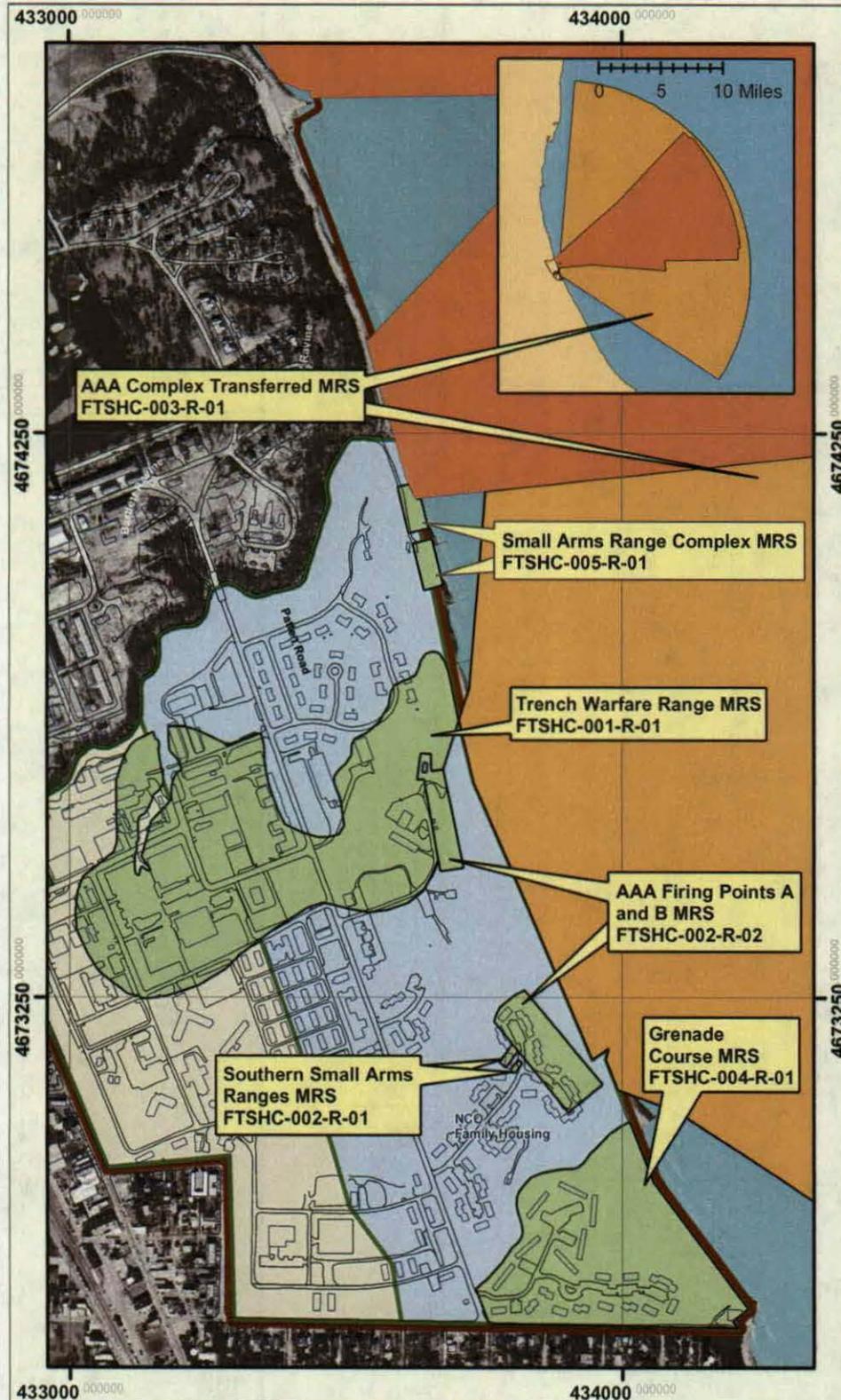
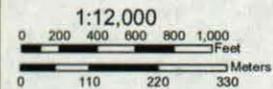


Figure 9-2



- Road
 - Water
 - Pre-BRAC Boundary
 - U.S. Army Reserve
 - U.S. Navy
 - Building Outline
- Area Status**
- MRS, Closed
 - MRS, Transferred
 - BRAC Range Fan

Projection: UTM Zone 16
Datum: WGS 84
Units: Meters
Grid: 1,000 Meter



SITE INSPECTION REPORT
FORT SHERIDAN, IL

Source: Produced for the U.S. Army Corps of Engineers by engineering-environmental Management, Inc. (eM)

Date: March 2007
Edition: Final

- **AAA Complex MRA (FTSHC-002-R)**

- **Southern Small Arms Ranges MRS (FTSHC-002-R-01)**

A portion of the Southern Small Arms Ranges MRS overlaps with the AAA Firing Points A and B MRS. In order to avoid duplicating acreages, only the portions of the Southern Small Arms Ranges MRS lying outside of the AAA Firing Points A and B MRS were counted in the total acreage of the Southern Small Arms Ranges MRS. The overlapping portions are considered part of the AAA Firing Points A and B MRS. A very small portion of the MRS was also overlapped by Landfill 7, this portion has also been removed. The final acreage of the Southern Small Arms Ranges MRS has been reduced from approximately 1.0 acre to 0.21 acres (see **Figures 4-2 and 9-2**).

- **AAA Firing Points A and B MRS (FTSHC-002-R-02)**

It is recommended that the footprint of the AAA Firing Points A and B MRS be reduced by removing the range fan portions of the MRS. The small section of capped Landfill 7, an IRP site which overlaps with the northern edge of the AAA Firing Point "A", has been removed from the MRS. Additionally, the fenced area surrounding Building 384 has been included in the footprint of the MRS. Building 384 was previously approved for NFA by the US Department of the Army and the US Department of the Navy, in consultation with the EPA and the IEPA. Because the fenced area around Building 384 did not receive NFA, is adjacent to Firing Point "B," and has potentially related historical uses, it is recommended that the fenced area only be removed from the Trench Warfare Range MRS and added to the AAA Firing Points A and B MRS. Based on these changes, the MRS total acreage has been revised from 13.7 acres to 6.2 acres (see **Figures 4-2 and 9-2**).

- **AAA Complex-Transferred MRA (FTSHC-003-R)**

- **AAA Complex-Transferred MRS (FTSHC-003-R-01)**

Going into the SI, the MRS covered approximately 157,184 acres. However, newly acquired information regarding BRAC properties indicated a significant portion of the AAA Complex-Transferred MRS range fan coincided with BRAC range fans. Therefore, the BRAC portion of the range fans were removed from the MRS footprint reducing the final acreage to approximately 100,988 acres (see **Figures 4-3 and 9-2**).

- **Grenade Course MRA (FTSHC-004-R)**
 - **Grenade Course MRS (FTSHC-004-R-01)**

No changes in acreage (see **Figures 4-4** and **9-2**).

- **Small Arms Range Complex MRA (FTSHC-005-R)**
 - **Small Arms Range Complex MRS (FTSHC-005-R-01)**

Going into the SI, the MRS covered approximately 1.5 acres. However, a portion of the Small Arms Range Complex MRS is overlapped by a firing fan identified during the US Army CTT Range/Site Inventory for BRAC properties. The overlapping portion has been removed from the Small Arms Range Complex MRS for the purposes of this SI because this area was already counted under the BRAC MMRP. Therefore, the BRAC portion of the range fan was removed from the MRS footprint reducing the final acreage to approximately 1.4 acres (see **Figures 4-5** and **9-2**).

The acreage changes are summarized in **Table 9-2**.

Table 9-2: Summary of Acreage Changes

	Trench Warfare Range MRS	Southern Small Arms Ranges MRS	AAA Firing Points A and B MRS	AAA Complex – Transferred MRS	Grenade Course MRS	Small Arms Range Complex MRS
Site Acreage Presented in Phase 3 Inventory	42.5	N/A	N/A	N/A	N/A	N/A
Site Acreage Presented in HRR	53.1	1.0	13.7	157,184	25.7	1.5
Site Acreage Based on SI Findings	51.5	0.21	6.2	100,988	25.7	1.4
Explanation of Change	Fenced area surrounding Bldg 384 was removed and added to the AAA Firing Points A and B MRS. In addition, Landfill 5, an IRP site not eligible for the MMRP, partially overlaps the MRS, thus the overlapping area was removed from the MRS.	MRS footprint reduced as a result of adding the portions of the MRS which overlap with the AAA Firing Point “A” to the AAA Firing Points A and B MRS and removing the portion of the MRS that overlaps with Landfill 7.	Overall MRS footprint reduced by removing the range fan portions from the firing points and by removing the portion of the MRS that overlaps with Landfill 7. Additional footprint modification included adding the fenced area from around Building 384.	BRAC portion of range fans were removed from the MRS as it was already counted under the BRAC MMRP.	N/A	A small portion of the BRAC range fan was removed from the MRS as it was already counted under the BRAC MMRP.

N/A = Not Applicable

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**FINAL
SITE INSPECTION REPORT
FORT SHERIDAN, ILLINOIS**

**MILITARY MUNITIONS RESPONSE PROGRAM
SITE INSPECTION
MUNITIONS RESPONSE SITES**

Submitted To:

**US ARMY CORPS OF ENGINEERS
OMAHA DISTRICT
CENWO-PM-HC
106 S. 15th STREET
OMAHA, NE 68102-1618**

Prepared By:

**engineering-environmental Management, Inc.
9563 S. Kingston Court, Suite 200
Englewood, CO 80112**

**Contract Number DACA-45-02-D0010
Task Order Number 0003**

MARCH 2007

SIGNATURE PAGE

engineering-environmental Management, Inc.

**FINAL
SITE INSPECTION REPORT
FORT SHERIDAN, ILLINOIS**

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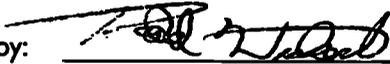
MARCH 2007

Prepared by:



Greg Pudlik, P.G.
e²M Sr. Project Manager/Hydrogeologist

Reviewed by:



Todd Wickert
e²M MMRP QA/QC Manager

Approved by:



Courtney Ingersoll
e²M Technical Program Manager

EXECUTIVE SUMMARY

Under contract with the United States Army Corps of Engineers (USACE), Omaha District, engineering-environmental Management, Inc. (e²M) has prepared the following Site Inspection (SI) Report for the other than operational ranges and sites with known or suspected munitions and explosives of concern (MEC), munitions debris, or munitions constituents (MC) at Fort Sheridan (FTSH), Illinois. These Munitions Response Sites (MRSs) are being addressed under the United States (US) Army Military Munitions Response Program (MMRP). The work performed for this SI was completed in accordance with the *Scope of Work Closed, Transferring, and Transferred (CTT) Ranges/Sites, Site Inspection, Multiple Installations, Air Combat Command (ACC) Contract Number DACA-45-02-D0010, Task Order 0003 (SOW)*; dated 19 March 2004.

The US Army's Phase 3 CTT Range/Site Inventory at the Fort Sheridan Army Reserve Complex (FSARC), dated December 2002, identified the Trench Warfare Range as the only MRS. Due to historical site activities and the potential for MC and MEC to be present, this site qualified for the MMRP and was given the Army Environmental Database Restoration (AEDB-R) number FTSHC-001-R-01.

A Memorandum of Understanding (MOU) between the Department of the Army and the Department of the Navy dated 8 August 1991 (**Appendix A**) was discovered during the records review for the US Navy MMRP Preliminary Assessment (PA) (Malcolm Pirnie, 2003). The memorandum documents the Army's continued remediation responsibility for the FTSH property realigned to the Navy. Therefore, this SI will include MMRP-eligible sites on both the US Army Reserve Command (USARC) and US Navy properties. The boundaries of these sites were derived from the March 1996 Archive Search Report, Fort Sheridan (ASR) by USACE, St. Louis.

In March 2003, URS, Inc. conducted the US Army CTT Range/Site Inventory for the Base Realignment and Closure (BRAC) property at Fort Sheridan. This inventory included the following BRAC sites: Trap Shoot Range, Infiltration Range, Small Bore Rifle Range, Rifle Range, 38-Acre Parcel, Bayonet Training Range, AA Artillery Location C, AA Artillery Location D, and AA Artillery Location E, all of which were located on the BRAC property at Fort Sheridan.

Subsequent to the US Army Phase 3 CTT Range/Site Inventory, during the US Navy's MMRP PA (Malcolm Pirnie, 2003), the following sites were identified on the Fort Sheridan property that was realigned to the Navy: 1) the Anti-Aircraft Artillery (AAA) Area; 2) the Grenade Course; 3) the Five Small Arms, Pistol, and Machine Gun Ranges; and 4) the Trench Training System.

March 2007

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During the Historical Records Review (HRR) process, due to site locations and similar historical usage, two of the Five Small Arms, Pistol, and Machine Gun Ranges (the Northern Pistol Range MRS and Northern Machine Gun Range MRS) were grouped together into a Munitions Response Area (MRA) named the Small Arms Range Complex. (Note: An MRA is an area known or suspected to contain MEC or MC and consists of one or more MRSs. All acreage within an MRA is designated as an MRS with no overlapping acres.) The remaining three of the Five Small Arms, Pistol, and Machine Gun Ranges (the Southern Small Arms Range MRS, Southern Machine Gun Range MRS, and the Southern Pistol Range MRS) along with Firing Points "A" and "B" from the AAA Area were grouped into an MRA named the AAA Complex. The portion of the AAA Area that is considered an impact area in Lake Michigan became a separate Transferred MRS. The Trench Warfare Range identified by the Army and the Trench Training System identified by the Navy are eastern and western portions of the same site, respectively. This entire site is referred to as the Trench Warfare Range MRS.

