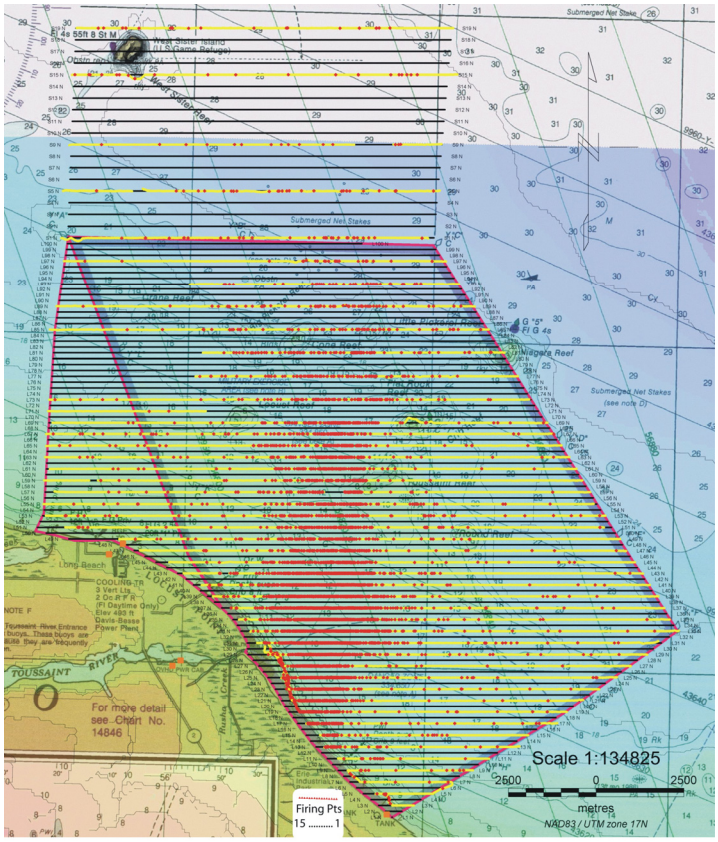
The MTA UXO Survey and Target Recovery on Lake Erie at the Former Erie Army Depot

ESTCP Project MM2003-24



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LIST OF ACRONYMS

DAQ	Data Acquisition System
DAS	Data Analysis System
DERP	Defense Environmental Restoration Program
DoD	Department of Defense
EOD	Explosive Ordnance Disposal
EODMU	Explosive Ordnance Disposal Mobile Unit
EOTI	Explosive Ordnance Technologies Incorporated
ESTCP	Environmental Security Technology Certification Program
FRAG	Fragmentation/Shrapnel
FUDS	Formerly Used Defense Site
GPS	Global Positioning System
MEC	Munitions and Explosives of Concern
MPPEH	Material Potentially Presenting Explosive Hazard
MTA	Marine Towed Array
MTADS	Multi-sensor Towed Array Detection System
NAD	North American Datum
NOAA	National Oceanographic and Atmospheric Administration
PDF	Portable Document Format
PNNL	Pacific Northwest National Laboratory
POC	Point of Contact
POS	Prove Out Site
SERDP	Strategic Environmental Research and Development Program
TCRA	Time Critical Removal Action
USACE	United States Army Corps of Engineers
UXO	Unexploded Ordnance
VSP	Visual Sampe Plan
WAA	Wide Area Assessment

1.0 Introduction

1.1 Background

The former Erie Army Depot, Ottawa County, OH, is located along the western shore of Lake Erie about 5 miles west of the town of Port Clinton. This site and the associated impact areas are designated by the United States Government as a Formerly Used Defense Site (FUDS) under the Defense Environmental Restoration Program (DERP).[1,2] This property was formerly used for artillery, testing and mortar and small arms training, resulting in impact areas on land and northward into the Lake almost to the Canadian Border. Ordnance and explosive waste (OEW) and potentially live or unexploded ordnance (UXO) have been found on the lake bottom, in the Federal navigation channel in the Toussaint River, in the marshland adjacent to the firing ranges, and along beaches fronting the former Depot, (Reference 2, Appendices B and J).[3-5]

The impact areas were located on, near, or offshore of the FUDS beaches adjacent to Lake Erie. Several different range fans have been described that were associated with different types of ordnance operations. Proof testing of projectiles and the gun barrels that were designed to fire them took place from a series of 15 fixed gun emplacements (located adjacent to one another in a line about 2000 meters inland from the beach, see later). Ordnance found on or near the FUDS shore of Lake Erie appears to be mobile and may have originated from offshore or near shore impact areas. In FY06, ESTCP was directed by Congress to conduct work to characterize UXO contamination impacting the Toussaint River and Lake areas associated with ordnance testing that may affect the shoreline and the river. This operation was set up in accordance with the recommendations of the Defense Sciences Board.[6]

1.2 Site History/Characteristics

1.2.1 Former Erie Army Depot

The subject study area consists of the beach and an area of Lake Erie fronting the former Erie Army Depot (now called Erie Industrial Park), between Camp Perry Ohio National Guard Training Center and the mouth of the Toussaint River in northwest Ohio (Figure 1, adapted from Ref 2, Appendix L). This FUDS site is located in rural Carroll Township, Ottawa County, OH, on Lake Erie, approximately 37 miles east of Toledo and 6 miles west of Port Clinton. The Erie Army Depot was initially established in 1918 as the Camp Perry Proving Grounds, and then was redesignated as Erie Proving Grounds. For almost a half century (1918-1966) this site was used by the Department of the Army for testing and proof-firing of artillery and as an ordnance storage and issue center (USACE Rock Island 1993).[2] The beach area between the Industrial Park and the Toussaint River is owned by the Toussaint Shooting Club.

Camp Perry was established in 1907 by the state of Ohio for the training of the state National Guard. Part of the camp was used to establish the Erie Army Depot in the spring of 1918. During the next 2 years, the site was used to proof fire (verify that the cannons will withstand the pressure of firing) thousands of pieces of artillery. Between World Wars I and II, the site was less active and was used primarily to warehouse and issue various items of ordnance. In 1941, the artillery test firing mission of the site was reactivated in support of World War II and the

name of the facility was changed to the Erie Proving Ground. During the subsequent 5 years, 70 percent of the mobile artillery used by the U.S. Army or provided to Allied armies was tested and proof-accepted at Erie Proving Ground. Between 1946 and 1951, the site reverted to a peace-time role and was renamed the Erie Army Depot. Late in 1951, the depot assumed the additional roles of anti-aircraft support testing and the overhauling of surface-to-air guided missiles (in support of the Korean Conflict). Additional activities included logistical support to the Regular Army and National Guard anti-aircraft units training at Camp Perry.[2] Test firings of Vietnam-era munitions continued into the early and mid-1970s and continues today as the mission of the Camp Perry Ordnance Office.

Figure 1 illustrates 1965 period firing fans and target zones related to the present Erie Industrial Park. Discussions with previous employees of the Erie Army Depot and present officials of Camp Perry indicate that the firing points and range patterns have been similar for other periods. The Erie Army Depot was excessed by the General Services Administration in 1966 and closed in 1967. However, ARES, Inc., a company under contract to the Federal Government, has continued to manufacture and test fire artillery and other large-caliber barrels on this property as a commercially owned and operated enterprise. Currently, ARES reportedly fires inert rounds into the land targets, and polices up the rounds.[3] The majority of acreage encompassing the former Erie Army Depot site is no longer Federal property and is now classified as a FUDS. Approximately 5.7 km^2 (1,400 acres) of property at the former Erie Army Depot is leased from the State of Ohio to private land owners.

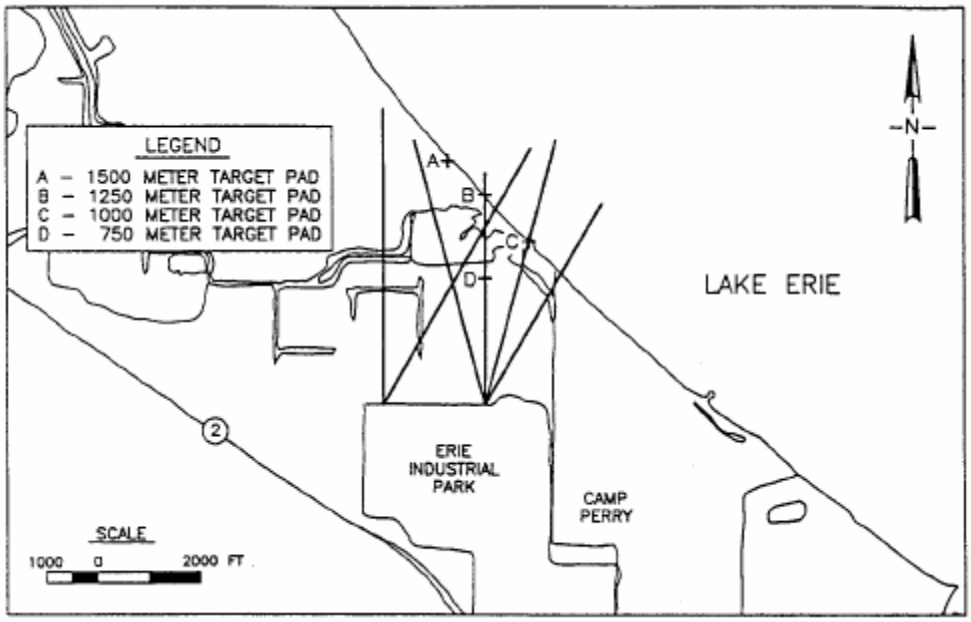

Figure 1. Firing fans and target locations for Erie Army Depot in 1965

Several impact areas in Lake Erie were established by the Erie Army Depot in order to test artillery by proof firing. The boundaries of these areas are generally known for the World War II era and well known from the 1960's to present. Figure 2 shows an edited version of a range map from an earlier document.[2] The lake impact areas, which are currently used by Camp Perry, are significantly smaller in size than those documented as being active by Erie Army Depot in the earlier years (Figure 2). Approximately 388 km^2 (96,000 acres) of Lake Erie and 5.78 km^2 (1,428

acres) of land are classified as formerly used target areas. The currently maintained impact/safety zone used by Camp Perry includes 145.8 km^2 (36,033 acres) of the FUDS Lake impact zone (USACE District, Rock Island 1993a, 1993b). In addition to the test firing conducted by the Erie Army Depot, these impact areas were extensively used in training missions by the Navy, Air Force, National Guard, and Army Reserves. This multi-use facility and its 75-year history of ordnance firings is reflected by the wide range of types and calibers of ordnance recovered on or near the former impact areas. OEW recovered or identified on the FUDS site beaches include a broad variety of direct fire and indirect fire munitions currently or formerly maintained in the arsenals of U.S. military forces. Shells range in size from the largest World War I 240-mm and more recent 155-mm artillery rounds to smaller World War II 45-mm armor-piercing and 1960's 60-mm mortar projectiles and modern small-caliber rifle cartridges associated with present Camp Perry activities.

The ordnance pattern impact areas included surfaces classified as lake (388 km^2 (96,000 acres)) of Lake Erie) (Figure 2), wet lands (1.3 km^2 (329.5 acres) including the beach), and dry land. OEW and UXO have been found on the study area beach and during the 1991 dredging operations for the Federal navigation channel at the Toussaint River, which were conducted by the USACE District, Buffalo.[3]

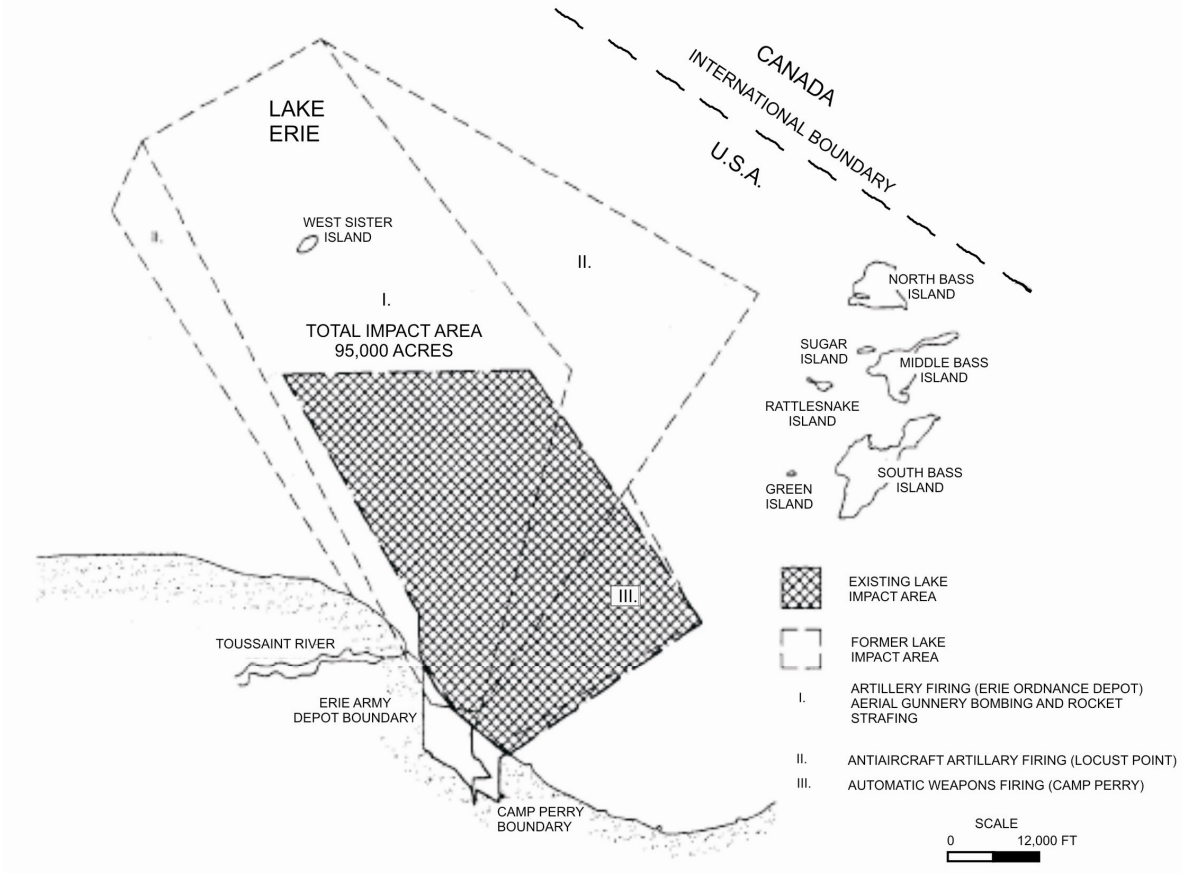

Figure 2. Estimate of the historical impact areas in Lake Erie. Figure adapted from REF 2, Appendix L.

1.2.2 Ordnance Recoveries and Cleanups

In 1992 the Huntsville Division was assigned responsibility for conducting the immediate removal of OEW along the 4.8-km (3-mile) (an approximately 150-m-wide (500-ft wide zone) beach frontage as part of their OEW site remediation mission. From 1 September through 9 December 1992, EOD Technology (EODT) conducted beach OEW cleanup operations under contract to the Huntsville Division. Post-cleanup site inspections have revealed the presence of additional occurrences of ordnance on the beach, raising concerns that the near shore ordnance field may be mobile and transportable to the beach by natural coastal processes.

Several previous activities have uncovered a variety of munitions types. These activities have included dredging, a TCRA and a beach removal action. The recovered munitions types are listed in Table 1**.** In addition to those known to have been fired over the life of the range, it has been anecdotally reported that munitions were dumped from barges in the vicinity of the impact area during the 1960s. The types of munitions and quantities were not documented.

Table 1. List of ordnance recovered in earlier actions

MUNITION	COMMENT
M52 Fuze	Found during dredging
3.5 in rocket	Found during dredging
M15 Smoke Grenade	Found during dredging
60 mm Mortar	Found during dredging and beach removal action and TCRA
81mm Mortar	Found during TCRA
20 mm Projectile	Found during Beach Removal Action
40mm Projectile	Found during TCRA
75mm Projectile	Found during TCRA
90 mm Projectile	Found during dredging and TCRA
105 mm Projectile	Found during dredging and beach removal action and TCRA
106 mm Projectile	Found during dredging and beach removal action and TCRA
155 mm Projectile	Found during TCRA
165 mm Projectile	Pieces found during Beach Removal Action

In FY06, ESTCP was directed by Congress to conduct work to characterize UXO contamination impacting the Toussaint River area**.** The purpose of the pilot program was to use technologies suitable for wide area assessment (WAA) of suspected munitions contaminated sites to address the issues enumerated below.[7]

- Characterize the areas in and around the mouth of the Toussaint River that are contaminated with munitions from historical activities at the Erie Army Depot and Camp Perry.

- Identify areas of Lake Erie and the shoreline that have concentrations of munitions.

- Characterize the site conditions in a way that will support future investigations, a prioritization of required activities, remediation approaches, and cost estimation tasks. The activities in this project will:
  - Bound the munitions-contaminated areas in Lake Erie and on the adjacent beaches,
  - Estimate the density and distribution of munitions types and sizes,
  - Locate areas where munitions are likely to migrate to the river channel, and

- Determine the extent to which munitions have been transported into the river.

The ESTCP Program Office established the boundaries of the MTA proposed survey area. The primary area is shown bounded in red. The extended area bounded in yellow was proposed to be surveyed following completion of the primary area.

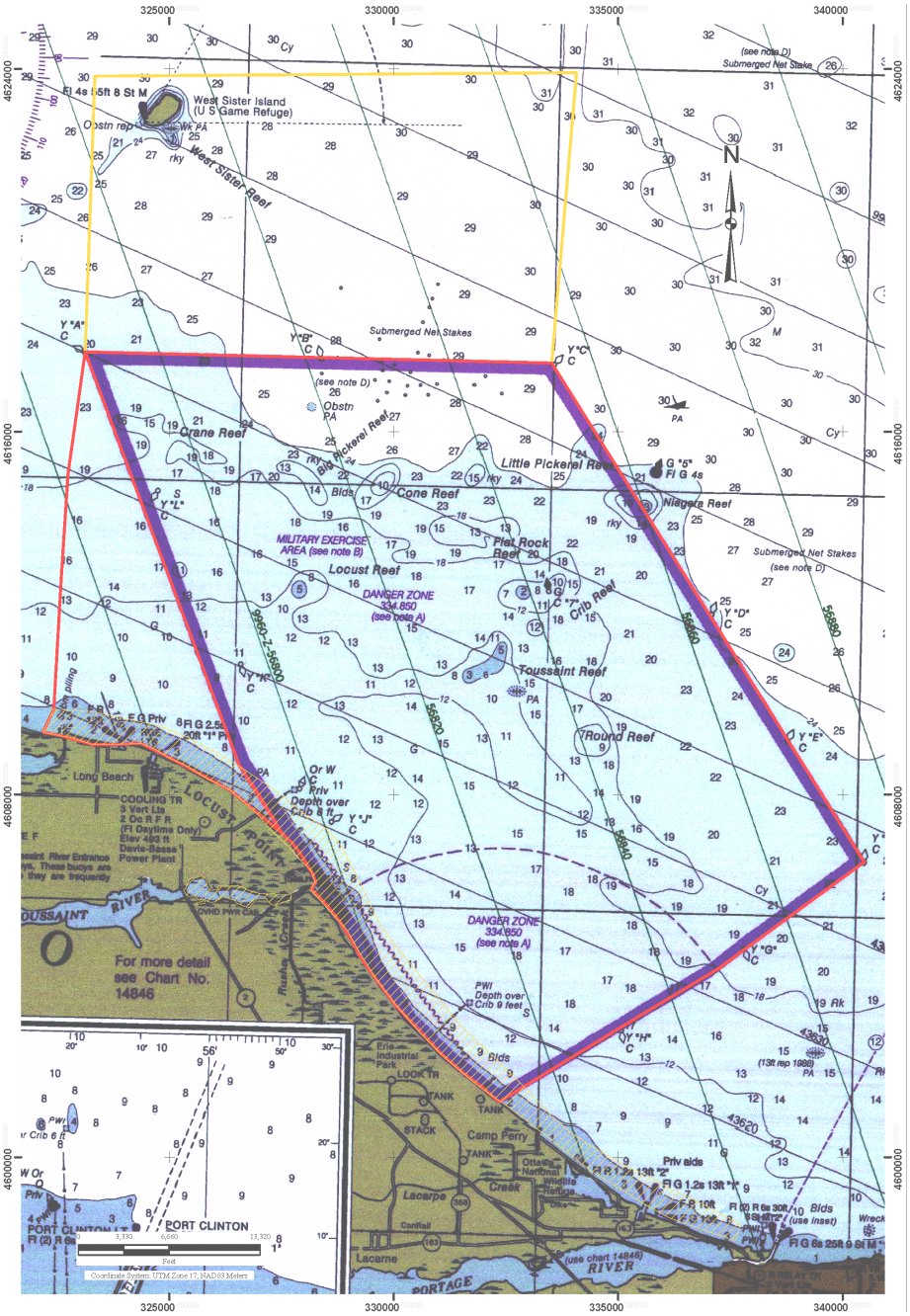

Figure 3. Adaptation of a NOAA chart to show the boundaries of the survey area.

1.3 Technology Description

This demonstration employed several technologies; each was chosen to contribute to the overall goals of the demonstration. These technologies included

- the **Marine Towed Array** (MTA) to survey the impact area in Lake Erie and the deeper parts of the river,
- the **helicopter-mounted magnetometer array** to survey the beach, shallow water, and marshy areas, and
- a **statistical tool** to aid in planning transects for the marine array in interpreting the data gathered.

The primary detection sensor used by both the MTA and the Airborne platform were arrays of full-field Cs vapor magnetometers. These sensors detect only ferrous metals. The airborne magnetometer array, originally developed by NRL as the Airborne MTADS was chosen to explore the beach, very shallow water areas of the Lake, and marshy areas adjacent to the beach. This technology was not a direct part of the MTA Project. The activities of the airborne magnetometer array are described in a separate report. Some areas of the Lake were specifically surveyed so that the MTA and airborne surveys would overlap to provide a comparison of the two survey products.

Visual Sample Plan (**VSP**) is a statistical sampling software utility designed by Pacific Northwest National Lab (PNNL) through funding from multiple government agencies to provide the site investigators a simple to use defensible method of gathering and analyzing their respective data. Through funding from SERDP and ESTCP, VSP has been developed to aid in transect sampling to identify areas where the likelihood of UXO presence is elevated. PNNL, using VSP, designed the survey approach and transect sampling plan for the Lake Erie project. The survey transect plan designed for use in this project by PNNL and approved by the Program Office, is shown in **Figure 4**. The east/west transects are spaced 165 meters apart in the main survey area; in the extended area, the spacing is increased to 330 meters. Also shown in Figure 4 are the two GPS base station positions that were used by the MTA. All activities in this project were carried out in accordance with the ESTCP Toussaint River Demonstration Plan, which was issued in draft form to AETC on July 18 and in final form on August 9.

AETC's Marine Towed Array (MTA) was chosen to conduct the transect survey of the areas of the Lake that were of concern to this project. The MTA was developed under sponsorship of ESTCP in Project MM2003-24. Prior to being deployed to Lake Erie, it had been used to complete two extended demonstration surveys on the Currituck Sound (adjacent to the Former Duck Naval Bombing Range in North Carolina) and on Ostrich Bay (adjacent to the Former Naval Ammunition Depot-Puget Sound in Washington State). The operating characteristics, capabilities, and limitations of the system are extensively described in the reports of these demonstrations.

Briefly, the MTA deploys an array of 8 Cs vapor magnetometers with a horizontal spacing of 0.6 m on a sensor platform that is designed to operate at and maintain the platform at a fixed altitude (nominally ~1 m) above the bottom surface. The system was designed to operate in Sea State 1 conditions in water depths between 1.25 and 5 m. In the Currituck Sound demonstration, it was shown that the system could successfully operate in wave conditions that mildly exceeded Sea State 1. In preparation for the demonstration on Puget Sound, the MTA was adapted to successfully survey in water depths of 7.5 m. This was accomplished by lengthening the tow cable by 6 m and reducing the operating speed by about a factor of two. The increased survey depth capability required a production rate decrease of ~50%. Additionally, the lengthened tow cable decreased the positional accuracy of the sensor readings by ~50% in the horizontal plane.

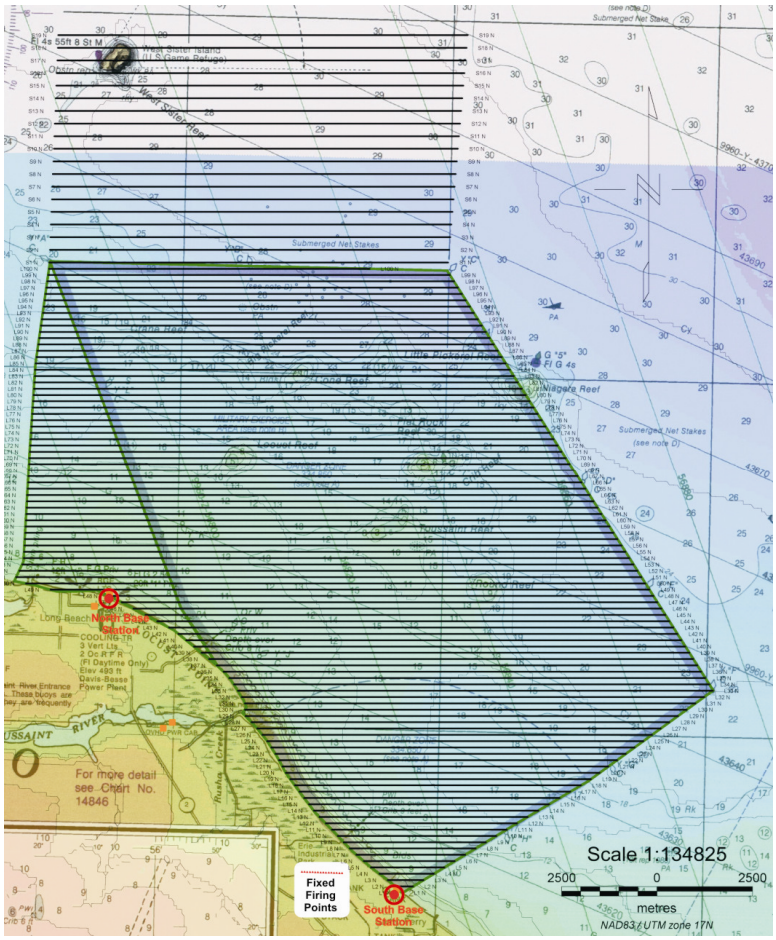

Figure 4. NOAA map with the proposed survey transects superimposed.

1.4 MTA Survey Plan

The AETC proposed Lake Erie Demonstration Plan was submitted to the Program Office on June 29 in Draft form and on 20 July in revised form.[8] AETC proposed to conduct a 5-week geophysical survey of the specified areas using the MTA. The initial plan called for surveying alternate transects as specified by PNNL in the VSP developed specifically for the MTA. This was subject to change, based upon the results during the progress of the survey. An interruption of MTA activities was proposed following week 3 of the survey to allow for repair of the equipment, a respite for the AETC employees, and to allow the Program Office to examine the results of the first three weeks of operations and to project the preferred survey operations for the remaining period.

We proposed to conduct the survey operations in a concentrated study involving 10-12 hour daily operations and some weekend operations. The extended hours of survey operations were designed to enhance productivity because of the time required for setup and breakdown of the equipment and because of the extended ferry times from the dock to the survey transects (particularly as the survey progressed to several miles north of the marina).

Following completion of the survey operations, AETC proposed to analyze the datasets using the MTADS DAS as directed by the Program Office. The results were to be organized to support a diver recovery operation of 200 targets. Targets in the dig list were to be prioritized per direction of the Program Office.

AETC agreed to manage and oversee the target recovery process by means of a subcontract placed with EOTI of Redbank, NJ. EOTI responded to a Statement of Work prepared by AETC and a subcontract was negotiated with EOTI to support all operations involved in the recovery of 200 anomalies from the Lake sediments. EOTI prepared a general Work Plan for Target Retrieval on Lake Erie.[9] This was supported by a Site Specific Work Plan in Support of Validation of the Marine Towed Array Demonstration at the Former Erie Army Depot and the Toussaint River.[10] All operations were carried out under guidance of a Site Specific Safety and Health Plan[11] and a Dive Management Plan,[12] which was a document specifying safety procedures specifically associated with diving operations.

2.0 The MTA Survey

2.1 MTA Deployment

During the week of 7 August all electronic and mechanical components of the MTA were exercised and secured for shipment to Port Clinton. System spare components were checked against inventory and secured for transport. Tool boxes, system spares, and repair hardware were sorted and packed for shipment to support the field operation. All packing containers were inspected and compared to the equipment inventories that are pasted on the sides of the boxes.

A pickup truck and a 14-foot box truck were rented from agencies in North Carolina to support the field operation. All pack out operations were completed on 11 August; the support equipment was packed and stored in the box truck. The two vehicles were used to tow the pontoon boat and the sensor platform from Cary to Port Clinton on 14 August.

Chet Bassani and Chris Gibson (AETC) were joined by Wayne Lewallen and Kevin Osborne (EOTI) in Port Clinton on the evening of 14 August. Mr. Osborne transported the chase boat to the site, which supported and tended the survey vessel. Jim McDonald and Nagi Khadr joined the other crew in Port Clinton on 15 August.

2.2 Survey Logs and Data Files

The Operations Log presented in Table 2 details the daily operations during the survey period. Main site survey operations began with Transect 29, which intersects the mouth of the Toussaint River at the west end of the transect. All survey operations on 17 August inadvertently took place within Range 1 during live fire operations on the range. Beginning on 18 August, transects north of Range 1 were surveyed until arrangements were completed for access to the Range 1 area when live fire operations were not underway. The Operations Log presents details of the survey progress.

Table 3 presents the daily data log. This table lists the file names for the individual surveys and notes details that are relevant to the editing and processing of the data. The times listed are the actual times during which the files were being created. Ferry time to and from the site and travel time between transects and in turns are not part of these files. The transect distances are derived from the GPS information recorded in the survey files.

2.3 The Toussaint River Survey

Even though there are no significant tides on Lake Erie, the level of the water in the lake is strongly dependent upon the direction and strength of the wind. During the period of the survey operations we observed that the water level rose and fell by more than a meter. After several days of strong west winds, the water level was reduced so much that access or egress through the Toussaint River to or from the Beef Creek Marina was not possible. During these periods, the survey vessel and the sensor platform were moved several miles to the west to the Wild Wings Marina where the Lake access channel is deeper. During the periods of lowest water, our equipment was also stranded in the Wild Wings Marina. Following periods of very low water,

Table 2. Survey Operations Log

Day	Operations
Monday, August 14	Bassani, Gibson, Lewallen, Osborne arrive with equipment and boats
Tuesday, August 15	McDonald and Khadr arrive. Support hotel changed to Fairfield Inn. Boats launched from Beef Creek Marina. Third (adjacent) slip rented to accommodate sensor platform. Channel depth observed to be marginal at lake entrance. Potential areas explored for installation of calibration lanes
Wednesday, August 16	Base station set at south site. Platform assembled and tested (dead mag and actuator cable - replaced from spares). Established line for Cal target installation. Explored Toussaint River channel. Depth 1.3-2.0 m, except at mouth of river. EOTI rented equipment to support dive operations.
Thursday, August 17	Launched sensor platform. Surveyed lines 29, 31, 33, & 35. Survey began at 0810, finished line 35 at 1620. EOTI installed cal pipes. During pipe survey hung buoy line and lost platform cover. Could not find. Arranged for Fedex shipment of spare covers.
Friday, August 18	Pulled survey boat and platform. Repaired snout (interface bottle mount) and stripped bolt damage. New covers shipped from Cary. Finished installation of the Cal Line, removed end buoys. Lewallen departed.
Saturday, August 19	Covers arrived at 1430. Assembled platform and launched system and parked in slip for AM survey.
Sunday, August 20	System on Lake by 700. 2+ ft waves. Engine failed (no gas from fuel pump). Limped back to marina. No Johnson engine mechanics available on Sunday. Departed marina at 1530
Monday, August 21	Pulled boat and platform. Boat/engine to Dubert's Marine. Picked up boat after repair, reassembled and launched at 1600. Drove for 1 hr with no problem. Pulled boat, remated with platform, and launched and parked at dock. Visit to Camp Perry Range Control officer. Range control was unaware of our operations. Range 1 scheduled asbusy 7 day weeks until October.
Tuesday, August 22	Ran several passes on Cal lines. Started Tr37 at 845. Surveyed 37, 39, 41, & 43. Moved MTA to Wild Wings Marina. Visited Range Control to work out a schedule for surveying within Range 1.
Wednesday, August 23	Started TR 45 at 0800. Completed lines 45, 47, 49, & 51. Met with Col. Clemens at Range Control. She offered 8/28, 29 access to Range 1, a half day on 8/27 and 9/11-15 (100%).
Thursday, August 24	Started Tr53 at 0805. Rain in AM with high waves (Tr 53 & 55). Front passed, wind switched to south, waves died. Completed Tr57 & 59 and 20 min of west end of Tr61
Friday, August 25	Completed (short) Tr61, 63, 65, & 67. McDonald fell into the Lake
Saturday, August 26	Lake rough in AM. Began survey at noon. Completed Tr73 & 77. West end of 73 & 71 also completed.
Sunday, August 27	Surveyed East ends of Tr77, 81, 85, & 89 and then completed west components of 85 & 89. Moved system back to Beef Creek Marina to start on Range 1 area. McDonald did target analysis and wrote a progress report for the Program Office.
Monday, August 28	Problems with water in Trimble Base Station Controller. Required computer to reprogram. Started surveying at 0830. Rained all day. Rough seas became very rough by end of day. Tr27, 25, 23, 21, 19, and 17 completed. Hard drive crash at end of day. System was unrecoverable; data from 6 transects lost.
Tuesday, August 29	Repaired equipment with spares and ordered two new hard drives. Weather/waves too bad to survey.
Wednesday, August 30	Predicted bad weather/waves for remainder of week. Packed and shipped broken equipment to Cary. Returned to Cary two days before planned break.
Sunday, September 10	All returned to Port Clinton (2130).
Monday, September 11	All equipment assembled and tested (OK). Small craft warnings, 3-5 ft waves. Worked on target picking and target reports all day.
Tuesday, September 12	Base Station set up UNDER Sky station. Started survey at 0800 in relative calm. Swells began building at end of Tr27. Completed Tr27, 25, 23, & 21. Rain began at Tr 25. Completed two north/south transits along the shore in helo area.
Wednesday, September13	Surveying by 0810. First two lines rock and roll in waves. Wind died at 1100, became glassy calm. Completed Tr19, 17, 15, 13, 11, 9, 7, 5, & 3. Finished Range 1 area. Few RTK dropouts-none bad. Equipment moved to Wild Wings marina. Base station set up on North control point.
Thursday, September 14	Rough water, no survey
Friday, September 15	Lines Tr93, Tr97, and WS 1 completed. MTA ferried back to Wild Wings from east end of site.

Table 2. Continued.

Day	Operations
Saturday, September 16	Super calm all night. MTA on Lake at daylight. Lost port platform cover half way to West Sister Is. Two hour ferry back to East End Marina. Manufactured port cover from starboard spare, silicone, new holes, & Gorilla tape. Moved back to Wild Wings marina. Helo crashed into Lake.
Sunday, September 17	Left dock at 0700. Winds south, water smooth for 1 mile. Waves built to 2 ft with following sea. Arrived at transect WS5 and started survey at 0830 with 3 ft waves from 150 deg. Broke weak link early in WS5, lost data could not recover position, took 3 hr to complete line. Broke 2 weak links early in WS9; lost ~ 1km of data - could not recover position because of seas. Wind improved and took good data on western half of WS9.
Monday, September 18	Rough water, no survey. Move boat to East End Marina. Pulled boat, left platform connected. Completed River target analysis - sent Spreadsheet to Herb. Completed analysis of common Airborne area - spreadsheet to Herb. Prepared 10 spreadsheets with 168 targets specified for dig list. Additional targets will come from northern transects.
Tuesday, September 19	Rough seas. Platform pulled (boat remains in water). Opened platform, patches worked pretty well. EM partially installed (cables missing). Checked EM noise levels (2 receivers at a time). Sent Geonics home.
Wednesday, September 20	2-4 ft waves. Survey not possible. Relaunched system.
Thursday, September 21	Depart East End Marina at 0800. Start WS19 at 1000. Start WS15 at 1230. Return to Beef Creek with great difficulty. Talked with Program Office and H. Nelson re finishing options. Chris departed to Cleveland at 1900.
Friday, September 22	Beef Creek at 0700. Lake to rough to survey. Pulled platform onto trailer. Pressure washed platform, coiled cable on top. Secured platform, boat, and box truck. Left Beef Creek for CLE at 1300. CLE-RDU at 1630.
Monday, October 9	Chet, Chris, Kevin return to Port Clinton
Tuesday, October 10	Seas too rough to survey
Wednesday, October 11	Seas too rough to survey
Thursday, October 12	Seas too rough to survey
Friday, October 13	DAQ Computer motherboard self destructed. Not possible to diagnose or repair in the field. Spare does not exist and no work-around is possible. All equipment packed for return to Cary.
Saturday, October 14	Chet & Chris return to Cary with vehichles, boat, platform, and equipment.
Monday, October 16	Vehicles returned to rental agencies. Demobilize equipment

when the wind lays, the lake level takes about 1 day to return to its average height. During periods of rising or falling water levels, the water flow in the Toussaint River is quite strong, with currents perhaps in excess of 3 knots in narrower parts of the river. During periods of average lake height we measured water depths in the dredged channel of the river. They range from ~1.2 meters near the mouth of the River to 2.5 meters in wider areas of the river where the shoreline is reinforced with rip rap. The channel is marked with red and white buoys, see Figure 5. The dredged channel width varies widely from as little as 2 meters (on occasion) at the mouth of the river up to perhaps 30 meters wide where Beef Creek and the Toussaint River merge. The depth of the channel becomes so shallow about 250 meters south of the Highway 2 Bridge that the boat and the sensor platform cannot proceed farther. Because the entire channel is relatively shallow and very tight, the tow cable length was reduced to 8 meters to survey the channel. Six passes were made to provide coverage of most of the dredged channel area. Figure 6 shows the tow vessel underway on August 30 during the river survey. It is apparent that the survey is taking place during a period when the river current was fairly strong, flowing from the Lake into the river.

Figure 7 shows the magnetic anomaly mapped data file superimposed upon a 1996 aerial photograph. The Davis-Besse nuclear power plant is located immediately north of the Toussaint River. The water intake (and exhaust) to the cooling tower stretches from the water channel below the beach well out into the Lake. The intake pipeline lies proud of the Lake bottom. Its location is shown on nautical maps and hand-held marine GPS displays.

Table 3. Lake Erie Daily Data Log

Date	File Name	16m Cable	22m Cable	Transect No.	Time (hr)	Distance (km)	Comments
17-Aug	Erie.1	√		Tr-29	2.83	13.90	Mag 8 noisy/loose actuator cable; Broke weak link
	Erie.2	√		Tr-31	1.75	11.72	
	Erie.3	√		Tr-33	2.03	12.86	
	Erie.4	√		Tr-35	1.93	12.90	
22-Aug	Erie.cal Aug22-1	√		N/A			Cal line (pipes and Rebar) Mag 8 noise back to normal
	Erie.5		√	Tr-37	1.63	12.83	
	Erie.6		√	Tr-39	1.90	13.40	Broke Weak Link
	Erie.7		√	Tr-41	1.79	13.38	
	Erie.8		√	Tr-43	2.05	13.76	Broke Weak Link
	Erie.9		√	Tr-45	0.50	3.69	
	Erie.cal Aug22-2a 22m		√	N/A			
23-Aug	Erie.cal Aug23		√	N/A			Cal Line (Pipes & Rebar)
	Erie.10		√	Tr-45b	1.52	11.09	
	Erie.11		√	Tr-47	0.54	3.24	Broke Weak Link
	Erie.12		√	Tr-47b	1.85	11.26	
	Erie.13		√	Tr-49	2.40	15.57	
	Erie.14		√	Tr-51	2.55	16.20	
24-Aug	Erie.15		√	Tr-53	2.17	16.08	
	Erie.16		√	Tr-55	2.80	16.12	
	Erie.17		√	Tr-57	2.01	15.14	Re-powered mags
	Erie.18		√	Tr-59	1.95	15.19	Re-powered mags
	Erie.19		√	Tr-61b	0.29	2.42	
25-Aug	Erie.20		√	Tr-61b	1.70	13.84	
	Erie.21		√	Tr-63	1.79	15.02	
	Erie.22		√	Tr-65	2.18	15.08	Broke Weak Link
	Erie.23		√	Tr-67	1.74	14.60	Re-powered mags
	Erie.24		√	Tr-69 & Tr-71	1.21	9.63	
	Erie.25		√	Tr-73b	0.61	4.96	
27-Aug	Erie.26		√	Tr-69b	1.74	10.07	
	Erie.27		√	Tr-73b	1.33	9.46	
	Erie.28		√	Tr-77	1.47	9.45	
	Erie.29		√	Tr-81	1.46	8.82	
	Erie.30		√	Tr-85b	1.39	8.40	
	Erie.31		√	Tr-89	2.35	12.11	
	Erie.32		√	Tr-85b	0.78	4.58	
30-Aug	Erie.39	N/A	N/A	N/A			Toussaint River Survey with 8m TC
12-Sep	Erie.40		√	Tr-27	1.90	10.88	
	Erie.41		√	Tr-25	1.73	9.83	
	Erie.42		√	Tr-23	1.55	9.18	
	Erie.43		√	Tr-21	1.77	10.66	Includes data from end of transect towards mouth of river
13-Sep	Erie.44		√	Tr-19	1.44	9.91	Includes data towards start of transect
	Erie.45		√	Tr-17	1.11	7.63	
	Erie.46		√	Tr-15	0.90	6.41	
	Erie.47		√	Tr-13	0.82	6.02	
	Erie.48		√	Tr-11	0.67	4.84	
	Erie.49		√	Tr-9	0.53	4.17	
	Erie.50		√	Tr-7 & Tr-5	0.74	5.50	
	Erie.51		√	Tr-3	0.22	1.26	Includes datafrom end of transect towards mouth of river
	Erie.52		√	N/A			Cal Line (Pipes & Rebar) Poor coverage of Rebar
15-Sep	Erie.54		√	Tr-93	2.11	8.07	
	Erie.55		√	Tr-97	3.05	11.95	
	Erie.56		√	WS-1	2.79	11.12	
17-Sep	Erie.58		√	WS-5	2.67	11.17	Broke Weak Link
	Erie.59		√	WS-9	3.01	11.65	Broke Weak Link Twice
21-Sep	Erie.63		√	WS-19	2.29	10.89	
	Erie.64		√	WS-15	2.19	11.81	
Total Survey of Transects (hr)					**85.70**		
Total Transect Distance (km)						**529.70**	

Figure 5. The MTA survey boat is shown approaching the mouth of the Toussaint River. Note the red and white channel marking buoys.

Figure 6. The MTA boat is shown underway surveying on the Toussaint River. The survey direction is toward the mouth of the River.

Figure 7. The Toussaint River survey magnetic anomaly map is shown overlaid on a 1996 aerial photograph.

Figure 8 shows the eastern most 250 meters of the River survey as a magnetic anomaly image. Twenty-six targets that were chosen for analysis are shown in the image. These results of the analysis and the targets that were chosen for intrusive investigation are discussed in a later Section of this document. Data clips, at this same resolution of the remainder of the River survey are shown in **Appendix A** of this document.

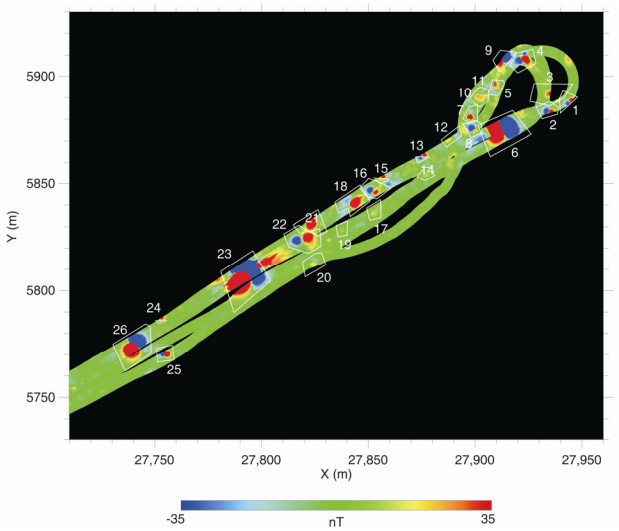

Figure 8. Magnetic anomaly image of the eastern most 250 meters of the Toussaint River survey. The white polygons show the areas of the data chosen for analysis of the individual targets.

2.4 Calibration Targets

On 16 August, areas north of the mouth of the Toussaint River were investigated to determine a suitable location for installation of the pipe and rebar calibration targets. A site was chosen about 300 meters north of the mouth of the river just to the west of the buoy line marking the channel. Water depths along this north/south line varied from 9 to about 13 feet. On 17 and 18 August the pipe targets and the rebar sections were installed. This was accomplished by stretching a rope (with knots at fixed intervals) between two weights. The pipes or rebar targets were installed at the knots and small drop weights with buoys were placed at each of the installed targets. The target locations were determined using GPS from the chase boat. The lines from each of the targets were pulled taught vertically and the GPS was used to acquire the float position. Unfortunately, sea state conditions were not ideal during either the installation or reacquisition of the calibration targets. Wave heights exceeded 2 feet on both days.

Figures 9 and 10 show magnetic anomaly images from surveys over the calibration targets taken on August 22. Both 16 meter and 22 meter cable lengths were used during this survey. There are about 8 passes back and forth over the targets. Both the pipe and rebar images are shown at two different sensitivity scales. The pipe sections are of four different sizes approximating 60 mm and 81 mm mortars, 2.75 in warheads, and 105 mm projectiles. The smallest pipe sections (Numbers 3 and 10) are not detectable at these scales. The 81 mm surrogate (Numbers 2 and 6) are just detectable. These images appear noisy because there are many sensor passes over the targets that have been superimposed and because there is a fair amount of small background clutter in the area. Images such as these are used to calibrate (at a fine scale) the layback distance corrections and the tow point angle corrections for the two different length cables. The registration of the targets is excellent (except for Rebar Number 8). The misregistration of this target was likely the result of the tow vessel and the sensor platform being in a turn during one of the passes.

The white crosses shown in Figures 9 and 10 are the locations of the targets as determined by the GPS reacquisition the day following their placement. It is apparent that neither the placement of the targets nor their GPS reacquisition was carried out with precision. The techniques that we

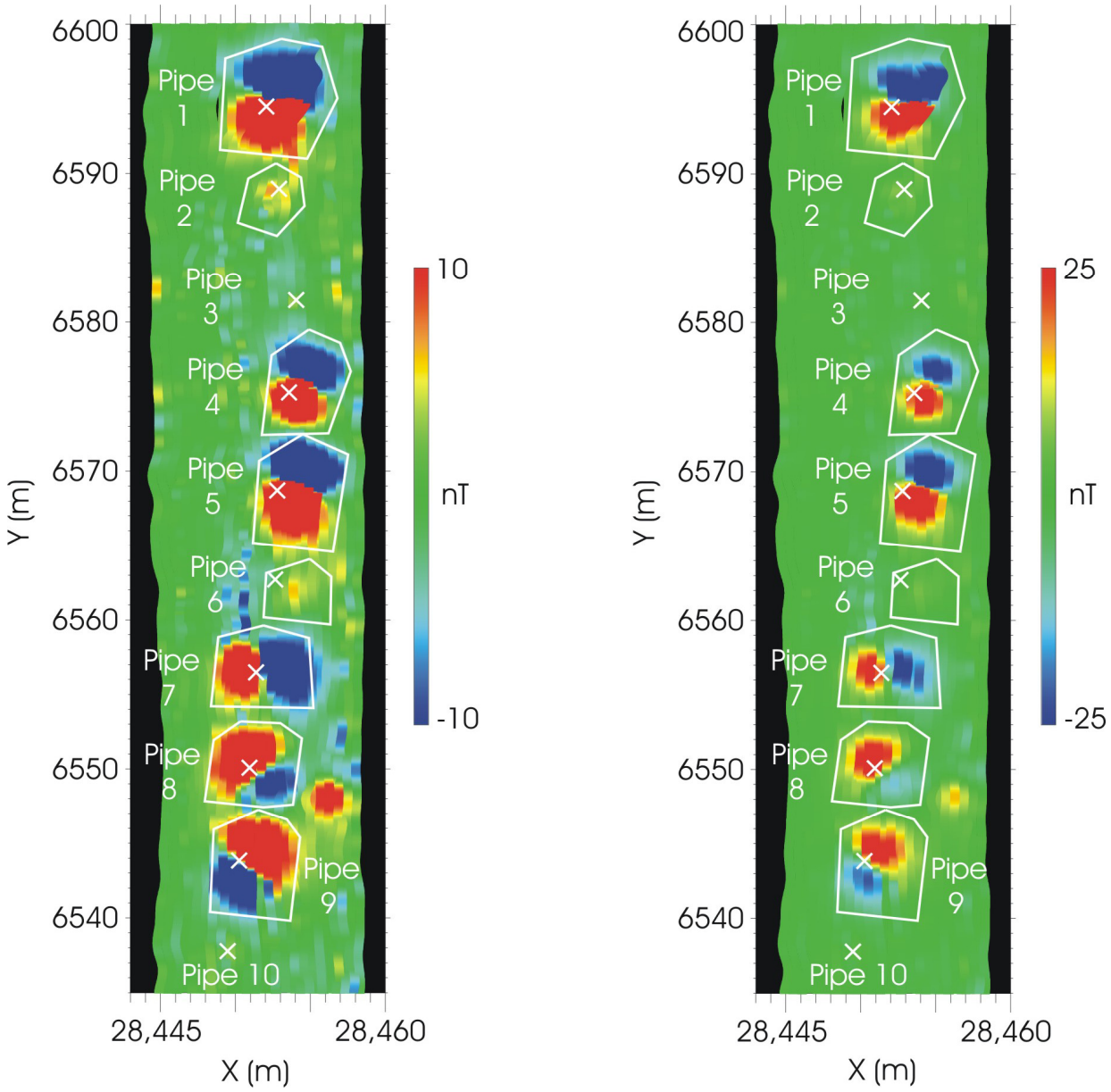

Figure 9. Magnetic anomaly images are shown for the pipe surrogate targets at two presentation scales. The white crosses are the target positions reacquired using GPS from the chase boat.

used for the target placement and position reacquisition were the same that we used during the Duck demonstration of the MTA and similar to the approach used by the Navy EOD divers placing calibration and POS targets in Ostrich Bay prior to the MTA demonstration. In both of these prior instances the water (wave) conditions were approximately calm during these operations. In Duck, the water depths were approximately half those in Lake Erie. The water depths in Ostrich Bay were approximately the same as those in Lake Erie. The calibration target location accuracy in Duck was approximately 20 cm. The accuracy in Ostrich Bay was just under 1 meter. However, the entire POS and Calibration sites had to be installed a second time to get the positioning better than 1 meter.

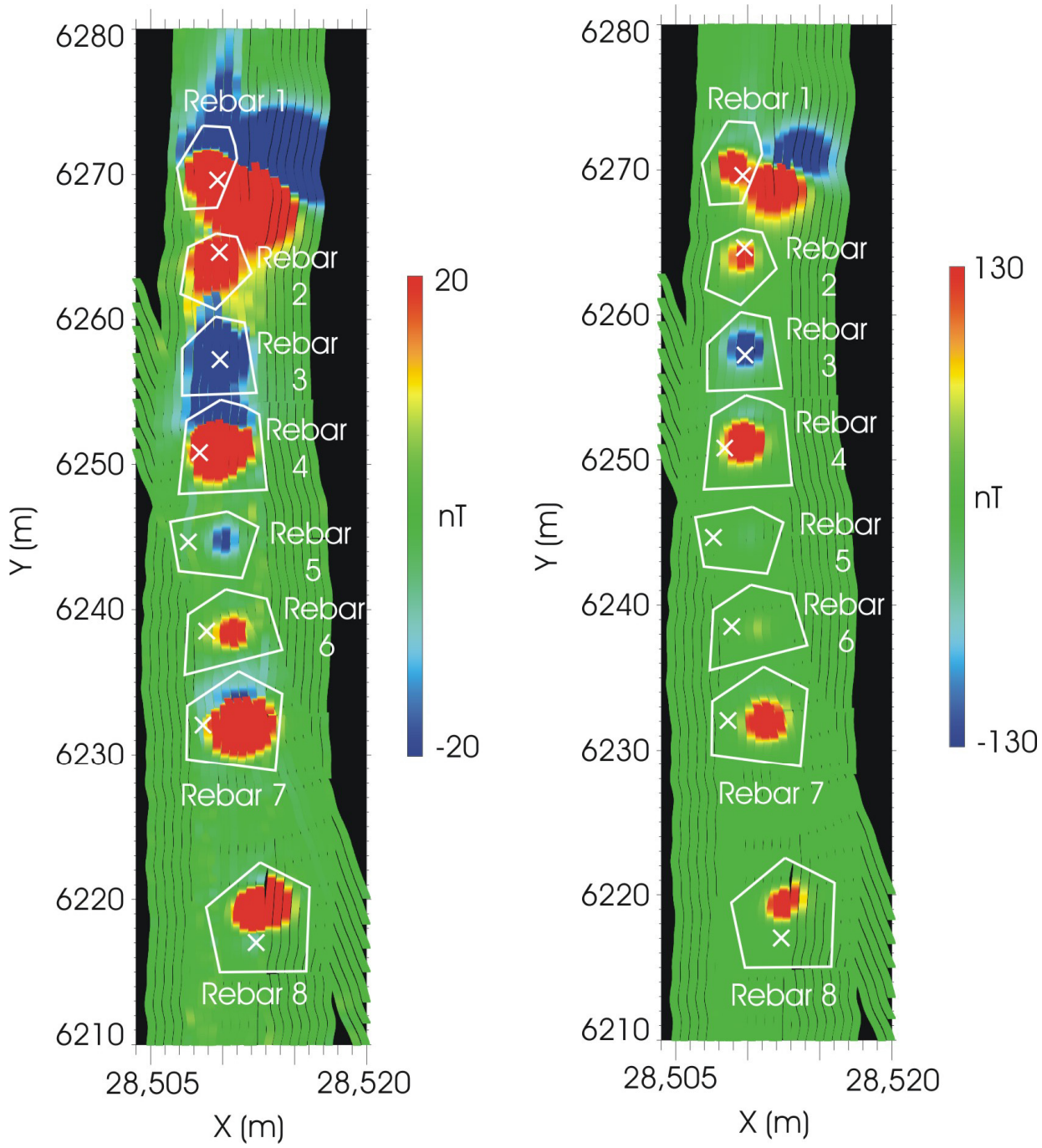

Figure 10. Magnetic anomaly images are shown at two different scales from the survey of the rebar targets. The white crosses mark the target positions reacquired by GPS from the chase boat.

This approach for placement and reacquisition of targets is clearly not accurate enough to use in the sea state conditions and at the water depths encountered on Lake Erie. Table 4 shows a comparison of the GPS-measured positions and the survey target fitting positions for the pipe and rebar targets.

It is apparent from the images in Figures 9 and 10, and from the target fits that some of the pipe sections and the rebar sections have significant remnant moments. It would have been better if these targets were degaussed before they were used. However, their remnant moments do not

Table 4. Comparison of the calibration target positions from GPS measurements and from fitting of survey data.

Calibration Target ID	DAS Analysis Results				GPS Positions		Difference
	Size (m)	Fit Quality	UTM X (m) fit	UTM Y (m) fit	UTM X (m)	UTM Y (m)	GPS-FIT (m)
Rebar No. 1	0.191	0.864	328508.93	4606270.78	328509.65	4606269.61	1.4
Rebar No. 2	0.159	0.835	328509.53	4606263.92	328509.78	4606264.64	0.8
Rebar No. 3	0.204	0.929	328509.99	4606257.90	328509.82	4606257.25	0.7
Rebar No. 4	0.270	0.970	328509.87	4606251.47	328508.41	4606250.81	1.6
Rebar No. 5	0.090	0.886	328510.02	4606244.82	328507.62	4606244.66	2.4
Rebar No. 6	0.103	0.870	328510.72	4606238.24	328508.90	4606238.53	1.8
Rebar No. 7	0.234	0.931	328511.33	4606232.11	328508.63	4606232.06	2.7
Rebar No. 8	0.221	0.918	328512.61	4606219.36	328512.33	4606217.03	2.4
					Average Miss Distance		1.7
Pipe No. 1	0.187	0.706	328453.55	4606595.03	328452.06	4606594.49	1.6
Pipe No. 2	0.062	0.657	328452.41	4606588.30	328452.91	4606588.97	0.8
Pipe No. 3					328454.05	4606581.47	
Pipe No. 4	0.149	0.925	328454.59	4606575.85	328453.57	4606575.28	1.2
Pipe No. 5	0.184	0.927	328454.03	4606569.08	328452.79	4606568.71	1.3
Pipe No. 6	0.085	0.752	328453.22	4606562.51	328452.65	4606562.70	0.6
Pipe No. 7	0.157	0.918	328451.87	4606556.83	328451.37	4606556.47	0.6
Pipe No. 8	0.150	0.914	328451.55	4606550.21	328450.94	4606550.09	0.6
Pipe No. 9	0.169	0.905	328450.91	4606543.93	328450.25	4606543.84	0.7
Pipe No. 10					328449.48	4606537.78	
					Average Miss Distance		0.9

significantly affect the fit target positions. It should also be noted that a large indigenous target (likely a 155 mm projectile) lies very close to rebar target Number 1.

During the course of the survey operations, following storms that generated 6-8 foot waves, we observed that some of the pipe targets had been moved a small distance by the wave action associated with the storms.

It was our intent to survey the calibration targets each day when leaving or returning to the Beef Creek Marina. During the course of operations, the majority of the time the MTA was parked at marinas several miles from the calibration targets. We returned to Beef Creek for two periods during the operations. On each of these occasions the calibration targets were again remeasured. It is our belief based upon the analysis of the individual targets from single passes and from the registration of the targets from overlaying many passes that the measurement error associated with the target positions was likely the ±20 cm typical or earlier deployments. This implies that the majority of the position error in Table 4 resulted from the techniques used for the

emplacement and initial position measurements. We are developing new techniques to improve this process.

2.5 Survey Data

As shown in Table 3, the actual site survey was carried out between 17 August and 21 September. The survey crews were also on site the entire second week of October to conduct additional surveys, but were unable to get onto the Lake because of rough water conditions. Figure 11 shows transects that were actually surveyed. South of Transect 70 (as shown in Figure 4) the odd numbered transects were surveyed. The survey lines are shown in yellow superimposed upon the edited NOAA marine map. North of transect 70 every fourth transect was surveyed. In the extended survey area, five roughly equally spaced transects were surveyed. We returned in October with the intention of finishing the western parts of Transects 77, 81, and 93 and completing additional Transects in the extended survey area. Adverse weather conditions did not allow these surveys to be completed.

There were a few short missed areas on Transects TR57, Tr59, WS5, and WS9 that resulted when the tow cable weak link parted and the wave conditions were so rough that we could not return to the required position to completely fill in the missed area. There were also a few other survey lines where we deviated from the planned transect line (Tr69, WS1, and WS15). This was caused either because the water over the reefs was too shallow to survey, or because fishing boats were anchored on the transect line.

Between TR31 and TR19 we surveyed several lines parallel to the shoreline. These passes were intended to overlap with the Airborne survey to provide some common survey areas and targets for comparison of the MTA and the Airborne systems.

2.5.1 Data Preprocessing – The Automatic Target Picker As part of the data preprocessing we applied a threshold-based automated target picker to the data to isolate likely targets. The threshold was chosen to exclude very small targets (those likely too small to be projectiles) and the target picker was run to exclude targets that did not have more than half of the target signature included in the survey data. The automatic target picker choices are shown in Figure 11 as red diamonds superimposed on the yellow survey transects. Approximately 5,500 targets were chosen by the automated target picker. Scaling this information, based upon the fraction of the area that was actually surveyed, we estimated that a comprehensive survey of the entire site would yield 400,000-500,000 targets.

2.5.2 Target Analysis – Creation of the Dig List The MTADS data analysis system, adapted from the airborne MTADS DAS for the Marine Towed Array, was used to analyze individual anomalies. To analyze an individual anomaly an analyst boxes the area of interest in the mapped data file image using the computer mouse. These data are extracted from the dataset and submitted to a dipole fitting routine for analysis. The analysis routine applies a 3-dimensional fit to the 3-dimensional data, conducts an iterative fit of the anomaly to a dipole signature and returns the coordinate position of the target, its magnetic moment, the orientation of the induced dipole in 3 dimensions and the depth of the target (derived from its height above the ellipsoid). The magnetic moment and the depth of the target are used to derive an approxi-

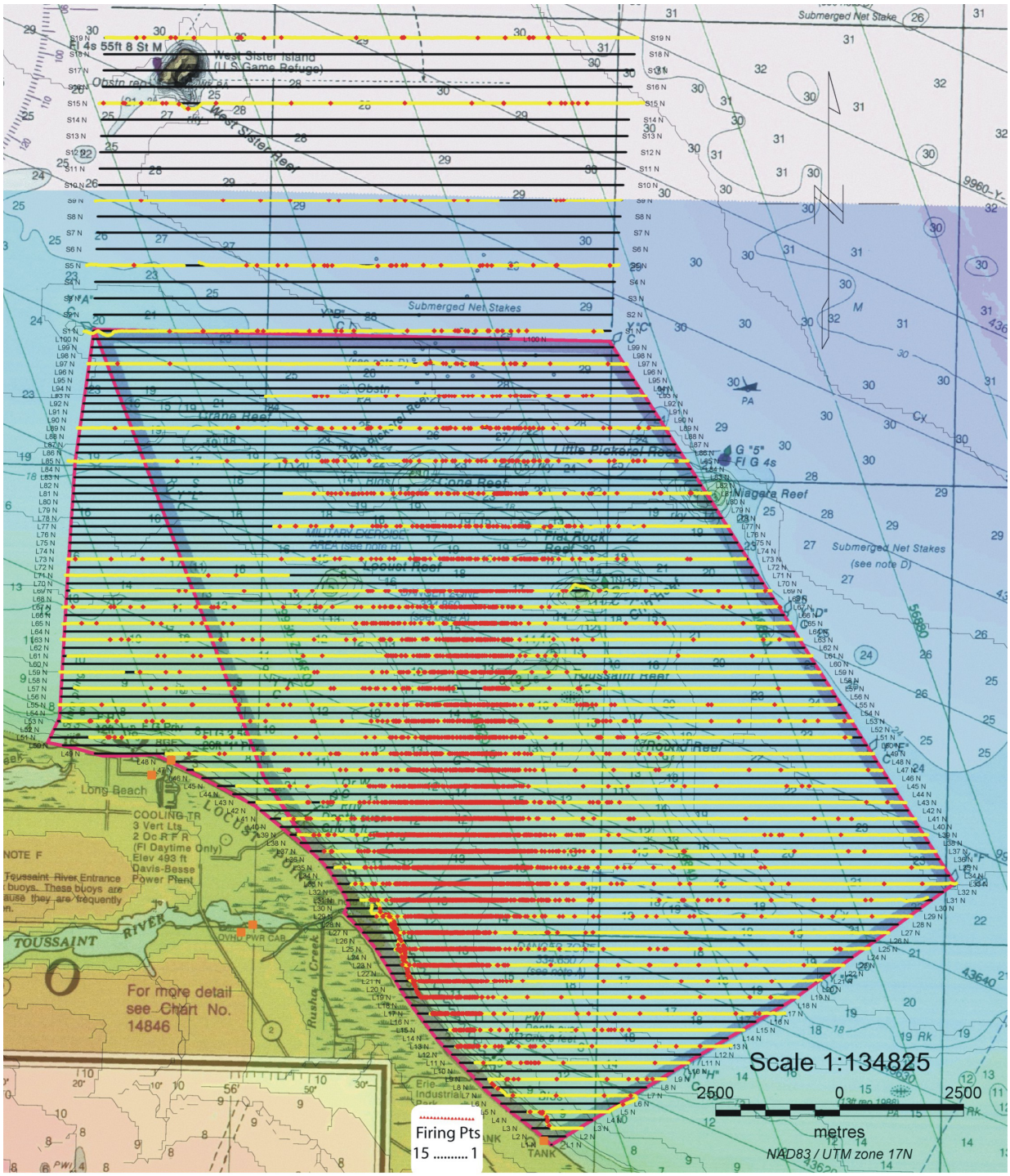

Figure 11. The main site transects that were surveyed are shown in yellow. The red diamonds show the targets chosen by the automated target picker, as explained in the text. The red triangles at the base of the image show the locations of the 15 fixed firing positions that were used for proof firing projectiles.

mate size of the target, assuming a cylindrical shape with an aspect ratio of 3 or 4 to 1. These parameters are reported for each target in the analyzed target list.

The individual areas of the survey that were chosen for analysis are described in Section 3. In general we chose targets for analysis only if the peak of the anomaly signal was contained within the bounds of the individual transect. Targets lying closer to each other than ~3 meters were excluded from analysis to assure that the targets that the divers recovered corresponded to the analyzed target on the dig list. Individual targets were excluded from analysis if their signatures were visibly very unlike typical ordnance anomaly signatures. Following a trial fit of an anomaly, if the fit parameters were indicative of multiple contributing targets or were too massive to be the result of the largest projectiles known to have been fired on the range, they were excluded from the analysis. Targets with fit depths more than 0.6 m below the sediment surface remained on the target fit list, but were not included in the recommended dig list.

3.0 Survey Results

Magnetic anomalies in the Lake Erie survey data were analyzed using the MTADS DAS as adapted for analyzing MTA survey data. Data were analyzed in five separate groups in accordance with the Program Office direction.

Group 1. All data in transects TR35, TR37, TR89, WS15, and WS19 were analyzed. These data were chosen as indicative of the main site survey. Transects further south were not analyzed because they lie within Range 1, the currently active range fan for Camp Perry. It was assumed that it would be difficult for divers to work within the active range area. The transects named above sample the southern, midrange, and northern limits of the former Range 2 fans.

Group 2. All magnetic anomalies in the survey of the Toussaint River were analyzed.

Group 3. Selected magnetic anomalies offshore from the Davis-Besse nuclear power plant were analyzed. This area lies west of the range fans described in Chapter 1 of this report and would presumably represent background clutter from indigenous metallic objects not associated with the Erie Army Depot or Camp Perry.

Group 4. The Program Office requested that we identify magnetic anomalies associated with the relatively shallow water areas described as reefs in the NOAA nautical charts. These areas are primarily used by sport fishermen (and are often crowded with boats). Targets were chosen for investigation that are associated with six of the named reefs in the Range 2 area.

Group 5. Several survey passes were made parallel to the shoreline between transects TR19 and TR31. We analyzed targets in these shallow water areas for comparison with the airborne survey.

3.1 The Toussaint River Survey

Figure 7 shows the Toussaint River survey magnetic anomaly image superimposed upon an aerial photograph of the area. Figure 8 shows a more detailed image of about 250 meters of the survey nearest the mouth of the River. Figure 8 shows 26 magnetic anomalies in this area that were boxed for analysis using the MTADS Data Analysis System (DAS). Appendix A shows this image and the other six images at the same resolution, which comprise the entire river survey. The target analyst chose 128 anomalies from the River Survey for analysis. Twelve of these anomalies (or partial anomalies) were categorized as likely buoys. These were marked so that their positions could be checked when targets were being reacquired. The majority of the anomalies in the river were either too large or their signatures were too complex for them to be ordnance. For 16 of the anomalies, the DAS failed to converge on a fit; in another 19 cases the fit quality was <0.85 (indicative of a target that could not be fit to a single dipole image. In an additional 13 cases that resulted in a satisfactory fit, the predicted target size diameter was >300 mm. Two pipelines were visibly identified that crossed the River in the survey area. It is likely that several of the large and complex targets were moorings that had been lost from previous buoys that marked the channel. The analyst chose 28 anomalies as potential ordnance and as suitable for recovery. This Dig List and the Target Report as submitted to the Program Office is

Table 5. Target dig list and dig results from the survey of the Toussaint River

AETC TARGET ANALYSIS											Diver Comments and Information						P.I. Comment
AETC Target ID	Nelson List Targ. ID	UTM X (m)	UTM Y (m)	Water Depth (m)	Max. Signal (nT)	Min. Signal (nT)	Size (m)	Burial Depth (m)	Fit Quality	Analyst Comments	Targ. Burial Depth (ft)	Targ. Size (in)	OE ID	Targ. Wt. (lb)	Attitude	Diver Comment	
Riv-21	TRU-1	327823.81	4605831.96	1.9	247.8	-8.9	0.278	0.5	0.792	very large target	-	-	-	-	-	Silt & Mud Bottom, Target deeper than 2 ft	
Riv-25	TRU-2	327754.84	4605770.89	1.9	118	-129.5	0.179	0.0	0.966	good target	-	-	-	-	-	Silt & Mud Bottom, Target deeper than 2 ft	
Riv-30	TRU-3	327687.06	4605743.41	1.9	107.3	-105.7	0.217	0.1	0.990	good target	14"	48"	-	8	Horizontal	Silt & Mud Bottom, Steel fence post	
Riv-32	TRU-4	327631.78	4605710.16	2.7	122.9	-140.6	0.207	0.0	0.986	large target, large remnant moment	-	-	-	-	-	Silt Bottom, Target deeper than 2 ft	
Riv-38	TRU-5	327563.14	4605688.72	2.7	50.4	-13.1	0.149	0.3	0.948	good target	2	2X2	-	150	Horizontal	Silt & Mud Bottom, Metal Box, Too heavy to lift	
Riv-39	TRU-6	327552.88	4605690.61	2.6	265.9	-55.7	0.276	0.4	0.987	very large target	2	-	-	-	North	Silt & Mud Bottom, Al Cans	Diver Missed Target
Riv-42	TRU-7	327399.10	4605631.16	1.9	14.3	-13.1	0.094	0.1	0.910	small target, likely too deep to dig	1	4'X1/8"	-	1	North	Silt & Mud Bottom, Piece of Wire	
Riv-43	TRU-8	327393.11	4605628.32	2.0	20.7	-2.7	0.100	0.3	0.914	good target	1	3"	-	0.25	Horizontal	Silt & Mud Bottom, Shotgun Shell	Diver Missed Target
Riv-45	TRU-9	327367.74	4605606.56	1.8	32.8	-39.5	0.131	0.0	0.987	target south edge of channel, strong remnant moment	1	25	-	30	Horizontal	Silt Bottom, Steel Belted Tire	
Riv-48	TRU-10	327300.09	4605624.13	1.9	67.1	-42.8	0.138	0.0	0.941	good target north edge of channel	2	-	-	-	-	Silt Bottom, Target located, deeper than 2'	Diver Missed Target
Riv-53	TRU-11	327224.23	4605666.65	1.8	25.1	-28.4	0.154	0.5	0.899	good target in center of channel	2	-	-	-	-	Silt Bottom, Target is soda cans	Diver Missed Target
Riv-60	TRU-12	327153.99	4605715.48	1.8	22.5	-13.2	0.133	0.6	0.945	good target	1	8	-	0.25	Horizontal	Silt & Mud Bottom, Target is soda cans	Diver Missed Target
Riv-70	TRU-13	327039.96	4605758.48	1.9	16.9	-6.7	0.068	0.0	0.897	very small target, north edge of channel	0	10	-	20	Horizontal	Silt & Mud Bottom, Boat Anchor	
Riv-71	TRU-14	327031.77	4605759.46	1.9	35.9	-5.4	0.082	0.0	0.962	small target, north edge of channel	2	10	-	0.25	Horizontal	Silt & Mud Bottom, Wire	
Riv-73	TRU-15	326962.98	4605770.47	1.9	43.7	-28.1	0.098	0.0	0.979	small target	2	-	-	-	-	Silt & Mud Bottom, Target located deeper than 2'	
Riv-74	TRU-16	326893.18	4605784.72	1.9	80.8	-27.6	0.115	0.0	0.979	good target, north edge of channel	2	-	-	-	-	Silt & Mud Bottom, Target located deeper than 2'	
Riv-79	TRU-17	326793.19	4605812.80	1.9	142.2	-32	0.208	0.2	0.969	large target, center of channel	2	-	-	-	-	Mud Bottom, Can't reach targ below 2'	
Riv-83	TRU-18	326668.49	4605860.29	1.9	51.6	-22	0.135	0.0	0.923	good target, south edge of channel	20"	11"X3"	-	25	Horizontal	Mud Bottom, Metal Clump	
Riv-84	TRU-19	326652.14	4605865.02	1.9	46.1	-46.4	0.135	0.0	0.951	good target, middle of channel	2	-	-	-	-	Mud Bottom, Can't reach targ below 2'	
Riv-87	TRU-20	326555.86	4605878.84	1.8	22	-12.9	0.110	0.2	0.958	small target in center of channel, likely too deep to dig	2	-	-	-	-	Soft Mud Bottom, Can't reach targ below 2'	
Riv-94	TRU-21	326448.01	4605853.60	1.7	33.8	-32.3	0.083	0.0	0.894	eastmost of a group of small clutter targets	3	-	-	-	-	Soft Mud Bottom, Can't reach targ below 3'	
Riv-109	TRU-22	326310.98	4605849.46	1.7	24.3	-20.5	0.125	0.1	0.970	small target, mostly remnant	2	-	-	-	-	Soft Mud Bottom, Can't reach targ below 2'	
Riv-110	TRU-23	326303.08	4605829.30	1.8	103.4	-8	0.120	0.0	0.962	good target	2	-	-	-	-	Mud Bottom, Can't reach targ below 2'	
Riv-111	TRU-24	326268.73	4605834.71	1.8	94	-20	0.145	0.1	0.957	good target, center of channel	0.5	4"X4"	-	0.25	Horizontal	Soft Mud Bottom, Small Can	Diver Missed Target
Riv-113	TRU-25	326200.25	4605814.55	1.8	67.5	-8.4	0.121	0.0	0.962	good target	3	-	-	-	-	Soft Mud Bottom, Can't reach targ below 3'	
Riv-116	TRU-26	326194.19	4605811.90	1.9	14.1	-6.9	0.064	0.0	0.892	clutter target	2	3'X3'	-	300	Straight Down	Soft Silt & Mud Bottom, Concrete Block, Not Recovered	Diver Missed Target
Riv-117	TRU-27	326189.44	4605814.96	1.8	30	-3.7	0.098	0.1	0.969	good small target	2	-	-	-	-	Soft mud Bottom, Can't reach targ below 2'	
Riv-123	TRU-28	325982.65	4605807.90	1.8	29.4	-23.5	0.146	0.3	0.935	partial signature	2	-	-	-	-	Soft Silt & Mud Bottom, Can't reach targ below 2'	

included in Appendix B of this document. Table 5 shows the analyst predictions and target recovery results for the 28 targets that were intrusively investigated. The final report written by EOTI[13] following their recovery operations details the results of each of the target dives. These results have been integrated into the Tables below, which correlate the analyst's predictions with the dive results. Appendix D contains the EOTI final report.

At the very narrow mouth of the river the bottom is sand, which is constantly scoured away or replaced by the strong currents in the river that are controlled by the rising and falling of the water level in the Lake. During the warmer parts of the year, this area is almost constantly being dredged by a dragline that is permanently located on a barge to keep the channel open for boats that are resident in the two marinas on the river.

The bottom of the remainder of the river is soft silt or mud, which is very deep in parts of the channel. The mud made it difficult for divers to recover many of the targets. No recovery was made for one-half of the targets on the dig list; the diver explanation was that the mud was too deep to touch the target, which in most cases could be detected using a hand-held sensor. In six other cases, we concluded that the diver recognized (or recovered) an object that was not specified by the analyst. In several cases the recoveries were objects (soda cans, concrete blocks) that are not detectable with magnetometers. In other cases (expended shotgun shell or a piece of wire), the objects were too small to be associated with the analyzed target. There were no ordnance-related objects recovered in the Toussaint River (except the expended shotgun shell).

3.2 The Davis-Besse Impoundment Area

The area north of the Davis-Besse property shoreline and west of the Range 2 fans lies immediately adjacent to the primary impact areas associated with the proof testing of projectiles and gun barrels. We analyzed 24 magnetic anomalies associated with parts of 8 different survey transects (Tr51, Tr53, Tr55, Tr61, Tr63, Tr67, Tr69, and Tr73) in this area. Thirteen of these were declared as possible UXO. The Dig List/Target Report is included in Appendix B. Divers reacquired and dove on 11 of these targets. Table 6 shows the analyst's predictions and the diver's observations for these targets.

This entire area was described as having a rocky or hard clay bottom, unlike much of the remaining area (except the reefs), which have either a sandy or mud bottom. There were no UXO identified or recovered from this area. Four of the eleven magnetic anomalies were ascribed to magnetic geological features, four were lost or abandoned boat anchors, and the remainder were boat parts or pieces of scrap metal. See Table 6 for the documentation.

3.3 Areas common to the Airborne Survey

Several survey lines were run parallel to the shoreline between MTA survey transects Tr19 and Tr31. These shallow water data, in addition to the western ends of the overlapping transects, were analyzed for comparison with the Airborne survey data. Some magnetic anomaly image clips showing the anomalies chosen for analysis, are included in Appendix A. We chose 124 anomalies from this area as likely to be UXO. The AETC dig list is included in Appendix B.