Therefore, the naming conventions of the MRAs and MRSs going into the SI were as follows:

- Trench Warfare Range MRA (FTSHC-001-R)
 - Trench Warfare Range MRS (FTSHC-001-R-01);
- AAA Complex MRA
 - Southern Small Arms Range MRS
 - Southern Machine Gun Range MRS
 - Southern Pistol Range MRS
 - AAA Firing Point "A" MRS
 - AAA Firing Point "B" MRS
- AAA Complex-Transferred MRA
 - AAA Complex-Transferred MRS
- Grenade Course MRA
 - Grenade Course MRS
- Small Arms Range Complex MRA
 - Northern Pistol Range MRS
 - Northern Machine Gun Range MRS

Additional information on the MMRP-eligible sites was collected during the three SI records collection visits on 20–24 September 2004, 18 April – 18 May 2005, and 26–28 October 2005; the Technical Project Planning (TPP) Meeting Number 2 on 21 September 2005; and the SI field work which took place on 10 April 2006.

After the Draft SI Report was submitted, as a result of comments and discussions with the US Army Environmental Command (USAEC), the naming conventions of the MRAs and MRSs were revised and AEDB-R numbers were obtained for all of the MRAs and MRSs. The new revised naming conventions are as follows:

- Trench Warfare Range MRA (FTSHC-001-R)
 - Trench Warfare Range MRS (FTSHC-001-R-01);
- AAA Complex MRA (FTSHC-002-R)
 - Southern Small Arms Ranges MRS (FTSHC-002-R-01)
(Previously consisted of the Southern Small Arms Range MRS, Southern Pistol Range MRS, and Southern Machine Gun Range MRS)
 - AAA Firing Points A and B MRS (FTSHC-002-R-02)
(Previously consisted of the AAA Firing Point "A" MRS and AAA Firing Point "B" MRS)
- AAA Complex-Transferred MRA (FTSHC-003-R)
 - AAA Complex-Transferred MRS (FTSHC-003-R-01);
- Grenade Course MRA (FTSHC-004-R)
 - Grenade Course MRS (FTSHC-004-R-01)
- Small Arms Range Complex MRA (FTSHC-005-R)
 - Small Arms Range Complex MRS (FTSHC-005-R-01)
(Previously consisted of the Northern Pistol Range MRS and the Northern Machine Gun Range MRS)

The findings and recommendations are presented below:

- **Trench Warfare Range MRA (FTSHC-001-R)**
 - **Trench Warfare Range MRS (FTSHC-001-R-01)**

The Trench Warfare Range MRS is being recommended for No Further Action (NFA) because of no evidence of MEC and MC. Results of previous investigations and the SI field work did not identify MEC. In addition, although analytical results from surface soil sampling during the SI field work indicated that concentrations of metals (aluminum, calcium, iron, magnesium, potassium, and sodium) exceeded the Illinois Environmental Protection Agency (IEPA) Tiered Approach to Corrective Action Objectives (TACO) standards, only magnesium was reported at a concentration greater than the site background level. It should also be noted that calcium, magnesium, potassium, and sodium are naturally occurring elements in the environment and are thus not considered MC of concern. Explosives were not detected above reporting limits.

Based on further review of historical documents and the results of the SI field work, it is also recommended that the footprint of the Trench Warfare Range MRS be slightly reduced based on the following information. A fenced area posted with unexploded ordnance (UXO) warning signs around Building 384 was observed during the SI field work. This fenced area overlaps with the Trench Warfare Range MRS and the AAA Firing Points A and B MRS; however, the building itself is completely surrounded by the Trench Warfare Range MRS footprint. Building 384 itself was previously approved for NFA by the US Department of the Army and the US Department of the Navy, in consultation with both the Environmental Protection Agency (EPA) and the IEPA; however, the fenced area around the building was not. Since the fenced area is adjacent to Firing Point B and has potentially related historical uses, it is recommended that the fenced area, not including Building 384, be removed from the Trench Warfare Range MRS and added to the AAA Firing Points A and B MRS.

Landfill 5, an Installation Restoration Program (IRP) site not eligible for the MMRP, partially overlaps the Trench Warfare Range MRS. Therefore, this overlapping area was removed from the Trench Warfare Range MRS footprint.

- **AAA Complex MRA (FTSHC-002-R)**

- **Southern Small Arms Ranges MRS (FTSHC-002-R-01)**

The Southern Small Arms Ranges MRS is recommended for NFA because of historical usage as small arms ranges and because previous investigations did not identify the presence of MEC or MC. However, a portion of the Southern Small Arms Ranges MRS overlaps with the AAA Firing Points A and B MRS, that is being recommended for Further Characterization. In order to avoid duplicating acreages, only the portions of the Southern Small Arms Ranges MRS lying outside of the AAA Firing Points A and B MRS were counted in the total acreage of the Southern Small Arms Ranges MRS and subsequently recommended for NFA. The overlapping portions are considered part of the AAA Firing Points A and B MRS.

- **AAA Firing Points A and B MRS (FTSHC-002-R-02)**

The AAA Firing Points A and B MRS is being recommended for further characterization. This is based on the potential for "dud pits" existing near the firing pads and the discovery of a 105 millimeter (mm) cartridge near the AAA Firing Point B during a previous investigation.

A reduction in the footprint of the AAA Firing Point A and B MRS is also recommended. The range fan portions of the MRS are recommended to be removed from the MRS footprint because MEC were not identified in previous investigations or in the SI field work. A portion of capped Landfill 7, an IRP site, lies within Firing Point A and the overlapping portion was removed from the Firing Point A footprint. In addition, for the reasons previously described for the Trench Warfare Range MRS, it is recommended that the fenced area with posted UXO warning signs around Building 384 be added to the MRS.

- **AAA Complex- Transferred MRA (FTSHC-003-R)**

- **AAA Complex – Transferred MRS (FTSHC-003-R-01)**

The AAA Complex – Transferred MRS is the range fan area over Lake Michigan. The firing fans identified during the US Army CTT Range/Site Inventory for BRAC property for the three AA Artillery Locations over Lake Michigan have been removed from the AAA Complex – Transferred MRS for the purposes of this SI because this area was already counted under the BRAC program.

The AAA Complex – Transferred MRS is being recommended for NFA. During the spring of 2000, Harding ESE contracted with UXB International to provide UXO diving support for investigative work they were performing in Lake Michigan. No evidence of UXO was discovered. Sediment and surface water sampling conducted offshore of the AAA Complex in Lake Michigan in 2001 did not indicate the presence of explosive constituents.

- **Grenade Course MRA (FTSHC-004-R)**

- **Grenade Course MRS (FTSHC-004-R-01)**

The Grenade Course MRS is being recommended for further characterization. As stated in the Work Plan (WP), the presence of MEC has previously been confirmed in the Grenade Course MRS. Therefore, further investigation was not conducted during the SI field work.

- **Small Arms Range Complex MRA (FTSHC-005-R)**

- **Small Arms Range Complex MRS (FTSHC-005-R-01)**

A portion of the Small Arms Range Complex MRS is overlapped by a firing fan identified during the US Army CTT Range/Site Inventory for BRAC properties. The overlapping portion has been removed from the Small Arms Range Complex MRS for the purposes of this SI because this area was already counted under the BRAC MMRP.

The Small Arms Range Complex MRS is being recommended for NFA. No evidence of MEC has been reported at the MRS and historical usage at these types of ranges would not include the use of MEC. Analytical surface soil sample results from previous investigations also indicate that MC is not a concern at this MRS.

A summary of the findings and recommendations is presented in the following table:

Summary Table

MRA	MRS	Recommendation	Basis for Recommendation	
			MEC	MC
Trench Warfare Range MRA (FTSHC-001-R) (51.5 acres)	Trench Warfare Range MRS (FTSHC-001-R-01) (51.5 acres)	No Further Action Reduce footprint of MRS from 53.1 to 51.5 acres. MRS footprint reduced by removing the overlapping portion of Landfill 5 and removing the fenced area around Building 384.	MEC was not identified during the SI field work or during previous investigations at the site.	Surface soil samples collected during SI field work contained aluminum, calcium, iron, magnesium, potassium, and sodium at concentrations above the IEPA TACO standards; however, only magnesium was reported at a concentration greater than the site background level. It should also be noted that calcium, magnesium, potassium, and sodium are naturally occurring elements in the environment and are thus not considered MC of concern. Explosives were not detected above reporting limits.
AAA Complex MRA (FTSHC-002-R) (6.41 acres)	Southern Small Arms Ranges MRS (FTSHC-002-R-01) (0.21 acres)	No Further Action. Reduce footprint from approximately 1.0 acre to 0.21 acres. MRS footprint reduced as a result of removing the portions of the MRS which overlap with the AAA Firing Point "A" and adding them to the AAA Firing Points A and B MRS, and removing the portion of the MRS that overlaps with Landfill 7.	MEC is not suspect because of historical usage; in addition, MEC has not been identified during previous investigations or during the SI field work.	MC is not considered a concern based on previous investigations and discussions from the TPP 2 meeting, and no elevated levels were found during the SI field work.
	AAA Firing Points A and B MRS (FTSHC-002-R-02) (6.2 acres)	Further Characterization. Modify the footprint of the MRS from 13.7 to 6.2 acres. Overall footprint reduced by removing the range fan portions from the firing points and by removing the portion of the MRS that overlaps with Landfill 7. The fenced area from around Building 384 is also recommended to be removed from the Trench Warfare Range MRS and added to the AAA Firing Points A and B MRS.	MEC may exist in potential "dud pits" located near the firing points. A 105mm cartridge case was found in the vicinity of the AAA Firing Point "B". It was also observed during the SI field work the fenced area around Building 384 is posted with UXO warning signs.	Surface soil samples collected during SI field work contained aluminum, calcium, iron, magnesium, potassium, and sodium at concentrations above the IEPA TACO standards; however, only potassium was reported at a concentration greater than the site background level. It should also be noted that calcium, magnesium, potassium, and sodium are naturally occurring elements in the environment and are thus not considered MC of concern. Explosives were not detected above reporting limits.

Summary Table (continued)

MRA	MRS	Recommendation	Basis for Recommendation	
			MEC	MC
<p>AAA Complex – Transferred MRA (FTSHC-003-R)</p> <p>(100,988 acres)</p>	<p>AAA Complex – Transferred MRS (FTSHC-003-R-01)</p> <p>(100,988 acres)</p>	<p>No Further Action</p> <p>The acreage of the firing fans identified during the US Army CTT Range/Site Inventory for BRAC property for the three AA Artillery Locations over Lake Michigan have been removed from the MRS since this area was already counted under the BRAC program, thus reducing the acreage from 157,184 acres to 100,988 acres.</p>	<p>MEC was not found during ordnance diving support conducted by UXB International at the site during the spring of 2000.</p>	<p>A Site Investigation Report (Harding ESE, 2001) concluded explosive constituents were not present in the sediment samples collected in Lake Michigan. The Report also concluded that chemical constituents contained in artillery fired from the AAA ranges have not impacted Lake Michigan.</p> <p>IEPA has reviewed these report findings and determined the risk at this site is acceptable.</p>
<p>Grenade Course MRA (FTSHC-004-R)</p> <p>(25.7 acres)</p>	<p>Grenade Course MRS (FTSHC-004-R-01)</p> <p>(25.7 acres)</p>	<p>Further Characterization</p>	<p>Previous field work at this MRS has confirmed the presence of MEC.</p>	<p>Metals have been detected at concentrations greater than background levels and metallic debris of unknown origin has been located at the MRS during previous field work.</p>
<p>Small Arms Range Complex MRA (FTSHC-005-R)</p> <p>(1.4 acres)</p>	<p>Small Arms Range Complex MRS (FTSHC-005-R-01)</p> <p>(1.4 acres)</p>	<p>No Further Action</p> <p>A small portion of the overlapping BRAC range fan was removed from the MRS as it was already counted under the BRAC program, thus reducing the acreage from 1.5 acres to 1.4 acres.</p>	<p>MEC is not suspected at this MRS because it was historically used for small arms only.</p>	<p>Results of the Phase III Remedial Investigation/Baseline Risk Assessment (RI/BRA) sampling analysis indicate lead concentrations at the site do not exceed background levels.</p>

ACRONYMS and ABBREVIATIONS

AA	Anti-Aircraft
AAA	Anti-Aircraft Artillery
AAFES	Army & Air Force Exchange Service
ACC	Air Combat Command
AEDB-R	Army Environmental Database Restoration
ASR	Archive Search Report
AT	Anti-Tank
bgs	Below Ground Surface
BRA	Baseline Risk Assessment
BRAC	Base Realignment and Closure
°C	Celsius
cal	Caliber
CD	Compact Disc
CENWO-PM	USACE, Omaha District Project Manager
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CLP	Contract Laboratory Program
COC	Chain of Custody
CSM	Conceptual Site Model
CTC	Cost To Complete
CTT	Closed, Transferring, and Transferred
DERP	Defense Environmental Restoration Program
DMM	Discarded Military Munitions
DoD	Department of Defense
DQCR	Data Quality Control Report
DSA	Diane Short and Associates, Inc.
e ² M	engineering-environmental Management, Inc.
EM	Electromagnetic
EOD	Explosive Ordnance Disposal
EPA	Environmental Protection Agency
ERIS	Environmental Restoration Information System
FPM	Field Project Manager
FS	Feasibility Study
FSARC	Fort Sheridan Army Reserve Complex
°F	Fahrenheit
FTSH	Fort Sheridan
FY	Fiscal Year
GPS	Global Positioning System

ACRONYMS and ABBREVIATIONS

HB	Heavy Barrel
HMX	High Melting Explosive - Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine, also known as Octogen
HRR	Historical Records Review
HTRW	Hazardous, Toxic, and Radioactive Waste
IEPA	Illinois Environmental Protection Agency
IRP	Installation Restoration Program
LCS	Laboratory Control Sample
MC	Munitions Constituents
MDL	Method Detection Limit
MEC	Munitions and Explosives of Concern
MG	Machine Gun
mm	Millimeter
MMRP	Military Munitions Response Program
MOU	Memorandum of Understanding
mph	Miles per Hour
MRA	Munitions Response Area
MRS	Munitions Response Site
MRS-PP	Munitions Response Site Prioritization Protocol
MS/MSD	Matrix Spike/Matrix Spike Duplicate
NCO	Non-Commissioned Officer
NCP	National Oil and Hazardous Substances Contingency Plan
NFA	No Further Action
OB/OD	Open Burn/Open Detonation
OE	Ordnance and Explosives
OU	Operable Unit
PA	Preliminary Assessment
PEL	PEL Laboratories, Inc.
PETN	pentaerythrite tetranitrate
QA	Quality Assurance
QC	Quality Control
RA	Risk Assessment
RDX	Royal or Research Department Explosive: hexahydro-1,3,5-trinitro-1,3,5 triazine, which is also known as cyclonite
RI	Remedial Investigation
RI/BRA	Remedial Investigation/Baseline Risk Assessment
RRC	Regional Readiness Center
SAIC	Science Applications International Corporation

ACRONYMS and ABBREVIATIONS

SARA	Superfund Amendments and Reauthorization Act
SI	Site Inspection
SOW	Scope of Work
STL	Severn Trent Laboratories, Inc.
TACO	Tiered Approach to Corrective Action Objectives
TAL	Target Analyte List
TNT	Trinitrotoluene
TPP	Technical Project Planning
µg/g	micrograms per gram
µg/L	micrograms per liter
US	United States
USACE	United States Army Corps of Engineers
USAEC	United States Army Environmental Command
USARC	United States Army Reserve Command
USDA	United States Department of Agriculture
U.S.C.	United States Code
UXO	Unexploded Ordnance
WP	Work Plan
WWI	World War I
WWII	World War II

GLOSSARY OF TERMS

Closed Range – A military range that has been taken out of service as a range and that either has been put to new uses that are incompatible with range activities or is not considered by the military to be a potential range area. A closed range is still under the control of a Department of Defense (DoD) component.

Defense Site – Locations that are or were owned by, leased to, or otherwise possessed or used by the Department of Defense. The term does not include any operational range, operating, storage or manufacturing facility, or facility that is used for or was permitted for the treatment or disposal of military munitions. (10 USC 2710(e)(1))

Discarded Military Munitions (DMM) – Military munitions that have been abandoned without proper disposal or removed from storage in a military magazine or other storage area for the purpose of disposal. The term does not include unexploded ordnance, military munitions that are being held for future use or planned disposal, or military munitions that have been properly disposed of consistent with applicable environmental laws and regulations. (10 USC 2710(e)(2))

Explosive Ordnance Disposal (EOD) – The detection, identification, on-site evaluation, rendering safe, recovery, and final disposal of unexploded explosive ordnance and of other munitions that have become an imposing danger, for example, by damage or deterioration.

Explosives Safety – A condition where operational capability and readiness, personnel, property, and the environment are protected from the unacceptable effects or risks of potential mishaps involving military munitions.

Formerly Used Defense Site (FUDS) – A DoD program that focuses on compliance and cleanup efforts at sites that were formerly used by the DoD. A FUDS property is eligible for the Military Munitions Response Program (MMRP) if the release occurred prior to October 17, 1986; the property was transferred from DoD control prior to October 17, 1986; and the property or project meets other FUDS eligibility criteria.

Glossary of Terms (continued)

Military Munitions – All ammunition products and components produced for or used by the armed forces for national defense and security, including ammunition products or components under the control of the Department of Defense, the Coast Guard, the Department of Energy, and the National Guard. The term includes confined gaseous, liquid, and solid propellants; explosives, pyrotechnics, chemical and riot control agents, smokes, and incendiaries, including bulk explosives and chemical warfare agents; chemical munitions, rockets, guided and ballistic missiles, bombs, warheads, mortar rounds, artillery ammunition, small arms ammunition, grenades, mines, torpedoes, depth charges, cluster munitions and dispensers, demolition charges; and devices and components thereof.

The term does not include wholly inert items; improvised explosive devices; and nuclear weapons, nuclear devices, and nuclear components, other than non-nuclear components of nuclear devices that are managed under the nuclear weapons program of the Department of Energy after all required sanitization operations under the Atomic Energy Act of 1954 (42 USC 2011 et seq.) have been completed. (10 USC 101(e)(4))

Munitions Constituents (MC) – Any materials originating from unexploded ordnance (UXO), discarded military munitions (DMM), or other military munitions, including explosive and non-explosive materials, and emission, degradation, or breakdown elements of such ordnance or munitions. (10 USC 2710(e)(4))

Munitions and Explosives of Concern (MEC) – This term, which distinguishes specific categories of military munitions that may pose unique explosives safety risks, means: Unexploded Ordnance (UXO), as defined in 10 USC 2710(e)(9); Discarded military munitions (DMM), as defined in 10 USC 2710 (e)(2); or Munitions Constituents (MC) (e.g. TNT, RDX), as defined in 10 USC 2710 (e)(3), present in high enough concentrations to pose an explosive hazard.

Munitions Debris – Remnants of munitions (e.g. fragments, penetrators, projectiles, shell casings, links, fins) remaining after munitions use, demilitarization, or disposal.

Glossary of Terms (continued)

Munitions Response (MR) – Response actions, including investigation, removal and remedial actions to address the explosives safety, human health, or environmental risks presented by unexploded ordnance (UXO), discarded military munitions (DMM), or munitions constituents (MC), or to support a determination that no removal or remedial action is required.

Munitions Response Area (MRA) – Any area on a defense site that is known or suspected to contain UXO, DMM, or MC. Examples include former ranges and munitions burial areas. A munitions response area is comprised of one or more munitions response sites.

Munitions Response Site (MRS) – A discrete location within a MRA that is known to require a munitions response.

Operational Range – A range that is under the jurisdiction, custody, or control of the Secretary of Defense and that is used for range activities; or although not currently being used for range activities, that is still considered by the Secretary to be a range and has not been put to a new use that is incompatible with range activities (10 USC 101 (e)(3)). Also includes “military range”, “active range”, and “inactive range” as those terms are defined in 40 Code of Federal Regulations (CFR) 266.201.

Range – The term ‘range,’ when used in a geographic sense, means a designated land or water area that is set aside, managed, and used for range activities of the Department of Defense. The term includes firing lines and positions, maneuver areas, firing lanes, test pads, detonation pads, impact areas, electronic scoring sites, buffer zones with restricted access, and exclusionary areas. The term also includes airspace areas designated for military use in accordance with regulations and procedures prescribed by the Administrator of the Federal Aviation Administration. (10 USC 101 (e)(1))

Transferred Range – A range that is no longer under military control and had been leased by the DoD, transferred, or returned from the DoD to another entity, including federal entities. This includes a military range that is no longer under military control, but that was used under the terms of an executive order, special-use permit or authorization, right-of-way, public land order, or other instrument issued by the federal land manager. Additionally, property that was previously used by the military as a range, but did not have a formal use agreement, also qualifies as a transferred range.

Glossary of Terms (continued)

Transferring Range – A range that is proposed to be leased, transferred, or returned from the DoD to another entity, including federal entities. This includes a military range that was used under the terms of a withdrawal, executive order, special-use permit or authorization, right-of-way, public land order, or other instrument issued by the federal land manager or property owner. An operational range will not be considered a transferring range until the transfer is imminent (generally defined as the transfer date is within 12 months and a receiving entity has been notified).

Unexploded Ordnance (UXO) – Military munitions that: have been primed, fuzed, 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 whether by malfunction, design, or any other cause. (10 USC 101 (e)(5))

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Appendix B	Final HRR (on compact disc [CD])
Appendix C	TPP Meeting Minutes
Appendix D	Field Documentation
Appendix E	Laboratory Analytical Reports (on CD)
Appendix F	Data Validation Reports
Appendix G	Munitions Response Site Prioritization Protocols (on CD)

1.0 INTRODUCTION

1.1 Summary

Under contract with the United States Army Corps of Engineers (USACE), Omaha District, engineering-environmental Management, Inc. (e²M) has prepared the following Site Inspection (SI) Report for the other than operational ranges and sites with known or suspected munitions and explosives of concern (MEC), munitions debris, or munitions constituents (MC) at Fort Sheridan (FTSH), Illinois. These Munitions Response Sites (MRSs) are being addressed under the United States (US) Army Military Munitions Response Program (MMRP). The work performed for this SI was completed in accordance with the *Scope of Work Closed, Transferring, and Transferred (CTT) Ranges/Sites, Site Inspection, Multiple Installations, Air Combat Command (ACC) Contract Number DACA-45-02-D0010, Task Order 0003 (SOW)*; dated 19 March 2004.

The US Army's Phase 3 CTT Range/Site Inventory at the Fort Sheridan Army Reserve Complex (FSARC), dated December 2002, identified the Trench Warfare Range as the only MRS (see **Figure I-1**) (Note: Figure I-1 was taken directly from the CTT Range/Site Inventory report). Due to historical site activities and the potential for MC and MEC to be present, this site qualified for the MMRP and was given the Army Environmental Database Restoration (AEDB-R) number FTSHC-001-R-01.

A Memorandum of Understanding (MOU) between the Department of the Army and the Department of the Navy dated 8 August 1991 (**Appendix A**) was discovered during the records review for the US Navy MMRP Preliminary Assessment (PA) (Malcolm Pirnie, 2003). The memorandum documents the Army's continued remediation responsibility for the FTSH property realigned to the Navy. Therefore, this SI will include MMRP-eligible sites on both the US Army Reserve Command (USARC) and US Navy properties. The boundaries of these sites were derived from the March 1996 Archive Search Report, Fort Sheridan (ASR) by USACE, St. Louis.

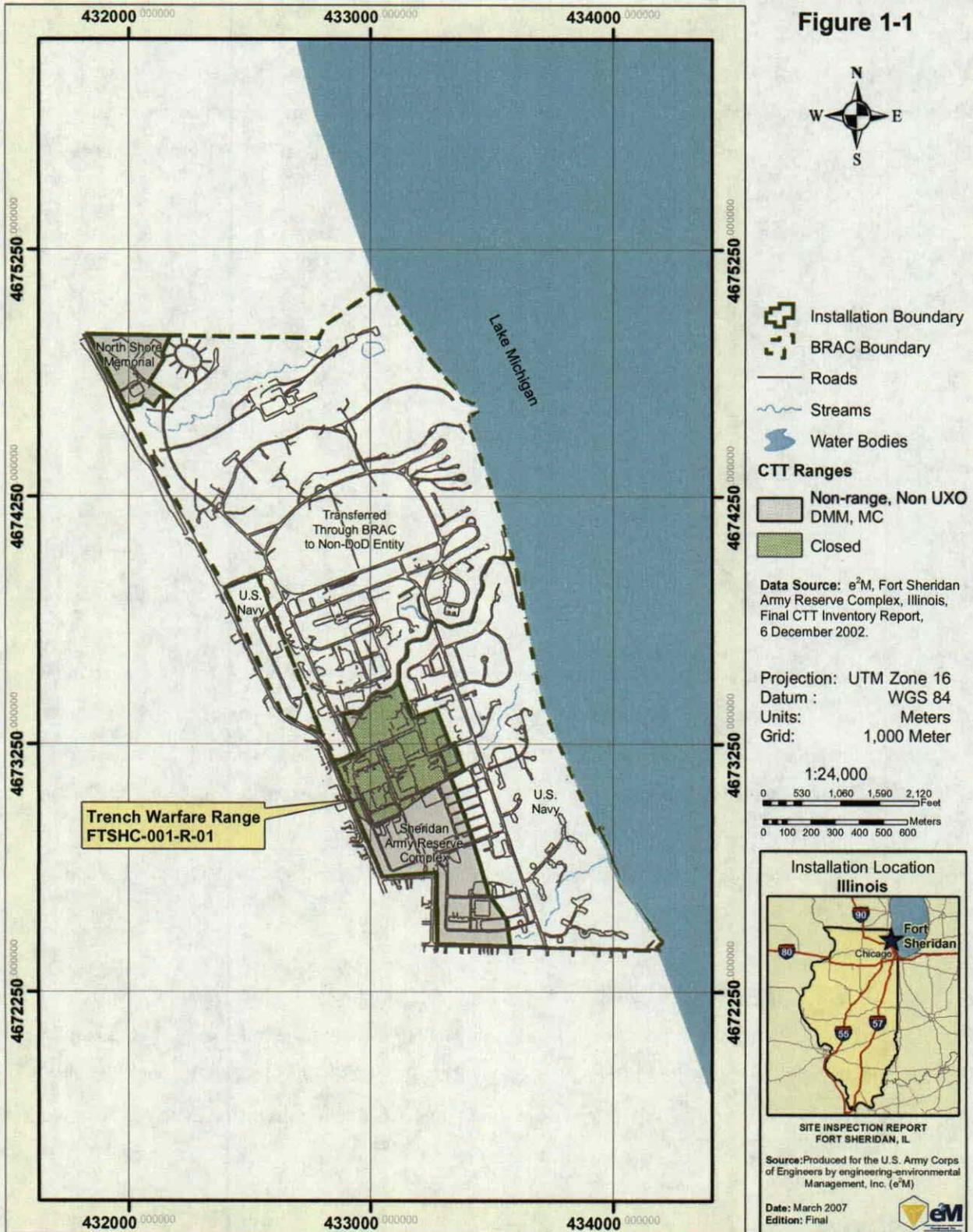
In March 2003, URS, Inc. conducted the US Army CTT Range/Site Inventory for the Base Realignment and Closure (BRAC) property at Fort Sheridan. This inventory included the following BRAC sites: Trap Shoot Range, Infiltration Range, Small Bore Rifle Range, Rifle Range, 38-Acre Parcel, Bayonet Training Range, AA Artillery Location C, AA Artillery Location D, and AA Artillery Location E, all of which were located on the BRAC property at Fort Sheridan (see **Figure I-2**).