Table 6. Target dig list and dig results from the survey of the Davis-Besse Impoundment Area

AETC TARGET ANALYSIS										Diver Comments and Information						
AETC Target ID	Nelson List Targ. ID	UTM X (m)	UTM Y (m)	Water Depth (m)	Max. Signal (nT)	Min. Signal (nT)	Size (m)	Burial Depth (m)	Analyst Comments	Targ. Burial Depth (in)	Target Length (in)	OE Type	Orientation	Weight (lb)	Attitude	Diver Narrative
TR55-2	TRU-208	324531.09	4610143.48	3.2	19	-3.9	0.091	0.09	small target	0.0	48.0	Other	North	1000	Horizontal	Rocky bottom - large hot rock - unable to recover
TR55-3	TRU-209	325092.60	4610137.63	3.5	23.1	-5.7	0.114	0.36	105mm?	0.0	10.0	Other	North	10	Horizontal	Rocky bottom - hot rock (10 in by 10 in)
TR61-1	TRU-210	324395.86	4611125.75	3.7	35.1	-22.1	0.153	0.27	155mm?	0.0	36.0	Scrap	East	50	Horizontal	Rocky bottom - anchor - same item as target TRU-244
TR61-3	TRU-211	325270.80	4611126.55	3.9	33.8	-16.8	0.142	0.12	155mm?	0.0	18.0	Scrap	South	20	Horizontal	Rocky bottom - metal scrap
TR63-2	TRU-212	323816.91	4611456.03	4.1	36.9	-33.6	0.171	0.36	155mm+?	0.0	30.0	Scrap	East	15	Horizontal	Rocky bottom - anchor
TR67-1	TRU-213	322692.44	4612115.43	4.8	31.4	-4.5	0.104	0.03	105mm?	0.0	12.0	Scrap	North	15	Horizontal	Rocky bottom - steel round anchor
TR67-3	TRU-214	323853.50	4612114.43	4.7	41.5	-26.4	0.160	0.24	155mm?	6.0	14.0	Scrap	South	20	Horizontal	Rocky bottom - scrap metal piece (14 in by 18 in)
TR69-2	TRU-215	324967.51	4612445.28	4.8	45.1	-32.4	0.166	0.25	155mm?	0.0	8.0	Scrap	South	6	Horizontal	Rocky bottom - boat carburetor
TR73-1	TRU-216	322741.23	4613105.97	5.6	23.2	-7.3	0.128	0.45	good target	NA	NA	NA	NA	NA	NA	Rocky bottom - contact under 10 ft wide bolder - not recovered
TR73-2	TRU-217	323463.08	4613104.42	5.6	13.1	-6.4	0.100	0.23	105mm?	NA	NA	NA	NA	NA	NA	Hard clay / rock bottom - no contact
TR73-3	TRU-218	324095.14	4613107.22	5.7	50.8	-29.3	0.162	0.20	155mm?	0.0	48.0	Scrap	South	20	Horizontal	Hard clay / rock bottom - old boat anchor

The dig list provided by the Program Office to the divers contained only 6 anomalies common to both the MTA and the Airborne surveys, and an additional 12 anomalies exclusively from the airborne data. Of these combined 18 targets, the divers identified seven 155 mm projectiles and two 2.75 in warheads. The two remaining MTA targets were declared as too deeply buied to dig. Three of the Airborne-only targets were declared to be "dry holes." The remaining targets were metallic scrap. The information is documented in Table 7.

3.4 The Reef Areas

Most of the reef areas described below that lie within the impact area fairly gently rise from the depth of the major part of the lake to within 5 or 10 feet of the surface. The rise is slow enough that we could survey directly over the reefs without worrying that the sensor platform could not accommodate the rising bottom. The exception is Crib Reef which rises fairly abruptly to within 1 foot of the surface. There is a buoy placed on the shallowest point. Each of these reefs lies several miles from the nearest shoreline. Apparently, the reefs or their associated bottom structure attract fish, because these are the areas where fishing boats congregate in large numbers. The Program Office was interested in knowing whether magnetic anomalies adjacent to the reefs are UXO, which might pose a threat to fishermen, or were predominantly metallic clutter associated with the fishing boats.

The survey transects that passed over on near the reefs did not show an excessive number of magnetic anomalies compared to the surrounding areas. Targets were analyzed that were specifically associated with six of the reefs: Cone Reef, Crib Reef, Little Pickerel Reef, Round Reef, Toussaint Reef and Flat Rock Reef. The AETC Dig Lists/Target Reports that were turned in to the Program Office are provided in Appendix B.

The Program Office Dig List that was provided to the Dive Team contained 36 targets. The results are documented in Table 8. From the 36 dive, the Dive Teams identified/recovered ten 155 mm projectiles, three 105 mm projectiles, one 90 mm projectile, two 75 mm projectiles, and one 4.2 in mortar. In addition, on Toussaint Reef a group of shrapnel pieces were recovered, which were the result of a high-order detonation of a projectile. Thirteen of the dives did not result in a target recovery either because the target was buried too deeply, it could not be isolated, or the object was identified as a "hot rock." The remaining targets were metallic scrap, including anchors and one 55 gallon drum.

The fraction of the dives on the reef areas that resulted in recovery of intact ordnance was slightly lower than that of the entire impact area. This was not because of a large amount of metallic debris left by fishermen, but rather resulted from the rocky bottom surface (some of it geologically active) that prohibited the divers from excavating into the bottom to recover targets.

Table 7. Target dig list and dig results from the common MTA and Airborne surveys

AETC TARGET ANALYSIS												Diver Comments and Information						
AETC Target ID	Nelson List Targ. ID	UTM X (m)	UTM Y (m)	Helo UTM X (m)	Helo UTM Y (m)	Water Depth (m)	Max. Signal (nT)	Min. Signal (nT)	Size (m)	Burial Depth (m)	Analyst Comment	Burial Depth (in)	Length (in)	OE Type	Orientation	Wt (lb)	Attitude	Diver Comment
Air-63	TRH-100	329133.91	4605645.03	329134.20	4605645.27	1.9	59	-122	0.34	0.8	massive target	NA	NA	NA	NA	NA	NA	Contact below 2 feet
Air-101	TRH-101	329433.15	4604793.75	329434.65	4604793.80	2.1	68	-34	0.18	0.3	large projo	24	24	155mm	Straight Down	90	Vert	155mm below 2 Feet - Not recovered
Air-102	TRH-102	329439.91	4604772.44	329438.96	4604770.44	2.1	96	-56	0.19	0.2	large projo	NA	NA	NA	NA	NA	NA	Strong contact below 2 feet
Air-103	TRH-103	329456.32	4604720.67	329457.22	4604720.60	2.1	111	-43	0.20	0.2	large projo	6	24	155mm	North	90	Hor	Mud Bottom
Air-104	TRH-104	329444.60	4604693.45	329518.47	4604589.26	1.9	29	-19	0.13	0.1	projo	26	48	2.75 in Rocket	60 Deg Down	25	60 Deg Down	Hard Mud - Not Recovered - Assumed Fuzed
Air-105	TRH-105	329498.16	4604629.38	329574.41	4604481.35	2.1	28	-8	0.10	-0.1	105mm	6	48	2.75 in Rocket	E	25	Hor	Mud - Not Recovered - Fuzed
	TRH-106			329345.56	4604761.77							12	24	155mm	N	90	Hor	Sand - Not Recovered - Fuzed
	TRH-107			329294.77	4604739.73							12	24	155mm	N	90	Hor	Sand
	TRH-108			329301.82	4604693.06							0	72	Scrap	E	5	Hor	Sand - Metal Rod
	TRH-109			329371.50	4604678.29							8	24	155mm	N	90	Hor	Sand / Mud
	TRH-110			329360.10	4604665.34							30	24	155mm	Straight Down	90	Vert	Mud - Not Recovered
	TRH-111			329426.14	4604551.17							6	24	155mm	N	90	Hor	Sand - Not Recovered - Fuzed
	TRH-112			329124.82	4604745.03							6	96	scrap	W	40	Hor	Sand - 12 in dia pipe - too big to dig out
	TRH-113			329111.53	4604758.68							12	6	Scrap	E	1	Hor	Steel Can - Sand
	TRH-114			329098.27	4604719.44							NA	NA	NA	NA	NA	NA	No Contact
	TRH-115			329098.64	4604709.04							NA	NA	NA	NA	NA	NA	No Contact
	TRH-116			329164.54	4604557.02							16	96	Scrap	N		Hor	Steel I-beam - too big to dig out
	TRH-117			329161.52	4604571.68							NA	NA	NA	NA	NA	NA	No Contact

Table 8. Target dig lists and dig results from areas around the reefs

Cone Reef Dig List With Dive Results

AETC TARGET ANALYSIS										Diver Comments and Information						
Target ID	Nelson List Targ. ID	UTM X (m)	UTM Y (m)	Water Depth (m)	Max. Signal (nT)	Min. Signal (nT)	Size (m)	Burial Depth (m)	Analyst Comments	Burial Depth (in)	Length (in)	OE Type	Orientation	Wt. (lb)	Attitude	Narrative
TR81-1	TRU-201	329154.60	4614425.64	6.6	91.7	-25.5	0.186	0.11	large target, dig	NA	NA	NA	NA	NA	NA	Sand / rock bottom - contact below 2 feet
TR81-2	TRU-202	329161.88	4614425.90	6.7	89.6	-77.3	0.190	0.00	large target dig, 2nd target 5m West	3	20	4.2 in Mortar	North	50	Horizontal	Sand / rock bottom
TR81-4	TRU-203	329534.91	4614429.39	6.4	17.4	-5.2	0.119	0.49	projo?	NA	NA	NA	NA	NA	NA	Sand / rock bottom - contact below 2 feet
TR81-5	TRU-204	329655.59	4614428.03	6.7	62.4	-45.9	0.177	0.60	155mm?	NA	NA	NA	NA	NA	NA	Sand / rock bottom - contact not found within 36 ft dia circle

Crib Reef Dig List With Dive Results

AETC TARGET ANALYSIS										Diver Comments and Information						
Target ID	Nelson List Targ. ID	UTM X (m)	UTM Y (m)	Water Depth (m)	Max. Signal (nT)	Min. Signal (nT)	Size (m)	Burial Depth (m)	Analyst Comments	Burial Depth (in)	Length (in)	OE Type	Orientation	Wt. (lb)	Attitude	Narrative
TR69-3	TRU-205	332577.84	4612447.27	2.4	23.4	-5.7	0.146	0.00	155mm?	0	24	155mm	North	90	Horizontal	Sand / rock bottom
TR69-4	TRU-206	332640.77	4612446.44	2.5	10.5	-7.9	0.118	0.00	105mm?	0	24	155mm	North	90	Horizontal	Hard sand / clay bottom
TR69-5	TRU-207	333327.74	4612452.09	4.5	41.6	-3.4	0.120	0.12	projo?	NA	NA	NA	NA	NA	NA	Sand / rock bottom - contact not found

Pickerel Reef Dig List With Dive Results

AETC TARGET ANALYSIS										Diver Comments and Information						
Target ID		UTM X (m)	UTM Y (m)	Water Depth (m)	Max. Signal (nT)	Min. Signal (nT)	Size (m)	Burial Depth (m)	Analyst Comments	Burial Depth (in)	Length (in)	OE Type	Orientation	Wt. (lb)	Attitude	Narrative
TR85-5	TRU-229	331782.14	4615077.25	5.9	30.8	-5.7	0.119	0.00	105mm?	NA	NA	NA	NA	NA	NA	Sand bottom - contact below 2 feet - not recovered
TR85-6	TRU-230	331869.59	4615073.85	5.9	48.5	-5.8	0.122	0.00	projo?	3	24	155mm	North	90	Horizontal	Sand bottom
TR85-7	TRU-231	331980.75	4615086.28	7.1	46.3	-9.3	0.141	0.04	155mm?	2	24	155mm	North	90	Straight up	Sand bottom
TR85-8	TRU-232	332009.73	4615086.67	7.0	51.5	-14.1	0.122	0.00	projo?	NA	NA	NA	NA	NA	NA	Sand bottom - contact below 2 feet - not recovered
TR85-9	TRU-233	332105.79	4615086.89	7.3	91.2	-33.4	0.209	0.00	large projo, dig	6	6	155mm	North	90	Horizontal	Sand bottom

Table 8. Continued

Round Reef Dig List With Diver Results

AETC TARGET ANALYSIS											Diver Comments and Information						
Target ID	Nelson List Targ. ID	UTM X (m)	UTM Y (m)	Water Depth (m)	Max. Signal (nT)	Min. Signal (nT)	Size (m)	Burial Depth (m)	Fit Quality	Analyst Comments	Burial Depth (in)	Length (in)	OE Type	Orientation	Wt. (lb)	Attitude	Diver Narrative
TR47-2	TRU-234	334514.14	4608815.88	4.6	68.5	-30.8	0.190	0.43	0.903	bigger than155mm, dig	12	NA	NA	NA	NA	NA	Rock bottom - contact under rocks (12 inches or more) - unable to recover
TR49-1	TRU-235	334545.64	4609137.50	3.7	45.6	-5.3	0.133	0.00	0.772	may be 2 targets,dig anyway	NA	NA	NA	North	NA	NA	Rocky bottom - multiple targets under rocks - unable to recover

Toussaint Reef Dig List with Ground Truth

AETC TARGET ANALYSIS											Diver Comments and Information						
Target ID	Nelson List Targ. ID	UTM X (m)	UTM Y (m)	Water Depth (m)	Max. Signal (nT)	Min. Signal (nT)	Size (m)	Burial Depth (m)	Fit Quality	Analyst Comments	Burial Depth (in)	Length (in)	OE Type	Orientation	Wt. (lb)	Attitude	Narrative
TR57-1	TRU-236	331371.46	4610466.53	3.6	31.6	-15.5	0.153	0.5	0.862	155mm?, 2nd target 3m NE	0	20	90mm	East	40.0	Horizontal	Rock bottom
TR57-3	TRU-237	331412.85	4610467.91	3.4	34.3	-10.9	0.159	0.0	0.883	boat anchor with chain?, dig	4	24	155mm	North	90.0	Horizontal	Rock / sand bottom
TR57-5	TRU-238	331462.74	4610465.05	3.3	13.9	-5.8	0.084	0.0	0.864	small target	6	20	105mm	North	50.0	Horizontal	Rock / sand bottom
TR57-6	TRU-239	331482.93	4610465.61	3.0	43.4	-6.0	0.113	0.0	0.916	105mm (or larger)	0	48	Scrap	NA	80.0	Horizontal	Rocky bottom - 55 gal drum - not recovered
TR57-7	TRU-240	331492.56	4610466.30	2.7	11.5	-2.8	0.089	0.0	0.937	small target	0	18	90mm	NA	40.0	Horizontal	Rocky bottom
TR57-8	TRU-241	331757.79	4610466.57	3.0	14.3	-2.1	0.117	0.2	0.948	105mm?	NA	NA	NA	NA	NA	NA	Rock / sand bottom - no contact
TR59-3	TRU-242	331487.76	4610796.68	3.4	12.4	-13.0	0.100	0.0	0.549	105mm? In geology, 2nd target 5m East	4	8	Frag	North	5.0	Horizontal	Rock / sand bottom - 155mm frag
TR59-5	TRU-243	331568.56	4610796.03	3.0	18.3	-5.0	0.093	0.0	0.939	105mm?	NA	NA	NA	NA	NA	NA	Rocky / sand bottom - contact below 2'
TR61-1	TRU-244	324395.86	4611125.75	3.7	35.1	-22.1	0.153	0.3	0.968	155mm?, large remnant moment	NA	NA	Scrap	NA	NA	NA	Rocky bottom - anchor - same item as target TRU-210
TR61-3	TRU-245	325270.80	4611126.55	3.9	33.8	-16.8	0.142	0.1	0.972	155mm?	0	8	Other	South	8.0	Horizontal	Rocky bottom - hot rock (8 in dia)
TR61-5	TRU-246	332072.37	4611129.23	3.9	22.0	-5.2	0.113	0.0	0.958	105mm?	NA	NA	NA	NA	NA	NA	Hard rocky / concrete bottom - contact found - item unknown - not recovered
TR61-6	TRU-247	332430.85	4611129.71	3.6	11.4	-4.8	0.093	0.0	0.932	105mm?	0	20	105mm	West	50.0	Horizontal	Rocky bottom

Flat Rock Reef Dig List with Diver Results

AETC TARGET ANALYSIS											Diver Comments and Information						
Target ID	Nelson List Targ. ID	UTM X (m)	UTM Y (m)	Water Depth (m)	Max. Signal (nT)	Min. Signal (nT)	Size (m)	Burial Depth (m)	Fit Quality	Analyst Comments	Burial Depth (in)	Length (in)	OE Type	Orientation	Wt. (lb)	Attitude	Narrative
TR-77-1	TRU-219	330814.90	4613769.88	6.1	44.6	-12.1	0.164	0.23	0.983	155mm?	6	24	155mm	NW	90.0	Horizontal	Hard clay / rock bottom
TR77-4	TRU-220	331101.83	4613764.93	6.3	104.8	-59.1	0.200	0.00	0.979	very large target, 2nd target 5m West	20	NA	Scrap	North	50.0	NA	Clay / rock bottom - big anchor stuck on rock bottom - not recovered
TR77-5	TRU-221	331175.38	4613765.41	6.2	110.9	-64.2	0.226	0.20	0.957	240mm?	4	18	75mm	North	40.0	Horizontal	Sand / rock
TR77-6	TRU-222	331245.04	4613765.69	5.6	9.5	-6.9	0.101	0.00	0.951	105mm?	3	18	75mm	North	40.0	Horizontal	Sand / rock
TR77-9	TRU-223	331417.54	4613761.45	6.5	106.1	-65	0.206	0.09	0.870	240mm?	3	24	155mm	North	90.0	Horizontal	Sand / rock
TR77-10	TRU-224	331483.96	4613751.69	6.2	38.7	-22.8	0.160	0.00	0.884	155mm?	24	NA	Scrap	Straight down	NA	Straight down	Rock bottom - anchor stuck on rock - not recovered
TR77-12	TRU-225	331690.78	4613767.08	6.2	41.5	-15.1	0.143	0.08	0.956	155mm?	24	24	155mm	North	90.0	Straight down	Silt and mud bottom - 155mm stuck on rock bottom - not recovered
TR77-16	TRU-226	331892.74	4613766.87	4.7	15.6	-6.4	0.098	0.00	0.861	105mm?	NA	NA	NA	NA	NA	NA	Sand / rock - contact below 2 feet
TR77-17	TRU-227	332308.40	4613761.81	6	92.9	-14.6	0.187	0.23	0.985	large target, dig	24	24	155mm	Straight down	90.0	NA	Sand / rock - unable to recover
TR77-18	TRU-228	332327.84	4613765.48	5.8	51.6	-8.7	0.155	0.00	0.975	155mm?	3	20	105mm	North	50.0	Horizontal	Sand bottom

3.5 The Primary Impact Areas

All the data in 5 complete transects were analyzed primarily with the intent of identifying ordnance (projectiles). These included transects Tr35, Tr37, Tr89, WS15, and WS19. The two most southern transects lie just north of (beyond) the range fan for Range 1, which is the only currently active range in Lake Erie associated with Camp Perry.

Transects Tr35 and Tr37 lie slightly more than 5 km due north of the original fixed firing points for proof testing projectiles and barrels. These firing points are shown in Figure 11. Transect Tr89 is about 14 km due north of the firing points and the northern most transect WS19 is 21.8 km north of the firing points. The automated target picks shown in Figure 11 generally indicate that the primary distribution of magnetic anomalies stretch from the firing points in a northward direction. The targets are most dense close to the firing point; however their density is still substantial 15 km north of the firing points. At distances greater than about 16 km north of the firing points, the anomaly densities fall to approximately those seen in the Davis-Bessy Impoundment Area and at the eastern most limits of the impact range.

Reportedly, during proof firing of the projectiles the guns were aimed at the tops of poles located on land at distances of 750, 1,000, 1,250, and 1,500 m down range from the firing points. These are identified in Figure 1. Some of the poles are still standing. An observer was located in an observation bunker immediately above each gun to monitor the firings. Because the guns were aimed at only slightly elevated angles, we surmise that most of the fired projectiles impacted the Lake surface and skipped to impact again further down range. This may account for some of the widening east-west distribution of anomalies with increasing distance from the firing points. We know from target recoveries (described in Section 5) that many, but not all the fired projectiles were inert. A significant fraction of the recovered projectiles revealed that they had been fired without removing the shipping lugs (from the fuze wells). This issue is also discussed more extensively in Section 5.

Figure 12 shows a magnetic anomaly image composed of data clips from transect TR37. The analyst's target identification number is shown in white. For instance, the target identified as 116 will have the unique target identification of Tr37-116 in the AETC Target Report or the AETC Dig List. The white polygons are those drawn by the analyst using the computer mouse. The data within the boxed area are used to perform the target fit. As shown in Figure 12, not all magnetic anomalies were chosen for analysis. In general, targets that were identified as lying less than 3 meters from an adjacent target were not chosen for analysis (or if they were, they were not included on the recommended dig list). This was done to reduce the likelihood of the diver mistaking the intended target for another one nearby. In general, targets were not chosen for analysis if the majority of their signatures were not included in the 8-sensor measurement track. There were exceptions to this rule (see targets 24 and 83). Targets such as these were boxed for analysis because they appeared to be extremely large or they had unique signatures. In most cases, even though these targets were analyzed, they were demoted from the recommended dig list. In a few cases the analyst felt that it was worth digging a target even though it was unlikely to be a projectile. The rationale for this is that if the target can be recovered, its identity can be associated with the unique signature for future applications.

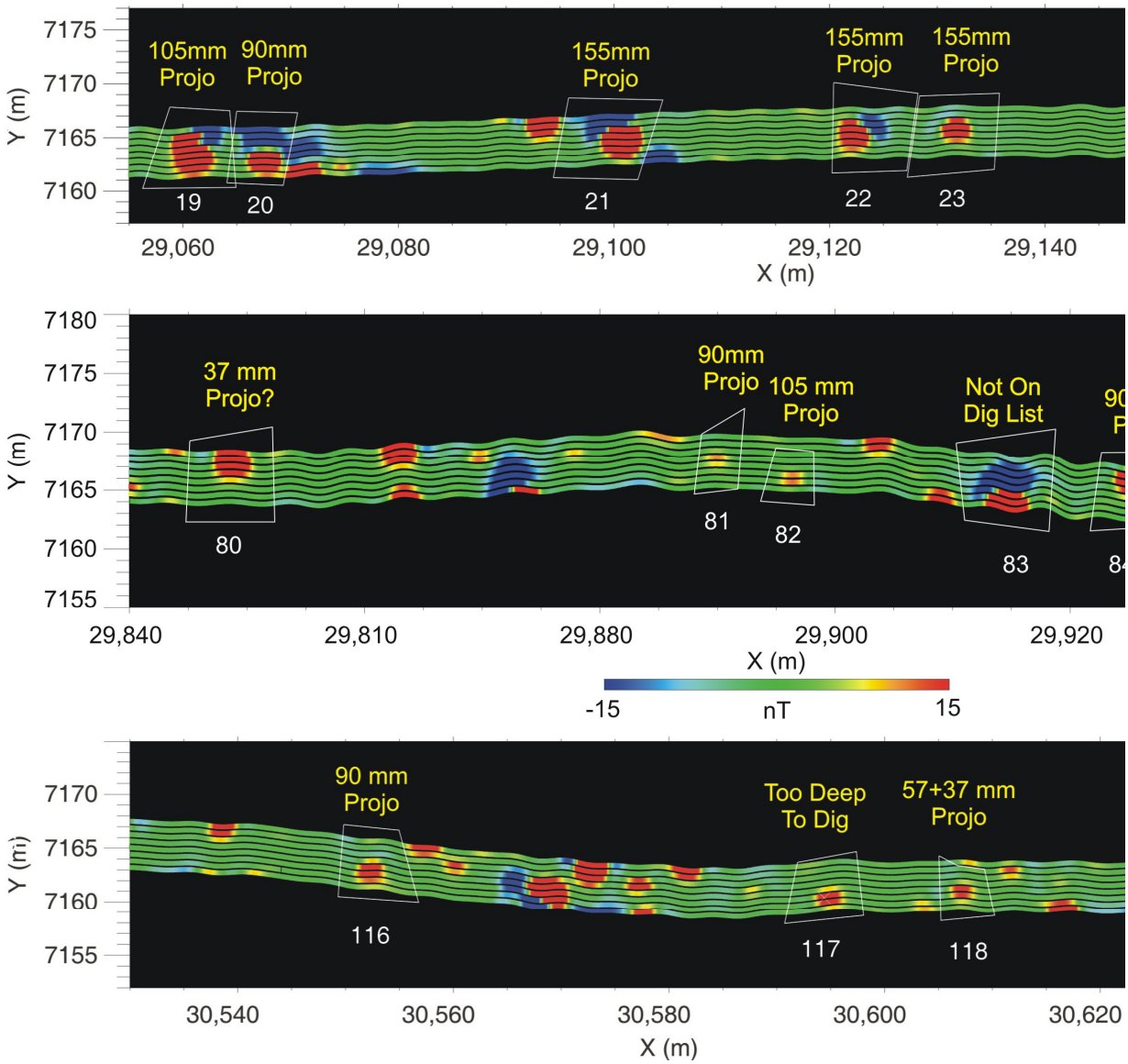

Figure 12. Magnetic anomaly image clips from the analysis of data from transect Tr37. Anomalies boxed for analysis are shown as white polygons. Target numbers are shown in white; the target identification made by the diver is shown in yellow.

Figure 12 also shows (in yellow) the diver's comment about the item recovered from investigation of the target following its reacquisition and flagging by the dive team. As is apparent from this figure, in most cases the result of the recovery was consistent with the analysis and instructions on the dig sheet. This is not always the case, however. Note targets 80 and 85. The recovered items were much too small to be associated with the analyzed target on the dig list. A 37 mm projectile and a fuze would not likely be detectable by our sensors, given their distance above the bottom. Even if such a target passed directly below one of the sensors and was detected, its signature would not stretch across several sensor tracks. In the case of target 118, it is likely that the diver, in addition to recovering the 57 mm projectile also found and picked up the additional 37 mm projectile, i.e. one of the fainter anomalies about 3 meters from the primary target.

The Target Reports and the Recommended Dig Lists for the five analyzed transects are provided in Appendix B. These five reports include the analysis of 443 targets. 169 targets were included on the recommended dig list.

Figure 13 shows a presentation of the targets on the diver's dig list provided by the Program Office. The targets on the dig list are shown as large red diamonds (♦). The targets in the Toussaint River and in the Davis-Besse Impoundment area are also included in the image.

Tables 9-12 contain the analysis information for the targets chosen by the Program Office for intrusive investigation. Also included are the results of the intrusive investigations, the identification of the anomaly (if one was found) and the diver comments on the target and the bottom conditions.

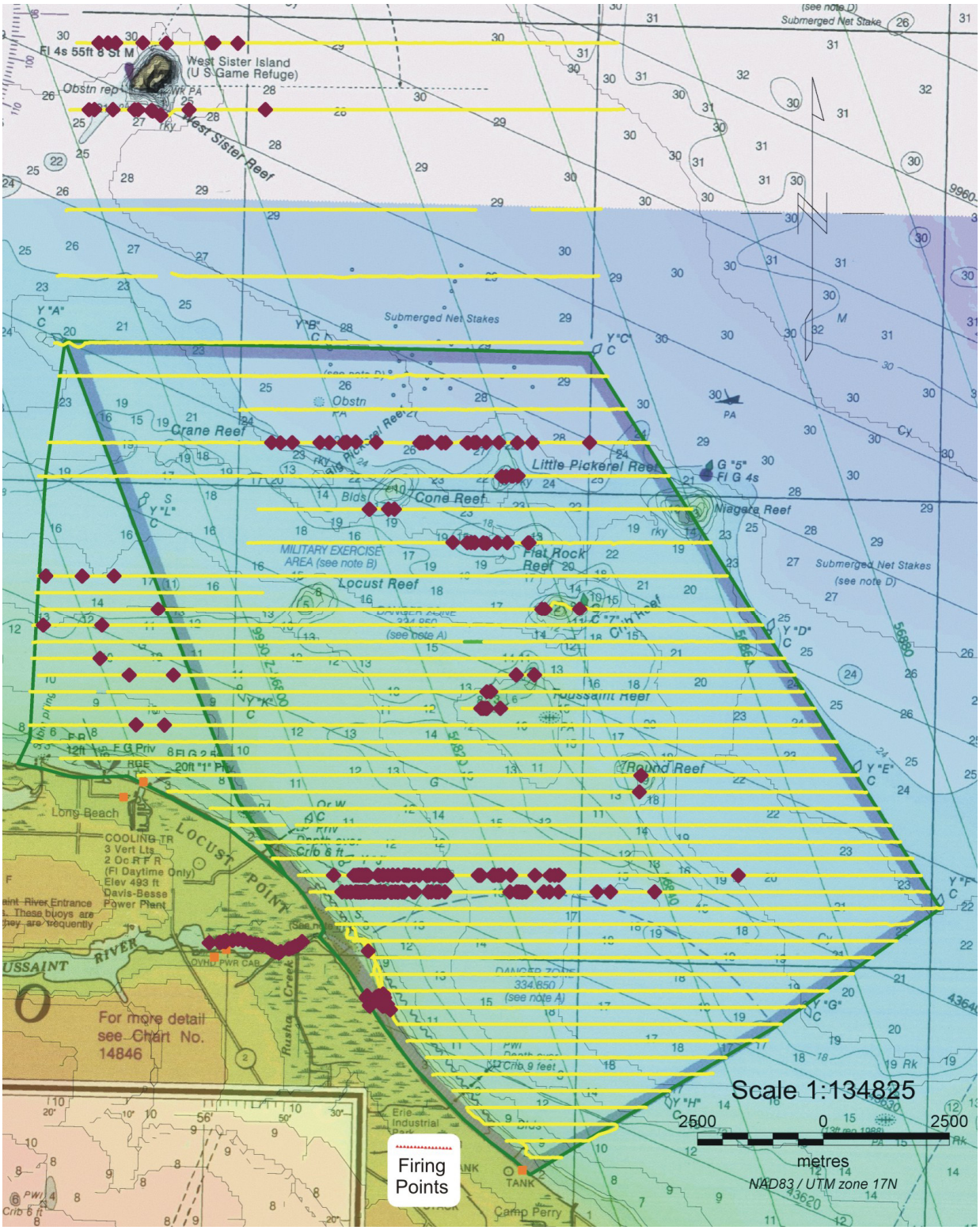

Figure 13. All targets on the diver's dig list are shown as large red diamonds superimposed on the survey map.

Table 9. Target Dig list and dig results from transect Tr35 survey

AETC TARGET ANALYSIS										Diver Comments and Information						
AETC Target ID	Nelson List Targ. ID	UTM X (m)	UTM Y (m)	Water Depth (m)	Max. Signal (nT)	Min. Signal (nT)	Size (m)	Burial Depth (m)	Analyst Comment	Burial Depth (in)	Targ. Length (in)	Wt. (lb)	OE ID	Orientation	Attitude	Narrative
TR35-2	TRU-248	328613.63	4606837.02	3.7	69	-62	0.180	0.4	Remnant Moment	4.0	36.0	2	Scrap	North	Horizontal	Metal rod - 36 in by 0.25 in
TR35-3	TRU-249	328708.89	4606832.87	3.8	69	-18	0.117	0.2	105mm maybe	6.0	24.0	90	155mm	NA	Horizontal	Sandy / clay bottom
TR35-6	TRU-250	328799.25	4606833.46	3.9	83	-32	0.152	0.1	155mm maybe	NA	NA	NA	NA	NA	NA	Hard clay - dug to 18 in - anomaly was deeper
TR35-7	TRU-251	328886.35	4606836.42	4	24	-10	0.094	0.3	81mm maybe	36.0	10.0	2	Frag	North	Horizontal	Soft mud bottom - 4.2 in mortar tail boom
TR35-9	TRU-252	328923.37	4606832.96	4.1	65	-7	0.122	0.2	105-155mm?, 2nd target 6m West	6.0	24.0	90	155mm	North	Horizontal	Sand / clay bottom
TR35-10	TRU-253	328947.28	4606832.66	4.1	80	-28	0.155	0.3	155mm size, nice target	8.0	24.0	90	155mm	North	Horizontal	Sand / clay bottom
TR35-12	TRU-254	328987.63	4606832.39	4.1	20	-2	0.082	0.2	81mm maybe	24.0	24.0	NA	Scrap	North	Straight down	Flat sheet of metal - unable to recover
TR35-15	TRU-255	329065.46	4606836.76	4.2	81	-28	0.135	0.1	155mm maybe	0.0	24.0	90	155mm	East	Horizontal	Soft clay bottom
TR35-20	TRU-256	329145.16	4606831.64	4.3	101	-34	0.168	0.1	155mm ?	NA	NA	NA	NA	NA	NA	Sand / clay bottom - nothing found
TR35-21	TRU-257	329156.03	4606833.08	4.3	40	3	0.118	0.4	105mm ?	6.0	14.0	40	90mm	North	Horizontal	Sand / clay bottom -90mm APHE, unfuzed
TR35-22	TRU-258	329187.06	4606840.41	4.3	45	-3	0.118	0.3	105mm?	8.0	24.0	90	155mm	North	Horizontal	Sand / clay bottom
TR35-23	TRU-259	329205.54	4606839.34	4.3	85	-34	0.152	0.2	155mm ?	8.0	24.0	90	155mm	North	Horizontal	Sand / clay bottom
TR35-24	TRU-260	329230.87	4606833.77	4.3	75	-13	0.138	0.2	155mm ?	24.0	NA	NA	NA	NA	NA	Hard clay, contact below 2 feet, not recover
TR35-26	TRU-261	329294.63	4606834.42	4.3	65	-12	0.130	0.2	155mm, 2nd target 3 m NW	24.0	NA	NA	NA	NA	NA	Hard clay, contact below 2 feet, not recover
TR35-27	TRU-262	329347.69	4606837.20	4.4	59	-28	0.126	0.3	155mm ?	6.0	24.0	90	155mm	North	Horizontal	clay bottom, 155mm fuzed, not recovered
TR35-28	TRU-263	329359.81	4606834.49	4.4	76	-14	0.148	0.5	155mm ?	8.0	24.0	90	155mm	North	Horizontal	Sand / clay bottom
TR35-29	TRU-264	329377.65	4606835.78	4.3	30	-8	0.091	0.1	105mm ?	12.0	4.0	2	Frag	South	Horizontal	Mud / clay bottom - 90mm nose cone pieces
TR35-33	TRU-265	329439.54	4606837.33	4.3	50	-5	0.138	0.5	155mm?, targ 33&34 9m apart	26.0	4.0	1	Frag	Straight down		Sand / clay bottom - nose cone
TR35-34	TRU-266	329448.26	4606835.48	4.3	81	-33	0.153	0.2	155mm ?	12.0	24.0	90	155mm	North	Horizontal	Hard clay / sand bottom
TR35-36	TRU-267	329474.12	4606833.18	4.3	20	-8	0.108	0.5	105mm ?	1.0	6.0	0	Frag	North	Horizontal	Hard clay / sand bottom - dug four holes - all frag - projectile cone
TR35-45	TRU-268	329587.70	4606831.98	4.4	100	-52	0.215	0.7	220mm projo?, target 44 6m West	6.0	24.0	90	155mm	North	Horizontal	Sand/clay bottom-155mm fuzed-not recovered
TR35-46	TRU-269	329601.97	4606831.98	4.4	52	-21	0.155	0.4	155mm?, target 46&47 4m apart	8.0	24.0	90	155mm	North	Horizontal	Sandy / clay bottom
TR35-47	TRU-270	329606.64	4606832.73	4.4	45	-30	0.125	0.1	155mm ?	6.0	14.0	30	90mm	North	Horizontal	Sand / clay bottom
TR35-53	TRU-271	329673.12	4606836.17	4.4	114	-56	0.165	0.1	155mm ?	8.0	16.0	2	Frag	North	Horizontal	Mud bottom - 155mm rotating band
TR35-59	TRU-272	329723.75	4606831.90	4.4	66	-15	0.134	0.2	155mm, clutter around	6.0	20.0	40	4.2in Mortar	North	Horizontal	4.2 in mortar, fuzed - not recovered
TR35-64	TRU-273	329800.61	4606838.14	4.5	25	-12	0.108	0.1	105mm?	0.0	6.0	2	Frag	North	Horizontal	Frag - not recovered
TR35-67	TRU-274	329851.89	4606837.42	4.5	49	-10	0.123	0.3	105mm ?	3.0	20.0	40	90mm	North	Horizontal	Sandy bottom - 90mm
TR35-85	TRU-275	330027.44	4606834.83	4.5	51	-25	0.125	0.0	105-155mm, lots ofclutter	8.0	7.0	2	37mm	North	Horizontal	Sandy bottom
TR35-87	TRU-276	330056.38	4606835.28	4.5	29	-15	0.116	0.3	105mm?, target 87&88 5m apart	NA	NA	NA	NA	NA	NA	No contact found
TR35-88	TRU-277	330061.79	4606836.87	4.6	59	-15	0.145	0.5	155mm?, in clutter	5.0	16.0	30	105mm	West	Horizontal	Mud bottom
TR35-109	TRU-278	330328.38	4606835.94	4.7	60	-40	0.149	0.2	strong remnant moment, 155mm?	8.0	8.0	2	37mm	Straight down		Hard sandy bottom - 37mm unfuzed
TR35-112	TRU-279	330385.57	4606837.38	4.6	98	-127	0.215	0.3	8 in ?	0.0	24.0	90	155mm	West	Horizontal	Hard gravel bottom
TR35-117	TRU-280	330483.29	4606837.11	4.7	28	-8	0.098	0.2	105mm?	8.0	24.0	90	155mm	South	Horizontal	Mud bottom
TR35-122	TRU-281	330529.89	4606837.00	4.7	40	-12	0.111	0.2	105mm?, 122 &123 10m apart	2.0	20.0	40	4.2 in Mortar	North	Horizontal	Sandy bottom-4.2in mortar, fuzed-not recovered
TR35-123	TRU-282	330538.73	4606836.26	4.7	57	-23	0.151	0.2	155mm ?	6.0	20.0	40	4.2 in Mortar	North	Horizontal	Sandy bottom-4.2in mortar, fuzed-not recovered
TR35-128	TRU-283	330654.19	4606837.01	4.7	40	-20	0.120	0.3	155mm?, 2nd target 3m SW	5.0	20.0	40	90mm	East	Horizontal	Hard sandy bottom-90mm fuzed-not recovered
TR35-176	TRU-294	331944.94	4606836.09	4.9	17	-6	0.091	0.3	small target	6.0	24.0	90	155mm	North	Horizontal	Soft mud bottom - 155mm & M48 fuze - not recovered
TR35-178	TRU-295	332082.33	4606838.96	5.1	33	-4	0.100	0.0	105mm?	6.0	24.0	90	155mm	North	Horizontal	155mm, fuzed - not recovered
TR35-179	TRU-296	332127.62	4606837.39	5.1	20	-6	0.103	0.4	105mm?	3.0	24.0	90	155mm	North	Horizontal	155mm, fuzed - not recovered
TR35-180	TRU-297	332169.82	4606832.73	5.1	22	-8	0.090	0.0	small target	8.0	4.0	1	Frag	NA	Horizontal	Sand / clay bottom - 4.2 in mortar rotation disc
TR35-181	TRU-298	332192.40	4606831.91	5.1	20	-9	0.105	0.3	105mm?	20.0	20.0	30	4.2 in Mortar	North	Horizontal	Sand bottom, 4.2in mortar, fuzed, not recover
TR35-182	TRU-299	332208.47	4606832.67	5.1	18	-3	0.087	0.2	small tartget	24.0	20.0	1	Frag	NE	Horizontal	Sand / clay bottom
TR35-183	TRU-300	332263.44	4606834.82	5.2	126	-48	0.192	0.4	large for a 155mm	6.0	24.0	90	155mm	North	Horizontal	Soft mud and gravel bottom
TR35-186	TRU-301	332619.99	4606838.37	5.3	35	-9	0.105	0.2	105mm, good target	6.0	8.0	1	Scrap	NA	NA	Clay / sand bottom - top of paint thinner can
TR35-187	TRU-302	332732.13	4606835.47	5.4	19	-13	0.102	0.2	105mm?	24.0	NA	NA	NA	NA	NA	sand / clay bottom - Contact below 2 feet
TR35-188	TRU-303	332912.68	4606835.26	5.5	28	-2	0.105	0.3	105mm?	28.0	24.0	90	155mm	NE	Horizontal	Sand/clay bottom, 155mm fuzed, not recovered
TR35-190	TRU-304	333674.36	4606837.95	5.9	18	-4	0.088	0.4	small target	8.0	6.0	1	Scrap	NE	Horizontal	Mud bottom - sheet metal (6 in x 6 in x 1/8 in) & 50 caliber
TR35-191	TRU-305	333938.53	4606837.98	5.9	15	-5	0.079	0.1	small target	15.0	14.0	20	75mm	North	Horizontal	Mud bottom -75mm, unfuzed
TR35-192	TRU-306	334814.94	4606837.28	5.3	57	-49	0.194	0.6	larger than a 155mm	2.0	96.0	1500	Scrap	South	Horizontal	Sand bottom - big metal plate 8ft by 4 ft 1.5 in - not recovered

Table 10. Target dig list and dig results for transect Tr37 survey

AETC Target Analysis										Diver Comments and Information						
AETC Target ID	Nelson List Targ. ID	UTM X (m)	UTM Y (m)	Water Depth (m)	Max. Signal (nT)	Min. Signal (nT)	Size (m)	Burial Depth (m)	Analyst Comment	Burial Depth (In)	Length (in)	OE Type	Weight (lb)	Orientation	Attitude	Narrative
TR37-5	TRU-330	328448.28	4607166.98	3.9	39.4	-10.4	0.127	0.4	good target	1.0	14.0	105mm	35.0	North	Horizontal	
TR37-10	TRU-331	328849.76	4607165.94	4.1	58.1	-20.9	0.148	0.4	155mm?	0.0	24.0	155mm	90.0	NE	Horizontal	Hard clay bottom - 155mm
TR37-11	TRU-332	328897.75	4607166.18	4.2	99.1	-39.4	0.182	0.3	larger than a 155mm, dig	NA	NA	NA	NA	NA	NA	Soft clay bottom - contact below 2 feet
TR37-12	TRU-333	328937.76	4607169.00	4.2	64.5	-19.9	0.156	0.4	155mm?, target 12&13 8m apart	NA	NA	NA	NA	NA	NA	Contact below 2 feet
TR37-13	TRU-334	328945.87	4607168.29	4.2	96.4	-42.7	0.154	0.3	155mm, clutter to East	0.0	24.0	155mm	90.0	North	Horizontal	Hard clay bottom
TR37-14	TRU-335	328954.49	4607167.29	4.3	77.8	-22.4	0.144	0.3	155mm?, Targets 14, 15, 16 within 10m	3.0	24.0	2 ea 155mm	180.0	North	Horizontal	2 ea, 155mm
TR37-15	TRU-336	328960.11	4607168.88	4.3	86.3	-21.6	0.140	0.2	155mm in clutter	8.0	24.0	155mm + Scrap	90.0	East	Horizontal	Soft bottom, 155mm located under ball of metal cable - cable not recovered
TR37-16	TRU-337	328966.44	4607167.25	4.3	95.9	-53.8	0.171	0.2	155mm in clutter	0.0	24.0	155mm	90.0	North	Horizontal	Hard clay bottom
TR37-17	TRU-338	329012.26	4607166.51	4.3	74.8	-37.4	0.168	0.4	155mm?	0.0	24.0	155mm	90.0	North	Horizontal	one other contact (small) near by
TR37-18	TRU-339	329042.91	4607164.63	4.3	21.7	-9.1	0.105	0.3	105mm?	NA	NA	NA	NA	NA	NA	Anomaly located - unable to recover - deeper than one foot
TR37-19	TRU-340	329061.10	4607165.12	4.4	64.2	-32.4	0.217	1.0	very large target dig?	2.0	14.0	105mm	40.0	North	Straight down	Clay bottom
TR37-20	TRU-341	329067.49	4607163.87	4.3	66.8	-49	0.164	0.3	155mm?, clutter 3m East	8.0	14.0	90mm	40.0	North	Horizontal	Hard clay bottom
TR37-21	TRU-342	329100.39	4607165.93	4.4	127.4	-73	0.225	0.6	very large target in clutter, dig?	1.0	24.0	155mm	90.0	NE	Horizontal	Clay bottom
TR37-22	TRU-343	329122.97	4607165.90	4.4	48.6	-23.9	0.142	0.4	155mm?, Target 22, 23 7m apart	3.0	24.0	155mm	90.0	North	Horizontal	Clay bottom
TR37-23	TRU-344	329131.66	4607166.03	4.4	41.2	-7.8	0.118	0.5	105mm?	NA	NA	NA	NA	NA	NA	Hard clay - contact below 2 feet
TR37-37	TRU-345	329332.11	4607166.42	4.4	74.4	-22.7	0.174	0.5	155mm, Targets 37, 38, 39 clustered together	4.0	24.0	155mm	90.0	West	Horizontal	Sand bottom
TR37-38	TRU-346	329339.68	4607163.77	4.4	66.5	-27.7	0.156	0.4	155mm?	0.0	24.0	155mm	90.0	North	Horizontal	Hard sand bottom
TR37-39	TRU-347	329348.41	4607165.61	4.4	63.3	-33.3	0.168	0.4	155mm?	0.0	24.0	155mm	90.0	North	Horizontal	Sand bottom
TR37-42	TRU-348	329433.15	4607167.20	4.4	69.9	-27	0.148	0.2	155mm?	16.0	24.0	155mm	90.0	North	Horizontal	Sandy bottom
TR37-49	TRU-349	329530.31	4607165.27	4.4	39.2	-8.8	0.116	0.3	105mm?, dig	5.0	24.0	155mm	90.0	North	Horizontal	Sandy bottom
TR37-55	TRU-350	329615.25	4607166.31	4.5	63.4	-24.6	0.159	0.4	155mm?	4.0	24.0	155mm	90.0	North	Horizontal	Sandy bottom
TR37-56	TRU-351	329623.57	4607166.82	4.5	50.2	-22.1	0.120	0.2	target in clutter	3.0	24.0	155mm	90.0	North	Horizontal	Sand and mud bottom
TR37-57	TRU-352	329630.89	4607165.86	4.5	91.1	-41.2	0.163	0.2	155mm? other targets East and West	3.0	24.0	155mm	90.0	North	Horizontal	Sandy bottom
TR37-65	TRU-353	329720.26	4607165.93	4.5	68.4	-33.9	0.173	0.5	large target, 65&66 5m apart	3.0	24.0	155mm	90.0	North	Horizontal	Sandy bottom
TR37-66	TRU-354	329727.00	4607166.50	4.5	57.6	-23	0.143	0.4	155mm?	18.0	9.0	90mm	40.0	North	Horizontal	Hard sand bottom
TR37-80	TRU-355	329848.52	4607167.49	4.5	67.8	-10	0.133	0.3	155mm?	8.0	7.0	37mm	2.0	North	Horizontal	Unfuzed
TR37-81	TRU-356	329889.89	4607168.25	4.6	14.3	-4.7	0.085	0.4	mortar?, targets 81&82 5m apart	6.0	20.0	90mm	40.0	North	Horizontal	Sandy bottom
TR37-82	TRU-357	329896.65	4607165.84	4.6	15.6	-6.5	0.083	0.2	two sensors see, mortar?	6.0	20.0	105mm	30.0	North	Horizontal	Sand bottom
TR37-84	TRU-358	329925.18	4607165.97	4.6	53.3	-6.6	0.128	0.5	155mm?, Targets 84,85&86 clustered together	12.0	20.0	90mm	40.0	East	Horizontal	Sandy bottom
TR37-85	TRU-359	329932.14	4607162.40	4.6	166.4	-137	0.253	0.5	very large target, dig?	6.0	2.0	Fuze	0.5	North	Horizontal	Hard sand bottom
TR37-86	TRU-360	329940.34	4607164.70	4.6	128.4	-116.3	0.224	0.4	very large target, dig	5.0	24.0	155mm	90.0	North	Horizontal	Sandy bottom - half burried
TR37-92	TRU-361	330035.21	4607166.44	4.6	53.4	-12.8	0.138	0.3	155mm?	5.0	24.0	155mm	90.0	NW	Horizontal	Sandy / mud bottom
TR37-93	TRU-362	330044.00	4607167.03	4.6	60.6	-55.8	0.161	0.2	155mm?, target 94 2m East	2.0	24.0	155mm	90.0	North	Horizontal	Sandy bottom
TR37-94	TRU-363	330046.71	4607166.14	4.6	72.2	-18.2	0.142	0.3	155mm?, target 93 2m West	2.0	24.0	155mm	90.0	North	Horizontal	Sandy bottom
TR37-102	TRU-364	330141.21	4607162.65	4.6	69.4	-34.1	0.146	0.2	155mm,dig	6.0	24.0	155mm	90.0	North	Horizontal	Sandy bottom
TR37-112	TRU-365	330292.69	4607163.21	4.6	64.9	-58	0.153	0.2	155mm, dig	6.0	24.0	155mm	90.0	North	Horizontal	Sandy bottom
TR37-114	TRU-366	330341.22	4607164.62	4.6	58.0	-35.2	0.142	0.2	155mm?dig	8.0	20.0	Fuze, 90mm & Frag	40.0	North	Horizontal	All three items were 2 feet apart - more contacts around
TR37-115	TRU-367	330441.62	4607166.96	4.7	83.2	-56	0.159	0.2	155mm? dig	NA	NA	NA	NA	NA	NA	Hard clay - contact below 2 feet
TR37-116	TRU-368	330552.25	4607163.42	4.7	29.2	-8.5	0.101	0.3	105mm?	4.0	20.0	90mm	40.0	North	Horizontal	Sand bottom
TR37-117	TRU-369	330594.69	4607160.54	4.8	27.9	-4.2	0.098	0.3	105mm? dig	NA	NA	NA	NA	NA	NA	Sandy bottom - item below 2 feet
TR37-118	TRU-370	330606.70	4607161.42	4.8	22.8	-7	0.109	0.5	105mm? dig	3.0	10.0	57mm & 37mm	6.0	North	Horizontal	Sandy bottom
TR37-119	TRU-371	330632.31	4607162.33	4.7	19.2	-2.4	0.090	0.4	105mm? dig	0.0	24.0	155mm	90.0	North	Horizontal	Sandy bottom
TR37-120	TRU-372	330695.57	4607161.27	4.7	70.3	-35.7	0.145	0.1	155mm? dig	NA	NA	NA	NA	NA	NA	Sandy bottom - contact below 2 feet
TR37-150	TRU-389	336477.42	4607163.71	7.0	22.4	-4.1	0.108	0.5	105mm?	14.0	20.0	90mm	30.0	East	Horizontal	Mud and silt bottom - unfuzed

Table 11. Target Dig list and dig results from transect WS89 survey

AETC TARGET ANALYSIS									Diver Comments and Information						
AETC Target ID	Nelson List Targ. ID	UTM X (m)	UTM Y (m)	Water Depth (m)	Max. Signal (nT)	Min. Signal (nT)	Size (m)	Analyst Comment	Burial Depth (in)	Target Length (in)	OE ID	Orientation	Weight (lb)	Attitude	Narrative
TR89-5	TRU-307	327216.62	4615746.32	7.6	31.4	-9.3	0.129	good target	36	24	155mm	Straight down	90	Straight down	Very soft mud bottom - unable to recover
TR89-6	TRU-308	327396.15	4615740.68	7.7	66.0	-23.6	0.182	good target	24	24	155mm	Straight down	90	Straight down	Very soft mud bottom - unable to recover
TR89-7		327629.81	4615744.49	7.8	8.4	-2.7	0.104	Good target, may be too deep							
TR89-11	TRU-309	328177.26	4615743.93	8.0	48.1	-4.9	0.168	155mm?	32	24	155mm	Straight down	90	Straight down	Soft mud - not recovered
TR89-12	TRU-310	328363.85	4615745.58	8.1	78.6	-15.3	0.197	large target on 8 sensors, use	15	12	Scrap	North	20	Horizontal	Soft mud - not recovered
TR89-13	TRU-311	328655.62	4615741.72	8.2	51.2	-3.7	0.144	large target, does not look like UXO, Dig Anyway	36	24	155mm	Straight down	90	Straight down	Soft mud - felt with hand - 155mm base - three feet deep - not recovered
TR89-14	TRU-312	328709.32	4615752.65	8.1	55.3	-6.6	0.172	large target, 155mm?, use	36	24	155mm	North	90	Straight down	Soft mud
TR89-15	TRU-313	328889.86	4615756.55	8.2	12.0	-4.1	0.113	good target, 105mm?	24	24	155mm	Straight down	90	Straight down	Soft mud - not recovered
TR89-16	TRU-314	329294.32	4615751.92	8.3	18.5	-3.5	0.105	good target, 105mm?	24	24	155mm	Up	90	Straight up	Soft mud
TR89-19	TRU-315	330156.62	4615740.11	8.5	66.1	-10.6	0.177	good target, 155mm?	30	24	155mm	Straight down	90	Straight down	Soft mud - not recovered
TR89-20	TRU-316	330176.30	4615741.03	8.5	29.5	-17.7	0.151	good target 155mm?	32	24	155mm	West	90	Horizontal	Soft mud bottom
TR89-21	TRU-317	330223.62	4615741.34	8.6	41.8	-5.6	0.143	good target, 155mm?	24	14	90mm	East	40	Horizontal	Soft mud bottom - 90mm, fuzed - not recovered
TR89-23	TRU-318	330313.47	4615753.05	8.6	91.4	-6.9	0.162	good target on 7 sensors, 155mm?	24	24	155mm	North	90	Straight Down	Soft mud bottom
TR89-24	TRU-319	330587.90	4615741.67	8.6	20.5	-2.7	0.107	good target 105mm?	0	NA	Scrap	West	NA	NA	Soft mud bottom - trash, cans, metal motor - not recovered
TR89-25	TRU-320	330670.80	4615741.77	8.5	23.6	-4.0	0.108	good target, 105mm?	32	24	155mm	West	90	Straight down	Very soft mud
TR89-29	TRU-321	331097.69	4615740.34	8.6	21.4	-7.3	0.108	partial signal, 105mm?	30	24	155mm	Straight down	90	Straight down	Soft mud bottom - 155mm - not recovered
TR89-30	TRU-322	331114.77	4615740.59	8.5	39.8	-4.5	0.153	good target, 155mm?	24	NA	Frag	Straight down	NA	Straight down	Soft mud bottom - frag - not recovered
TR89-31	TRU-323	331230.12	4615746.29	8.6	22.3	-4.2	0.111	good target 105mm?	24	24	155mm	North	90	Straight down	Very soft mud - 155mm - not recovered
TR89-32	TRU-324	331283.41	4615746.89	8.6	21.0	-2.6	0.106	good target, 105mm?	24	24	155mm	Straight down	90	Horizontal	Soft mud bottom - 155mm - not recovered
TR89-34	TRU-325	331476.39	4615747.75	8.6	50.0	-13.4	0.165	good target, 155mm?	36	24	155mm	North	90	Horizontal	Soft mud bottom
TR89-36	TRU-326	331727.85	4615744.03	8.2	110.3	-59.3	0.193	good target, larger than 155mm	32	24	155mm	North	90	Straight down	Soft mud bottom - not recovered
TR89-42	TRU-327	332095.09	4615738.36	8.7	28.7	-5.6	0.115	good target, 105mm?	8	14	90mm	North	30	Straight up	Hard clay bottom - 90mm nose up
TR89-44	TRU-328	332388.54	4615742.57	8.7	21.0	-4.0	0.118	good target, 105mm?	32	NA	NA	NA	NA	NA	Soft mud - dug 32 in but contact was deeper
TR89-46	TRU-329	333526.36	4615744.76	8.8	13.4	-6.0	0.129	good target	0	1	Scrap	NA	NA	NA	Soft mud - ball of 1 in diameter cable - not recovered

Table 12. Target Dig List and dig results from transects WS15 and WS19

AETC TARGET ANALYSIS										Diver Comments and Information						
AETC Target ID	Nelson List Targ. ID	UTM X (m)	UTM Y (m)	Water Depth (m)	Max. Signal (nT)	Min. Signal (nT)	Size (m)	Burial Depth (m)	Analyst Comments	Burial Depth (in)	Length (in)	OE Type	Orientation	Wt. (lb)	Attitude	Narrative
WS15-1	TRU-58	323597.65	4622345.54	8.6	6.7	-1.4	0.116	1.2	multiple clutter objects	24	NA	NA	NA	NA	NA	Soft mud - Small hit in area - contact below two feet
WS15-2	TRU-59	323709.19	4622348.36	8.6	53.6	-8.9	0.181	0.6	good target, projo?	NA	NA	NA	NA	NA	NA	Soft mud - contact below 2 feet
WS15-3	TRU-60	324074.23	4622346.67	8.6	18.1	-3.7	0.102	0.1	likely clutter	19	5.0	Scrap	Horizontal	2	Horizontal	Old broken metal box 5 in by 5 in
WS15-4	TRU-61	324501.23	4622344.52	8.6	17.2	-10.9	0.129	0.3	strongly inverted, likely clutter	0	NA	NA	NA	NA	NA	Lots of small signal detector - no major contacts
WS15-5	TRU-62	324576.89	4622344.71	8.6	72.9	-4.7	0.180	0.5	excellent target, projo?	NA	NA	NA	NA	NA	NA	Soft mud bottom - contact below 2 ft
WS15-6	TRU-63	324830.77	4622327.24	8.8	9.8	-6.2	0.104	0.3	clutter	8	10.0	Scrap	South	3	Horizontal	Soft mud, metal junk 10in by 10in
WS15-7	TRU-64	324862.02	4622318.33	8.8	8.4	-3.7	0.089	0.6	clutter over reef	NA	NA	NA	NA	NA	NA	Soft mud - contact below 2 feet
WS15-8	TRU-65	325015.32	4622232.35						part of 4-target group over reef	24	NA	NA	NA	NA	NA	Soft mud - contact below 2 feet
WS15-9	TRU-66	325019.61	4622233.60	8.6	37	-8.8	0.140	0.1	4-target group, looks like boat anchor	24	36.0	250 lb Bomb	North	250	Horizontal	Soft mud, 250lb bomb, not recovered
WS15-10	TRU-67	325024.18	4622233.06						part of 4-target group over reef	24	36.0	NA	South	10	Horizontal	Soft mud - big piece of metal - 36in by 28in
WS15-11	TRU-68	325581.26	4622346.79	8.6	32.8	-14.1	0.154	0.4	good target, possible 155mm	36	NA	NA	NA	NA	NA	Soft mud - contact below 2 feet
WS15-12	TRU-69	327096.15	4622346.01	8.9	74	-17.8	0.214	0.4	very good target, large projo?	36	24.0	155mm	straight down	90	Straight Down	Soft mud bottom - 155mm nose down - 36 inches down - not recovered
WS19-1	TRU-50	323790.97	4623669.75	9.3	100.5	12.6	0.155	0.1	partial signature, dig	24.0	NA	NA	NA	NA	NA	Soft Silt and mud bottom - contact below 2 feet - soda can on surface
WS19-3	TRU-51	323974.50	4623665.58	9.4	672.9	-219.3	0.411	0.4	single object, too big for UXO, find out	12.0	NA	NA	NA	NA	NA	Not recovered - big pile of metal trash 12 inches deep
WS19-4	TRU-52	324127.60	4623667.48	9.5	16.6	-3.7	0.096	0.1	likely too small for UXO	NA	NA	NA	NA	NA	NA	Silt and mud bottom - No contact
WS19-5	TRU-53	324666.62	4623668.14	9.8	27.2	-3.2	0.118	0.3	small target	36.0	NA	NA	NA	NA	NA	Soft mud bottom and contact below 3 feet
WS19-6	TRU-54	325134.79	4623663.33	9.5	41.3	-13.9	0.195	0.6	large target, could be projectile	36.0	NA	NA	NA	NA	NA	Soft silt and mud - contact below 2 feet
WS19-7	TRU-55	326030.44	4623667.58	9.3	52.1	-8.6	0.176	0.6	could be 155mm	36.0	24.0	155mm	straight down	90.0	Straight Down	Soft mud - item (155mm) base down 36 inches - not recovered
WS19-8	TRU-56	326076.20	4623667.69	9.2	54.4	-8.7	0.148	0.3	looks like a boat anchor	NA	NA	NA	NA	NA	NA	Very soft mud and contact below 2 feet
WS19-9	TRU-57	326548.65	4623661.11	9.2	74.4	-38.1	0.206	0.4	Large inverted target, projo?	36.0	NA	NA	NA	NA	NA	Soft mud and contact below 3 feet

4. Target Recovery Operations

AETC contracted with Explosive Ordnance Technologies, Inc. (EOTI) to conduct the target reacquisition and marking, target recovery, and materials disposal for the recovered materials. In addition, they supported installation of the calibration targets and provided a chase boat and UXO-qualified diver to support the MTA survey operations.

Based upon the recommended Dig Lists generated from the MTA surveys (Appendix B) and an additional target list provided by Sky Research from the Airborne survey, the Program Office established a dig list of 255 targets for intrusive investigation. These are identified in Tables 6-9 in this report and visually depicted in Figure 13.

EOTI's fieldwork was performed in three phases.[13] Initially, a small advance party of UXO Technicians mobilized to the site to arrange logistical support. This party also refined operational procedures and began reacquisition and recovery of the anomalies. Additional UXO Technicians were then mobilized to conduct the intrusive site operations and to document the results and classify the investigated items. Following the investigation and documentation phase, a partial demobilization of personnel took place. A closeout party remained to conduct disposal operations and other closeout tasks. During this phase, following the explosive demilitarization of recovered MPPEH, the scrap was collected, inspected, certified free of explosive hazard, and transferred to a recycling facility. EOTI initially mobilized personnel and equipment on 25 September 2006. The subsequent mobilization of additional personnel and equipment occurred on 1 October 2006. Final site work was complete on 20 October 2006.

Figure 14. With the dive boat and the chase boat working together, an UXO Tech prepares to mark the position of a reacquired target.

4.1 Target Reacquisition

To reacquire a target on the Dig List, the reacquisition team navigates to the location of the anomaly using a Trimble Geo XT hand-held GPS capable of sub-meter accuracy. Daily Quality Control tests of the device revealed that it routinely achieved sub-foot accuracy when tested against known benchmarks. Driving the support boat, the team converges on the predicted location of the anomaly using the GPS unit. The location is marked with a weight and buoy, Figure 14. The magnetic anomaly is then reacquired from the boat using an underwater magnetometer (Schonstedt MG-230 Gradiometer) and if necessary the emplaced buoy position is refined.

4.2 Target Recovery

A UXO Diver preparing to recover a target dives on the

marked location carrying a Fisher Model 1280-X hand-held underwater metal detector, Figure 15. If the target is not located immediately at the weight, the diver begins circling the weight in an outwardly spiraling pattern until he locates the metallic anomaly. If the diver cannot identify a magnetic anomaly within about 2.5 meters of the drop weight, the supervisory UXO tech in the group must make a decision either to declare the location a "dry hole" or to go through the reacquisition process again to confirm the correct target location. If the diver locates the target and is satisfied that the identified anomaly corresponds to the anomaly on the dig sheet he then, either with his hands or with hand tools depending on the depth of the anomaly, attempts to uncover the item so that it can be identified and recovered.

Figure 15. A UXO diver with a Fisher metal detector is shown preparing to dive on a marked target in the Toussaint River. The dive boat in the background is reacquiring and marking additional targets for investigation.

Each anomaly on the dig list was carefully uncovered (if possible) so that it could be examined to identify the item, evaluate its condition, and to determine if it can be brought to the surface for consolidation. In some cases, the bottom composition precluded access to and/or identification of the anomaly. In other cases, the bottom composition allowed enough access to identify the anomaly, but recovery of the item was not feasible. Whenever possible, Figure 16 and 17, anomalies were raised to the surface and marked with tape bearing the target number.

Following its investigation, each anomaly item was documented on the dig list spreadsheet. The observations made by the dive team members have been incorporated into the reports presented as Tables 6-9. Additionally, each recovered item was photographed. Photographs are included electronically in Appendix C. The file names for the photographs relate to the anomaly that they represent (for example, File TRU-358.jpg, is a photograph of the item identified as Anomaly

Figure 16. A UXO diver is shown returning to the surface with a 90 mm projectile that was lying proud of the bottom.

Figure 17. A lift bag and the dive boat hoist were required to free this 155 mm projectile from the mud.

TRU-358). TRU-XXX is one of the Dig List designations provided to EOTI by the Program Office. Tables 6-9 in this report correlate the Program Office unique target identification numbers with the AETC unique target identification numbers assigned at the time of the target analysis.

Figure 18. A UXO Tech is shown showing off a collection of projectiles recovered during one day's diving.

4.3 Target Disposal

All recovered items were carefully inspected to verify that they did not present an explosive hazard. For some targets this required a cursory cleaning. However, except for the targets that were buried in the mud, the recovered ordnance was relatively clean and in near pristine condition. Figure 18 shows 23 projectiles in the dive boat, which were collected during the course of a successful day of diving. The recovered targets were brought ashore and hand-carried to a secure stockpile storage point that was provided by ARES, Inc.

Many of the recovered items required demolition operations to ensure that they were free of explosive hazards prior to disposal. On 18 October 2006, demolition operations were conducted on 85 items at a facility provided by ARES, Inc.

Explosive shaped-charge perforators were used to puncture and vent each of the items. These were obtained from Halliburton Corporation in Alvarado, TX. Cast boosters, Detonating Cord, non-electric detonators, and associated materials needed for the demolition operations were obtained from Hilltop Energy, Inc., Mineral City, OH. Figure 19 shows preparations for the demolition. A trench was dug and the ordnance items were placed in the bottom of the trench. The perforators are fixed both to the body of the projectile and to the fuze area (if one was present). The collection of ordnance was tamped (in this case) with 3 layers of sand bags, and all the charges were detonated simultaneously. The tamping was to reduce the danger of shrapnel damage (if any of the items were HE filled). It also reduced the scattering of the ordnance, which had to be collected following demolition. Most of the explosive energy is released into

Figure 19. Three UXO techs are shown preparing the stockpiled ordnance for demolition.

lifting a plume of sand straight up into the air.

Following the demolition, certified MEC scrap and other metallic scrap recovered during the operation were certified as free of explosives residue. The scrap was collected into barrels and transported for disposal after completion of the fieldwork. The scrap was disposed of through a local metal recycling facility, Burns Iron and Metal Company, Inc., Fremont, Ohio. As required by law, ordnance and ordnance scrap could not be released to the public until it has been either processed through a smelter or shredded. A total of 3,320 pounds of scrap was turned in. In accordance with DoD 4160.21-M, the turn-in of scrap was documented on DD Form 1348-1A, Issue Release/Receipt Document.

5.0 Summary

During the intrusive investigation phase of this demonstration project, a total of 229 anomalies from the Program Office Dig List were reacquired, investigated, and documented. In 6 instances, the diver investigation of a single Dig List target resulted in the recovery of more than 1 item. One anomaly on the Program Office Dig List was identified twice; it was investigated twice based upon two different anomaly numbers.

No HE-filled projectiles were recovered during the intrusive investigations at Lake Erie. However, 33 MEC items were identified that could not be recovered either because of the way they were fuzed or because they were not sufficiently accessible to determine their fuzing. These unrecovered MEC items are documented below in Table 13. Eleven of the intrusive investigations resulted in identification of shrapnel that resulted from high order detonation of projectiles. This documents the fact that a fraction of projectiles fired on this range were HE filled.

After consultation with LTC Herrington-Clemens at Camp Perry, and in accordance with customary practice, EOTI reported the existence of these MEC items to LT Patrick Gerhardstein at EODMU Two, Det Crane in Crane, IN for their prosecution and disposal. EODMU Two Det Crane is a detachment of the US Navy EOD Mobile Unit Two.

Figure 20 is a representation of Figure 13 modified to show the partition between UXO recoveries (♦) and non-UXO recoveries (♦) among the 229 intrusive investigations.

5.1 The Toussaint River

Of the 28 intrusive investigations made in the Toussaint River there were no UXO recoveries or identifications. However, for 21 of the 28 targets that were investigated, the diver either failed to identify any target or we concluded that he recovered a target different from the one specified in the Dig List. We conclude that there is insufficient information resulting from the investigations in the Toussaint River to determine whether UXO is present. We do feel however, if UXO is present in the River channel it will likely be located very near the mouth of the River where sand is constantly migrating into and out of the channel because of strong currents in the narrow channel at the mouth of the river.

Because most of the dredged boat channel in the River has several feet of very soft silt on the bottom, it is very unlikely that UXO will migrate very far up river unless it is mechanically moved by dredging or other operations. The very deep and soft silt/mud would effectively trap any ordnance migrating into the river from the Lake.

Table 13. Target list of identified UXO that were not recovered

AETC Target ID	Nelson List Targ. ID	UTM X (m)	UTM Y (m)	Water Depth (m)	Burial Depth (in)	Length (in)	OE Type	Wt. (lb)	Orientation	Attitude	Diver Comment
WS19-7	TRU-55	326030.44	4623667.58	9.3	36	24	155mm	90	straight down	Straight Down	Soft mud - 155mm base down - not recovered
WS15-9	TRU-66	325019.61	4622233.60	8.6	24	36	250 lb Bomb	250	North	Horizontal	Soft mud - 250 lb bomb - not recovered
WS15-12	TRU-69	327096.15	4622346.01	8.9	36	24	155mm	90	straight down	Straight Down	Soft mud - 155mm nose down - not recovered
TR77-12	TRU-225	331690.78	4613767.08	6.2	24	24	155mm	90	North	Straight down	Silt and mud bottom - 155mm stuck in rocky bottom - not recovered
TR77-17	TRU-227	332308.40	4613761.81	6.0	24	24	155mm	90	Straight down	NA	Sand/rock - unable to recover
TR35-27	TRU-262	329347.69	4606837.20	4.4	6	24	155mm	90	North	Horizontal	Sand/clay bottom-155mm fuzed-not recovered
TR35-45	TRU-268	329587.70	4606831.98	4.4	6	24	155mm	90	North	Horizontal	Sand/clay bottom-155mm fuzed-not recovered
TR35-59	TRU-272	329723.75	4606831.90	4.4	6	20	4.2 in Mortar	40	North	Horizontal	4.2 in mortar, fuzed - not recovered
TR35-122	TRU-281	330529.89	4606837.00	4.7	2	20	4.2 in Mortar	40	North	Horizontal	Sandy bottom - 4.2 in mortar, fuzed - not recovered
TR35-123	TRU-282	330538.73	4606836.26	4.7	6	20	4.2 in Mortar	40	North	Horizontal	Sandy bottom - 4.2 in mortar, fuzed - not recovered
TR35-128	TRU-283	330654.19	4606837.01	4.7	5	20	90mm	40	East	Horizontal	Hard sandy bottom - 90mm fuzed - not recovered
TR35-176	TRU-294	331944.94	4606836.09	4.9	6	24	155mm	90	North	Horizontal	Soft mud bottom - 155mm & M48 fuze - not recovered
TR35-178	TRU-295	332082.33	4606838.96	5.1	6	24	155mm	90	North	Horizontal	155mm, fuzed - not recovered
TR35-179	TRU-296	332127.62	4606837.39	5.1	3	24	155mm	90	North	Horizontal	155mm, fuzed - not recovered
TR35-181	TRU-298	332192.40	4606831.91	5.1	20	20	4.2 in Mortar	30	North	Horizontal	Sand/clay bottom-4.2 in mortar, fuzed-not recovered
TR35-188	TRU-303	332912.68	4606835.26	5.5	28	24	155mm	90	NE	Horizontal	Sand/clay bottom-155mm fuzed-not recovered
TR89-5	TRU-307	327216.62	4615746.32	7.6	36	24	155mm	90	Straight down	Straight down	Very soft mud bottom - unable to recover
TR89-6	TRU-308	327396.15	4615740.68	7.7	24	24	155mm	90	Straight down	Straight down	Very soft mud bottom - unable to recover
TR89-11	TRU-309	328177.26	4615743.93	8.0	32	24	155mm	90	Straight down	Straight down	Soft mud - not recovered
TR89-13	TRU-311	328655.62	4615741.72	8.2	36	24	155mm	90	Straight down	Straight down	Soft mud-felt with hand-155mm base- not recovered
TR89-15	TRU-313	328889.86	4615756.55	8.2	24	24	155mm	90	Straight down	Straight down	Soft mud - not recovered
TR89-19	TRU-315	330156.62	4615740.11	8.5	30	24	155mm	90	Straight down	Straight down	Soft mud - not recovered
TR89-21	TRU-317	330223.62	4615741.34	8.6	24	14	90mm	40	East	Horizontal	Soft mud bottom - 90mm, fuzed - not recovered
TR89-29	TRU-321	331097.69	4615740.34	8.6	30	24	155mm	90	Straight down	Straight down	Soft mud bottom - 155mm - not recovered
TR89-31	TRU-323	331230.12	4615746.29	8.6	24	24	155mm	90	North	Straight down	Very soft mud - 155mm - not recovered
TR89-32	TRU-324	331283.41	4615746.89	8.6	24	24	155mm	90	Straight down	Horizontal	Soft mud bottom - 155mm - not recovered
TR89-36	TRU-326	331727.85	4615744.03	8.2	32	24	155mm	90	North	Straight down	Soft mud bottom - not recovered
Air-101	TRH-101	329434.65	4604793.80	2.1	24	24	155mm	90	Straight Down	Vert	155mm below 2 Feet - Not recovered
Air-104	TRH-104	329518.47	4604589.26	1.9	26	48	2.75in Rocket	25	60 Deg Down	60 Deg Down	Hard Mud - Not Recovered - Assumed Fuzed
Air-105	TRH-105	329574.41	4604481.35	2.1	6	48	2.75in Rocket	25	E	Hor	Mud - Not Recovered - Fuzed
	TRH-106	329345.56	4604761.77	1.3	12	24	155mm	90	N	Hor	Sand - Not Recovered - Fuzed
	TRH-110	329360.10	4604665.34	1.8	30	24	155mm	90	Straight Down	Vert	Mud - Not Recovered
	TRH-111	329426.14	4604551.17	2.0	6	24	155mm	90	N	Hor	Sand - Not Recovered - Fuzed

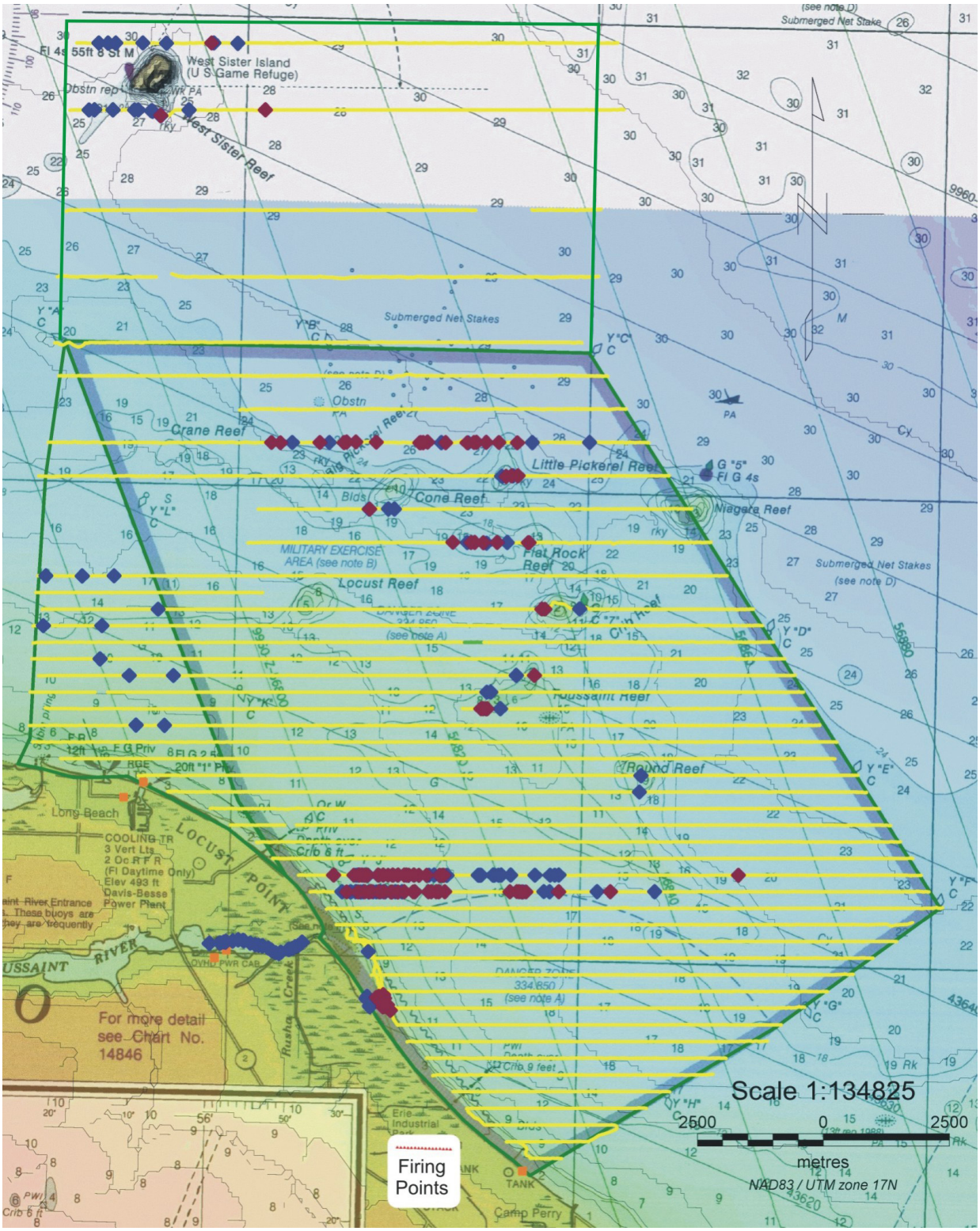

Figure 20. The UXO recoveries are noted as red diamonds; the recoveries in which no UXO was found are noted as blue diamonds.