CTT RANGE, UXO-DMM-MC SITES Fort Sheridan, IL



Figure 1-1

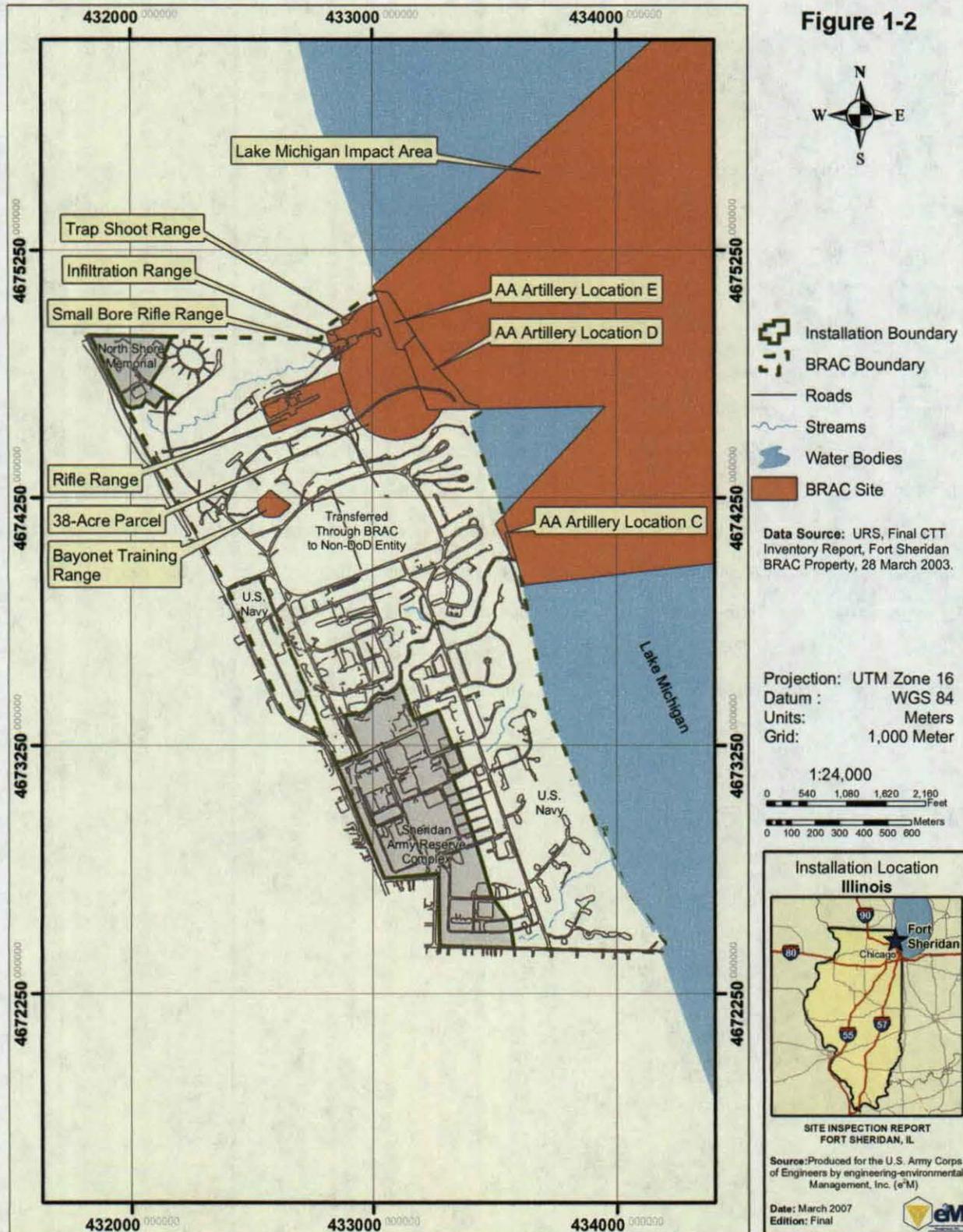




SITES from BRAC INVENTORY Fort Sheridan, IL



Figure 1-2



During the US Navy MMRP PA (Malcolm Pirnie, 2003), the following sites were identified on Fort Sheridan as property transferred to the Navy: 1) AAA Area (including the transferred AAA impact areas extending over Lake Michigan); 2) Grenade Course; 3) Five Small Arms, Pistol, and Machine Gun Ranges; and 4) Trench Training System. The Trench Warfare Range identified by the Army and the Trench Training System identified by the Navy are east and west parts of the same site (see **Figure I-3**).

During the Historical Records Review (HRR) process, due to site locations and similar historical usage, two of the Five Small Arms, Pistol, and Machine Gun Ranges (the Northern Pistol Range MRS and Northern Machine Gun Range MRS) were grouped together into a Munitions Response Area (MRA) named the Small Arms Range Complex. (Note: An MRA is an area known or suspected to contain MEC or MC and consists of one or more MRSs. All acreage within an MRA is the total sum of the MRS acreages, with no MRS acreages overlapping). The remaining three of the Five Small Arms, Pistol, and Machine Gun Ranges (the Southern Small Arms Range MRS, Southern Machine Gun Range MRS, and the Southern Pistol Range MRS) along with Firing Points "A" and "B" from the AAA Area were grouped into an MRA named the AAA Complex. The portion of the AAA Area that is considered an impact area in Lake Michigan became a separate Transferred MRS. The Trench Warfare Range identified by the Army and the Trench Training System identified by the Navy are eastern and western portions of the same site, respectively. This entire site is referred to as the Trench Warfare Range MRS.

Therefore, the naming conventions of the MRAs and MRSs going into the SI were as follows:

- Trench Warfare Range MRA (FTSHC-001-R)
 - Trench Warfare Range MRS (FTSHC-001-R-01);
- AAA Complex MRA
 - Southern Small Arms Range MRS
 - Southern Machine Gun Range MRS
 - Southern Pistol Range MRS
 - AAA Firing Point "A" MRS
 - AAA Firing Point "B" MRS
- AAA Complex-Transferred MRA
 - AAA Complex-Transferred MRS
- Grenade Course MRA
 - Grenade Course MRS



SITES IDENTIFIED in US NAVY MMRP PA Fort Sheridan, IL

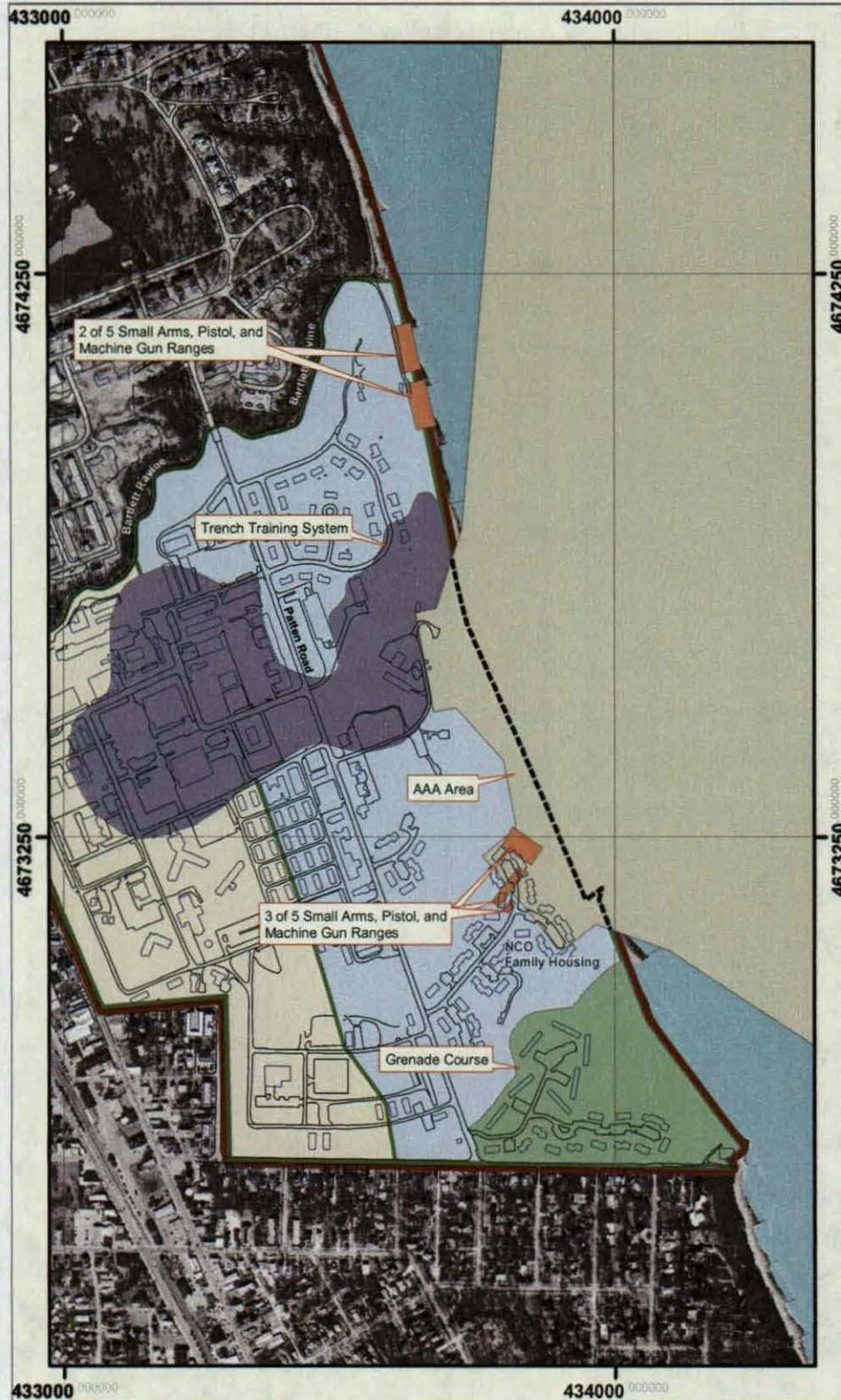


Figure 1-3



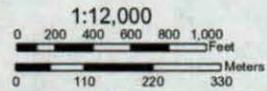
- Road
- Water
- Pre-BRAC Boundary
- U.S. Army Reserve
- U.S. Navy
- Building Outline

Site Description

- Trench Training System
- Grenade Course
- 5 Small Arms, Pistol, and Machine Gun Ranges
- AAA Area (area over Lake Michigan transferred)

Data Source: adapted from Malcom Pirnie, U.S. Navy MMRP PA, 2003.

Projection: UTM Zone 16
Datum: WGS 84
Units: Meters
Grid: 1,000 Meter



SITE INSPECTION REPORT
FORT SHERIDAN, IL
Source: Produced for the U.S. Army Corps of Engineers by engineering-environmental Management, Inc. (eM)
Date: March 2007
Edition: Final



- Small Arms Range Complex MRA
 - Northern Pistol Range MRS
 - Northern Machine Gun Range MRS

Additional information on the MMRP-eligible sites was collected during the three SI records collection visits on 20–24 September 2004, 18 April – 18 May 2005, and 26–28 October 2005; the Technical Project Planning (TPP) Meeting Number 2 on 21 September 2005; and the SI field work which took place on 10 April 2006.

The firing fans identified during the US Army CTT Range/Site Inventory for BRAC property for the three AA Artillery Locations over Lake Michigan have been removed from the AAA Complex – Transferred MRS and the Small Arms Range Complex MRS for the purposes of this SI since this area was already counted under the BRAC MMRP. For more details, refer to **Sections 3.3.3, 3.3.4, and 4.3.**

Figure I-4 depicts the MRA footprints as they were going into the SI, and **Figure I-5** depicts the MRS footprints as they were going into the SI.

After the Draft SI Report was submitted, as a result of comments and discussions with the US Army Environmental Command (USAEC), the naming conventions of the MRAs and MRSs were revised and AEDB-R numbers were obtained for all of the MRAs and MRSs. The new revised naming conventions will be used from this point forward in the report, except in sections where the original naming conventions are required to discuss historical activities such as the field activities and results. The new revised naming conventions are as follows:

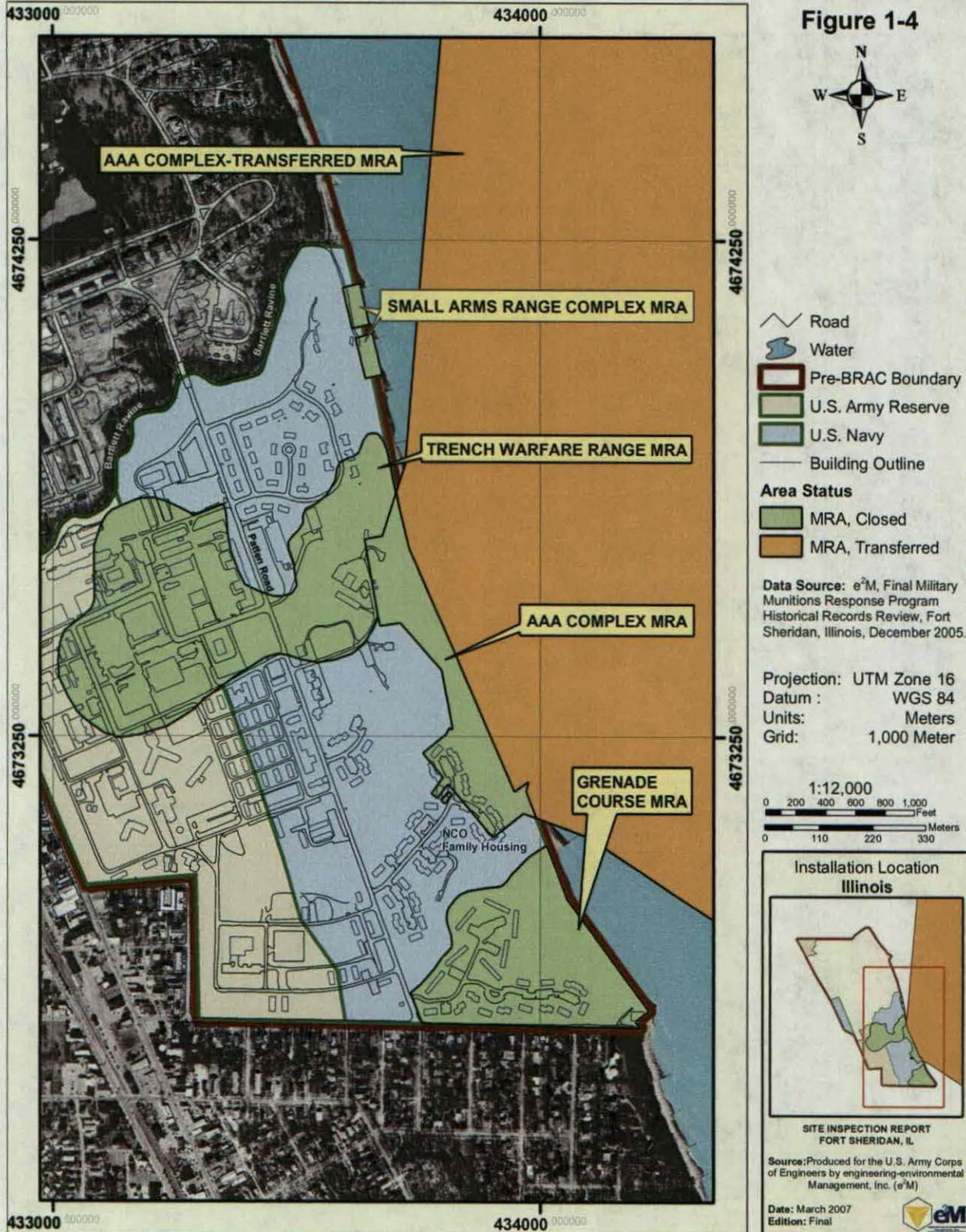
- Trench Warfare Range MRA (FTSHC-001-R)
 - Trench Warfare Range MRS (FTSHC-001-R-01);
- AAA Complex MRA (FTSHC-002-R)
 - Southern Small Arms Ranges MRS (FTSHC-002-R-01)
(Previously consisted of the Southern Small Arms Range MRS, Southern Pistol Range MRS, and Southern Machine Gun Range MRS)
 - AAA Firing Points A and B MRS (FTSHC-002-R-02)
(Previously consisted of the Firing Point “A” MRS and Firing Point “B” MRS)