5.2 The Davis-Besse Impoundment Area

This area is outside the formal range boundary adjacent to the shoreline of the nuclear power plant property. There were 11 intrusive investigations carried out in this area. In each dive the bottom was described as rock, rocky, or hard clay. The recoveries included 4 anchors, several pieces of metal scrap or boat parts, and several references to hot rocks or geological returns. Figure 11 shows that this area is only sparsely populated with metallic anomalies. Based upon the rather limited number of intrusive dives made in this large area we can conclude that there is very little or perhaps no UXO contamination west of this range boundary. The magnetic anomalies measured in this area and reported in Table 7 likely represent the indigenous background level from historical non-ordnance related activities.

5.3 The Impact Ranges

5.3.1 The Ordnance Recovered

Table 14 summarizes the results of the intrusive investigations that took place within the current and former Erie Proving Ground Range boundaries, extending to the north side of West Sister Island. The intrusive investigations in the Toussaint River and in the Davis-Besse Impoundment Area described above are not included in this discussion.

Table 14. Summary of the intrusive investigations within the range boundaries

Recovery	Survey Area							
	Airborne	All Reefs	Tr35	Tr37	Tr89	WS15	WS19	Subtotal
155 mm Projo	7	10	18	25	16	2	1	79
105 mm Projo		3	1	3				7
90 mm Projo		2	4	7	2			15
75 mm Projo		2	1					3
57 mm Projo				1				1
37 mm Projo			2	2				4
4.2 in Mortar		1	4					5
2.75 in WH	2							2
250 lb GP Bomb						1		1
Fuze/Ordnance Components				2				2
Frag Recovery		1	8	1	1			11
Anomaly Not Identified/Too Deep/ Hot Rocks, etc.	4	12	6	7	3	7	6	45
Total Intrusive Dives	18	31	49	44	24	12	8	186

Of the 186 intrusive investigations, almost 25% resulted in inconclusive results where either no anomaly was identified because it was buried too deeply to uncover or because the bottom was too hard to dig the anomaly out with hand tools. A higher fraction of unidentified items occurred in the West Sister Transects. This was primarily the result of the deeper water conditions and because of the deep soft mud bottom surrounding the island.

5.3.2 The Fraction of Non-Ordnance Recoveries

Of the 141 intrusive dives that resulted in identification of the target, 117 intact ordnance items were recovered and an additional 13 recoveries were described as fuzes, ordnance

components and/or frag pieces. The fraction of non-ordnance related recoveries within the range boundaries was quite low (8.5%). This does not constitute a false alarm rate as usually depicted in ROC curves, which document the analyst's performance in discriminating between ordnance and clutter. Not all anomalies within a transect area were accepted for analysis, or if they were analyzed, some were excluded from the target list because they did not fit the profile of an ordnance item. The reasons for excluding targets from the target list are documented above. If all of the excluded targets were included in the target list, they would likely have no affect on the fraction of ordnance that was recovered. Most targets that were excluded were excluded because the visual inspection of their signatures made it plain that they were not ordnance – they would have been listed as "don't-dig" targets.

The target lists of analyzed targets prepared by AETC were much more extensive than the list of targets that were investigated by divers. The list of targets recommended by AETC for diver investigation was somewhat more extensive than the reduced list provided to the divers. In general, the targets that were investigated by the divers were those rated "most probably ordnance" by AETC. Only if the entire target list was investigated (or the entire target list was uniformly sampled by intrusive investigation) would the 8.5% non-ordnance recoveries in the range area represent a false alarm rate.

The way that the intrusive investigation candidates were selected from the overall target lists reflects the analyst's ability to cherry pick ordnance from a target list (or stated another way, it reflects the analyst's ability to minimize false alarms in the first 30% (or so) of the ROC curve).

5.3.3 Recovered Ordnance that were not Projectiles

The mortars and 2.75 in war heads were recovered relatively close to shore and probably were the result of training on the land-based ranges. In particular, the 2.75 in WH's were recovered very close to the shoreline (from the Helicopter beach and shallow water survey).

The GP bomb is an outlier. It presumably resulted from an air drop, and thus tends to confirm the rumors that the island might have been used as a bombing target. We would caution that one bomb recovery does not constitute or establish a bombing target. Investigations on the island proper would likely prove much more useful for determining this issue. A simple surface inspection might be adequate to establish the presence of air dropped weapons. In general, one would also expect to find a substantial number of 155 mm projectiles on the island. West Sister Island is within easy range for this ordnance, if properly fired from the fixed firing points.

We found no evidence that parts of these ranges were used to dump large caches of ordnance from barges when the range was closed for proof testing. However, the transect spacing, particularly on the northern half of our survey, were quite widely spaced. It is entirely possible that a few barges of ordnance could have been dumped and not detected by our transect surveys.

5.3.4 Presence of Live Ordnance in the Impact Areas.

The density and general distribution of ordnance found in this demonstration survey and from the intrusive recovery of selected anomalies is consistent with the long and intense use of these ranges for proof testing a range of projectiles and guns. More than 80% of our intact ordnance recoveries were 90 mm, 105 mm, and 155 mm projectiles. Most of the remainder was smaller projectiles, mortars and 2.75 in rocket/WHs. Each of the ordnance items was challenged by a shaped-charge jet perforator. There were no high order detonations during the demolition, indicating that none was explosive filled.

Examination of the ordnance photos shows that all the recovered 155 mm and most of the 105 mm projectiles were fired with shipping lugs in place. The remaining smaller projectiles were recovered without shipping lugs, some had dummy fuze plugs, some had no fuze plugs, and the remainder could not be evaluated from the photos. 155 mm and 105 mm projectiles (high explosive filled or inert) are typically shipped with shipping lugs so they can be handled with mechanical lifts. Usually the shipping lugs are removed before firing. Often they are not replaced with fuzes if they are being fired as practice rounds whether they are live or not. Detonation of a 155 mm round usually leaves the base plate intact. The base plate presents a larger magnetic anomaly signature than many of the smaller projectiles that we recovered. We recovered no 155 mm base plates.

We did, however recover two projectile fuzes and there were 11 instances of frag recoveries that were consistent with detonations of larger projectiles. This is documented in Table 14. In Table 13 the 33 ordnance items that were identified, but not recovered, were described. Fifteen of these (eight 155-mm and two 90-mm projectiles, four 4.2-in mortars, and one 2.75-in WH) were described as being fuzed. It is reasonable to assume that most, if not all of these items, were explosive-filled. Based upon the other recovered 155 mm projectiles, all with shipping lugs, it seems unlikely that a shipping lug would have been replaced with a fuze on a 155 mm projectile if it had an inert fill.

In summary, we conclude that many inert projectiles of all sizes were fired onto this range. Furthermore, there is conclusive evidence that explosive-filled projectiles have also been fired on the range. It is conjectural as to the relative fractions of inert and live ordnance that have been fired. The conclusion is that discovered (or recovered) ordnance must be assumed to be live, until shown to be otherwise.

5.4 Survey Production Issues

By modifying the MTA sensor platform and tow cable, we were able to survey in all the planned areas on Lake Erie, in many cases in water more than 9.6 meters deep. Because of the relatively short tow cable (even when lengthened to 22 meters) our survey speed was cut by 50% when the water was more than 7.5 meters deep. Survey speed had to be reduced even more when wave conditions were higher than ~1.5 feet. On much of the northern half of the site we surveyed at speeds between 1.2 and 1.4 meters/second. At

speeds less than ~1.1 meters/second the platform stalls because there is not enough water flow over the stern planes to control the pitch and roll. When the platform stalls in relatively shallow water it pitches downward (following the drooping tow cable) and into the bottom. When the system stalls while operating very deep it rolls (the steeply descending tow cable does not allow the system to dive). On a few occasions we have had the platform roll completely upside down. This usually happens when we have broken the weak link and the wind/waves are drifting the boat and platform along at about 1 meter/second. When this happens, we have to use the chase boat (and or the diver) to right the platform after it floats to the surface.

Two other conditions adversely affected our survey production rate. We had assumed that we could travel from the marina to the distant survey transects by pulling the tow cable in very short and ferrying the system at 5 knots. With high wave conditions, this proved to be completely impractical. The tow boat pitching over the waves violently jerks the tow cable and breaks the weak link; requiring the system to stop to repair the damage. Additionally, this violent jerking on the platform for several hours ferrying back and forth between the marina and the survey area damaged the platform and resulted in permanent loss of one of the sensor platform covers and stripping of the threads in the fastener seats for the attachment bolts.

The final adverse condition that we failed to anticipate was the deteriorating weather during the intended period of the survey operation. During the initial weeks of the operation, there were more relatively calm days than days with wave conditions that would not allow us to attempt to survey. By mid September, on more than half of the days wave conditions were too severe to survey. When we attempted to complete some survey lanes by returning to the site in the second week in October, the entire week was lost because of high winds and waves. 15-20 knot winds can generate off shore wave heights of more than 5 feet in a period of only about an hour.

It was our intent when we began the demonstration to complete well over 1,000 line km of transect surveys. When we completed the last successful survey day on 21 September we had completed only 530 line km, (Table 3). This corresponds to a survey rate of 6.2 km/hour or 1.7 meters/sec. The system was designed to survey at 5 knots (or 2.55 meters/sec).

In spite of the lower survey production rate than anticipated, we completed survey transects that sampled the entire Range 1 and Range 2 areas and extended to beyond (north of) West Sister Island. The survey results, combined with the dig results resulted in an effective mapping of the Erie Army Depot (Camp Perry) impact range areas and a bounding of the limits of the ordnance contamination area.

6.0 Cost Information

Table 15 shows the budget proposed by AETC Incorporated for the MTA demonstration at the Former Erie Army Depot as originally incorporated into the AETC Demonstration Plan. The total proposed costs including mobilization and demobilization, preparation of all work products required for the intrusive investigation and the writing of the final report was $426.521K.

AETC subcontracted the intrusive investigation work to EOTI. Intrusive work took place following the Demonstration Survey and preparation of the dig support products. This was a firm fixed-price subcontract for $247.532K to reacquire, recover, and dispose of 200 anomalies. During the course of the recovery operations AETC modified the subcontract to allow prosecution of an additional 29 anomalies resulting from the Airborne magnetometry survey. The cost of the additional effort was $22.574K. The results of the EOTI recovery project are described in this report and the complete EOTI report is included in electronic format as Appendix D.

The actual final costs incurred by AETC have not been completely reconciled at this point. However, submission of this report in final form and completion of the rebuilding of the data acquisition computer on the tow vessel will complete the charging to this job and will effectively deplete the account.

The overall budget projections outlined in Table 15 proved to be very close to the actual incurred total expenses. Mobilization and demobilization costs were kept relatively low because, using only 2 persons, we moved the MTA vessel and the sensor platform to and from the job site on their transport trailers towed (in one day) by rental vehicles. The vehicles also supported the on-site operations. Mobilization and demobilization costs for this operation were >70% less than they were for the demonstration on Ostrich Bay, primarily because we did not use commercial carriers to move the equipment.

We handled the costs for the second support vessel (chase boat) and the UXO-certified diver/ boat driver during all operations by a separate subcontract to EOTI. These costs were approximately $50K. The presence of the diver in the chase boat proved to be extremely valuable on several occasions when repairs to the sensor platform had to be carried out in the water several miles off shore.

Overall labor costs were approximately 10% higher than anticipated. This was primarily the result of our traveling back to the site for one week in October to attempt to finish the incomplete and additional transects to fill out the survey. Our inability to complete these tasks mildly hurt our overall productivity. The more important reason that our overall productivity was significantly below expectations is that we incorrectly estimated our survey speeds. The combination of rough water (on many days) and the deep water (particularly on the northern half of the area) combined to reduce our survey speed by more than a factor of two during these periods. Additionally, during the second half of the survey operation, high winds and waves forced us to remain at the dock more than half of the time.

Table 15. Proposed budget for AETC MTA survey operations at the Former Erie Army Depot.

Mobilization								
Vehicles		Rent	Miles					**Subtotal**
	Excursion SUV, 6 Weeks	$2,835.14						$2,835.14
	Box Truck, 6 Weeks	$8,926.88	$240.00					$9,166.88
		Airfare	**Salary**	**Per Diem**	**Gas**	**Car**	**EOD Overtime**	
Packup	2 Persons,1 day (8/4)		$1,992.72					$1,992.72
Transport To Port Clinton	2 Persons, 2 days (8/5-6)		$3,985.44	$622.08	$450.00			$5,057.52
	P.I. (8/6) 1 Round trip	$494.00	$1,757.52	$640.00				$2,891.52
	Software Engineer (1 Round Trip, Champaign)	$500.00	$1,002.16	$640.00				$2,142.16
	EOTI/EOD (1 Round Trip)	$500.00						$500.00
	EOD Car (5 weeks)					$2,000.00		$2,000.00
Assembly/Launch	All hands, one day, Aug 7, 8 hr		$5,101.76	$777.60				$5,879.36
Dock	Chase boat and slip rental							$3,650
Operations								
Aug 9-15 P.I. home on 8/15	All Hands, 5days*12hr, 2 days*8hr		$48,466.72	$5,443.20	$630.00			$54,539.92
Aug 16-29 All home on 8/29	4 Persons, + EOD, 10 days*12hr+4 days*8hr		$63,575.52	$8,709.12	$1,260.00		$672.00	$74,216.64
All AETC Hands Return 9/4	Four Round-Trip Airfares, no EOD Return	$1,976.16						$1,976.16
Sept 5-18	4 Hands, EOD on Call, 10 days*12hr+4days*8hr		$91,380.88	$8,709.12	1260.00			$101,350.00
DeMobilization								
Disassembly 9/19	3 Persons		$3,654.56	$466.56				$4,121.12
Packout 9/20	3 Persons,1 day (9/20)		$3,680.56	$493.77				$4,174.33
Transport To Cary	2 Persons, 2 days (9/21-22)		$7,361.12	$622.08	$450.00			$8,433.20
Other Costs								
	Evaluation Trips (4/05)							$3,000.00
	Demonstration Plan							$4,000.00
	Develop HASP							$2,000.00
	Equipment Maintenance							$15,000.00
	Data Processing & Products (off site)							$20,000.00
	Equipment Repair/Restocking							$20,000.00
	Develop/Deliver Report							$25,000.00
	Prepare Datasets, Analyze 2000 targets, Prepare Dig Sheets							$21,000.00
						SUBTOTAL		$394,926.68
						TOTAL WITH FEE		$426,520.81

There were a few days lost because of breakdowns and searching for shops and mechanics to do repairs. In general, we budget ahead for these glitches because they seem to always occur during the first few days of a field operation. Having complete sets of component spares, tools, and equipment manuals minimizes lost time due to breakdowns.

There was a considerable amount of reconstruction and sensor platform structural repair work resulting from damage during the Lake Erie Demonstration. Much of this was the result of operating at depths twice those anticipated in the original design (and from cumulative wear and tear on the equipment from the multiple surveys). Some of these repairs have not been completed yet. It is currently our intention to have this work done at the same time as we are carrying out system modifications and design changes to support the next field demonstration. We believe that some savings can be realized if these processes are carried out at the same time.

As a final antidote, during our two visits to the site prior to the mobilization we picked what we though was the ideal marina to support the operation. Beef Creek Marina, on the Toussaint River, is only about 250 meters from the entrance to the Lake. We failed to realize that strong west and northwest winds sometimes blow the top 3 feet of the Lake Erie toward Buffalo. As the water level in the Lake continued to decrease, and as the survey operation moved continually further to the north and west we moved to a second marina (Wild Wings) , and then a third marina (East Side). In Beef Creek Marina, drifting sand closed the entrance to the Lake and the access channel was effectively dry. In the Wild Wings Marina, although the channel remained open, the boats ended up high and dry at the dock. In the East Side Marina there was constant access to the lake and to the slips at low water, but access was restricted during high water because of a low underpass at the Lake entrance. Additionally, the East Side Marina did not have boat ramps that were adequate to launch or recover the tow vessel. We had to rent three adjacent slips at each marina to accommodate the MTA vessel, the sensor platform, and the chase boat. During the operation, we continually moved back and forth among the marinas depending upon the weather conditions and what part of the area that we were surveying on a given day.

7.0 References

1. "Archive Search Report of the Former Erie Army Depot, Port Clinton, Ohio," Report No. A015, Environmental Science and Engineering, Inc., Jan. 1982

2. "Archive Search Report, Findings for the Former Erie Army Depot, Carroll Township, Ohio," U.S. Army Corps of Engineers, Rock Island District, August 1993

3. "Beach and Underwater Occurrences of Ordnance at a Former Defense Site: Erie Army Depot, Ohio," Joan Pope, Richard D. Lewis, and Timothy Welp, U.S. Army Corps of Engineers, Waterways Experiment Station, Report CERC-96-1, January 1996

4. "Unexploded Ordnance Support for the Toussaint River Dredging Demonstration Project, Ottawa County, Ohio," Human Factors Applications, Inc., Final Removal Report, February, 1996

5. "USACE Ordnance and Explosives Project Daily Quality Assurance Report at the Former Erie Army Depot (Beach Area) – QAR #46," ATI, August, 2002

6. "Report of the Defense Science Board Task Force on Unexploded Ordnance," Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics, Washington, D.C. 20301-3140, December, 2003, http://www.acq.osd.mil/dsb/uxo.pdf.

7. "Environmental Security Technology Certification Program Demonstration Plan for the Former Erie Army Depot and the Toussaint River," ESTCP, 8 August 2006

8. "UXO Characterization Plan for the Toussaint River and former Erie Army Depot, A Proposal Submitted by AETC Incorporated To Conduct a MTA Survey of Selected Areas of Lake Erie Adjacent to the Former Erie Army Depot and the Toussaint River, AETC Incorporated, 20 July 2006

9. "EOTI Work Plan for Target Retrieval on Lake Erie," EOTI, 12 September 2006

10. "Site Specific Work Plan in Support of Validation of the Marine Towed Array Demonstration at the Former Erie Army Depot and the Toussaint River," EOTI, 14 September 2006

11. "Site Specific Safety and Health Plan in Support of Validation of the Marine Towed Array Demonstration at the Former Erie Army Depot and the Toussaint River," EOTI, 14 September 2006

12. "Dive Management Plan in Support of Validation of the Marine Towed Array Demonstration at the Former Erie Army Depot and the Toussaint River," EOTI, 18 September 2006

13. “Explosive Ordnance Technologies, Inc (EOTI), Site Specific Final Report. Support of Validation of the Marine Towed Array Demonstration at the Former Erie Army Depot and Toussaint River, Port Clinton, OH,” EOTI, 27 October 2006

8.0 Points of Contact

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Beef Creek Marina 4358 N. Rider Rd. Oak Harbor, OH 43449	Dan Mora	Manager	Tel: 419-898-1829
Wild Wings Marina 6395 N Russell Rd. Oak Harbor, OH 43449			Tel: 419-898-1416
East End Marina 10195 W. State Rt. 2 Oak Harbor, OH 43449			Tel: 419-898-7009
Fairfield Inn 3760 E. State Rd Port Clinton, OH 43452			Tel: 419-732-2434

APPENDIX A

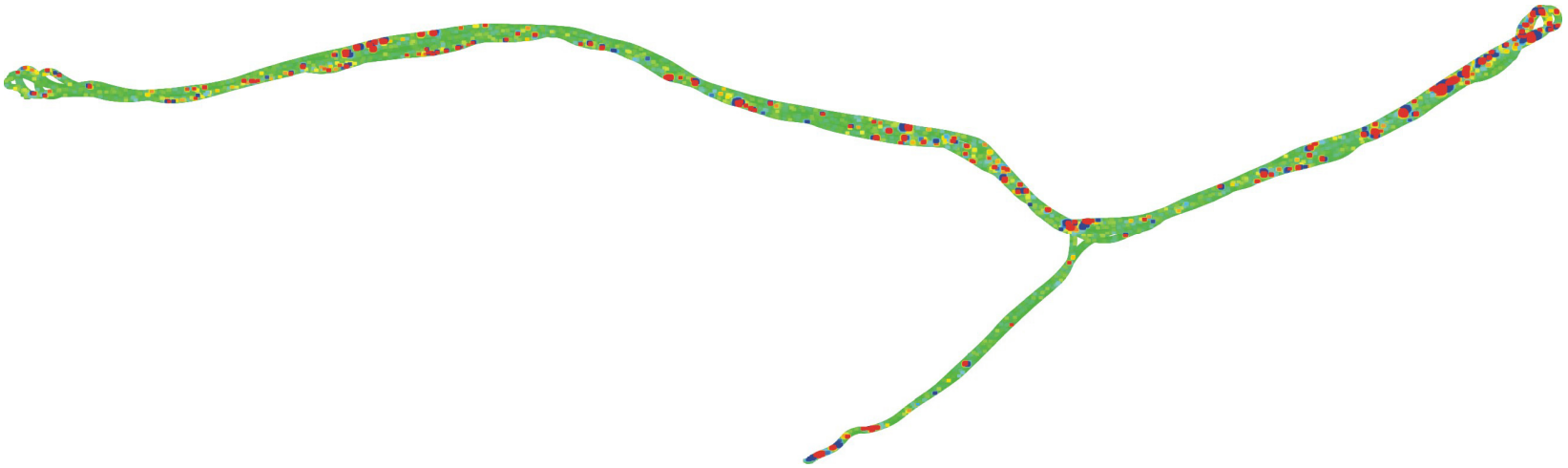


Figure 21. Magnetic Anomaly image of the MTA survey of the Toussaint River.

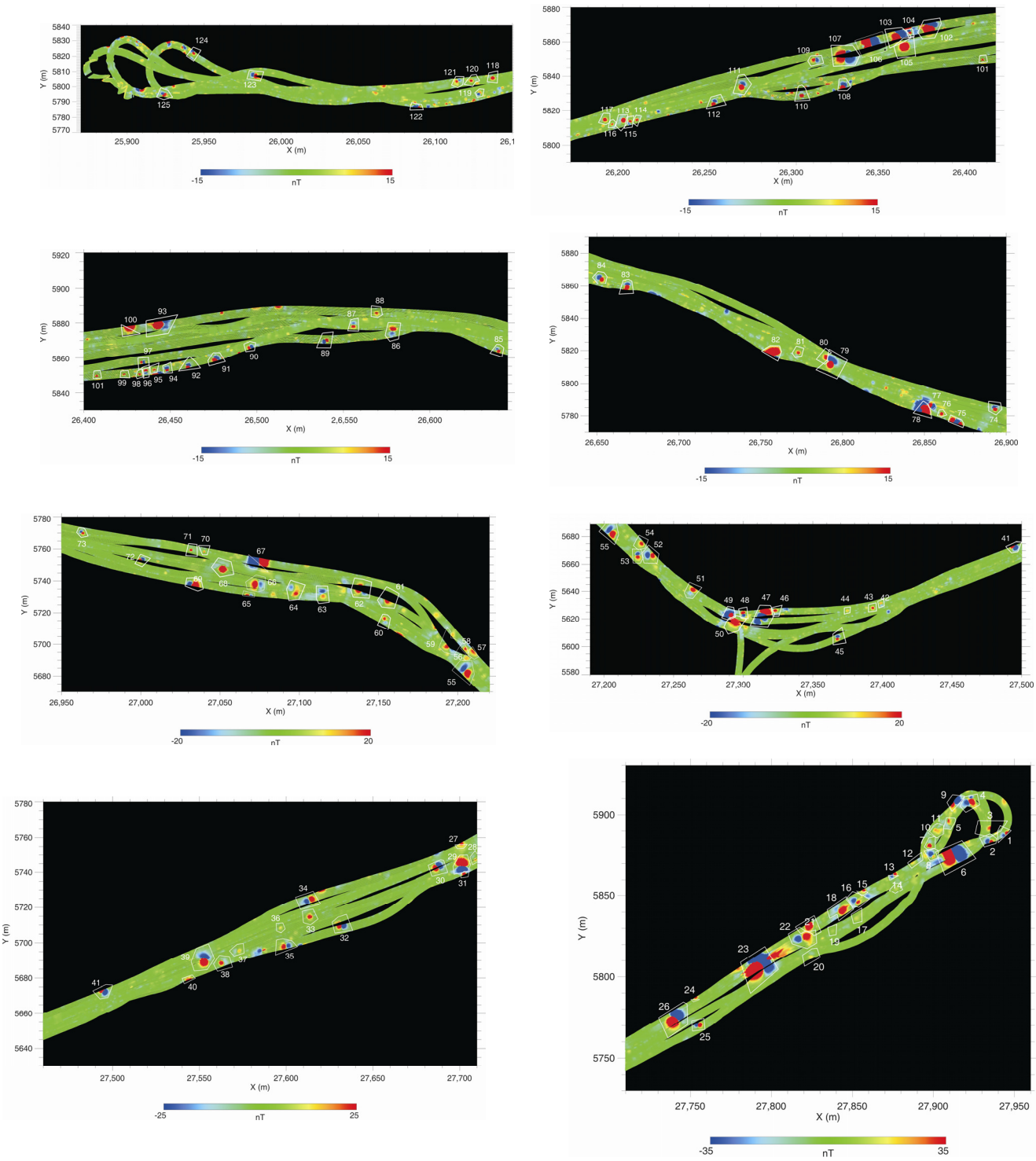


Figure 22. Magnetic anomaly images of the MTA survey of the Toussaint River. The analyst's target picks are shown as white polygons. The panels read from left to right and top to bottom

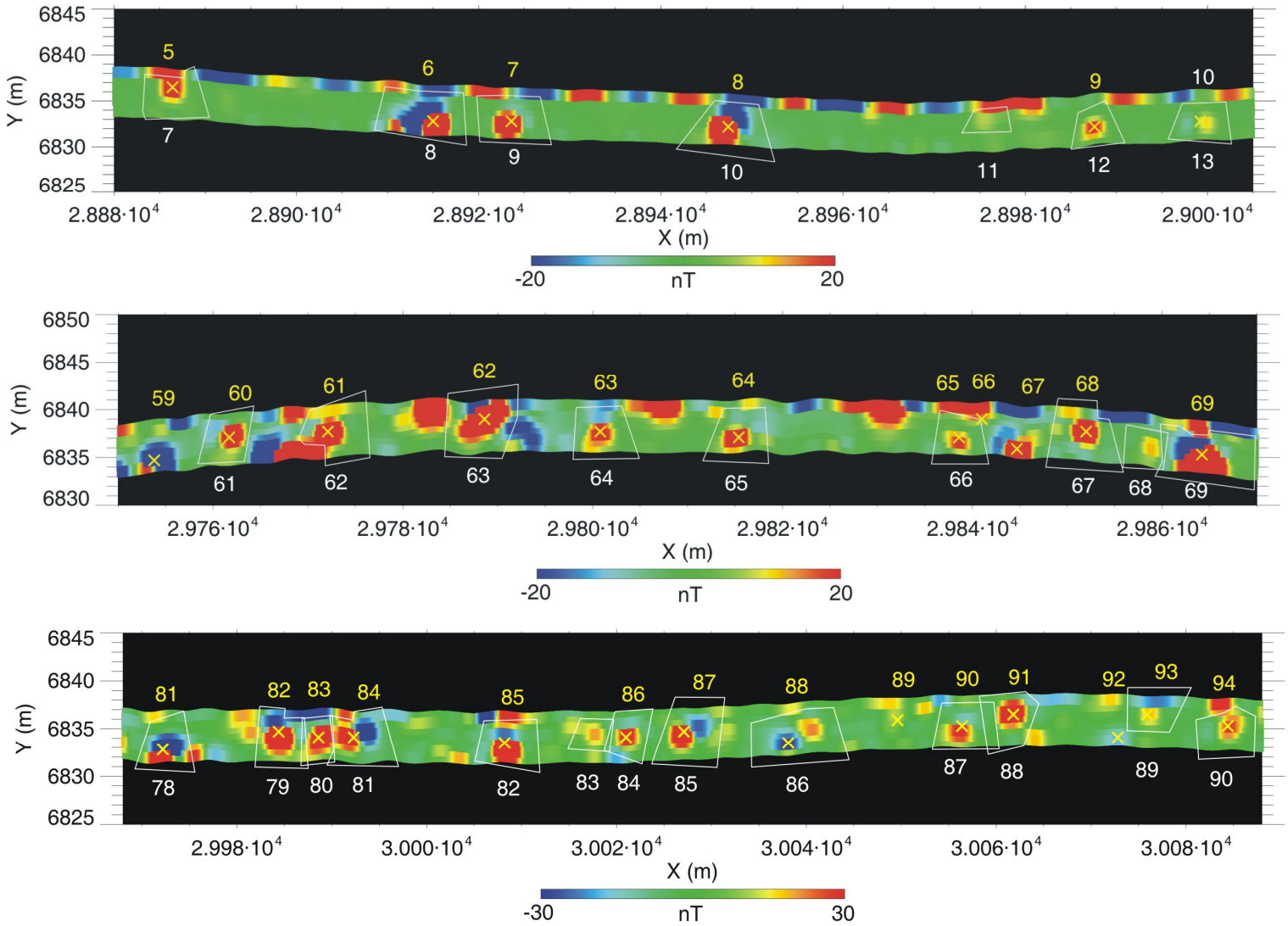


Figure 23. Data clips from analysis of transect Tr35. The automatic target picker numbers and positions are in yellow. The DAS analysis polygons and target numbers are shown in white. The streakiness (noise) on mag 8 was caused by an actuator cable that came loose and rested against the mag. It was resecured when the platform was removed from the water a short time later.

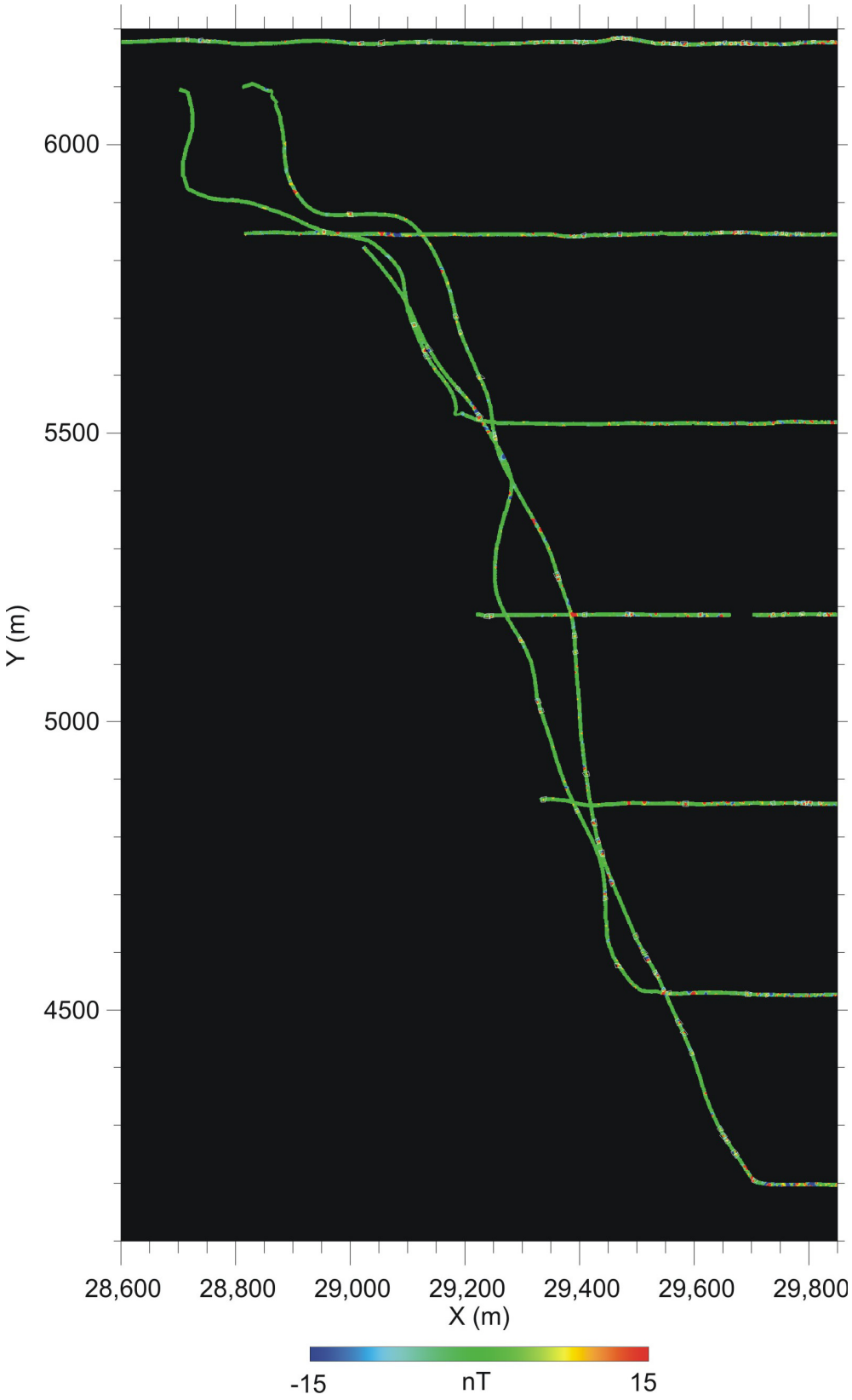


Figure 24. This shows a magnetic anomaly image of the west end of transects Tr17-Tr29 and the survey tracks made parallel to shore to provide a comparison of the MTA and Airborne surveys.

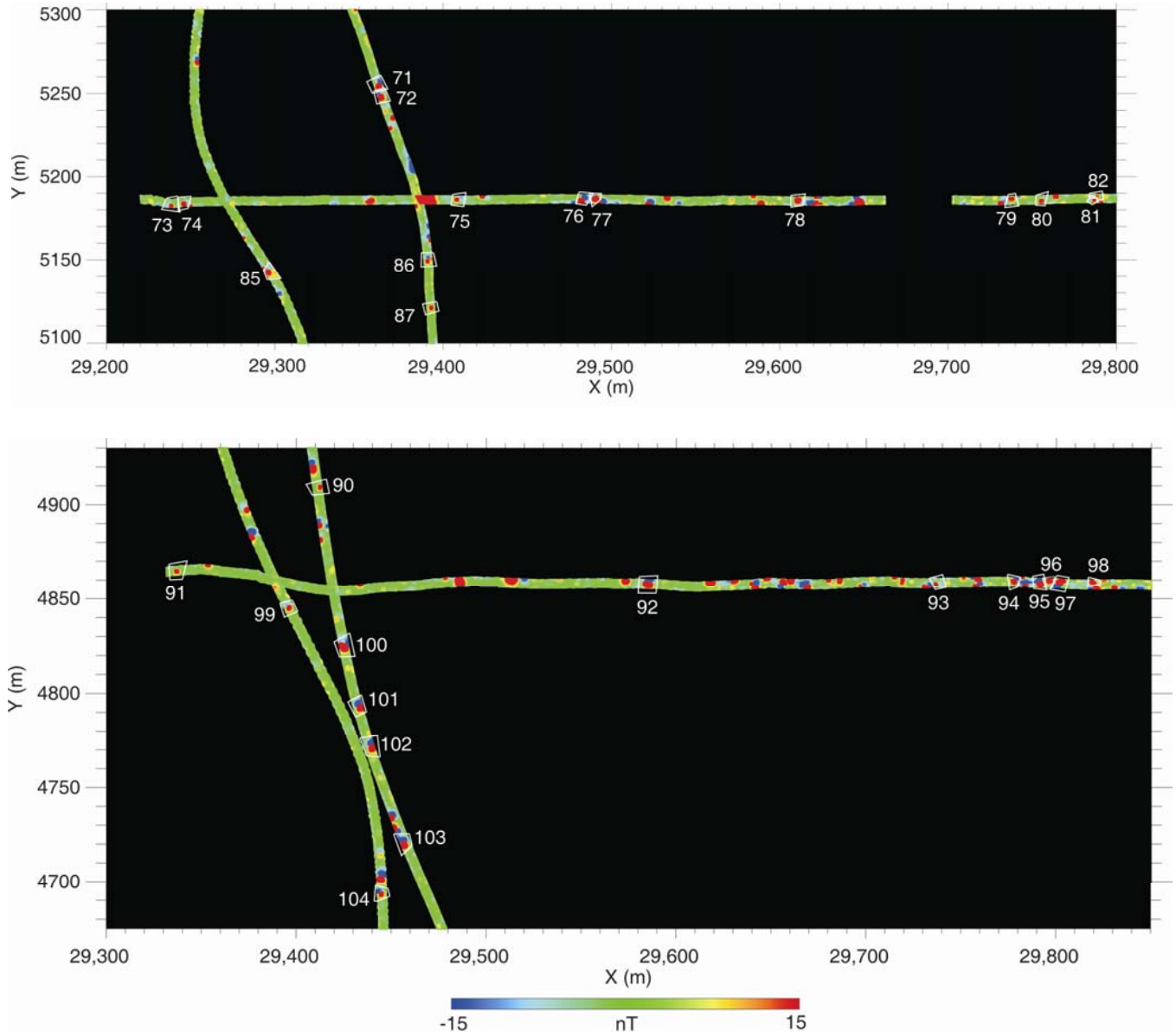


Figure 25. Magnetic anomaly image showing greater detail for transects Tr21 and Tr23 shown above in Figure 24.

Cone Reef Dig List

Mon Sep 11 17:02:37 2006
PRIMARY COORDINATES: MTADS LOCAL - Relative to UTM (300000.00,4600000.00) meters
SECONDARY COORDINATES: UTM=17, nad83
THIRD COORDINATES: Latitude/Longitude, nad83

Target ID	Local X (m)	Local Y (m)	UTM X(m)	UTM Y(m)	Latitude	Longitude	Water Depth (m)	Max. Signal (nT)	Min. Signal (nT)	Size (m)	Burial Depth (m)	Moment	Fit Quality	Analyst Comments	Dig/ Don't Dig
TR81-1	29154.60	14425.64	329154.60	4614425.64	41.6632774	-83.0520764	6.6	91.7	-25.5	0.186	0.11	3.6325	0.990	large target, dig	Dig
TR81-2	29161.88	14425.90	329161.88	4614425.90	41.6632813	-83.0519890	6.7	89.6	-77.3	0.190	0.00	3.8465	0.976	large target dig, 2nd target 5m West	Dig
TR81-4	29534.91	14429.39	329534.91	4614429.39	41.6633926	-83.0475122	6.4	17.4	-5.2	0.119	0.49	0.9419	0.914	projo?	Dig
TR81-5	29655.59	14428.03	329655.59	4614428.03	41.6634062	-83.0460631	6.7	62.4	-45.9	0.177	0.60	3.1576	0.554	155mm?	Dig
TR81-3	29470.03	14426.89	329470.03	4614426.89	41.6633562	-83.0482903	6.5	558.8	-1030.2	0.418	0.00	41.1768	0.425	ship wreck?	Don't Dig
TR85-1	29677.64	15086.06	329677.64	4615086.06	41.6693341	-83.0459860	6.7	20.5	-3.7	0.091	0.00	0.4304	0.719	105mm?	Don't Dig
TR85-2	30151.28	15084.66	330151.28	4615084.66	41.6694226	-83.0402996	6.5	21.3	-3.3	0.094	0.00	0.4698	0.921	105mm, monster target 5m East	Don't Dig

Crib Reef Dig List

Thurs. Sep 14, 2006
PRIMARY COORDINATES: MTADS LOCAL - Relative to UTM (300000.00,4600000.00) meters
SECONDARY COORDINATES: UTM=17, nad83
THIRD COORDINATES: Latitude/Longitude, nad83

Target ID	Local X (m)	Local Y (m)	UTM X (m)	UTM Y (m)	Latitude	Longitude	Water Depth (m)	Max. Signal (nT)	Min. Signal (nT)	Size (m)	Burial Depth (m)	Moment	Fit Quality	Analyst Comments	Dig/ Don't Dig
TR69-3	32577.84	12447.27	332577.84	4612447.27	41.6461954	-83.0104292	2.4	23.4	-5.7	0.146	0.00	1.7708	0.953	155mm?	Dig
TR69-4	32640.77	12446.44	332640.77	4612446.44	41.6462012	-83.0096738	2.5	10.5	-7.9	0.118	0.00	0.9297	0.967	105mm?	Dig
TR69-5	33327.74	12452.09	333327.74	4612452.09	41.6463959	-83.0014310	4.5	41.6	-3.4	0.120	0.12	0.9667	0.969	projo?	Dig

Dig List for the Davis Bessy Impoundment Area Dig List

Wed Sep 13, 2006
PRIMARY COORDINATES: MTADS LOCAL - Relative to UTM (300000.00,4600000.00) meters
SECONDARY COORDINATES: UTM=17, nad83,
THIRD COORDINATES: Latitude/Longitude, nad83

Target ID	Local X (m)	Local Y (m)	UTM X (m)	UTM Y (m)	Water Depth (m)	Max. Signal (nT)	Min. Signal (nT)	Size (m)	Burial Depth (m)	Moment	Fit Quality	Analyst Comments	Dig/ Don't Dig
TR53-2	23394.58	9804.41	323394.58	4609804.41	3.1	53.5	-41.8	0.171	0.79	2.8249	0.973	good target, maybe too deep	Dig
TR55-1	24129.39	10136.21	324129.39	4610136.21	3.2	14.6	-1.8	0.122	0.87	1.0324	0.943	good target	Dig
TR55-2	24531.09	10143.48	324531.09	4610143.48	3.2	19	-3.9	0.091	0.09	0.4187	0.908	small target	Dig
TR55-3	25092.60	10137.63	325092.60	4610137.63	3.5	23.1	-5.7	0.114	0.36	0.8275	0.935	105mm?	Dig
TR61-1	24395.86	11125.75	324395.86	4611125.75	3.7	35.1	-22.1	0.153	0.27	2.0092	0.968	155mm?	Dig
TR61-3	25270.80	11126.55	325270.80	4611126.55	3.9	33.8	-16.8	0.142	0.12	1.6297	0.972	155mm?	Dig
TR63-2	23816.91	11456.03	323816.91	4611456.03	4.1	36.9	-33.6	0.171	0.36	2.8461	0.960	155mm+?	Dig
TR67-1	22692.44	12115.43	322692.44	4612115.43	4.8	31.4	-4.5	0.104	0.03	0.6414	0.946	105mm?	Dig
TR67-3	23853.50	12114.43	323853.50	4612114.43	4.7	41.5	-26.4	0.160	0.24	2.3328	0.965	155mm?	Dig
TR69-2	24967.51	12445.28	324967.51	4612445.28	4.8	45.1	-32.4	0.166	0.25	2.5893	0.963	155mm?	Dig
TR73-1	22741.23	13105.97	322741.23	4613105.97	5.6	23.2	-7.3	0.128	0.45	1.1896	0.939	good target	Dig
TR73-2	23463.08	13104.42	323463.08	4613104.42	5.6	13.1	-6.4	0.100	0.23	0.5666	0.942	105mm?	Dig
TR73-3	24095.14	13107.22	324095.14	4613107.22	5.7	50.8	-29.3	0.162	0.20	2.406	0.959	155mm?	Dig
TR51-1	23436.26	9480.45	323436.26	4609480.45				0.112	*	0.7836	0.962	105mm with remnant	Don't Dig
TR51-2	23533.74	9477.80	323533.74	4609477.80				0.111	*	0.7806	0.790	multiple targets	Don't Dig
TR51-3	25357.95	9476.70	325357.95	4609476.70				0.124	*	1.0731	0.717	5 sensors see, 105mm+	Don't Dig
TR51-4	25905.71	9476.27	325905.71	4609476.27				0.082	*	0.3065	0.893	multiple targets	Don't Dig
TR53-1	23030.80	9804.43	323030.80	4609804.43	3	16	-23.3	0.135	0.91	1.3999	0.864	too much remnant, don’t use	Don't Dig
TR53-3	23575.27	9804.08	323575.27	4609804.08	3.2	13.2	-16.4	0.143	1.32	1.639	0.870	too much remnant	Don't Dig
TR61-2	25118.93	11125.21	325118.93	4611125.21	3.9	36.4	-45.1	0.132	0.76	1.2874	0.321	partial signal, dont use	Don't Dig
TR63-1	23445.32	11454.98	323445.32	4611454.98	4.1	159.4	-118.7	0.239	0.09	7.6966	0.924	not UXO	Don't Dig
TR67-2	23457.20	12116.83	323457.20	4612116.83	4.8	13.3	-3.2	0.082	0.07	0.3141	0.786	small target	Don't Dig
TR69-1	24829.67	12446.52	324829.67	4612446.52	4.7	329.9	-147.7	0.384	0.64	31.9024	0.818	not UXO	Don't Dig
TR73-4	24499.61	13106.86	324499.61	4613106.86	5.6	48.3	-45.4	0.188	0.34	3.7759	0.906	155mm+	Don't Dig

Flat Rock Reef Dig List

Thurs. Sep 14, 2006
SITE: Transect_N77 Flat Rock Reef Target Report
PRIMARY COORDINATES: MTADS LOCAL - Relative to UTM (300000.00,4600000.00) meters
SECONDARY COORDINATES: UTM=17, nad83
THIRD COORDINATES: Latitude/Longitude, nad83

Target ID	Local X (m)	Local Y (m)	UTM X (m)	UTM Y (m)	Latitude	Longitude	Water Depth (m)	Max. Signal (nT)	Min. Signal (nT)	Size (m)	Burial Depth (m)	Moment	Fit Quality	Analyst Comments	Dig/ Don't Dig
TR77-1	30814.90	13769.88	330814.90	4613769.88	41.65773	-83.03196	6.1	44.6	-12.1	0.164	0.23	2.4701	0.983	155mm?	Dig
TR77-4	31101.83	13764.93	331101.83	4613764.93	41.65775	-83.02852	6.3	104.8	-59.1	0.200	0.00	4.5458	0.979	very large target, 2nd target 5m West	Dig
TR77-5	31175.38	13765.41	331175.38	4613765.41	41.65776	-83.02763	6.2	110.9	-64.2	0.226	0.20	6.4976	0.957	240mm?	Dig
TR77-6	31245.04	13765.69	331245.04	4613765.69	41.65778	-83.0268	5.6	9.5	-6.9	0.101	0.00	0.5769	0.951	105mm?	Dig
TR77-9	31417.54	13761.45	331417.54	4613761.45	41.65778	-83.02472	6.5	106.1	-65	0.206	0.09	4.9515	0.870	240mm?	Dig
TR77-10	31483.96	13751.69	331483.96	4613751.69	41.65771	-83.02392	6.2	38.7	-22.8	0.160	0.00	2.3118	0.884	155mm?	Dig
TR77-12	31690.78	13767.08	331690.78	4613767.08	41.65789	-83.02145	6.2	41.5	-15.1	0.143	0.08	1.6617	0.956	155mm?	Dig
TR77-16	31892.74	13766.87	331892.74	4613766.87	41.65793	-83.01902	4.7	15.6	-6.4	0.098	0.00	0.5295	0.861	105mm?	Dig
TR77-17	32308.39	13761.81	332308.40	4613761.81	41.65797	-83.01403	6	92.9	-14.6	0.187	0.23	3.6751	0.985	large target, dig	Dig
TR77-18	32327.84	13765.48	332327.84	4613765.48	41.65801	-83.0138	5.8	51.6	-8.7	0.155	0.00	2.0938	0.975	155mm?	Dig
TR77-2	31057.67	13766.00	331057.67	4613766.00	41.65775	-83.02905	6.4	50.5	-44.1	0.165	0.08	2.5242	0.932	155mm?, in clutter	Don't Dig
TR77-3	31081.37	13764.36	331081.37	4613764.36	41.65774	-83.02876	6.3	15.4	-4	0.120	0.61	0.9653	0.797	projo? Too deep	Don't Dig
TR77-7	31261.63	13764.45	331261.63	4613764.45	41.65777	-83.0266	5.5	29.4	-4.6	0.114	0.00	0.8325	0.760	multiple targets	Don't Dig
TR77-8	31362.43	13761.55	331362.43	4613761.55	41.65777	-83.02539	6	51.8	-31.2	0.168	0.25	2.6975	0.984	large target in a group of large targets	Don't Dig
TR77-11	31589.52	13765.47	331589.52	4613765.47	41.65785	-83.02266	6	45.1	-17.4	0.164	0.05	2.4754	0.929	155mm partial signature	Don't Dig
TR77-13	31716.54	13769.96	331716.54	4613769.96	41.65792	-83.02114	5.8	23.5	-21	0.159	0.00	2.2508	0.924	155mm?"	Don't Dig
TR77-14	31826.02	13765.71	331826.02	4613765.71	41.65791	-83.01982	4.9	11.7	-5	0.091	0.12	0.4313	0.755	105mm?	Don't Dig
TR77-15	31849.11	13765.12	331849.11	4613765.12	41.6579	-83.01955	4.8	10.7	-1.3	0.086	0.00	0.3593	0.831	small target	Don't Dig
TR77-19	32654.58	13769.01	332654.58	4613769.01	41.65811	-83.00988	5.2	66	-4.9	0.133	0.00	1.321	0.643	155mm?	Don't Dig
TR77-20	32717.51	13768.61	332717.51	4613768.61	41.65812	-83.00912	5.2	22.6	-8.5	0.128	0.30	1.1775	0.972	large target.2nd target 5mEast	Don't Dig

Pickerel Reef Dig List

Thurs. Sep 14, 2006
PRIMARY COORDINATES: MTADS LOCAL - Relative to UTM (300000.00,4600000.00) meters
SECONDARY COORDINATES: UTM=17, nad83
THIRD COORDINATES: Latitude/Longitude, nad83

Target ID	Local X (m)	Local Y (m)	UTM X (m)	UTM Y (m)	Latitude	Longitude	Water Depth (m)	Max. Signal (nT)	Min. Signal (nT)	Size (m)	Burial Depth (m)	Moment	Fit Quality	Analyst Comments	Dig/ Don't Dig
TR85-5	31782.14	15077.25	331782.14	4615077.25	41.6697019	-83.0207186	5.9	30.8	-5.7	0.119	0.00	0.9504	0.959	105mm?	Dig
TR85-6	31869.59	15073.85	331869.59	4615073.85	41.6696898	-83.0196678	5.9	48.5	-5.8	0.122	0.00	1.0265	0.965	projo?	Dig
TR85-7	31980.75	15086.28	331980.75	4615086.28	41.6698251	-83.0183368	7.1	46.3	-9.3	0.141	0.04	1.5674	0.979	155mm?	Dig
TR85-8	32009.72	15086.67	332009.73	4615086.67	41.6698347	-83.0179890	7.0	51.5	-14.1	0.122	0.00	1.0208	0.843	projo?	Dig
TR85-9	32105.79	15086.89	332105.79	4615086.89	41.6698569	-83.0168358	7.3	91.2	-33.4	0.209	0.00	5.1918	0.950	large projo, dig	Dig
TR85-1	29677.64	15086.06	329677.64	4615086.06	41.6693341	-83.0459860	6.7	20.5	-3.7	0.091	0.00	0.4304	0.719	105mm?	Don't Dig
TR85-2	30151.28	15084.66	330151.28	4615084.66	41.6694226	-83.0402996	6.5	21.3	-3.3	0.094	0.00	0.4698	0.921	105mm, monster target 5m East	Don't Dig
TR85-3	31495.95	15085.47	331495.95	4615085.47	41.6697154	-83.0241567	7.4	15.8	-4	0.104	0.17	0.6387	0.887	105mm?	Don't Dig
TR85-4	31638.38	15084.70	331638.38	4615084.70	41.6697386	-83.0224466	7.0	29.6	-12.7	0.130	0.11	1.2509	0.950	likely not UXO	Don't Dig

Target Analysis for Comparison of MTA and Airborne Survey Results

Sat Sep 16, 2006

PROJECT: MTA Survey of the Former Erie Army Depot Range

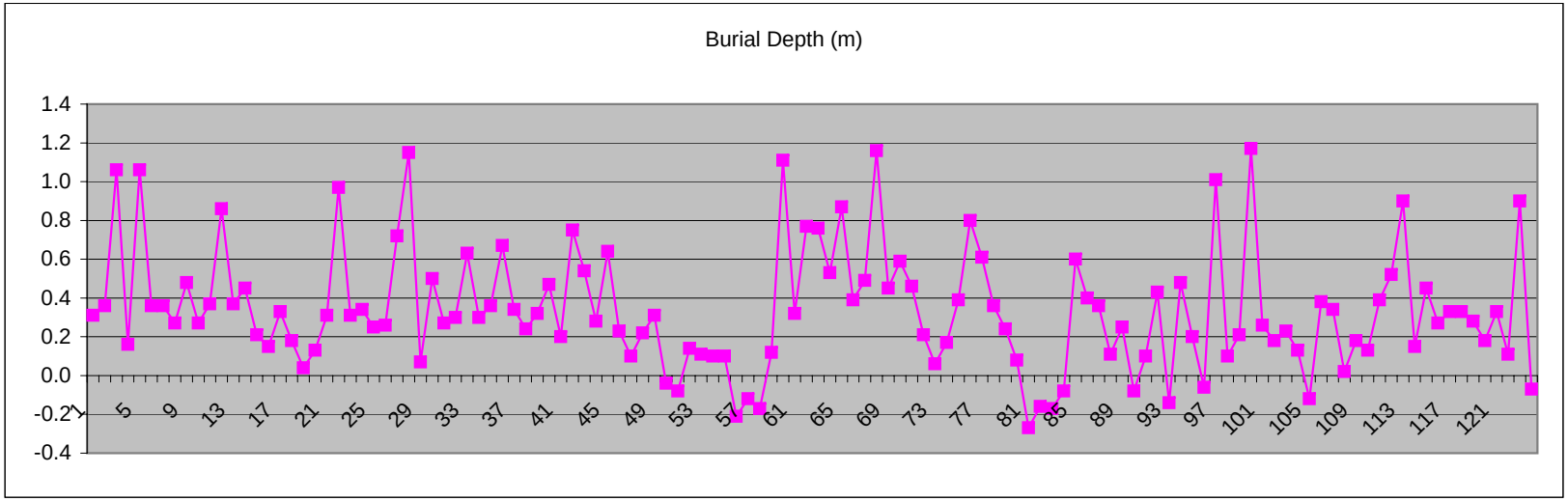
SITE: Airborne_Comparison_Area
PRIMARY COORDINATES: MTADS LOCAL - Relative to UTM (300000.00,4600000.00) meters
SECONDARY COORDINATES: UTM=17, nad83
THIRD COORDINATES: Latitude/Longitude, nad83

Target ID	Local X (m)	Local Y (m)	UTM X (m)	UTM Y (m)	Water Depth (m)	Maximum Signal (nT)	Minimum Signal (nT)	Size (m)	Burial Depth (m)	Moment	Fit Quality	Analyst Comment
1	28700.35	6180.64	328700.35	4606180.64	2.7	25	-24	0.111	0.3	0.769	0.9728	105mm
2	28715.51	6182.24	328715.51	4606182.24	2.7	47	-7	0.120	0.4	0.984	0.9589	projo
3	28740.49	6179.11	328740.49	4606179.11	2.8	39	-27	0.193	1.1	4.066	0.8148	large projo
4	28751.52	6178.48	328751.52	4606178.48	2.8	16	-5	0.088	0.2	0.387	0.9214	81mm
5	29017.47	6176.59	329017.47	4606176.59	3.5	61	-40	0.223	1.1	6.293	0.8998	large projo
6	29054.13	6176.45	329054.13	4606176.45	3.5	90	-7	0.147	0.4	1.802	0.7415	155m
7	29118.12	6177.30	329118.12	4606177.30	3.7	24	-8	0.097	0.4	0.515	0.9215	105mm
8	29138.04	6177.57	329138.04	4606177.57	3.7	42	-16	0.129	0.3	1.207	0.9467	projo
9	29172.52	6175.88	329172.52	4606175.88	3.8	36	-7	0.125	0.5	1.091	0.7813	projo
10	29282.08	6175.07	329282.08	4606175.07	3.9	22	-4	0.083	0.3	0.327	0.7817	81mm
11	29324.99	6176.58	329324.99	4606176.58	3.7	39	-16	0.131	0.4	1.267	0.9536	155mm
12	29353.20	6177.44	329353.20	4606177.43	3.9	14	-5	0.112	0.9	0.790	0.9583	105mm
13	29369.78	6177.24	329369.78	4606177.24	4.0	60	-13	0.135	0.4	1.392	0.9025	155mm
14	29391.23	6178.24	329391.23	4606178.24	4.0	142	-38	0.197	0.5	4.335	0.9758	large projo
15	29396.05	6176.84	329396.05	4606176.84	4.0	71	-25	0.145	0.2	1.712	0.9417	155mm
16	29410.38	6177.70	329410.38	4606177.70	4.0	70	-20	0.132	0.2	1.306	0.8857	projo
17	29459.35	6183.38	329459.35	4606183.38	4.0	34	-14	0.128	0.3	1.175	0.9575	projo
18	29466.13	6183.70	329466.13	4606183.70	4.1	21	-7	0.085	0.2	0.350	0.9537	81mm
19	29476.40	6185.11	329476.40	4606185.11	4.1	66	-11	0.105	0.0	0.662	0.8554	105mm
20	29477.12	6183.23	329477.12	4606183.23	4.1	61	-12	0.107	0.1	0.692	0.7967	105mm
21	29482.68	6184.55	329482.68	4606184.55	4.1	66	-7	0.130	0.3	1.249	0.9597	projo
22	29489.84	6183.31	329489.84	4606183.31	4.1	29	-5	0.138	1.0	1.500	0.9597	projo
23	29528.19	6175.26	329528.19	4606175.26	4.1	25	-6	0.102	0.3	0.591	0.9301	105mm
24	29546.39	6176.61	329546.39	4606176.61	4.2	63	-32	0.163	0.3	2.463	0.9615	155mm
25	29559.96	6175.04	329559.96	4606175.04	4.1	76	-13	0.141	0.3	1.569	0.9703	155mm
26	29564.33	6175.97	329564.33	4606175.97	4.1	43	-5	0.110	0.3	0.751	0.8751	105mm
27	29569.24	6175.33	329569.24	4606175.33	4.2	10	-3	0.096	0.7	0.502	0.8731	105mm
28	29581.36	6174.83	329581.36	4606174.83	4.2	83	-69	0.258	1.2	9.693	0.7254	3 targets, siganls overlap
29	29613.65	6175.25	329613.65	4606175.25	4.2	39	-6	0.096	0.1	0.506	0.9259	105mm
30	29639.84	6174.91	329639.84	4606174.91	4.3	29	-7	0.113	0.5	0.823	0.9721	105mm

Target ID	Local X (m)	Local Y (m)	UTM X (m)	UTM Y (m)	Water Depth (m)	Maximum Signal (nT)	Minimum Signal (nT)	Size (m)	Burial Depth (m)	Moment	Fit Quality	Analyst Comment
31	29643.92	6175.56	329643.92	4606175.56	4.2	15	-4	0.073	0.3	0.224	0.6132	81mm
32	29652.51	6176.17	329652.51	4606176.17	4.3	61	-46	0.163	0.3	2.449	0.9525	155mm
33	29664.93	6175.35	329664.93	4606175.35	4.3	36	-4	0.131	0.6	1.283	0.9709	projo
34	29673.05	6176.39	329673.05	4606176.39	4.3	27	-11	0.109	0.3	0.722	0.8843	105mm
35	29685.42	6174.77	329685.42	4606174.77	4.3	106	-26	0.178	0.4	3.164	0.7778	2 targets signals overlap
36	29695.49	6176.47	329695.49	4606176.47	4.3	103	-46	0.223	0.7	6.254	0.8115	multiple overlapping targets
37	29725.40	6174.56	329725.40	4606174.56	4.4	91	-10	0.152	0.3	1.997	0.9216	155mm
38	29758.16	6173.68	329758.16	4606173.68	4.4	25	-3	0.088	0.2	0.386	0.8916	81mm
39	29781.99	6176.01	329781.99	4606176.01	4.4	18	-6	0.093	0.3	0.448	0.8127	81/105mm
40	29807.97	6178.30	329807.97	4606178.30	4.4	35	-10	0.120	0.5	0.980	0.8554	projo
41	29841.32	6177.60	329841.32	4606177.60	4.4	39	-9	0.106	0.2	0.666	0.9665	105mm
42	29000.96	5880.21	329000.96	4605880.21	2.1	42	-1	0.145	0.8	1.710	0.9445	155mm
43	28954.18	5850.29	328954.18	4605850.29	2.0	29	-6	0.125	0.5	1.094	0.944	projo
44	29390.84	5841.70	329390.84	4605841.70	3.8	21	-10	0.107	0.3	0.683	0.9293	105mm
45	29406.99	5843.69	329406.99	4605843.69	3.8	101	-63	0.223	0.6	6.302	0.9211	large projo
46	29445.77	5844.38	329445.77	4605844.38	4.0	16	-6	0.085	0.2	0.350	0.7961	81mm
47	29470.21	5845.57	329470.21	4605845.57	4.0	109	-88	0.195	0.1	4.161	0.9778	large projo
48	29584.45	5847.95	329584.45	4605847.95	4.2	52	-9	0.125	0.2	1.109	0.9788	projo
49	29645.29	5848.50	329645.29	4605848.50	4.2	34	-7	0.119	0.3	0.962	0.9368	105mm
50	29648.44	5848.05	329648.44	4605848.05	4.2	46	-7	0.104	0.0	0.629	0.9418	
51	29673.65	5849.99	329673.65	4605849.99	4.2	110	-22	0.139	-0.1	1.515	0.9447	155mm
52	29678.75	5847.24	329678.75	4605847.24	4.3	17	-9	0.083	0.1	0.327	0.9215	81mm
53	29682.72	5849.39	329682.72	4605849.39	4.3	107	-48	0.171	0.1	2.801	0.9659	large projo
54	29742.43	5847.91	329742.43	4605847.91	4.3	80	-17	0.134	0.1	1.351	0.9714	projo
55	29753.68	5846.50	329753.68	4605846.50	4.4	46	-3	0.114	0.1	0.839	0.9599	105mm
56	29761.29	5846.00	329761.29	4605846.00	4.3	30	-25	0.102	-0.2	0.600	0.9498	105mm
57	29778.95	5845.69	329778.95	4605845.69	4.3	74	-19	0.117	-0.1	0.902	0.9589	105mm
58	29788.91	5846.18	329788.91	4605846.18	4.4	46	-23	0.113	-0.2	0.808	0.9494	105mm
59	29824.57	5845.29	329824.57	4605845.29	4.4	28	-27	0.134	0.1	1.364	0.9645	projo
60	29110.39	5689.16	329110.39	4605689.16	2.0	29	-8	0.179	1.1	3.266	0.9368	large projo
61	29184.58	5704.51	329184.58	4605704.51	2.1	21	-10	0.134	0.3	1.360	0.9498	155mm
62	29191.82	5674.52	329191.82	4605674.52	2.1	15	-6	0.122	0.8	1.019	0.6262	projo
63	29133.91	5645.03	329133.91	4605645.03	1.9	59	-122	0.339	0.8	22.023	0.9425	massive target
64	29133.17	5629.97	329133.17	4605629.97	2.0	15	-12	0.105	0.5	0.656	0.6964	105mm
65	29225.57	5596.89	329225.57	4605596.89	2.1	17	-3	0.131	0.9	1.282	0.9176	projo
66	29187.18	5577.46	329187.18	4605577.46	1.9	16	-9	0.117	0.4	0.908	0.9513	105mm
67	29222.86	5534.11	329222.86	4605534.11	1.8	14	-7	0.116	0.5	0.882	0.8975	105mm
68	29224.92	5528.95	329224.92	4605528.95	1.9	47	-23	0.248	1.2	8.601	0.8582	240mm
69	29252.67	5497.05	329252.67	4605497.05	2.1	20	-14	0.128	0.5	1.188	0.9701	projo
70	29253.01	5491.57	329253.01	4605491.57	2.1	22	-9	0.132	0.6	1.301	0.9364	projo
71	29362.41	5255.10	329362.41	4605255.10	2.1	49	-16	0.187	0.5	3.711	0.9793	large projo

Target ID	Local X (m)	Local Y (m)	UTM X (m)	UTM Y (m)	Water Depth (m)	Maximum Signal (nT)	Minimum Signal (nT)	Size (m)	Burial Depth (m)	Moment	Fit Quality	Analyst Comment
72	29362.74	5248.66	329362.74	4605248.66	2.1	44	-13	0.158	0.2	2.230	0.9369	155mm
73	29237.80	5182.68	329237.81	4605182.68	2.1	24	-9	0.099	0.1	0.549	0.8092	
74	29246.43	5184.03	329246.43	4605184.03	2.1	38	-9	0.120	0.2	0.981	0.9116	projo
75	29408.73	5186.71	329408.73	4605186.71	2.5	19	-10	0.149	0.4	1.878	0.9882	155mm
76	29483.04	5186.60	329483.04	4605186.60	3.2	37	-20	0.195	0.8	4.159	0.9758	large projo
77	29490.17	5187.32	329490.17	4605187.32	3.3	47	-8	0.171	0.6	2.837	0.9844	large projo
78	29611.11	5185.99	329611.11	4605185.99	3.7	89	-10	0.183	0.4	3.478	0.9783	large projo
79	29737.26	5186.90	329737.26	4605186.90	4.0	34	-6	0.130	0.2	1.236	0.9536	projo
80	29755.75	5185.67	329755.75	4605185.67	4.0	26	-5	0.114	0.1	0.839	0.938	105mm
81	29786.77	5186.06	329786.77	4605186.06	4.0	16	-9	0.075	-0.3	0.238	0.5609	81mm
82	29788.16	5188.52	329788.16	4605188.52	4.0	14	-8	0.084	-0.2	0.329	0.7203	81mm
83	29817.52	5186.43	329817.52	4605186.43	4.1	21	-8	0.097	-0.2	0.513	0.9109	105mm
84	29828.98	5185.87	329828.98	4605185.87	4.1	26	-13	0.111	-0.1	0.774	0.9099	105mm
85	29296.01	5143.81	329296.01	4605143.81	1.9	23	-11	0.163	0.6	2.442	0.9086	155mm
86	29390.76	5150.42	329390.76	4605150.42	2.2	22	-13	0.131	0.4	1.258	0.8283	projo
87	29393.04	5121.28	329393.04	4605121.28	2.2	21	-3	0.117	0.4	0.900	0.9677	105mm
88	29326.55	5035.54	329326.55	4605035.54	2.0	39	-19	0.159	0.1	2.288	0.9344	155mm
89	29331.71	5019.10	329331.71	4605019.10	1.9	27	-14	0.150	0.3	1.920	0.9542	155mm
90	29412.25	4909.75	329412.25	4604909.75	2.2	26	-4	0.095	-0.1	0.488	0.8442	105mm
91	29336.95	4864.93	329336.95	4604864.93	2.0	24	-5	0.104	0.1	0.634	0.9455	105mm
92	29585.33	4858.96	329585.33	4604858.96	2.9	74	-30	0.240	0.4	7.846	0.9621	240mm
93	29736.99	4857.82	329737.00	4604857.82	3.5	24	-11	0.101	-0.1	0.581	0.8727	105mm
94	29778.03	4860.35	329778.03	4604860.35	3.6	33	-23	0.174	0.5	2.965	0.9669	large projo
95	29791.18	4858.79	329791.18	4604858.79	3.6	65	-27	0.172	0.2	2.883	0.9778	large projo
96	29796.59	4859.62	329796.59	4604859.62	3.6	48	-6	0.124	-0.1	1.079	0.9372	projo
97	29801.27	4857.90	329801.27	4604857.90	3.6	36	-32	0.226	1.0	6.495	0.8832	240mm
98	29818.85	4859.18	329818.85	4604859.18	3.7	33	-9	0.110	0.1	0.748	0.8031	105mm
99	29395.68	4845.89	329395.68	4604845.89	1.9	24	-10	0.139	0.2	1.514	0.9805	projo
100	29426.91	4825.30	329426.91	4604825.30	2.1	58	-50	0.290	1.2	13.840	0.9239	very large target
101	29433.15	4793.75	329433.15	4604793.75	2.1	68	-34	0.183	0.3	3.455	0.9529	large projo
102	29439.91	4772.44	329439.91	4604772.44	2.1	96	-56	0.190	0.2	3.861	0.9163	large projo
103	29456.32	4720.67	329456.32	4604720.67	2.1	111	-43	0.196	0.2	4.234	0.9714	large projo
104	29444.60	4693.45	329444.60	4604693.45	1.9	29	-19	0.128	0.1	1.179	0.7137	projo
105	29498.16	4629.38	329498.16	4604629.38	2.1	28	-8	0.103	-0.1	0.611	0.7477	105mm
106	29510.06	4600.76	329510.06	4604600.76	2.1	17	-7	0.118	0.4	0.918	0.8286	105mm
107	29518.38	4588.37	329518.38	4604588.37	2.1	186	-124	0.265	0.3	10.528	0.9742	massive target
108	29467.11	4578.61	329467.10	4604578.61	1.9	34	-12	0.126	0.0	1.142	0.8709	projo
109	29531.41	4564.71	329531.41	4604564.71	2.1	20	-8	0.107	0.2	0.697	0.919	105mm
110	29535.92	4561.43	329535.92	4604561.43	2.1	59	-41	0.166	0.1	2.562	0.95	155mm
111	29546.34	4535.56	329546.34	4604535.56	2.1	27	-31	0.157	0.4	2.173	0.9241	155mm
112	29555.66	4529.44	329555.66	4604529.44	2.0	18	-10	0.156	0.5	2.144	0.9382	155mm

Target ID	Local X (m)	Local Y (m)	UTM X (m)	UTM Y (m)	Water Depth (m)	Maximum Signal (nT)	Minimum Signal (nT)	Size (m)	Burial Depth (m)	Moment	Fit Quality	Analyst Comment
113	29694.00	4529.10	329694.00	4604529.10	2.1	24	-18	0.190	0.9	3.896	0.8965	large projo
114	29728.00	4526.42	329728.00	4604526.42	3.1	27	-17	0.122	0.2	1.028	0.9303	projo
115	29573.73	4480.67	329573.73	4604480.67	2.1	47	-48	0.200	0.5	4.518	0.9459	large projo
116	29582.04	4461.28	329582.04	4604461.28	2.1	32	-9	0.116	0.3	0.881	0.723	105mm
117	29596.52	4425.17	329596.52	4604425.17	2.1	20	-7	0.118	0.3	0.932	0.9563	105mm
118	29645.56	4294.66	329645.57	4604294.66	2.1	18	-13	0.118	0.3	0.929	0.8949	105mm
119	29651.54	4282.14	329651.54	4604282.14	2.1	53	-19	0.148	0.3	1.844	0.9624	155mm
120	29657.06	4276.63	329657.06	4604276.63	2.1	44	-47	0.160	0.2	2.299	0.9631	155mm
121	29657.86	4272.04	329657.86	4604272.04	2.1	14	-3	0.087	0.3	0.372	0.8876	81mm
122	29668.96	4253.21	329668.96	4604253.21	2.1	35	-81	0.166	0.1	2.595	0.8809	155mm
123	29672.13	4247.34	329672.13	4604247.34	2.1	28	-18	0.191	0.9	3.950	0.9429	large projo
124	29703.33	4204.81	329703.33	4604204.81	2.1	69	-27	0.152	-0.1	1.976	0.9561	155mm



Round Reef Dig List

Thurs. Sept 14, 2006
PRIMARY COORDINATES: MTADS LOCAL - Relative to UTM (300000.00,4600000.00) meters
SECONDARY COORDINATES: UTM=17, nad83
THIRD COORDINATES: Latitude/Longitude, nad83

Target ID	Local X (m)	Local Y (m)	UTM X (m)	UTM Y (m)	Latitude	Longitude	Water Depth (m)	Max. Signal (nT)	Min. Signal (nT)	Size (m)	Burial Depth (m)	Moment	Fit Quality	Analyst Comments	Dig/ Don't Dig
TR47-2	34514.14	8815.88	334514.14	4608815.88	41.6139105	-82.9861874	4.6	68.5	-30.8	0.190	0.43	3.850	0.903	bigger than155mm, dig	Dig
TR49-1	34545.64	9137.50	334545.64	4609137.50	41.6168122	-82.9858984	3.7	45.6	-5.3	0.133	0.00	1.327	0.772	may be 2 targets,dig anyway	Dig
TR47-1	34450.68	8815.45	334450.68	4608815.45	41.6138935	-82.9869485	4.5	191.8	-191.4	0.294	0.38	14.345	0.986	likely too big for UXO	Don't Dig
TR49-2	34567.84	9138.18	334567.84	4609138.18	41.6168230	-82.9856323	3.3	23.3	-23.6	0.138	0.13	1.485	0.910	155mm?	Don't Dig

Toussaint Reef Dig List

Thurs. Sep 14, 2006
PRIMARY COORDINATES: MTADS LOCAL - Relative to UTM (300000.00,4600000.00) meters
SECONDARY COORDINATES: UTM=17, nad83
THIRD COORDINATES: Latitude/Longitude, nad83

Target ID	Local X (m)	Local Y (m)	UTM X (m)	UTM Y (m)	Latitude	Longitude	Water Depth (m)	Max. Signal (nT)	Min. Signal (nT)	Size (m)	Burial Depth (m)	Moment	Fit Quality	Analyst Comments	Dig/ Don't Dig
TR57-1	31371.46	10466.54	331371.46	4610466.53	41.6281114	-83.0243488	3.6	31.6	-15.5	0.153	0.48	2.008	0.862	155mm?, 2nd target 3m NE	Dig
TR57-3	31412.85	10467.91	331412.85	4610467.91	41.6281325	-83.0238526	3.4	34.3	-10.9	0.159	0.00	2.256	0.883	boat anchor with chain?, dig	Dig
TR57-5	31462.74	10465.05	331462.74	4610465.05	41.6281173	-83.0232531	3.3	13.9	-5.8	0.084	0.00	0.333	0.864	small target	Dig
TR57-6	31482.93	10465.61	331482.93	4610465.61	41.6281266	-83.0230110	3.0	43.4	-6.0	0.113	0.00	0.808	0.916	105mm (or larger)	Dig
TR57-7	31492.56	10466.30	331492.56	4610466.30	41.6281349	-83.0228958	2.7	11.5	-2.8	0.089	0.00	0.397	0.937	small target	Dig
TR57-8	31757.79	10466.57	331757.79	4610466.57	41.6281933	-83.0197137	3.0	14.3	-2.1	0.117	0.15	0.898	0.948	105mm?	Dig
TR59-3	31487.76	10796.68	331487.76	4610796.68	41.6311078	-83.0230463	3.4	12.4	-13.0	0.100	0.00	0.561	0.549	105mm? In geology, 2nd target 5m East	Dig
TR59-5	31568.56	10796.03	331568.56	4610796.03	41.6311190	-83.0220767	3.0	18.3	-5.0	0.093	0.00	0.456	0.939	105mm?	Dig
TR61-1	24395.86	11125.75	324395.86	4611125.75	41.6325402	-83.1082292	3.7	35.1	-22.1	0.153	0.27	2.009	0.968	155mm?, large remnant moment	Dig
TR61-3	25270.80	11126.55	325270.80	4611126.55	41.6327396	-83.0977321	3.9	33.8	-16.8	0.142	0.12	1.630	0.972	155mm?	Dig
TR61-5	32072.37	11129.23	332072.37	4611129.23	41.6342246	-83.0161254	3.9	22.0	-5.2	0.113	0.00	0.820	0.958	105mm?	Dig
TR61-6	32430.85	11129.71	332430.85	4611129.71	41.6343043	-83.0118243	3.6	11.4	-4.8	0.093	0.00	0.458	0.932	105mm?	Dig
TR57-2	31404.49	10466.26	331404.49	4610466.26	41.6281159	-83.0239524	3.4	11.5	-5.2	0.090	0.06	0.406	0.870	likely not UXO	Don't Dig
TR57-4	31451.78	10466.52	331451.78	4610466.52	41.6281282	-83.0233851	3.3	13.3	-4.1	0.084	0.00	0.336	0.770	small target, likely not UXO	Don't Dig
TR59-4	31528.10	10794.08	331528.10	4610794.08	41.6310929	-83.0225616	3.3	106.5	-6.7	0.204	0.31	4.793	0.886	very large target, dig	Don't Dig
TR59-6	32287.10	10794.25	332287.10	4610794.25	41.6312543	-83.0134550	3.6	16.0	-6.8	0.102	0.00	0.592	0.816	105mm?	Don't Dig
TR61-2	25118.93	11125.21	325118.93	4611125.21	41.6326942	-83.0995539	3.9	36.4	-45.1	0.132	0.76	1.287	0.321	partial signal, dont use	Don't Dig
TR61-4	31981.88	11128.51	331981.88	4611128.51	41.6341991	-83.0172110	3.2	8.7	-3.9	0.085	0.00	0.350	0.902	small target	Don't Dig