MRA FOOTPRINTS GOING INTO SI Fort Sheridan, IL



Figure 1-4





MRS FOOTPRINTS GOING INTO SI Fort Sheridan, IL

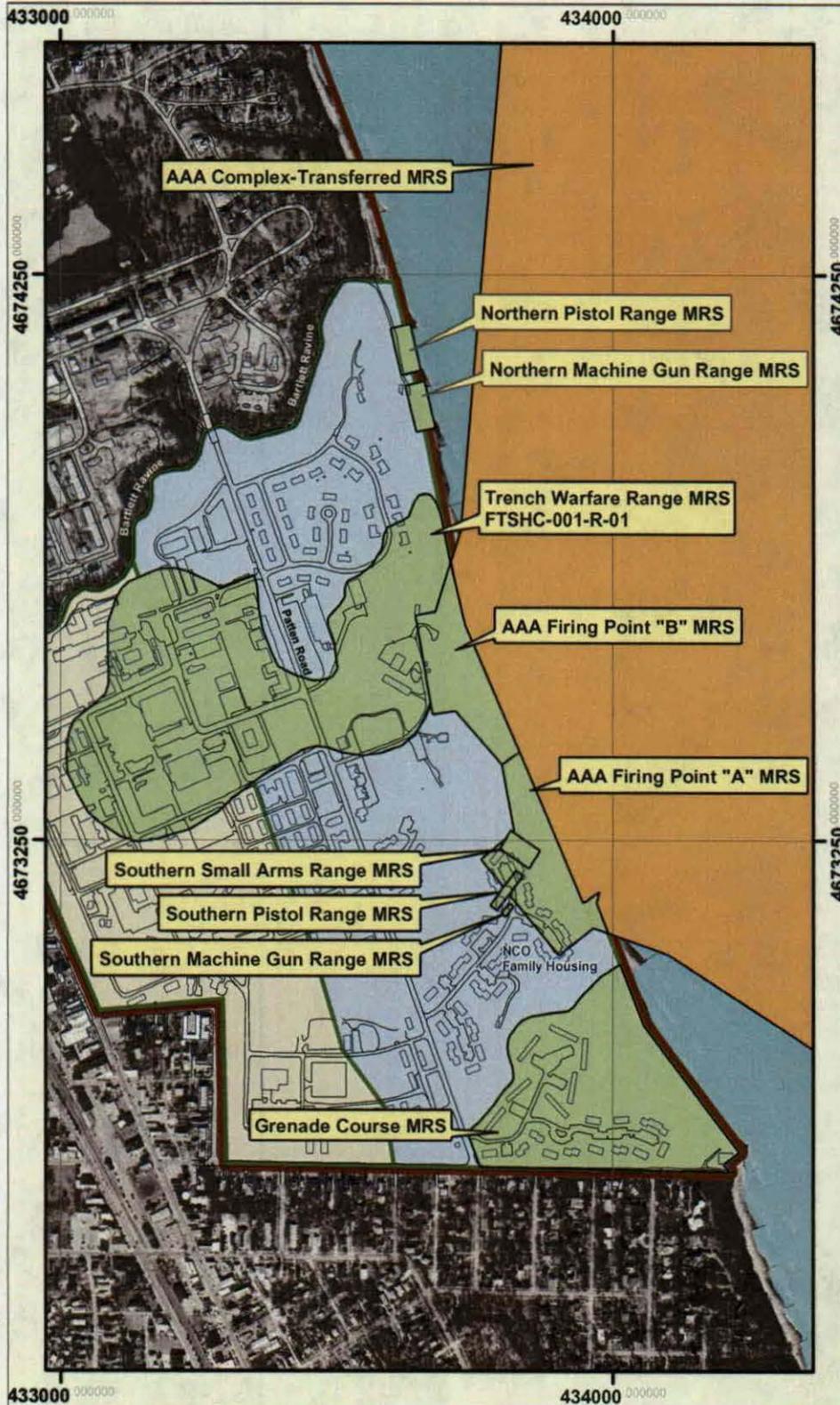


Figure 1-5



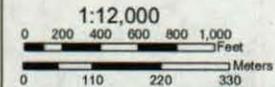
- Road
- Water
- Pre-BRAC Boundary
- U.S. Army Reserve
- U.S. Navy
- Building Outline

Area Status

- MRA, Closed
- MRA, Transferred

Data Source: e²M, Final Military Munitions Response Program Historical Records Review, Fort Sheridan, Illinois, December 2005.

Projection: UTM Zone 16
Datum: WGS 84
Units: Meters
Grid: 1,000 Meter



Installation Location
Illinois

SITE INSPECTION REPORT
FORT SHERIDAN, IL

Source: Produced for the U.S. Army Corps of Engineers by engineering-environmental Management, Inc. (e²M)

Date: March 2007
Edition: Final

- AAA Complex-Transferred MRA (FTSHC-003-R)
 - AAA Complex-Transferred MRS (FTSHC-003-R-01);
- Grenade Course MRA (FTSHC-004-R)
 - Grenade Course MRS (FTSHC-004-R-01)
- Small Arms Range Complex MRA (FTSHC-005-R)
 - Small Arms Range Complex MRS (FTSHC-005-R-01)
(Previously consisted of the Northern Pistol Range MRS and the Northern Machine Gun Range MRS)

This SI Report has been developed to provide a summary of what is known about the MRSs, including the results of field work that took place in April 2006, and to make recommendations regarding their future disposition. This SI follows the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the US Environmental Protection Agency's (EPA) National Oil and Hazardous Substances Contingency Plan's (NCP) Remedial Site Evaluation process as stated in Code of Federal Regulations (CFR) Title 40, Part 300.420.

This SI Report incorporates the findings of the US Army CTT Range/Site Inventory, the Final Historical Records Review (HRR), the Conceptual Site Model (CSM), the comments and resolutions generated during the TPP 2 meeting discussion, and the results of the April 2006 field work.

This SI Report includes the following specific information:

- Regulatory Framework and Project Objectives,
- Project Team,
- Background,
- MRS Historical and Site Layout Summaries,
- SI Field Activities,
- SI Field Results,
- CSM,
- Conclusions,
- Recommendations, and
- References.

The following appendices are attached to and considered part of this SI report: Memorandum of Understanding between the Department of the Army and the Department of the Navy (**Appendix A**); Final HRR (provided on compact disc [CD]) (**Appendix B**); TPP Meeting Minutes (**Appendix C**); Field Documentation (**Appendix D**); PEL Laboratories, Inc. (PEL) and Severn Trent Laboratories, Inc. (STL) Analytical Reports (on CD) (**Appendix E**); Data Validation Reports (**Appendix F**); and Munitions Response Site Prioritization Protocols (MRS-PPs) (on CD) (**Appendix G**).

1.2 Regulatory Framework

The regulatory structure for managing MRSs at FTSH is guided by a mixture of federal, state, and local laws, as well as Department of Defense (DoD) and US Army regulations and guidance. Key legislative and administrative precedents to date will likely influence the final regulatory framework for the MMRP. The key legislative and administrative precedents include the following:

- The Defense Environmental Restoration Program (DERP) Guidance (September 2001) established an MMRP element for defense sites with known or potential unexploded ordnance (UXO) or discarded military munitions (DMM). The history of DERP dates back to the Superfund Amendments and Reauthorization Act of 1986 (SARA) and is defined in 10 United States Code (USC) §2701(b), which states the goals of the program shall include the following:
 - The identification, investigation, research and development, and cleanup of contamination from hazardous substances, and pollutants and contaminants; and
 - Correction of other environmental damage (such as detection and disposal of UXO) which creates an imminent and substantial endangerment to the public health or welfare, or to the environment.
- Sections 311-312 of the National Defense Authorization Act (NDAA) of Fiscal Year (FY) 02 reinforced the Office of the Secretary of Defense (OSD) 2001 DERP Guidance by tasking the DoD to develop and maintain an inventory of defense sites that are known or suspected to contain UXO, DMM, or MC.
 - Section 311 requires the DoD to develop a protocol for prioritizing defense sites for response activities in consultation with state regulators and Tribal members.
 - Section 312 requires the DoD to create a separate program element to ensure the DoD can identify and track MMRP funding.

The OSD 2001 DERP Guidance and the NDAA 2002, described above, established the MMRP. The DERP and the MMRP provide guidance and methods for conducting a baseline inventory of defense sites known or suspected to contain UXO, DMM, or MC.

1.3 Project Objectives

The primary objective of the MMRP SI is to collect reliable information necessary to make one of the following recommendations in accordance with the MMRP:

- Whether an MRS qualifies for No Further Action (NFA).
- Whether an immediate response is needed.
- Whether further characterization is warranted.

The secondary objective of the SI is to collect information to refine the MMRP Cost to Complete (CTC) estimates, in part by providing analytical data to enter into the Environmental Restoration Information System (ERIS) and to populate a portion of the MRS Prioritization Protocol (MRS-PP) for each of the MMRP eligible sites.

In order to address the primary objective of the SI, field work was designed to determine the presence or absence of MEC on the surface through the completion of limited visual/magnetometer surveys. Attainment of the secondary objective of the SI was achieved in part through the collection and analysis of surface soil samples for MC (explosives and metals).

2.0 PROJECT TEAM

The role of the Project Team is to execute this MMRP SI in accordance with Federal, State, and local regulatory requirements. The Project Team consists of the following:

- Regulatory Agency – Illinois Environmental Protection Agency (IEPA);
- Program Manager –USAEC;
- Executing Agency – USACE, Omaha District;
- FTSH Personnel – 88th Regional Readiness Center (RRC);
- US Army – Installation Management Agency (IMA);
- SI Consultant – e²M; and
- Subcontractors – Malcolm Pirnie, Inc., PEL Laboratories, Inc (PEL), Severn Trent Laboratories, Inc. (STL), and Diane Short and Associates, Inc. (DSA).

3.0 BACKGROUND

3.1 Installation History

FTSH (Federal Facility Identification number: IL2104IL131) is located along the southwestern shore of Lake Michigan in the State of Illinois and encompasses approximately 712 acres of land. A site location map is provided in **Figure 3-1**.

FTSH was established in 1887 to serve as an infantry post to help stabilize the City of Chicago following the Chicago Fire in 1871 and rioting by its citizens associated with labor problems (e²M, 2002; USACE, 1996). FTSH was operational between 1887 and 1993 and "provided training facilities for US Army troops participating in the Spanish-American War (1898), the Mexican Intervention of 1913, World War I (1917), World War II (1940), and was established as a Nike missile launch site in the 1950s (SAIC, 1999a)."

"Between 1967 and 1993, operations at FTSH were primarily administrative, with the Post serving alternately as headquarters for the Fifth Army, the US Army Recruiting Command, the Fourth Army, and also providing administrative and logistical support to 74 US Army Reserve centers located in Midwestern states from Minnesota to Michigan (SAIC, 1999a)."

In 1988, FTSH was recommended for closure under BRAC and the site officially closed in May 1993. "The southwest quadrant and the northwest corner (approximately 100 acres) of the Post were realigned to the US Army Reserve Command. In January 1994, the southeast quadrant and a small area on the central west side of FTSH (approximately 206 acres) were realigned to the US Navy for housing and administrative offices (SAIC, 1999a)." The combined USARC and US Navy properties are also known as the DoD Operable Unit (OU) (approximately 306 acres). **Figure 3-2** provides the boundaries of the parcels of land as they were transferred under BRAC and shows the Lake County Forest Preserve. The remainder of the property at FTSH has been transferred out of DoD ownership under BRAC and is known as the Surplus OU. The majority of this property was transferred in March 1998 to the cities of Highland Park and Highwood and to the Lake County Forest Preserve District (Ceres, 2004).



INSTALLATION LOCATION Fort Sheridan, IL

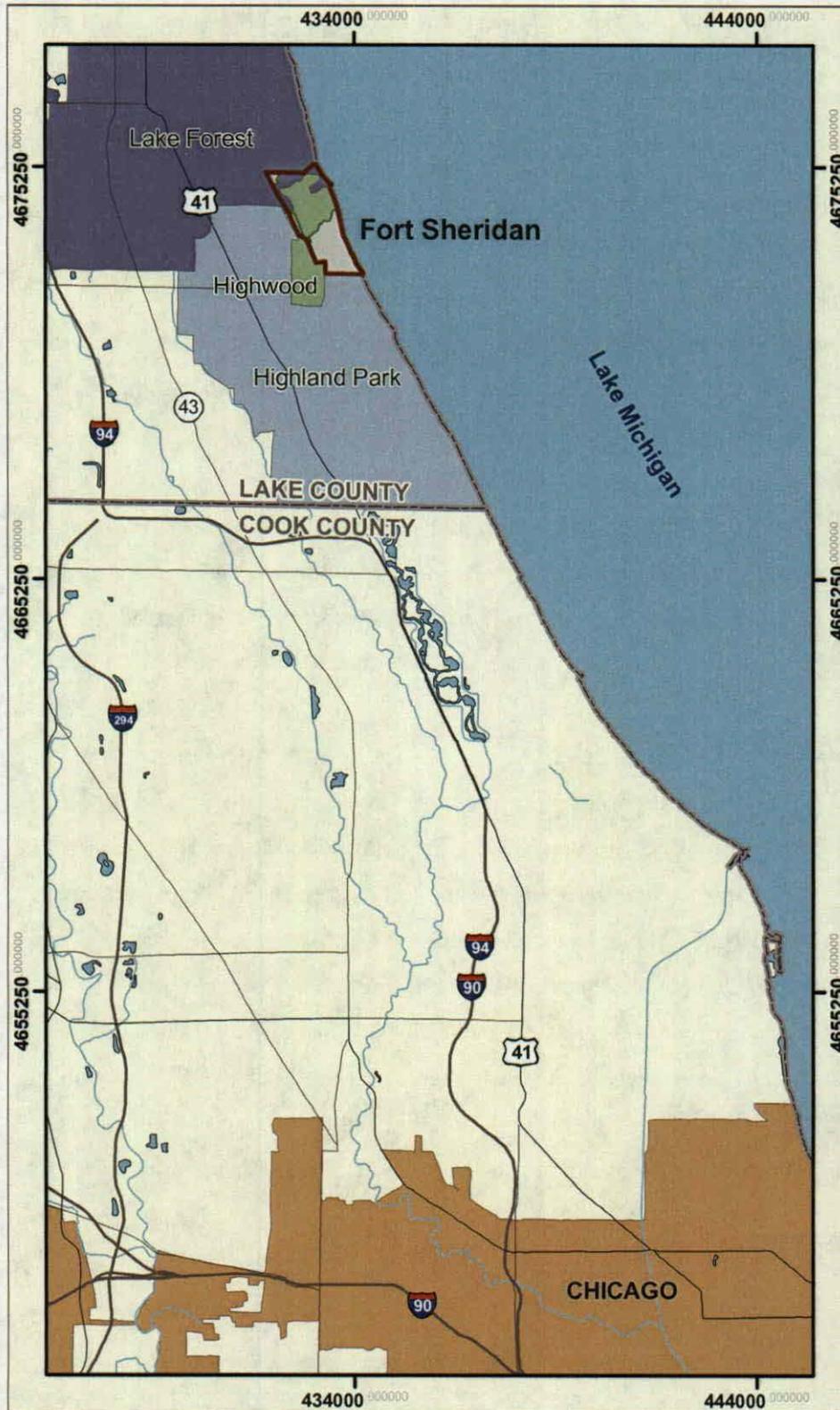


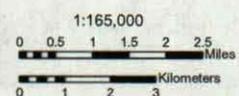
Figure 3-1



- County Boundary
 - Interstate Highway
 - Major Highway
 - Stream
 - Water
 - Pre-BRAC Boundary
 - Installation
- Municipality**
- Highland Park
 - Highwood
 - Lake Forest
 - Chicago Area

Data Source: e²M, Final Military Munitions Response Program Historical Records Review, Fort Sheridan, Illinois, December 2005, Figure 2-1.

Projection: UTM Zone 16
Datum: WGS 84
Units: Meters
Grid: 10,000 Meter



Appendices

- Appendix A Memorandum of Understanding between the Department of the Army and the Department of the Navy
- Appendix B Final HRR
- Appendix C TPP Meeting Minutes
- Appendix D Field Documentation
- Appendix E Laboratories Analytical Reports
- Appendix F Data Validation Reports
- Appendix G Munitions Response Site Prioritization Protocols



DEPARTMENT OF THE ARMY
WASHINGTON, DC 20310-6200



ONLY TO
ATTENTION OF



MEMORANDUM OF UNDERSTANDING
BETWEEN
THE DEPARTMENT OF THE ARMY AND THE DEPARTMENT OF THE NAVY

SUBJECT: TRANSFER OF CERTAIN PROPERTIES AT FORT SHERIDAN,
ILLINOIS

1. **PURPOSE.** The purpose of this Memorandum of Understanding (MOU) is to provide for the transfer from the Department of the Army (DOA) to the Department of the Navy (DON) of approximately 142 acres of land and improvements, including 329 units of military family housing, hereafter referred to as "housing areas 3, 4, and 5," and a parcel of land of 40 acres, more or less, which is located between the site of the future Army Reserve Center and housing areas 4 and 5 at Fort Sheridan, Illinois. These properties are more particularly described on the Map, which is attached as Exhibit A, and incorporated by reference.

2. **BACKGROUND.**

a. Section 204(b)(3) of the Defense Authorization Amendments and Base Closure and Realignment Act of 1988, P.L. 100-526, authorizes the transfer of real property between military departments and other instrumentalities within the Department of Defense (DoD), with priority given to such department or instrumentality that agrees to pay fair market value.

b. The Report of the Defense Secretary's Commission on Base Realignments and Closures recommended the closure of Fort Sheridan, Illinois, and the DON has requested the transfer of the above described property as provided by Section 204(b)(3).

3. **AGREEMENT.**

Subject to availability of funds:

a. The DON agrees to transfer \$24,000,000 to the DOA for deposit in the DOD Base Closure Account, pursuant to Section 204(b)(4)(A), in Fiscal Year 1994.

b. The DOA agrees to transfer to DON the property described in paragraph 1 above, effective 1 October 1993. At that time the DON will assume responsibility for the operation and maintenance

of the above described property. Current occupants will be allowed to remain in their quarters until rotation from the area occurs. Personnel of Army activities eligible for housing at Fort Sheridan on 1 January 1991 will have equal priority with Navy personnel for assignment to all categories of housing at Fort Sheridan. The DOA recognizes that the DON will redesignate some quarters to serve more enlisted personnel as dictated by housing requirements. The DON agrees to coordinate future housing assignment policy changes with the Headquarters DOA, if they have a major impact on Army personnel.

* c. Prior to transfer of the property, the DOA will provide a description of environmental studies performed, types of contamination discovered, and recommended remedial actions. To date, environmental testing is in progress, and no remedial action has been recommended. The parties will continue to discuss environmental issues, and the DOA will continue to furnish documentation of environmental conditions to the DON as it is received. The DOA will retain responsibility and liability for environmental restoration of the above described properties, except for the landfill in housing area 5. As to that landfill, the DON assumes liability for the first \$1 million in clean up costs; Army retains liability for clean up in excess of \$1 million.

d. The parties will immediately begin negotiations to implement the transfer. The negotiations shall include, but not be limited to, a survey of the properties, the transfer of operation and management responsibilities, including utilities and snow removal, custodial and other maintenance contracts, property accountability, hand receipt responsibilities, personal property, and other details necessary for a smooth transition. Particular attention will be given to the continuance and establishment of the infrastructure necessary to provide for the operation of the site as "stand alone" housing. The parties acknowledge that the utility system supporting the planned Army Reserve Center west of Patten Road may require integration with that of the housing area.

e. The DON agrees to pay all costs incident to the transfer of the properties including, but not limited to, the costs of legal descriptions and surveys.

f. In the event that the DON determines that the above described property is excess to its needs, the DON agrees to

transfer to DOA funds equivalent to the amount received by DON in excess of \$24,000,000, as a result of disposal.

PROVIDED, HOWEVER, that the above described property transfer to the DON is conditioned upon the transfer of funds described above. In the event the DON is unable to transfer said funds by 30 September 1995, the above described property automatically reverts to the DOA for disposal. The DON shall vacate the property by a date certain to be agreed upon between the parties.

4. EXECUTION. This Memorandum of Understanding becomes effective upon approval by the Secretary of Defense.

M. P. W. Stone

M. P. W. Stone
Secretary of the Army

8-8-91

Date

H. Lawrence Garrett III

H. Lawrence Garrett III
Secretary of the Navy

8/8/91

Date

Appendix B

Final Historical Records Review (HRR) can be found on the
Appendices compact disc.

**Military Munitions Response Program Site Inspection
Fort Sheridan, Illinois
TPP 2 Meeting Minutes
21 September 2005**

The 21 September 2005 Technical Project Planning (TPP) meeting for the Military Munitions Response Program (MMRP) Site Inspection (SI) for Fort Sheridan, IL was conducted by the United States Army Corps of Engineers (USACE), Omaha District and engineering-environmental Management, Inc. (e²M) at Fort Sheridan in Lake County, IL.

Introduction

All TPP meeting attendees provided personal introductions and explained their role as it relates to the project. Please see attached sign-in sheet for attendees contact information.

TPP 2 Briefing

The TPP 2 briefing was given by Courtney Ingersoll of e²M. Handouts included a copy of the briefing and a meeting agenda.

Comments and discussion generated from the briefing are described below.

- The June 2005 HRR is a draft document.
- Navy land will be retained by the federal government, but the new housing on it will be built/managed by a non-profit privatized organization. It will be a RCI – Residential Community Initiative. Building demolition will start on or about 1 October 2005.
- The Navy POC (for Grenade Range issues) is:
Jerry Cencula, PE
Navy Facilities Midwest
847-688-4766 x. 306
Jerry.cencula@navy.mil
- Because the former Fort Sheridan lands are still federally-owned and actively used, it is the 88th RRC and not BRAC that is held responsible.
- ERA dollars are used to fund MMRP (Tom Symalla).
- 1991 MOA between Navy and Army – Navy bought their land from Army for \$24 million and holds the Army responsible for all environmental issues.

Data Gap Discussion

- The 88th RRC is concerned about moving forward on risk from hearsay evidence.
 - What is the driver that warrants further action? Do we consider an interview (absent of any other data) to be the confirmation point? Ms. Ingersoll, e²M responded interview documentation is one piece of evidence in the determination of presence of absence of MEC/MC.
 - How do we prove a negative? Mr. Symalla, USAEC responded we are not here to prove the negative as it is very difficult.
- Mr. Brian Conrath, IEPA agrees with the 88th RRC assessment. It is Mr. Conrath's experience at Fort Sheridan, if no previous studies or investigations looked for contamination in an area; most likely it is not a concern with the area. The BRAC Closure Report contains numerous data points from not only the Surplus OU, but also the DoD OU – which is current Army/Navy-owned Fort Sheridan property.

- Mr. Bill Walters, 88th RRC – utility drawings should be available at the Navy. Could we geo-reference and see where soil disturbing activities have occurred? Give us a grid of what was disturbed. Ms. Ingersoll agreed, if copies of the BRAC Closure Report and drawings could be obtained.
- AAA Complex – TD – A Site Investigation Report, Harding ESE, 2001 concluded no explosive or chemical constituents were present in the Lake Michigan sediment samples. Mr. Symalla asked Mr. Conrath if the State of Illinois would perceive this data as stated the impact areas pose no risk. Mr. Conrath replied an EPA report confirmed the risk is acceptable based on further investigation. Therefore, e²M will recommend no further action for this MRS.
- Grenade Course – Mr. Walters discussed all of the development, utilities and housing, in the area of the former Grenade Course MRS. He wanted to know if we could conclude no presence of MEC/MC as there were no reported UXO related EOD responses during development.

SI Field Work

Discussed use of magnetometer:

- 1) Not good because it just reveals anomalies without knowing what they are. Scope of SI work at Fort Sheridan does not include digging anomalies to verify whether the anomaly is a munition.
- 2) e²M will/can make scientific recommendations as to whether the anomalies are possible MEC or garbage or utilities.
- 3) Mr. Walters stated steam lines run underground all over Fort Sheridan and will cause interference.
- 4) e²M will use magnetometers for UXO avoidance, to potentially identify burial sites, and to identify patterns of anomalies at suspected sites that may indicate previous munitions use.

Trench Warfare Range

- Potential no further action recommendation.
- Van Horne Ravine is subject to severe and massive erosion, any burial near the surface would be gone by now.
- The Navy Open Lands Project legislation will declare all ravines and beaches land use to be only ravines and beaches and will not allow development of this types of land in the future. Ravine should have captured any upstream run-off; therefore, lead, nickel analytical data should tell the story.
- Per the ASR, RCRA 8 Metals sampling conducted at the outfalls, in the landfill and other areas showed no elevated levels of concern.
- Mr. Conrath also stated due to the severe erosion, and development in the area including housing and utilities, it is unlikely MEC is an issue in Van Horne Ravine.
- Mr. Conrath recommended the proposed action for the Trench Warfare Range includes pulling one sample and analyzing for TAL metals and explosives. Should that analytical show no elevated levels, and including the previous RCRA 8 analysis, no further action for the site can be recommended.

AAA Complex

- Per Mr. Conrath, some of the concrete pads for the firing points are still there.
- Did they bury munitions near any firing points? Per previous investigations, nothing was found around the firing points. Verify this information from the BRAC Closure Report.
- There has been a lot of development in the area. Where would be the best location to find soil that is indicative of past/historical use? The ranges were razed to make room for housing.

- Proposed action for the AAA Complex includes making sure that BRAC Closure Report didn't analyze this site 6-9 years ago. Then, proposed action may include taking one sample at the AAA firing points, but not at the small arms firing ranges.