Target ID	Local X (m)	Local Y (m)	UTM X (m)	UTM Y (m)	Water Depth (m)	Max. Signal (nT)	Min. Signal (nT)	Size (m)	Burial Depth (m)	Moment	Fit Quality	Analyst Comments	Dig/ Don't Dig
Riv-21	27823.81	5831.96	327823.81	4605831.96	1.9	247.8	-8.9	0.278	0.5	12.123	0.792	very large target	Dig
Riv-25	27754.84	5770.89	327754.84	4605770.89	1.9	118	-129.5	0.179	0.0	3.257	0.966	good target	Dig
Riv-30	27687.06	5743.41	327687.06	4605743.41	1.9	107.3	-105.7	0.217	0.1	5.788	0.990	good target	Dig
Riv-32	27631.79	5710.16	327631.78	4605710.16	2.7	122.9	-140.6	0.207	0.0	5.012	0.986	large target, large remnant moment	Dig
Riv-38	27563.14	5688.72	327563.14	4605688.72	2.7	50.4	-13.1	0.149	0.3	1.858	0.948	good target	Dig
Riv-39	27552.88	5690.61	327552.88	4605690.61	2.6	265.9	-55.7	0.276	0.4	11.811	0.987	very large target	Dig
Riv-42	27399.10	5631.16	327399.10	4605631.16	1.9	14.3	-13.1	0.094	0.1	0.471	0.910	small target, likely too deep to dig	Dig
Riv-43	27393.11	5628.32	327393.11	4605628.32	2.0	20.7	-2.7	0.100	0.3	0.570	0.914	good target	Dig
Riv-45	27367.73	5606.56	327367.74	4605606.56	1.8	32.8	-39.5	0.131	0.0	1.277	0.987	target south edge of channel, strong remnant moment	Dig
Riv-48	27300.09	5624.13	327300.09	4605624.13	1.9	67.1	-42.8	0.138	0.0	1.483	0.941	good target north edge of channel	Dig
Riv-53	27224.23	5666.65	327224.23	4605666.65	1.8	25.1	-28.4	0.154	0.5	2.079	0.899	good target in center of channel	Dig
Riv-60	27153.98	5715.48	327153.99	4605715.48	1.8	22.5	-13.2	0.133	0.6	1.343	0.945	good target	Dig
Riv-70	27039.96	5758.48	327039.96	4605758.48	1.9	16.9	-6.7	0.068	0.0	0.179	0.897	very small target, north edge of channel	Dig
Riv-71	27031.77	5759.46	327031.77	4605759.46	1.9	35.9	-5.4	0.082	0.0	0.309	0.962	small target, north edge of channel	Dig
Riv-73	26962.98	5770.47	326962.98	4605770.47	1.9	43.7	-28.1	0.098	0.0	0.526	0.979	small target	Dig
Riv-74	26893.18	5784.72	326893.18	4605784.72	1.9	80.8	-27.6	0.115	0.0	0.851	0.979	good target, north edge of channel	Dig
Riv-79	26793.19	5812.80	326793.19	4605812.80	1.9	142.2	-32	0.208	0.2	5.112	0.969	large target, center of channel	Dig
Riv-83	26668.49	5860.29	326668.49	4605860.29	1.9	51.6	-22	0.135	0.0	1.401	0.923	good target, south edge of channel	Dig
Riv-84	26652.14	5865.02	326652.14	4605865.02	1.9	46.1	-46.4	0.135	0.0	1.389	0.951	good target, middle of channel	Dig
Riv-87	26555.86	5878.85	326555.86	4605878.84	1.8	22	-12.9	0.110	0.2	0.747	0.958	small target in center of channel, likely too deep to dig	Dig
Riv-94	26448.01	5853.60	326448.01	4605853.60	1.7	33.8	-32.3	0.083	0.0	0.326	0.894	eastmost of a group of small clutter targets	Dig
Riv-109	26310.98	5849.46	326310.98	4605849.46	1.7	24.3	-20.5	0.125	0.1	1.112	0.970	small target, mostly remnant	Dig

Target ID	Local X (m)	Local Y (m)	UTM X (m)	UTM Y (m)	Water Depth (m)	Max. Signal (nT)	Min. Signal (nT)	Size (m)	Burial Depth (m)	Moment	Fit Quality	Analyst Comments	Dig/ Don't Dig
Riv-110	26303.08	5829.30	326303.08	4605829.30	1.8	103.4	-8	0.120	0.0	0.965	0.962	good target	Dig
Riv-111	26268.73	5834.71	326268.73	4605834.71	1.8	94	-20	0.145	0.1	1.738	0.957	good target, center of channel	Dig
Riv-113	26200.25	5814.55	326200.25	4605814.55	1.8	67.5	-8.4	0.121	0.0	0.999	0.962	good target	Dig
Riv-116	26194.19	5811.90	326194.19	4605811.90	1.9	14.1	-6.9	0.064	0.0	0.147	0.892	clutter target	Dig
Riv-117	26189.44	5814.96	326189.44	4605814.96	1.8	30	-3.7	0.098	0.1	0.526	0.969	good small target	Dig
Riv-123	25982.65	5807.90	325982.65	4605807.90	1.8	29.4	-23.5	0.146	0.3	1.772	0.935	partial signature	Dig
Target ID	**Local X (m)**	**Local Y (m)**	**UTM X (m)**	**UTM Y (m)**	**Water Depth (m)**	**Max. Signal (nT)**	**Min. Signal (nT)**	**Size (m)**	**Burial Depth (m)**	**Moment**	**Fit Quality**	**Analyst Comments**	**Dig/ Don't Dig**
Riv-1	27944.70	5887.97	327944.70	4605887.97	1.9	57.7	-35.6	0.206	0.5	4.925	0.951	In turn-around at Lake entrance, buoy?	Don't Dig
Riv-2	27934.62	5883.59	327934.62	4605883.59	1.9	56.1	-49.8	0.196	0.4	4.248	0.963	In turn-around at Lake entrance, buoy?	Don't Dig
Riv-3	27935.04	5890.74	327935.04	4605890.74	1.8	36.4	-9.8	0.212	1.4	5.359	0.701	Target in mouth of river	Don't Dig
Riv-4	27922.57	5907.82	327922.57	4605907.82	1.9	102.9	-48.8	0.267	1.0	10.780	0.825	target in mouth of river	Don't Dig
Riv-5	27909.44	5896.28	327909.44	4605896.28	1.8	33.5	-15.5	0.142	0.7	1.608	0.611	target in mouth of river	Don't Dig
Riv-6	27912.32	5876.46	327912.32	4605876.46	1.9	742.7	-1642	0.665	0.8	166.282	0.993	monster target, steel plate?	Don't Dig
Riv-7	27897.78	5881.47	327897.78	4605881.47	1.9	66.6	-15.4	0.152	0.2	1.966	0.880	target near mouth of river	Don't Dig
Riv-8	27898.98	5875.48	327898.98	4605875.48	1.9	24.6	-51.8	0.184	0.5	3.528	0.825	target all remnant moment	Don't Dig
Riv-9	27911.78	5907.55	327911.78	4605907.55								buoy in mouth of river?	Don't Dig
Riv-10	27902.98	5890.66	327902.98	4605890.66	1.8	23.7	-9.4	0.213	2.1	5.433	0.800	two targets nearby	Don't Dig
Riv-11	27901.53	5891.21	327901.53	4605891.21	1.8	26.5	-12.2	0.156	0.8	2.141	0.876	two targets nearby	Don't Dig
Riv-12	27888.78	5871.82	327888.78	4605871.82	1.9	20.9	-18.5	0.201	1.5	4.577	0.795	target in channel	Don't Dig
Riv-13	27873.02	5862.61	327873.02	4605862.61								buoy?	Don't Dig
Riv-14	27877.52	5854.61	327877.52	4605854.61	1.8	11.8	-4.3	0.135	1.3	1.385	0.783	looks like a cluster of junk	Don't Dig
Riv-15	27855.58	5852.11	327855.58	4605852.11								large target, won't fit	Don't Dig
Riv-16	27852.14	5846.76	327852.14	4605846.76	1.9	41.9	-42.6	0.234	1.0	7.256	0.902	large target	Don't Dig
Riv-17	27851.80	5835.94	327851.80	4605835.94	1.8	13.8	-3	0.135	2.4	1.393	0.296	looks like a cluster of junk	Don't Dig
Riv-18	27842.45	5841.66	327842.45	4605841.66	1.9	76	-24.1	0.356	2.1	25.388	0.949	vey large target, too big for UXO	Don't Dig
Riv-19	27837.72	5828.61	327837.72	4605828.61	1.9	9.6	-4.6	0.107	0.8	0.696	0.848	too deep to dig	Don't Dig
Riv-20	27824.66	5813.37	327824.66	4605813.37	1.8	19	-10.4	0.149	0.7	1.854	0.896	good target	Don't Dig
Riv-22	27819.05	5824.49	327819.05	4605824.49	1.9	68.2	-58.8	0.390	2.4	33.567	0.905	too big for UXO, likely too deep to dig	Don't Dig
Riv-23	27791.34	5807.17	327791.34	4605807.17	1.8	2437.8	-665.5	1.038	2.1	632.447	0.967	junk automobile?	Don't Dig
Riv-24	27751.78	5786.03	327751.78	4605786.03								buoy?	Don't Dig
Riv-26	27740.28	5774.95	327740.28	4605774.95	1.9	525	-465.2	0.521	1.0	79.707	0.984	massive target, half the size of #23	Don't Dig
Riv-27	27702.33	5756.01	327702.33	4605756.01								buoy?	Don't Dig
Riv-28	27708.57	5748.03	327708.58	4605748.03	2.0	18.4	-7.8	0.108	0.2	0.713	0.888	small target	Don't Dig
Riv-29	27701.33	5743.72	327701.33	4605743.72	1.9	176.6	-207.5	0.352	0.8	24.528	0.980	very large target, strong remnant moment	Don't Dig
Riv-31	27702.61	5739.19	327702.61	4605739.19								buoy?	Don't Dig
Riv-33	27613.48	5715.36	327613.48	4605715.36	2.0	49.3	-7.3	0.173	1.2	2.907	0.915	good target	Don't Dig
Riv-34	27613.29	5724.48	327613.29	4605724.48	1.9	45.8	-36.9	0.249	1.1	8.711	0.979	large target, strong remnant moment	Don't Dig
Riv-35	27599.89	5698.46	327599.89	4605698.46	2.1	36	-33.3	0.204	0.8	4.768	0.975	large target	Don't Dig

Target ID	Local X (m)	Local Y (m)	UTM X (m)	UTM Y (m)	Water Depth (m)	Max. Signal (nT)	Min. Signal (nT)	Size (m)	Burial Depth (m)	Moment	Fit Quality	Analyst Comments	Dig/ Don't Dig
Riv-36	27596.10	5708.89	327596.10	4605708.89	2.1	12.9	-6	0.099	1.0	0.552	0.870	small target in center of channel	Don't Dig
Riv-37	27571.90	5695.64	327571.90	4605695.64	2.7	15.6	-9.9	0.133	0.6	1.344	0.930	small target in channel, too deep to dig	Don't Dig
Riv-40	27545.84	5679.86	327545.84	4605679.86								buoy?	Don't Dig
Riv-41	27494.52	5673.68	327494.52	4605673.68	1.9	92	-78.5	0.245	0.2	8.315	0.976	buoy?	Don't Dig
Riv-44	27374.51	5626.56	327374.51	4605626.56	2.0	12.9	-0.9	0.083	0.2	0.325	0.967	small target	Don't Dig
Riv-46	27323.19	5625.61	327323.19	4605625.61	1.8	30.4	-9.7	0.146	0.4	1.748	0.931	large target	Don't Dig
Riv-47	27314.77	5624.44	327314.77	4605624.44	1.8	1523.3	-1277	0.497	0.2	69.497	0.951	massive target	Don't Dig
Riv-49	27290.42	5623.02	327290.42	4605623.02	1.8	359.9	-69.5	0.198	0.1	4.417	0.680	large target	Don't Dig
Riv-50	27293.25	5618.00	327293.25	4605618.00	1.7	36.2	-9.5	0.260	2.5	9.974	0.714	very large target	Don't Dig
Riv-51	27263.06	5640.39	327263.06	4605640.39	1.9	32.5	-13	0.210	1.2	5.236	0.936	large target	Don't Dig
Riv-52	27233.06	5667.05	327233.06	4605667.05	2.0	33.5	-34.5	0.247	1.2	8.555	0.950	very large target	Don't Dig
Riv-54	27227.39	5676.29	327227.39	4605676.29	1.9	24.9	-9.8	0.198	1.2	4.402	0.971	large target, north edge ofchannel	Don't Dig
Riv-55	27204.93	5683.55	327204.93	4605683.55	1.8	41.8	-35	0.260	1.8	9.904	0.924	very large target	Don't Dig
Riv-56	27204.89	5691.21	327204.89	4605691.21								target in channel, can't fit	Don't Dig
Riv-57	27209.45	5692.73	327209.45	4605692.73								target on north edge of channel, can't fit	Don't Dig
Riv-58	27204.80	5697.48	327204.80	4605697.48								target in channel, can't fit	Don't Dig
Riv-59	27195.31	5698.67	327195.32	4605698.67	1.9	25.8	-16.1	0.225	1.3	6.419	0.769	large target in center of channel	Don't Dig
Riv-61	27154.25	5728.12	327154.25	4605728.12	1.9	30.8	-9	0.224	1.5	6.314	0.884	large target, partial signature	Don't Dig
Riv-62	27139.60	5735.35	327139.60	4605735.35	1.8	32.5	-20.4	0.301	1.7	15.441	0.891	very large target, partial signature	Don't Dig
Riv-63	27114.67	5732.15	327114.67	4605732.15	1.8	16.3	-23	0.190	1.2	3.873	0.825	large target, likely too deep to dig	Don't Dig
Riv-64	27096.29	5734.53	327096.29	4605734.53	1.7	22.7	-15.2	0.263	2.6	10.279	0.738	looks like a cluster of targets	Don't Dig
Riv-65	27071.69	5732.35	327071.69	4605732.35								buoy?	Don't Dig
Riv-66	27073.52	5738.21	327073.52	4605738.21	1.8	39.7	-17.7	0.256	1.5	9.443	0.979	very large target	Don't Dig
Riv-67	27069.67	5749.36	327069.67	4605749.36								massive target, won't fit	Don't Dig
Riv-68	27051.61	5747.69	327051.61	4605747.69	1.9	147.4	-9.6	0.279	1.1	12.329	0.961	very large target in center of the channel	Don't Dig
Riv-69	27036.03	5739.57	327036.03	4605739.57								very large target south edge of channel, can't fit	Don't Dig
Riv-72	27000.51	5753.46	327000.51	4605753.46	1.8	46.7	-49.2	0.126	0.0	1.141	0.975	target in center of channel	Don't Dig
Riv-75	26872.90	5776.53	326872.90	4605776.53								buoy?	Don't Dig
Riv-76	26860.20	5781.53	326860.20	4605781.53	1.8	29.6	-5.5	0.080	0.0	0.285	0.900	small target	Don't Dig
Riv-77	26854.46	5786.40	326854.46	4605786.40	1.9	91	-76.5	0.139	0.0	1.504	0.922	target, just north of massive target	Don't Dig
Riv-78	26849.88	5784.81	326849.87	4605784.81	1.8	1950	-133.3	0.459	0.3	54.471	0.923	massive target	Don't Dig
Riv-80	26789.65	5816.10	326789.66	4605816.10	1.9	20.4	-4.9	0.120	0.7	0.983	0.882	target just west of larger target	Don't Dig
Riv-81	26772.66	5818.51	326772.66	4605818.51	1.8	41.7	11	0.125	0.5	1.109	0.881	good target	Don't Dig
Riv-82	26760.50	5819.67	326760.50	4605819.67								massive target south edge of channel, can't fit	Don't Dig
Riv-85	26639.45	5864.62	326639.45	4605864.62	1.7	33.9	-16.2	0.093	-0.4	0.451	0.945	small target, south edge of channel	Don't Dig
Riv-86	26578.51	5875.80	326578.51	4605875.80	1.7	27.8	-13	0.160	0.7	2.305	0.944	large target, may be too deep to dig	Don't Dig
Riv-88	26569.30	5886.05	326569.30	4605886.05	2.0	14.3	-5.3	0.111	0.6	0.777	0.934	small target	Don't Dig
Riv-89	26539.70	5869.96	326539.70	4605869.96	1.7	37.2	-42.9	0.108	-0.4	0.706	0.957	small target on south edge of channel	Don't Dig
Riv-90	26496.22	5866.31	326496.22	4605866.31	1.7	24.6	-26.8	0.103	-0.1	0.614	0.946	small target, south edge of channel	Don't Dig
Riv-91	26476.24	5859.54	326476.24	4605859.54	1.6	63.7	-72.5	0.144	-0.2	1.693	0.894	buoy?	Don't Dig
Riv-92	26460.33	5855.32	326460.33	4605855.32	1.7	84	-112.8	0.125	-0.6	1.090	0.803	small target, south edge of channel	Don't Dig

Target ID	Local X (m)	Local Y (m)	UTM X (m)	UTM Y (m)	Water Depth (m)	Max. Signal (nT)	Min. Signal (nT)	Size (m)	Burial Depth (m)	Moment	Fit Quality	Analyst Comments	Dig/ Don't Dig
Riv-93	26443.40	5879.25	326443.40	4605879.25	2.0	1042.1	-21.2	0.359	0.2	26.180	0.877	very large target north edge of channel	Don't Dig
Riv-95	26440.94	5852.59	326440.94	4605852.59	1.7	18.9	-7.6	0.086	-0.2	0.354	0.900	clutter target	Don't Dig
Riv-96	26435.87	5852.09	326435.87	4605852.09	1.6	39.5	-20.3	0.084	-0.5	0.340	0.974	clutter target	Don't Dig
Riv-97	26433.93	5857.43	326433.93	4605857.43	1.8	26.5	-25.2	0.077	-0.6	0.257	0.816	clutter target	Don't Dig
Riv-98	26432.15	5850.29	326432.15	4605850.29	1.7	16.3	-1.9	0.067	-0.4	0.166	0.946	clutter target	Don't Dig
Riv-99	26423.43	5850.17	326423.43	4605850.17	1.7	18.8	-4	0.059	-0.6	0.117	0.900	clutter target	Don't Dig
Riv-100	26422.35	5873.82	326422.35	4605873.82								massive target north edge of channel, can't fit	Don't Dig
Riv-101	26407.50	5849.63	326407.50	4605849.63	1.7	21.3	-3.5	0.070	-0.3	0.193	0.952	clutter target	Don't Dig
Riv-102	26376.14	5870.77	326376.14	4605870.77	1.9	156.1	-196.9	0.559	1.9	98.821	0.839	massive target	Don't Dig
Riv-103	26358.78	5864.66	326358.78	4605864.66	1.9	143.1	-140.2	0.277	0.4	12.008	0.958	very large target	Don't Dig
Riv-104	26365.34	5865.65	326365.34	4605865.65	1.9	26.6	-21.6	0.080	-0.5	0.291	0.779	small target between two large targets	Don't Dig
Riv-105	26362.80	5857.85	326362.81	4605857.85	1.8	107.2	-9.2	0.265	1.3	10.527	0.992	very large target, dig?	Don't Dig
Riv-106	26342.84	5861.15	326342.84	4605861.15	1.9	323.3	-587.8	0.371	0.3	28.778	0.985	massive target	Don't Dig
Riv-107	26328.21	5852.46	326328.21	4605852.46	1.9	211.6	-128.5	0.367	0.0	27.932	0.986	massive target	Don't Dig
Riv-108	26327.17	5834.47	326327.17	4605834.47	1.8	205.2	-38.2	0.172	-0.3	2.857	0.752	large target south edge of channel	Don't Dig
Riv-112	26252.70	5825.18	326252.70	4605825.18	1.8	37.3	-31.6	0.117	-0.2	0.909	0.911	small target, south edge of channel	Don't Dig
Riv-114	26208.41	5814.97	326208.41	4605814.97	1.8	22.9	-5.6	0.076	-0.3	0.250	0.958	clutter target	Don't Dig
Riv-115	26204.00	5813.41	326204.00	4605813.41	1.8	23.8	-11.4	0.083	-0.4	0.318	0.903	clutter target	Don't Dig
Riv-118	26137.11	5806.15	326137.11	4605806.15	1.9	33	-5.5	0.116	0.2	0.886	0.979	good target	Don't Dig
Riv-119	26128.51	5795.60	326128.51	4605795.59	1.8	11.4	-22.6	0.089	-0.2	0.394	0.949	clutter target	Don't Dig
Riv-120	26123.83	5804.30	326123.83	4605804.30	1.9	19.3	-5.1	0.094	0.2	0.471	0.823	clutter target	Don't Dig
Riv-121	26114.76	5803.91	326114.76	4605803.91	1.8	17.6	-13.4	0.118	0.5	0.929	0.923	clutter	Don't Dig
Riv-122	26091.19	5788.27	326091.19	4605788.27								buoy?	Don't Dig
Riv-124	25943.18	5822.72	325943.18	4605822.72	1.9	34.7	-24.6	0.107	-0.2	0.699	0.919	clutter	Don't Dig
Riv-125	25923.74	5795.14	325923.74	4605795.14	1.8	21	-20.5	0.098	0.0	0.539	0.586	clutter	Don't Dig
Riv-126	27293.06	5568.34	327293.06	4605568.34	1.8	20.5	-9.8	0.103	0.1	0.610	0.897	small target in beef creek	Don't Dig
Riv-127	27154.95	5432.57	327154.95	4605432.57	1.9	113.8	-79.2	0.220	0.1	6.000	0.987	large target in center of channel in beef creek	Don't Dig
Riv-128	27030.11	5347.03	327030.11	4605347.03	1.8	93.5	-50.4	0.139	-0.3	1.533	0.385	cluster of trash in Beef Creek	Don't Dig

Transect 35 Dig List

Thurs. Sept 14, 2006
PRIMARY COORDINATES: MTADS LOCAL - Relative to UTM (300000.00,4600000.00) meters
SECONDARY COORDINATES: UTM=17, NAD83
THIRD COORDINATES: Latitude/Longitude, nad83

Target ID	Local X (m)	Local Y (m)	UTM X (m)	UTM Y (m)	Latitude	Longitude	Water Depth (m)	Max. Signal (nT)	Min. Signal (nT)	Size (m)	Burial Depth (m)	Moment	Fit Quality	Analyst Comment	Dig/ Don't Dig
TR35-2	28613.63	6837.02	328613.63	4606837.02	41.5948528	-83.0563973	3.7	69	-62	0.180	0.4	3.2761	0.939	Remnant Moment	Dig
TR35-3	28708.89	6832.87	328708.89	4606832.87	41.5948359	-83.0552538	3.8	69	-18	0.117	0.2	0.8933	0.536	105mm maybe	Dig
TR35-5	28774.98	6833.10	328774.98	4606833.10	41.5948521	-83.0544613	3.8	7	-1	0.078	0.6	0.2672	0.928	81mm maybe	Dig
TR35-6	28799.25	6833.46	328799.25	4606833.46	41.5948606	-83.0541704	3.9	83	-32	0.152	0.1	1.9742	0.967	155mm maybe	Dig
TR35-7	28886.35	6836.42	328886.35	4606836.42	41.5949058	-83.0531268	4	24	-10	0.094	0.3	0.4662	0.877	81mm maybe	Dig
TR35-9	28923.37	6832.96	328923.37	4606832.96	41.5948826	-83.0526820	4.1	65	-7	0.122	0.2	1.0379	0.933	105-155mm?, 2nd target 6m West	Dig
TR35-10	28947.28	6832.66	328947.28	4606832.66	41.5948850	-83.0523951	4.1	80	-28	0.155	0.3	2.1032	0.974	155mm size, nice target	Dig
TR35-12	28987.63	6832.39	328987.63	4606832.39	41.5948913	-83.0519112	4.1	20	-2	0.082	0.2	0.3061	0.924	81mm maybe	Dig
TR35-14	29040.68	6835.97	329040.68	4606835.97	41.5949349	-83.0512760	4.2	139	-39	0.204	0.8	4.7772	0.949	very large target, 2nd target 5m SE	Dig
TR35-15	29065.46	6836.76	329065.46	4606836.76	41.5949472	-83.0509792	4.2	81	-28	0.135	0.1	1.3923	0.922	155mm maybe	Dig
TR35-20	29145.16	6831.64	329145.16	4606831.64	41.5949182	-83.0500220	4.3	101	-34	0.168	0.1	2.682	0.871	155mm ?	Dig
TR35-21	29156.03	6833.08	329156.03	4606833.08	41.5949335	-83.0498921	4.3	40	3	0.118	0.4	0.9236	0.839	105mm ?	Dig
TR35-22	29187.06	6840.41	329187.06	4606840.41	41.5950061	-83.0495221	4.3	45	-3	0.118	0.3	0.9216	0.943	105mm?	Dig
TR35-23	29205.54	6839.34	329205.54	4606839.34	41.5950004	-83.0493002	4.3	85	-34	0.152	0.2	1.9976	0.958	155mm ?	Dig
TR35-24	29230.87	6833.77	329230.87	4606833.77	41.5949557	-83.0489949	4.3	75	-13	0.138	0.2	1.4886	0.904	155mm ?	Dig
TR35-26	29294.63	6834.42	329294.63	4606834.42	41.5949752	-83.0482305	4.3	65	-12	0.130	0.2	1.2547	0.886	155mm, 2nd target 3 m NW	Dig
TR35-27	29347.69	6837.20	329347.69	4606837.20	41.5950116	-83.0475950	4.4	59	-28	0.126	0.3	1.1264	0.850	155mm ?	Dig
TR35-28	29359.81	6834.49	329359.81	4606834.49	41.5949898	-83.0474489	4.4	76	-14	0.148	0.5	1.8425	0.745	155mm ?	Dig
TR35-29	29377.65	6835.78	329377.65	4606835.78	41.5950051	-83.0472353	4.3	30	-8	0.091	0.1	0.4289	0.550	105mm ?	Dig
TR35-33	29439.54	6837.33	329439.54	4606837.33	41.5950323	-83.0464937	4.3	50	-5	0.138	0.5	1.4751	0.886	155mm?, targ 33&34 9m apart	Dig
TR35-34	29448.26	6835.48	329448.26	4606835.48	41.5950176	-83.0463886	4.3	81	-33	0.153	0.2	2.012	0.914	155mm ?	Dig
TR35-36	29474.12	6833.18	329474.12	4606833.18	41.5950024	-83.0460778	4.3	20	-8	0.108	0.5	0.7111	0.886	105mm ?	Dig
TR35-45	29587.70	6831.98	329587.70	4606831.98	41.5950158	-83.0447155	4.4	100	-52	0.215	0.7	5.6091	0.906	220mm projo?, target 44 6m West	Dig
TR35-46	29601.97	6831.98	329601.97	4606831.98	41.5950188	-83.0445444	4.4	52	-21	0.155	0.4	2.0854	0.883	155mm?, target 46&47 4m apart	Dig
TR35-47	29606.64	6832.73	329606.64	4606832.73	41.5950266	-83.0444886	4.4	45	-30	0.125	0.1	1.1005	0.876	155mm ?	Dig
TR35-53	29673.12	6836.17	329673.12	4606836.17	41.5950718	-83.0436923	4.4	114	-56	0.165	0.1	2.5214	0.867	155mm ?	Dig
TR35-59	29723.75	6831.90	329723.75	4606831.90	41.5950441	-83.0430841	4.4	66	-15	0.134	0.2	1.3726	0.790	155mm, clutter around	Dig
TR35-64	29800.61	6838.15	329800.61	4606838.14	41.5951167	-83.0421641	4.5	25	-12	0.108	0.1	0.7144	0.927	105mm?	Dig
TR35-67	29851.89	6837.42	329851.89	4606837.42	41.5951211	-83.0415490	4.5	49	-10	0.123	0.3	1.056	0.885	105mm ?	Dig
TR35-85	30027.44	6834.83	330027.44	4606834.83	41.5951351	-83.0394433	4.5	51	-25	0.125	0.0	1.0943	0.846	105-155mm, lots ofclutter	Dig
TR35-87	30056.38	6835.28	330056.38	4606835.28	41.5951453	-83.0390963	4.5	29	-15	0.116	0.3	0.8904	0.913	105mm?, target 87&88 5m apart	Dig
TR35-88	30061.79	6836.87	330061.79	4606836.87	41.5951608	-83.0390319	4.6	59	-15	0.145	0.5	1.7354	0.955	155mm?, in clutter	Dig
TR35-109	30328.38	6835.94	330328.38	4606835.94	41.5952091	-83.0358349	4.7	60	-40	0.149	0.2	1.8818	0.914	strong remnant moment, 155mm?	Dig
TR35-112	30385.56	6837.38	330385.57	4606837.38	41.5952342	-83.0351495	4.6	98	-127	0.215	0.3	5.5767	0.923	8 in ?	Dig
TR35-117	30483.29	6837.11	330483.29	4606837.11	41.5952525	-83.0339776	4.7	28	-8	0.098	0.2	0.5358	0.846	105mm?	Dig

Target ID	Local X (m)	Local Y (m)	UTM X (m)	UTM Y (m)	Latitude	Longitude	Water Depth (m)	Max. Signal (nT)	Min. Signal (nT)	Size (m)	Burial Depth (m)	Moment	Fit Quality	Analyst Comment	Dig/ Don't Dig
TR35-122	30529.89	6837.00	330529.89	4606837.00	41.5952615	-83.0334187	4.7	40	-12	0.111	0.2	0.7648	0.908	105mm?, 122 &123 10m apart	Dig
TR35-123	30538.73	6836.26	330538.73	4606836.26	41.5952567	-83.0333126	4.7	57	-23	0.151	0.2	1.9473	0.941	155mm ?	Dig
TR35-128	30654.19	6837.01	330654.19	4606837.01	41.5952879	-83.0319282	4.7	40	-20	0.120	0.3	0.9839	0.900	155mm?, 2nd target 3m SW	Dig
TR35-155	31183.30	6834.57	331183.30	4606834.57	41.5953780	-83.0255827	5	116	-26	0.152	0.2	1.9911	0.904	155mm ?	Dig
TR35-159	31296.36	6834.90	331296.36	4606834.90	41.5954048	-83.0242270	5	38	-16	0.114	0.3	0.8308	0.879	105mm ?	Dig
TR35-164	31495.96	6837.13	331495.96	4606837.13	41.5954670	-83.0218342	5	37	-12	0.135	0.5	1.4008	0.945	155mm?	Dig
TR35-166	31526.34	6835.80	331526.34	4606835.80	41.5954615	-83.0214695	4.9	35	-5	0.114	0.3	0.8304	0.899	105mm?, targets 5m East & West	Dig
TR35-170	31683.34	6837.66	331683.34	4606837.66	41.5955113	-83.0195874	4.9	53	-21	0.145	0.5	1.7368	0.857	155mm?	Dig
TR35-171	31718.67	6834.18	331718.67	4606834.18	41.5954875	-83.0191627	4.9	49	-11	0.128	0.2	1.1709	0.776	155mm?	Dig
TR35-172	31762.03	6835.46	331762.03	4606835.46	41.5955081	-83.0186431	4.9	32	-12	0.113	0.4	0.8098	0.901	105mm?	Dig
TR35-173	31785.23	6837.74	331785.23	4606837.74	41.5955334	-83.0183655	5	52	-36	0.139	0.4	1.5126	0.818	155mm,strong remnant moment	Dig
TR35-174	31845.64	6838.38	331845.65	4606838.37	41.5955519	-83.0176413	4.9	26	-10	0.115	0.4	0.8681	0.940	105mm?	Dig
TR35-175	31889.30	6836.52	331889.30	4606836.52	41.5955444	-83.0171173	4.9	57	-33	0.152	0.4	2.0004	0.856	155mm?	Dig
TR35-176	31944.94	6836.09	331944.94	4606836.09	41.5955522	-83.0164500	4.9	17	-6	0.091	0.3	0.4293	0.929	small target	Dig
TR35-178	32082.33	6838.96	332082.33	4606838.96	41.5956070	-83.0148032	5.1	33	-4	0.100	0.0	0.5604	0.814	105mm?	Dig
TR35-179	32127.62	6837.39	332127.62	4606837.39	41.5956024	-83.0142596	5.1	20	-6	0.103	0.4	0.6232	0.966	105mm?	Dig
TR35-180	32169.82	6832.73	332169.82	4606832.73	41.5955693	-83.0137523	5.1	22	-8	0.090	0.0	0.4141	0.812	small target	Dig
TR35-181	32192.40	6831.91	332192.40	4606831.91	41.5955667	-83.0134813	5.1	20	-9	0.105	0.3	0.661	0.904	105mm?	Dig
TR35-182	32208.47	6832.67	332208.47	4606832.67	41.5955768	-83.0132888	5.1	18	-3	0.087	0.2	0.3783	0.947	small tartget	Dig
TR35-183	32263.44	6834.82	332263.44	4606834.82	41.5956077	-83.0126302	5.2	126	-48	0.192	0.4	4.0092	0.863	large for a 155mm	Dig
TR35-186	32619.99	6838.37	332619.99	4606838.37	41.5957145	-83.0083556	5.3	35	-9	0.105	0.2	0.6631	0.940	105mm, good target	Dig
TR35-187	32732.13	6835.47	332732.13	4606835.47	41.5957119	-83.0070101	5.4	19	-13	0.102	0.2	0.6021	0.953	105mm?	Dig
TR35-188	32912.68	6835.26	332912.68	4606835.26	41.5957478	-83.0048449	5.5	28	-2	0.105	0.3	0.6461	0.959	105mm?	Dig
TR35-190	33674.36	6837.95	333674.36	4606837.95	41.5959310	-82.9957117	5.9	18	-4	0.088	0.4	0.383	0.912	small target	Dig
TR35-191	33938.53	6837.98	333938.53	4606837.98	41.5959862	-82.9925439	5.9	15	-5	0.079	0.1	0.2835	0.809	small target	Dig
TR35-192	34814.94	6837.28	334814.94	4606837.28	41.5961617	-82.9820339	5.3	57	-49	0.194	0.6	4.094	0.964	larger than a 155mm	Dig
TR35-1	28175.00	6837.38	328175.00	4606837.38	41.5947618	-83.0616570	2.9	42	-36	0.130	0.1	1.2313	0.917	Remnant moment, large target to west	Don't Dig
TR35-4	28714.82	6835.34	328714.82	4606835.34	41.5948593	-83.0551833	3.8	16	-7	0.084	0.2	0.3332	0.910	81mm maybe	Don't Dig
TR35-8	28914.84	6832.94	328914.84	4606832.94	41.5948806	-83.0527842	4.1	74	-57	0.152	0.0	1.9909	0.852	anchor maybe, chain 3m to west	Don't Dig
TR35-11	28975.31	6832.82	328975.31	4606832.82	41.5948924	-83.0520590	4.1	8	0	0.048	-0.1	0.0608	0.734	very small target, clutter?	Don't Dig
TR35-13	28999.02	6832.64	328999.01	4606832.64	41.5948959	-83.0517747	4.2	11	-7	0.086	0.3	0.3538	0.926	81mm maybe, remnant moment	Don't Dig
TR35-16	29077.61	6838.90	329077.61	4606838.90	41.5949691	-83.0508341	4.2	137	-88	0.224	0.4	6.3784	0.875	anchor maybe, chain 3 meters to west	Don't Dig
TR35-17	29109.40	6832.36	329109.40	4606832.36	41.5949170	-83.0504511	4.3	73	-22	0.154	0.4	2.0787	0.936	155mm or anchor, 2nd target 3 m west	Don't Dig
TR35-18	29106.18	6833.60	329106.18	4606833.60	41.5949275	-83.0504899	4.3	29	-12	0.110	0.1	0.755	0.908	chain from anchor?	Don't Dig
TR35-19	29126.71	6832.57	329126.71	4606832.57	41.5949226	-83.0502435	4.3	56	-25	0.145	0.1	1.7209	0.875	155mm ?	Don't Dig
TR35-25	29261.40	6830.74	329261.40	4606830.74	41.5949349	-83.0486279	4.3	52	-7	0.120	-0.1	0.9659	0.875	105mm?	Don't Dig
TR35-30	29392.85	6834.52	329392.85	4606834.52	41.5949971	-83.0470527	4.3	23	-5	0.084	0.2	0.336	0.863	81mm ?	Don't Dig
TR35-31	29412.34	6833.32	329412.34	4606833.32	41.5949904	-83.0468186	4.3	54	-19	0.110	-0.1	0.7617	0.842	105mm ?	Don't Dig
TR35-32	29424.46	6834.37	329424.46	4606834.37	41.5950025	-83.0466736	4.3	88	-38	0.168	0.2	2.6772	0.900	155mm ?	Don't Dig
TR35-35	29462.91	6836.01	329462.91	4606836.01	41.5950254	-83.0462130	4.3	12	-11	0.075	0.3	0.2427	0.692	81mm ?	Don't Dig
TR35-37	29525.49	6836.60	329525.49	4606836.60	41.5950441	-83.0454628	4.3	43	-11	0.105	0.2	0.6484	0.809	105mm ?	Don't Dig

Target ID	Local X (m)	Local Y (m)	UTM X (m)	UTM Y (m)	Latitude	Longitude	Water Depth (m)	Max. Signal (nT)	Min. Signal (nT)	Size (m)	Burial Depth (m)	Moment	Fit Quality	Analyst Comment	Dig/ Don't Dig
TR35-38	29531.41	6835.78	329531.41	4606835.78	41.5950380	-83.0453916	4.3	18	-7	0.110	0.5	0.7569	0.883	105mm ?	Don't Dig
TR35-39	29544.40	6833.53	329544.40	4606833.53	41.5950205	-83.0452351	4.4	62	-22	0.142	0.3	1.6043	0.841	155mm ?	Don't Dig
TR35-40	29548.58	6835.37	329548.58	4606835.37	41.5950380	-83.0451855	4.3	41	-14	0.107	0.1	0.6845	0.814	105mm ?	Don't Dig
TR35-41	29552.43	6832.18	329552.43	4606832.18	41.5950101	-83.0451385	4.3	44	-17	0.115	0.1	0.8642	0.792	105mm ?	Don't Dig
TR35-42	29563.79	6832.12	329563.79	4606832.12	41.5950119	-83.0450023	4.4	47	-12	0.100	0.1	0.5609	0.561	105mm ?	Don't Dig
TR35-43	29568.17	6833.97	329568.17	4606833.97	41.5950296	-83.0449502	4.4	62	-19	0.124	0.3	1.0806	0.820	105-155mm ?	Don't Dig
TR35-44	29581.76	6833.61	329581.76	4606833.61	41.5950292	-83.0447872	4.3	35	-11	0.143	0.6	1.6425	0.844	may be geology	Don't Dig
TR35-48	29617.30	6832.27	329617.30	4606832.27	41.5950247	-83.0443606	4.4	20	-7	0.127	1.1	1.1641	0.696	may be geology	Don't Dig
TR35-49	29636.60	6832.95	329636.60	4606832.95	41.5950350	-83.0441294	4.4	74	-41	0.167	0.2	2.6342	0.808	155mm ?	Don't Dig
TR35-50	29641.16	6832.77	329641.17	4606832.77	41.5950343	-83.0440746	4.4	56	-37	0.169	0.5	2.7482	0.893	155mm, partial signal	Don't Dig
TR35-51	29652.93	6835.04	329652.93	4606835.04	41.5950572	-83.0439342	4.4	64	-26	0.100	-0.1	0.5615	0.596	may be clutter	Don't Dig
TR35-52	29656.42	6835.47	329656.42	4606835.47	41.5950619	-83.0438924	4.4	41	-21	0.118	0.1	0.9385	0.776	may be clutter	Don't Dig
TR35-54	29685.75	6836.45	329685.75	4606836.45	41.5950770	-83.0435410	4.4	44	-17	0.132	0.4	1.297	0.958	155mm ?	Don't Dig
TR35-55	29694.32	6833.68	329694.32	4606833.68	41.5950538	-83.0434374	4.4	94	-43	0.122	0.1	1.0133	0.569	maybe part of a collection of clutter	Don't Dig
TR35-56	29700.85	6834.29	329700.85	4606834.29	41.5950607	-83.0433593	4.4	97	-20	0.150	0.2	1.9143	0.874	155mm ?	Don't Dig
TR35-57	29711.08	6833.05	329711.08	4606833.05	41.5950518	-83.0432363	4.4	72	-18	0.166	0.4	2.5936	0.829	size = 155mm, clutter 2m North	Don't Dig
TR35-58	29716.85	6833.48	329716.85	4606833.48	41.5950568	-83.0431672	4.4	18	-8	0.120	0.9	0.9796	0.915	deep, may be geology	Don't Dig
TR35-60	29729.96	6831.83	329729.96	4606831.83	41.5950448	-83.0430096	4.4	-3	-29	0.098	0.3	0.5354	0.922	105mm, partial signal	Don't Dig
TR35-61	29761.67	6837.64	329761.67	4606837.64	41.5951038	-83.0426310	4.3	35	-12	0.119	0.2	0.9593	0.891	105mm ?	Don't Dig
TR35-62	29772.24	6837.97	329772.24	4606837.97	41.5951090	-83.0425044	4.3	51	-9	0.110	0.0	0.753	0.742	105mm ?	Don't Dig
TR35-63	29789.05	6838.65	329789.05	4606838.65	41.5951187	-83.0423029	4.5	91	-28	0.235	1.2	7.3522	0.808	looks like a pile of clutter	Don't Dig
TR35-65	29815.35	6837.60	329815.35	4606837.60	41.5951149	-83.0419873	4.4	38	-9	0.119	0.2	0.9416	0.896	105mm ?	Don't Dig
TR35-66	29838.65	6836.67	329838.65	4606836.67	41.5951115	-83.0417076	4.4	20	-5	0.070	-0.1	0.1928	0.702	very small target	Don't Dig
TR35-68	29859.24	6836.30	329859.24	4606836.30	41.5951126	-83.0414606	4.4	13	-6	0.091	0.3	0.4282	0.938	may be geology	Don't Dig
TR35-69	29864.37	6835.29	329864.37	4606835.29	41.5951046	-83.0413988	4.5	112	-38	0.131	0.3	1.2637	0.414	looks like multiple targets	Don't Dig
TR35-70	29877.91	6833.98	329877.91	4606833.98	41.5950956	-83.0412361	4.5	64	-33	0.134	0.1	1.3731	0.863	155mm ?	Don't Dig
TR35-71	29884.53	6834.38	329884.53	4606834.38	41.5951007	-83.0411568	4.5	59	-18	0.182	0.9	3.3999	0.624	likely is geology	Don't Dig
TR35-72	29890.05	6833.63	329890.05	4606833.63	41.5950951	-83.0410904	4.5	27	-14	0.136	0.8	1.4269	0.899	likely is geology	Don't Dig
TR35-73	29920.98	6834.02	329920.98	4606834.02	41.5951052	-83.0407196	4.5	53	-19	0.119	0.0	0.9416	0.882	may be geology	Don't Dig
TR35-74	29927.62	6835.36	329927.62	4606835.36	41.5951187	-83.0406403	4.5	43	-20	0.135	0.2	1.3839	0.931	may be geology	Don't Dig
TR35-75	29935.18	6834.52	329935.18	4606834.52	41.5951127	-83.0405494	4.5	78	-27	0.162	0.3	2.3944	0.940	155mm ?	Don't Dig
TR35-76	29944.17	6833.58	329944.17	4606833.58	41.5951062	-83.0404414	4.4	62	-20	0.150	0.2	1.9103	0.828	155mm ?	Don't Dig
TR35-77	29967.01	6834.10	329967.01	4606834.10	41.5951158	-83.0401676	4.4	50	-12	0.120	0.3	0.9716	0.837	105-155mm ?	Don't Dig
TR35-78	29972.36	6832.20	329972.36	4606832.20	41.5950998	-83.0401030	4.5	52	-65	0.196	0.3	4.2479	0.925	all remnant moment, unlikely ordnance	Don't Dig
TR35-79	29984.51	6834.68	329984.51	4606834.68	41.5951247	-83.0399580	4.5	84	-29	0.159	0.3	2.2713	0.958	155mm ?	Don't Dig
TR35-80	29988.88	6834.24	329988.88	4606834.24	41.5951216	-83.0399054	4.5	47	-14	0.119	0.3	0.952	0.830	105mm ?	Don't Dig
TR35-81	29992.56	6834.57	329992.56	4606834.57	41.5951254	-83.0398614	4.5	45	-41	0.157	0.4	2.1886	0.917	may be geology	Don't Dig
TR35-82	30008.38	6833.42	330008.38	4606833.42	41.5951184	-83.0396714	4.5	73	-24	0.130	0.0	1.2387	0.815	155mm ?	Don't Dig
TR35-83	30018.18	6834.92	330018.18	4606834.92	41.5951340	-83.0395543	4.5	21	-8	0.096	0.3	0.5029	0.849	likely geolgoy	Don't Dig
TR35-84	30021.05	6834.25	330021.05	4606834.25	41.5951286	-83.0395196	4.5	34	-12	0.107	0.1	0.6907	0.882	105mm ?	Don't Dig
TR35-86	30039.05	6834.63	330039.05	4606834.63	41.5951358	-83.0393039	4.5	22	-30	0.142	0.7	1.6266	0.609	geolgoy	Don't Dig
TR35-89	30075.96	6836.90	330075.96	4606836.90	41.5951641	-83.0388620	4.6	18	-11	0.081	0.1	0.3049	0.840	geology	Don't Dig
TR35-90	30084.45	6835.16	330084.45	4606835.16	41.5951502	-83.0387596	4.5	28	-8	0.108	0.7	0.7117	0.666	likely geology	Don't Dig
TR35-91	30088.59	6836.76	330088.59	4606836.76	41.5951655	-83.0387105	4.6	32	-5	0.097	0.1	0.5156	0.684	105mm ?	Don't Dig

Target ID	Local X (m)	Local Y (m)	UTM X (m)	UTM Y (m)	Latitude	Longitude	Water Depth (m)	Max. Signal (nT)	Min. Signal (nT)	Size (m)	Burial Depth (m)	Moment	Fit Quality	Analyst Comment	Dig/ Don't Dig
TR35-92	30098.83	6835.94	330098.83	4606835.94	41.5951603	-83.0385874	4.6	55	-20	0.143	0.4	1.6656	0.868	155mm ?	Don't Dig
TR35-93	30103.63	6834.19	330103.63	4606834.19	41.5951456	-83.0385295	4.6	26	-14	0.138	1.2	1.4869	0.680	geology	Don't Dig
TR35-94	30144.46	6835.74	330144.45	4606835.74	41.5951682	-83.0380403	4.6	18	-6	0.104	0.7	0.6309	0.808	geology	Don't Dig
TR35-95	30149.05	6836.47	330149.05	4606836.47	41.5951758	-83.0379854	4.6	33	-21	0.139	0.7	1.5328	0.790	geology	Don't Dig
TR35-96	30158.59	6836.28	330158.59	4606836.28	41.5951761	-83.0378710	4.6	112	-70	0.222	0.6	6.1475	0.900	size = 8in	Don't Dig
TR35-97	30162.16	6834.44	330162.16	4606834.44	41.5951603	-83.0378276	4.6	125	-27	0.163	0.0	2.4544	0.958	155mm ?	Don't Dig
TR35-98	30164.75	6835.33	330164.75	4606835.33	41.5951689	-83.0377968	4.6	39	-14	0.102	0.1	0.5946	0.932	105mm ?	Don't Dig
TR35-99	30177.81	6836.98	330177.81	4606836.98	41.5951865	-83.0376407	4.6	30	-30	0.166	0.7	2.5743	0.896	geology	Don't Dig
TR35-100	30199.66	6836.26	330199.66	4606836.26	41.5951847	-83.0373785	4.5	37	-15	0.118	0.5	0.9259	0.853	geology?	Don't Dig
TR35-101	30213.04	6835.94	330213.04	4606835.94	41.5951847	-83.0372179	4.6	44	-7	0.134	0.4	1.3557	0.822	geology ?	Don't Dig
TR35-102	30223.27	6834.99	330223.27	4606834.99	41.5951783	-83.0370950	4.6	54	-12	0.110	0.1	0.7443	0.919	105mm ?	Don't Dig
TR35-103	30240.14	6834.60	330240.14	4606834.60	41.5951783	-83.0368926	4.6	74	-11	0.138	0.2	1.4685	0.916	155mm ?	Don't Dig
TR35-104	30245.37	6835.97	330245.37	4606835.97	41.5951918	-83.0368302	4.6	21	-13	0.103	0.3	0.6129	0.921	geology ?	Don't Dig
TR35-105	30265.37	6837.88	330265.37	4606837.88	41.5952132	-83.0365910	4.6	33	-14	0.126	0.3	1.1401	0.919	likely not ordnance	Don't Dig
TR35-106	30268.04	6836.12	330268.04	4606836.12	41.5951979	-83.0365585	4.6	61	-10	0.144	0.5	1.6769	0.841	group of 3 items	Don't Dig
TR35-107	30275.79	6836.78	330275.79	4606836.78	41.5952055	-83.0364657	4.6	52	-19	0.112	0.1	0.801	0.848	105mm ?	Don't Dig
TR35-108	30317.75	6837.07	330317.75	4606837.07	41.5952171	-83.0359626	4.6	40	-8	0.119	0.4	0.9491	0.875	geology ?	Don't Dig
TR35-110	30340.53	6836.20	330340.53	4606836.20	41.5952141	-83.0356892	4.6	32	-4	0.084	0.0	0.336	0.832	geology ?	Don't Dig
TR35-111	30358.15	6836.94	330358.15	4606836.94	41.5952244	-83.0354782	4.6	78	-59	0.174	0.8	2.9833	0.498	multiple targets	Don't Dig
TR35-113	30421.88	6834.76	330421.88	4606834.76	41.5952183	-83.0347133	4.6	22	-7	0.087	0.1	0.3753	0.810	geology	Don't Dig
TR35-114	30445.65	6836.05	330445.65	4606836.05	41.5952350	-83.0344287	4.6	36	-7	0.099	-0.1	0.5545	0.699	105mm ?	Don't Dig
TR35-115	30461.78	6835.49	330461.78	4606835.49	41.5952334	-83.0342351	4.6	24	-4	0.086	0.2	0.3592	0.713	geology	Don't Dig
TR35-116	30468.95	6837.50	330468.95	4606837.50	41.5952530	-83.0341497	4.6	30	-16	0.145	0.5	1.7123	0.812	likely geology	Don't Dig
TR35-118	30495.48	6837.88	330495.48	4606837.88	41.5952620	-83.0338317	4.7	52	-19	0.112	0.1	0.7952	0.856	105mm in clutter?	Don't Dig
TR35-119	30501.46	6838.84	330501.46	4606838.84	41.5952720	-83.0337602	4.7	58	-12	0.131	0.4	1.275	0.933	155mm ?	Don't Dig
TR35-120	30506.48	6838.48	330506.48	4606838.48	41.5952698	-83.0336999	4.7	81	-40	0.148	0.2	1.8265	0.922	155mm ?	Don't Dig
TR35-121	30514.01	6837.67	330514.01	4606837.67	41.5952641	-83.0336094	4.7	53	-17	0.130	0.3	1.2495	0.915	looks like multiple targets	Don't Dig
TR35-124	30569.23	6838.98	330569.23	4606838.98	41.5952877	-83.0329476	4.7	136	-105	0.239	0.4	7.7372	0.919	large target, good fit, but this looks like a crab trap ?	Don't Dig
TR35-125	30603.75	6837.19	330603.75	4606837.19	41.5952788	-83.0325331	4.7	47	-18	0.130	0.5	1.234	0.936	155mm ?	Don't Dig
TR35-126	30635.21	6834.57	330635.21	4606834.57	41.5952619	-83.0321551	4.7	66	-28	0.154	0.8	2.0808	0.825	strong remnant moment	Don't Dig
TR35-127	30640.21	6836.95	330640.20	4606836.95	41.5952844	-83.0320959	4.7	90	-22	0.147	0.5	1.7795	0.904	155mm ?	Don't Dig
TR35-129	30669.76	6834.49	330669.76	4606834.49	41.5952686	-83.0317408	4.8	82	-55	0.157	0.2	2.1826	0.926	strong remnant moment	Don't Dig
TR35-130	30673.26	6834.98	330673.26	4606834.98	41.5952737	-83.0316990	4.8	36	-13	0.101	-0.1	0.5804	0.855	105mm?, second target 4m West	Don't Dig
TR35-131	30685.07	6835.10	330685.07	4606835.10	41.5952773	-83.0315574	4.8	27	-7	0.103	-0.4	0.6192	0.844	may be geology	Don't Dig
TR35-132	30701.35	6836.80	330701.35	4606836.80	41.5952960	-83.0313627	4.7	24	-8	0.094	0.3	0.4679	0.718	geolgoy	Don't Dig
TR35-133	30713.91	6834.89	330713.91	4606834.89	41.5952815	-83.0312115	4.8	73	-17	0.113	0.1	0.8091	0.868	105-155mm ?	Don't Dig
TR35-134	30724.61	6835.57	330724.60	4606835.57	41.5952899	-83.0310835	4.8	38	-34	0.151	0.5	1.9595	0.830	looks like multiple targets	Don't Dig
TR35-135	30737.22	6836.84	330737.23	4606836.84	41.5953039	-83.0309325	4.8	49	-26	0.148	0.4	1.8389	0.859	may be geology	Don't Dig
TR35-136	30746.99	6836.67	330746.99	4606836.67	41.5953046	-83.0308153	4.8	57	-18	0.247	2.6	8.5257	0.563	geology	Don't Dig
TR35-137	30786.85	6835.33	330786.85	4606835.33	41.5953009	-83.0303370	4.8	36	-148	0.197	0.4	4.2957	0.933	signal is all remnant	Don't Dig
TR35-138	30806.82	6836.16	330806.82	4606836.16	41.5953126	-83.0300977	4.7	38	-3	0.110	0.4	0.7613	0.913	looks like geology	Don't Dig
TR35-139	30824.70	6836.88	330824.70	4606836.88	41.5953229	-83.0298835	4.8	58	-14	0.148	0.5	1.8293	0.697		Don't Dig
TR35-140	30877.06	6831.46	330877.06	4606831.46	41.5952852	-83.0292542	4.8	144	-35	0.307	0.9	16.3051	0.866	partial signature, don't dig	Don't Dig
TR35-141	30893.31	6835.67	330893.31	4606835.67	41.5953265	-83.0290604	4.8	36	-19	0.138	0.6	1.4823	0.781	geology?	Don't Dig
TR35-142	30919.57	6834.64	330919.57	4606834.64	41.5953228	-83.0287453	4.8	136	-38	0.188	0.4	3.7716	0.843	8in?	Don't Dig

Target ID	Local X (m)	Local Y (m)	UTM X (m)	UTM Y (m)	Latitude	Longitude	Water Depth (m)	Max. Signal (nT)	Min. Signal (nT)	Size (m)	Burial Depth (m)	Moment	Fit Quality	Analyst Comment	Dig/ Don't Dig
TR35-143	30930.27	6834.11	330930.26	4606834.11	41.5953203	-83.0286169	4.8	106	-45	0.184	0.3	3.5174	0.895	155mm ?	Don't Dig
TR35-144	30937.21	6834.24	330937.21	4606834.24	41.5953229	-83.0285336	4.9	100	-30	0.186	0.6	3.6257	0.779	multiple targets	Don't Dig
TR35-145	30953.93	6835.46	330953.93	4606835.46	41.5953374	-83.0283335	4.8	89	-18	0.149	0.4	1.8591	0.867	15mm ?	Don't Dig
TR35-146	30971.65	6835.29	330971.65	4606835.29	41.5953397	-83.0281209	4.9	47	-20	0.175	1.2	3.034	0.758	target in clutter or geology	Don't Dig
TR35-147	30991.01	6836.59	330991.01	4606836.59	41.5953554	-83.0278891	4.7	68	-17	0.199	1.3	4.4287	0.605	likely is geology	Don't Dig
TR35-148	31030.22	6835.30	331030.22	4606835.30	41.5953522	-83.0274186	4.9	116	-21	0.148	0.2	1.846	0.913	155mm ?	Don't Dig
TR35-149	31040.25	6837.54	331040.25	4606837.54	41.5953744	-83.0272989	4.9	265	-225	0.286	0.4	13.1597	0.938	multiple targets or geology	Don't Dig
TR35-150	31047.44	6838.07	331047.43	4606838.07	41.5953807	-83.0272130	4.9	58	-12	0.132	0.4	1.3094	0.887	155mm ?	Don't Dig
TR35-151	31054.75	6837.77	331054.75	4606837.77	41.5953796	-83.0271251	4.9	180	-58	0.182	0.2	3.3907	0.961	this is a complex signal, likely not ordnance	Don't Dig
TR35-152	31071.16	6838.51	331071.16	4606838.51	41.5953897	-83.0269286	4.9	656	-705	0.406	0.3	37.7914	0.868	massive target, likely not ordnance	Don't Dig
TR35-153	31087.67	6836.33	331087.67	4606836.33	41.5953736	-83.0267300	4.9	125	-21	0.164	0.2	2.4861	0.884	155mm ?	Don't Dig
TR35-154	31134.09	6835.44	331134.09	4606835.44	41.5953754	-83.0261731	4.9	139	-144	0.256	0.4	9.4761	0.935	very larget target, 2nd target 3m East	Don't Dig
TR35-156	31206.61	6836.27	331206.61	4606836.27	41.5953982	-83.0253037	4.9	42	-12	0.118	0.2	0.9305	0.840	105mm ?	Don't Dig
TR35-157	31274.57	6833.77	331274.57	4606833.77	41.5953900	-83.0244881	5	53	1	0.123	0.2	1.0635	0.894	geology?	Don't Dig
TR35-158	31281.36	6834.35	331281.36	4606834.35	41.5953967	-83.0244067	5	64	-60	0.167	0.3	2.633	0.938	155mm, strong remnant moment	Don't Dig
TR35-160	31353.04	6836.48	331353.04	4606836.48	41.5954310	-83.0235478	5	40	-13	0.141	0.8	1.5996	0.862	155mm ?	Don't Dig
TR35-161	31362.80	6834.15	331362.80	4606834.15	41.5954121	-83.0234302	5	64	-23	0.130	0.1	1.2286	0.795	155mm ?	Don't Dig
TR35-162	31418.91	6833.73	331418.91	4606833.73	41.5954201	-83.0227572	4.9	53	-55	0.160	0.3	2.3293	0.914	155mm ?	Don't Dig
TR35-163	31477.88	6836.33	331477.88	4606836.33	41.5954560	-83.0220508	5	20	-4	0.087	0.3	0.3717	0.946	geolgoy	Don't Dig
TR35-165	31516.66	6837.14	331516.66	4606837.14	41.5954715	-83.0215860	4.9	43	-38	0.151	0.4	1.9314	0.917	likely not ordnance	Don't Dig
TR35-167	31538.96	6837.93	331538.96	4606837.93	41.5954832	-83.0213188	5	36	-5	0.114	0.4	0.826	0.852	105mm?	Don't Dig
TR35-168	31563.23	6835.36	331563.23	4606835.36	41.5954653	-83.0210271	4.9	51	-18	0.117	-0.1	0.8959	0.891	105mm?	Don't Dig
TR35-169	31620.32	6838.38	331620.32	4606838.38	41.5955045	-83.0203432	4.9	32	-22	0.094	0.3	0.4705	0.745	105mm ?	Don't Dig
TR35-177	32067.18	6841.23	332067.18	4606841.23	41.5956243	-83.0149855	5	8	-26	0.112	0.6	0.7922	0.837	likely geology	Don't Dig
TR35-184	32428.57	6835.42	332428.57	4606835.42	41.5956478	-83.0106502	5.3	17	-3	0.087	0.4	0.3779	0.908	small target	Don't Dig
TR35-185	32547.46	6834.42	332547.46	4606834.42	41.5956637	-83.0092243	5.3	11	-5	0.087	0.5	0.3771	0.851	small target very deep	Don't Dig
TR35-189	33284.49	6836.64	333284.49	4606836.64	41.5958379	-83.0003866	5.8	17	-7	0.096	0.2	0.5038	0.879	small target	Don't Dig
TR35-193	36571.86	6833.91	336571.86	4606833.91	41.5964928	-82.9609638	6.8	12	-4	0.064	0.0	0.1478	0.927	very small target	Don't Dig
TR35-194	36651.82	6839.14	336651.81	4606839.14	41.5965562	-82.9600064	6.8	16	-10	0.084	0.0	0.3341	0.960	very small target, all remanant moment	Don't Dig
TR35-195	37963.44	6834.93	337963.44	4606834.93	41.5967855	-82.9442759	7.2	7	-4	0.056	-0.2	0.0968	0.857	very small target	Don't Dig
TR35-196	39610.30	6835.92	339610.30	4606835.92	41.5971268	-82.9245263	7.3	32	-18	0.130	0.1	1.2276	0.974	size = 155mm, strong remnant moment	Don't Dig

Transect 37 Dig List

Thurs. Sep 14, 2006
PRIMARY COORDINATES: MTADS LOCAL - Relative to UTM (300000.00,4600000.00) meters
SECONDARY COORDINATES: UTM=17, nad83
THIRD COORDINATES: Latitude/Longitude, nad83

Target ID	Local X (m)	Local Y (m)	UTM X (m)	UTM Y (m)	UTM Y(m)	Latitude	Longitude	Water Depth (m)	Max. Signal (nT)	Min. Signal (nT)	Size (m)	Burial Depth (m)	Moment	Fit Quality	Analyst Comment	Dig/ Don't Dig
TR35-5	28448.28	7166.98	328448.28	4607166.98	41.59779	-83.0584744	169.9620000	3.9	39.4	-10.4	0.127	0.4	1.153	0.943	good target	Dig
TR35-6	28575.64	7169.14	328575.64	4607169.14	41.59783	-83.0569477	169.1590000	3.9	21.2	-5.6	0.139	1.2	1.507	0.895	155mm?	Dig
TR35-10	28849.76	7165.94	328849.76	4607165.94	41.59786	-83.0536596	169.7140000	4.1	58.1	-20.9	0.148	0.4	1.817	0.945	155mm?	Dig
TR35-11	28897.75	7166.18	328897.75	4607166.18	41.59788	-83.0530843	169.7180000	4.2	99.1	-39.4	0.182	0.3	3.419	0.973	larger than a 155mm, dig	Dig
TR35-12	28937.76	7169.00	328937.76	4607169.00	41.59791	-83.0526052	169.6660000	4.2	64.5	-19.9	0.156	0.4	2.125	0.965	155mm?, target 12&13 8m apart	Dig
TR35-13	28945.87	7168.29	328945.87	4607168.29	41.59791	-83.0525077	169.6940000	4.2	96.4	-42.7	0.154	0.3	2.076	0.709	155mm, clutter to East	Dig
TR35-14	28954.49	7167.29	328954.49	4607167.29	41.5979	-83.0524041	169.7330000	4.3	77.8	-22.4	0.144	0.3	1.685	0.965	155mm?, Targets 14, 15, 16 within 10m	Dig
TR35-15	28960.11	7168.88	328960.11	4607168.88	41.59791	-83.0523372	169.7720000	4.3	86.3	-21.6	0.140	0.2	1.557	0.910	155mm in clutter	Dig
TR35-16	28966.44	7167.25	328966.44	4607167.25	41.5979	-83.0522608	169.7770000	4.3	95.9	-53.8	0.171	0.2	2.812	0.975	155mm in clutter	Dig
TR35-17	29012.26	7166.51	329012.26	4607166.51	41.5979	-83.0517111	169.5520000	4.3	74.8	-37.4	0.168	0.4	2.692	0.939	155mm?	Dig
TR35-18	29042.91	7164.63	329042.91	4607164.63	41.59789	-83.0513431	169.5970000	4.3	21.7	-9.1	0.105	0.3	0.662	0.873	105mm?	Dig
TR35-19	29061.10	7165.12	329061.10	4607165.12	41.5979	-83.0511251	168.8650000	4.4	64.2	-32.4	0.217	1.0	5.793	0.842	very large target dig?	Dig
TR35-20	29067.49	7163.87	329067.49	4607163.87	41.59789	-83.0510481	169.6070000	4.3	66.8	-49	0.164	0.3	2.507	0.959	155mm?, clutter 3m East	Dig
TR35-21	29100.39	7165.93	329100.39	4607165.93	41.59792	-83.0506541	169.2670000	4.4	127.4	-73	0.225	0.6	6.411	0.903	very large target in clutter, dig?	Dig
TR35-22	29122.97	7165.90	329122.97	4607165.90	41.59792	-83.0503834	169.4760000	4.4	48.6	-23.9	0.142	0.4	1.632	0.956	155mm?, Target 22, 23 7m apart	Dig
TR35-23	29131.66	7166.03	329131.66	4607166.03	41.59793	-83.0502792	169.4350000	4.4	41.2	-7.8	0.118	0.5	0.929	0.907	105mm?	Dig
TR35-37	29332.11	7166.42	329332.11	4607166.42	41.59797	-83.0478756	169.3240000	4.4	74.4	-22.7	0.174	0.5	2.958	0.973	155mm, Targets 37, 38, 39 clustered together	Dig
TR35-38	29339.68	7163.77	329339.68	4607163.77	41.59795	-83.0477840	169.4480000	4.4	66.5	-27.7	0.156	0.4	2.161	0.889	155mm?	Dig
TR35-39	29348.41	7165.61	329348.41	4607165.61	41.59797	-83.0476798	169.3600000	4.4	63.3	-33.3	0.168	0.4	2.677	0.915	155mm?	Dig
TR35-42	29433.15	7167.20	329433.15	4607167.20	41.598	-83.0466641	169.5580000	4.4	69.9	-27	0.148	0.2	1.836	0.929	155mm?	Dig
TR35-49	29530.31	7165.27	329530.31	4607165.27	41.598	-83.0454984	169.4840000	4.4	39.2	-8.8	0.116	0.3	0.871	0.916	105mm?, dig	Dig
TR35-55	29615.25	7166.31	329615.25	4607166.31	41.59803	-83.0444801	169.3610000	4.5	63.4	-24.6	0.159	0.4	2.256	0.939	155mm?	Dig
TR35-56	29623.57	7166.82	329623.57	4607166.82	41.59804	-83.0443806	169.5700000	4.5	50.2	-22.1	0.120	0.2	0.981	0.843	target in clutter	Dig
TR35-57	29630.89	7165.86	329630.89	4607165.86	41.59803	-83.0442925	169.5250000	4.5	91.1	-41.2	0.163	0.2	2.430	0.920	155mm? other targets East and West	Dig
TR35-65	29720.26	7165.93	329720.26	4607165.93	41.59805	-83.0432207	169.1880000	4.5	68.4	-33.9	0.173	0.5	2.934	0.925	large target, 65&66 5m apart	Dig
TR35-66	29727.00	7166.50	329727.00	4607166.50	41.59806	-83.0431401	169.3080000	4.5	57.6	-23	0.143	0.4	1.653	0.925	155mm?	Dig
TR35-80	29848.52	7167.49	329848.52	4607167.49	41.59809	-83.0416831	169.3280000	4.5	67.8	-10	0.133	0.3	1.322	0.751	155mm?	Dig
TR35-81	29889.89	7168.25	329889.89	4607168.25	41.59811	-83.0411873	169.2100000	4.6	14.3	-4.7	0.085	0.4	0.349	0.934	mortar?, targets 81&82 5m apart	Dig
TR35-82	29896.64	7165.84	329896.65	4607165.84	41.59809	-83.0411055	169.3930000	4.6	15.6	-6.5	0.083	0.2	0.322	0.945	two sensors see, mortar?	Dig
TR35-84	29925.18	7165.97	329925.18	4607165.97	41.59809	-83.0407634	169.1070000	4.6	53.3	-6.6	0.128	0.5	1.182	0.918	155mm?, Targets 84,85&86 clustered together	Dig
TR35-85	29932.14	7162.40	329932.14	4607162.40	41.59806	-83.0406789	169.0650000	4.6	166.4	-137	0.253	0.5	9.143	0.970	very large target, dig?	Dig

Target ID	Local X (m)	Local Y (m)	UTM X (m)	UTM Y (m)	UTM Y(m)	Latitude	Longitude	Water Depth (m)	Max. Signal (nT)	Min. Signal (nT)	Size (m)	Burial Depth (m)	Moment	Fit Quality	Analyst Comment	Dig/ Don't Dig
TR35-86	29940.34	7164.70	329940.34	4607164.70	41.59809	-83.0405812	169.1420000	4.6	128.4	-116.3	0.224	0.4	6.307	0.933	very large target, dig	Dig
TR35-92	30035.21	7166.44	330035.21	4607166.44	41.59812	-83.0394441	169.1830000	4.6	53.4	-12.8	0.138	0.3	1.492	0.929	155mm?	Dig
TR35-93	30044.00	7167.03	330044.00	4607167.03	41.59813	-83.0393388	169.3220000	4.6	60.6	-55.8	0.161	0.2	2.367	0.947	155mm?, target 94 2m East	Dig
TR35-94	30046.71	7166.14	330046.71	4607166.14	41.59812	-83.0393061	169.2430000	4.6	72.2	-18.2	0.142	0.3	1.623	0.956	155mm?, target 93 2m West	Dig
TR35-102	30141.21	7162.65	330141.21	4607162.65	41.59811	-83.0381718	169.3500000	4.6	69.4	-34.1	0.146	0.2	1.751	0.931	155mm,dig	Dig
TR35-112	30292.69	7163.21	330292.69	4607163.21	41.59815	-83.0363554	169.4870000	4.6	64.9	-58	0.153	0.2	2.030	0.921	155mm, dig	Dig
TR35-114	30341.22	7164.62	330341.22	4607164.62	41.59817	-83.0357739	169.4260000	4.6	58.0	-35.2	0.142	0.2	1.632	0.921	155mm?dig	Dig
TR35-115	30441.62	7166.96	330441.62	4607166.96	41.59821	-83.0345706	169.4120000	4.7	83.2	-56	0.159	0.2	2.251	0.968	155mm? dig	Dig
TR35-116	30552.25	7163.42	330552.25	4607163.42	41.5982	-83.0332429	169.2350000	4.7	29.2	-8.5	0.101	0.3	0.576	0.698	105mm?	Dig
TR35-117	30594.69	7160.54	330594.69	4607160.54	41.59819	-83.0327332	169.2210000	4.8	27.9	-4.2	0.098	0.3	0.537	0.852	105mm? dig	Dig
TR35-118	30606.70	7161.42	330606.70	4607161.42	41.5982	-83.0325894	169.0750000	4.8	22.8	-7	0.109	0.5	0.726	0.938	105mm? dig	Dig
TR35-119	30632.31	7162.33	330632.31	4607162.33	41.59821	-83.0322825	169.1790000	4.7	19.2	-2.4	0.090	0.4	0.419	0.944	105mm? dig	Dig
TR35-120	30695.57	7161.27	330695.57	4607161.27	41.59822	-83.0315236	169.3720000	4.7	70.3	-35.7	0.145	0.1	1.718	0.902	155mm? dig	Dig
TR35-123	30830.96	7165.23	330830.96	4607165.23	41.59828	-83.0299011	168.8180000	4.8	57.7	-19.5	0.163	0.6	2.456	0.916	155mm?, deep?	Dig
TR35-126	31318.32	7164.57	331318.32	4607164.57	41.59838	-83.0240565	168.7830000	5.0	67.5	-35.3	0.173	0.5	2.913	0.943	155mm? dig	Dig
TR35-127	31339.65	7164.09	331339.65	4607164.09	41.59838	-83.0238006	168.6940000	5.0	36.7	-16.5	0.150	0.5	1.916	0.848	155mm?	Dig
TR35-128	31364.36	7165.10	331364.36	4607165.10	41.59839	-83.0235045	168.9220000	5.0	81.4	-73.6	0.198	0.4	4.407	0.895	large target, dig	Dig
TR35-129	31371.14	7164.02	331371.14	4607164.02	41.59838	-83.0234229	169.2260000	4.9	43.7	-16	0.118	0.1	0.939	0.949	105mm?	Dig
TR35-131	31604.97	7166.23	331604.97	4607166.23	41.59845	-83.0206195	168.9380000	5.0	52.8	-41.4	0.154	0.3	2.074	0.953	155mm?, Target 131, 132 7m apart	Dig
TR35-132	31611.49	7166.57	331611.49	4607166.57	41.59846	-83.0205414	168.7420000	4.9	33.7	-28.3	0.131	0.5	1.281	0.730	155mm dig	Dig
TR35-133	31625.48	7165.27	331625.48	4607165.27	41.59845	-83.0203731	169.0740000	5.0	38.6	-9.9	0.106	0.2	0.672	0.831	105mm?dig	Dig
TR35-134	31639.49	7165.24	331639.49	4607165.24	41.59845	-83.0202051	168.7910000	4.9	20.7	-9.9	0.117	0.5	0.894	0.930	105mm? dig	Dig
TR35-136	31713.79	7164.18	331713.79	4607164.18	41.59846	-83.0193138	169.1200000	4.9	102.4	-27.9	0.157	0.2	2.183	0.924	155mm, Targets 136, 137 7m apart	Dig
TR35-137	31721.74	7165.43	331721.74	4607165.43	41.59847	-83.0192189	168.8760000	4.9	40.2	-6	0.123	0.4	1.062	0.964	105mm? dig	Dig
TR35-138	31775.45	7166.45	331775.44	4607166.45	41.59849	-83.0185751	168.7520000	4.9	26.5	-21.9	0.144	0.5	1.669	0.908	155mm? dig	Dig
TR35-141	31960.24	7167.52	331960.24	4607167.52	41.59854	-83.0163593	168.9060000	4.9	41.6	-35.9	0.153	0.4	2.038	0.935	155mm? dig	Dig
TR35-142	32307.54	7163.93	332307.54	4607163.93	41.59858	-83.0121935	168.4610000	5.0	18.8	-5.2	0.115	0.7	0.861	0.847	105mm?	Dig
TR35-143	32442.21	7165.31	332442.21	4607165.31	41.59862	-83.0105789	168.6640000	5.1	18.1	-4.5	0.095	0.5	0.486	0.899	105mm?	Dig
TR35-144	32741.97	7163.80	332741.97	4607163.80	41.59867	-83.0069836	168.4880000	5.3	19.6	-4.9	0.094	0.4	0.470	0.825	105mm?	Dig
TR35-145	32836.20	7164.51	332836.20	4607164.51	41.5987	-83.0058538	168.4000000	5.3	20.6	-5	0.111	0.5	0.764	0.895	105mm?	Dig
TR35-146	32917.48	7168.19	332917.48	4607168.19	41.59875	-83.0048801	168.7290000	5.4	19.2	-4.4	0.079	0.1	0.277	0.799	81mm?	Dig
TR35-148	33535.96	7164.65	333535.96	4607164.65	41.59884	-82.9974621	167.9610000	5.5	15.5	-1	0.104	0.7	0.631	0.920	105mm?	Dig
TR35-150	36477.42	7163.71	336477.42	4607163.71	41.59944	-82.9621863	166.6930000	7.0	22.4	-4.1	0.108	0.5	0.713	0.942	105mm?	Dig
TR35-1	27761.21	7167.02	327761.20	4607167.02	41.59764	-83.0667135	171.3100000	2.3	19.5	-12	0.128	0.6	1.196	0.923	105mm?	Don't Dig
TR35-2	27895.82	7166.56	327895.82	4607166.56	41.59766	-83.0650992	171.5030000	2.6	74.3	-8.5	0.118	0.0	0.927	0.911	in clutter, dont dig	Don't Dig
TR35-3	27901.22	7166.18	327901.22	4607166.18	41.59766	-83.0650343	170.7780000	2.7	102.9	-32.2	0.221	0.7	6.094	0.926	likely not ordnance	Don't Dig
TR35-4	28309.19	7168.38	328309.19	4607168.38	41.59777	-83.0601427	170.3290000	3.6	26.0	-8.5	0.192	0.3	4.012	0.913	partial signature, dont dig	Don't Dig
TR35-7	28596.27	7167.78	328596.27	4607167.78	41.59783	-83.0567000	170.2410000	3.9	5.5	-1.7	0.053	0.1	0.082	0.837	very small target	Don't Dig
TR35-8	28655.73	7167.39	328655.73	4607167.39	41.59784	-83.0559868	170.0050000	3.9	1044.1	-151.9	0.373	0.3	29.202	0.872	massive target, partial signature	Don't Dig
TR35-9	28780.50	7165.47	328780.50	4607165.47	41.59785	-83.0544900	169.8400000	4.0	6.7	-3.2	0.064	0.3	0.146	0.803	very small target	Don't Dig
TR35-24	29160.63	7164.39	329160.62	4607164.38	41.59792	-83.0499314	169.4050000	4.4	119.7	-1142	0.409	0.4	38.579	0.979	partial signature, dont dig	Don't Dig
TR35-25	29167.97	7166.70	329167.97	4607166.70	41.59794	-83.0498439	169.2740000	4.4	33.7	-10.1	0.118	0.6	0.930	0.861	105mm?	Don't Dig

Target ID	Local X (m)	Local Y (m)	UTM X (m)	UTM Y (m)	UTM Y(m)	Latitude	Longitude	Water Depth (m)	Max. Signal (nT)	Min. Signal (nT)	Size (m)	Burial Depth (m)	Moment	Fit Quality	Analyst Comment	Dig/ Don't Dig
TR35-26	29192.67	7166.73	329192.67	4607166.73	41.59794	-83.0495478	169.2330000	4.5	114.1	-150.8	0.239	0.6	7.689	0.808	not UXO	Don't Dig
TR35-27	29209.29	7166.41	329209.29	4607166.41	41.59795	-83.0493484	169.5150000	4.4	38.8	-17.2	0.131	0.3	1.270	0.941	targets in clutter, dont dig	Don't Dig
TR35-28	29238.02	7164.43	329238.02	4607164.43	41.59793	-83.0490033	169.4060000	4.4	1523.3	-1290	0.514	0.5	76.783	0.918	too big for UXO	Don't Dig
TR35-29	29259.59	7164.70	329259.59	4607164.70	41.59794	-83.0487447	169.4780000	4.4	101.0	-42.7	0.179	0.4	3.216	0.923	too much clutter, dont dig	Don't Dig
TR35-30	29264.09	7164.06	329264.09	4607164.06	41.59794	-83.0486905	169.3870000	4.4	32.2	-27.6	0.144	0.4	1.684	0.947	too much clutter dont dig	Don't Dig
TR35-31	29267.35	7166.05	329267.35	4607166.05	41.59795	-83.0486520	169.4820000	4.4	65.9	-21.1	0.144	0.3	1.690	0.926	too much clutter, dont dig	Don't Dig
TR35-32	29291.06	7166.58	329291.06	4607166.58	41.59796	-83.0483678	169.4550000	4.4	79.4	-45.5	0.179	0.4	3.228	0.964	155mm?, 2nd target 2m East	Don't Dig
TR35-33	29294.65	7166.57	329294.66	4607166.57	41.59797	-83.0483247	169.3790000	4.4	62.2	-14.7	0.134	0.4	1.357	0.923	155mm, 2nd target 2m West	Don't Dig
TR35-34	29303.21	7167.11	329303.21	4607167.11	41.59797	-83.0482223	169.5100000	4.4	56.9	-34.3	0.154	0.3	2.071	0.962	155mm in clutter	Don't Dig
TR35-35	29302.90	7164.02	329302.90	4607164.02	41.59794	-83.0482251	169.1390000	4.4	42.1	-24.8	0.161	0.7	2.377	0.923	155mm in clutter	Don't Dig
TR35-36	29320.22	7166.11	329320.22	4607166.11	41.59797	-83.0480181	169.4280000	4.4	16.1	-3.7	0.084	0.4	0.333	0.878	small target in clutter	Don't Dig
TR35-40	29393.78	7164.80	329393.78	4607164.80	41.59797	-83.0471356	169.4510000	4.4	43.5	-9.3	0.117	0.4	0.909	0.926	105mm?	Don't Dig
TR35-41	29408.46	7164.09	329408.46	4607164.09	41.59797	-83.0469593	169.3150000	4.4	50.5	-8.6	0.141	0.5	1.599	0.810	partial signature, dont dig	Don't Dig
TR35-43	29441.03	7166.43	329441.03	4607166.43	41.598	-83.0465694	169.6510000	4.4	18.4	-8	0.095	0.1	0.485	0.966	small target in clutter	Don't Dig
TR35-44	29443.78	7167.83	329443.77	4607167.83	41.59801	-83.0465369	169.5780000	4.4	45.8	-37	0.152	0.2	1.986	0.928	target in clutter	Don't Dig
TR35-45	29444.34	7164.99	329444.34	4607164.99	41.59798	-83.0465292	169.4790000	4.4	65.9	-10.4	0.134	0.3	1.345	0.913	target in clutter	Don't Dig
TR35-46	29467.25	7162.88	329467.25	4607162.87	41.59797	-83.0462540	167.3100000	4.4	46.6	-26.2	0.334	2.5	20.984	0.619	target in clutter	Don't Dig
TR35-47	29481.38	7165.95	329481.38	4607165.95	41.598	-83.0460853	169.3870000	4.4	201.7	-179.4	0.262	0.4	10.151	0.912	multiple targets	Don't Dig
TR35-48	29506.48	7165.65	329506.48	4607165.65	41.598	-83.0457843	169.7510000	4.4	54.7	-36.5	0.133	0.0	1.334	0.931	complex target, don't dig	Don't Dig
TR35-50	29555.12	7165.85	329555.12	4607165.85	41.59801	-83.0452011	169.3180000	4.5	72.4	-25.4	0.162	0.4	2.416	0.963	155mm, other targets 2m SE	Don't Dig
TR35-51	29558.49	7159.27	329558.49	4607159.27	41.59796	-83.0451588	166.6000000	4.5	57.9	-30.1	0.580	3.2	110.019	0.323	multiple targets, dont dig	Don't Dig
TR35-52	29572.37	7165.14	329572.37	4607165.14	41.59801	-83.0449940	169.2130000	4.5	89.5	-41.5	0.169	0.5	2.745	0.777	155mm?, 2nd target 2m East	Don't Dig
TR35-53	29576.61	7165.48	329576.61	4607165.48	41.59802	-83.0449433	169.4860000	4.5	39.8	-28.5	0.131	0.3	1.276	0.914	target in clutter	Don't Dig
TR35-54	29587.60	7163.92	329587.60	4607163.92	41.598	-83.0448110	169.6720000	4.5	39.1	-20.5	0.105	0.1	0.646	0.938	target in clutter	Don't Dig
TR35-58	29645.81	7165.63	329645.81	4607165.63	41.59803	-83.0441134	168.9770000	4.5	118.0	-108.5	0.256	0.8	9.490	0.737	target lookd complex	Don't Dig
TR35-59	29659.09	7166.36	329659.09	4607166.36	41.59804	-83.0439544	169.2480000	4.5	74.8	-41	0.177	0.5	3.151	0.966	155mm, 2nd target 2m East	Don't Dig
TR35-60	29661.61	7167.65	329661.61	4607167.65	41.59805	-83.0439246	169.2030000	4.5	68.8	-36.8	0.181	0.6	3.364	0.975	target in clutter	Don't Dig
TR35-61	29679.78	7165.14	329679.78	4607165.14	41.59803	-83.0437060	169.5280000	4.5	53.3	-9.3	0.109	0.2	0.740	0.866	105mm?	Don't Dig
TR35-62	29691.27	7165.73	329691.26	4607165.73	41.59804	-83.0435684	169.5850000	4.5	42.6	-29.2	0.120	0.1	0.970	0.883	target in clutter	Don't Dig
TR35-63	29695.29	7167.46	329695.29	4607167.46	41.59806	-83.0435206	169.0320000	4.5	35.0	-12	0.144	0.7	1.694	0.874	target in clutter	Don't Dig
TR35-64	29701.93	7165.31	329701.93	4607165.31	41.59804	-83.0434404	169.2380000	4.5	74.3	-65.9	0.184	0.4	3.541	0.941	strong remnant moment	Don't Dig
TR35-67	29737.25	7168.24	329737.25	4607168.24	41.59807	-83.0430176	169.4530000	4.5	51.2	-30.3	0.132	0.2	1.289	0.919	target in clutter	Don't Dig
TR35-68	29743.91	7168.80	329743.91	4607168.80	41.59808	-83.0429380	169.0470000	4.5	89.7	-27.8	0.189	0.6	3.812	0.973	larget target in clutter	Don't Dig
TR35-69	29751.00	7167.63	329751.00	4607167.63	41.59807	-83.0428526	169.0560000	4.5	39.9	-15.5	0.143	0.6	1.651	0.755	complex target, dont dig	Don't Dig
TR35-70	29760.13	7167.71	329760.13	4607167.71	41.59807	-83.0427431	169.3390000	4.6	50.3	-16.6	0.133	0.3	1.327	0.853	155mm?	Don't Dig
TR35-71	29773.23	7168.90	329773.24	4607168.90	41.59809	-83.0425863	169.4150000	4.6	68.2	-30.9	0.147	0.2	1.809	0.963	155mm? larger target 4m East	Don't Dig
TR35-72	29777.68	7170.33	329777.68	4607170.33	41.5981	-83.0425335	168.8940000	4.6	220.5	-205	0.337	0.7	21.522	0.947	too big for UXO?	Don't Dig
TR35-73	29782.04	7167.81	329782.04	4607167.81	41.59808	-83.0424804	169.2340000	4.6	49.1	-24.5	0.142	0.4	1.601	0.961	target in clutter	Don't Dig
TR35-74	29784.46	7169.88	329784.46	4607169.88	41.5981	-83.0424520	169.4530000	4.5	66.6	-19.5	0.120	0.2	0.976	0.879	target in clutter	Don't Dig
TR35-75	29793.59	7169.01	329793.59	4607169.01	41.59809	-83.0423423	169.2010000	4.6	50.5	-8.9	0.122	0.4	1.028	0.873	105mm?	Don't Dig
TR35-76	29800.07	7168.19	329800.07	4607168.19	41.59809	-83.0422643	169.1910000	4.6	158.0	-85.1	0.225	0.4	6.441	0.939	likely not UXO	Don't Dig
TR35-77	29807.51	7168.75	329807.51	4607168.75	41.59809	-83.0421753	169.2980000	4.5	66.0	-29.5	0.159	0.3	2.269	0.981	155mm?	Don't Dig
TR35-78	29810.52	7166.76	329810.52	4607166.76	41.59808	-83.0421386	169.0280000	4.5	55.1	-15.9	0.144	0.6	1.675	0.919	155mm?	Don't Dig
TR35-79	29825.55	7165.55	329825.55	4607165.55	41.59807	-83.0419581	169.2640000	4.6	72.4	-48.5	0.176	0.3	3.105	0.946	partial signal, dont dig	Don't Dig
TR35-83	29914.57	7164.83	329914.57	4607164.83	41.59808	-83.0408903	168.8520000	4.6	138.2	-94.5	0.249	0.7	8.741	0.897	partial signal dont dig	Don't Dig

Target ID	Local X (m)	Local Y (m)	UTM X (m)	UTM Y (m)	UTM Y(m)	Latitude	Longitude	Water Depth (m)	Max. Signal (nT)	Min. Signal (nT)	Size (m)	Burial Depth (m)	Moment	Fit Quality	Analyst Comment	Dig/ Don't Dig
TR35-87	29967.58	7164.00	329967.58	4607164.00	41.59809	-83.0402544	169.1570000	4.6	24.5	-10.2	0.107	0.3	0.693	0.843	105mm?	Don't Dig
TR35-88	29979.37	7164.23	329979.37	4607164.23	41.59809	-83.0401131	168.1350000	4.6	31.9	-7.5	0.161	1.4	2.374	0.668	complex target, dont dig	Don't Dig
TR35-89	29988.46	7165.48	329988.46	4607165.48	41.5981	-83.0400044	169.0720000	4.6	84.5	-67.4	0.193	0.5	4.077	0.843	likely not UXO	Don't Dig
TR35-90	29995.54	7164.92	329995.54	4607164.92	41.5981	-83.0399193	169.1980000	4.6	19.1	-7.5	0.098	0.4	0.525	0.902	target in clutter	Don't Dig
TR35-91	30014.29	7164.91	330014.29	4607164.91	41.5981	-83.0396945	169.4590000	4.6	47.3	-11.3	0.104	0.1	0.632	0.925	target in clutter	Don't Dig
TR35-95	30094.10	7162.05	330094.10	4607162.05	41.59809	-83.0387366	168.9260000	4.6	49.7	-50.7	0.187	0.6	3.722	0.946	partial signature, dont dig	Don't Dig
TR35-96	30099.39	7162.53	330099.39	4607162.53	41.5981	-83.0386733	169.3370000	4.6	24.2	-5.2	0.092	0.2	0.434	0.875	target in clutter	Don't Dig
TR35-97	30112.40	7161.56	330112.40	4607161.56	41.59809	-83.0385170	169.2420000	4.6	53.4	-23	0.143	0.2	1.641	0.951	155mm?	Don't Dig
TR35-98	30117.56	7163.07	330117.56	4607163.07	41.59811	-83.0384556	169.1170000	4.6	70.6	-17.4	0.148	0.4	1.841	0.916	155mm?	Don't Dig
TR35-99	30123.69	7163.03	330123.69	4607163.03	41.59811	-83.0383820	169.2400000	4.6	62.0	-20.1	0.140	0.3	1.545	0.910	target in clutter	Don't Dig
TR35-100	30127.13	7162.65	330127.13	4607162.65	41.59811	-83.0383406	169.5340000	4.6	20.8	-6.1	0.076	0.0	0.245	0.881	target in clutter	Don't Dig
TR35-101	30131.35	7163.05	330131.35	4607163.05	41.59811	-83.0382902	168.5120000	4.6	20.4	-10.7	0.125	1.0	1.098	0.613	target in clutter	Don't Dig
TR35-103	30156.54	7162.79	330156.54	4607162.79	41.59811	-83.0379880	169.3290000	4.6	54.5	-25.1	0.139	0.2	1.501	0.970	target in clutter	Don't Dig
TR35-104	30159.74	7163.62	330159.74	4607163.62	41.59812	-83.0379499	169.2220000	4.6	52.2	-43.2	0.165	0.3	2.558	0.961	target in clutter	Don't Dig
TR35-105	30174.36	7163.61	330174.36	4607163.61	41.59813	-83.0377746	169.1920000	4.6	35.6	-16.2	0.128	0.4	1.196	0.907	105mm?	Don't Dig
TR35-106	30187.83	7161.93	330187.83	4607161.93	41.59811	-83.0376126	169.4240000	4.6	51.1	-5.7	0.117	0.1	0.915	0.892	105mm?	Don't Dig
TR35-107	30197.79	7165.28	330197.78	4607165.28	41.59815	-83.0374942	169.3090000	4.6	64.6	-8.3	0.172	0.2	2.882	0.896	multiple targets	Don't Dig
TR35-108	30223.01	7163.30	330223.01	4607163.30	41.59813	-83.0371911	169.3530000	4.6	82.9	-23	0.150	0.3	1.914	0.938	155mm? 2nd target 2m NE	Don't Dig
TR35-109	30225.77	7164.84	330225.77	4607164.84	41.59815	-83.0371585	169.6000000	4.6	47.2	-13.1	0.107	0.0	0.702	0.964	target in clutter	Don't Dig
TR35-110	30234.65	7162.67	330234.65	4607162.67	41.59813	-83.0370513	169.2630000	4.6	58.8	-21.1	0.145	0.4	1.717	0.858	155mm?	Don't Dig
TR35-111	30270.32	7164.27	330270.32	4607164.27	41.59815	-83.0366240	169.2510000	4.6	595.5	-638.8	0.379	0.4	30.670	0.961	not UXO	Don't Dig
TR35-113	30312.05	7165.04	330312.05	4607165.03	41.59817	-83.0361239	169.4630000	4.6	41.9	-9.1	0.097	0.1	0.509	0.783	partial signature, dont dig	Don't Dig
TR35-121	30721.25	7162.53	330721.25	4607162.53	41.59823	-83.0312160	169.0500000	4.8	116.8	-40.7	0.196	0.4	4.222	0.932	not UXO	Don't Dig
TR35-122	30797.20	7164.38	330797.20	4607164.38	41.59827	-83.0303057	169.1210000	4.8	112.8	-43.8	0.170	0.2	2.770	0.921	155mm in clutter	Don't Dig
TR35-124	31165.54	7166.38	331165.55	4607166.38	41.59836	-83.0258891	169.2350000	4.9	59.1	-21.3	0.116	0.1	0.882	0.818	105mm?	Don't Dig
TR35-125	31240.60	7167.16	331240.60	4607167.16	41.59838	-83.0249892	168.8940000	4.9	45.8	-9.6	0.133	0.4	1.324	0.881	155mm?	Don't Dig
TR35-130	31439.66	7164.92	331439.66	4607164.92	41.59841	-83.0226015	168.8920000	5.0	47.3	-34.8	0.157	0.4	2.194	0.953	155mm? dig, 2nd target 3m East	Don't Dig
TR35-135	31658.68	7163.75	331658.68	4607163.75	41.59844	-83.0199746	168.6500000	4.9	49.8	-47.2	0.191	0.6	3.933	0.923	partial signature	Don't Dig
TR35-139	31856.80	7166.27	331856.81	4607166.27	41.59851	-83.0175994	168.9150000	4.9	21.9	-4.7	0.094	0.3	0.463	0.899	105mm?	Don't Dig
TR35-140	31863.48	7165.97	331863.48	4607165.97	41.5985	-83.0175192	168.7820000	5.0	41.7	-29	0.146	0.5	1.769	0.941	likely not UXO	Don't Dig
TR35-147	33188.97	7160.28	333188.97	4607160.28	41.59873	-83.0016222	168.0400000	5.4	16.6	-6.3	0.110	0.7	0.751	0.875	too deep	Don't Dig
TR35-149	36464.61	7164.88	336464.61	4607164.88	41.59945	-82.9623403	167.2590000	7.0	31.8	-22.4	0.117	0.0	0.914	0.891	partial signature dont dig	Don't Dig

Transect 89 Target Dig List

Thurs. Sep 14, 2006
PRIMARY COORDINATES: MTADS LOCAL - Relative to UTM (300000.00,4600000.00) meters
SECONDARY COORDINATES: UTM=17, nad83
THIRD COORDINATES: Latitude/Longitude, nad83

Target ID	Local X (m)	Local Y (m)	UTM X (m)	UTM Y (m)	UTM Y (m)	Latitude	Longitude	Water Depth (m)	Max. Signal (nT)	Min. Signal (nT)	Size (m)	Burial Depth (m)	Moment	Fit Quality	Analyst Comment	Dig/ Don't Dig
TR89-5	27216.62	15746.32	327216.62	4615746.32	41.67475	-83.0757214	166.5480000	7.6	31.4	-9.3	0.129	0.0	1.208	0.781	good target	Dig
TR89-6	27396.15	15740.68	327396.15	4615740.68	41.67474	-83.0735643	166.2280000	7.7	66.0	-23.6	0.182	0.3	3.387	0.806	good target	Dig
TR89-7	27629.81	15744.49	327629.81	4615744.49	41.67482	-83.0707601	165.7300000	7.8	8.4	-2.7	0.104	0.6	0.629	0.899	Good target, may be too deep	Dig
TR89-11	28177.26	15743.93	328177.26	4615743.93	41.67493	-83.0641873	165.8160000	8.0	48.1	-4.9	0.168	0.3	2.664	0.778	155mm?	Dig
TR89-12	28363.85	15745.58	328363.85	4615745.58	41.67499	-83.0619476	165.7230000	8.1	78.6	-15.3	0.197	0.4	4.311	0.970	large target on 8 sensors, use	Dig
TR89-13	28655.62	15741.72	328655.62	4615741.72	41.67502	-83.0584435	165.9520000	8.2	51.2	-3.7	0.144	0.2	1.699	0.640	large target, does not look like UXO, Dig Anyway	Dig
TR89-14	28709.32	15752.65	328709.32	4615752.65	41.67513	-83.0578019	165.5850000	8.1	55.3	-6.6	0.172	0.5	2.864	0.825	large target, 155mm?, use	Dig
TR89-15	28889.86	15756.55	328889.86	4615756.55	41.6752	-83.0556354	165.5900000	8.2	12.0	-4.1	0.113	0.5	0.819	0.885	good target, 105mm?	Dig
TR89-16	29294.32	15751.92	329294.32	4615751.92	41.67525	-83.0507782	165.8090000	8.3	18.5	-3.5	0.105	0.1	0.657	0.794	good target, 105mm?	Dig
TR89-19	30156.62	15740.11	330156.62	4615740.11	41.67532	-83.0404218	165.5290000	8.5	66.1	-10.6	0.177	0.3	3.132	0.869	good target, 155mm?	Dig
TR89-20	30176.30	15741.03	330176.30	4615741.03	41.67534	-83.0401859	165.4260000	8.5	29.5	-17.7	0.151	0.4	1.935	0.916	good target 155mm?	Dig
TR89-21	30223.62	15741.34	330223.62	4615741.34	41.67535	-83.0396177	165.3870000	8.6	41.8	-5.6	0.143	0.3	1.650	0.774	good target, 155mm?	Dig
TR89-23	30313.47	15753.05	330313.47	4615753.05	41.67547	-83.0385423	165.4890000	8.6	91.4	-6.9	0.162	0.2	2.392	0.825	good target on 7 sensors, 155mm?	Dig
TR89-24	30587.90	15741.67	330587.90	4615741.67	41.67543	-83.0352442	165.5440000	8.6	20.5	-2.7	0.107	0.2	0.699	0.952	good target 105mm?	Dig
TR89-25	30670.80	15741.77	330670.80	4615741.77	41.67545	-83.0342489	165.7420000	8.5	23.6	-4.0	0.108	0.0	0.702	0.916	good target, 105mm?	Dig
TR89-29	31097.69	15740.34	331097.69	4615740.34	41.67553	-83.0291231	165.7000000	8.6	21.4	-7.3	0.108	0.0	0.716	0.752	partial signal, 105mm?	Dig
TR89-30	31114.77	15740.59	331114.77	4615740.59	41.67553	-83.0289182	165.2280000	8.5	39.8	-4.5	0.153	0.5	2.015	0.913	good target, 155mm?	Dig
TR89-31	31230.12	15746.29	331230.12	4615746.29	41.67561	-83.0275348	165.5060000	8.6	22.3	-4.2	0.111	0.2	0.775	0.936	good target 105mm?	Dig
TR89-32	31283.41	15746.89	331283.41	4615746.89	41.67562	-83.0268952	165.3180000	8.6	21.0	-2.6	0.106	0.3	0.680	0.823	good target, 105mm?	Dig
TR89-34	31476.39	15747.75	331476.39	4615747.75	41.67567	-83.0245784	165.2320000	8.6	50.0	-13.4	0.165	0.5	2.528	0.938	good target, 155mm?	Dig
TR89-36	31727.85	15744.03	331727.85	4615744.03	41.67569	-83.0215583	166.1830000	8.2	110.3	-59.3	0.193	-0.1	4.072	0.977	good target, larger than 155mm	Dig
TR89-42	32095.09	15738.36	332095.09	4615738.36	41.67572	-83.0171475	165.4650000	8.7	28.7	-5.6	0.115	0.1	0.863	0.949	good target, 105mm?	Dig
TR89-44	32388.54	15742.57	332388.54	4615742.57	41.67582	-83.0136253	165.4510000	8.7	21.0	-4.0	0.118	0.1	0.920	0.867	good target, 105mm?	Dig
TR89-46	33526.36	15744.76	333526.36	4615744.76	41.67608	-82.9999646	164.8130000	8.8	13.4	-6.0	0.129	0.5	1.226	0.929	good target	Dig
TR89-1	23542.29	15742.54	323542.29	4615742.54	41.67391	-83.1198328	166.1590000	6.7	110.9	-18.7	0.395	1.3	34.705	0.696	Partial Signal, poor fit, dont use	Don't Dig
TR89-2	26021.94	15751.92	326021.94	4615751.92	41.67454	-83.0900660	167.9040000	6.7	15.7	-1.1	0.064	-0.5	0.152	0.671	Partial Signal, Target larger than fit, d	Don't Dig
TR89-3	26111.30	15748.30	326111.31	4615748.30	41.67452	-83.0889921	167.5210000	6.8	6.5	-4.2	0.062	-0.2	0.136	0.714	Small target reasonable fit	Don't Dig
TR89-4	27039.87	15742.33	327039.87	4615742.32	41.67467	-83.0778422	166.7280000	7.5	16.7	-9.8	0.115	-0.1	0.858	0.866	Partial signal, size =105mm	Don't Dig
TR89-8	27688.55	15737.91	327688.55	4615737.91	41.67477	-83.0700530	165.8430000	7.9	31.0	-3.6	0.138	0.5	1.493	0.832	partial signal dont use	Don't Dig
TR89-9	27717.48	15737.58	327717.48	4615737.58	41.67478	-83.0697056	165.8270000	7.9	14.1	-4.7	0.116	0.5	0.879	0.733	partial signal dont use	Don't Dig
TR89-10	28088.29	15746.39	328088.29	4615746.39	41.67494	-83.0652562	166.5540000	8.0	6.7	-2.5	0.064	-0.3	0.151	0.679	small targetg	Don't Dig
TR89-17	29992.75	15741.26	329992.75	4615741.26	41.6753	-83.0423896	165.5230000	8.4	7.1	-2.3	0.075	0.3	0.237	0.716	small target on 3 sensors	Don't Dig
TR89-18	30029.93	15743.03	330029.93	4615743.03	41.67532	-83.0419437	165.7450000	8.4	10.1	-5.0	0.087	0.1	0.368	0.559	small target on 3 sensors	Don't Dig
TR89-22	30250.42	15737.44	330250.42	4615737.44	41.67532	-83.0392948	165.2410000	8.6	25.4	-10.0	0.148	0.5	1.838	0.837	partial signal, 155mm?	Don't Dig
TR89-26	30716.26	15740.17	330716.26	4615740.17	41.67544	-83.0337026	166.1060000	8.5	51.0	-16.4	0.105	-0.4	0.662	0.531	partial signal, dont use	Don't Dig
TR89-27	30950.82	15762.54	330950.82	4615762.54	41.67569	-83.0308928	165.4620000	8.6	26.0	-5.0	0.129	0.3	1.206	0.811	partial signal	Don't Dig
TR89-28	31044.92	15768.07	331044.92	4615768.06	41.67576	-83.0297646	165.7810000	8.6	80.8	-4.6	0.138	-0.1	1.491	0.679	partial signal, dont use	Don't Dig
TR89-33	31394.64	15742.38	331394.65	4615742.38	41.67561	-83.0255584	165.3880000	8.6	77.6	-28.0	0.189	0.3	3.833	0.976	looks like 2 targets, anchor w chain?	Don't Dig
TR89-35	31687.82	15739.03	331687.82	4615739.03	41.67564	-83.0220375	165.7250000	8.4	58.5	-59.6	0.223	0.2	6.232	0.973	part signal, dont use	Don't Dig
TR89-37	31820.17	15746.91	331820.17	4615746.91	41.67574	-83.0204506	165.9650000	8.3	107.2	-7.9	0.167	0.0	2.633	0.728	complex target, dont use	Don't Dig
TR89-38	31832.92	15746.77	331832.92	4615746.77	41.67574	-83.0202975	165.4320000	8.3	9.0	-5.9	0.103	0.5	0.616	0.714	good target deep, 105mm?	Don't Dig
TR89-39	31906.75	15743.98	331906.75	4615743.98	41.67573	-83.0194103	166.4470000	8.0	13.4	-9.6	0.092	-0.2	0.442	0.879	doesnt look like UXO	Don't Dig
TR89-40	31922.02	15745.67	331922.02	4615745.67	41.67575	-83.0192274	165.9720000	7.9	9.3	-3.8	0.094	0.4	0.466	0.821	likely not UXO	Don't Dig
TR89-41	31983.64	15750.01	331983.65	4615750.01	41.6758	-83.0184887	166.2230000	7.9	13.4	-2.9	0.084	0.1	0.336	0.871	good small target	Don't Dig
TR89-43	32143.40	15744.36	332143.40	4615744.36	41.67578	-83.0165691	165.6500000	8.7	10.9	-4.2	0.075	-0.1	0.241	0.869	small target	Don't Dig
TR89-45	32830.91	15749.87	332830.91	4615749.87	41.67598	-83.0083160	165.3550000	8.6	9.4	-5.2	0.094	0.3	0.463	0.794	small target	Don't Dig
TR89-47	33837.45	15746.63	333837.45	4615746.62	41.67616	-82.9962299	164.9120000	8.8	7.1	-2.2	0.090	0.5	0.412	0.912	might be geology	Don't Dig
TR89-48	34109.53	15745.65	334109.53	4615745.65	41.67621	-82.9929629	164.6950000	8.8	9.4	-10.7	0.143	0.7	1.636	0.785	partial signal dont use	Don't Dig

MTA DIG LIST, WS TRANSECT 15

Thu Sep 28, 2006
PRIMARY COORDINATES: MTADS LOCAL - Relative to UTM (300000.00,4600000.00) meters
SECONDARY COORDINATES: UTM=17, nad83
THIRD COORDINATES: Latitude/Longitude, nad83

Target ID	Local X (m)	Local Y (m)	UTM X (m)	UTM Y (m)	Latitude	Longitude	Water Depth (m)	Max. Signal (nT)	Min. Signal (nT)	Size (m)	Burial Depth (m)	Moment	Fit Quality	Analyst Comments	Dig/ Don't Dig
WS15-1	23597.65	22345.54	323597.65	4622345.54	41.7333534	-83.1211214	8.6	6.7	-1.4	0.116	1.2	0.888	0.902	multiple clutter objects	Dig
WS15-2	23709.19	22348.36	323709.19	4622348.36	41.7334035	-83.1197819	8.6	53.6	-8.9	0.181	0.6	3.344	0.985	good target, projo?	Dig
WS15-3	24074.23	22346.67	324074.23	4622346.67	41.7334692	-83.1153949	8.6	18.1	-3.7	0.102	0.1	0.597	0.818	likely clutter	Dig
WS15-4	24501.23	22344.52	324501.23	4622344.52	41.7335442	-83.1102633	8.6	17.2	-10.9	0.129	0.3	1.201	0.961	strongly inverted, likely clutter	Dig
WS15-5	24576.89	22344.71	324576.89	4622344.71	41.7335626	-83.1093541	8.6	72.9	-4.7	0.180	0.5	3.310	0.992	excellent target, projo?	Dig
WS15-6	24830.78	22327.24	324830.77	4622327.24	41.7334614	-83.1062982	8.8	9.8	-6.2	0.104	0.3	0.635	0.898	clutter	Dig
WS15-7	24862.02	22318.33	324862.02	4622318.33	41.7333880	-83.1059201	8.8	8.4	-3.7	0.089	0.6	0.403	0.697	clutter over reef	Dig
WS15-8	25015.32	22232.35	325015.32	4622232.35	41.7326479	-83.1040528								part of 4-target group over reef	Dig
WS15-9	25019.61	22233.60	325019.61	4622233.60	41.7326601	-83.1040016	8.6	37	-8.8	0.140	0.1	1.545	0.870	4-target group, looks like boat anchor	Dig
WS15-10	25024.18	22233.06	325024.18	4622233.06	41.7326562	-83.1039465								part of 4-target group over reef	Dig
WS15-11	25581.26	22346.79	325581.26	4622346.79	41.7338023	-83.0972857	8.6	32.8	-14.1	0.154	0.4	2.043	0.992	good target, possible 155mm	Dig
WS15-12	27096.15	22346.01	327096.15	4622346.01	41.7341263	-83.0790813	8.9	74	-17.8	0.214	0.4	5.519	0.782	very good target, large projo?	Dig
WS15-13	27892.64	22344.18	327892.64	4622344.18	41.7342826	-83.0695094	9.1	16.2	-2.5	0.096	0.2	0.499	0.838	likely clutter	Don't Dig
WS15-14	27954.85	22346.75	327954.85	4622346.75	41.7343193	-83.0687626	9.1	7.9	-5	0.093	0.3	0.450	0.853	likely clutter	Don't Dig
WS15-15	30739.74	22345.14	330739.74	4622345.14	41.7349026	-83.0352957	9.5	7.6	-11.7	0.120	0.4	0.987	0.933	junk	Don't Dig
WS15-16	31381.74	22346.08	331381.74	4622346.08	41.7350476	-83.0275807	9.6	22.3	-10.4	0.122	0.2	1.034	0.947	good target, 155mm?	Don't Dig
WS15-17	31389.56	22344.85	331389.57	4622344.85	41.7350382	-83.0274864	9.6	28	-5.8	0.143	0.7	1.641	0.922	good target 155mm?	Don't Dig
WS15-18	32272.94	22346.30	332272.94	4622346.30	41.7352381	-83.0168709	9.6	9.3	-3.2	0.110	0.6	0.750	0.781	geology?	Don't Dig
WS15-19	32287.45	22346.88	332287.45	4622346.88	41.7352464	-83.0166966	9.6	11	-2.8	0.109	0.5	0.734	0.954	likely clutter	Don't Dig
WS15-20	32354.72	22345.97	332354.72	4622345.97	41.7352524	-83.0158879	9.7	9.1	-3	0.102	0.8	0.607	0.806	likely clutter	Don't Dig
WS15-21	32769.57	22346.03	332769.57	4622346.03	41.7353403	-83.0109025	9.7	21.1	-3.7	0.135	0.5	1.403	0.965	looks like multiple objects	Don't Dig
WS15-22	32887.77	22344.56	332887.77	4622344.56	41.7353519	-83.0094816	9.7	11	-3.8	0.083	0.2	0.322	0.830	likely junk	Don't Dig
WS15-23	32987.59	22344.73	332987.59	4622344.73	41.7353745	-83.0082820	9.8	9.4	-2.6	0.091	0.5	0.424	0.910	likely junk	Don't Dig
WS15-24	33013.78	22345.38	333013.78	4622345.38	41.7353858	-83.0079676	9.7	9.3	-2.4	0.095	0.5	0.485	0.881	clutter	Don't Dig
WS15-25	33065.96	22346.96	333065.97	4622346.96	41.7354110	-83.0073408	9.7	22.5	-2.8	0.117	0.2	0.910	0.902	good target	Don't Dig

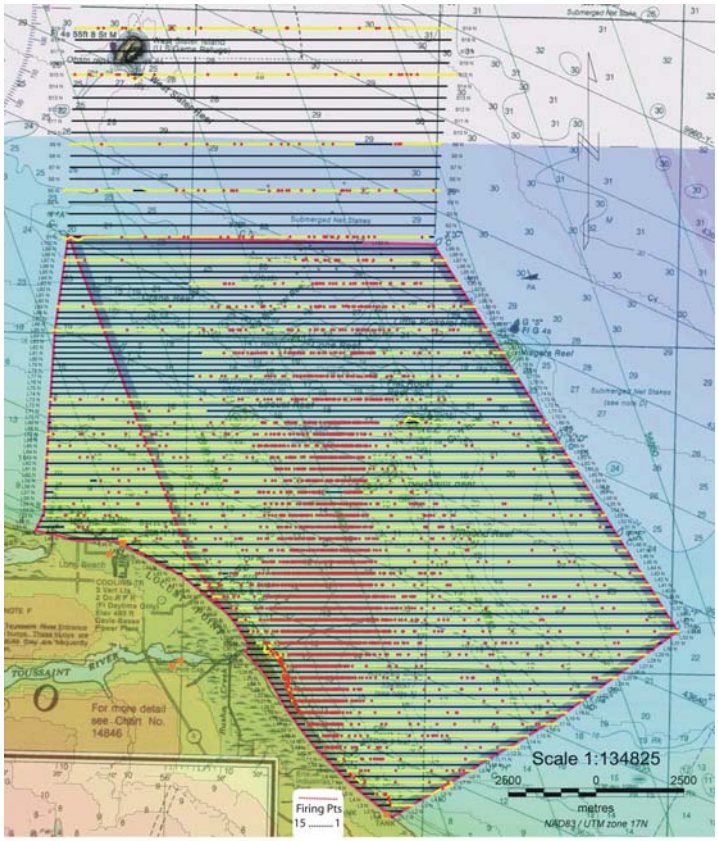
MTA Dig List, WS Transect 19

Thu Sep 28 08:34:27 2006
PRIMARY COORDINATES: MTADS LOCAL - Relative to UTM (300000.00,4600000.00) meters
SECONDARY COORDINATES: UTM=17, nad83
THIRD COORDINATES: Latitude/Longitude, nad83

Target ID	Local X (m)	Local Y (m)	UTM X (m)	UTM Y (m)	Water Depth (m)	Max. Signal (nT)	Min. Signal (nT)	Size (m)	Burial Depth (m)	Moment	Fit Quality	Analyst Comments	Dig/ Don't Dig
WS19-1	23790.97	23669.75	323790.97	4623669.75	9.3	100.5	12.6	0.155	0.1	2.088	0.84	partial signature, dig	Dig
WS19-3	23974.50	23665.58	323974.50	4623665.58	9.4	672.9	-219.3	0.411	0.4	39.184	0.91	single object, too big for UXO, find out	Dig
WS19-4	24127.60	23667.48	324127.60	4623667.48	9.5	16.6	-3.7	0.096	0.1	0.506	0.82	likely too small for UXO	Dig
WS19-5	24666.62	23668.14	324666.62	4623668.14	9.8	27.2	-3.2	0.118	0.3	0.932	0.59	small target	Dig
WS19-6	25134.79	23663.33	325134.79	4623663.33	9.5	41.3	-13.9	0.195	0.6	4.213	0.98	large target, could be projectile	Dig
WS19-7	26030.44	23667.58	326030.44	4623667.58	9.3	52.1	-8.6	0.176	0.6	3.075	0.98	could be 155mm	Dig
WS19-8	26076.20	23667.69	326076.20	4623667.69	9.2	54.4	-8.7	0.148	0.3	1.826	0.80	looks like a boat anchor	Dig
WS19-9	26548.65	23661.11	326548.65	4623661.11	9.2	74.4	-38.1	0.206	0.4	4.944	0.99	Large inverted target, projo?	Dig
WS19-2	23874.01	23664.45	323874.01	4623664.45	9.3	5.9	-5.4	0.099	1.0	0.540	0.76	Too small for UXO, too deep	Don't Dig
WS19-11	26896.56	23668.13	326896.56	4623668.13	9.2	12.1	-7.9	0.112	0.2	0.804	0.83	likely clutter	Don't Dig
WS19-12	28409.33	23665.48	328409.33	4623665.48	9.3	8.7	-7.8	0.107	0.3	0.699	0.91	looks like clutter	Don't Dig
WS19-13	29333.30	23666.36	329333.30	4623666.36	9.5	58.4	-8.4	0.159	0.4	2.272	0.93	good target, 155mm?	Don't Dig
WS19-14	29370.56	23669.05	329370.57	4623669.05	9.5	8.6	-10.2	0.085	0.5	0.345	0.41	looks like clutter	Don't Dig
WS19-15	30437.45	23667.61	330437.45	4623667.61	9.6	10.9	-4.6	0.079	0.1	0.277	0.82	junk	Don't Dig
WS19-16	30863.02	23662.20	330863.02	4623662.20	9.7	23.7	-3.8	0.116	0.4	0.875	0.92	105mm?	Don't Dig
WS19-17	31415.28	23664.60	331415.28	4623664.60	9.7	19.9	-3.2	0.132	0.8	1.302	0.95	looks like multiple targets	Don't Dig
WS19-18	31894.49	23665.69	331894.49	4623665.69	9.8	17.3	-9.4	0.131	0.6	1.275	0.94	possible projo, too deep	Don't Dig
WS19-19	31901.52	23666.14	331901.52	4623666.14	9.8	26.6	-7.7	0.125	0.2	1.092	0.97	possible projo, 3 targets within 8 m	Don't Dig
WS19-20	31907.45	23666.23	331907.45	4623666.23	9.7	23.2	-2.9	0.103	0.1	0.623	0.75	possible projo, too deep	Don't Dig
WS19-21	31980.12	23667.49	331980.12	4623667.49	9.8	25.3	-20.1	0.140	0.6	1.554	0.83	good target, too deep	Don't Dig
WS19-22	32267.84	23668.28	332267.84	4623668.28	9.8	10.2	-2.8	0.091	0.4	0.424	0.74	junk	Don't Dig
WS19-23	32286.03	23668.63	332286.03	4623668.63	9.8	31.4	-6.4	0.130	0.3	1.236	0.89	good target, too deep	Don't Dig
WS19-24	32941.84	23666.57	332941.84	4623666.57	9.8	9.4	-3.7	0.119	1.0	0.957	0.89	clutter	Don't Dig
WS19-25	33346.50	23665.72	333346.50	4623665.72	9.9	9.1	-3.9	0.109	0.8	0.733	0.82	clutter	Don't Dig

The MTA UXO Survey and Target Recovery on Lake Erie at the Former Erie Army Depot

ESTCP Project MM 200324



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FIGURES

TABLES

LIST OF ACRONYMS

DAQ	Data Acquisition System
DAS	Data Analysis System
DERP	Defense Environmental Restoration Program
DoD	Department of Defense
EOD	Explosive Ordnance Disposal
EODMU	Explosive Ordnance Disposal Mobile Unit
EOTI	Explosive Ordnance Technologies Incorporated
ESTCP	Environmental Security Technology Certification Program
FRAG	Fragmentation/Shrapnel
FUDS	Formerly Used Defense Site
GPS	Global Positioning System
MEC	Munitions and Explosives of Concern
MPPEH	Material Potentially Presenting Explosive Hazard
MTA	Marine Towed Array
MTADS	Multi-sensor Towed Array Detection System
NAD	North American Datum
NOAA	National Oceanographic and Atmospheric Administration
PDF	Portable Document Format
PNNL	Pacific Northwest National Laboratory
POC	Point of Contact
POS	Prove Out Site
SERDP	Strategic Environmental Research and Development Program
TCRA	Time Critical Removal Action
USACE	United States Army Corps of Engineers
UXO	Unexploded Ordnance
VSP	Visual Sampe Plan
WAA	Wide Area Assessment

1.0 Introduction

1.1 Background

The former Erie Army Depot, Ottawa County, OH, is located along the western shore of Lake Erie about 5 miles west of the town of Port Clinton. This site and the associated impact areas are designated by the United States Government as a Formerly Used Defense Site (FUDS) under the Defense Environmental Restoration Program (DERP).[1,2] This property was formerly used for artillery, testing and mortar and small arms training, resulting in impact areas on land and northward into the Lake almost to the Canadian Border. Ordnance and explosive waste (OEW) and potentially live or unexploded ordnance (UXO) have been found on the lake bottom, in the Federal navigation channel in the Toussaint River, in the marshland adjacent to the firing ranges, and along beaches fronting the former Depot, (Reference 2, Appendices B and J).[3-5]

The impact areas were located on, near, or offshore of the FUDS beaches adjacent to Lake Erie. Several different range fans have been described that were associated with different types of ordnance operations. Proof testing of projectiles and the gun barrels that were designed to fire them took place from a series of 15 fixed gun emplacements (located adjacent to one another in a line about 2000 meters inland from the beach, see later). Ordnance found on or near the FUDS shore of Lake Erie appears to be mobile and may have originated from offshore or near shore impact areas. In FY06, ESTCP was directed by Congress to conduct work to characterize UXO contamination impacting the Toussaint River and Lake areas associated with ordnance testing that may affect the shoreline and the river. This operation was set up in accordance with the recommendations of the Defense Sciences Board.[6]

1.2 Site History/Characteristics

1.2.1 Former Erie Army Depot

The subject study area consists of the beach and an area of Lake Erie fronting the former Erie Army Depot (now called Erie Industrial Park), between Camp Perry Ohio National Guard Training Center and the mouth of the Toussaint River in northwest Ohio (Figure 1, adapted from Ref 2, Appendix L). This FUDS site is located in rural Carroll Township, Ottawa County, OH, on Lake Erie, approximately 37 miles east of Toledo and 6 miles west of Port Clinton. The Erie Army Depot was initially established in 1918 as the Camp Perry Proving Grounds, and then was redesignated as Erie Proving Grounds. For almost a half century (1918-1966) this site was used by the Department of the Army for testing and proof-firing of artillery and as an ordnance storage and issue center (USACE Rock Island 1993).[2] The beach area between the Industrial Park and the Toussaint River is owned by the Toussaint Shooting Club.

Camp Perry was established in 1907 by the state of Ohio for the training of the state National Guard. Part of the camp was used to establish the Erie Army Depot in the spring of 1918. During the next 2 years, the site was used to proof fire (verify that the cannons will withstand the pressure of firing) thousands of pieces of artillery. Between World Wars I and II, the site was less active and was used primarily to warehouse and issue various items of ordnance. In 1941, the artillery test firing mission of the site was reactivated in support of World War II and the

name of the facility was changed to the Erie Proving Ground. During the subsequent 5 years, 70 percent of the mobile artillery used by the U.S. Army or provided to Allied armies was tested and proof-accepted at Erie Proving Ground. Between 1946 and 1951, the site reverted to a peace-time role and was renamed the Erie Army Depot. Late in 1951, the depot assumed the additional roles of anti-aircraft support testing and the overhauling of surface-to-air guided missiles (in support of the Korean Conflict). Additional activities included logistical support to the Regular Army and National Guard anti-aircraft units training at Camp Perry.[2] Test firings of Vietnam-era munitions continued into the early and mid-1970s and continues today as the mission of the Camp Perry Ordnance Office.

Figure 1 illustrates 1965 period firing fans and target zones related to the present Erie Industrial Park. Discussions with previous employees of the Erie Army Depot and present officials of Camp Perry indicate that the firing points and range patterns have been similar for other periods. The Erie Army Depot was excessed by the General Services Administration in 1966 and closed in 1967. However, ARES, Inc., a company under contract to the Federal Government, has continued to manufacture and test fire artillery and other large-caliber barrels on this property as a commercially owned and operated enterprise. Currently, ARES reportedly fires inert rounds into the land targets, and polices up the rounds.[3] The majority of acreage encompassing the former Erie Army Depot site is no longer Federal property and is now classified as a FUDS. Approximately 5.7 km^2 (1,400 acres) of property at the former Erie Army Depot is leased from the State of Ohio to private land owners.

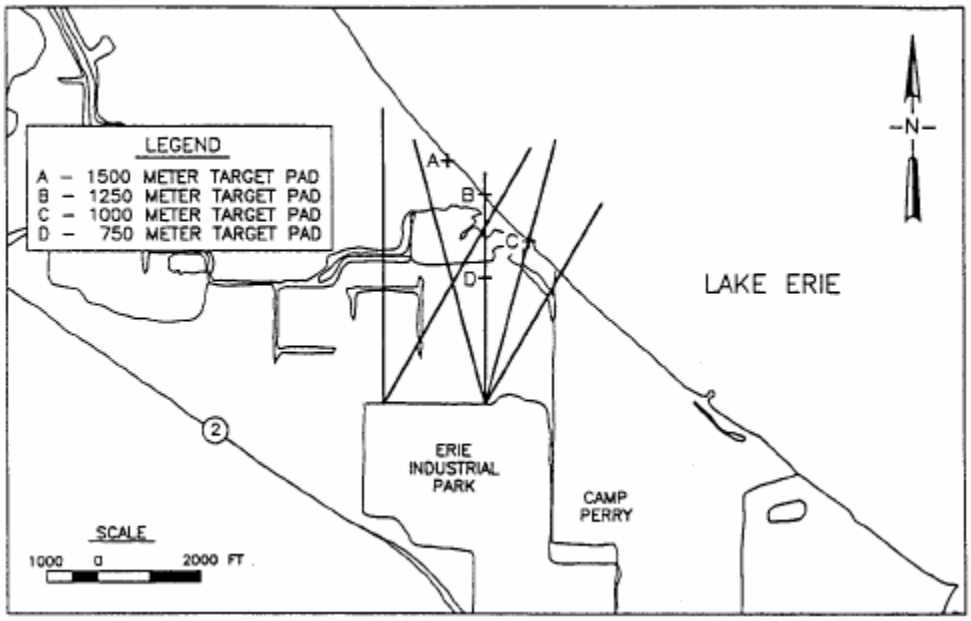

Figure 1. Firing fans and target locations for Erie Army Depot in 1965

Several impact areas in Lake Erie were established by the Erie Army Depot in order to test artillery by proof firing. The boundaries of these areas are generally known for the World War II era and well known from the 1960's to present. Figure 2 shows an edited version of a range map from an earlier document.[2] The lake impact areas, which are currently used by Camp Perry, are significantly smaller in size than those documented as being active by Erie Army Depot in the earlier years (Figure 2). Approximately 388 km^2 (96,000 acres) of Lake Erie and 5.78 km^2 (1,428

acres) of land are classified as formerly used target areas. The currently maintained impact/safety zone used by Camp Perry includes 145.8 km^2 (36,033 acres) of the FUDS Lake impact zone (USACE District, Rock Island 1993a, 1993b). In addition to the test firing conducted by the Erie Army Depot, these impact areas were extensively used in training missions by the Navy, Air Force, National Guard, and Army Reserves. This multi-use facility and its 75-year history of ordnance firings is reflected by the wide range of types and calibers of ordnance recovered on or near the former impact areas. OEW recovered or identified on the FUDS site beaches include a broad variety of direct fire and indirect fire munitions currently or formerly maintained in the arsenals of U.S. military forces. Shells range in size from the largest World War I 240-mm and more recent 155-mm artillery rounds to smaller World War II 45-mm armor-piercing and 1960's 60-mm mortar projectiles and modern small-caliber rifle cartridges associated with present Camp Perry activities.

The ordnance pattern impact areas included surfaces classified as lake (388 km^2 (96,000 acres)) of Lake Erie) (Figure 2), wet lands (1.3 km^2 (329.5 acres) including the beach), and dry land. OEW and UXO have been found on the study area beach and during the 1991 dredging operations for the Federal navigation channel at the Toussaint River, which were conducted by the USACE District, Buffalo.[3]

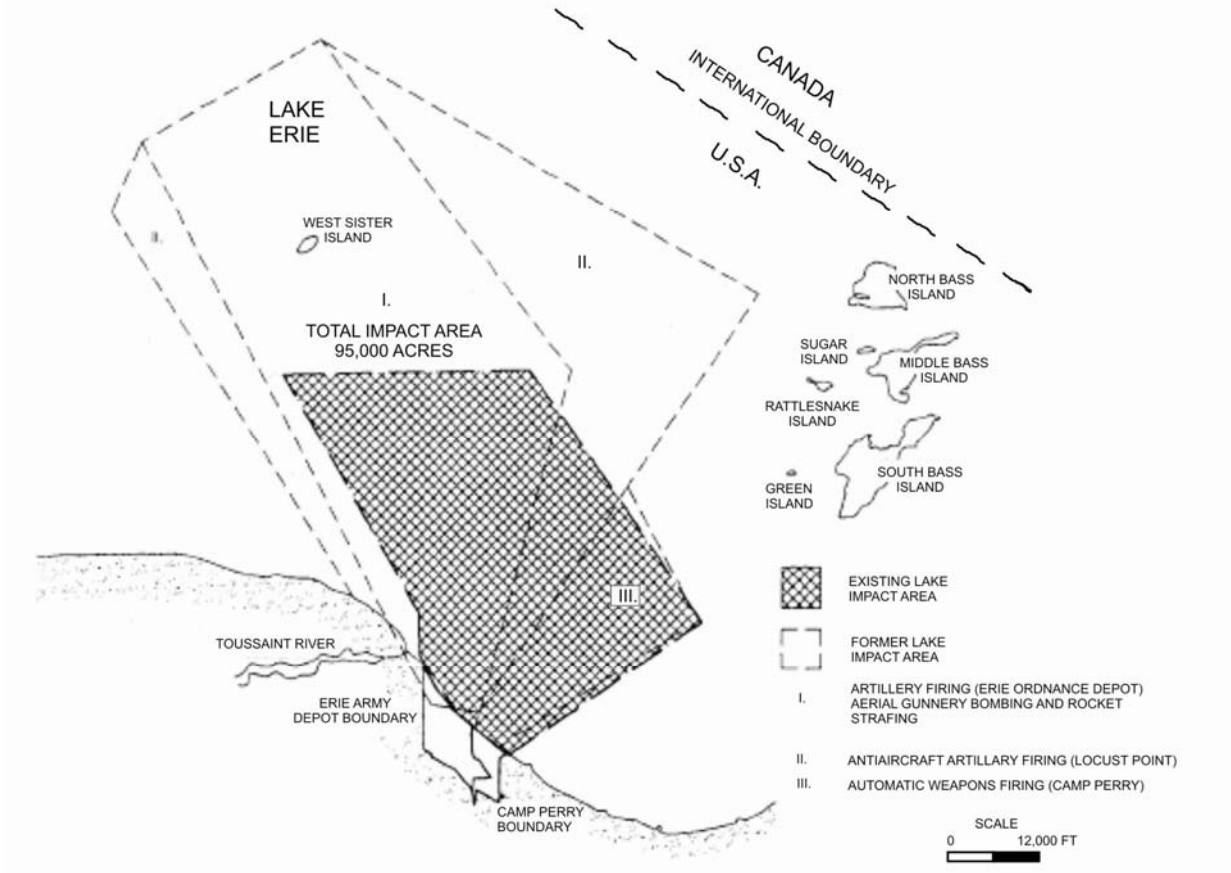

Figure 2. Estimate of the historical impact areas in Lake Erie. Figure adapted from REF 2, Appendix L.

1.2.2 Ordnance Recoveries and Cleanups

In 1992 the Huntsville Division was assigned responsibility for conducting the immediate removal of OEW along the 4.8-km (3-mile) (an approximately 150-m-wide (500-ft wide zone) beach frontage as part of their OEW site remediation mission. From 1 September through 9 December 1992, EOD Technology (EODT) conducted beach OEW cleanup operations under contract to the Huntsville Division. Post-cleanup site inspections have revealed the presence of additional occurrences of ordnance on the beach, raising concerns that the near shore ordnance field may be mobile and transportable to the beach by natural coastal processes.

Several previous activities have uncovered a variety of munitions types. These activities have included dredging, a TCRA and a beach removal action. The recovered munitions types are listed in Table 1**.** In addition to those known to have been fired over the life of the range, it has been anecdotally reported that munitions were dumped from barges in the vicinity of the impact area during the 1960s. The types of munitions and quantities were not documented.

In FY06, ESTCP was directed by Congress to conduct work to characterize UXO contamination impacting the Toussaint River area The purpose of the pilot program was to use technologies suitable for wide area assessment (WAA) of suspected munitions contaminated sites to address the issues enumerated below.[7]

Table 1. List of ordnance recovered in earlier actions

MUNITION	COMMENT
M52 Fuze	Found during dredging
3.5 in rocket	Found during dredging
M15 Smoke Grenade	Found during dredging
60 mm Mortar	Found during dredging and beach removal action and TCRA
81mm Mortar	Found during TCRA
20 mm Projectile	Found during Beach Removal Action
40mm Projectile	Found during TCRA
75mm Projectile	Found during TCRA
90 mm Projectile	Found during dredging and TCRA
105 mm Projectile	Found during dredging and beach removal action and TCRA
106 mm Projectile	Found during dredging and beach removal action and TCRA
155 mm Projectile	Found during TCRA
165 mm Projectile	Pieces found during Beach Removal Action

- Characterize the areas in and around the mouth of the Toussaint River that are contaminated with munitions from historical activities at the Erie Army Depot and Camp Perry.

- Identify areas of Lake Erie and the shoreline that have concentrations of munitions.

- Characterize the site conditions in a way that will support future investigations, a prioritization of required activities, remediation approaches, and cost estimation tasks. The activities in this project will:

  - Bound the munitions-contaminated areas in Lake Erie and on the adjacent beaches,

  - Estimate the density and distribution of munitions types and sizes,

- Locate areas where munitions are likely to migrate to the river channel, and
- Determine the extent to which munitions have been transported into the river.

The ESTCP Program Office established the boundaries of the MTA proposed survey area. The primary area is shown bounded in red. The extended area bounded in yellow was proposed to be surveyed following completion of the primary area.

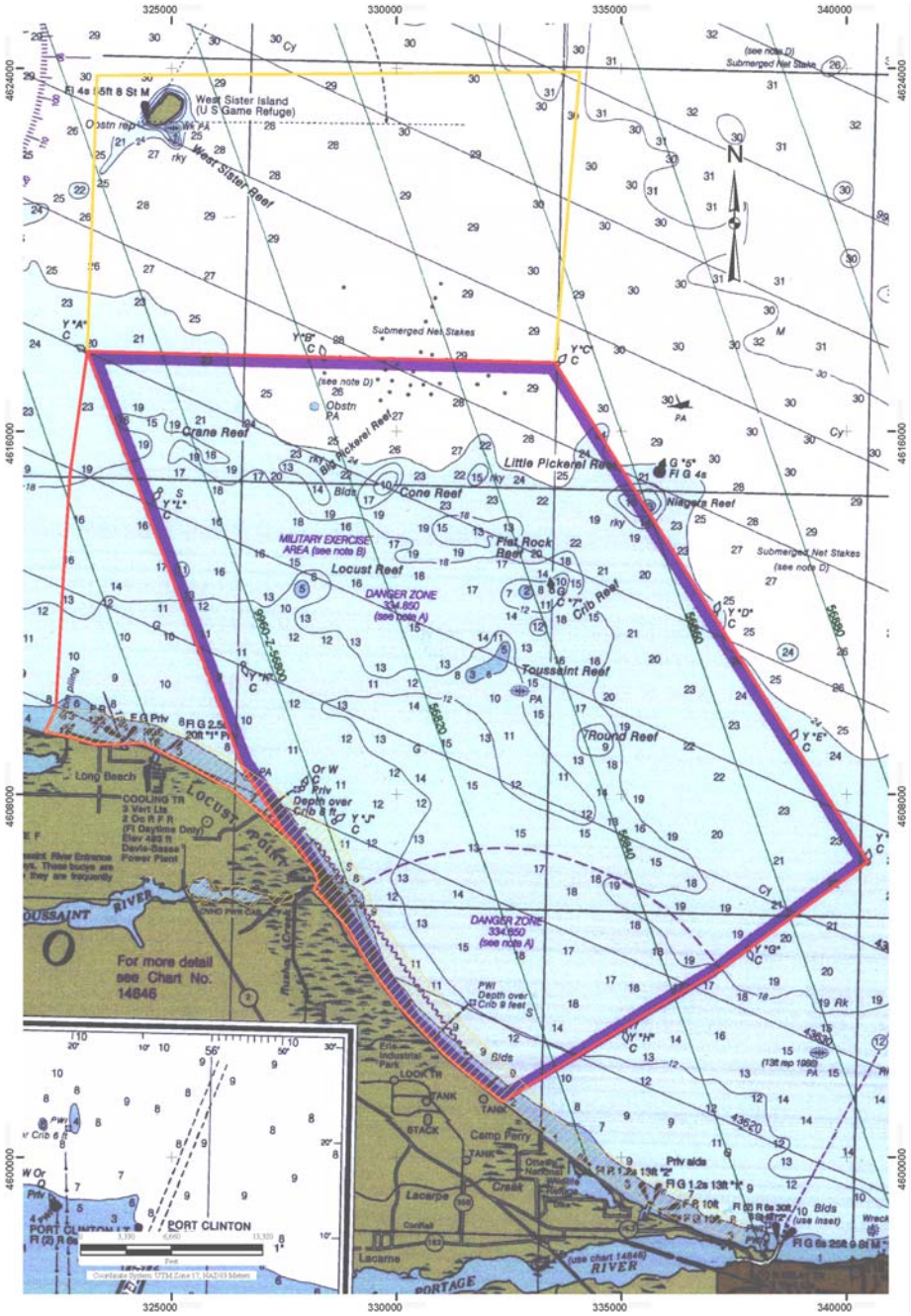

Figure 3. Adaptation of a NOAA chart to show the boundaries of the survey area.

1.3 Technology Description

This demonstration employed several technologies; each was chosen to contribute to the overall goals of the demonstration. These technologies included

- the **Marine Towed Array** (MTA) to survey the impact area in Lake Erie and the deeper parts of the river,
- the **helicopter-mounted magnetometer array** to survey the beach, shallow water, and marshy areas, and
- a **statistical tool** to aid in planning transects for the marine array in interpreting the data gathered.

The primary detection sensor used by both the MTA and the Airborne platform were arrays of full-field Cs vapor magnetometers. These sensors detect only ferrous metals. The airborne magnetometer array, originally developed by NRL as the Airborne MTADS was chosen to explore the beach, very shallow water areas of the Lake, and marshy areas adjacent to the beach. This technology was not a direct part of the MTA Project. The activities of the airborne magnetometer array are described in a separate report. Some areas of the Lake were specifically surveyed so that the MTA and airborne surveys would overlap to provide a comparison of the two survey products.

Visual Sample Plan (**VSP**) is a statistical sampling software utility designed by Pacific Northwest National Lab (PNNL) through funding from multiple government agencies to provide the site investigators a simple to use defensible method of gathering and analyzing their respective data. Through funding from SERDP and ESTCP, VSP has been developed to aid in transect sampling to identify areas where the likelihood of UXO presence is elevated. PNNL, using VSP, designed the survey approach and transect sampling plan for the Lake Erie project. The survey transect plan designed for use in this project by PNNL and approved by the Program Office, is shown in **Figure 4**. The east/west transects are spaced 165 meters apart in the main survey area; in the extended area, the spacing is increased to 330 meters. Also shown in Figure 4 are the two GPS base station positions that were used by the MTA. All activities in this project were carried out in accordance with the ESTCP Toussaint River Demonstration Plan, which was issued in draft form to AETC on July 18 and in final form on August 9.

AETC's Marine Towed Array (MTA) was chosen to conduct the transect survey of the areas of the Lake that were of concern to this project. The MTA was developed under sponsorship of ESTCP in Project MM2003-24. Prior to being deployed to Lake Erie, it had been used to complete two extended demonstration surveys on the Currituck Sound (adjacent to the Former Duck Naval Bombing Range in North Carolina) and on Ostrich Bay (adjacent to the Former Naval Ammunition Depot-Puget Sound in Washington State). The operating characteristics, capabilities, and limitations of the system are extensively described in the reports of these demonstrations.

Briefly, the MTA deploys an array of 8 Cs vapor magnetometers with a horizontal spacing of 0.6 m on a sensor platform that is designed to operate at and maintain the platform at a fixed altitude

(nominally ~1 m) above the bottom surface. The system was designed to operate in Sea State 1 conditions in water depths between 1.25 and 5 m. In the Currituck Sound demonstration, it was shown that the system could successfully operate in wave conditions that mildly exceeded Sea State 1. In preparation for the demonstration on Puget Sound, the MTA was adapted to successfully survey in water depths of 7.5 m. This was accomplished by lengthening the tow cable by 6 m and reducing the operating speed by about a factor of two. The increased survey depth capability required a production rate decrease of ~50%. Additionally, the lengthened tow cable decreased the positional accuracy of the sensor readings by ~50% in the horizontal plane.

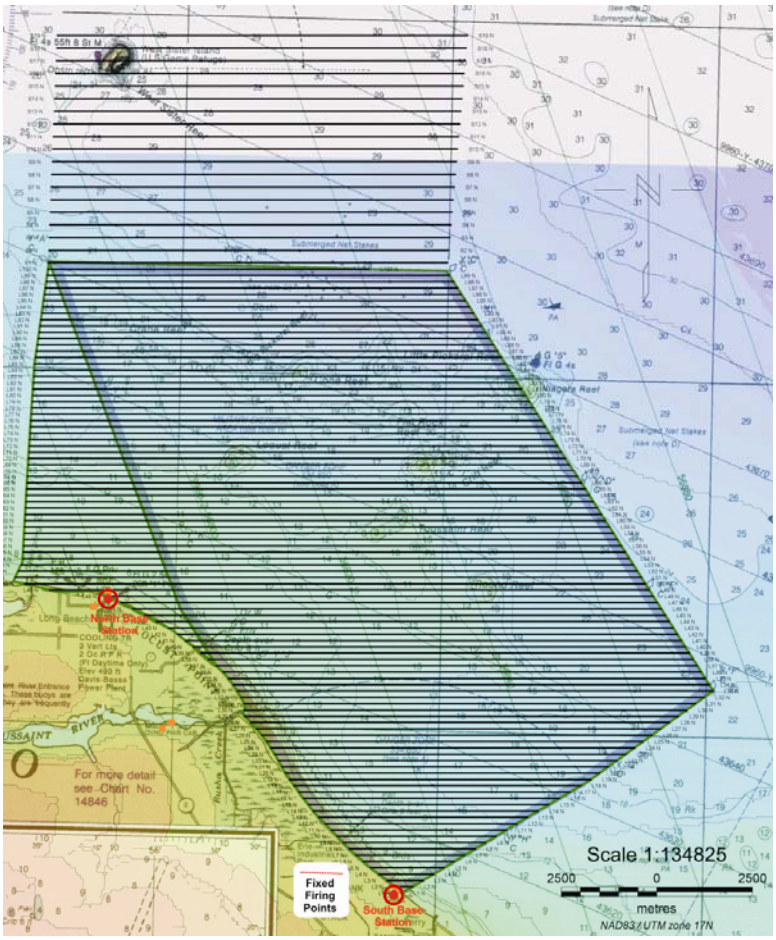

Figure 4. NOAA map with the proposed survey transects superimposed.

1.4 MTA Survey Plan

The AETC proposed Lake Erie Demonstration Plan was submitted to the Program Office on June 29 in Draft form and on 20 July in revised form.[8] AETC proposed to conduct a 5-week geophysical survey of the specified areas using the MTA. The initial plan called for surveying alternate transects as specified by PNNL in the VSP developed specifically for the MTA. This was subject to change, based upon the results during the progress of the survey. An interruption of MTA activities was proposed following week 3 of the survey to allow for repair of the equipment, a respite for the AETC employees, and to allow the Program Office to examine the results of the first three weeks of operations and to project the preferred survey operations for the remaining period.

We proposed to conduct the survey operations in a concentrated study involving 10-12 hour daily operations and some weekend operations. The extended hours of survey operations were designed to enhance productivity because of the time required for setup and breakdown of the equipment and because of the extended ferry times from the dock to the survey transects (particularly as the survey progressed to several miles north of the marina).

Following completion of the survey operations, AETC proposed to analyze the datasets using the MTADS DAS as directed by the Program Office. The results were to be organized to support a diver recovery operation of 200 targets. Targets in the dig list were to be prioritized per direction of the Program Office.

AETC agreed to manage and oversee the target recovery process by means of a subcontract placed with EOTI of Redbank, NJ. EOTI responded to a Statement of Work prepared by AETC and a subcontract was negotiated with EOTI to support all operations involved in the recovery of 200 anomalies from the Lake sediments. EOTI prepared a general Work Plan for Target Retrieval on Lake Erie.[9] This was supported by a Site Specific Work Plan in Support of Validation of the Marine Towed Array Demonstration at the Former Erie Army Depot and the Toussaint River.[10] All operations were carried out under guidance of a Site Specific Safety and Health Plan[11] and a Dive Management Plan,[12] which was a document specifying safety procedures specifically associated with diving operations.

2.0 The MTA Survey

2.1 MTA Deployment

During the week of 7 August all electronic and mechanical components of the MTA were exercised and secured for shipment to Port Clinton. System spare components were checked against inventory and secured for transport. Tool boxes, system spares, and repair hardware were sorted and packed for shipment to support the field operation. All packing containers were inspected and compared to the equipment inventories that are pasted on the sides of the boxes.

A pickup truck and a 14-foot box truck were rented from agencies in North Carolina to support the field operation. All pack out operations were completed on 11 August; the support equipment was packed and stored in the box truck. The two vehicles were used to tow the pontoon boat and the sensor platform from Cary to Port Clinton on 14 August.

Chet Bassani and Chris Gibson (AETC) were joined by Wayne Lewallen and Kevin Osborne (EOTI) in Port Clinton on the evening of 14 August. Mr. Osborne transported the chase boat to the site, which supported and tended the survey vessel. Jim McDonald and Nagi Khadr joined the other crew in Port Clinton on 15 August.

2.2 Survey Logs and Data Files

The Operations Log presented in Table 2 details the daily operations during the survey period. Main site survey operations began with Transect 29, which intersects the mouth of the Toussaint River at the west end of the transect. All survey operations on 17 August inadvertently took place within Range 1 during live fire operations on the range. Beginning on 18 August, transects north of Range 1 were surveyed until arrangements were completed for access to the Range 1 area when live fire operations were not underway. The Operations Log presents details of the survey progress.

Table 3 presents the daily data log. This table lists the file names for the individual surveys and notes details that are relevant to the editing and processing of the data. The times listed are the actual times during which the files were being created. Ferry time to and from the site and travel time between transects and in turns are not part of these files. The transect distances are derived from the GPS information recorded in the survey files.

2.3 The Toussaint River Survey

Even though there are no significant tides on Lake Erie, the level of the water in the lake is strongly dependent upon the direction and strength of the wind. During the period of the survey operations we observed that the water level rose and fell by more than a meter. After several days of strong west winds, the water level was reduced so much that access or egress through the Toussaint River to or from the Beef Creek Marina was not possible. During these periods, the survey vessel and the sensor platform were moved several miles to the west to the Wild Wings Marina where the Lake access channel is deeper. During the periods of lowest water, our equipment was also stranded in the Wild Wings Marina. Following periods of very low water,

Table 2. Survey Operations Log

Day	Operations
Monday, August 14	Bassani, Gibson, Lewallen, Osborne arrive with equipment and boats
Tuesday, August 15	McDonald and Khadr arrive. Support hotel changed to Fairfield Inn. Boats launched from Beef Creek Marina. Third (adjacent) slip rented to accommodate sensor platform. Channel depth observed to be marginal at lake entrance. Potential areas explored for installation of calibration lanes
Wednesday, August 16	Base station set at south site. Platform assembled and tested (dead mag and actuator cable - replaced from spares). Established line for Cal target installation. Explored Toussaint River channel. Depth 1.3-2.0 m, except at mouth of river. EOTI rented equipment to support dive operations.
Thursday, August 17	Launched sensor platform. Surveyed lines 29, 31, 33, & 35. Survey began at 0810, finished line 35 at 1620. EOTI installed cal pipes. During pipe survey hung buoy line and lost platform cover. Could not find. Arranged for Fedex shipment of spare covers.
Friday, August 18	Pulled survey boat and platform. Repaired snout (interface bottle mount) and stripped bolt damage. New covers shipped from Cary. Finished installation of the Cal Line, removed end buoys. Lewallen departed.
Saturday, August 19	Covers arrived at 1430. Assembled platform and launched system and parked in slip for AM survey.
Sunday, August 20	System on Lake by 700. 2+ ft waves. Engine failed (no gas from fuel pump). Limped back to marina. No Johnson engine mechanics available on Sunday. Departed marina at 1530
Monday, August 21	Pulled boat and platform. Boat/engine to Dubert's Marine. Picked up boat after repair, reassembled and launched at 1600. Drove for 1 hr with no problem. Pulled boat, remated with platform, and launched and parked at dock. Visit to Camp Perry Range Control officer. Range control was unaware of our operations. Range 1 scheduled asbusy 7 day weeks until October.
Tuesday, August 22	Ran several passes on Cal lines. Started Tr37 at 845. Surveyed 37, 39, 41, & 43. Moved MTA to Wild Wings Marina. Visited Range Control to work out a schedule for surveying within Range 1.
Wednesday, August 23	Started TR 45 at 0800. Completed lines 45, 47, 49, & 51. Met with Col. Clemens at Range Control. She offered 8/28, 29 access to Range 1, a half day on 8/27 and 9/11-15 (100%).
Thursday, August 24	Started Tr53 at 0805. Rain in AM with high waves (Tr 53 & 55). Front passed, wind switched to south, waves died. Completed Tr57 & 59 and 20 min of west end of Tr61
Friday, August 25	Completed (short) Tr61, 63, 65, & 67. McDonald fell into the Lake
Saturday, August 26	Lake rough in AM. Began survey at noon. Completed Tr73 & 77. West end of 73 & 71 also completed.
Sunday, August 27	Surveyed East ends of Tr77, 81, 85, & 89 and then completed west components of 85 & 89. Moved system back to Beef Creek Marina to start on Range 1 area. McDonald did target analysis and wrote a progress report for the Program Office.
Monday, August 28	Problems with water in Trimble Base Station Controller. Required computer to reprogram. Started surveying at 0830. Rained all day. Rough seas became very rough by end of day. Tr27, 25, 23, 21, 19, and 17 completed. Hard drive crash at end of day. System was unrecoverable; data from 6 transects lost.
Tuesday, August 29	Repaired equipment with spares and ordered two new hard drives. Weather/waves too bad to survey.
Wednesday, August 30	Predicted bad weather/waves for remainder of week. Packed and shipped broken equipment to Cary. Returned to Cary two days before planned break.
Sunday, September 10	All returned to Port Clinton (2130).
Monday, September 11	All equipment assembled and tested (OK). Small craft warnings, 3-5 ft waves. Worked on target picking and target reports all day.
Tuesday, September 12	Base Station set up UNDER Sky station. Started survey at 0800 in relative calm. Swells began building at end of Tr27. Completed Tr27, 25, 23, & 21. Rain began at Tr 25. Completed two north/south transits along the shore in helo area.
Wednesday, September13	Surveying by 0810. First two lines rock and roll in waves. Wind died at 1100, became glassy calm. Completed Tr19, 17, 15, 13, 11, 9, 7, 5, & 3. Finished Range 1 area. Few RTK dropouts-none bad. Equipment moved to Wild Wings marina. Base station set up on North control point.
Thursday, September 14	Rough water, no survey
Friday, September 15	Lines Tr93, Tr97, and WS 1 completed. MTA ferried back to Wild Wings from east end of site.

Table 2. Continued.

Day	Operations
Saturday, September 16	Super calm all night. MTA on Lake at daylight. Lost port platform cover half way to West Sister Is. Two hour ferry back to East End Marina. Manufactured port cover from starboard spare, silicone, new holes, & Gorilla tape. Moved back to Wild Wings marina. Helo crashed into Lake.
Sunday, September 17	Left dock at 0700. Winds south, water smooth for 1 mile. Waves built to 2 ft with following sea. Arrived at transect WS5 and started survey at 0830 with 3 ft waves from 150 deg. Broke weak link early in WS5, lost data could not recover position, took 3 hr to complete line. Broke 2 weak links early in WS9; lost ~ 1km of data - could not recover position because of seas. Wind improved and took good data on western half of WS9.
Monday, September 18	Rough water, no survey. Move boat to East End Marina. Pulled boat, left platform connected. Completed River target analysis - sent Spreadsheet to Herb. Completed analysis of common Airborne area - spreadsheet to Herb. Prepared 10 spreadsheets with 168 targets specified for dig list. Additional targets will come from northern transects.
Tuesday, September 19	Rough seas. Platform pulled (boat remains in water). Opened platform, patches worked pretty well. EM partially installed (cables missing). Checked EM noise levels (2 receivers at a time). Sent Geonics home.
Wednesday, September 20	2-4 ft waves. Survey not possible. Relaunched system.
Thursday, September 21	Depart East End Marina at 0800. Start WS19 at 1000. Start WS15 at 1230. Return to Beef Creek with great difficulty. Talked with Program Office and H. Nelson re finishing options. Chris departed to Cleveland at 1900.
Friday, September 22	Beef Creek at 0700. Lake to rough to survey. Pulled platform onto trailer. Pressure washed platform, coiled cable on top. Secured platform, boat, and box truck. Left Beef Creek for CLE at 1300. CLE-RDU at 1630.
Monday, October 9	Chet, Chris, Kevin return to Port Clinton
Tuesday, October 10	Seas too rough to survey
Wednesday, October 11	Seas too rough to survey
Thursday, October 12	Seas too rough to survey
Friday, October 13	DAQ Computer motherboard self destructed. Not possible to diagnose or repair in the field. Spare does not exist and no work-around is possible. All equipment packed for return to Cary.
Saturday, October 14	Chet & Chris return to Cary with vehichles, boat, platform, and equipment.
Monday, October 16	Vehicles returned to rental agencies. Demobilize equipment

when the wind lays, the lake level takes about 1 day to return to its average height. During periods of rising or falling water levels, the water flow in the Toussaint River is quite strong, with currents perhaps in excess of 3 knots in narrower parts of the river. During periods of average lake height we measured water depths in the dredged channel of the river. They range from ~1.2 meters near the mouth of the River to 2.5 meters in wider areas of the river where the shoreline is reinforced with rip rap. The channel is marked with red and white buoys, see Figure 5. The dredged channel width varies widely from as little as 2 meters (on occasion) at the mouth of the river up to perhaps 30 meters wide where Beef Creek and the Toussaint River merge. The depth of the channel becomes so shallow about 250 meters south of the Highway 2 Bridge that the boat and the sensor platform cannot proceed farther. Because the entire channel is relatively shallow and very tight, the tow cable length was reduced to 8 meters to survey the channel. Six passes were made to provide coverage of most of the dredged channel area. Figure 6 shows the tow vessel underway on August 30 during the river survey. It is apparent that the survey is taking place during a period when the river current was fairly strong, flowing from the Lake into the river.

Figure 7 shows the magnetic anomaly mapped data file superimposed upon a 1996 aerial photograph. The Davis-Besse nuclear power plant is located immediately north of the Toussaint River. The water intake (and exhaust) to the cooling tower stretches from the water channel below the beach well out into the Lake. The intake pipeline lies proud of the Lake bottom. Its location is shown on nautical maps and hand-held marine GPS displays.

Table 3. Lake Erie Daily Data Log

Date	File Name	16m Cable	22m Cable	Transect No.	Time (hr)	Distance (km)	Comments
17-Aug	Erie.1	√		Tr-29	2.83	13.90	Mag 8 noisy/loose actuator cable; Broke weak link
	Erie.2	√		Tr-31	1.75	11.72	
	Erie.3	√		Tr-33	2.03	12.86	
	Erie.4	√		Tr-35	1.93	12.90	
22-Aug	Erie.cal Aug22-1	√		N/A			Cal line (pipes and Rebar) Mag 8 noise back to normal
	Erie.5		√	Tr-37	1.63	12.83	
	Erie.6		√	Tr-39	1.90	13.40	Broke Weak Link
	Erie.7		√	Tr-41	1.79	13.38	
	Erie.8		√	Tr-43	2.05	13.76	Broke Weak Link
	Erie.9		√	Tr-45	0.50	3.69	
	Erie.cal Aug22-2a 22m		√	N/A			
23-Aug	Erie.cal Aug23		√	N/A			Cal Line (Pipes & Rebar)
	Erie.10		√	Tr-45b	1.52	11.09	
	Erie.11		√	Tr-47	0.54	3.24	Broke Weak Link
	Erie.12		√	Tr-47b	1.85	11.26	
	Erie.13		√	Tr-49	2.40	15.57	
	Erie.14		√	Tr-51	2.55	16.20	
24-Aug	Erie.15		√	Tr-53	2.17	16.08	
	Erie.16		√	Tr-55	2.80	16.12	
	Erie.17		√	Tr-57	2.01	15.14	Re-powered mags
	Erie.18		√	Tr-59	1.95	15.19	Re-powered mags
	Erie.19		√	Tr-61b	0.29	2.42	
25-Aug	Erie.20		√	Tr-61b	1.70	13.84	
	Erie.21		√	Tr-63	1.79	15.02	
	Erie.22		√	Tr-65	2.18	15.08	Broke Weak Link
	Erie.23		√	Tr-67	1.74	14.60	Re-powered mags
	Erie.24		√	Tr-69 & Tr-71	1.21	9.63	
	Erie.25		√	Tr-73b	0.61	4.96	
27-Aug	Erie.26		√	Tr-69b	1.74	10.07	
	Erie.27		√	Tr-73b	1.33	9.46	
	Erie.28		√	Tr-77	1.47	9.45	
	Erie.29		√	Tr-81	1.46	8.82	
	Erie.30		√	Tr-85b	1.39	8.40	
	Erie.31		√	Tr-89	2.35	12.11	
	Erie.32		√	Tr-85b	0.78	4.58	
30-Aug	Erie.39	N/A	N/A	N/A			Toussaint River Survey with 8m TC
12-Sep	Erie.40		√	Tr-27	1.90	10.88	
	Erie.41		√	Tr-25	1.73	9.83	
	Erie.42		√	Tr-23	1.55	9.18	
	Erie.43		√	Tr-21	1.77	10.66	Includes data from end of transect towards mouth of river
13-Sep	Erie.44		√	Tr-19	1.44	9.91	Includes data towards start of transect
	Erie.45		√	Tr-17	1.11	7.63	
	Erie.46		√	Tr-15	0.90	6.41	
	Erie.47		√	Tr-13	0.82	6.02	
	Erie.48		√	Tr-11	0.67	4.84	
	Erie.49		√	Tr-9	0.53	4.17	
	Erie.50		√	Tr-7 & Tr-5	0.74	5.50	
	Erie.51		√	Tr-3	0.22	1.26	Includes datafrom end of transect towards mouth of river
	Erie.52		√	N/A			Cal Line (Pipes & Rebar) Poor coverage of Rebar
15-Sep	Erie.54		√	Tr-93	2.11	8.07	
	Erie.55		√	Tr-97	3.05	11.95	
	Erie.56		√	WS-1	2.79	11.12	
17-Sep	Erie.58		√	WS-5	2.67	11.17	Broke Weak Link
	Erie.59		√	WS-9	3.01	11.65	Broke Weak Link Twice
21-Sep	Erie.63		√	WS-19	2.29	10.89	
	Erie.64		√	WS-15	2.19	11.81	
Total Survey of Transects (hr)					**85.70**		
Total Transect Distance (km)						**529.70**	

Figure 5. The MTA survey boat is shown approaching the mouth of the Toussaint River. Note the red and white channel marking buoys.