Grenade Course

- Navy Lawyers have been informed about the site.
- Tom Symalla will call Jerry Cencula about MMRP.
- Proposed actions at the Grenade Course include no magnetometer survey. The BRAC Closure Report data should be checked and then the proposed action may include taking one sample for the MRS-PP near Landfill 6/7 in areas that will not create undue concerns by current residents..

Small Arms Range

- Proposed action for the site includes checking the BRAC Closure Report data to see if there was any analysis for this site. If there was not any BRAC analysis, then the proposed action will include pulling five samples from the bluff.
- Meeting concluded at 1100.

Action Items

Item	Responsible Party
Call Jerry Cencula about Grenade Range	Mr. Symalla, AEC
Assist e ² M in obtaining full copy of BRAC Closure report.	Mr. Symalla, AEC/ Ms. Ingersoll, e ² M
Compile and distribute meeting minutes	e ² M

TPP 2 Meeting Attendees
Fort Sheridan, IL
21 September 2005

NAME	ORGANIZATION	PHONE	EMAIL
Courtney Ingersoll	e ² M	757-643-7886	cingersoll@e2m.net
Thomas Symalla	USAEC	410-436-7105	thomas.symalla@us.army.mil
Angela Atkins	IMA-ARD/EEI	703-602-3197	angela.atkins@hqda.army.mil
Brian Conrath	IEPA	217-557-8155	brian.conrath@epa.state.il.us
Bill Walters	88 th RRC	847-266-3045	bill.walters2@us.army.mil
Eric Johnson	88 th RRC	708-209-2600 x.273	eric.johnson33@us.army.mil
Lisa Gulbranson	88 th RRC	612-713-3752	lisa.gulbranson@us.army.mil
David Torgersen	88 th RRC	612-713-3820	david.torgersen@us.army.mil



e²M DAILY QUALITY CONTROL REPORT

Day of Week: Monday
Weather Conditions: Bright Sun
Temperature: 70-75
Wind: Still
Humidity: Low

Technical PM: Craig Vrable
Project: Fort Sheridan
Project No.: 3050-098-98-02
Report No.: 1
Date: 10 April 2006

e ² M Personnel: Kevin Sedlak
Visitors Present: None
Subcontractor Personnel: Steve Burhans
<p>Work Performed/Sampling Activities: Entered the Van Horne Ravine. It was approximately 40 feet deep with running water in the bottom. Soil samples were collected from areas where culverts entered into the main ravine. We examined the ravine from the south end to the north end and did not observe any MEC or munitions debris (see Picture 1 below). The ravine drains to Lake Michigan via a buried pipe. The southern end of this pipe was not visible; the northern end of the pipe was visible once outside of the ravine (see Picture 2 below). A soil sample was collected down stream of the northern end of the drainage pipe.</p> <p>Located at the northeast corner of the Trench Warfare Range is Building #384 (bordering the northwestern edge of the AAA Complex MRA). Surrounding this building is a fence with UXO warning signs affixed to it (see Picture 3 below). The fenced area is mainly within the Anti-Aircraft Artillery Firing Point "B", however the building itself is within the Trench Warfare Range and therefore part of the fenced area is also within the Trench Warfare Range. See figures 3-5 from the Work Plan for building location. The area within the fence line did not have any visible surface MEC or munitions debris.</p> <p>We then proceeded to the AAA Complex. The area appeared to be mainly residential housing overlooking Lake Michigan on top of a bluff approximately 40 feet high. Soil samples were collected from drainage areas (see Picture 4 below) and a pit discovered on the side of the bluff. No MEC or munitions debris were observed in this area. There appears to be a recently installed remediation system located in a line of wells at the bottom of the bluff and the beach.</p>
Quality Control Activities (including field calibrations): Tested the metal detector and set up the GPS handheld device on a known point to ensure the system was operating properly.
Health and Safety Levels and Activities: Held health and safety tailgate.
Problems Encountered/Corrective Actions Taken: None.

Downtime/Standby: None.

Special Notes: None.

By Kevin Sedlak

Title Field Project Manager



Picture 1

View of the
Ravine from
south to
north.

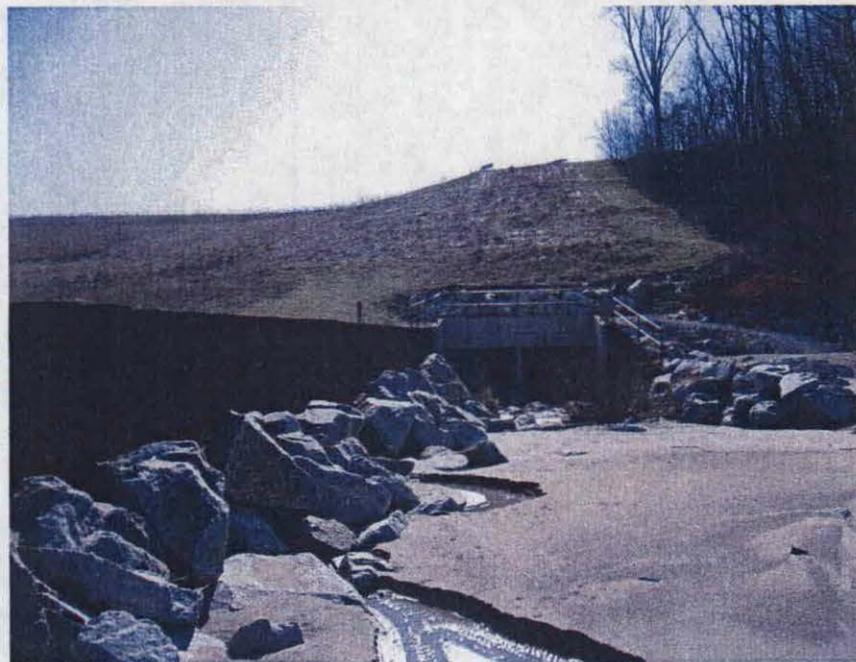


Picture 2

View
looking
south at the
north end of
the pipe
draining the
ravine



Picture 3
View of fence surrounding building 384.



Picture 4
View of culvert for storm water drainage from the AAA area where a soil sample was collected.

Appendix E

Laboratory Analytical Reports can be found on the
Appendices compact disc.

Appendix F

Data Validation Reports

Inorganic Data
Quality Review Report

**INORGANIC DATA QUALITY REVIEW REPORT
METALS BY ICP SW-846 METHOD 6010B and Mercury**

SDG: 2503598

PROJECT: Ft. Sheridan; for e2m

LABORATORY: PEL Laboratories, Inc., Tampa FL

SAMPLE MATRIX: Soil SAMPLING DATE (Month/Year): 4/06

ANALYSES REQUESTED: SW-846 Method 6010 (ICP), 7471 Mercury

NO. OF SAMPLES: 11 soils

SAMPLE NO: See attached results forms

DATA REVIEWER: William Berning

QA REVIEWER: Diane Short and Associates Inc. INITIALS/DATE: _____

Telephone Logs included Yes ___ No X___

Contractual Violations Yes ___ No X___

The project Sampling and Analysis Plan (SAP), the EPA Contract Laboratory Program National Functional Guidelines for Inorganic Review, 2002 and the SW-846 Methods have been referenced by the reviewer to perform this data validation review. The EPA qualifiers have been expanded to include a descriptor code and value to define QC violations and their values, per the approval of the Project Manager. Per the Scope of Work, the review includes validation of all calibrations, chains of custody, and QC forms referencing the above documents. All of the data are also further reviewed for the calculation algorithms and submitted continuing calibration blanks as determined by the project manager. General comments regarding the data/analytical quality are part of the review when raw data are submitted.

I. DELIVERABLES

All deliverables were present as specified in the Statement of Work or project contract.

Yes No

The following is noted for clarification:

The package contained 11 soil samples analyzed for 26 project-specific ICP metals and mercury. There were double Form 1's due to the reporting of sample dilutions on separate Form 1's. The package received a Level IV review (the 10% check).

II. CALIBRATIONS

A. All initial instrument calibrations were performed as defined in the contract or Statement of Work (SOW). All correlation coefficients of the 3 point curve were > 0.995 .

Yes No NA

B. The initial calibration verification (ICV) and continuing calibration verification (CCV) standards were analyzed at the required frequency.

Yes No

Sequencing was not required, but sufficient calibrations were present to verify that the frequencies were met for client samples.

C. And the ICV and CCV standard percent recovery results were within the required control limits of 90 - 110% (Mercury 80 - 120%).

Yes No

III. CRDL STANDARDS

The 2 x CRDL standards were analyzed as required in the SOW.

Yes No NA

Not required.

IV. BLANKS

Note: the highest blank associated with any particular analyte is used for the qualification process and is the value entered after the "B" blank descriptor.

A. The initial calibration blanks (ICB) and continuing calibration blanks (CCB) were analyzed at the required frequency.

Yes No NA

Sequencing was not required, but sufficient calibration blanks were present to verify that the frequencies were met for client samples.

B. And the ICB and CCB results were within the required control limits.

Yes No NA

Per the Level IV review of the raw data, there were as many as 10 blank analyte detects reported in the calibration blanks. The presence of this many contaminants in the calibration blanks could be a concern and should be evaluated further with respect to laboratory performance. Much of this contamination may be due to poor instrument maintenance or may indicate a need to re-evaluate the method detection limits due to increasing instrument 'noise' or interferences. As most client data were either non-detect or much greater than the contamination, client data overall are not significantly impacted.

Analytes were found in the calibration blanks at levels requiring qualification for the following parameters.

E2FSMet0506

SDG	SAMPLE ID	ANALYTE	QUALIFICATION
2503598	all detects <5x .108 mg/kg	Molybdenum	UCB.11
	all detects <5x .34 mg/kg	Selenium	UCB.34
	all detects <5x .12 mg/kg	Silver	UCB.12

Analytes reported as contaminants in the calibration blank are qualified UCB# in the affected samples, where # is the value of the blank corrected to the units of the sample. Sample detects whose values are less than 5x blank are qualified UCB and are fully usable as undetected values at that level. See the summary table at the end of this report.

C. And all analytes in the Leach Blank were less than the CRDL, or less than 2x the instrument detection limit (IDL), whichever is lower.

Yes ___ No ___ NA X

No TCLP analysis was performed.

V. PREPARATION BLANKS

A. Preparation blanks were prepared and analyzed at the required frequency.

Yes X No ___

B. And all analytes in the preparation blank were less than the CRDL, or less than the instrument detection limit (IDL), whichever is lower.

Yes ___ No X

While analytes were reported in the preparation blank, they weren't at levels requiring sample qualification.

C. Field, trip, decon rinse or other field blanks are contained and identified in the package.

Yes ___ No X NA ___

No field blanks were identified.

D. And the reported results are less than the CRDL or less than the IDL, whichever is lower.

Yes ___ No ___ NA X

VIA. ICP INTERFERENCE CHECK SAMPLE

A. The Interference Check Sample (ICS) was analyzed as required in the SOW or contract.

Yes X No ___ NA ___

B. And the ICS percent recovery results were reported for all required ICS analytes and were within required control limits of 80% to 120%.

Yes X No ___ NA ___

C. ICP analysis results for analytes not required to be present in a given ICS standard were within acceptable limits.

Yes ___ No ___ NA X

Not requested by client and data not provided by laboratory.

VIB. INTERELEMENT CORRECTION FACTORS

The Interelement Correction Factors are included and complete for all possible interferent analytes.

Yes No NA

Review of possible other contaminants was not requested by the client.

VII. SPIKE SAMPLE RECOVERY

A. A matrix (pre-digestion) spike sample was analyzed for each digestion group and/or matrix or as required in the SOW.

Yes No

B. And the Matrix spike percent recoveries were within the required control limits of 75 – 125%.

Yes No NA

The following SDGs had matrix spike results that resulted in sample qualification.

SDG	SAMPLE ID	ANALYTE	QUALIFICATION
2503598	all	Antimony	JS52
	all	Lead	JS67
	all soil detects	Titanium	JS176

The samples were qualified JS#, where the # is the percent recovery of that particular analyte. A low matrix spike recovery indicates a possible low bias to the reported result. A high matrix spike recovery indicates as possible high bias to the reported result, but does not affect non-detected values. Please see the summary table at the end of this report.

B. A Post-digest spike was analyzed if required.

Yes No NA

C. The MS/MSD samples were client samples

Yes No NA

VIII. DUPLICATES

A. Matrix (pre-digestion) duplicate samples were analyzed at the required frequency

Yes No

B. And the Matrix duplicate relative percent differences (RPD) were within the required control limits (Water 20%, Soil 35%) or the RL limits were met if the duplicate values are $< 5 \times \text{RL}$. If the either one of the duplicate results are $< 5 \times \text{RL}$, the RPD is not used. The QC limit used is the difference between the original and the duplicate results (\pm the RL) for water and ($\pm 2X$ the RL) for soils.

Yes No NA

IX. LABORATORY CONTROL SAMPLE

A. Laboratory control samples (LCS) were analyzed at the required frequency.

Yes No

The laboratory also ran an LCS duplicate.

B. And LCS recoveries were within the required control limits of 80 to 120%.

Yes No

X. MSA RESULTS AND GRAPHITE FURNACE ANALYSIS (GFAA)

Duplicate injections were performed for all analyses and the RSDs were less than 20% for all reported results. (Method of Standard Additions (MSA) requires only a single injection).

Yes No NA

Graphite furnace was not done.

XI. ICP SERIAL DILUTION

A. ICP Serial Dilutions have been analyzed at the required frequency if the analyte concentrations are greater than 50 x IDL.

Yes No NA

B. And the percent difference criteria of $\pm 10\%$ have been met.

Yes No NA

The following analytes were qualified due to serial dilution percent differences out of the control limits.