Figure 6. The MTA boat is shown underway surveying on the Toussaint River. The survey direction is toward the mouth of the River.

Figure 7. The Toussaint River survey magnetic anomaly map is shown overlaid on a 1996 aerial photograph.

Figure 8 shows the eastern most 250 meters of the River survey as a magnetic anomaly image. Twenty-six targets that were chosen for analysis are shown in the image. These results of the analysis and the targets that were chosen for intrusive investigation are discussed in a later Section of this document. Data clips, at this same resolution of the remainder of the River survey are shown in **Appendix A** of this document.

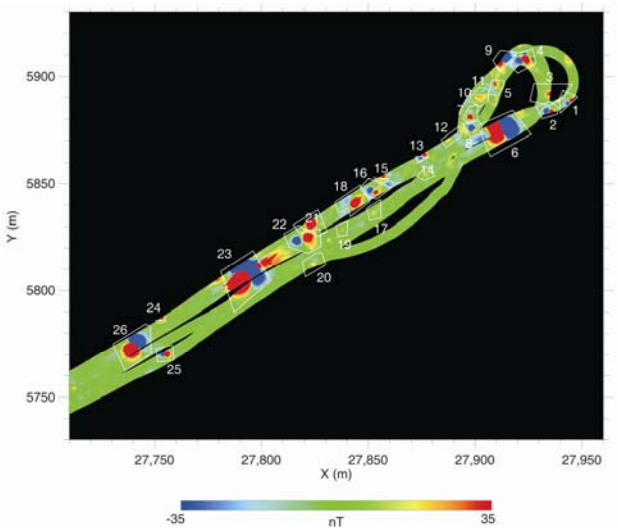

Figure 8. Magnetic anomaly image of the eastern most 250 meters of the Toussaint River survey. The white polygons show the areas of the data chosen for analysis of the individual targets.

2.4 Calibration Targets

On 16 August, areas north of the mouth of the Toussaint River were investigated to determine a suitable location for installation of the pipe and rebar calibration targets. A site was chosen about 300 meters north of the mouth of the river just to the west of the buoy line marking the channel. Water depths along this north/south line varied from 9 to about 13 feet. On 17 and 18 August the pipe targets and the rebar sections were installed. This was accomplished by stretching a rope (with knots at fixed intervals) between two weights. The pipes or rebar targets were installed at the knots and small drop weights with buoys were placed at each of the installed targets. The target locations were determined using GPS from the chase boat. The lines from each of the targets were pulled taught vertically and the GPS was used to acquire the float position. Unfortunately, sea state conditions were not ideal during either the installation or reacquisition of the calibration targets. Wave heights exceeded 2 feet on both days.

Figures 9 and 10 show magnetic anomaly images from surveys over the calibration targets taken on August 22. Both 16 meter and 22 meter cable lengths were used during this survey. There are about 8 passes back and forth over the targets. Both the pipe and rebar images are shown at two different sensitivity scales. The pipe sections are of four different sizes approximating 60 mm and 81 mm mortars, 2.75 in warheads, and 105 mm projectiles. The smallest pipe sections (Numbers 3 and 10) are not detectable at these scales. The 81 mm surrogate (Numbers 2 and 6) are just detectable. These images appear noisy because there are many sensor passes over the targets that have been superimposed and because there is a fair amount of small background clutter in the area. Images such as these are used to calibrate (at a fine scale) the layback distance corrections and the tow point angle corrections for the two different length cables. The registration of the targets is excellent (except for Rebar Number 8). The misregistration of this target was likely the result of the tow vessel and the sensor platform being in a turn during one of the passes.

The white crosses shown in Figures 9 and 10 are the locations of the targets as determined by the GPS reacquisition the day following their placement. It is apparent that neither the placement of the targets nor their GPS reacquisition was carried out with precision. The techniques that we

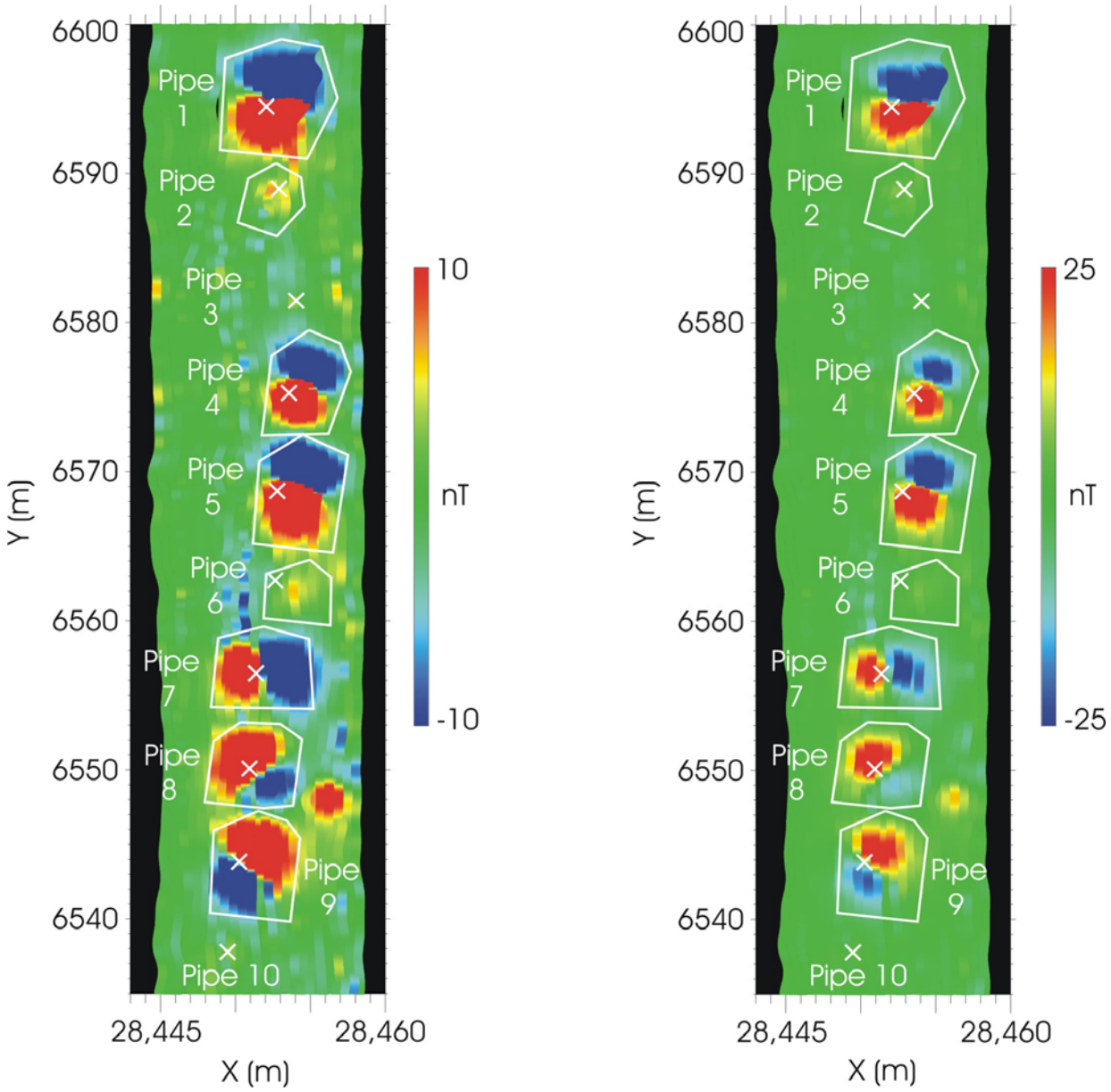

Figure 9. Magnetic anomaly images are shown for the pipe surrogate targets at two presentation scales. The white crosses are the target positions reacquired using GPS from the chase boat.

used for the target placement and position reacquisition were the same that we used during the Duck demonstration of the MTA and similar to the approach used by the Navy EOD divers placing calibration and POS targets in Ostrich Bay prior to the MTA demonstration. In both of these prior instances the water (wave) conditions were approximately calm during these operations. In Duck, the water depths were approximately half those in Lake Erie. The water depths in Ostrich Bay were approximately the same as those in Lake Erie. The calibration target location accuracy in Duck was approximately 20 cm. The accuracy in Ostrich Bay was just under 1 meter. However, the entire POS and Calibration sites had to be installed a second time to get the positioning better than 1 meter.

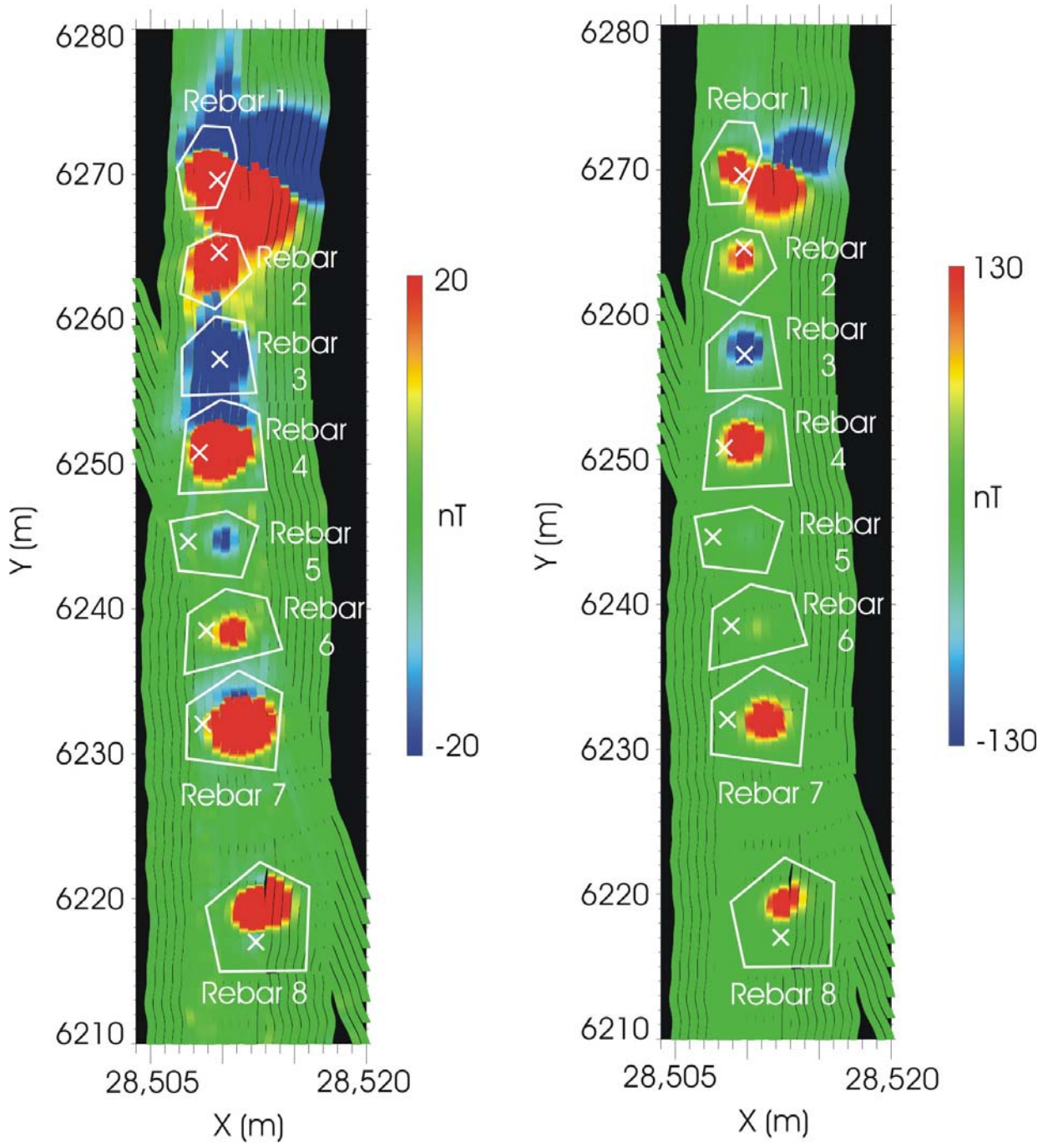

Figure 10. Magnetic anomaly images are shown at two different scales from the survey of the rebar targets. The white crosses mark the target positions reacquired by GPS from the chase boat.

This approach for placement and reacquisition of targets is clearly not accurate enough to use in the sea state conditions and at the water depths encountered on Lake Erie. Table 4 shows a comparison of the GPS-measured positions and the survey target fitting positions for the pipe and rebar targets.

It is apparent from the images in Figures 9 and 10, and from the target fits that some of the pipe sections and the rebar sections have significant remnant moments. It would have been better if these targets were degaussed before they were used. However, their remnant moments do not

Table 4. Comparison of the calibration target positions from GPS measurements and from fitting of survey data.

Calibration Target ID	DAS Analysis Results				GPS Positions		Difference
	Size (m)	Fit Quality	UTM X (m) fit	UTM Y (m) fit	UTM X (m)	UTM Y (m)	GPS-FIT (m)
Rebar No. 1	0.191	0.864	328508.93	4606270.78	328509.65	4606269.61	1.4
Rebar No. 2	0.159	0.835	328509.53	4606263.92	328509.78	4606264.64	0.8
Rebar No. 3	0.204	0.929	328509.99	4606257.90	328509.82	4606257.25	0.7
Rebar No. 4	0.270	0.970	328509.87	4606251.47	328508.41	4606250.81	1.6
Rebar No. 5	0.090	0.886	328510.02	4606244.82	328507.62	4606244.66	2.4
Rebar No. 6	0.103	0.870	328510.72	4606238.24	328508.90	4606238.53	1.8
Rebar No. 7	0.234	0.931	328511.33	4606232.11	328508.63	4606232.06	2.7
Rebar No. 8	0.221	0.918	328512.61	4606219.36	328512.33	4606217.03	2.4
					Average Miss Distance		1.7
Pipe No. 1	0.187	0.706	328453.55	4606595.03	328452.06	4606594.49	1.6
Pipe No. 2	0.062	0.657	328452.41	4606588.30	328452.91	4606588.97	0.8
Pipe No. 3					328454.05	4606581.47	
Pipe No. 4	0.149	0.925	328454.59	4606575.85	328453.57	4606575.28	1.2
Pipe No. 5	0.184	0.927	328454.03	4606569.08	328452.79	4606568.71	1.3
Pipe No. 6	0.085	0.752	328453.22	4606562.51	328452.65	4606562.70	0.6
Pipe No. 7	0.157	0.918	328451.87	4606556.83	328451.37	4606556.47	0.6
Pipe No. 8	0.150	0.914	328451.55	4606550.21	328450.94	4606550.09	0.6
Pipe No. 9	0.169	0.905	328450.91	4606543.93	328450.25	4606543.84	0.7
Pipe No. 10					328449.48	4606537.78	
					Average Miss Distance		0.9

significantly affect the fit target positions. It should also be noted that a large indigenous target (likely a 155 mm projectile) lies very close to rebar target Number 1.

During the course of the survey operations, following storms that generated 6-8 foot waves, we observed that some of the pipe targets had been moved a small distance by the wave action associated with the storms.

It was our intent to survey the calibration targets each day when leaving or returning to the Beef Creek Marina. During the course of operations, the majority of the time the MTA was parked at marinas several miles from the calibration targets. We returned to Beef Creek for two periods during the operations. On each of these occasions the calibration targets were again remeasured. It is our belief based upon the analysis of the individual targets from single passes and from the registration of the targets from overlaying many passes that the measurement error associated with the target positions was likely the ±20 cm typical or earlier deployments. This implies that the majority of the position error in Table 4 resulted from the techniques used for the

emplacement and initial position measurements. We are developing new techniques to improve this process.

2.5 Survey Data

As shown in Table 3, the actual site survey was carried out between 17 August and 21 September. The survey crews were also on site the entire second week of October to conduct additional surveys, but were unable to get onto the Lake because of rough water conditions. Figure 11 shows transects that were actually surveyed. South of Transect 70 (as shown in Figure 4) the odd numbered transects were surveyed. The survey lines are shown in yellow superimposed upon the edited NOAA marine map. North of transect 70 every fourth transect was surveyed. In the extended survey area, five roughly equally spaced transects were surveyed. We returned in October with the intention of finishing the western parts of Transects 77, 81, and 93 and completing additional Transects in the extended survey area. Adverse weather conditions did not allow these surveys to be completed.

There were a few short missed areas on Transects TR57, Tr59, WS5, and WS9 that resulted when the tow cable weak link parted and the wave conditions were so rough that we could not return to the required position to completely fill in the missed area. There were also a few other survey lines where we deviated from the planned transect line (Tr69, WS1, and WS15). This was caused either because the water over the reefs was too shallow to survey, or because fishing boats were anchored on the transect line.

Between TR31 and TR19 we surveyed several lines parallel to the shoreline. These passes were intended to overlap with the Airborne survey to provide some common survey areas and targets for comparison of the MTA and the Airborne systems.

2.5.1 Data Preprocessing – The Automatic Target Picker

As part of the data preprocessing we applied a threshold-based automated target picker to the data to isolate likely targets. The threshold was chosen to exclude very small targets (those likely too small to be projectiles) and the target picker was run to exclude targets that did not have more than half of the target signature included in the survey data. The automatic target picker choices are shown in Figure 11 as red diamonds superimposed on the yellow survey transects. Approximately 5,500 targets were chosen by the automated target picker. Scaling this information, based upon the fraction of the area that was actually surveyed, we estimated that a comprehensive survey of the entire site would yield 400,000-500,000 targets.

2.5.2 Target Analysis – Creation of the Dig List

The MTADS data analysis system, adapted from the airborne MTADS DAS for the Marine Towed Array, was used to analyze individual anomalies. To analyze an individual anomaly an analyst boxes the area of interest in the mapped data file image using the computer mouse. These data are extracted from the dataset and submitted to a dipole fitting routine for analysis. The analysis routine applies a 3-dimensional fit to the 3-dimensional data, conducts an iterative fit of the anomaly to a dipole signature and returns the coordinate position of the target, its

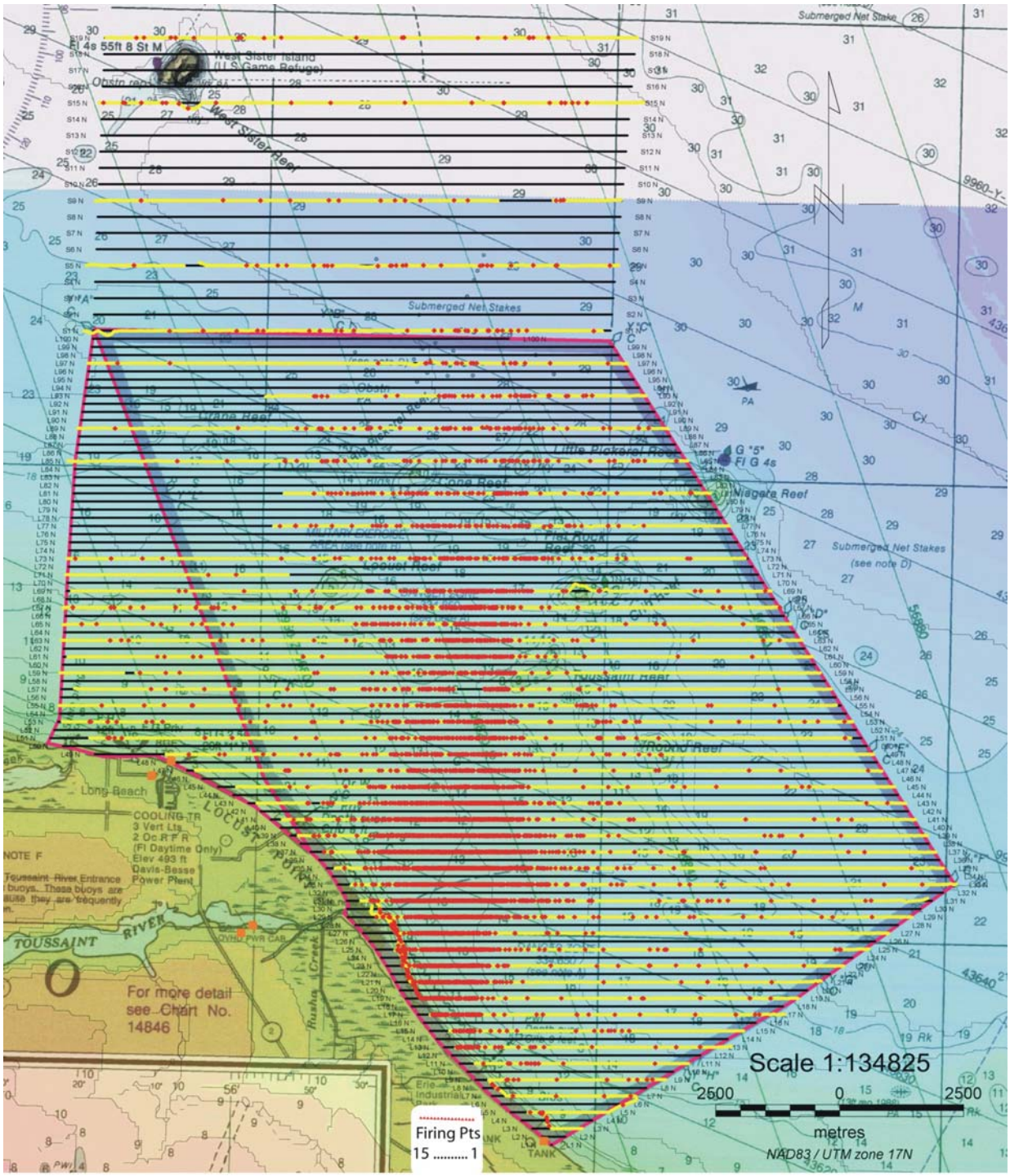

Figure 11. The main site transects that were surveyed are shown in yellow. The red diamonds show the targets chosen by the automated target picker, as explained in the text. The red triangles at the base of the image show the locations of the 15 fixed firing positions that were used for proof firing projectiles.

magnetic moment, the orientation of the induced dipole in 3 dimensions and the depth of the target (derived from its height above the ellipsoid). The magnetic moment and the depth of the target are used to derive an approxi-

mate size of the target, assuming a cylindrical shape with an aspect ratio of 3 or 4 to 1. These parameters are reported for each target in the analyzed target list.

The individual areas of the survey that were chosen for analysis are described in Section 3. In general we chose targets for analysis only if the peak of the anomaly signal was contained within the bounds of the individual transect. Targets lying closer to each other than ~3 meters were excluded from analysis to assure that the targets that the divers recovered corresponded to the analyzed target on the dig list. Individual targets were excluded from analysis if their signatures were visibly very unlike typical ordnance anomaly signatures. Following a trial fit of an anomaly, if the fit parameters were indicative of multiple contributing targets or were too massive to be the result of the largest projectiles known to have been fired on the range, they were excluded from the analysis. Targets with fit depths more than 0.6 m below the sediment surface remained on the target fit list, but were not included in the recommended dig list.

3.0 Survey Results

Magnetic anomalies in the Lake Erie survey data were analyzed using the MTADS DAS as adapted for analyzing MTA survey data. Data were analyzed in five separate groups in accordance with the Program Office direction.

Group 1. All data in transects TR35, TR37, TR89, WS15, and WS19 were analyzed. These data were chosen as indicative of the main site survey. Transects further south were not analyzed because they lie within Range 1, the currently active range fan for Camp Perry. It was assumed that it would be difficult for divers to work within the active range area. The transects named above sample the southern, midrange, and northern limits of the former Range 2 fans.

Group 2. All magnetic anomalies in the survey of the Toussaint River were analyzed.

Group 3. Selected magnetic anomalies offshore from the Davis-Besse nuclear power plant were analyzed. This area lies west of the range fans described in Chapter 1 of this report and would presumably represent background clutter from indigenous metallic objects not associated with the Erie Army Depot or Camp Perry.

Group 4. The Program Office requested that we identify magnetic anomalies associated with the relatively shallow water areas described as reefs in the NOAA nautical charts. These areas are primarily used by sport fishermen (and are often crowded with boats). Targets were chosen for investigation that are associated with six of the named reefs in the Range 2 area.

Group 5. Several survey passes were made parallel to the shoreline between transects TR19 and TR31. We analyzed targets in these shallow water areas for comparison with the airborne survey.

3.1 The Toussaint River Survey

Figure 7 shows the Toussaint River survey magnetic anomaly image superimposed upon an aerial photograph of the area. Figure 8 shows a more detailed image of about 250 meters of the survey nearest the mouth of the River. Figure 8 shows 26 magnetic anomalies in this area that were boxed for analysis using the MTADS Data Analysis System (DAS). Appendix A shows this image and the other six images at the same resolution, which comprise the entire river survey. The target analyst chose 128 anomalies from the River Survey for analysis. Twelve of these anomalies (or partial anomalies) were categorized as likely buoys. These were marked so that their positions could be checked when targets were being reacquired. The majority of the anomalies in the river were either too large or their signatures were too complex for them to be ordnance. For 16 of the anomalies, the DAS failed to converge on a fit; in another 19 cases the fit quality was <0.85 (indicative of a target that could not be fit to a single dipole image. In an additional 13 cases that resulted in a satisfactory fit, the predicted target size diameter was >300 mm. Two pipelines were visibly identified that crossed the River in the survey area. It is likely that several of the large and complex targets were moorings that had been lost from previous buoys that marked the channel. The analyst chose 28 anomalies as potential ordnance and as suitable for recovery. This Dig List and the Target Report as submitted to the Program Office is

Table 5. Target dig list and dig results from the survey of the Toussaint River

AETC TARGET ANALYSIS											Diver Comments and Information						P.I. Comment
AETC Target ID	Nelson List Targ. ID	UTM X (m)	UTM Y (m)	Water Depth (m)	Max. Signal (nT)	Min. Signal (nT)	Size (m)	Burial Depth (m)	Fit Quality	Analyst Comments	Targ. Burial Depth (ft)	Targ. Size (in)	OE ID	Targ. Wt. (lb)	Attitude	Diver Comment	
Riv-21	TRU-1	327823.81	4605831.96	1.9	247.8	-8.9	0.278	0.5	0.792	very large target	-	-	-	-	-	Silt & Mud Bottom, Target deeper than 2 ft	
Riv-25	TRU-2	327754.84	4605770.89	1.9	118	-129.5	0.179	0.0	0.966	good target	-	-	-	-	-	Silt & Mud Bottom, Target deeper than 2 ft	
Riv-30	TRU-3	327687.06	4605743.41	1.9	107.3	-105.7	0.217	0.1	0.990	good target	14"	48"	-	8	Horizontal	Silt & Mud Bottom, Steel fence post	
Riv-32	TRU-4	327631.78	4605710.16	2.7	122.9	-140.6	0.207	0.0	0.986	large target, large remnant moment	-	-	-	-	-	Silt Bottom, Target deeper than 2 ft	
Riv-38	TRU-5	327563.14	4605688.72	2.7	50.4	-13.1	0.149	0.3	0.948	good target	2	2X2	-	150	Horizontal	Silt & Mud Bottom, Metal Box, Too heavy to lift	
Riv-39	TRU-6	327552.88	4605690.61	2.6	265.9	-55.7	0.276	0.4	0.987	very large target	2	-	-	-	North	Silt & Mud Bottom, Al Cans	Diver Missed Target
Riv-42	TRU-7	327399.10	4605631.16	1.9	14.3	-13.1	0.094	0.1	0.910	small target, likely too deep to dig	1	4'X1/8"	-	1	North	Silt & Mud Bottom, Piece of Wire	
Riv-43	TRU-8	327393.11	4605628.32	2.0	20.7	-2.7	0.100	0.3	0.914	good target	1	3"	-	0.25	Horizontal	Silt & Mud Bottom, Shotgun Shell	Diver Missed Target
Riv-45	TRU-9	327367.74	4605606.56	1.8	32.8	-39.5	0.131	0.0	0.987	target south edge of channel, strong remnant moment	1	25	-	30	Horizontal	Silt Bottom, Steel Belted Tire	
Riv-48	TRU-10	327300.09	4605624.13	1.9	67.1	-42.8	0.138	0.0	0.941	good target north edge of channel	2	-	-	-	-	Silt Bottom, Target located, deeper than 2'	Diver Missed Target
Riv-53	TRU-11	327224.23	4605666.65	1.8	25.1	-28.4	0.154	0.5	0.899	good target in center of channel	2	-	-	-	-	Silt Bottom, Target is soda cans	Diver Missed Target
Riv-60	TRU-12	327153.99	4605715.48	1.8	22.5	-13.2	0.133	0.6	0.945	good target	1	8	-	0.25	Horizontal	Silt & Mud Bottom, Target is soda cans	Diver Missed Target
Riv-70	TRU-13	327039.96	4605758.48	1.9	16.9	-6.7	0.068	0.0	0.897	very small target, north edge of channel	0	10	-	20	Horizontal	Silt & Mud Bottom, Boat Anchor	
Riv-71	TRU-14	327031.77	4605759.46	1.9	35.9	-5.4	0.082	0.0	0.962	small target, north edge of channel	2	10	-	0.25	Horizontal	Silt & Mud Bottom, Wire	
Riv-73	TRU-15	326962.98	4605770.47	1.9	43.7	-28.1	0.098	0.0	0.979	small target	2	-	-	-	-	Silt & Mud Bottom, Target located deeper than 2'	
Riv-74	TRU-16	326893.18	4605784.72	1.9	80.8	-27.6	0.115	0.0	0.979	good target, north edge of channel	2	-	-	-	-	Silt & Mud Bottom, Target located deeper than 2'	
Riv-79	TRU-17	326793.19	4605812.80	1.9	142.2	-32	0.208	0.2	0.969	large target, center of channel	2	-	-	-	-	Mud Bottom, Can't reach targ below 2'	
Riv-83	TRU-18	326668.49	4605860.29	1.9	51.6	-22	0.135	0.0	0.923	good target, south edge of channel	20"	11"X3"	-	25	Horizontal	Mud Bottom, Metal Clump	
Riv-84	TRU-19	326652.14	4605865.02	1.9	46.1	-46.4	0.135	0.0	0.951	good target, middle of channel	2	-	-	-	-	Mud Bottom, Can't reach targ below 2'	
Riv-87	TRU-20	326555.86	4605878.84	1.8	22	-12.9	0.110	0.2	0.958	small target in center of channel, likely too deep to dig	2	-	-	-	-	Soft Mud Bottom, Can't reach targ below 2'	
Riv-94	TRU-21	326448.01	4605853.60	1.7	33.8	-32.3	0.083	0.0	0.894	eastmost of a group of small clutter targets	3	-	-	-	-	Soft Mud Bottom, Can't reach targ below 3'	
Riv-109	TRU-22	326310.98	4605849.46	1.7	24.3	-20.5	0.125	0.1	0.970	small target, mostly remnant	2	-	-	-	-	Soft Mud Bottom, Can't reach targ below 2'	
Riv-110	TRU-23	326303.08	4605829.30	1.8	103.4	-8	0.120	0.0	0.962	good target	2	-	-	-	-	Mud Bottom, Can't reach targ below 2'	
Riv-111	TRU-24	326268.73	4605834.71	1.8	94	-20	0.145	0.1	0.957	good target, center of channel	0.5	4"X4"	-	0.25	Horizontal	Soft Mud Bottom, Small Can	Diver Missed Target
Riv-113	TRU-25	326200.25	4605814.55	1.8	67.5	-8.4	0.121	0.0	0.962	good target	3	-	-	-	-	Soft Mud Bottom, Can't reach targ below 3'	
Riv-116	TRU-26	326194.19	4605811.90	1.9	14.1	-6.9	0.064	0.0	0.892	clutter target	2	3'X3'	-	300	Straight Down	Soft Silt & Mud Bottom, Concrete Block, Not Recovered	Diver Missed Target
Riv-117	TRU-27	326189.44	4605814.96	1.8	30	-3.7	0.098	0.1	0.969	good small target	2	-	-	-	-	Soft mud Bottom, Can't reach targ below 2'	
Riv-123	TRU-28	325982.65	4605807.90	1.8	29.4	-23.5	0.146	0.3	0.935	partial signature	2	-	-	-	-	Soft Silt & Mud Bottom, Can't reach targ below 2'	

included in Appendix B of this document. Table 5 shows the analyst predictions and target recovery results for the 28 targets that were intrusively investigated. The final report written by EOTI[13] following their recovery operations details the results of each of the target dives. These results have been integrated into the Tables below, which correlate the analyst's predictions with the dive results. Appendix D contains the EOTI final report.

At the very narrow mouth of the river the bottom is sand, which is constantly scoured away or replaced by the strong currents in the river that are controlled by the rising and falling of the water level in the Lake. During the warmer parts of the year, this area is almost constantly being dredged by a dragline that is permanently located on a barge to keep the channel open for boats that are resident in the two marinas on the river.

The bottom of the remainder of the river is soft silt or mud, which is very deep in parts of the channel. The mud made it difficult for divers to recover many of the targets. No recovery was made for one-half of the targets on the dig list; the diver explanation was that the mud was too deep to touch the target, which in most cases could be detected using a hand-held sensor. In six other cases, we concluded that the diver recognized (or recovered) an object that was not specified by the analyst. In several cases the recoveries were objects (soda cans, concrete blocks) that are not detectable with magnetometers. In other cases (expended shotgun shell or a piece of wire), the objects were too small to be associated with the analyzed target. There were no ordnance-related objects recovered in the Toussaint River (except the expended shotgun shell).

3.2 The Davis-Besse Impoundment Area

The area north of the Davis-Besse property shoreline and west of the Range 2 fans lies immediately adjacent to the primary impact areas associated with the proof testing of projectiles and gun barrels. We analyzed 24 magnetic anomalies associated with parts of 8 different survey transects (Tr51, Tr53, Tr55, Tr61, Tr63, Tr67, Tr69, and Tr73) in this area. Thirteen of these were declared as possible UXO. The Dig List/Target Report is included in Appendix B. Divers reacquired and dove on 11 of these targets. Table 6 shows the analyst's predictions and the diver's observations for these targets.

This entire area was described as having a rocky or hard clay bottom, unlike much of the remaining area (except the reefs), which have either a sandy or mud bottom. There were no UXO identified or recovered from this area. Four of the eleven magnetic anomalies were ascribed to magnetic geological features, four were lost or abandoned boat anchors, and the remainder were boat parts or pieces of scrap metal. See Table 6 for the documentation.

3.3 Areas common to the Airborne Survey

Several survey lines were run parallel to the shoreline between MTA survey transects Tr19 and Tr31. These shallow water data, in addition to the western ends of the overlapping transects, were analyzed for comparison with the Airborne survey data. Some magnetic anomaly image clips showing the anomalies chosen for analysis, are included in Appendix A. We chose 124 anomalies from this area as likely to be UXO. The AETC dig list is included in Appendix B.

Table 6. Target dig list and dig results from the survey of the Davis-Besse Impoundment Area

AETC TARGET ANALYSIS										Diver Comments and Information						
AETC Target ID	Nelson List Targ. ID	UTM X (m)	UTM Y (m)	Water Depth (m)	Max. Signal (nT)	Min. Signal (nT)	Size (m)	Burial Depth (m)	Analyst Comments	Targ. Burial Depth (in)	Target Length (in)	OE Type	Orientation	Weight (lb)	Attitude	Diver Narrative
TR55-2	TRU-208	324531.09	4610143.48	3.2	19	-3.9	0.091	0.09	small target	0.0	48.0	Other	North	1000	Horizontal	Rocky bottom - large hot rock - unable to recover
TR55-3	TRU-209	325092.60	4610137.63	3.5	23.1	-5.7	0.114	0.36	105mm?	0.0	10.0	Other	North	10	Horizontal	Rocky bottom - hot rock (10 in by 10 in)
TR61-1	TRU-210	324395.86	4611125.75	3.7	35.1	-22.1	0.153	0.27	155mm?	0.0	36.0	Scrap	East	50	Horizontal	Rocky bottom - anchor - same item as target TRU-244
TR61-3	TRU-211	325270.80	4611126.55	3.9	33.8	-16.8	0.142	0.12	155mm?	0.0	18.0	Scrap	South	20	Horizontal	Rocky bottom - metal scrap
TR63-2	TRU-212	323816.91	4611456.03	4.1	36.9	-33.6	0.171	0.36	155mm+?	0.0	30.0	Scrap	East	15	Horizontal	Rocky bottom - anchor
TR67-1	TRU-213	322692.44	4612115.43	4.8	31.4	-4.5	0.104	0.03	105mm?	0.0	12.0	Scrap	North	15	Horizontal	Rocky bottom - steel round anchor
TR67-3	TRU-214	323853.50	4612114.43	4.7	41.5	-26.4	0.160	0.24	155mm?	6.0	14.0	Scrap	South	20	Horizontal	Rocky bottom - scrap metal piece (14 in by 18 in)
TR69-2	TRU-215	324967.51	4612445.28	4.8	45.1	-32.4	0.166	0.25	155mm?	0.0	8.0	Scrap	South	6	Horizontal	Rocky bottom - boat carburetor
TR73-1	TRU-216	322741.23	4613105.97	5.6	23.2	-7.3	0.128	0.45	good target	NA	NA	NA	NA	NA	NA	Rocky bottom - contact under 10 ft wide bolder - not recovered
TR73-2	TRU-217	323463.08	4613104.42	5.6	13.1	-6.4	0.100	0.23	105mm?	NA	NA	NA	NA	NA	NA	Hard clay / rock bottom - no contact
TR73-3	TRU-218	324095.14	4613107.22	5.7	50.8	-29.3	0.162	0.20	155mm?	0.0	48.0	Scrap	South	20	Horizontal	Hard clay / rock bottom - old boat anchor

The dig list provided by the Program Office to the divers contained only 6 anomalies common to both the MTA and the Airborne surveys, and an additional 12 anomalies exclusively from the airborne data. Of these combined 18 targets, the divers identified seven 155 mm projectiles and two 2.75 in warheads. The two remaining MTA targets were declared as too deeply buied to dig. Three of the Airborne-only targets were declared to be "dry holes." The remaining targets were metallic scrap. The information is documented in Table 7.

3.4 The Reef Areas

Most of the reef areas described below that lie within the impact area fairly gently rise from the depth of the major part of the lake to within 5 or 10 feet of the surface. The rise is slow enough that we could survey directly over the reefs without worrying that the sensor platform could not accommodate the rising bottom. The exception is Crib Reef which rises fairly abruptly to within 1 foot of the surface. There is a buoy placed on the shallowest point. Each of these reefs lies several miles from the nearest shoreline. Apparently, the reefs or their associated bottom structure attract fish, because these are the areas where fishing boats congregate in large numbers. The Program Office was interested in knowing whether magnetic anomalies adjacent to the reefs are UXO, which might pose a threat to fishermen, or were predominantly metallic clutter associated with the fishing boats.

The survey transects that passed over on near the reefs did not show an excessive number of magnetic anomalies compared to the surrounding areas. Targets were analyzed that were specifically associated with six of the reefs: Cone Reef, Crib Reef, Little Pickerel Reef, Round Reef, Toussaint Reef and Flat Rock Reef. The AETC Dig Lists/Target Reports that were turned in to the Program Office are provided in Appendix B.

The Program Office Dig List that was provided to the Dive Team contained 36 targets. The results are documented in Table 8. From the 36 dive, the Dive Teams identified/recovered ten 155 mm projectiles, three 105 mm projectiles, one 90 mm projectile, two 75 mm projectiles, and one 4.2 in mortar. In addition, on Toussaint Reef a group of shrapnel pieces were recovered, which were the result of a high-order detonation of a projectile. Thirteen of the dives did not result in a target recovery either because the target was buried too deeply, it could not be isolated, or the object was identified as a "hot rock." The remaining targets were metallic scrap, including anchors and one 55 gallon drum.

The fraction of the dives on the reef areas that resulted in recovery of intact ordnance was slightly lower than that of the entire impact area. This was not because of a large amount of metallic debris left by fishermen, but rather resulted from the rocky bottom surface (some of it geologically active) that prohibited the divers from excavating into the bottom to recover targets.

Table 7. Target dig list and dig results from the common MTA and Airborne surveys

AETC TARGET ANALYSIS												Diver Comments and Information						
AETC Target ID	Nelson List Targ. ID	UTM X (m)	UTM Y (m)	Helo UTM X (m)	Helo UTM Y (m)	Water Depth (m)	Max. Signal (nT)	Min. Signal (nT)	Size (m)	Burial Depth (m)	Analyst Comment	Burial Depth (in)	Length (in)	OE Type	Orientation	Wt (lb)	Attitude	Diver Comment
Air-63	TRH-100	329133.91	4605645.03	329134.20	4605645.27	1.9	59	-122	0.34	0.8	massive target	NA	NA	NA	NA	NA	NA	Contact below 2 feet
Air-101	TRH-101	329433.15	4604793.75	329434.65	4604793.80	2.1	68	-34	0.18	0.3	large projo	24	24	155mm	Straight Down	90	Vert	155mm below 2 Feet - Not recovered
Air-102	TRH-102	329439.91	4604772.44	329438.96	4604770.44	2.1	96	-56	0.19	0.2	large projo	NA	NA	NA	NA	NA	NA	Strong contact below 2 feet
Air-103	TRH-103	329456.32	4604720.67	329457.22	4604720.60	2.1	111	-43	0.20	0.2	large projo	6	24	155mm	North	90	Hor	Mud Bottom
Air-104	TRH-104	329444.60	4604693.45	329518.47	4604589.26	1.9	29	-19	0.13	0.1	projo	26	48	2.75 in Rocket	60 Deg Down	25	60 Deg Down	Hard Mud - Not Recovered - Assumed Fuzed
Air-105	TRH-105	329498.16	4604629.38	329574.41	4604481.35	2.1	28	-8	0.10	-0.1	105mm	6	48	2.75 in Rocket	E	25	Hor	Mud - Not Recovered - Fuzed
	TRH-106			329345.56	4604761.77							12	24	155mm	N	90	Hor	Sand - Not Recovered - Fuzed
	TRH-107			329294.77	4604739.73							12	24	155mm	N	90	Hor	Sand
	TRH-108			329301.82	4604693.06							0	72	Scrap	E	5	Hor	Sand - Metal Rod
	TRH-109			329371.50	4604678.29							8	24	155mm	N	90	Hor	Sand / Mud
	TRH-110			329360.10	4604665.34							30	24	155mm	Straight Down	90	Vert	Mud - Not Recovered
	TRH-111			329426.14	4604551.17							6	24	155mm	N	90	Hor	Sand - Not Recovered - Fuzed
	TRH-112			329124.82	4604745.03							6	96	scrap	W	40	Hor	Sand - 12 in dia pipe - too big to dig out
	TRH-113			329111.53	4604758.68							12	6	Scrap	E	1	Hor	Steel Can - Sand
	TRH-114			329098.27	4604719.44							NA	NA	NA	NA	NA	NA	No Contact
	TRH-115			329098.64	4604709.04							NA	NA	NA	NA	NA	NA	No Contact
	TRH-116			329164.54	4604557.02							16	96	Scrap	N		Hor	Steel I-beam - too big to dig out
	TRH-117			329161.52	4604571.68							NA	NA	NA	NA	NA	NA	No Contact

Table 8. Target dig lists and dig results from areas around the reefs

Cone Reef Dig List With Dive Results

AETC TARGET ANALYSIS										Diver Comments and Information						
Target ID	Nelson List Targ. ID	UTM X (m)	UTM Y (m)	Water Depth (m)	Max. Signal (nT)	Min. Signal (nT)	Size (m)	Burial Depth (m)	Analyst Comments	Burial Depth (in)	Length (in)	OE Type	Orientation	Wt. (lb)	Attitude	Narrative
TR81-1	TRU-201	329154.60	4614425.64	6.6	91.7	-25.5	0.186	0.11	large target, dig	NA	NA	NA	NA	NA	NA	Sand / rock bottom - contact below 2 feet
TR81-2	TRU-202	329161.88	4614425.90	6.7	89.6	-77.3	0.190	0.00	large target dig, 2nd target 5m West	3	20	4.2 in Mortar	North	50	Horizontal	Sand / rock bottom
TR81-4	TRU-203	329534.91	4614429.39	6.4	17.4	-5.2	0.119	0.49	projo?	NA	NA	NA	NA	NA	NA	Sand / rock bottom - contact below 2 feet
TR81-5	TRU-204	329655.59	4614428.03	6.7	62.4	-45.9	0.177	0.60	155mm?	NA	NA	NA	NA	NA	NA	Sand / rock bottom - contact not found within 36 ft dia circle

Crib Reef Dig List With Dive Results

AETC TARGET ANALYSIS										Diver Comments and Information						
Target ID	Nelson List Targ. ID	UTM X (m)	UTM Y (m)	Water Depth (m)	Max. Signal (nT)	Min. Signal (nT)	Size (m)	Burial Depth (m)	Analyst Comments	Burial Depth (in)	Length (in)	OE Type	Orientation	Wt. (lb)	Attitude	Narrative
TR69-3	TRU-205	332577.84	4612447.27	2.4	23.4	-5.7	0.146	0.00	155mm?	0	24	155mm	North	90	Horizontal	Sand / rock bottom
TR69-4	TRU-206	332640.77	4612446.44	2.5	10.5	-7.9	0.118	0.00	105mm?	0	24	155mm	North	90	Horizontal	Hard sand / clay bottom
TR69-5	TRU-207	333327.74	4612452.09	4.5	41.6	-3.4	0.120	0.12	projo?	NA	NA	NA	NA	NA	NA	Sand / rock bottom - contact not found

Pickerel Reef Dig List With Dive Results

AETC TARGET ANALYSIS										Diver Comments and Information						
Target ID		UTM X (m)	UTM Y (m)	Water Depth (m)	Max. Signal (nT)	Min. Signal (nT)	Size (m)	Burial Depth (m)	Analyst Comments	Burial Depth (in)	Length (in)	OE Type	Orientation	Wt. (lb)	Attitude	Narrative
TR85-5	TRU-229	331782.14	4615077.25	5.9	30.8	-5.7	0.119	0.00	105mm?	NA	NA	NA	NA	NA	NA	Sand bottom - contact below 2 feet - not recovered
TR85-6	TRU-230	331869.59	4615073.85	5.9	48.5	-5.8	0.122	0.00	projo?	3	24	155mm	North	90	Horizontal	Sand bottom
TR85-7	TRU-231	331980.75	4615086.28	7.1	46.3	-9.3	0.141	0.04	155mm?	2	24	155mm	North	90	Straight up	Sand bottom
TR85-8	TRU-232	332009.73	4615086.67	7.0	51.5	-14.1	0.122	0.00	projo?	NA	NA	NA	NA	NA	NA	Sand bottom - contact below 2 feet - not recovered
TR85-9	TRU-233	332105.79	4615086.89	7.3	91.2	-33.4	0.209	0.00	large projo, dig	6	6	155mm	North	90	Horizontal	Sand bottom

Table 8. Continued

Round Reef Dig List With Diver Results

AETC TARGET ANALYSIS											Diver Comments and Information						
Target ID	Nelson List Targ. ID	UTM X (m)	UTM Y (m)	Water Depth (m)	Max. Signal (nT)	Min. Signal (nT)	Size (m)	Burial Depth (m)	Fit Quality	Analyst Comments	Burial Depth (in)	Length (in)	OE Type	Orientation	Wt. (lb)	Attitude	Diver Narrative
TR47-2	TRU-234	334514.14	4608815.88	4.6	68.5	-30.8	0.190	0.43	0.903	bigger than155mm, dig	12	NA	NA	NA	NA	NA	Rock bottom - contact under rocks (12 inches or more) - unable to recover
TR49-1	TRU-235	334545.64	4609137.50	3.7	45.6	-5.3	0.133	0.00	0.772	may be 2 targets,dig anyway	NA	NA	NA	North	NA	NA	Rocky bottom - multiple targets under rocks - unable to recover

Toussaint Reef Dig List with Ground Truth

AETC TARGET ANALYSIS											Diver Comments and Information						
Target ID	Nelson List Targ. ID	UTM X (m)	UTM Y (m)	Water Depth (m)	Max. Signal (nT)	Min. Signal (nT)	Size (m)	Burial Depth (m)	Fit Quality	Analyst Comments	Burial Depth (in)	Length (in)	OE Type	Orientation	Wt. (lb)	Attitude	Narrative
TR57-1	TRU-236	331371.46	4610466.53	3.6	31.6	-15.5	0.153	0.5	0.862	155mm?, 2nd target 3m NE	0	20	90mm	East	40.0	Horizontal	Rock bottom
TR57-3	TRU-237	331412.85	4610467.91	3.4	34.3	-10.9	0.159	0.0	0.883	boat anchor with chain?, dig	4	24	155mm	North	90.0	Horizontal	Rock / sand bottom
TR57-5	TRU-238	331462.74	4610465.05	3.3	13.9	-5.8	0.084	0.0	0.864	small target	6	20	105mm	North	50.0	Horizontal	Rock / sand bottom
TR57-6	TRU-239	331482.93	4610465.61	3.0	43.4	-6.0	0.113	0.0	0.916	105mm (or larger)	0	48	Scrap	NA	80.0	Horizontal	Rocky bottom - 55 gal drum - not recovered
TR57-7	TRU-240	331492.56	4610466.30	2.7	11.5	-2.8	0.089	0.0	0.937	small target	0	18	90mm	NA	40.0	Horizontal	Rocky bottom
TR57-8	TRU-241	331757.79	4610466.57	3.0	14.3	-2.1	0.117	0.2	0.948	105mm?	NA	NA	NA	NA	NA	NA	Rock / sand bottom - no contact
TR59-3	TRU-242	331487.76	4610796.68	3.4	12.4	-13.0	0.100	0.0	0.549	105mm? In geology, 2nd target 5m East	4	8	Frag	North	5.0	Horizontal	Rock / sand bottom - 155mm frag
TR59-5	TRU-243	331568.56	4610796.03	3.0	18.3	-5.0	0.093	0.0	0.939	105mm?	NA	NA	NA	NA	NA	NA	Rocky / sand bottom - contact below 2'
TR61-1	TRU-244	324395.86	4611125.75	3.7	35.1	-22.1	0.153	0.3	0.968	155mm?, large remnant moment	NA	NA	Scrap	NA	NA	NA	Rocky bottom - anchor - same item as target TRU-210
TR61-3	TRU-245	325270.80	4611126.55	3.9	33.8	-16.8	0.142	0.1	0.972	155mm?	0	8	Other	South	8.0	Horizontal	Rocky bottom - hot rock (8 in dia)
TR61-5	TRU-246	332072.37	4611129.23	3.9	22.0	-5.2	0.113	0.0	0.958	105mm?	NA	NA	NA	NA	NA	NA	Hard rocky / concrete bottom - contact found - item unknown - not recovered
TR61-6	TRU-247	332430.85	4611129.71	3.6	11.4	-4.8	0.093	0.0	0.932	105mm?	0	20	105mm	West	50.0	Horizontal	Rocky bottom

Flat Rock Reef Dig List with Diver Results

AETC TARGET ANALYSIS											Diver Comments and Information						
Target ID	Nelson List Targ. ID	UTM X (m)	UTM Y (m)	Water Depth (m)	Max. Signal (nT)	Min. Signal (nT)	Size (m)	Burial Depth (m)	Fit Quality	Analyst Comments	Burial Depth (in)	Length (in)	OE Type	Orientation	Wt. (lb)	Attitude	Narrative
TR-77-1	TRU-219	330814.90	4613769.88	6.1	44.6	-12.1	0.164	0.23	0.983	155mm?	6	24	155mm	NW	90.0	Horizontal	Hard clay / rock bottom
TR77-4	TRU-220	331101.83	4613764.93	6.3	104.8	-59.1	0.200	0.00	0.979	very large target, 2nd target 5m West	20	NA	Scrap	North	50.0	NA	Clay / rock bottom - big anchor stuck on rock bottom - not recovered
TR77-5	TRU-221	331175.38	4613765.41	6.2	110.9	-64.2	0.226	0.20	0.957	240mm?	4	18	75mm	North	40.0	Horizontal	Sand / rock
TR77-6	TRU-222	331245.04	4613765.69	5.6	9.5	-6.9	0.101	0.00	0.951	105mm?	3	18	75mm	North	40.0	Horizontal	Sand / rock
TR77-9	TRU-223	331417.54	4613761.45	6.5	106.1	-65	0.206	0.09	0.870	240mm?	3	24	155mm	North	90.0	Horizontal	Sand / rock
TR77-10	TRU-224	331483.96	4613751.69	6.2	38.7	-22.8	0.160	0.00	0.884	155mm?	24	NA	Scrap	Straight down	NA	Straight down	Rock bottom - anchor stuck on rock - not recovered
TR77-12	TRU-225	331690.78	4613767.08	6.2	41.5	-15.1	0.143	0.08	0.956	155mm?	24	24	155mm	North	90.0	Straight down	Silt and mud bottom - 155mm stuck on rock bottom - not recovered
TR77-16	TRU-226	331892.74	4613766.87	4.7	15.6	-6.4	0.098	0.00	0.861	105mm?	NA	NA	NA	NA	NA	NA	Sand / rock - contact below 2 feet
TR77-17	TRU-227	332308.40	4613761.81	6	92.9	-14.6	0.187	0.23	0.985	large target, dig	24	24	155mm	Straight down	90.0	NA	Sand / rock - unable to recover
TR77-18	TRU-228	332327.84	4613765.48	5.8	51.6	-8.7	0.155	0.00	0.975	155mm?	3	20	105mm	North	50.0	Horizontal	Sand bottom

3.5 The Primary Impact Areas

All the data in 5 complete transects were analyzed primarily with the intent of identifying ordnance (projectiles). These included transects Tr35, Tr37, Tr89, WS15, and WS19. The two most southern transects lie just north of (beyond) the range fan for Range 1, which is the only currently active range in Lake Erie associated with Camp Perry.

Transects Tr35 and Tr37 lie slightly more than 5 km due north of the original fixed firing points for proof testing projectiles and barrels. These firing points are shown in Figure 11. Transect Tr89 is about 14 km due north of the firing points and the northern most transect WS19 is 21.8 km north of the firing points. The automated target picks shown in Figure 11 generally indicate that the primary distribution of magnetic anomalies stretch from the firing points in a northward direction. The targets are most dense close to the firing point; however their density is still substantial 15 km north of the firing points. At distances greater than about 16 km north of the firing points, the anomaly densities fall to approximately those seen in the Davis-Bessy Impoundment Area and at the eastern most limits of the impact range.

Reportedly, during proof firing of the projectiles the guns were aimed at the tops of poles located on land at distances of 750, 1,000, 1,250, and 1,500 m down range from the firing points. These are identified in Figure 1. Some of the poles are still standing. An observer was located in an observation bunker immediately above each gun to monitor the firings. Because the guns were aimed at only slightly elevated angles, we surmise that most of the fired projectiles impacted the Lake surface and skipped to impact again further down range. This may account for some of the widening east-west distribution of anomalies with increasing distance from the firing points. We know from target recoveries (described in Section 5) that many, but not all the fired projectiles were inert. A significant fraction of the recovered projectiles revealed that they had been fired without removing the shipping lugs (from the fuze wells). This issue is also discussed more extensively in Section 5.

Figure 12 shows a magnetic anomaly image composed of data clips from transect TR37. The analyst's target identification number is shown in white. For instance, the target identified as 116 will have the unique target identification of Tr37-116 in the AETC Target Report or the AETC Dig List. The white polygons are those drawn by the analyst using the computer mouse. The data within the boxed area are used to perform the target fit. As shown in Figure 12, not all magnetic anomalies were chosen for analysis. In general, targets that were identified as lying less than 3 meters from an adjacent target were not chosen for analysis (or if they were, they were not included on the recommended dig list). This was done to reduce the likelihood of the diver mistaking the intended target for another one nearby. In general, targets were not chosen for analysis if the majority of their signatures were not included in the 8-sensor measurement track. There were exceptions to this rule (see targets 24 and 83). Targets such as these were boxed for analysis because they appeared to be extremely large or they had unique signatures. In most cases, even though these targets were analyzed, they were demoted from the recommended dig list. In a few cases the analyst felt that it was worth digging a target even though it was unlikely to be a projectile. The rationale for this is that if the target can be recovered, its identity can be associated with the unique signature for future applications.

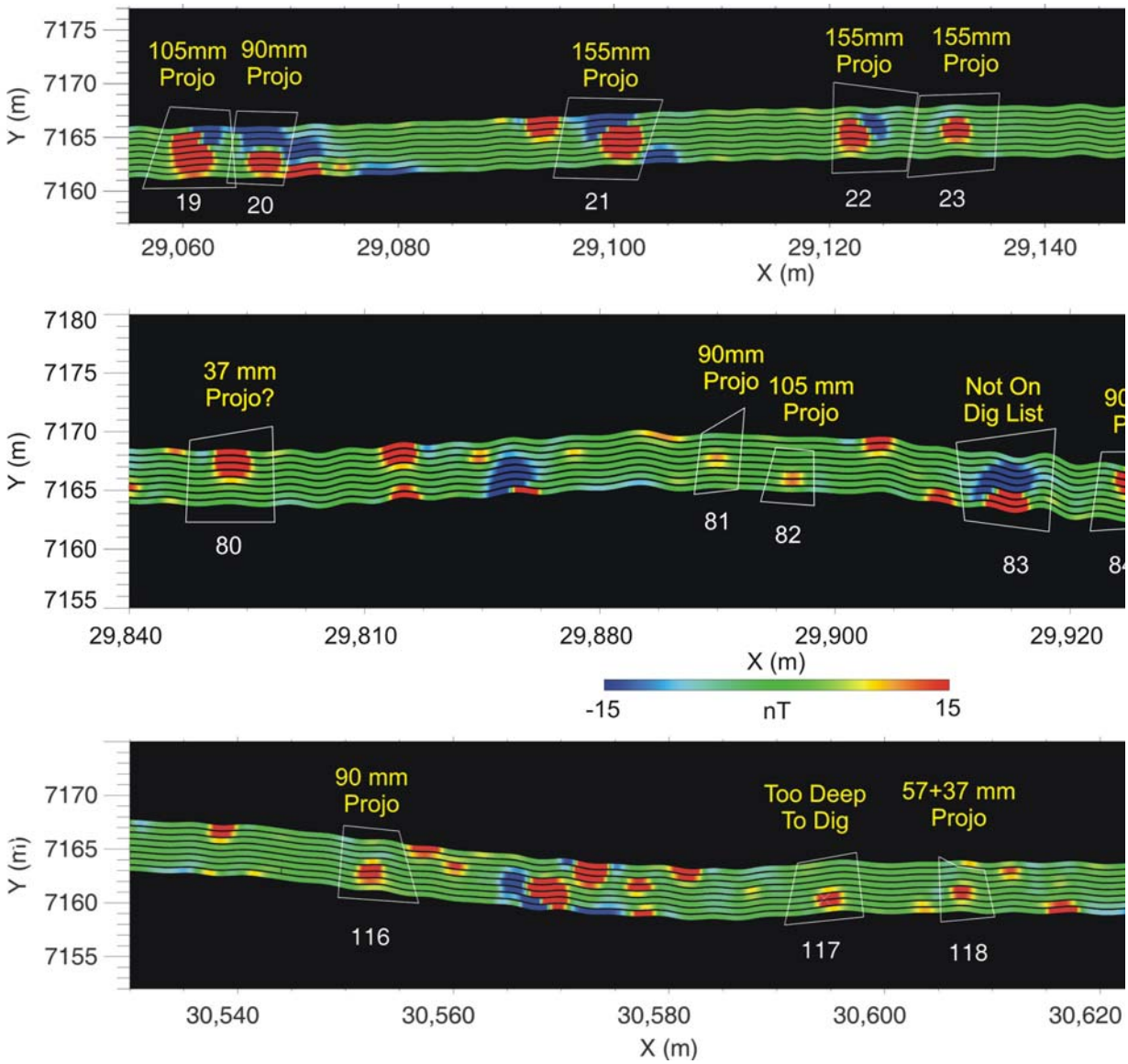

Figure 12. Magnetic anomaly image clips from the analysis of data from transect Tr37. Anomalies boxed for analysis are shown as white polygons. Target numbers are shown in white; the target identification made by the diver is shown in yellow.

Figure 12 also shows (in yellow) the diver's comment about the item recovered from investigation of the target following its reacquisition and flagging by the dive team. As is apparent from this figure, in most cases the result of the recovery was consistent with the analysis and instructions on the dig sheet. This is not always the case, however. Note targets 80 and 85. The recovered items were much too small to be associated with the analyzed target on the dig list. A 37 mm projectile and a fuze would not likely be detectable by our sensors, given their distance above the bottom. Even if such a target passed directly below one of the sensors and was detected, its signature would not stretch across several sensor tracks. In the case of target 118, it is likely that the diver, in addition to recovering the 57 mm projectile also found and picked up the additional 37 mm projectile, i.e. one of the fainter anomalies about 3 meters from the primary target.

The Target Reports and the Recommended Dig Lists for the five analyzed transects are provided in Appendix B. These five reports include the analysis of 443 targets. 169 targets were included on the recommended dig list.

Figure 13 shows a presentation of the targets on the diver's dig list provided by the Program Office. The targets on the dig list are shown as large red diamonds (♦). The targets in the Toussaint River and in the Davis-Besse Impoundment area are also included in the image.

Tables 9-12 contain the analysis information for the targets chosen by the Program Office for intrusive investigation. Also included are the results of the intrusive investigations, the identification of the anomaly (if one was found) and the diver comments on the target and the bottom conditions.

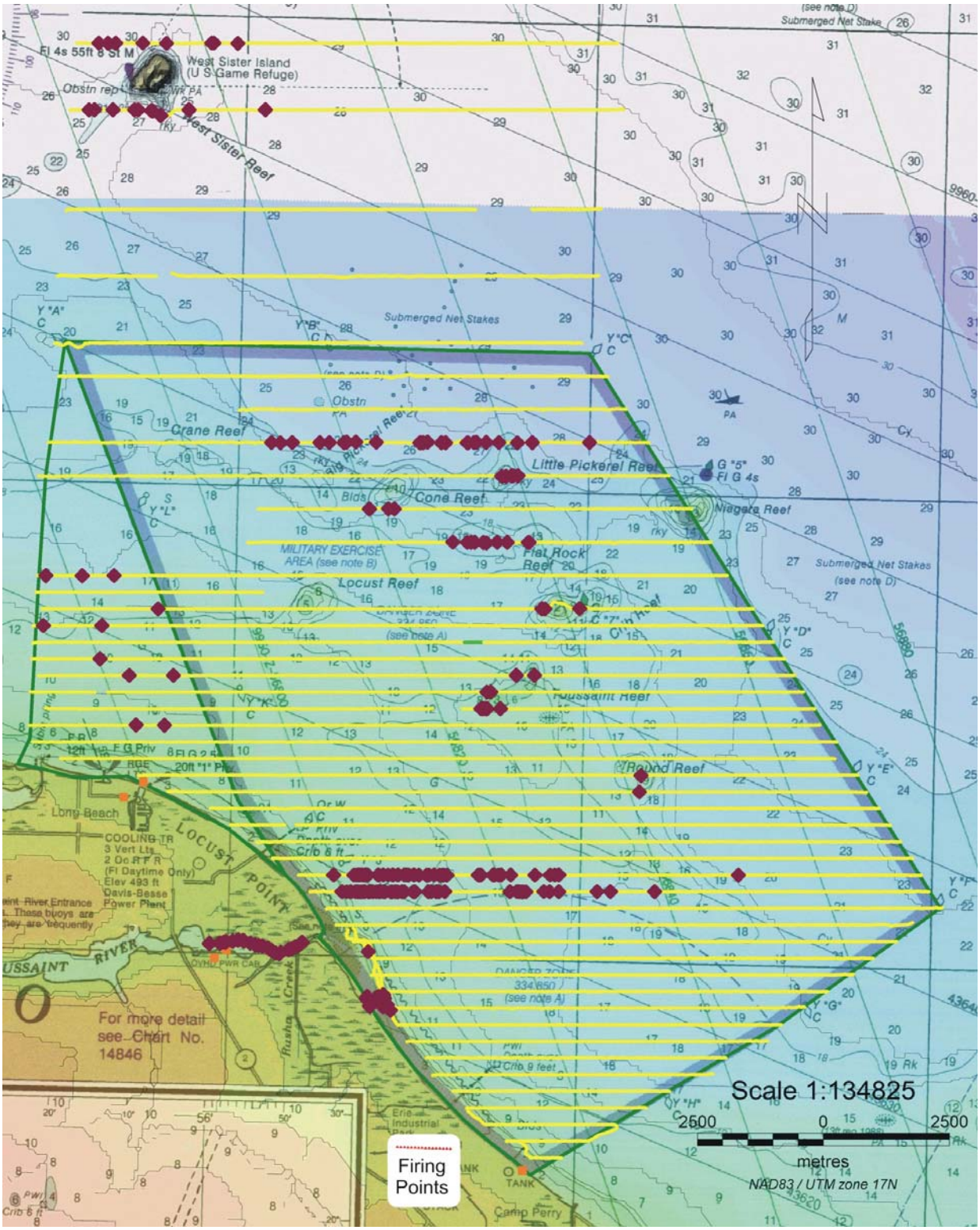

Figure 13. All targets on the diver's dig list are shown as large red diamonds superimposed on the survey map.

Table 9. Target Dig list and dig results from transect Tr35 survey

AETC TARGET ANALYSIS										Diver Comments and Information						
AETC Target ID	Nelson List Targ. ID	UTM X (m)	UTM Y (m)	Water Depth (m)	Max. Signal (nT)	Min. Signal (nT)	Size (m)	Burial Depth (m)	Analyst Comment	Burial Depth (in)	Targ. Length (in)	Wt. (lb)	OE ID	Orientation	Attitude	Narrative
TR35-2	TRU-248	328613.63	4606837.02	3.7	69	-62	0.180	0.4	Remnant Moment	4.0	36.0	2	Scrap	North	Horizontal	Metal rod - 36 in by 0.25 in
TR35-3	TRU-249	328708.89	4606832.87	3.8	69	-18	0.117	0.2	105mm maybe	6.0	24.0	90	155mm	NA	Horizontal	Sandy / clay bottom
TR35-6	TRU-250	328799.25	4606833.46	3.9	83	-32	0.152	0.1	155mm maybe	NA	NA	NA	NA	NA	NA	Hard clay - dug to 18 in - anomaly was deeper
TR35-7	TRU-251	328886.35	4606836.42	4	24	-10	0.094	0.3	81mm maybe	36.0	10.0	2	Frag	North	Horizontal	Soft mud bottom - 4.2 in mortar tail boom
TR35-9	TRU-252	328923.37	4606832.96	4.1	65	-7	0.122	0.2	105-155mm?, 2nd target 6m West	6.0	24.0	90	155mm	North	Horizontal	Sand / clay bottom
TR35-10	TRU-253	328947.28	4606832.66	4.1	80	-28	0.155	0.3	155mm size, nice target	8.0	24.0	90	155mm	North	Horizontal	Sand / clay bottom
TR35-12	TRU-254	328987.63	4606832.39	4.1	20	-2	0.082	0.2	81mm maybe	24.0	24.0	NA	Scrap	North	Straight down	Flat sheet of metal - unable to recover
TR35-15	TRU-255	329065.46	4606836.76	4.2	81	-28	0.135	0.1	155mm maybe	0.0	24.0	90	155mm	East	Horizontal	Soft clay bottom
TR35-20	TRU-256	329145.16	4606831.64	4.3	101	-34	0.168	0.1	155mm ?	NA	NA	NA	NA	NA	NA	Sand / clay bottom - nothing found
TR35-21	TRU-257	329156.03	4606833.08	4.3	40	3	0.118	0.4	105mm ?	6.0	14.0	40	90mm	North	Horizontal	Sand / clay bottom -90mm APHE, unfuzed
TR35-22	TRU-258	329187.06	4606840.41	4.3	45	-3	0.118	0.3	105mm?	8.0	24.0	90	155mm	North	Horizontal	Sand / clay bottom
TR35-23	TRU-259	329205.54	4606839.34	4.3	85	-34	0.152	0.2	155mm ?	8.0	24.0	90	155mm	North	Horizontal	Sand / clay bottom
TR35-24	TRU-260	329230.87	4606833.77	4.3	75	-13	0.138	0.2	155mm ?	24.0	NA	NA	NA	NA	NA	Hard clay, contact below 2 feet, not recover
TR35-26	TRU-261	329294.63	4606834.42	4.3	65	-12	0.130	0.2	155mm, 2nd target 3 m NW	24.0	NA	NA	NA	NA	NA	Hard clay, contact below 2 feet, not recover
TR35-27	TRU-262	329347.69	4606837.20	4.4	59	-28	0.126	0.3	155mm ?	6.0	24.0	90	155mm	North	Horizontal	clay bottom, 155mm fuzed, not recovered
TR35-28	TRU-263	329359.81	4606834.49	4.4	76	-14	0.148	0.5	155mm ?	8.0	24.0	90	155mm	North	Horizontal	Sand / clay bottom
TR35-29	TRU-264	329377.65	4606835.78	4.3	30	-8	0.091	0.1	105mm ?	12.0	4.0	2	Frag	South	Horizontal	Mud / clay bottom - 90mm nose cone pieces
TR35-33	TRU-265	329439.54	4606837.33	4.3	50	-5	0.138	0.5	155mm?, targ 33&34 9m apart	26.0	4.0	1	Frag	Straight down		Sand / clay bottom - nose cone
TR35-34	TRU-266	329448.26	4606835.48	4.3	81	-33	0.153	0.2	155mm ?	12.0	24.0	90	155mm	North	Horizontal	Hard clay / sand bottom
TR35-36	TRU-267	329474.12	4606833.18	4.3	20	-8	0.108	0.5	105mm ?	1.0	6.0	0	Frag	North	Horizontal	Hard clay / sand bottom - dug four holes - all frag - projectile cone
TR35-45	TRU-268	329587.70	4606831.98	4.4	100	-52	0.215	0.7	220mm projo?, target 44 6m West	6.0	24.0	90	155mm	North	Horizontal	Sand/clay bottom-155mm fuzed-not recovered
TR35-46	TRU-269	329601.97	4606831.98	4.4	52	-21	0.155	0.4	155mm?, target 46&47 4m apart	8.0	24.0	90	155mm	North	Horizontal	Sandy / clay bottom
TR35-47	TRU-270	329606.64	4606832.73	4.4	45	-30	0.125	0.1	155mm ?	6.0	14.0	30	90mm	North	Horizontal	Sand / clay bottom
TR35-53	TRU-271	329673.12	4606836.17	4.4	114	-56	0.165	0.1	155mm ?	8.0	16.0	2	Frag	North	Horizontal	Mud bottom - 155mm rotating band
TR35-59	TRU-272	329723.75	4606831.90	4.4	66	-15	0.134	0.2	155mm, clutter around	6.0	20.0	40	4.2in Mortar	North	Horizontal	4.2 in mortar, fuzed - not recovered
TR35-64	TRU-273	329800.61	4606838.14	4.5	25	-12	0.108	0.1	105mm?	0.0	6.0	2	Frag	North	Horizontal	Frag - not recovered
TR35-67	TRU-274	329851.89	4606837.42	4.5	49	-10	0.123	0.3	105mm ?	3.0	20.0	40	90mm	North	Horizontal	Sandy bottom - 90mm
TR35-85	TRU-275	330027.44	4606834.83	4.5	51	-25	0.125	0.0	105-155mm, lots ofclutter	8.0	7.0	2	37mm	North	Horizontal	Sandy bottom
TR35-87	TRU-276	330056.38	4606835.28	4.5	29	-15	0.116	0.3	105mm?, target 87&88 5m apart	NA	NA	NA	NA	NA	NA	No contact found
TR35-88	TRU-277	330061.79	4606836.87	4.6	59	-15	0.145	0.5	155mm?, in clutter	5.0	16.0	30	105mm	West	Horizontal	Mud bottom
TR35-109	TRU-278	330328.38	4606835.94	4.7	60	-40	0.149	0.2	strong remnant moment, 155mm?	8.0	8.0	2	37mm	Straight down		Hard sandy bottom - 37mm unfuzed
TR35-112	TRU-279	330385.57	4606837.38	4.6	98	-127	0.215	0.3	8 in ?	0.0	24.0	90	155mm	West	Horizontal	Hard gravel bottom
TR35-117	TRU-280	330483.29	4606837.11	4.7	28	-8	0.098	0.2	105mm?	8.0	24.0	90	155mm	South	Horizontal	Mud bottom
TR35-122	TRU-281	330529.89	4606837.00	4.7	40	-12	0.111	0.2	105mm?, 122 &123 10m apart	2.0	20.0	40	4.2 in Mortar	North	Horizontal	Sandy bottom-4.2in mortar, fuzed-not recovered
TR35-123	TRU-282	330538.73	4606836.26	4.7	57	-23	0.151	0.2	155mm ?	6.0	20.0	40	4.2 in Mortar	North	Horizontal	Sandy bottom-4.2in mortar, fuzed-not recovered
TR35-128	TRU-283	330654.19	4606837.01	4.7	40	-20	0.120	0.3	155mm?, 2nd target 3m SW	5.0	20.0	40	90mm	East	Horizontal	Hard sandy bottom-90mm fuzed-not recovered
TR35-176	TRU-294	331944.94	4606836.09	4.9	17	-6	0.091	0.3	small target	6.0	24.0	90	155mm	North	Horizontal	Soft mud bottom - 155mm & M48 fuze - not recovered
TR35-178	TRU-295	332082.33	4606838.96	5.1	33	-4	0.100	0.0	105mm?	6.0	24.0	90	155mm	North	Horizontal	155mm, fuzed - not recovered
TR35-179	TRU-296	332127.62	4606837.39	5.1	20	-6	0.103	0.4	105mm?	3.0	24.0	90	155mm	North	Horizontal	155mm, fuzed - not recovered
TR35-180	TRU-297	332169.82	4606832.73	5.1	22	-8	0.090	0.0	small target	8.0	4.0	1	Frag	NA	Horizontal	Sand / clay bottom - 4.2 in mortar rotation disc
TR35-181	TRU-298	332192.40	4606831.91	5.1	20	-9	0.105	0.3	105mm?	20.0	20.0	30	4.2 in Mortar	North	Horizontal	Sand bottom, 4.2in mortar, fuzed, not recover
TR35-182	TRU-299	332208.47	4606832.67	5.1	18	-3	0.087	0.2	small tartget	24.0	20.0	1	Frag	NE	Horizontal	Sand / clay bottom
TR35-183	TRU-300	332263.44	4606834.82	5.2	126	-48	0.192	0.4	large for a 155mm	6.0	24.0	90	155mm	North	Horizontal	Soft mud and gravel bottom
TR35-186	TRU-301	332619.99	4606838.37	5.3	35	-9	0.105	0.2	105mm, good target	6.0	8.0	1	Scrap	NA	NA	Clay / sand bottom - top of paint thinner can
TR35-187	TRU-302	332732.13	4606835.47	5.4	19	-13	0.102	0.2	105mm?	24.0	NA	NA	NA	NA	NA	sand / clay bottom - Contact below 2 feet
TR35-188	TRU-303	332912.68	4606835.26	5.5	28	-2	0.105	0.3	105mm?	28.0	24.0	90	155mm	NE	Horizontal	Sand/clay bottom, 155mm fuzed, not recovered
TR35-190	TRU-304	333674.36	4606837.95	5.9	18	-4	0.088	0.4	small target	8.0	6.0	1	Scrap	NE	Horizontal	Mud bottom - sheet metal (6 in x 6 in x 1/8 in) & 50 caliber
TR35-191	TRU-305	333938.53	4606837.98	5.9	15	-5	0.079	0.1	small target	15.0	14.0	20	75mm	North	Horizontal	Mud bottom -75mm, unfuzed
TR35-192	TRU-306	334814.94	4606837.28	5.3	57	-49	0.194	0.6	larger than a 155mm	2.0	96.0	1500	Scrap	South	Horizontal	Sand bottom - big metal plate 8ft by 4 ft 1.5 in - not recovered

Table 10. Target dig list and dig results for transect Tr37 survey

AETC Target Analysis										Diver Comments and Information						
AETC Target ID	Nelson List Targ. ID	UTM X (m)	UTM Y (m)	Water Depth (m)	Max. Signal (nT)	Min. Signal (nT)	Size (m)	Burial Depth (m)	Analyst Comment	Burial Depth (In)	Length (in)	OE Type	Weight (lb)	Orientation	Attitude	Narrative
TR37-5	TRU-330	328448.28	4607166.98	3.9	39.4	-10.4	0.127	0.4	good target	1.0	14.0	105mm	35.0	North	Horizontal	
TR37-10	TRU-331	328849.76	4607165.94	4.1	58.1	-20.9	0.148	0.4	155mm?	0.0	24.0	155mm	90.0	NE	Horizontal	Hard clay bottom - 155mm
TR37-11	TRU-332	328897.75	4607166.18	4.2	99.1	-39.4	0.182	0.3	larger than a 155mm, dig	NA	NA	NA	NA	NA	NA	Soft clay bottom - contact below 2 feet
TR37-12	TRU-333	328937.76	4607169.00	4.2	64.5	-19.9	0.156	0.4	155mm?, target 12&13 8m apart	NA	NA	NA	NA	NA	NA	Contact below 2 feet
TR37-13	TRU-334	328945.87	4607168.29	4.2	96.4	-42.7	0.154	0.3	155mm, clutter to East	0.0	24.0	155mm	90.0	North	Horizontal	Hard clay bottom
TR37-14	TRU-335	328954.49	4607167.29	4.3	77.8	-22.4	0.144	0.3	155mm?, Targets 14, 15, 16 within 10m	3.0	24.0	2 ea 155mm	180.0	North	Horizontal	2 ea, 155mm
TR37-15	TRU-336	328960.11	4607168.88	4.3	86.3	-21.6	0.140	0.2	155mm in clutter	8.0	24.0	155mm + Scrap	90.0	East	Horizontal	Soft bottom, 155mm located under ball of metal cable - cable not recovered
TR37-16	TRU-337	328966.44	4607167.25	4.3	95.9	-53.8	0.171	0.2	155mm in clutter	0.0	24.0	155mm	90.0	North	Horizontal	Hard clay bottom
TR37-17	TRU-338	329012.26	4607166.51	4.3	74.8	-37.4	0.168	0.4	155mm?	0.0	24.0	155mm	90.0	North	Horizontal	one other contact (small) near by
TR37-18	TRU-339	329042.91	4607164.63	4.3	21.7	-9.1	0.105	0.3	105mm?	NA	NA	NA	NA	NA	NA	Anomaly located - unable to recover - deeper than one foot
TR37-19	TRU-340	329061.10	4607165.12	4.4	64.2	-32.4	0.217	1.0	very large target dig?	2.0	14.0	105mm	40.0	North	Straight down	Clay bottom
TR37-20	TRU-341	329067.49	4607163.87	4.3	66.8	-49	0.164	0.3	155mm?, clutter 3m East	8.0	14.0	90mm	40.0	North	Horizontal	Hard clay bottom
TR37-21	TRU-342	329100.39	4607165.93	4.4	127.4	-73	0.225	0.6	very large target in clutter, dig?	1.0	24.0	155mm	90.0	NE	Horizontal	Clay bottom
TR37-22	TRU-343	329122.97	4607165.90	4.4	48.6	-23.9	0.142	0.4	155mm?, Target 22, 23 7m apart	3.0	24.0	155mm	90.0	North	Horizontal	Clay bottom
TR37-23	TRU-344	329131.66	4607166.03	4.4	41.2	-7.8	0.118	0.5	105mm?	NA	NA	NA	NA	NA	NA	Hard clay - contact below 2 feet
TR37-37	TRU-345	329332.11	4607166.42	4.4	74.4	-22.7	0.174	0.5	155mm, Targets 37, 38, 39 clustered together	4.0	24.0	155mm	90.0	West	Horizontal	Sand bottom
TR37-38	TRU-346	329339.68	4607163.77	4.4	66.5	-27.7	0.156	0.4	155mm?	0.0	24.0	155mm	90.0	North	Horizontal	Hard sand bottom
TR37-39	TRU-347	329348.41	4607165.61	4.4	63.3	-33.3	0.168	0.4	155mm?	0.0	24.0	155mm	90.0	North	Horizontal	Sand bottom
TR37-42	TRU-348	329433.15	4607167.20	4.4	69.9	-27	0.148	0.2	155mm?	16.0	24.0	155mm	90.0	North	Horizontal	Sandy bottom
TR37-49	TRU-349	329530.31	4607165.27	4.4	39.2	-8.8	0.116	0.3	105mm?, dig	5.0	24.0	155mm	90.0	North	Horizontal	Sandy bottom
TR37-55	TRU-350	329615.25	4607166.31	4.5	63.4	-24.6	0.159	0.4	155mm?	4.0	24.0	155mm	90.0	North	Horizontal	Sandy bottom
TR37-56	TRU-351	329623.57	4607166.82	4.5	50.2	-22.1	0.120	0.2	target in clutter	3.0	24.0	155mm	90.0	North	Horizontal	Sand and mud bottom
TR37-57	TRU-352	329630.89	4607165.86	4.5	91.1	-41.2	0.163	0.2	155mm? other targets East and West	3.0	24.0	155mm	90.0	North	Horizontal	Sandy bottom
TR37-65	TRU-353	329720.26	4607165.93	4.5	68.4	-33.9	0.173	0.5	large target, 65&66 5m apart	3.0	24.0	155mm	90.0	North	Horizontal	Sandy bottom
TR37-66	TRU-354	329727.00	4607166.50	4.5	57.6	-23	0.143	0.4	155mm?	18.0	9.0	90mm	40.0	North	Horizontal	Hard sand bottom
TR37-80	TRU-355	329848.52	4607167.49	4.5	67.8	-10	0.133	0.3	155mm?	8.0	7.0	37mm	2.0	North	Horizontal	Unfuzed
TR37-81	TRU-356	329889.89	4607168.25	4.6	14.3	-4.7	0.085	0.4	mortar?, targets 81&82 5m apart	6.0	20.0	90mm	40.0	North	Horizontal	Sandy bottom
TR37-82	TRU-357	329896.65	4607165.84	4.6	15.6	-6.5	0.083	0.2	two sensors see, mortar?	6.0	20.0	105mm	30.0	North	Horizontal	Sand bottom
TR37-84	TRU-358	329925.18	4607165.97	4.6	53.3	-6.6	0.128	0.5	155mm?, Targets 84,85&86 clustered together	12.0	20.0	90mm	40.0	East	Horizontal	Sandy bottom
TR37-85	TRU-359	329932.14	4607162.40	4.6	166.4	-137	0.253	0.5	very large target, dig?	6.0	2.0	Fuze	0.5	North	Horizontal	Hard sand bottom
TR37-86	TRU-360	329940.34	4607164.70	4.6	128.4	-116.3	0.224	0.4	very large target, dig	5.0	24.0	155mm	90.0	North	Horizontal	Sandy bottom - half burried
TR37-92	TRU-361	330035.21	4607166.44	4.6	53.4	-12.8	0.138	0.3	155mm?	5.0	24.0	155mm	90.0	NW	Horizontal	Sandy / mud bottom
TR37-93	TRU-362	330044.00	4607167.03	4.6	60.6	-55.8	0.161	0.2	155mm?, target 94 2m East	2.0	24.0	155mm	90.0	North	Horizontal	Sandy bottom
TR37-94	TRU-363	330046.71	4607166.14	4.6	72.2	-18.2	0.142	0.3	155mm?, target 93 2m West	2.0	24.0	155mm	90.0	North	Horizontal	Sandy bottom
TR37-102	TRU-364	330141.21	4607162.65	4.6	69.4	-34.1	0.146	0.2	155mm,dig	6.0	24.0	155mm	90.0	North	Horizontal	Sandy bottom
TR37-112	TRU-365	330292.69	4607163.21	4.6	64.9	-58	0.153	0.2	155mm, dig	6.0	24.0	155mm	90.0	North	Horizontal	Sandy bottom
TR37-114	TRU-366	330341.22	4607164.62	4.6	58.0	-35.2	0.142	0.2	155mm?dig	8.0	20.0	Fuze, 90mm & Frag	40.0	North	Horizontal	All three items were 2 feet apart - more contacts around
TR37-115	TRU-367	330441.62	4607166.96	4.7	83.2	-56	0.159	0.2	155mm? dig	NA	NA	NA	NA	NA	NA	Hard clay - contact below 2 feet
TR37-116	TRU-368	330552.25	4607163.42	4.7	29.2	-8.5	0.101	0.3	105mm?	4.0	20.0	90mm	40.0	North	Horizontal	Sand bottom
TR37-117	TRU-369	330594.69	4607160.54	4.8	27.9	-4.2	0.098	0.3	105mm? dig	NA	NA	NA	NA	NA	NA	Sandy bottom - item below 2 feet
TR37-118	TRU-370	330606.70	4607161.42	4.8	22.8	-7	0.109	0.5	105mm? dig	3.0	10.0	57mm & 37mm	6.0	North	Horizontal	Sandy bottom
TR37-119	TRU-371	330632.31	4607162.33	4.7	19.2	-2.4	0.090	0.4	105mm? dig	0.0	24.0	155mm	90.0	North	Horizontal	Sandy bottom
TR37-120	TRU-372	330695.57	4607161.27	4.7	70.3	-35.7	0.145	0.1	155mm? dig	NA	NA	NA	NA	NA	NA	Sandy bottom - contact below 2 feet
TR37-150	TRU-389	336477.42	4607163.71	7.0	22.4	-4.1	0.108	0.5	105mm?	14.0	20.0	90mm	30.0	East	Horizontal	Mud and silt bottom - unfuzed

Table 11. Target Dig list and dig results from transect WS89 survey

AETC TARGET ANALYSIS									Diver Comments and Information						
AETC Target ID	Nelson List Targ. ID	UTM X (m)	UTM Y (m)	Water Depth (m)	Max. Signal (nT)	Min. Signal (nT)	Size (m)	Analyst Comment	Burial Depth (in)	Target Length (in)	OE ID	Orientation	Weight (lb)	Attitude	Narrative
TR89-5	TRU-307	327216.62	4615746.32	7.6	31.4	-9.3	0.129	good target	36	24	155mm	Straight down	90	Straight down	Very soft mud bottom - unable to recover
TR89-6	TRU-308	327396.15	4615740.68	7.7	66.0	-23.6	0.182	good target	24	24	155mm	Straight down	90	Straight down	Very soft mud bottom - unable to recover
TR89-7		327629.81	4615744.49	7.8	8.4	-2.7	0.104	Good target, may be too deep							
TR89-11	TRU-309	328177.26	4615743.93	8.0	48.1	-4.9	0.168	155mm?	32	24	155mm	Straight down	90	Straight down	Soft mud - not recovered
TR89-12	TRU-310	328363.85	4615745.58	8.1	78.6	-15.3	0.197	large target on 8 sensors, use	15	12	Scrap	North	20	Horizontal	Soft mud - not recovered
TR89-13	TRU-311	328655.62	4615741.72	8.2	51.2	-3.7	0.144	large target, does not look like UXO, Dig Anyway	36	24	155mm	Straight down	90	Straight down	Soft mud - felt with hand - 155mm base - three feet deep - not recovered
TR89-14	TRU-312	328709.32	4615752.65	8.1	55.3	-6.6	0.172	large target, 155mm?, use	36	24	155mm	North	90	Straight down	Soft mud
TR89-15	TRU-313	328889.86	4615756.55	8.2	12.0	-4.1	0.113	good target, 105mm?	24	24	155mm	Straight down	90	Straight down	Soft mud - not recovered
TR89-16	TRU-314	329294.32	4615751.92	8.3	18.5	-3.5	0.105	good target, 105mm?	24	24	155mm	Up	90	Straight up	Soft mud
TR89-19	TRU-315	330156.62	4615740.11	8.5	66.1	-10.6	0.177	good target, 155mm?	30	24	155mm	Straight down	90	Straight down	Soft mud - not recovered
TR89-20	TRU-316	330176.30	4615741.03	8.5	29.5	-17.7	0.151	good target 155mm?	32	24	155mm	West	90	Horizontal	Soft mud bottom
TR89-21	TRU-317	330223.62	4615741.34	8.6	41.8	-5.6	0.143	good target, 155mm?	24	14	90mm	East	40	Horizontal	Soft mud bottom - 90mm, fuzed - not recovered
TR89-23	TRU-318	330313.47	4615753.05	8.6	91.4	-6.9	0.162	good target on 7 sensors, 155mm?	24	24	155mm	North	90	Straight Down	Soft mud bottom
TR89-24	TRU-319	330587.90	4615741.67	8.6	20.5	-2.7	0.107	good target 105mm?	0	NA	Scrap	West	NA	NA	Soft mud bottom - trash, cans, metal motor - not recovered
TR89-25	TRU-320	330670.80	4615741.77	8.5	23.6	-4.0	0.108	good target, 105mm?	32	24	155mm	West	90	Straight down	Very soft mud
TR89-29	TRU-321	331097.69	4615740.34	8.6	21.4	-7.3	0.108	partial signal, 105mm?	30	24	155mm	Straight down	90	Straight down	Soft mud bottom - 155mm - not recovered
TR89-30	TRU-322	331114.77	4615740.59	8.5	39.8	-4.5	0.153	good target, 155mm?	24	NA	Frag	Straight down	NA	Straight down	Soft mud bottom - frag - not recovered
TR89-31	TRU-323	331230.12	4615746.29	8.6	22.3	-4.2	0.111	good target 105mm?	24	24	155mm	North	90	Straight down	Very soft mud - 155mm - not recovered
TR89-32	TRU-324	331283.41	4615746.89	8.6	21.0	-2.6	0.106	good target, 105mm?	24	24	155mm	Straight down	90	Horizontal	Soft mud bottom - 155mm - not recovered
TR89-34	TRU-325	331476.39	4615747.75	8.6	50.0	-13.4	0.165	good target, 155mm?	36	24	155mm	North	90	Horizontal	Soft mud bottom
TR89-36	TRU-326	331727.85	4615744.03	8.2	110.3	-59.3	0.193	good target, larger than 155mm	32	24	155mm	North	90	Straight down	Soft mud bottom - not recovered
TR89-42	TRU-327	332095.09	4615738.36	8.7	28.7	-5.6	0.115	good target, 105mm?	8	14	90mm	North	30	Straight up	Hard clay bottom - 90mm nose up
TR89-44	TRU-328	332388.54	4615742.57	8.7	21.0	-4.0	0.118	good target, 105mm?	32	NA	NA	NA	NA	NA	Soft mud - dug 32 in but contact was deeper
TR89-46	TRU-329	333526.36	4615744.76	8.8	13.4	-6.0	0.129	good target	0	1	Scrap	NA	NA	NA	Soft mud - ball of 1 in diameter cable - not recovered

Table 12. Target Dig List and dig results from transects WS15 and WS19

AETC TARGET ANALYSIS										Diver Comments and Information						
AETC Target ID	Nelson List Targ. ID	UTM X (m)	UTM Y (m)	Water Depth (m)	Max. Signal (nT)	Min. Signal (nT)	Size (m)	Burial Depth (m)	Analyst Comments	Burial Depth (in)	Length (in)	OE Type	Orientation	Wt. (lb)	Attitude	Narrative
WS15-1	TRU-58	323597.65	4622345.54	8.6	6.7	-1.4	0.116	1.2	multiple clutter objects	24	NA	NA	NA	NA	NA	Soft mud - Small hit in area - contact below two feet
WS15-2	TRU-59	323709.19	4622348.36	8.6	53.6	-8.9	0.181	0.6	good target, projo?	NA	NA	NA	NA	NA	NA	Soft mud - contact below 2 feet
WS15-3	TRU-60	324074.23	4622346.67	8.6	18.1	-3.7	0.102	0.1	likely clutter	19	5.0	Scrap	Horizontal	2	Horizontal	Old broken metal box 5 in by 5 in
WS15-4	TRU-61	324501.23	4622344.52	8.6	17.2	-10.9	0.129	0.3	strongly inverted, likely clutter	0	NA	NA	NA	NA	NA	Lots of small signal detector - no major contacts
WS15-5	TRU-62	324576.89	4622344.71	8.6	72.9	-4.7	0.180	0.5	excellent target, projo?	NA	NA	NA	NA	NA	NA	Soft mud bottom - contact below 2 ft
WS15-6	TRU-63	324830.77	4622327.24	8.8	9.8	-6.2	0.104	0.3	clutter	8	10.0	Scrap	South	3	Horizontal	Soft mud, metal junk 10in by 10in
WS15-7	TRU-64	324862.02	4622318.33	8.8	8.4	-3.7	0.089	0.6	clutter over reef	NA	NA	NA	NA	NA	NA	Soft mud - contact below 2 feet
WS15-8	TRU-65	325015.32	4622232.35						part of 4-target group over reef	24	NA	NA	NA	NA	NA	Soft mud - contact below 2 feet
WS15-9	TRU-66	325019.61	4622233.60	8.6	37	-8.8	0.140	0.1	4-target group, looks like boat anchor	24	36.0	250 lb Bomb	North	250	Horizontal	Soft mud, 250lb bomb, not recovered
WS15-10	TRU-67	325024.18	4622233.06						part of 4-target group over reef	24	36.0	NA	South	10	Horizontal	Soft mud - big piece of metal - 36in by 28in
WS15-11	TRU-68	325581.26	4622346.79	8.6	32.8	-14.1	0.154	0.4	good target, possible 155mm	36	NA	NA	NA	NA	NA	Soft mud - contact below 2 feet
WS15-12	TRU-69	327096.15	4622346.01	8.9	74	-17.8	0.214	0.4	very good target, large projo?	36	24.0	155mm	straight down	90	Straight Down	Soft mud bottom - 155mm nose down - 36 inches down - not recovered
WS19-1	TRU-50	323790.97	4623669.75	9.3	100.5	12.6	0.155	0.1	partial signature, dig	24.0	NA	NA	NA	NA	NA	Soft Silt and mud bottom - contact below 2 feet - soda can on surface
WS19-3	TRU-51	323974.50	4623665.58	9.4	672.9	-219.3	0.411	0.4	single object, too big for UXO, find out	12.0	NA	NA	NA	NA	NA	Not recovered - big pile of metal trash 12 inches deep
WS19-4	TRU-52	324127.60	4623667.48	9.5	16.6	-3.7	0.096	0.1	likely too small for UXO	NA	NA	NA	NA	NA	NA	Silt and mud bottom - No contact
WS19-5	TRU-53	324666.62	4623668.14	9.8	27.2	-3.2	0.118	0.3	small target	36.0	NA	NA	NA	NA	NA	Soft mud bottom and contact below 3 feet
WS19-6	TRU-54	325134.79	4623663.33	9.5	41.3	-13.9	0.195	0.6	large target, could be projectile	36.0	NA	NA	NA	NA	NA	Soft silt and mud - contact below 2 feet
WS19-7	TRU-55	326030.44	4623667.58	9.3	52.1	-8.6	0.176	0.6	could be 155mm	36.0	24.0	155mm	straight down	90.0	Straight Down	Soft mud - item (155mm) base down 36 inches - not recovered
WS19-8	TRU-56	326076.20	4623667.69	9.2	54.4	-8.7	0.148	0.3	looks like a boat anchor	NA	NA	NA	NA	NA	NA	Very soft mud and contact below 2 feet
WS19-9	TRU-57	326548.65	4623661.11	9.2	74.4	-38.1	0.206	0.4	Large inverted target, projo?	36.0	NA	NA	NA	NA	NA	Soft mud and contact below 3 feet

4. Target Recovery Operations

AETC contracted with Explosive Ordnance Technologies, Inc. (EOTI) to conduct the target reacquisition and marking, target recovery, and materials disposal for the recovered materials. In addition, they supported installation of the calibration targets and provided a chase boat and UXO-qualified diver to support the MTA survey operations.

Based upon the recommended Dig Lists generated from the MTA surveys (Appendix B) and an additional target list provided by Sky Research from the Airborne survey, the Program Office established a dig list of 255 targets for intrusive investigation. These are identified in Tables 6-9 in this report and visually depicted in Figure 13.

EOTI's fieldwork was performed in three phases.[13] Initially, a small advance party of UXO Technicians mobilized to the site to arrange logistical support. This party also refined operational procedures and began reacquisition and recovery of the anomalies. Additional UXO Technicians were then mobilized to conduct the intrusive site operations and to document the results and classify the investigated items. Following the investigation and documentation phase, a partial demobilization of personnel took place. A closeout party remained to conduct disposal operations and other closeout tasks. During this phase, following the explosive demilitarization of recovered MPPEH, the scrap was collected, inspected, certified free of explosive hazard, and transferred to a recycling facility. EOTI initially mobilized personnel and equipment on 25 September 2006. The subsequent mobilization of additional personnel and equipment occurred on 1 October 2006. Final site work was complete on 20 October 2006.

4.1 Target Reacquisition

To reacquire a target on the Dig List, the reacquisition team navigates to the location of the anomaly using a Trimble Geo XT hand-held GPS capable of sub-meter accuracy. Daily Quality Control tests of the device revealed that it routinely achieved sub-foot accuracy when tested against known benchmarks. Driving the support boat, the team converges on the predicted location of the anomaly using the GPS unit. The location is marked with a weight and buoy, Figure 14. The magnetic anomaly is then reacquired from the boat using an underwater magnetometer (Schonstedt MG-230 Gradiometer) and if necessary the emplaced buoy position is refined.

Figure 14. With the dive boat and the chase boat working together, an UXO Tech prepares to mark the position of a reacquired target.

4.2 Target Recovery

Figure 15. A UXO diver with a Fisher metal detector is shown preparing to dive on a marked target in the Toussaint River. The dive boat in the background is reacquiring and marking additional targets for investigation.

A UXO Diver preparing to recover a target dives on the marked location carrying a Fisher Model 1280-X hand-held underwater metal detector, Figure 15. If the target is not located immediately at the weight, the diver begins circling the weight in an outwardly spiraling pattern until he locates the metallic anomaly. If the diver cannot identify a magnetic anomaly within about 2.5 meters of the drop weight, the supervisory UXO tech in the group must make a decision either to declare the location a "dry hole" or to go through the reacquisition process again to confirm the correct target location. If the diver locates the target and is satisfied that the identified anomaly corresponds to the anomaly on the dig sheet he then, either with his hands or with hand tools depending on the depth of the anomaly, attempts to uncover the item so that it can be identified and recovered.

Each anomaly on the dig list was carefully uncovered (if possible) so that it could be examined to identify the item, evaluate its condition, and to determine if it can be brought to the surface for consolidation. In some cases, the bottom composition precluded access to and/or identification of the anomaly. In other cases, the bottom composition allowed enough access to identify the anomaly, but recovery of the item was not feasible. Whenever possible, Figure 16 and 17, anomalies were raised to the surface and marked with tape bearing the target number.

Following its investigation, each anomaly item was documented on the dig list spreadsheet. The observations made by the dive team members have been incorporated into the reports presented as Tables 6-9. Additionally, each recovered item was photographed. Photographs are included electronically in Appendix C. The file names for the photographs relate to the anomaly that they

Figure 16. A UXO diver is shown returning to the surface with a 90 mm projectile that was lying proud of the bottom.

Figure 17. A lift bag and the dive boat hoist were required to free this 155 mm projectile from the mud.

represent (for example, File TRU-358.jpg, is a photograph of the item identified as Anomaly TRU-358). TRU-XXX is one of the Dig List designations provided to EOTI by the Program Office. Tables 6-9 in this report correlate the Program Office unique target identification numbers with the AETC unique target identification numbers assigned at the time of the target analysis.

Figure 18. A UXO Tech is shown showing off a collection of projectiles recovered during one day's diving.

4.3 Target Disposal

All recovered items were carefully inspected to verify that they did not present an explosive hazard. For some targets this required a cursory cleaning. However, except for the targets that were buried in the mud, the recovered ordnance was relatively clean and in near pristine condition. Figure 18 shows 23 projectiles in the dive boat, which were collected during the course of a successful day of diving. The recovered targets were brought ashore and hand-carried to a secure stockpile storage point that was provided by ARES, Inc.

Many of the recovered items required demolition operations to ensure that they were free of explosive hazards prior to disposal. On 18 October 2006, demolition operations were conducted on 85 items at a facility provided by ARES, Inc.

Explosive shaped-charge perforators were used to puncture and vent each of the items. These were obtained from Halliburton Corporation in Alvarado, TX. Cast boosters, Detonating Cord, non-electric detonators, and associated materials needed for the demolition operations were obtained from Hilltop Energy, Inc., Mineral City, OH. Figure 19 shows preparations for the demolition. A trench was dug and the ordnance items were placed in the bottom of the trench. The perforators are fixed both to the body of the projectile and to the fuze area (if one was present). The collection of ordnance was tamped (in this case) with 3 layers of sand bags, and all the charges were detonated simultaneously. The tamping was to reduce the danger of shrapnel damage (if any of the items were HE filled). It also reduced the scattering of the ordnance, which had to be collected following

Figure 19. Three UXO techs are shown preparing the stockpiled ordnance for demolition.

demolition. Most of the explosive energy is released into lifting a plume of sand straight up into the air.

Following the demolition, certified MEC scrap and other metallic scrap recovered during the operation were certified as free of explosives residue. The scrap was collected into barrels and transported for disposal after completion of the fieldwork. The scrap was disposed of through a local metal recycling facility, Burns Iron and Metal Company, Inc., Fremont, Ohio. As required by law, ordnance and ordnance scrap could not be released to the public until it has been either processed through a smelter or shredded. A total of 3,320 pounds of scrap was turned in. In accordance with DoD 4160.21-M, the turn-in of scrap was documented on DD Form 1348-1A, Issue Release/Receipt Document.

5.0 Summary

During the intrusive investigation phase of this demonstration project, a total of 229 anomalies from the Program Office Dig List were reacquired, investigated, and documented. In 6 instances, the diver investigation of a single Dig List target resulted in the recovery of more than 1 item. One anomaly on the Program Office Dig List was identified twice; it was investigated twice based upon two different anomaly numbers.

No HE-filled projectiles were recovered during the intrusive investigations at Lake Erie. However, 33 MEC items were identified that could not be recovered either because of the way they were fuzed or because they were not sufficiently accessible to determine their fuzing. These unrecovered MEC items are documented below in Table 13. Eleven of the intrusive investigations resulted in identification of shrapnel that resulted from high order detonation of projectiles. This documents the fact that a fraction of projectiles fired on this range were HE filled.

After consultation with LTC Herrington-Clemens at Camp Perry, and in accordance with customary practice, EOTI reported the existence of these MEC items to LT Patrick Gerhardstein at EODMU Two, Det Crane in Crane, IN for their prosecution and disposal. EODMU Two Det Crane is a detachment of the US Navy EOD Mobile Unit Two.

Figure 20 is a representation of Figure 13 modified to show the partition between UXO recoveries (♦) and non-UXO recoveries (♦) among the 229 intrusive investigations.

5.1 The Toussaint River

Of the 28 intrusive investigations made in the Toussaint River there were no UXO recoveries or identifications. However, for 21 of the 28 targets that were investigated, the diver either failed to identify any target or we concluded that he recovered a target different from the one specified in the Dig List. We conclude that there is insufficient information resulting from the investigations in the Toussaint River to determine whether UXO is present. We do feel however, if UXO is present in the River channel it will likely be located very near the mouth of the River where sand is constantly migrating into and out of the channel because of strong currents in the narrow channel at the mouth of the river.

Because most of the dredged boat channel in the River has several feet of very soft silt on the bottom, it is very unlikely that UXO will migrate very far up river unless it is mechanically moved by dredging or other operations. The very deep and soft silt/mud would effectively trap any ordnance migrating into the river from the Lake.

Table 13. Target list of identified UXO that were not recovered

AETC Target ID	Nelson List Targ. ID	UTM X (m)	UTM Y (m)	Water Depth (m)	Burial Depth (in)	Length (in)	OE Type	Wt. (lb)	Orientation	Attitude	Diver Comment
WS19-7	TRU-55	326030.44	4623667.58	9.3	36	24	155mm	90	straight down	Straight Down	Soft mud - 155mm base down - not recovered
WS15-9	TRU-66	325019.61	4622233.60	8.6	24	36	250 lb Bomb	250	North	Horizontal	Soft mud - 250 lb bomb - not recovered
WS15-12	TRU-69	327096.15	4622346.01	8.9	36	24	155mm	90	straight down	Straight Down	Soft mud - 155mm nose down - not recovered
TR77-12	TRU-225	331690.78	4613767.08	6.2	24	24	155mm	90	North	Straight down	Silt and mud bottom - 155mm stuck in rocky bottom - not recovered
TR77-17	TRU-227	332308.40	4613761.81	6.0	24	24	155mm	90	Straight down	NA	Sand/rock - unable to recover
TR35-27	TRU-262	329347.69	4606837.20	4.4	6	24	155mm	90	North	Horizontal	Sand/clay bottom-155mm fuzed-not recovered
TR35-45	TRU-268	329587.70	4606831.98	4.4	6	24	155mm	90	North	Horizontal	Sand/clay bottom-155mm fuzed-not recovered
TR35-59	TRU-272	329723.75	4606831.90	4.4	6	20	4.2 in Mortar	40	North	Horizontal	4.2 in mortar, fuzed - not recovered
TR35-122	TRU-281	330529.89	4606837.00	4.7	2	20	4.2 in Mortar	40	North	Horizontal	Sandy bottom - 4.2 in mortar, fuzed - not recovered
TR35-123	TRU-282	330538.73	4606836.26	4.7	6	20	4.2 in Mortar	40	North	Horizontal	Sandy bottom - 4.2 in mortar, fuzed - not recovered
TR35-128	TRU-283	330654.19	4606837.01	4.7	5	20	90mm	40	East	Horizontal	Hard sandy bottom - 90mm fuzed - not recovered
TR35-176	TRU-294	331944.94	4606836.09	4.9	6	24	155mm	90	North	Horizontal	Soft mud bottom - 155mm & M48 fuze - not recovered
TR35-178	TRU-295	332082.33	4606838.96	5.1	6	24	155mm	90	North	Horizontal	155mm, fuzed - not recovered
TR35-179	TRU-296	332127.62	4606837.39	5.1	3	24	155mm	90	North	Horizontal	155mm, fuzed - not recovered
TR35-181	TRU-298	332192.40	4606831.91	5.1	20	20	4.2 in Mortar	30	North	Horizontal	Sand/clay bottom-4.2 in mortar, fuzed-not recovered
TR35-188	TRU-303	332912.68	4606835.26	5.5	28	24	155mm	90	NE	Horizontal	Sand/clay bottom-155mm fuzed-not recovered
TR89-5	TRU-307	327216.62	4615746.32	7.6	36	24	155mm	90	Straight down	Straight down	Very soft mud bottom - unable to recover
TR89-6	TRU-308	327396.15	4615740.68	7.7	24	24	155mm	90	Straight down	Straight down	Very soft mud bottom - unable to recover
TR89-11	TRU-309	328177.26	4615743.93	8.0	32	24	155mm	90	Straight down	Straight down	Soft mud - not recovered
TR89-13	TRU-311	328655.62	4615741.72	8.2	36	24	155mm	90	Straight down	Straight down	Soft mud-felt with hand-155mm base- not recovered
TR89-15	TRU-313	328889.86	4615756.55	8.2	24	24	155mm	90	Straight down	Straight down	Soft mud - not recovered
TR89-19	TRU-315	330156.62	4615740.11	8.5	30	24	155mm	90	Straight down	Straight down	Soft mud - not recovered
TR89-21	TRU-317	330223.62	4615741.34	8.6	24	14	90mm	40	East	Horizontal	Soft mud bottom - 90mm, fuzed - not recovered
TR89-29	TRU-321	331097.69	4615740.34	8.6	30	24	155mm	90	Straight down	Straight down	Soft mud bottom - 155mm - not recovered
TR89-31	TRU-323	331230.12	4615746.29	8.6	24	24	155mm	90	North	Straight down	Very soft mud - 155mm - not recovered
TR89-32	TRU-324	331283.41	4615746.89	8.6	24	24	155mm	90	Straight down	Horizontal	Soft mud bottom - 155mm - not recovered
TR89-36	TRU-326	331727.85	4615744.03	8.2	32	24	155mm	90	North	Straight down	Soft mud bottom - not recovered
Air-101	TRH-101	329434.65	4604793.80	2.1	24	24	155mm	90	Straight Down	Vert	155mm below 2 Feet - Not recovered
Air-104	TRH-104	329518.47	4604589.26	1.9	26	48	2.75in Rocket	25	60 Deg Down	60 Deg Down	Hard Mud - Not Recovered - Assumed Fuzed
Air-105	TRH-105	329574.41	4604481.35	2.1	6	48	2.75in Rocket	25	E	Hor	Mud - Not Recovered - Fuzed
	TRH-106	329345.56	4604761.77	1.3	12	24	155mm	90	N	Hor	Sand - Not Recovered - Fuzed
	TRH-110	329360.10	4604665.34	1.8	30	24	155mm	90	Straight Down	Vert	Mud - Not Recovered
	TRH-111	329426.14	4604551.17	2.0	6	24	155mm	90	N	Hor	Sand - Not Recovered - Fuzed

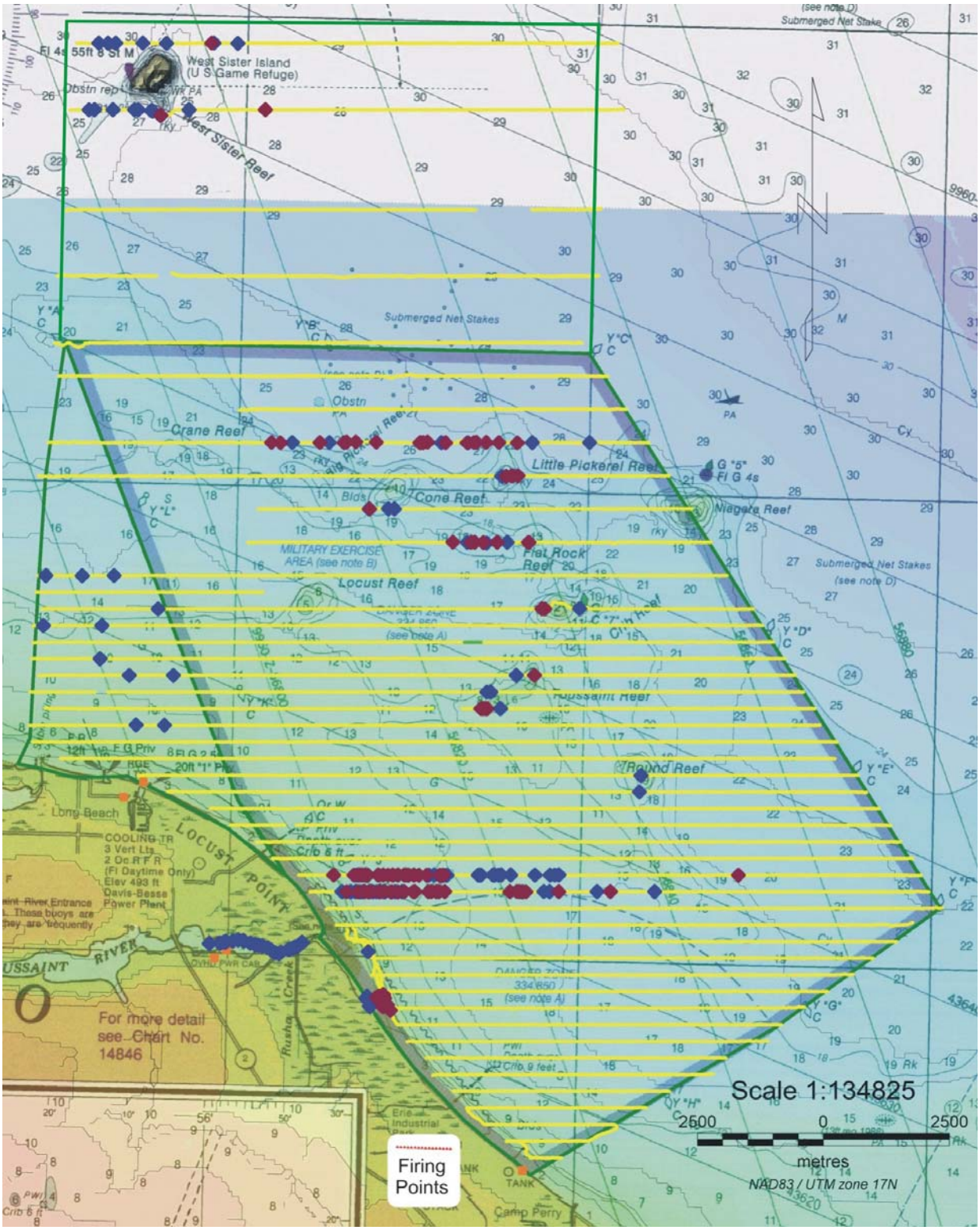

Figure 20. The UXO recoveries are noted as red diamonds; the recoveries in which no UXO was found are noted as blue diamonds.

5.2 The Davis-Besse Impoundment Area

This area is outside the formal range boundary adjacent to the shoreline of the nuclear power plant property. There were 11 intrusive investigations carried out in this area. In each dive the bottom was described as rock, rocky, or hard clay. The recoveries included 4 anchors, several pieces of metal scrap or boat parts, and several references to hot rocks or geological returns. Figure 11 shows that this area is only sparsely populated with metallic anomalies. Based upon the rather limited number of intrusive dives made in this large area we can conclude that there is very little or perhaps no UXO contamination west of this range boundary. The magnetic anomalies measured in this area and reported in Table 7 likely represent the indigenous background level from historical non-ordnance related activities.

5.3 The Impact Ranges

5.3.1 The Ordnance Recovered

Table 14 summarizes the results of the intrusive investigations that took place within the current and former Erie Proving Ground Range boundaries, extending to the north side of West Sister Island. The intrusive investigations in the Toussaint River and in the Davis-Besse Impoundment Area described above are not included in this discussion.

Table 14. Summary of the intrusive investigations within the range boundaries

Recovery	Survey Area							
	Airborne	All Reefs	Tr35	Tr37	Tr89	WS15	WS19	Subtotal
155 mm Projo	7	10	18	25	16	2	1	79
105 mm Projo		3	1	3				7
90 mm Projo		2	4	7	2			15
75 mm Projo		2	1					3
57 mm Projo				1				1
37 mm Projo			2	2				4
4.2 in Mortar		1	4					5
2.75 in WH	2							2
250 lb GP Bomb						1		1
Fuze/Ordnance Components				2				2
Frag Recovery		1	8	1	1			11
Anomaly Not Identified/Too Deep/ Hot Rocks, etc.	4	12	6	7	3	7	6	45
Total Intrusive Dives	18	31	49	44	24	12	8	186

Of the 186 intrusive investigations, almost 25% resulted in inconclusive results where either no anomaly was identified because it was buried too deeply to uncover or because the bottom was too hard to dig the anomaly out with hand tools. A higher fraction of unidentified items occurred in the West Sister Transects. This was primarily the result of the deeper water conditions and because of the deep soft mud bottom surrounding the island.

5.3.2 The Fraction of Non-Ordnance Recoveries

Of the 141 intrusive dives that resulted in identification of the target, 117 intact ordnance items were recovered and an additional 13 recoveries were described as fuzes, ordnance components and/or frag pieces. The fraction of non-ordnance related recoveries within the range boundaries was quite low (8.5%). This does not constitute a false alarm rate as usually depicted in ROC curves, which document the analyst's performance in discriminating between ordnance and

clutter. Not all anomalies within a transect area were accepted for analysis, or if they were analyzed, some were excluded from the target list because they did not fit the profile of an ordnance item. The reasons for excluding targets from the target list are documented above. If all of the excluded targets were included in the target list, they would likely have no affect on the fraction of ordnance that was recovered. Most targets that were excluded were excluded because the visual inspection of their signatures made it plain that they were not ordnance – they would have been listed as "don't-dig" targets.

The target lists of analyzed targets prepared by AETC were much more extensive than the list of targets that were investigated by divers. The list of targets recommended by AETC for diver investigation was somewhat more extensive than the reduced list provided to the divers. In general, the targets that were investigated by the divers were those rated "most probably ordnance" by AETC. Only if the entire target list was investigated (or the entire target list was uniformly sampled by intrusive investigation) would the 8.5% non-ordnance recoveries in the range area represent a false alarm rate.

The way that the intrusive investigation candidates were selected from the overall target lists reflects the analyst's ability to cherry pick ordnance from a target list (or stated another way, it reflects the analyst's ability to minimize false alarms in the first 30% (or so) of the ROC curve).

5.3.3 Recovered Ordnance that were not Projectiles

The mortars and 2.75 in war heads were recovered relatively close to shore and probably were the result of training on the land-based ranges. In particular, the 2.75 in WH's were recovered very close to the shoreline (from the Helicopter beach and shallow water survey).

The GP bomb is an outlier. It presumably resulted from an air drop, and thus tends to confirm the rumors that the island might have been used as a bombing target. We would caution that one bomb recovery does not constitute or establish a bombing target. Investigations on the island proper would likely prove much more useful for determining this issue. A simple surface inspection might be adequate to establish the presence of air dropped weapons. In general, one would also expect to find a substantial number of 155 mm projectiles on the island. West Sister Island is within easy range for this ordnance, if properly fired from the fixed firing points.

We found no evidence that parts of these ranges were used to dump large caches of ordnance from barges when the range was closed for proof testing. However, the transect spacing, particularly on the northern half of our survey, were quite widely spaced. It is entirely possible that a few barges of ordnance could have been dumped and not detected by our transect surveys.

5.3.4 Presence of Live Ordnance in the Impact Areas.

The density and general distribution of ordnance found in this demonstration survey and from the intrusive recovery of selected anomalies is consistent with the long and intense use of these ranges for proof testing a range of projectiles and guns. More than 80% of our intact ordnance recoveries were 90 mm, 105 mm, and 155 mm projectiles. Most of the remainder was smaller projectiles, mortars and 2.75 in rocket/WHs. Each of the ordnance items was challenged by a

shaped-charge jet perforator. There were no high order detonations during the demolition, indicating that none was explosive filled.

Examination of the ordnance photos shows that all the recovered 155 mm and most of the 105 mm projectiles were fired with shipping lugs in place. The remaining smaller projectiles were recovered without shipping lugs, some had dummy fuze plugs, some had no fuze plugs, and the remainder could not be evaluated from the photos. 155 mm and 105 mm projectiles (high explosive filled or inert) are typically shipped with shipping lugs so they can be handled with mechanical lifts. Usually the shipping lugs are removed before firing. Often they are not replaced with fuzes if they are being fired as practice rounds whether they are live or not. Detonation of a 155 mm round usually leaves the base plate intact. The base plate presents a larger magnetic anomaly signature than many of the smaller projectiles that we recovered. We recovered no 155 mm base plates.

We did, however recover two projectile fuzes and there were 11 instances of frag recoveries that were consistent with detonations of larger projectiles. This is documented in Table 14. In Table 13 the 33 ordnance items that were identified, but not recovered, were described. Fifteen of these (eight 155-mm and two 90-mm projectiles, four 4.2-in mortars, and one 2.75-in WH) were described as being fuzed. It is reasonable to assume that most, if not all of these items, were explosive-filled. Based upon the other recovered 155 mm projectiles, all with shipping lugs, it seems unlikely that a shipping lug would have been replaced with a fuze on a 155 mm projectile if it had an inert fill.

In summary, we conclude that many inert projectiles of all sizes were fired onto this range. Furthermore, there is conclusive evidence that explosive-filled projectiles have also been fired on the range. It is conjectural as to the relative fractions of inert and live ordnance that have been fired. The conclusion is that discovered (or recovered) ordnance must be assumed to be live, until shown to be otherwise.

5.4 Survey Production Issues

By modifying the MTA sensor platform and tow cable, we were able to survey in all the planned areas on Lake Erie, in many cases in water more than 9.6 meters deep. Because of the relatively short tow cable (even when lengthened to 22 meters) our survey speed was cut by 50% when the water was more than 7.5 meters deep. Survey speed had to be reduced even more when wave conditions were higher than ~1.5 feet. On much of the northern half of the site we surveyed at speeds between 1.2 and 1.4 meters/second. At speeds less than ~1.1 meters/second the platform stalls because there is not enough water flow over the stern planes to control the pitch and roll. When the platform stalls in relatively shallow water it pitches downward (following the drooping tow cable) and into the bottom. When the system stalls while operating very deep it rolls (the steeply descending tow cable does not allow the system to dive). On a few occasions we have had the platform roll completely upside down. This usually happens when we have broken the weak link and the wind/waves are drifting the boat and platform along at about 1 meter/second. When this happens, we have to use the chase boat (and or the diver) to right the platform after it floats to the surface.

Two other conditions adversely affected our survey production rate. We had assumed that we could travel from the marina to the distant survey transects by pulling the tow cable in very short and ferrying the system at 5 knots. With high wave conditions, this proved to be completely impractical. The tow boat pitching over the waves violently jerks the tow cable and breaks the weak link; requiring the system to stop to repair the damage. Additionally, this violent jerking on the platform for several hours ferrying back and forth between the marina and the survey area damaged the platform and resulted in permanent loss of one of the sensor platform covers and stripping of the threads in the fastener seats for the attachment bolts.

The final adverse condition that we failed to anticipate was the deteriorating weather during the intended period of the survey operation. During the initial weeks of the operation, there were more relatively calm days than days with wave conditions that would not allow us to attempt to survey. By mid September, on more than half of the days wave conditions were too severe to survey. When we attempted to complete some survey lanes by returning to the site in the second week in October, the entire week was lost because of high winds and waves. 15-20 knot winds can generate off shore wave heights of more than 5 feet in a period of only about an hour.

It was our intent when we began the demonstration to complete well over 1,000 line km of transect surveys. When we completed the last successful survey day on 21 September we had completed only 530 line km, (Table 3). This corresponds to a survey rate of 6.2 km/hour or 1.7 meters/sec. The system was designed to survey at 5 knots (or 2.55 meters/sec).

In spite of the lower survey production rate than anticipated, we completed survey transects that sampled the entire Range 1 and Range 2 areas and extended to beyond (north of) West Sister Island. The survey results, combined with the dig results resulted in an effective mapping of the Erie Army Depot (Camp Perry) impact range areas and a bounding of the limits of the ordnance contamination area.

6.0 Cost Information

Table 15 shows the budget proposed by AETC Incorporated for the MTA demonstration at the Former Erie Army Depot as originally incorporated into the AETC Demonstration Plan. The total proposed costs including mobilization and demobilization, preparation of all work products required for the intrusive investigation and the writing of the final report was $426.521K.

AETC subcontracted the intrusive investigation work to EOTI. Intrusive work took place following the Demonstration Survey and preparation of the dig support products. This was a firm fixed-price subcontract for $247.532K to reacquire, recover, and dispose of 200 anomalies. During the course of the recovery operations AETC modified the subcontract to allow prosecution of an additional 29 anomalies resulting from the Airborne magnetometry survey. The cost of the additional effort was $22.574K. The results of the EOTI recovery project are described in this report and the complete EOTI report is included in electronic format as Appendix D.

The actual final costs incurred by AETC have not been completely reconciled at this point. However, submission of this report in final form and completion of the rebuilding of the data acquisition computer on the tow vessel will complete the charging to this job and will effectively deplete the account.

The overall budget projections outlined in Table 15 proved to be very close to the actual incurred total expenses. Mobilization and demobilization costs were kept relatively low because, using only 2 persons, we moved the MTA vessel and the sensor platform to and from the job site on their transport trailers towed (in one day) by rental vehicles. The vehicles also supported the on-site operations. Mobilization and demobilization costs for this operation were >70% less than they were for the demonstration on Ostrich Bay, primarily because we did not use commercial carriers to move the equipment.

We handled the costs for the second support vessel (chase boat) and the UXO-certified diver/ boat driver during all operations by a separate subcontract to EOTI. These costs were approximately $50K. The presence of the diver in the chase boat proved to be extremely valuable on several occasions when repairs to the sensor platform had to be carried out in the water several miles off shore.

Overall labor costs were approximately 10% higher than anticipated. This was primarily the result of our traveling back to the site for one week in October to attempt to finish the incomplete and additional transects to fill out the survey. Our inability to complete these tasks mildly hurt our overall productivity. The more important reason that our overall productivity was significantly below expectations is that we incorrectly estimated our survey speeds. The combination of rough water (on many days) and the deep water (particularly on the northern half of the area) combined to reduce our survey speed by more than a factor of two during these periods. Additionally, during the second half of the survey operation, high winds and waves forced us to remain at the dock more than half of the time.

Table 15. Proposed budget for AETC MTA survey operations at the Former Erie Army Depot.

Mobilization								
Vehicles		Rent	Miles					**Subtotal**
	Excursion SUV, 6 Weeks	$2,835.14						$2,835.14
	Box Truck, 6 Weeks	$8,926.88	$240.00					$9,166.88
		Airfare	**Salary**	**Per Diem**	**Gas**	**Car**	**EOD Overtime**	
Packup	2 Persons,1 day (8/4)		$1,992.72					$1,992.72
Transport To Port Clinton	2 Persons, 2 days (8/5-6)		$3,985.44	$622.08	$450.00			$5,057.52
	P.I. (8/6) 1 Round trip	$494.00	$1,757.52	$640.00				$2,891.52
	Software Engineer (1 Round Trip, Champaign)	$500.00	$1,002.16	$640.00				$2,142.16
	EOTI/EOD (1 Round Trip)	$500.00						$500.00
	EOD Car (5 weeks)					$2,000.00		$2,000.00
Assembly/Launch	All hands, one day, Aug 7, 8 hr		$5,101.76	$777.60				$5,879.36
Dock	Chase boat and slip rental							$3,650
Operations								
Aug 9-15 P.I. home on 8/15	All Hands, 5days*12hr, 2 days*8hr		$48,466.72	$5,443.20	$630.00			$54,539.92
Aug 16-29 All home on 8/29	4 Persons, + EOD, 10 days*12hr+4 days*8hr		$63,575.52	$8,709.12	$1,260.00		$672.00	$74,216.64
All AETC Hands Return 9/4	Four Round-Trip Airfares, no EOD Return	$1,976.16						$1,976.16
Sept 5-18	4 Hands, EOD on Call, 10 days*12hr+4days*8hr		$91,380.88	$8,709.12	1260.00			$101,350.00
DeMobilization								
Disassembly 9/19	3 Persons		$3,654.56	$466.56				$4,121.12
Packout 9/20	3 Persons,1 day (9/20)		$3,680.56	$493.77				$4,174.33
Transport To Cary	2 Persons, 2 days (9/21-22)		$7,361.12	$622.08	$450.00			$8,433.20
Other Costs								
	Evaluation Trips (4/05)							$3,000.00
	Demonstration Plan							$4,000.00
	Develop HASP							$2,000.00
	Equipment Maintenance							$15,000.00
	Data Processing & Products (off site)							$20,000.00
	Equipment Repair/Restocking							$20,000.00
	Develop/Deliver Report							$25,000.00
	Prepare Datasets, Analyze 2000 targets, Prepare Dig Sheets							$21,000.00
						SUBTOTAL		$394,926.68
						TOTAL WITH FEE		$426,520.81

There were a few days lost because of breakdowns and searching for shops and mechanics to do repairs. In general, we budget ahead for these glitches because they seem to always occur during the first few days of a field operation. Having complete sets of component spares, tools, and equipment manuals minimizes lost time due to breakdowns.

There was a considerable amount of reconstruction and sensor platform structural repair work resulting from damage during the Lake Erie Demonstration. Much of this was the result of operating at depths twice those anticipated in the original design (and from cumulative wear and tear on the equipment from the multiple surveys). Some of these repairs have not been completed yet. It is currently our intention to have this work done at the same time as we are carrying out system modifications and design changes to support the next field demonstration. We believe that some savings can be realized if these processes are carried out at the same time.

As a final antidote, during our two visits to the site prior to the mobilization we picked what we though was the ideal marina to support the operation. Beef Creek Marina, on the Toussaint River, is only about 250 meters from the entrance to the Lake. We failed to realize that strong west and northwest winds sometimes blow the top 3 feet of the Lake Erie toward Buffalo. As the water level in the Lake continued to decrease, and as the survey operation moved continually further to the north and west we moved to a second marina (Wild Wings) , and then a third marina (East Side). In Beef Creek Marina, drifting sand closed the entrance to the Lake and the access channel was effectively dry. In the Wild Wings Marina, although the channel remained open, the boats ended up high and dry at the dock. In the East Side Marina there was constant access to the lake and to the slips at low water, but access was restricted during high water because of a low underpass at the Lake entrance. Additionally, the East Side Marina did not have boat ramps that were adequate to launch or recover the tow vessel. We had to rent three adjacent slips at each marina to accommodate the MTA vessel, the sensor platform, and the chase boat. During the operation, we continually moved back and forth among the marinas depending upon the weather conditions and what part of the area that we were surveying on a given day.

7.0 References

1. "Archive Search Report of the Former Erie Army Depot, Port Clinton, Ohio," Report No. A015, Environmental Science and Engineering, Inc., Jan. 1982

2. "Archive Search Report, Findings for the Former Erie Army Depot, Carroll Township, Ohio," U.S. Army Corps of Engineers, Rock Island District, August 1993

3. "Beach and Underwater Occurrences of Ordnance at a Former Defense Site: Erie Army Depot, Ohio," Joan Pope, Richard D. Lewis, and Timothy Welp, U.S. Army Corps of Engineers, Waterways Experiment Station, Report CERC-96-1, January 1996

4. "Unexploded Ordnance Support for the Toussaint River Dredging Demonstration Project, Ottawa County, Ohio," Human Factors Applications, Inc., Final Removal Report, February, 1996

5. "USACE Ordnance and Explosives Project Daily Quality Assurance Report at the Former Erie Army Depot (Beach Area) – QAR #46," ATI, August, 2002

6. "Report of the Defense Science Board Task Force on Unexploded Ordnance," Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics, Washington, D.C. 20301-3140, December, 2003, http://www.acq.osd.mil/dsb/uxo.pdf.

7. "Environmental Security Technology Certification Program Demonstration Plan for the Former Erie Army Depot and the Toussaint River," ESTCP, 8 August 2006

8. "UXO Characterization Plan for the Toussaint River and former Erie Army Depot, A Proposal Submitted by AETC Incorporated To Conduct a MTA Survey of Selected Areas of Lake Erie Adjacent to the Former Erie Army Depot and the Toussaint River, AETC Incorporated, 20 July 2006

9. "EOTI Work Plan for Target Retrieval on Lake Erie," EOTI, 12 September 2006

10. "Site Specific Work Plan in Support of Validation of the Marine Towed Array Demonstration at the Former Erie Army Depot and the Toussaint River," EOTI, 14 September 2006

11. "Site Specific Safety and Health Plan in Support of Validation of the Marine Towed Array Demonstration at the Former Erie Army Depot and the Toussaint River," EOTI, 14 September 2006

12. "Dive Management Plan in Support of Validation of the Marine Towed Array Demonstration at the Former Erie Army Depot and the Toussaint River," EOTI, 18 September 2006

13. “Explosive Ordnance Technologies, Inc (EOTI), Site Specific Final Report. Support of Validation of the Marine Towed Array Demonstration at the Former Erie Army Depot and Toussaint River, Port Clinton, OH,” EOTI, 27 October 2006

8.0 Points of Contact

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Beef Creek Marina 4358 N. Rider Rd. Oak Harbor, OH 43449	Dan Mora	Manager	Tel: 419-898-1829
Wild Wings Marina 6395 N Russell Rd. Oak Harbor, OH 43449			Tel: 419-898-1416
East End Marina 10195 W. State Rt. 2 Oak Harbor, OH 43449			Tel: 419-898-7009
Fairfield Inn 3760 E. State Rd Port Clinton, OH 43452			Tel: 419-732-2434

Dive Management Plan
in
Support of Validation of the Marine Towed Array Demonstration
at
Former Erie Army Depot and Toussaint River

Prepared For:

AETC Incorporated
120 Quade Drive
Cary, NC 27513

Prepared By

EOTI
EXPLOSIVE ORDNANCE TECHNOLOGIES, INC.

105 West Tennessee Ave.
Oak Ridge TN, 37830

SEPTEMBER 18, 2006

DIVING MANAGEMENT PLAN

REFERENCES

a. US Navy Diving Manual
b. Diving Supervisors Handbook
c. EOTI proposal
d. US Navy No-Decompression tables

GENERAL PROCEDURES

Diving operations will focus on supporting the validation of the Marine Towed Array demonstration as well as the location, prosecution and possible disposal of any hazardous anomalies.

PERSONNEL

The OE/UXO dive teams will consist of a total of 8 persons having the following minimum qualifications:

SUXOS: One Senior UXO Supervisor with experience organizing and supervising ordnance related diving operations will serve as the overall superintendent overseeing OE/UXO and diving operations.

UXOSO/QC: One UXO Safety / Quality Control Officer with oversight experience in the safe preparation, and execution of the entire operation to include diving and demolition evolutions. He will also focus on the ability of the team to perform the mission in a technically productive and efficient, quantative manner.

UXO Technician III: Three UXO Technician III with experience supervising ordnance related diving operations will serve as the competent person diving and overseeing each dive team.

UXO Technician II: Three UXO Technicians with experience in ordnance related diving operations.

UXO Technicians will be certified divers qualified in all equipment and techniques used in the operation. They will also have 40 hours of HAZWOPER training meeting provisions established in 29 CFR 1910.120. If this 40 hour training course is more than 1 year old, the UXO Technicians will also have completed annual refresher training in accordance with 29 CFR 1910.120(e)(8) within the last 365 days. Documentation of this training will be provided prior to initiating fieldwork.

TARGET ACQUISITION

EOTI will obtain a list of GPS coordinates for each targets acquired by the Marine Towed Array (MTA). The EOTI dive team will attempt to locate, identify, determine condition and suggest best means of disposal.

TARGET PROCEUTION PROCEDURES

The SUXOS will task each dive team to dive designated search areas. Once the team reacquires a target a witness buoy will be placed at the mark. The dive team will then descend to the lakebed to locate the target. The use of a circle line search technique will be employed if needed. If available, an underwater ordnance locator will be used to locate buried targets.

PROCEDURES TO BE USED ONCE ORDNANCE IS LOCATED

Once contact has been located and determined to be ordnance or ordnance related material, the UXO divers will determine if it is safe or manageable enough to bring to the surface for disposal or if the ordnance must be disposed of in place (blown in place BIP).
The options will be to:

1. Locate and recovery of items as we find them.
1. Divide the work day into two phases,
    a. Phase one-Locate and confirm targets
    b. Phase two-Reacquire contacts and commence recovery operations

Phase times and durations will be determined day to day depending on quantity of positive contacts, time constraints for demolition operations, weather etc.

Ordnance items deemed safe to move will be brought to the surface and pre-positioned for disposal on land. Locations of targets thought to be too large or unsafe to move will be turned over to local EOD for future disposal.

Project Execution

Project field activities consist of the following tasks:

- Mobilization
- Site Preparation and Safety
- UXO diving support for Marine Towed Array demonstration and ordnance location and disposal
- Demobilization

The project will be accomplished in the field using a combined three-phase approach. The first phase will include mobilization, and site specific, diving and general safety training.

The second phase will include UXO diving support during the demonstration and UXO identification and recovery/disposal operations. The third phase, will include document preparation, equipment maintenance/turn in and de-mobilization.
EOTI will furnish all labor, materials, equipment, supplies, utilities, etc. to complete the UXO diving, locating and disposing of ordnance.

Due to the inherent risk in this type of operation the team will be limited to a 40-hour week consisting of five 8-hour days while performing UXO diving and or demolition operations, unless longer workweeks are approved by EOTI management. The workday will be from 0800 to 1700 hours. The hours and days of operations may change, with the concurrence of AETC due to project scheduling conflicts and/or weather related issues.

Phase I- Mobilization

EOTI will mobilize one SUXOS, one UXOSO/QC, three UXO Tech IIIs and six UXO Tech IIs, with all certifications, resumes, licenses, equipment and materials to complete the diving/munitions response effort.

Phase II - UXO diving support for Marine Tow Array (MTA) demonstration and ordnance location and disposal

The EOTI UXO dive team is prepared to locate, identify and dispose of ordnance items at the former Erie Depot, Lake Erie, OH.
Dive teams will reacquire and search to prove and positively identify the contacts as ordnance, that it is safe to move for disposal, or ordnance that is unsafe or too large to move. Locations for the items determined to be unsafe or too large to move will be provided to the local EOD unit. Items considered safe to move will be moved to a predetermined area in preparation for disposal on land.
Contacts will be reacquired and marked by carefully lowering a weighted marker buoy as close to the fix as possible. Once proper pre-dive procedures are completed the diver will descend down the target marker buoy maintaining underwater ordnance discipline. If the diver does not quickly locate the contact by sight or touch he will employ either circle line search techniques or an underwater ordnance locator to pin point the anomaly.
Upon target location, the diver will determine its condition as far as ordnance/scrap, armed/unarmed, fired/unfired, empty/filled, unknown/identified, moveable/not moveable etc.

At this point the option to locate and dispose of or locate, mark, recover then dispose of will be implemented.

Option 1- As soon as a target has been determined to be ordnance all search diving will be suspended. The target in question will then be removed from the water if it is determined to be safe enough to move or identified and marked if the item is deemed too unsafe to move.

Option 2- Once the MTA team locates a contact the dive team will dive to locate the item and positively determine what it is and its condition. If the item is ordnance, it will be marked with a marker buoy secured to the item or next to it using line, weights or augers. The diver will follow the buoy line to the surface to ensure that the float reaches the surface. Search operations may continue prosecuting each contact in the same manner as above. The operation will continue until the SUXOS determines that removal and disposal operations must commence. EOTI will begin with ordnance/ordnance related items that can be removed from the water and disposed of on land. Items deemed too large or dangerous to move will be disposed of in place.

Small lift balloons and or lifting lines may be used for moveable items.

Diving operations will be conducted as follows:

Note: All dive team members are qualified Navy divers with extensive diving experience in all aspects of ordnance related diving operations. Any one of the team members can perform any dive station position.

At the beginning of each day all diving equipment will have pre-dive checks performed on them in accordance with manufactures recommendations and normal diving standards.

The diving supervisor will give the overall daily diving and ordnance safety brief for the day's operations. Once personnel and equipment are ready and clear on the day's tasks, the dive boats will be loaded with all required equipment.

As a minimum a UXO Tech III and a UXO Tech II will make up the actual in water dive team. During the course of the diving day, divers will alternate between tasks as diver and surface tender. The diving supervisor will keep track of each divers bottom and surface interval times. Under no circumstances will divers exceed the, "no-decompression limits" outlined in the US Navy diving tables.

During diving operations one team member will be designated as Stand by dive in the case of an emergency. Stand by diver equipment will be centrally located to all diving activities for quick response to an emergency.

Once the UXO diver reaches the sea bed on a contact mark, he will proceed to locate the target. To do this he may require the use of a circle line search system or an underwater ordnance locator. When target has been acquired the diver will mark it with a buoy attached or placed near the target. Once secured the diver will surface and stand by for further instruction from the Dive supervisor or the SUXOS.

For recovery operations of ordnance items, the diver will reacquire the target and bring it to the surface crew by hand, lifting gear or with the assistance of salvage lift bag.

Targets designated as blow in place, will have a counter charge (size proportional to the target) placed on or as close as possible to the target. The charge will be connected to the blasting caps on a float at the surface via det cord. From the surface float the available initiation system will be employed to dispose of the contact.

At the end of diving operation each day, all equipment will be cleaned, air tanks filled and repairs made if needed. All preparations will be made to expedite the followings day's operations.

Demobilization

Upon completion of the project all personnel, material will be removed from the site and all rented equipment, boats and vehicles will be returned to the appropriate merchants.

See enclosures for:
(1) Underwater disposal SOP
(2) Surface disposal SOP
(3) Dive station SOP / Dive equipment
(4) Emergency notifications

(#1)

UNDERWATER DEMOLITION OPERATIONS

No underwater demolition Operations are Planned for this project.

(#2)

SURFACE DEMOLITION OPERATIONS SOP

Standing Operating Procedures

DISPOSAL RANGE OPERATIONS

1 INTRODUCTION

Experience and ongoing training programs have proven to be the best management tool within EOTI. Every effort must be focused on personal performance and training both on and off the job. Adherence to specific policies and procedures will greatly enhance the overall success of any disposal task and will ensure the safety of all personnel involved. It is the responsibility of all employees to comply with this Program and to bring to the attention of management personnel any shortcomings that may jeopardize any facet of the operation.

This program, in conjunction with the Site Specific Range Plan, will be utilized by all EOTI personnel engaged in disposal range activities. However, situations may exist that will warrant additional safety measures, such as fire trucks, medical personnel and protective clothing and equipment. The EOTI SUXOS and UXOSO have the overall responsibility to ensure compliance with the minimum requirements listed below, and upgrade as the situation dictates. The Site Specific Range Plan will be initially prepared by the Health and Safety Manager in coordination with the Project Manager. Should changing conditions or unexpected hazards on the site require additional changes to the Site Specific Range Plan, these changes will be addressed by the UXOSO and forwarded for approval to the Health and Safety Manager prior to initiating range operations.

The purpose of this procedure is to provide instructions for disposal by demolition of explosives, HE loaded components, MEC, propellants, and pyrotechnics. Operations include removal from storage, transfer to disposal area, unloading, unpacking, charging of disposal pits and detonation. Estimated daily production will vary according to type of items being destroyed.

2 DISPOSAL RANGE RESPONSIBILITIES

2.1 Senior UXO Supervisor (SUXOS)

The SUXOS will be responsible for assuring adequate safety measures are employed in all

aspects of disposal operations and housekeeping is maintained. The SUXOS shall visit the location as necessary to see that operations are carried out in a safe, clean, efficient and economical manner.

2.2 Demo Range Supervisor/Team Leader

The Disposal Range activities shall be under the direct control of an experienced and trained UXO supervisor charged with the responsibility for all activities within the area. The supervisor shall be responsible for training all operators regarding the nature of the materials handled, the hazards involved and the precautions necessary. The supervisor shall be present during all Disposal Range operations or designate a competent qualified person to be in charge during his absence in order to direct all operations.

2.3 UXO Safety Officer (UXOSO)

The UXOSO for the site is responsible for ensuring safe procedures are followed in all disposal operations. He conducts safety briefings daily covering the types of disposal operations scheduled for that day as well as anticipated hazards and any required PPE. He must be present during all UXO/OE disposal operations.

The only exception to the above is when the site has multiple simultaneous operations being conducted and there are continuous disposal operations. In that event a disposal team SSHO will be designated. This individual will report to the UXOSO and assume the UXOSO's responsibilities at the disposal range.

The UXOSO will conduct periodic safety audits of the disposal team and assist the disposal team SSHO in the performance of his duties.

2.4 UXO Quality Control (UXOQC)

The UXOQC will inspect each disposal pit and an area up to 500 feet in radius after firing each day to ensure there are no kickouts, hazardous MEC components or other hazardous items. In addition, the pit will be swept with a magnetometer and the large metal fragments (normally 4" and greater) and any hazardous debris removed from the pit after each firing. Extreme caution must be exercised when handling MEC which has been exposed to the forces of detonation. Any MEC discovered during the QC check will be properly stored at least intraline distance from the demolition pit during operations and removed on a daily basis. The QC must be present during all MEC disposal.

The only exception is when the site has multiple simultaneous operations being conducted and there are continuous disposal operations. In that event, a disposal team QC will be assigned. The disposal team SSHO and QC may be the same individual, depending on the complexity of the site and associated operations.

3 ADMINISTRATIVE REQUIREMENTS

This complete procedure will be posted in a conspicuous location in the area where the disposal operation is being conducted. There will be no deviation or change from this procedure without prior approval of the SUXOS, UXOSO and the client. Any potentially hazardous conditions or circumstances not covered by this procedure will be immediately reported to the SUXOS. Absence of a written safety requirement does not indicate that safeguards are not required. Supervisors will assure all general safety regulations and safe work practices are observed at all times. Each operator must read and be thoroughly familiar with this procedure. All supervisors and operators are required to read and adhere to the requirements contained in this procedure.

The quantity to be destroyed will be determined by the range limit. If there is any question about the quantity to be destroyed, the SUXOS will make the final determination. All scrap material must be certified by the SUXOS as free of explosive, pyrotechnic and/or propellant. This certification will be verified by the UXO QC and so documented.

Disposal of any kind is prohibited without the express permission of the client.

Chemical weapons/munitions items will not be destroyed at the disposal range unless special variances and/or permits are issued by both the appropriate regulatory agency and the appropriate command group. Should chemical weapons/munitions be located on a site, the CWM procedure will be followed. The item will be secured and the client will be contacted. The local EOD Unit or Technical Escort Unit will then be contacted for removal/disposal of the item.

4 GENERAL SAFETY PROVISIONS

This procedure shall be conspicuously posted in work areas involved in disposal operations. Supervisory personnel are responsible for the enforcement of its provisions. Basic disposal procedures will involve the following:

- In the event of an electrical storm, action will be taken to cease all disposal range operations and evacuate the area.
- All personnel are responsible for reporting all injuries, accidents and near-miss incidents to their supervisor. The supervisor is in turn responsible for reporting all injuries, accidents and near-miss incidents to the UXOSO. All such events will be thoroughly investigated by the SUXOS and the UXOSO in order to determine root cause(s) and appropriate actions taken to prevent recurrence.
- In the event of a fire or unplanned explosion, if possible, put out the fire if no MEC is involved. Fire extinguishers are to be available at each site for this purpose. If unable to do so, notify the fire department and evacuate the area. NEVER ATTEMPT TO FIGHT A FIRE INVOLVING MEC.
- Employees will not tamper with any safety devices or protective equipment.

- Any defect or unusual condition noted that is not covered by this procedure will be reported immediately to supervisory personnel.
- All safety regulations applicable to specific materials involved shall be observed.
- Methods of disposal shall be in accordance with this procedure and approved changes thereto.
- The Disposal Range activities shall be under the direct control of an experienced and trained UXO supervisor with the responsibility for all activities within the range.
- Fire extinguishers and first aid equipment shall be readily available during all disposal range operations.
- All personnel engaged in destroying ammunition shall wear natural fiber, close-weave clothes, such as 100% cotton, to include both outer and undergarments. Synthetic material such as nylon, polyester, etc. are not authorized unless treated with anti-static material by the manufacturer, and so labeled.
- Care will be taken to limit exposure to a minimum number of personnel, for the shortest time, to the least amount of hazardous material consistent with safe and efficient operations.
- Work locations will be maintained in a neat and orderly condition. Combustible materials will be kept to a minimum and debris will be immediately cleaned up in order to limit potential tripping hazards and fire hazards.
- All hand tools shall be maintained in a good state of repair. All tools will be inspected daily by the user. Any tools found to be in disrepair will be immediately removed from service until they can be repaired or replaced.
- Each material handling equipment and/or vehicle operator will have in his possession a valid operator's permit (i.e., state driver's license), as well as current operator training on the material handling equipment which will be used.
- Material handling equipment and other lifting devices will have the loading rating and date of next inspection marked on them. The load rating will not be exceeded and the equipment will not be used without a current inspection date.
- Safety shoes or boots will be worn by all personnel at disposal range operations.
- Leather or leather-palmed gloves will be worn when handling wooden boxes, munitions, and MEC.
- Lifting and carrying require care. Improper methods cause unnecessary strains. Observe the following preliminary rules before attempting to lift or carry:
  - When lifting, keep your arms and back as straight as possible, bend your knees and lift with your leg muscles.
  - Be sure you have good footing and lift with a smooth, even motion.
  - Be sure you have a clear path of travel with the load to be carried.
  - If a load is large or awkward in size, ask for assistance in carrying it.
  - If a piece of available material handling equipment is better suited to carry the load, use it.
- The disposal range shall be provided with a telephone and/or radio communication system. UXO personnel involved in disposal range operations will be certain to observe the Minimum Safe Distance with all radio frequency transmitters per table at Appendix A.
- Motor vehicles and material handling equipment used for transporting ammunition or explosives must meet the following requirements:

- Exhaust systems shall be kept in good mechanical repair at all times.
- Lighting systems shall be electric.
- As a minimum, two (2) Class 2A:10B:C rated, portable fire extinguisher shall be mounted on the vehicle outside of the cab, on the driver's side.
- Wheels of carriers must be chocked and brakes set during loading and unloading.
- No explosives or ammunition shall be loaded into or unloaded from, motor vehicles while their motors are running.

- Motor vehicles and material handling equipment used to transport explosives shall be inspected prior to use to determine that:
  - Fire extinguishers are filled and in good working order.
  - Electrical wiring is in good condition and properly attached.
  - Fuel tank and piping are secure and not leaking.
  - Brakes, steering and other equipment are in good condition.
  - The exhaust system is not exposed to accumulations of grease, oil, gasoline, or other fuels, and has ample clearance from fuel lines and other combustible materials.

- Employees are required to wear leather or rubber gloves when handling disposal materials. The type of glove worn is dependent on the type of disposal material being handled. Generally, leather gloves will be worn, with rubber gloves being used in instances involving leaking ordnance presenting a potential chemical hazard.
- A red warning flag will be displayed at the entrance to the Disposal Range and the entrance gate, if present, shall be locked when disposal work is in progress.
- An observer will be stationed at a location where there is a good view of the air and surface approaches to the Disposal Range before material is detonated. It shall be the responsibility of the observer to order the Supervisor to suspend firing if any aircraft, vehicles or personnel are sighted approaching the general demolition area.
- Two-way radios shall not be operated on the Demolition Range while the pit is primed or during the priming process, unless the radios are at the firing point and the firing line is shunted.
- An area two hundred (200) feet wide shall be cleared of dry grass, leaves and other extraneous combustible materials around the disposal area.
- No disposal activities will be conducted if there is less than a 2,000 foot ceiling and/or if wind velocity is in excess of 20 mph.
- Disposal shots must be fired during daylight hours.
- No more than two (2) persons shall ride in a truck transporting explosives or ammunition, and no person shall be allowed to ride in the trailer/bed.
- Vehicles shall not be refueled when carrying explosives. Vehicles must be one hundred (100) feet from magazines or trailers containing explosives before refueling.
- All vehicles used for transporting explosive materials will be cleaned of visible explosive contamination before releasing the vehicles for other duties.
- Personnel shall wash face and hands after handling explosives/UXO prior to conducting any other task, particularly hand to face activities such as eating, drinking, smoking, etc.

- If explosive contamination on clothing is known or suspected, clothing shall be changed prior to smoking.
- Eating, drinking, and smoking are prohibited at the Disposal Range as well as all other areas within the exclusion zone. These activities are limited to designated areas within the support zone.
- Pits shall be spaced a minimum of 50 feet apart. No more than 10 pits shall be prepared for a series of shots.

5 SPECIAL SAFETY REQUIREMENTS FOR DISPOSAL ACTIVITIES

The following basic safety requirements shall be implemented during all disposal operations:

- Fragmentation Range Table will be adhered to in all disposal range operations.
- Material awaiting destruction shall be stored at not less than intraline distance, based on the largest quantity involved, from adjacent explosive materials and from explosives being destroyed. The material shall be protected against accidental ignition or explosion from fragments, grass fires, burning embers or detonating impulse originating in materials being destroyed.
- Ammunition, UXO or explosives to be destroyed by detonation shall be detonated in a pit not less than three (3) feet deep and covered with not less than two feet of earth. The components shall be placed on their sides or in a position to expose the largest area to the influence of the initiating explosives. The disposal explosives shall be placed in intimate contact with the item to be detonated and held in place by earth packed over the disposal materials. The total quantity to be destroyed at one time shall not exceed the range limit.
- Special requirements for using electric detonators and electric blasting circuits are as follows:
  - Electric detonators and electric blasting circuits may be energized to dangerous levels from outside sources such as static electricity, induced electric currents and radio communication equipment. Safety precautions will be taken to reduce the possibility of a premature detonation of the electric detonator and explosive charges of which they form a part. Radios will not be operated while the pit is primed or during the priming process.
  - The shunt shall not be removed from the lead wires of the detonator until the moment of checking the circuit.
    NOTE: When testing the detonator, prior to connecting the detonator to the firing circuit, the lead wires of the detonator must be short circuited by twisting the bare ends of the wires together immediately after testing. The wires shall remain short circuited until the time to connect them to the blasting circuit.
  - When uncoiling, twisting or straightening the leads of the electrical detonator, keep the detonator (explosive end) pointing away from the body and away from other personnel. Hold the detonator lead wires approximately one (1) inch from the detonator body. Straighten the lead wires by hand and do not throw or wave the wires through the air to loosen them.

- At the power source end of the blasting circuit, the ends of the wires shall be shorted or twisted together at all times, except when actually firing the charge or testing the circuit.
- The connection between the detonator and the circuit firing wires must not be made unless the power end of the firing wires are shorted and grounded or the firing panel is off and locked.
- Blasting or disposal operations shall not be conducted during an electrical storm or when a storm is approaching within 10 miles. All operations shall be suspended, detonator wires and lead wires shall be short-circuited, and all personnel must be removed from the demolition range to a safe location when an electrical storm approaches. The area will remain evacuated until the storm has passed at least ten miles from the site.
- Prior to making connections to the blasting machine, the firing circuit shall be tested with a galvanometer for electrical continuity and ohmic resistance to ensure the blasting machine has the capacity to initiate the shot. The individual assigned to make the connections shall not complete the circuit at the blasting machine or panel and not give the signal for detonation until satisfied that all personnel in the vicinity have been evacuated to a safe distance (at least fragmentation distance). When used, the blasting machine or its actuating device shall be in the blaster's possession at all times. When using the panel, the switch must be locked in the open position until ready to fire, and the single key must be in the blaster's possession.

- Detonations will be counted to ensure detonation of all pits. After each series of detonations, a search shall be made of the surrounding area for unexploded MEC. Items such as lumps of explosives or unfuzed ammunition, may be picked up and prepared for the next shot.
- Fuzed ammunition or items which may have internally damaged components will be detonated in place, if possible.
- Prevailing weather condition information will be obtained from the U.S. Weather Service and the data logged in the Range Operations Log before each round of shots.
- A minimum of thirty (30) seconds will be maintained between each detonation.

DISPOSAL RANGE INSPECTION SCHEDULE

Checklist Items	Disposal Activity
1. Vehicle Access	Daily or Prior to Use
2. Entrance Gate	Daily or Prior to Use
3. Storage Trailer/Mag	Weekly
4. Fire Extinguishers	Monthly or Prior to Use
5. Personal Protective Equipment	Daily or Prior to Use
6. Circuit Testing Devices	Daily or Prior to Use
7. Disposal Site	Daily or Prior to Use
8. Operating Equipment	Daily or Prior to Use

- After each detonation and at the end of each day's operations, surface exposed scrap metal, casings, fragments, and related items shall be recovered from the disposal range and disposed of in accordance with contracted procedures, which must be in accordance with all applicable environmental regulations. All collected scrap metal will be 100% inspected for absence of explosive materials by disposal range personnel and certified by the UXOSO/UXO QC.
- When operated in accordance with the conditions of this procedure the disposal range should not present a noise problem to the surrounding community. However, if a noise complaint is received, the name, address and phone number of the complainant will be recorded and reported to the SUXOS, who in turn, will report it to the client.
- In excavating the pits, contour the ground so that runoff water is kept out of the pits. If operations are discontinued for more than two weeks, the pits should be filled until operations resume.
- Upon completion of the project the disturbed ground surface will be thoroughly inspected for MEC. The site may have to be leveled, seeded and mulched to establish a permanent vegetation cover to inhibit erosion; this will depend on the contract. At a minimum, the holes/pits will be filled in and contoured.