SDG	SAMPLE ID (dilution)	ANALYTE	QUALIFICATION
2503598	all (1)	Iron	JE11
	all (1)	Lead	JE13
	all (1)	Molybdenum	JE46
	all (1)	Nickel	JE12
	all (1)	Zinc	JE16

For serial dilution percent difference results that are out of control, the affected sample data have been qualified JE#, where # is the value of the %D. These results indicate possible non-linear chemical or matrix interferences that could add a high bias to the data. Please see the summary table at the end of this report.

C. The serial dilution analyses were on client samples

Yes No

XII. INSTRUMENT DETECTION LIMITS

A. The Instrument Detection Limits have met the Quarterly reporting requirements.

Yes No NA

This was determined to be acceptable during the contractual process.

B. And all sample results have met the required detection limits (CRDL).

Yes No NA

The laboratory has diluted several of the digestates to account for potential matrix effects. Some of the dilutions included reporting tin and/or thallium from the dilution analysis. The rationale for which data are reported from which run (original or diluted) has not been clarified. And at least some samples were reported from the specified dilution and no undiluted data were reported for comparison. It was noted, however, that although the dilutions performed raised the MDL's, the elevated MDL's were still below the reporting limits.

XIII. PREPARATION AND ANALYSIS LOGS

A. All samples were prepared or analyzed within the required holding times referencing the SOW (time of sample receipt to preparation/distillation).

Yes No

B. All samples were analyzed within the 40 CFR 136 (Clean Water Act) or method recommended holding times (time of sample collection to date of analysis).

Yes No

C. Chains of Custody (COC)

1. Chains of Custody (COC) were reviewed and all fields were complete, signatures were present and cross outs were clean and initialed.

Yes No

The project manager is informed of the following and the chains are being completed for the project record.

The COC's had improper cross-outs and overwrites.

It was noted that the laboratory cover memo and laboratory addendum stated that there were 13 samples, but that the COC's, the inorganic cover page and the Form 1's listed eleven samples.

2. Samples were received at the required temperature and preservation.

Yes No

XIV. FIELD QC

A. Field QC samples (duplicates, SRMs) were identified.

Yes No

The field duplicates are identified as FTSH-TRWR: DUP and R01.

B. Field duplicates were within a guidance limit of < 35% RPD limit for water or <50% RPD limit for soil. If values are < 5 x RL, the water limit is ± 2 x RL and the soil limit is ± 4 x RL. Final determination will be made by the project manager.

Yes No NA

Per the field manager, the duplicates are within project criteria. The reviewer has checked the data and concurs.

XV. GENERAL COMMENTS

The laboratory has complied with the requested methods and the quality of the data is acceptable and usable with consideration of the following qualifications. Note that the following qualifiers are used:

UCB#, where # is the value of the blank contamination. Data are usable as undetected values.

JS# is for matrix spike/matrix spike duplicate recoveries, where # is the analyte recovery. The bias to the data is considered to be high or low proportional to the analyte recovery. (JS125 would indicate the value could be 125% of the true value)

JE#, where # is an indication of non-linear matrix effects. Data could be biased high by the amount indicated by the number (JE15, data could be high by an additional 15%).

Summary:

*Very low level detections of molybdenum, silver and selenium could be false detections due to laboratory contamination, not the presence of the analytes in the sample. (UCB#)

*Antimony and lead could be biased low by the added factor indicated by the low matrix spike/matrix spike duplicate analyte recoveries (JS#). Titanium could be biased high by the added factor indicated by the high matrix spike/matrix spike duplicate analyte recoveries. (JS#)

*The matrix also exhibits the presence of non-linear effects for iron, lead, molybdenum, nickel and zinc. Data could be biased high by the added factor indicated by the serial dilution percent difference. (JE#)

Qualification or Comments in Detail

Chains-of-Custody

The project manager has been informed of items to be completed on the chains of custody.

Blanks

Per the Level IV review of the raw data, there were as many as 10 blank analyte detects reported in the calibration blanks. The presence of this many contaminants in the calibration blanks could be a concern and should be evaluated further with respect to laboratory performance. Much of this contamination may be due to poor instrument maintenance or may indicate a need to re-evaluate the method detection limits due to increasing instrument 'noise' or interferences. As most client data were either non-detect or much greater than the contamination, client data overall are not significantly impacted. Analytes were found in the calibration blanks at levels requiring qualification for the following parameters.

SDG	SAMPLE ID	ANALYTE	QUALIFICATION
2503598	all detects <5x .108 mg/kg	Molybdenum	UCB.11
	all detects <5x .34 mg/kg	Selenium	UCB.34
	all detects <5x .12 mg/kg	Silver	UCB.12

Analytes reported as contaminants in the calibration blank are qualified UCB# in the affected samples, where # is the value of the blank corrected to the units of the sample. Sample detects whose values are less than 5x blank are qualified UCB and are fully usable as undetected values at that level. See the summary table at the end of this report.

Matrix Spikes/Matrix Spike Duplicates

The following SDGs had matrix spike results that resulted in sample qualification.

SDG	SAMPLE ID	ANALYTE	QUALIFICATION
2503598	all	Antimony	JS52
	all	Lead	JS67
	all soil detects	Titanium	JS176

The samples were qualified JS#, where the # is the percent recovery of that particular analyte. A low matrix spike recovery indicates a possible low bias to the reported result. A high matrix spike recovery indicates as possible high bias to the reported result, but does not affect non-detected values. Please see the summary table at the end of this report.

Serial Dilutions

The following analytes were qualified due to serial dilution percent differences out of the control limits.

SDG	SAMPLE ID (dilution)	ANALYTE	QUALIFICATION
2503598	all (1)	Iron	JE11
	all (1)	Lead	JE13
	all (1)	Molybdenum	JE46
	all (1)	Nickel	JE12
	all (1)	Zinc	JE16

For serial dilution percent difference results that are out of control, the affected sample data have been qualified JE#, where # is the value of the %D. These results indicate possible non-linear chemical or matrix interferences that could add a high bias to the data. Please see the summary table at the end of this report.

Detection Limits

The laboratory has diluted several of the digestates to account for potential matrix effects. Some of the dilutions included reporting tin and/or thallium from the dilution analysis. The rationale for which data are reported from which run (original or diluted) has not been clarified. And at least some samples were reported from the specified dilution and no undiluted data were reported for comparison. It was noted, however, that although the dilutions performed raised the MDL's, the elevated MDL's were still below the original reporting limits.

Field Duplicates

The field duplicates are identified as FTSH-TRWR: DUP and R01. Per the field manager, the duplicates are within project criteria. The reviewer has checked the data and concurs.

QUALIFICATION SUMMARY TABLE

SDG	SAMPLE ID	ANALYTE	QUALIFICATION
2503598	all detects <5x .108 mg/kg	Molybdenum	UCB.11
	all detects <5x .34 mg/kg	Selenium	UCB.34
	all detects <5x .12 mg/kg	Silver	UCB.12
	all	Antimony	JS52
	all	Lead	JS67
	all soil detects	Titanium	JS176
	all (1)	Iron	JE11
	all (1)	Lead	JE13
	all (1)	Molybdenum	JE46
	all (1)	Nickel	JE12
	all (1)	Zinc	JE16

Appendix F

Data Validation Reports

Organic Data
Quality Review Report

**ORGANIC DATA QUALITY REVIEW REPORT
EXPLOSIVES SW-846 METHOD 8330**

SDG: 2503598

PROJECT Ft. Sheridan for e2m

LABORATORY: PEL Laboratories, Tampa FL

SAMPLE MATRIX: Soil SAMPLING DATE (Month/Year) 4 / 06

NO. OF SAMPLES 11 (S)

ANALYSES REQUESTED: SW846 8330 (Explosives)

SAMPLE NO. Attached

DATA REVIEWER: William Berning INITIALS/DATE: _____

QA REVIEWER: Diane Short & Associates, Inc.

Telephone Logs included Yes ___ No X

Contractual Violations Yes ___ No X

The project QAPP, the EPA Contract Laboratory Program National Functional Guidelines for Organic Review, 1999 (SOP), the EPA SW 846 Methods for Evaluating Solid Waste, Physical/Chemical Methods Third Edition, (SW-846) current updates, have been referenced by the reviewer to perform this data validation review. The EPA qualifiers have been expanded to include a descriptor code and value to define QC violations and their values, per the approval of the Project Manager and EPA. The review has been tasked for review of all calibrations, QC for all samples and ten percent review of chromatograms. General comments regarding the data/analytical quality are part of the review when raw data are submitted.

I. DELIVERABLES

All deliverables were present as specified in the Statement of Work (SOW), SW-846, or in the project contract.

Yes No

The following is noted for general clarification:

The 10% check of chromatograms and calculation checks for the solid matrix samples were performed on this SDG, per the SOW.

II. ANALYTICAL REPORT FORMS

The Analytical Report or Data Sheets are present and complete for all requested analyses.

Yes No

III. HOLDING TIMES

A. The contract holding times were met for all analyses (Time of sample receipt to time of extraction and from extraction to analysis)

Yes No

B. The Clean Water Act (40 CFR 136) or method holding times were met for all analyses (From time of sample collection to extraction and from extraction to analysis).

Yes No

C. All chains of custody are complete with signatures, dates and times.

Yes No NA

The project manager is informed of the following and the chains are being completed for the project record.

The COC's had improper cross-outs and overwrites.

It was noted that the laboratory cover memo and laboratory addendum stated that there were 13 samples, but that the COC's, the organic cover page and the Form 1's listed eleven samples.

D. Samples were received in proper condition (temperature, preservation)

Yes No

IV. INSTRUMENT CALIBRATION (IC) AND CONTINUING CALIBRATION (CC) VERIFICATION

A. The GC standards were analyzed at the required frequency (every 72 hours at a minimum).

Yes No

B. The chromatographic resolution and separation criteria were met.

Yes No

C. The suggested columns were used and the PQL's were met.

Yes No

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D. Calibration factors for IC met the 20% RSD limit or the linear regression $r > 0.995$.

Yes No

E. %D's for Continuing Calibration Factors and retention times (RT) were within the 25%D limits.

Yes No

V. BLANKS

A. Laboratory blanks

1. Laboratory blanks were analyzed for every sample set and for each matrix type or once in every twenty samples, whichever is more frequent.

Yes No

2. No blank contamination was found in the method blank.

Yes No

3. Instrument blank analysis was performed following most samples that contained analytes at high concentrations.

Yes No NA

No samples contained high concentrations.

B. Field Blanks

If field blanks were identified, no blank contamination was found.

Yes No NA

No field blanks were identified.

VI. MATRIX SPIKE/MATRIX SPIKE DUPLICATE (MS/MSD)

A. Matrix spike (MS) and matrix duplicate or matrix spike duplicate (MSD) were analyzed for every analysis performed and for every 20 samples or for every matrix whichever is more frequent.

Yes No

B. The MS and MSD percent recoveries (%R) were within the limits defined by the laboratory or in the contract.

Yes No NA

C. The MSD relative percent differences (RPD) were within the defined contract or laboratory limits.

Yes No NA

D. The MS/MSD are client samples.

Yes No NA

VII. LABORATORY CONTROL SAMPLE AND DUPLICATE (LCS/LCSD)

A. Laboratory Control Sample (LCS) and LCS duplicate were analyzed for every analysis performed and for every 20 samples or for every matrix whichever is more frequent.

Yes No

B. The LCS percent recoveries (%R) are within the limits defined by the laboratory or in the contract.

Yes No

VIII. SURROGATE RECOVERY

A. The Surrogate spike was analyzed with every sample.

Yes No

B. And met the recovery limits defined in the current contract. If recovery limits were exceeded, the sample was re-extracted and re-analyzed.

Yes No

A number of samples had surrogate recoveries above the control limits, but since all analytes were non-detects for all samples, no data qualification is required.

IX. FIELD QC

If Field Duplicates or Performance Check Compounds were identified, they met the RPD or % recovery criteria for the project. An RPD of 50% is used for soils. If the value of either duplicate is less than (5 x RL), a guidance of ± 4 x RL between the sample values is used.

Yes No NA

The field duplicates are identified as FTSH-TRWR: DUP and R01. Per the field manager, the duplicates are within project criteria. The reviewer has checked the data and concurs.

X. COMPOUND IDENTIFICATION

A. All raw data chromatograms and data system printouts were evaluated for all detected compounds and the identification is accurate.

Yes No

Per the 10% review.

B. Retention time limits or peak pattern identifications are met.

Yes No NA

This was checked for 2 samples against the calibration and against the blank chromatograms

C. Two column or two detector confirmation was performed for all detected values.

Yes No

Per case narrative. There were no detected values.

D. And the two values agreed within 25%. For data < 5 x RL, no %D is calculated as the difference is statistically insignificant.

Yes No NA

There were no detected values.

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XI. COMPOUND QUANTITATION AND REPORTED CRQLS

A. Raw data examination verified that all sample results were correctly calculated.

Yes X No NA

Per the 10% review.

B. The chromatograms and general system performance were acceptable for all instruments and analytical systems.

Yes X No

Per the ten percent check of the raw data.

XII. OVERALL ASSESSMENT OF THE CASE

Data comply with the required methods. Data are fully usable for project purposes with consideration of the following comments. No qualifiers have been applied.

Summary:

There are no issues to summarize.

Qualification or Comments in Detail

Chains of Custody

The project manager is informed of the necessary changes and the chains are being completed for the project record.

Field Duplicates

The field duplicates are identified as FTSH-TRWR: DUP and R01. Per the field manager, the duplicates are within project criteria. The reviewer has checked the data and concurs.

Munitions Response Site Prioritization Protocols – Summary Table

MRS-PP Scores	Trench Warfare Range MRS	Southern Small Arms Ranges MRS	AAA Firing Points A and B MRS	AAA Complex-Transferred MRS	Grenade Course MRS	Small Arms Range Complex MRS
EHE	8	8	5	7	2	8
CHE	No Known Hazard or Suspected CWM Hazard					
HHE	8	No Known or Suspected MC Hazard	6	No Known or Suspected MC Hazard	5	No Known or Suspected MC Hazard
Final Priority	8	8	5	7	2	8

The complete protocols for each site are saved on the Appendices cd.