6 METEOROLOGICAL CONDITIONS

The following meteorological conditions will be met before disposal operations will be allowed to proceed:

- Disposal operations will not be conducted during electrical storms or thunderstorms or as these storms approach, or when storms are within 10 miles of the site.
- Disposal operations shall be restricted to periods when surface wind speed is less than twenty (20) miles per hour.
- Disposal operations will not be conducted during periods of reduced visibility (less than one (1) mile) caused by but not limited to dense fog, blowing snow, rain, sand or dust storms.
- Disposal shall not be carried out on extremely cloudy days which are defined as: overcast (more than 80% cloud cover) with a ceiling of less than 2,000 feet.
- Disposal operations shall not be initiated until at least one half hour after sunrise and will be concluded by at least one half hour before sunset.
- Disposal operations will not be conducted during any inversion condition (low or high altitude).
- The Disposal Range supervisor will ensure that the Daily Operational Log and the Ordnance Accountability Log are properly filled out for each day's operations.
- The UXOSO and UXO QC will audit the range logs.
- No disposal operation will be left unattended during the active portion of the operation (i.e., during the burn or once any explosives or MEC are brought to the range).
- Disposal operations will not be conducted during periods of local air quality advisories/alerts.

7 PRE-DISPOSAL PROCEDURES

The success of any operation is dependent upon a thorough briefing, covering all phases of the task. The SUXOS will brief all personnel involved in range operations in the following areas:

- Type of MEC being destroyed.
- Type of counter charge or explosive being used.
- Placement and quantity of counter charge.
- Method of initiation (electric or non electric).
- Means of transporting and packaging MEC.
- Route to the disposal site.
- Equipment being used to effect detonation.
- Misfire procedures.
- Post shot clean up of range.

The EOTI UXOSO will conduct a safety briefing for all personnel involved in range operations in the following areas:

- Care and handling of explosive materials.
- Personal hygiene.
- Two man rule.
- Potential trip/fall hazards.
- Horse play on the range.
- Stay alert for any explosive hazards on the range.
- Location of emergency shelter (if available).
- Parking area for vehicles (vehicles must be positioned for immediate departure).
- Location of range vehicle (keep engine running).
- Wind direction (toxic fumes).
- Location of first aid kit and fire extinguisher.
- Route to nearest hospital or emergency aid station.
- Type of communications in event of an emergency, including who to contact and how.
- Storage location of counter charges, detonators and MEC awaiting disposal.

8 TASK ASSIGNMENTS

Individuals assigned tasks will report the completion of the task to the Disposal Range Supervisor. The types of tasks that may be required are:

- Contact local Police, Fire personnel, and FAA as required.
- Contact hospital/emergency response personnel.
- Secure all access roads to the range area.

- Visually check range for any unauthorized personnel.
- Check firing wire for continuity and shunt.
- Prepare designated pits as required.
- Check continuity of detonators.
- Designated technician maintain custody of blasting machine or fuse igniters.
- Secure detonators in a safe location.
- Place MEC in pit and place charge in desired location.

9 PREPARING EXPLOSIVE CHARGE FOR INITIATION

- Insure firing wire is shunted.
- Connect detonator to the firing wire.
- Isolate or insulate all connections.
- Prime the explosive charge.
- Depart to firing point (if using non electric firing system, obtain head count, pull igniters and depart to designated safe area).
- Obtain a head count.
- Yell **"fire in the hole"** three times (or an equivalent warning).
- Take cover.
- (If using electric firing system) connect firing wires to blasting machine and initiate charge.
- Remain in designated safe area until SUXOS or Disposal Range Supervisor announces **"All Clear."**

10 POST DISPOSAL PROCEDURES

Do not approach a smoking hole or allow personnel out of the designated safe area until cleared to do so.

- After the **"All Clear"** signal, check pit for low orders or kick outs.
- Do a magnetometer sweep of the pit and remove any fragmentation.
- Back fill hole as necessary.
- Police up all equipment.
- Notify police, fire, etc. that the operation is complete.

11 MISFIRE PROCEDURES

A thorough check of all equipment, firing wire and detonators will prevent most misfires.

11.1 Electric Misfires

In order to prevent electric misfires, one technician must be responsible for all electrical wiring in the circuit. If a misfire does occur, it must be cleared with extreme caution. The technician that is most familiar with the circuit is the logical choice to investigate and correct the situation.

- Check connections and make a second attempt to initiate charge.
- If unsuccessful, disconnect and connect to another blasting machine (if available) and attempt to initiate charge.
- Commence a 30-minute wait period.
- After the wait period has expired a designated technician will proceed down range to inspect the firing system; a safety observer must watch from a protected area.
- Disconnect and shunt the detonator wires, connect a new detonator to the firing circuit and prime the charge without disturbing the original detonator.
- Follow normal procedures for effecting initiation of the charge.

11.2 Non Electric Misfires

Working on a non electric misfire is the most hazardous of all operations. Occasionally, despite all painstaking efforts, a misfire will occur. Investigation and corrective action will be undertaken only by the technician that placed the charge.

- If charge fails to detonate at the determined time, initiate a 30 minute wait period plus the time of the safety fuse, i.e., 5 minute safety fuse plus thirty (30) minutes for a total of 35 minute wait period.
- After the wait period has expired, a designated technician will proceed down range to inspect the firing system. A safety observer must watch from a protected area.
- Prime the shot with a new non electric firing system and install a new fuse igniter.
- Follow normal procedures for effecting initiation of the charge.

12. RECORD KEEPING REQUIREMENTS

The following records will be collected and maintained:

- The client or EOTI (as directed) will obtain and maintain all required permits.
- The Disposal Range Supervisor will ensure the accurate completion of the logs.
- The UXOSO and UXO QC will monitor the entries in the log for completeness, accuracy and compliance with meteorological conditions.
- The Disposal Range Supervisor shall enter data in the Ordnance Accountability Log to match each Magazine Data Card on which detonation activities have occurred. The quantities recovered should also be the quantities destroyed.
- EOTI will retain a permanent file of all Disposal Records, including permits, Magazine Data Cards, training records, inspector reports, waste manifests if applicable, and operating logs.

TABLE 1

The following table is to be utilized when computing fragmentation ranges. It is essential when computing the explosive weight, that you include the explosive weight of the disposal/counter charge, propellant, etc. If you have a fraction of any kind, i.e. 1-15 oz., you go to the next highest weight to compute fragmentation range. The fragmentation ranges are for open, unbarricaded shots. If there is a protective shelter with overhead protection, you may be closer to the shot. However, every effort will be made to adhere to the appropriate fragmentation range regardless of shelter or depth the shot is buried. If you are using multiple pits you must insure that all pits are within the appropriate frag range. If this is not possible, you may consider detonating smaller quantities in the outer pits to be in compliance. At no time will you violate the fragmentation range without the written approval of the Health and Safety Manager.

NOTE: For the purpose of computing frag range, consider all explosives, including those used to counter charge, propellant, etc, when determining the total explosive weight.

THIS CHART IS GIVEN IN POUNDS AND FEET

EXP WT LBS	FRAG RANGE	EXP WT LBS	FRAG RANGE	EXP WT LBS	FRAG RANGE	EXP WT LBS	FRAG RANGE
1	330	16	832	31	1037	46	1182
2	416	17	849	32	1048	47	1191
3	476	18	865	33	1058	48	1199
4	524	19	881	34	1069	49	1208
5	564	20	896	35	1079	50	1214
6	598	21	910	36	1090	75	1392
7	631	22	925	37	1100	100	1532
8	660	23	938	38	1110	150	1752
9	686	24	952	39	1119	200	1931
10	710	25	965	40	1129	250	2079
11	734	26	978	41	1138	300	2208
12	756	27	990	42	1147	350	2327
13	776	28	1002	43	1156	400	2432
14	795	29	1014	44	1165	450	2528
15	814	30	1025	45	1174	500	2620

FORMULA: 100 X CUBE ROOT OF EXPLOSIVE WEIGHT = FRAG RANGE IN METERS.

TABLE 2

MINIMUM SAFE DISTANCE BETWEEN MOBILE RF TRANSMITTERS AND ELECTRIC BLASTING OPERATIONS

MINIMUM SAFE DISTANCE (FEET)					
Transmitter Power (Watts)	**MF 1.6 to 3.4 MHZ Industrial**	**HF 28 to 29.7 MHZ Amateur**	**VHF 35 to 36 MHZ Pub. Use 42 to 44 MHZ Pub. Use 50 to 64 MHZ Amateur**	**VHF 144 to 148 MHZ Amateur 150.8 to 161.6 MHZ Public Use**	**UHF 450 to 460 MHZ Public Use**
5[1]					
10	40	100	40	15	10
50	90	220	90	35	20
100	125	310	130	50	30
180[2]				65	40
250	200	490	205	75	45
500[3]			290		
600[4]	300	760	315	115	70
1,000[5]	400	980	410	150	90
10,000[6]	1,250		1,300		

[1] Citizens band radio (Walkie-Talkie) (26.96 to 27.23 MHZ) - Minimum safe distance - five feet.)
[2] Maximum power for 2-way mobile units in VHF (150.8 to 161.6 MHZ range) and for 2-way mobile and fixed station units in UHF (450 to 460 MHZ range).
[3] Maximum power for major VHF 2-way mobile and fixed station units in 35 to 44 MHZ range.
[4] Maximum power for 2-way fixed station units in VHF (150.8 to 161.6 MHZ range).
[5] Maximum power for amateur radio mobile units.
[6] Maximum power for some base stations in 42 to 44 MHZ band and 1.6 to 1.8 MHZ band.
NOTE: To convert feet to meters on this chart - feet X 0.307 = meters.

TABLE 3

MINIMUM SAFE DISTANCE BETWEEN TV AND FM BROADCASTING TRANSMITTERS AND ELECTRIC BLASTING OPERATIONS

Effective radiative power (watts)	Minimum safe distances (feet)		
	Channels 2 to 6 and FM	Channels 7 to 13	UHF
up to 1,000	1,000	750	600
10,000	1,800	1,300	600
100,000	3,200	2,300	1,100
316,000[2]	4,300	3,000	1,450
1,000,000	5,800	4,000	2,000
5,000,000[3]	9,000	6,200	3,000
10,000,000	10,200	7,400	3,500
100,000,000			6,000

Present maximum power, Channels 2 to 6 and FM.
Present maximum power, Channels 7 to 13.
Present maximum power, Channels 14 to 83.

NOTE: To convert feet to meters on this chart - feet X 0.307 =

(#3)

DIVE STATION SOP AND EQUIPMENT LIST

DIVE TEAM

– SUXOS/Dive Supervisor
David Farmer – UXOSO/QC (Dive safety officer)
Blair Oaks – UXO Tech III Diver
– UXO Tech III Diver
– UXO Tech III Diver
Kim Taply – UXO Tech II Diver
– UXO Tech II Diver
– UXO Tech II Diver
– UXO Tech II Diver
– UXO Tech II Diver
Myron Barto – UXO Tech II Diver

DIVE STATION EQUIPMENT

(2) Dive Boats – 18 – 24ft.
Stop watches - 2
Diver recall system - 2
Handheld depth finder - 2
Dive flag - 2
Dive Tables and Manuals - 1
First aide kit - 4
O2 cylinder - 1
Back board - 1
Surface communication system - 1
Lights - 3
Lift bags - 2
Compass - 3
Lines - Various
Peanut Buoys - 20
Weights 5lbs. - 20
Buoys – 10

DIVE EQUIPMENT

Scuba tanks - 10
B/C – 4
Regulators – 4
Weight belts and weights – 4
Underwater Ordnance Locator – 2
Digging gear – 2 sets

PERSONAL DIVE GEAR

Mask
Fins
Knife
Light
Dive watch
Gear bag
Wet suit

DIVE STATION RESPOSIBILITIES

Dive Supervisor – Planning and briefing the diving operations to include diving emergency. Assign dive station duties as required with the dive/work plan as well as diver rotation.

Dive Safety Officer – Over sees the safe diving operations. Conduct dive safety brief prior to any dive operations. Establish contact with dive recompression chamber and emergency medical facilities. Establish routes to hospital and chamber. Ensure all safety precautions are followed during explosive demolition operations.

Divers – Locate, Identify and dispose of any hazardous material in accordance with the dive/work plan established.

Standby Diver – Respond to any in water emergency/task as directed by the Dive Supervisor

Tender – Assist diver with dress out. Standby to assist standby diver as needed and assist Dive Supervisor as required.

DIVING OPERATIONS

Dive supervisor will review the dive/work plan with the divers prior to the divers dressing out. Upon completion on the brief the divers will dress out IAW Dive Supervisor check sheet. Once the Dive Sup check sheet is complete the divers will enter the water on the command of the dive Sup. Divers will perform in water checks of their equipment before leaving the surface.

Divers will attempt to locate the anomalies marked by the Marine Towed Array (MTA). Once located divers will mark the target with a color coded buoy to indicate the condition of the target and what action he determines is required.

Green buoy – Target is in a safe condition and is light enough to raise using lines or divers.

Red Buoy – Target is armed or condition is not easily determined. Target will be blown in place (BIP).

Yellow buoy – Target is in a safe condition, however the target is too large to be raised by diver or surface line.

If divers are unable to locate the target due to poor visibility a circle line will be set up and a search of the area will be conducted by hand and underwater magnetometer. Once target is located it will be marked as discussed above.

Targets that have been mark as (BIP) will be dealt with after all the targets marked as safe are removed from the area.

Demo operation for the (BIP) targets will be conducted IAW the dive/work plan and all proper authorities have been notified by Safety/QC and all divers are out of the water and accounted for.

After every demo shot a tech III diver will verify the target condition after the predetermine wait time and determine if the target has been destroyed or is in a safe condition.

Upon completion of all dive and demo operations all dive and demo gear will be cleaned and staged for the next day's evolution.

Dive Safety and Dive Supervisor will determine when all dive and demo operations will be suspended due to weather or other unforeseen conditions at the dive location.

(#4)
Emergency Notifications

Emergency resources are as follows:

- Ambulance: 911
- Fire: 911
- Police: 911
- Hospital (H. B. Magruder Memorial) (419) 734-3131 (For emergency assistance dial 911)
- Poison Control Hotline: 1-800-222-1222
- EPA National Response Center: 1-800-424-8802
- CHEMTREC: 1-800-424-9300
- Federal OSHA Emergency Hotline: 1-800-321-OSHA (6742)
- Live Ordnance Emergency:
- TEU (duty hours) (410) 671-3601
- TEU (after duty hours) (410) 671-2773
- EOTI Program Manager,
- Wayne Lewallen (732) 345-8099
- EOTI Health and Safety Manager,
- Chris Rinn (732) 345-8099
- Divers Alert Network (DAN) (919) 648-8111

EOTI
EXPLOSIVE ORDNANCE TECHNOLOGIES, INC.

ORDNANCE AND EXPLOSIVE REMEDIATION

105 W. Tennessee Ave. • Oak Ridge, TN 37830
Tel: (865) 220-8668 • Fax: (865) 220-8857

September 14, 2006,

AETC
Attention: Jim McDonald, PhD
120 Quade Dr.
Cary, NC 27513

Subject: UXO Support Work Plan, Toussaint River Survey

Dear Dr. McDonald:

Please find enclosed EOTI's Work Plan and Site Specific Safety and Health Plan for UXO Dive Support at Toussaint River.

The Work Plan anticipates that data for the points to be reacquired can be inserted as Appendix A when the data becomes available.

We look forward to supporting AETC on this project and on future projects. Please feel free to contact me at 865-220-8668 with any questions.

Sincerely,

Explosive Ordnance Technologies, Inc.

Wayne Lewallen
Vice President

Enclosure: Work Plan
Safety and Health Plan

EXPLOSIVE ORDNANCE TECHNOLOGIES, INC. (EOTI)
SITE SPECIFIC WORK PLAN

SUPPORT OF VALIDATION OF THE MARINE TOWED ARRAY DEMONSTRATION AT FORMER ERIE ARMY DEPOT AND TOUSSAINT RIVER

PRESENTED FOR:

AETC

AETC INCORPORATED
120 QUADE DRIVE
CARY, NC 27513

PRESENTED BY:

EOTI

EXPLOSIVE ORDNANCE TECHNOLOGIES, INC.
105 WEST TENNESSEE AVE.
OAK RIDGE, TN 37830

SEPTEMBER 14, 2006

EXPLOSIVE ORDNANCE TECHNOLOGIES, INC. (EOTI)
SITE SPECIFIC WORK PLAN

SUPPORT OF VALIDATION OF THE MARINE TOWED ARRAY DEMONSTRATION AT FORMER ERIE ARMY DEPOT AND TOUSSAINT RIVER

Submitted To:

AETC Incorporated
120 Quade Drive
Cary, NC 27513

Submitted By:

Explosive Ordnance Technologies, Inc. (EOTI)
105 W. Tennessee Ave.
Oak Ridge, TN 37830

September 14, 2006

TABLE OF CONTENTS

LIST OF ACRONYMS

AFB - Air Force Base
ASCII - American Standard Code for Information Interchange
CERCLA - Comprehensive Environmental Response, Compensation and Liability Act
CES - Civil Engineering Squadron
CFR - Code of Federal Regulations
CWM - Chemical Warfare Material
DGPS - Differential Global Positioning System
DID - Data Item Description
DD - Department of Defense
DGM - Digital Geophysical Mapping
DGPS - Differential Global Positioning System
DoD - Department of Defense
DQO - Data Quality Objective
EM - Electromagnetic
EM - Engineer Manual
EOD - Explosive Ordnance Disposal
EP - Engineer Pamphlet
ER - Engineer Regulation
ESRI - Environmental Systems Research Institute
EZ - Exclusion Zone
EOTI - Explosive Ordnance Technologies, Inc.
FGDC - Federal Geographic Data Committee
Frag - Fragmentation
FTP - File Transfer Protocol
GCS - Geographic Coordinate System
GIS - Geographic Information System
GPO - Geophysical Prove Out
GPS - Global Positioning System
HH - Hand Held
MEC - Munitions and Explosives of Concern
MPM - Most Probably Munition
MPPEH - Material Potentially Presenting Explosive Hazard
MR - Munitions Response
MSD - Minimum (safe) Separation Distance
MSDS - Materiel Safety Data Sheet
MV - Milli-volts
NA - Not Applicable
NAD - North American Datum
NCP National Contingency Plan
NTP - Notice to Proceed
NS - Not Seeded
OE - Ordnance and Explosives
OSHA - Occupational Safety and Health Administration
PBR – Precision Bombing Range

PC - Personal Computer
PDF - Portable Document File
POC - Point of Contact
PPE - Personal Protective Equipment
QC - Quality Control
RFP - Request for Proposal
RR - Range Residue
SDSFIE - Spatial Data Standards for Facilities, Infrastructure, and Environment
SOW - Statement of Work
SSHP - Site-specific Safety and Health Plan
SUXOS - Senior UXO Supervisor
USAF - United States Air Force
USACE - United States Army Corps of Engineers
UTM - Universal Transverse Mercator
UXO - Unexploded Ordnance
UXOQCS - UXO Quality Control Specialist
UXOSO - UXO Safety Officer
WP - Work Plan

INTRODUCTION

1.1 General Information

This Work Plan (WP) details the actions necessary to provide MEC/UXO support and dive operations required for reacquisition of marine based geophysical anomalies, identification and disposal of material potentially presenting an explosive hazard in designated areas of the former Erie Army Depot, Ottawa County, OH. A previous geophysical survey conducted in the study area revealed a number of anomalies that were potentially caused by munitions and explosives of concern (MEC). The purpose of the work described in this work plan is to safely reacquire and investigate designated anomalies in order to record data necessary to evaluate the effectiveness of the equipment and procedures used in Demonstration Validation results. Following the investigation of anomalies, EOTI will remediate potential explosive hazards and properly dispose of MEC scrap.

1.2 Site Location

The former Erie Army Depot, Ottawa County, OH, is located along the western shore of Lake Erie (Figure 1.1). This site and the associated impact areas are classified by the United States Government as a Formerly Used Defense Site (FUDS) under the Defense Environmental Restoration Program (DERP). This property was formerly used for artillery testing, resulting in impact areas on land and in Lake Erie. Ordnance and explosive waste (OEW) and potentially live or unexploded ordnance (UXO) have been found on the lake bottom, in the Federal navigation channel at the Toussaint River, in the marshland adjacent to the firing ranges, and along beaches fronting the former Depot. The impact areas were located in, near, or offshore of the FUDS beaches adjacent to Lake Erie. Ordnance found on or near the FUDS shore of Lake Erie appears to be mobile and may have originated from offshore or nearshore impact areas.

1.3 Site History

The subject study area consists of the beach and area of Lake Erie fronting the former Erie Army Depot (now called Erie Industrial Park), between Camp Perry Ohio National Guard Training Center and the mouth of the Toussaint River in northwest Ohio (Figure 1.1). This FUDS site is located in rural Carrol Township, Ottawa County, OH, on Lake Erie, approximately 37 miles east of Toledo, Ohio, and 6 miles east of Port Clinton, Ohio. The Erie Army Depot was initially established in 1918 as the Camp Perry Proving Grounds, and then redesignated as Erie Proving Grounds. For almost a half century (1918-1966) this site was used by the Department of the Army for testing and proof-firing of artillery and as an ordnance storage and issue center (USAED Rock Island 1993). Camp Perry was established in 1907 by the state of Ohio for the training of the state National Guard. Part of the camp was used to establish the Erie Army Depot in the spring of 1918. During the next 2 years, the site was used to proof fire (check for accuracy) thousands of pieces of artillery. Between World Wars I and II, the site was less active and was used primarily to warehouse and issue various items of ordnance. In 1941, the artillery test-firing mission of the site was reactivated in support of World War I1 and the name of the facility was changed to the Erie Proving Ground. During the next 5 years, 70 percent of the mobile artillery used by the U.S. Army or provided to Allied armies was tested and proof-accepted at Erie Proving Ground. Between 1946 and 1951, the site reverted to a peacetime role and was renamed the Erie Army Depot. Late in 195 1, the depot assumed the additional roles of anti-aircraft support testing and the overhauling of surface-to-air guided missiles (support to the Korean Conflict). Additional activities included logistical support to Regular Army and National

Guard anti-aircraft units training at Camp Perry (USAE District, Rock Island 1993a, 1993b; Bovia and Wirzylo 1992). Test firings of Vietnam-era munitions continued into the early and mid-1970s. Discussions with previous employees of the Erie Army Depot and present officials of Camp Perry indicate that the firing source and range patterns have been similar for other periods. The Erie Army Depot was excessed by the General Services Administration in 1966 and closed in 1967. However, ARES, Inc., a company under contract to the Federal Government, has continued to manufacture and test fire artillery and other large-caliber barrels on this property as a commercially owned and operated enterprise. The majority of acreage encompassing the former Erie Army Depot site is no longer Federal property and is now classified as a FUDS. Approximately 5.7 km2 (1,400 acres) of property at the former Erie Army is leased from the State of Ohio to private landowners. At present, the site is used still used for limited firing from Camp Perry and the Ares facility in the former Erie Army Depot. The immediate area near the Toussaint River is used for recreational and commercial boating.

1.4 Geology

The FUDS beach is a thin (less than 2- or 3-m (6.5- or 10-ft) -thick) blanket of sand, which sits on top of older lake clays. Layers of organic-rich silts and clays (including peat deposits) are intermingled within the sand body and may be exposed along the shore or in the nearshore, particularly in the troughs between bars. The peat deposits are the result of the relatively modern marsh deposits being exposed on the beach as the barrier migrates back over the marsh.
The shore northwest of the Toussaint River mouth is a wider and more stable sandy barrier beach than that which fronts the FUDS study site. This barrier includes several beach ridges which are crested by scrubs and trees suggesting previous beachlines and accretion cycles. The mouth of the Toussaint River is fronted by an extensive (460-m-wide by 920-m-long (1,500-ft-wide by 3,000-ft-long) shallow sand shoal, which is asymmetrical toward the east (Figure 7). This shoal represents a trapping of littoral sands which move from the northwest toward the river mouth and are then jetted into a delta-like shoal by river discharge and returning seiche (sudden rise and fall of water levels due to atmospheric conditions) waters which build up in the river during heavy winds from the north. It is probably the presence of this shoal which is responsible for trapping sand which would otherwise have nourished the unstable and eroding beach of the FUDS study area.

Three cores were taken by Buffalo District (USAE District, Buffalo 1989) along the proposed channel line lakeward of the Toussaint River mouth in support of the proposed navigation project. Logs from these cores suggest that the shoal consists of a 2- to 3-m (6.5- to 104) thickness of medium-to fine sand, which includes some coarser sand and a gravel zone overlying lacustrine clays. Lakeward of the FUDS study site, the shoreline is paralleled by a narrow band of fine-to-medium sandy material which extends approximately 150-300 m (500-1,000 ft) offshore to the 0.6- to 1.2-m (-2- to -44) (LWD) contour (Figure 7). This underwater sand extension of the beach includes a series of well-defined two to four shore-parallel sandbars. Lakeward of this sandy zone, the shallow, flat bottom (slope less than 1:300) is covered with a soft silty-mud layer out to approximately the 3-m (-104) (LWD) contour. This muddy layer pinches out toward the east and offshore, where the bottom becomes a firm blue-clay glacial till, which includes lag-deposit zones of sands and gravels.

The FUDS study site beach has exhibited shoreline retreat during all recorded shore position surveys (1877 to present). In establishing its Erosion Hazard Areas, the State of Ohio, Division of Geology used survey and aerial photographic data from 1877, 1973, and 1990 (Figure 8). Profiles were established at 30-m (100-ft) intervals and backbeach position was determined for each time interval. Profiles 10579 through 10759 cover the study area. These data (illustrated in Figure 8) document a shore which has experienced long-term recession rates, ranging from as little as 0.27 m/year (0.9 ft/year) (on the updrift side of the stone stick-out feature located near the Camp Perry border, profile 10625) to as much as 1.1 m/year (3.6 ft/year) (profile 10695). The average retreat rate for the study area is between 0.61 and 0.91 m/year (2 and 3 ft/year), or a total of 68.9 to 103.3 m (226 to 339 ft) since the 1877 baseline survey. The Buffalo District (USAE District, Buffalo 1989) conducted a shoreline change analysis in support of the design studies for the Toussaint River Navigation Project using additional aerial photography. They found an average recession rate for the shore southwest of the Toussaint River of 0.85 m/year (2.8 ft/year). Long-term shoreline retreat throughout the FUDS study site is exacerbated during periods of high water, when storms with winds from the north can drive the water level up the beach and over the low back beach causing the barrier to be breached. This type of impact occurred in 1986 during record high water levels on Lake Erie when the barrier near profile 10650 was inundated and flow between the lake and the backbeach marshes was unimpeded. This tenuous and eroding characteristic of the FUDS site beach has important implications in the evaluation of the ordnance distribution patterns. Since the Erie Army Depot was an active ordnance test facility (1918-1966) the beach has retreated 64 to 23 m (210 to 76 ft) to the present beach position. In addition, a breach occurred through the beach in 1986 which was in direct line with the dominant firing fan orientation (Figure 7). Thus, the beach which existed during the period of Erie Army Depot operation is now under water and the present beach is being eroded from what was an area 30.5 to 61 m (100 to 200 ft) landward of the former shore.

Figure 1.1, Project Site Location

2.0 TECHNICAL MANAGEMENT PLAN

2.1 Guidance, Regulations, and Policy

EOTI received a contract from AETC, Inc. to provide MEC support related to the Demonstration Validation efforts at the former Erie Army Depot and Toussaint River located in near the Port Clinton area, Ohio. The EOTI Dive SOP will govern diving operations. Based on the SOW, EOTI will conduct a subsurface clearance to identify and record required data for each anomaly identified in the demonstration. EOTI will perform all support activities as described in this work plan and consistent with the guidance and requirements ER 1110-1-8153 and other applicable requirements.

Unexploded Ordnance is a safety hazard and may constitute an imminent and substantial danger to personnel on the site. Unexploded Ordnance has been found in the project area and occurs due to military training activities that were conducted there. Since UXO Removal Operations will be conducted in accordance with the substantive requirements of CERCLA, 29 CFR 1910.120 applies. EOTI's work is to be performed in a manner consistent with CERCLA, Section 104 and the national Contingency Plan (NCP), Sections 300.120(d) and 300.400(e). Additional guidance and regulations used are listed in Section 15.

2.2 Chemical Warfare Material (CWM)

The areas covered under the Scope of Work for this project are not suspected to have CWM. However, a remote possibility exits that chemical warfare material could be encountered during the planned investigation and excavation activities at the Former Erie Army Depot and Toussaint River site. If suspected CWM is encountered during any work, the procedures listed below will be followed:

- The initial Exclusion Zone (EZ) for suspected CWM will be established and maintained a minimum of 450 feet upwind.
- Neither the suspect item nor the area will be disturbed further after discovery.
- The senior UXO qualified technician on site will immediately direct the dive team and all others working in the vicinity to stop work and evacuate the site in an upwind direction. Upon evacuation, the senior UXO qualified technician on site will account for all work site personnel.
- The senior UXO qualified technician on site will follow proper cordon procedures and immediately notify the Project Manager. Report emergencies by calling 911. .
- Before work resumes, the site plans will be reviewed for adequacy in consideration of the hazard discovered. The senior UXO qualified technician on site will provide a suspect CWM report including the following information:
    - Date and local time of event
    - Location
    - Preliminary identification of suspect CWM
    - A description of events

- A description of any property damage, personnel casualties, and/or injuries
- A description of whether medical services or facilities were required
- A list of immediate notification and support requirements identified during the initial emergency response assessment
- Any other pertinent information.

2.3 MEC Destruction and Unidentifiable MEC

All UXO disposal operations will be conducted in accordance with the SOW. If unidentifiable UXO is found, the default separation distance specified in DOD 6055.9-STD will be used to establish the exclusion zone. Unidentified UXO will not be disposed of until the munitions filler can be determined. CEHNC-OE-CX Interim Guidance 02-03 provides guidance in helping to determine unknown explosive fillers. The Site SUXOS will determine final disposition/disposal procedures.

If a UXO item is unacceptable-to-move (fuzed and fired) and is located in a work limits and the fragmentation zone does not include the public and buildings, it will be BIP. If the fragmentation zone is in the vicinity of the range boundary or extends beyond the range boundary in the vicinity of inhabited areas, and the fragmentation zone falls within any Schools or Neighborhoods "Safety Buffer Zones" then EOTI will utilize engineering controls to limit the fragment displacement distance thus reducing the fragmentation zone. All UXO discovered will be logged into the UXO Accountability Log. The log will be kept onsite and a digital copy will be transmitted to the EOTI Oak Ridge office for safe archiving.

Whenever possible, explosive destruction will be accomplished by electrical means to insure maximum control and safety.

Access to the areas where disposal operations are conducted is restricted and coordinated through ARES, Inc. and local authorities. If required, the Coast Guard will be contacted to assist in controlling access from the water. Barricades with signs will be placed on all roads that access the site to identify the exclusion area. Personnel deemed as non-essential to the demolition operation will be evacuated or assigned duties outside of the fragmentation zone.

The UXOSO is responsible for ensuring all personnel are accounted for during disposal operations and that the demolition operation is conducted in strict accordance with required procedures. The EOTI SUXOS and/or UXOSO will visually inspect the demolition site and announce all clear upon completion of demolition operations.

2.4 Technical Scope of the Project

The overall objective of this project is for EOTI to provide MEC support to AETC's Marine Geophysical Demonstration Validation project by reacquiring, excavating and recording detailed data related to anomalies previously identified and selected for investigation.

The Demonstration Validation project will take place at the former Erie Army Depot and Toussaint River site located in Port Clinton, OH. The former Erie Army Depot, Ottawa County, OH, is located along the western shore of Lake Erie (Figure 1). This site and the associated impact areas are classified by the United States Government as a Formerly Used Defense Site (FUDS) under the Defense Environmental Restoration Program (DERP). This property was formerly used for artillery testing, resulting in impact areas on land and in Lake Erie. Ordnance

and explosive waste (OEW) and potentially live or unexploded ordnance (UXO) have been found on the lake bottom, in the Federal navigation channel at the Toussaint River, in the marshland adjacent to the firing ranges, and along beaches fronting the former Depot. The impact areas were located in, near, or offshore of the FUDS beaches adjacent to Lake Erie. Ordnance found on or near the FUDS shore of Lake Erie appears to be mobile and may have originated from offshore or near shore impact areas. In FY06, ESTCP was directed by Congress to conduct work to characterize UXO contamination impacting the Toussaint River area.

The subject study area consists of the beach and area of Lake Erie fronting the former Erie Army Depot (now called Erie Industrial Park), between Camp Perry Ohio National Guard Training Center and the mouth of the Toussaint River in northwest Ohio (Figure 1). This FUDS site is located in rural Carrol Township, Ottawa County, OH, on Lake Erie, approximately 37 miles east of Toledo, Ohio, and 6 miles east of Port Clinton, Ohio. The Erie Army Depot was initially established in 1918 as the Camp Perry Proving Grounds, then re-designated as Erie Proving Grounds. For almost a half century (1918-1966) this site was used by the Department of the Army for testing and proof firing of artillery and as an ordnance storage and issue center (USAED Rock Island 1993). Camp Perry was established in 1907 by the state of Ohio for the training of the state National Guard. Part of the camp was used to establish the Erie Army Depot in the spring of 1918. During the next 2 years, the site was used to proof fire (check for accuracy) thousands of pieces of artillery. Between World Wars I and II, the site was less active and was used primarily to warehouse and issue various items of ordnance. In 1941, the artillery test-firing mission of the site was reactivated in support of World War I1 and the name of the facility was changed to the Erie Proving Ground. During the next 5 years, 70 percent of the mobile artillery used by the U.S. Army or provided to Allied armies was tested and proof-accepted at Erie Proving Ground. Between 1946 and 1951, the site reverted to a peacetime role and was renamed the Erie Army Depot. Late in 195 1, the depot assumed the additional roles of anti-aircraft support testing and the overhauling of surface-to-air guided missiles (support to the Korean Conflict). Additional activities included logistical support to Regular Army and National Guard anti-aircraft units training at Camp Perry (USAE District, Rock Island 1993a, 1993b; Bovia and Wirzylo 1992). Test firings of Vietnam-era munitions continued into the early and mid-1970s. Discussions with previous employees of the Erie Army Depot and present officials of Camp Perry indicate that the firing source and range patterns have been similar for other periods. The Erie Army Depot was listed as excess by the General Services Administration in 1966 and closed in 1967. However, ARES, Inc., a company under contract to the Federal Government, has continued to manufacture and test fire artillery and other large-caliber barrels on this property as a commercially owned and operated enterprise. The majority of acreage encompassing the former Erie Army Depot site is no longer Federal property and is now classified as a FUDS. Approximately 5.7 km2 (1,400 acres) of property at the former Erie Army is leased from the State of Ohio to private landowners.

At present, the site is used still used for limited firing from Camp Perry and the Ares facility in the former Erie Army Depot. The immediate area near the Toussaint River is used for recreational and commercial boating.

Digital Geophysical Mapping (DGM) was conducted in the area of the investigation using a variety of Marine based towed magnetometer arrays. These instruments were selected to validate their effectiveness as a marine geophysical tool. The results of the geophysical mapping

are used to select target anomalies that will be investigated under the SOW addressed in this work plan.

Based on the results of the previous geophysical investigation and data analysis approximately 200 anomalies will be reacquired and investigated. These discrete anomalies are shown in the figures located in Appendix A. A list of the anomalies, their location, and signal strength is also located in Appendix A. EOTI will navigate to the general location of each of the identified anomalies using a mapping grade GPS. EOTI will then pinpoint the predicted location of the anomaly using a magnetometer capable of underwater operation and place a marker. Each marker will be marked with a discreet number for that anomaly. During the subsurface investigation, the UXO team will then reacquire the anomaly with a hand-held underwater magnetometer.

Each anomaly will be investigated with a combination of air or water pumps and/or hand tools, depending on the depth of the anomaly and the bottom composition. Excavation will be to the side of the anomaly, within 12 inches of it. After that point, remaining excavation operations will be conducted carefully using hands and hand tools. The anomaly will be carefully uncovered, so that it can be examined to determine the item and its condition. Depending upon the visibility, identification may require that the examination be conducted by feeling the item with the hands. If the item can be moved, it will be brought to the surface, using lift bags or a winch as necessary. If the item cannot be moved, it will be marked and its location recorded for later disposal and it will be reported to the nearest local EOD unit. Each anomaly located will be immediately identified and recorded in the logbook. Information in the logbook entry will be used to complete the dig sheet (Appendix F). Information recorded will include: x, y, and z coordinates [UTM (meter), NAD83/NAVD88, Geoid03 system], description of the item and its condition, depth of the item, orientation, etc to the accuracy required to effectively assess the WAA technology. Each item recovered will also be documented with a digital photograph.

Maps, included in Appendix A of this work plan, identify the predicted location of each discrete anomaly identified for investigation. As anomalies are investigated, results will be displayed in the dig sheets and on a project specific GIS (see Chapter 7 of this work plan) displayed on a secured web-site.

EOTI will conduct demolition operations, as necessary to ensure that investigated items are free of explosive hazards prior to disposal. If items can be safely moved they will be consolidated in a bunker area provided by ARES, Inc. pending demolition operations. MEC scrap and Range Residue (RR) scrap created or recovered during the operation will be collected in secure containers for disposal after completion of the fieldwork. This scrap will disposed of through a local scrap dealer and will not be released to the public until it has been processed through a smelter or shredded. The turn-in of scrap will be documented on a DD Form 1348-1A, Issue Release / Receipt Document. The SUXOS will complete the DD Form 1348-1A in accordance with DoD 4160.21-M. A certificate will be prepared with the following statement: "*This certifies that the material listed has been 100 percent properly inspected and, to the best of our knowledge and belief, is free of explosive hazards, engine fluids, illuminating dials and other visible liquid HTRW materials*." The SUXOS and the UXO Safety Officer will sign the form.

EOTI will prepare a final report in accordance with Data Item Description (DID) MR-030. In addition to the DID requirements, EOTI will include all QC documentation in the Final Report.

EOTI will also include a cover letter signed by an authorized person of the company certifying, on behalf of the company, that the requirements of this Task Order have been met.

2.5 Changes in Site Conditions

Unforeseen circumstances, such as severe weather events, may create a change in site conditions that could temporarily affect the performance of this Task Order. Regardless of the reason for the change in site conditions, EOTI will immediately notify the AETC Project Manager of the change and of the action taken. Telephone/fax communications will be followed up by a hard copy communication.

2.6 Organization

EOTI is contracted by AETC to provide MEC support for the WAA assessment project as described above. EOTI's Project Manager will be the primary point of contact with the AETC project manager. He will be primarily responsible for project planning and execution and will make project related decisions. He directs and supports the Senior UXO Supervisor (SUXOS). The SUXOS is responsible for the safe execution of the Statement of Work (SOW). He coordinates with the AETC site manager and is supported by the UXO Safety Officer (UXOSO) and UXO Quality Control Specialist (UXOQCS). He directs the support teams. The UXOSO and UXOQCS are responsible to ensure compliance with the project safety and quality requirements, respectively. Each has a direct line to the EOTI corporate office. The EOTI Program Manager has overall responsibility for the project. He has contractual authority and will direct the project manager as required to ensure all project and contractual requirements are met. Figure 2.1 depicts key project personnel and their relationships and responsibilities with the project team.

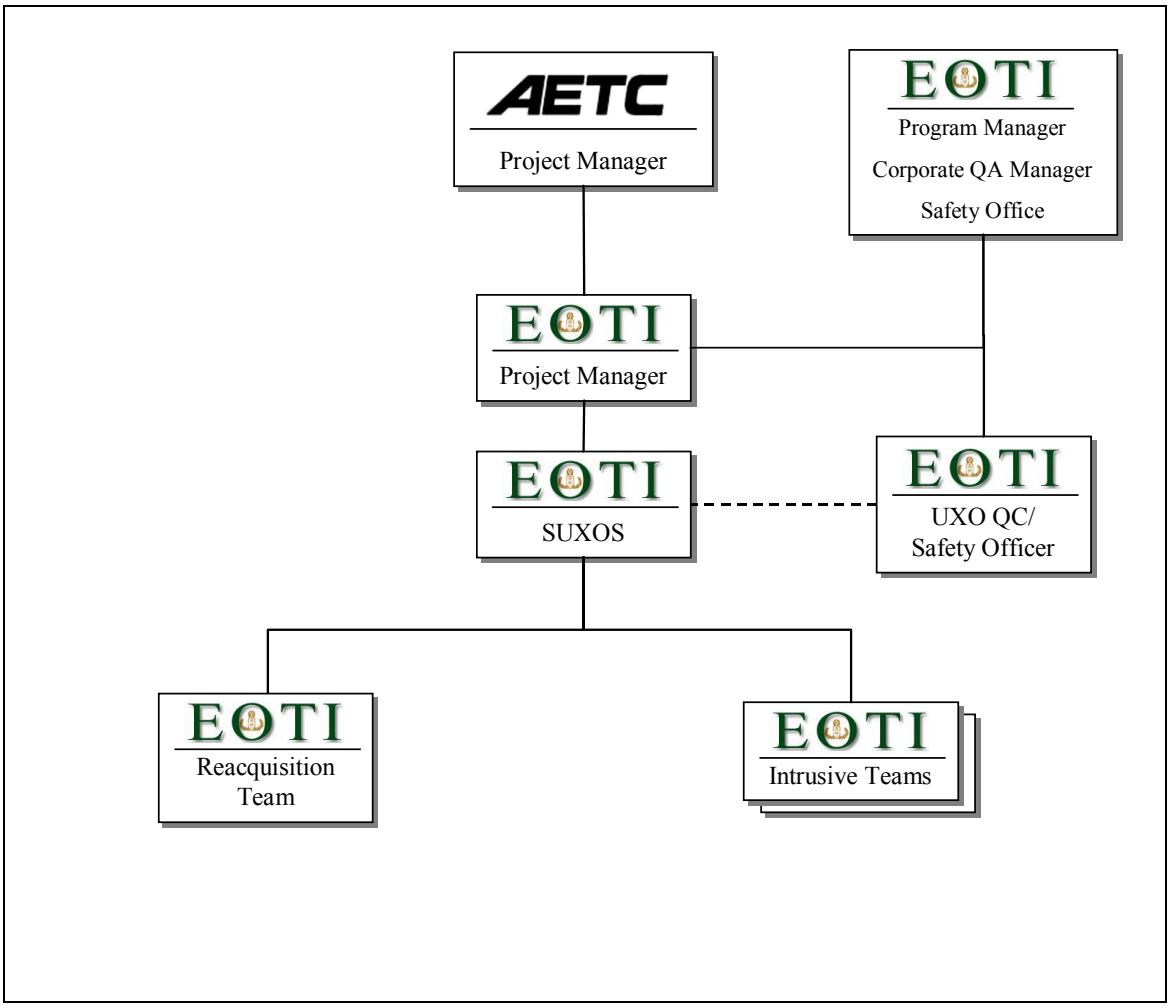

Figure 2.1 Project Organization Chart

2.6.1 Subcontractors

EOTI does not anticipate using subcontracting personnel in this operation. If it should become necessary to use any subcontractor personnel, they will be required to be familiar with and will comply with all requirements of the work plan.

2.6.2 Project Personnel

Program Manager
Mr. Wayne Lewallen is Vice President and EOTI Program Manager responsible for MEC operations. He has over 24 years experience managing UXO project sites.

Project Manager
Mr. Jim Daffron will be the EOTI Project Manager. Mr. Daffron is an EOTI Engineer and Project Manager. He has over 14 years experience managing MEC and construction projects.

Assistant Project Manager
Mr. Matthew Norris will be the Assistant Project Manager. Mr. Norris has over 4 years experience with ordnance/explosives operations and UXO project sites. In addition to assisting

the Project Manager, Mr. Norris will establish and maintain the web-based GIS associated with the project.

Safety and Health Manager
Mr. Chris Rinn will serve as the Corporate Safety and Health Manager of this project. He will oversee the preparation of the Accident Prevention Plan/Site Safety and Health Plan in accordance with Corps of Engineers, Department of Defense, OSHA and any additional state and local requirements.

Quality Control Manager
Mr. Dave Farmer will serve as the Quality Control Manager for this project. Mr. Farmer has over 15 years of EOD/UXO experience.

2.6.3 UXO Personnel and Qualifications

Senior UXO Supervisor (SUXOS)
The Senior UXO Supervisor has more than 15 years of EOD/UXO experience. The SUXOS will manage all on-site field activities. The SUXOS will keep the EOTI Project Manager apprised of activities requiring his notification. The responsibilities of the SUXOS include:

- Serving as Site Manager; Assisting in the development of operating procedures and the work plan;
- Identification of personnel and equipment requirements;
- Supervision of all daily field team activities;
- Early detection and identification of potential problem areas and institution of corrective measures;
- Overseeing project equipment maintenance program;
- Assisting with the preparation of all project reports;
- Preparation of a daily report, which will include man-hours expended, grids cleared, and any other information required by the Project Manager;
- Providing on-the-job training for selected UXO Supervisor(s) who may be called upon to temporarily perform SUXOS duties during his absence from the site, and;
- Supervision of UXO Technicians.

The SUXOS reports to the Project Manager and maintains day-to-day communications with him, assisting with the documentation of site conditions and activities, and interfacing with other personnel on site. His daily duties will include scheduling and executing a daily safety meeting, scheduling and coordinating field team activities, and oversight of all field activities.

UXO Safety Officer (UXOSO)
The UXOSO has more than ten years of military/civilian EOD/UXO experience. The UXOSO is responsible for implementing all site SSHP requirements, on-site training requirements and recommending changes to level of personal protection equipment (PPE) to the SUXOS as site conditions warrant. The UXOSO has Stop Work Authority for safety conditions. He will report all safety work stoppages immediately to the SUXOS and Corporate Safety Officer. The UXOSO evaluates and analyzes any potential safety problems, implements safety-related

corrective actions, and maintains a Daily Safety Log. The UXOSO reports to the Corporate Safety Manager. The UXOSO will:

- Perform on-the-job training for selected UXO technicians who may be called upon to temporarily perform the duties of UXOSO during his absence from the site
- Maintain daily liaison with the SUXOS
- Maintain Safety Log
- Coordinate issues with the Corporate Safety Manager and SUXOS

The position of UXO Safety Officer may be combined with the UXO Quality Control Specialist position for this project.

UXO Quality Control Specialist
The UXOQCS has more than ten years of military/civilian EOD/UXO experience. The UXOQCS will inspect/review all project operations, including explosives inventories, daily reports, time sheets and other documentation, and will inspect and approve each area prior to reporting it complete. The UXOQCS specific duties are outlined in Chapter 10.

UXO Supervisor (UXO Tech III)
This individual supervises a project team. This individual will have experience in OE clearance operations and supervising personnel, and shall have at least ten years combined active duty military EOD and contractor UXO experience. This individual will be able to fully perform all functions enumerated for UXO Sweep Personnel, UXO Technicians I and II. Specific duties of the UXO Technician III's include:

- Supervision of UXO teams during dive phase operations;
- Supervision of equipment maintenance;
- Supervision/performance of ordnance related scrap inspection;
- Determining whether OE items are acceptable to move; and
- Supervision of UXO Technician I and II.

UXO Technician II
These individuals will be graduates of a school listed in Paragraph 10.12. As an exception, a UXO Technician II may be a UXO Technician I with at least five years combined military EOD and contractor UXO experience. These individuals are able to fully perform all functions enumerated for UXO Sweep Personnel and UXO Technician I. The UXO Technician II's specific duties for this project will include:

- Performance of dive phase operations;
- Assisting in ordnance-related scrap inspections under the Technician III's direction; and
- Performing equipment maintenance.

UXO Technician I
These individuals will be graduates of the course listed in Paragraph 10.12. The UXO Technician I's specific duties (under the supervision of a UXO Technician III or a UXO-qualified individual of higher rank than the UXO Technician III) for this project will include:

- Assisting in ordnance-related scrap inspections.
- Assisting in performing equipment maintenance

2.6.4 Subcontractor Management

All subcontractors will be required to comply with requirements, provisions, and procedures in this Work Plan. EOTI does not anticipate using any subcontractors on this project.

2.7 Mobilization Plan

Mobilization will commence upon notification to proceed from AETC. Mobilization of all initially required personnel and equipment is expected to be complete within two weeks of notice to proceed. Once on site, the SUXOS will coordinate the following activities:

- Locate the hospital and confirm phone numbers and directions to facility;
- Establish contact with local POC's and verify contact information;
- Establish the scrap holding area; and

2.8 Site Preparation

2.8.1 Vegetation Removal

EOTI does not anticipate the need for significant vegetation removal. Some vegetation may be removed in the area immediately around the demolition area if one is required.

2.8.2 Field Test Plot

A field test plot will not be established for this project. Hand held magnetometers will be tested daily with a known metallic source in order to ensure that it is functioning properly.

2.9 Reporting and Disposition of MEC

2.9.1 Reporting

Any MEC item found will be carefully uncovered, so that it can be examined to determine the item and its condition. Each item will be identified in the logbook and on the dig sheet to include x, y, and z coordinates. Care will be taken when gathering and recording data to ensure the accuracy and completeness of data necessary to evaluate AETC technology.

2.9.2 Identification of MEC and Other Munitions

SUXOS – The SUXOS has overall responsibility for reporting and disposition of MEC. He will:

- Coordinate all disposal/demolition operations with the demolition team;
- Ensure a UXO Accountability Log is maintained.
- Assure that ordnance related scrap generated from any demolition operations is inspected prior to removal from the site.
- Inspect all recovered ordnance related scrap and non-ordnance related scrap.

UXOSO – The UXOSO is responsible for insuring all MEC operations meet safety requirements. He will:

- Verify the identification of MEC items;
- Assure the area is clear prior to capping in by the demolition team; and
- Insure compliance with all requirements of the SSHP.

UXOQCS - The UXOQCS is responsible for insuring that all OE operations meet quality requirements. He will:

- Verify processes by which scrap is inspected and certified to be free of OE; and
- Insure compliance with all requirements of the Quality Control Plan.
- Insure dig sheets are properly filled out with the accuracy and completeness required.

UXO Tech III – The UXO Tech III is responsible for the supervision of the UXO team. He will:

- Confirm the identification of MEC items;
- Post individuals at entry points (if required) during demolition operations;
- Assign team members to specific duties; and
- Check the area following each shot or series of shots.

UXO Tech II – The UXO Technicians II will:

- Provide tentative identification of MEC items; and
- Perform duties as assigned.

UXO Tech I – The UXO Technicians I will perform duties as assigned by the SUXOS and Team Chiefs.

2.9.3 Safety Precautions

Detailed specific safety procedures are described in the Site-Specific Safety and Health Plan (Appendix D.) The following general safety precautions will be followed during the execution of this project:

- Only UXO qualified personnel will perform MEC procedures.
- A minimum of two UXO-qualified personnel will be present during all MEC operations so that one UXO personnel may act as a safety observer.
- During all MEC operations, only the minimum number of personnel required to safely perform the task will be allowed on-site.
- Non-essential personnel will not be allowed on site during UXO operations. EOTI personnel may escort essential non-UXO qualified personnel as required and to the extent that they are not exposed to unnecessary risk. Visitors must coordinate with the SUXOS and will receive a safety briefing prior to entering the exclusion zone.
- Non-essential personnel will be briefed on site hazards prior to entering the project area.
- UXO operations will cease within EZ distance of non-essential personnel who are onsite.
- UXO personnel required for this project will include qualified UXO supervisors and technicians, all of whom possess the relevant United States military EOD or other approved qualifications and experience. Personnel for this project have been selected from a pool of available qualified UXO technicians.
- All UXO personnel assigned to this project will meet the personnel training and experience requirements set forth in the SOW and EP-1110-1-18, Engineering and Design, Ordnance and Explosives Response.
- Excavations will conform to EOTI's Corporate Safety and Health Program so that confined space hazards are not created.
- EOTI personnel will not attempt to remove any fuze(s) from the MEC and will not dismantle or strip components from any MEC.
- EOTI personnel are not authorized to inert any MEC items found on-site.
- MEC/UXO items will not be taken from the site as souvenirs.

2.9.4 Identification of MEC and Other Munitions

If any unexpected MEC item is located, the UXO Tech III will determine the item's status. All available data sources will be consulted prior to this determination. As live or suspected MEC is located, a detailed accounting will be accomplished. All live/suspected UXO or MEC items encountered will be entered on the working map and into the UXO Accountability Log (Appendix F). This accounting will include:

- Identification Number (a unique ID #)
- Location
- Nomenclature
- Fuze Description
- Fuze Condition
- Additional comments if required

Each type of live or suspect MEC item encountered will be identified using a unique numerical identifier. Photographs of live or suspect MEC items will be taken for documentation purposes. A ruler or some similar item, to show scale, should be placed adjacent to the item. The photographs will be utilized in the final report; thus, a focused, well thought out photograph, paying particular attention to lighting and shadows, is necessary.

2.9.5 Transportation

Ordnance that is determined to be safe to move will be brought to the surface and placed aboard the boat in a sand-filled box. These items will then be stored in a bunker area provided by ARES, Inc. pending demilitarization or demolition if deemed appropriate by the SUXOS.

2.9.6 Safe Holding Areas

All certified safe ordnance scrap will be stockpiled on site in a controlled secured area. Certification will follow the US Army Corps of Engineer requirements.

EOTI will provide a sealable container suitable for collection and disposal of anticipated metal scrap. The SUXOS will be responsible for siting and removal of the container and for disposal of the material collected. The container will be secured in such a way as to prevent unauthorized items from being added to it by non-project personnel.

2.9.7 Institutional Controls

EOTI will initially maintain a 500-foot separation distance between the site footprint and the general public acting as a safety cushion to protect the public against site hazards. This footprint will be expanded to the appropriate minimum safe distance (MSD) upon discovery of live ordnance. Controlling access to the site, closing roads, signs and barricades are all means of keeping the general public from accidentally wandering into the site during site operations. The Coast Guard will be contacted as appropriate to limit access by water. Continual training of all site workers in the hazards of MEC will be conducted periodically. If unauthorized personnel are observed in the Exclusion Zone, all MEC operations will cease until the area is cleared of unauthorized personnel.

2.9.8 Engineering Controls

EOTI may implement engineering controls, such as sand bag enclosures, if required to control the potential blast from a suspected UXO during disposal operations. The SUXOS will assess the situation and determine the appropriate engineering controls required. He will consider the type of item and the proximity of personnel and property that could be harmed by the potential detonation.

2.9.9 Post Demolition Operations

Upon completion of explosive demolition operations or explosive venting operations by the demolition team, the EOTI team will return to the demolition site(s) and verify that the shot hole and surrounding area is free of explosive hazards. A magnetometer assisted search will be completed to recover fragments or other Munitions Debris resulting from the demolition operation and to ensure complete destruction of energetic material.

2.10 MPPEH and Other Scrap

Inert items, including all Munitions Debris, metallic debris, shrapnel or fragments, and other scrap cleared will be collected and transported to the securable container location, and placed into securable/sealable containers.

2.10.1 Management of MPPEH and Scrap

Munitions Debris and scrap found while conducting dive operations will be inspected by a UXO Technician III to verify the item is inert and safe to handle before moving. It will then be collected at a pre-designated location on the boat. Before the collected material leaves the boat, the UXO Removal Team Leader (UXO Technician III) will perform an additional inspection of the scrap. Once the inspection is completed, the materials will be loaded onto a vehicle for transportation to the securable container location. The materials will then be downloaded and placed in securable/sealable containers. All MPPEH items will be investigated to insure that there are no explosives remaining in the items and that only inert filled or empty items are transported to the scrap area. A UXO Supervisor will double-check to ensure all items are inert prior to transportation to the demilitarization/securable container location. Redundancy is built into the investigation process to assure no live items are removed from the site.

2.10.2 Reporting/Accountability

The SUXOS will complete a DD Form 1348-1A in accordance with DoD 4160.21-M. A certificate will be prepared with the following statement:

"*This certifies that the material listed has been 100 percent properly inspected and, to the best of our knowledge and belief, is free of explosive hazards, engine fluids, illuminating dials and other visible liquid HTRW materials*."

The SUXOS and the UXO Safety Officer will sign the form.

2.10.3 Venting

EOTI will explosively vent intact ordnance items to insure that all ordnance is free of explosives prior to disposition.

2.10.4 Disposition

All inert ordnance and Munitions Debris will be turned-in to a local Scrap Dealer who will process it through a smelter or furnace prior to resale or release.

2.11 Additional Tasks

N/A

2.11.1 Public Affairs

EOTI personnel will refer all requests from media representatives for information to the appropriate AETC representative.

2.11.2 Community Relations and Access Control

Throughout the Dive phase of this project the EOTI SUXOS will be responsible to interact with agencies and stakeholders at the project location as required conducting operations with minimal impact upon the community as practicable. In order to protect other personnel and the general public, an initial exclusion zone will be established at a distance of 500 feet around the project footprint. This is the recommended safe separation distance. If a hazardous MEC is located, the exclusion zone will be reevaluated to determine whether it needs to be expanded. EOTI will maintain control of the project area until dive phase operations are complete. All MEC operations will halt for the duration of time any non-essential person is within the exclusion zone. Once they have departed the area, MEC operations may resume.

2.11.3 Dissemination of Data

All final text files generated by EOTI will be furnished to AETC in Word 6.0 or higher software, IBM PC compatible format. Tables will be provided in MS Excel spreadsheet format. EOTI will furnish copies of the plans, maps, and work plans to AETC in the quantities indicated in the RFP. EOTI will use express mail services for delivering final copies of submittals. E-mail submittals will be provided when preferred by AETC. Following each submittal, comments generated as a result of their review will be incorporated by EOTI. A detailed discussion of data processing and submittal is included in Chapter 7.

2.11.4 Status Reports

The SUXOS will coordinate with the AETC on-site representative to provide regular updates. Updates will include information relevant to progress, any problems encountered, and actions taken to solve any problems. The EOTI Project Manager will provide formal reports to the AETC Project Manager.

2.11.5 Final Report

EOTI will prepare a detailed final report in accordance with DID MR-030. The first draft of the final report will be submitted within 15 days after completion of fieldwork. The final report will be submitted 7 days after receipt of comments. The final report will include information regarding: site overview, technical approach to the project, documentation (i.e., drawings, logs,

reports, laboratory reports, etc.), submittals, maps, records of MEC, QC sweeps, documentation/receipts for disposition of munitions debris, photographs of major activities and MEC discoveries, dig sheets, reports, maps, lessons learned, and final conclusions. All Quality Control documentation will be included in the final report. EOTI will include a cover letter signed by an authorized person of the company, certifying on behalf of the company that the requirements of this Task Order have been met.

2.11.6 Lessons Learned

Lessons learned will be captured, documented, and submitted to AETC at the end of the project. In the event of an accident, the UXOSO will develop relevant lessons learned from the incident. If any lesson learned will affect the job by making it better, less expensive, faster, or safer, the SUXOS will compile it and present it to the AETC on-site representative during a regular update. In addition to lessons learned, EOTI will continually endeavor to improve methods and procedures. Changes to the WP will be submitted as appropriate.

3.0 EXPLOSIVE MANAGEMENT PLAN

The Explosive Management Plan details the management of explosives on site during the Marine Towed Array validation support project. The plan is written in accordance with DID MR-005-02.

3.1 Acquisition

Commercial explosives, if required for destruction of MPPEH will be acquired from a local licensed explosives dealer. The explosives will be delivered to the project location on the day that they are required and will be used on the day that they are delivered. No commercial explosives will be stored on site.

3.2 Initial Receipt

Explosives will be delivered to the project location by a DOT licensed transporter following approved routes. The transporter is responsible for providing copies of licenses, if requested, and for compliance with all DOT regulations. EOTI will inventory and record all explosives delivered and accepted at the site. The material will then be moved on site to required locations, as described below. The UXO team leader will inventory and account for explosive material used in the destruction of MPPEH. EOTI will only order the material required for the operation and all commercial explosives delivered to the site will be used in the operation.

3.3 Storage

Explosives will not be stored on site. All explosives will be delivered on scheduled demolition days in the quantity required to perform the planned demolition. The team leader will ensure that blasting caps and demolition material remain in suitable containers and are separated and sandbagged until used. Containers containing commercial explosives remain closed and under observation of a UXO qualified technician until demolition procedures are initiated. All demolition materials will be used on the day that it is delivered to the site and therefore no overnight storage of explosives is required.

3.4 Transportation

A licensed commercial transporter will deliver commercial explosives to the site. The transporter is required to possess required licenses and for coordination and compliance with all applicable transportation regulation and requirements. EOTI will inventory and take possession of the material at the site as described in Section 3.2 above.

If required, material will be transported on site by EOTI personnel in inspected and approved project vehicles. All explosives will be secured and sandbagged in the vehicles during transportation. Blasting caps will be physically separated from other explosives during transportation. Prior to transporting explosives on site, the Team Leader will inspect the vehicles intended to transport the material. Vehicles must be in good operating condition with no leaks or other conditions that could make the transportation of explosives unsafe. Vehicles will be properly marked with the required placards and will contain a fire extinguisher.

3.5 Receipt Procedures

All demolition materials will be inspected and inventoried by the team leader before it is accepted from the transporter. Incorrect orders and/or damaged material will not be accepted. Only the material required to complete the planned operation will be ordered and received.

The team leader will document the types and quantity of explosive material used and the type and quantity of MPPEH destroyed during demolition operations. The team leader is responsible for the proper issue and maintenance of explosives and explosive records. The team leader will verify that all explosives delivered to the site are consumed in the demolition operations and that no residue or packing material contains explosive material.

3.6 Inventory

The Team leader will conduct an initial inventory of explosives delivered to the site. Additional inventories will be conducted when explosives are issued for use in demolition operation and following demolition operations. All inventories will be documented and indicated in the daily log and included in the final report.

3.7 Lost, Stolen, and Unauthorized Use of Explosives

Only qualified employees will be permitted to use explosives at the project site. The Team Leader will ensure that unauthorized personnel remain clear of restricted areas. The Team Leader will conduct inventories each time explosives are used, transported or handled to insure accountability. If any of the explosive material is determined to be missing, the SUXOS will immediately report the loss to the EOTI Project manager. He will report the type and quantity of explosive missing, time that the items were discovered missing and any circumstances related to the incident or events leading up to the discovery of the missing items. The EOTI Project Manager will notify the AETC Project Manager, Bureau of Alcohol Tobacco and Firearms, and other local agencies of the incident. A written report will be submitted with 24 hours of the incident.

4.0 EXPLOSIVES SITING PLAN

4.1 Minimum Separation Distances

A minimum separation distance of 500 feet will be established to protect individual operating units in the event of an accidental detonation while excavation operations are underway. A minimum of 200 feet is per the EM 1110-1-4009 Engineering and Design Ordnance and Explosives Response, June 23, 2000, US Army Corps of Engineers (USACE), and Memorandum on the Determination of Appropriate Safety Distances on Ordnance and Explosives Project Sites. The 500-foot minimum distance will be used to allow an extra margin of safety. In the event that MEC is discovered, the EZ safe separation distance will be reevaluated and re-established based on the Material Potentially Presenting an Explosive Hazard (MPPEH) found or suspected. Essential personnel are generally considered the UXO Team, equipment operators, and site safety personnel and the Site Supervisor. The size of the EZ for excavation activities will be based on the criteria for unintentional/accidental detonations.

If during the conduct of the operation a hazardous MEC is recovered, an EZ for unintentional or accidental detonations will be established based on that item. This MEC item may be classified as the most probable munition (MPM) and minimum separation distance may be recalculated. If subsequently an MEC is recovered that has a greater fragmentation distance, the larger MEC may then become the MPM.

4.2 Planned or Established Demolition Areas

EOTI does not plan on establishing a Specific Demolition Area as any disposal operation will be conducted only as necessary to eliminate potential hazards and will not be an ongoing or repetitive endeavor. An area designated by ARES, Inc. will be used if it becomes necessary to conduct demolition operations. This area is shown in Figure 4-1.

4.3 Foot Print Areas

4.3.1 Blow-in-place

If a MEC that cannot be moved is identified EOTI will mark the item and record its location for disposal by EOD.

4.3.2 Collection Points

Non-Hazardous MEC-related items encountered during the completion of this project will be consolidated and secured by EOTI on-site for future disposal as scrap metal. The frequency of this disposal will be determined once dive phase begins.

4.3.3 Consolidation Shots

Any MEC that can be moved that is found and recovered will be secured in a bunker area provided by ARES, Inc. pending demolition. Consolidation Shots will be made by the SUXOS and will be governed by EOTI Standing Operating Procedures (SOP). The Detonation Area is shown in Figure 4-1.

4.3.4 Explosives Storage Magazines

No donor explosives will be stored on this site. Therefore, no Explosives Storage Magazines will be required.

4.4 MEC Storage Magazines

Any MEC that can be moved will be secured in a bunker area provided by ARES, Inc. pending demolition. Therefore, no additional MEC storage magazines will be required. The storage location is shown in Figure 4-1.

4.5 Site Map

An overall site map is included as Figure B1 in Appendix A. Other detailed working maps are also included in Appendix A. These maps show the planned work locations in detail.

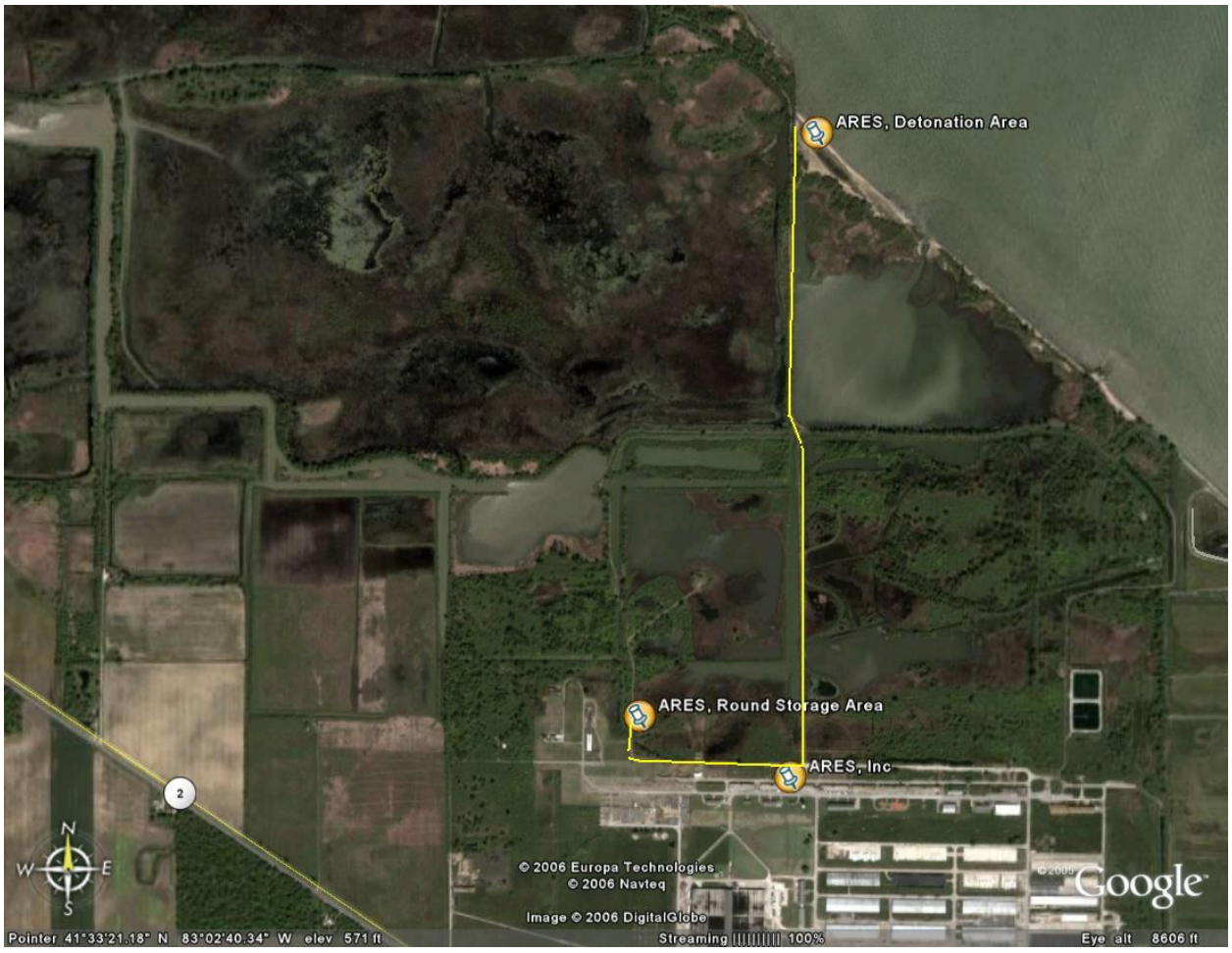

Figure 4-1.

5 GEOPHYSICAL PROVE-OUT PLAN

NO GEOPHYSICAL PROVE-OUT IS REQUIRED FOR THE COMPLETION OF THIS SOW

6 GEOPHYSICAL INVESTIGATION PLAN

NO GEOPHYSICAL INVESTIGATION IS REQUIRED IN EOTI'S SOW

7 GEOSPATIAL INFORMATION AND ELECTRONIC SUBMITTAL PLAN

7.1 General

GIS information provided by EOTI is currently not funded for this project.

8 MANAGEMENT PLAN

8.1 Project Management Approach

The SUXOS will be responsible for the day-to-day operations on-site. The SUXOS will accomplish the tasks, outlined in the SOW, in a timely manner. The SUXOS' duties are outlined in Section 2.6.3 and Section 2.9.2. The site UXOQCS is the key person to insure management is conforming to established procedures and work is completed in a timely manner. The UXOQCS will perform quality inspections of all work tasks as specified in Section 10.6. Any nonconformance that cannot be immediately resolved on site will be elevated to the Project Manager and / or the corporate Quality Manager.

Data will be collected from various operations on the work site and recorded on computer disks, in logbooks and on the various EOTI forms. Records of the limits of the areas cleared, the type and location of OE encountered, and description of OE will be recorded. The forms, logs, and disks will remain in the EOTI site office while portions of the data will be copied and sent to the PM for inclusion in reports. The site UXOQCS will review all data.

8.2 Schedule

EOTI has received a notice to proceed (NTP). Fieldwork consisting of target reacquisition is scheduled to commence with mobilization on or about 25 September 2006. Phase II investigation operations will commence the week of 2 October 2006. The order of reacquisition will be based on planned dive operations and the minimum separation distance (MSD) required between teams working during the dive phase. The SUXOS and Project Manager will plan and track progress of the reacquisition and dive operations and will adjust, as necessary, to ensure safe distances are maintained while progress is made toward completion of project.

EOTI will provide AETC with progress updates and revised schedules of activities throughout the project. EOTI will maintain an overall project schedule and will continually update a two-week schedule of tasks. The two week schedule will be created jointly between the SUXOS and Project Manager and will be used to plan the activities of each team and to ensure the proper personnel, equipment and other resources.

8.3 Cost Control

The PM and SUXOS will control and manage cost through the use of Purchase Orders (PO) and Travel Orders (TO). A record of expenditures will be tracked by the SUXOS and monitored by the PM. The PM will, using an Excel Cost Tracking Program, monitor man-hours and monies used.

EOTI will prepare and submit invoices in accordance with its contract with AETC. The EOTI project Manager will notify the AETC Project Manager immediately of any change in site condition or work requested outside of the SOW.

9 PROPERTY MANAGEMENT PLAN

Not Applicable to this Project

10 Quality Control Plan

10.1 Introduction

EOTI is committed to performing quality work and delivering quality products to our clients. This commitment to quality begins at the corporate level and is emphasized at every level down to the project level. Success is achieved through a total commitment of all team members at all levels of operation to continuous improvement resulting in exceeding the standard and expectations of our clients.

The EOTI Quality Control program is viewed as a dynamic program that is constantly changing and improving. All employees at all levels are encouraged to make suggestions on ways to improve operations, which ultimately improves the quality of our services. This continuous improvement requires the active participation of all employees and an effective lessons learned program.

10.2 Audit Procedures

The Corporate Quality Manager and other corporate personnel will audit all aspects of the project to ensure that quality objectives are met. The UXOQCS will verify that field procedures are completed in accordance with the Work Plan and are effective in achieving or exceeding quality standards. The UXOQCS will establish an audit frequency schedule of procedures, operations, equipment, etc. for use on the site to assure that all aspects of project operations are observed often enough to assure a continued increase in quality.

Equipment used at this site is dedicated solely to the project until its completion. If equipment field checks indicate that it is not operating correctly, and field repair cannot be made, the equipment is tagged and removed from service until it can be repaired or replaced. Replacement equipment will meet the specifications for accuracy and precision of the equipment it replaces. EOTI reviews equipment requirements and identifies equipment requiring daily tests and/or calibration.

Periodic Quality Control Audits are performed by the EOTI Corporate Quality Manager, to determine the effectiveness of the Quality Control measures performed at the site. A report of the audit will highlight any observed discrepancies, and will be sent to the SUXOS and the UXOQCS on the site. They will immediately work to take corrective action on all findings, and all corrective actions will be well documented through completion.

10.3 Corrective/Preventive Action Procedures

This Quality Control Plan allows for the immediate correction of quality deficiencies at the lowest level possible. The effectiveness of Quality Control measures and field techniques will be reviewed at least daily at the project level during daily debriefings. If deficiencies or better methods are identified, the UXOQCS and SUXOS will take corrective actions immediately as long as the change does not require a modification to the Work Plan. Changes to the Work Plan will be discussed with the Project Manager and approved by the client prior to implementation.

All deficiencies from project requirements that are observed are documented and reported. Deficiencies will be tracked to the point of corrective action. Examples of types of quality deficiencies could include:

- Delivery of items or services that do not meet the contractual requirements.
- Errors following work instructions or improper work instructions.
- Circumstances that result in items or services that do not meet quality/contractual/technical requirements.
- Technical modifications to the project by individuals that do not have proper authority.
- Errors in craftsmanship and trade skills.
- Directions to perform work outside the scope of work.

The Project Manager/SUXOS may take the following corrective actions:

- Identify the impact the deficiency may have on other project activities.
- Identify and implement the actions required to bring the project/activity back into compliance.
- Identify and implement procedures to preclude recurrence of the deficiency.

10.4 Data Management

Logbooks and records are periodically inspected by the UXOQCS. These inspections focus on the completeness, accuracy, and legibility of the entries and records. Results of these inspections are forwarded to the Project Manager. Logbooks are part of the official record and are maintained for the period directed by the contract. They are maintained on site for the duration of project operations and will be made available to the client for inspection at their request. After completion of the project, the logbooks and other site documentation become part of the Final Report. The following describes typical Quality Control documentation:

- A daily report of findings is generated and submitted to the SUXOS for each day of field activities. This report includes weather conditions, personnel on site, activities performed, directions received, deficiencies noted, problem areas, work plan modifications, injuries, start/stop times, tailgate safety briefs, equipment discrepancies, OE located, training conducted, visitors and any other appropriate project information. The UXOQCS will consult with the SUXOS on recommended corrective actions in cases where deficiencies are observed. All deficiencies will be documented in a corrective action log and will be followed up until completion.
- The SUXOS, UXOSO, UXOQCS and the UXO Team Leaders maintain field logbooks. These personnel use the books to record site activities and field data. The logbooks provide a record of site activities. The UXOSO maintains a log to record all safety matters associated with the project such as: safety briefings/meetings, safety training, safety audits, near-misses/accidents/incidents, causes and corrective actions taken, weather conditions and other related matters. The UXOQCS maintains a log to record the performance and results of Quality Control checks and audits. The SUXOS maintains a log to record site activities and progress made toward site goals. The SUXOS also maintains a photographic log. Photographs and/or videotapes are marked with a unique identifying number relating to the photographic log. Team Leaders maintain logs of the work accomplished by their team on a day-to-day basis.

- Other types of logs that may be found on a project site would include a Site Visitor Log, Confined Space Entry/Exit Log, or various types of Site Monitoring Logs. A Site Visitor Log is maintained, which includes a record of the visitor's name, company, date, time in/time out and a contact telephone number. Safety briefings and training for visitors are also recorded. Logs may also be maintained to keep track of entry and exit from the exclusion zone, or confined spaces, or areas where respiratory protection is required. Site monitoring logs may also be maintained in areas where exposure to site hazards has the potential for reaching the action level of an occupational hazard such as chemical exposure, heat or noise levels.
- The Project Manager and the SUXOS maintain training records for all site personnel. These records contain training certificates, licenses, and other qualifying data reflecting each individual's assigned position.
- The SUXOS maintains working maps of the operating areas throughout project execution. These maps document MEC finds, locations of sampling and other activities.
- Other types of documentation on site could include meeting minutes, inventory forms, various inspection forms, training forms, etc. These records will be audited as part of the official project site records.

10.5 Geophysical Reacquisition Program

EOTI will perform Quality Control on the geophysical reacquisition. Reacquisition includes the navigation to the location of the selected anomaly and reacquiring the anomaly with a hand held magnetometer. Positioning data will be recorded with mapping grade accuracy. Once the anomaly is investigated, detailed information will be carefully recorded on the dig sheets. The UXO Tech II will be responsible for insuring that the information is properly recorded on the dig sheet and the UXOQCS verify proper procedures for gathering and recording data through regular inspections. Target information from the reacquisition and excavation activities can be reviewed by the UXOQCS for Quality Control.

10.6 Field Operations

The UXOQCS performs random, unscheduled checks to ensure that personnel accomplish all work specified in the Work Plan. All procedures are well documented within the approved Work Plan, and all personnel on the site must be trained in these procedures. The UXOQCS conducts random observations of all UXO teams' search, clearance, and scrap inspection techniques to assure they are being done in accordance with accepted procedures.

Quality Control inspections are also performed for areas that are completed. When an area is completed, it is presented by the Team Leader to the UXOQCS for inspection. If any quality standard is not met, the area will be failed and turned back to the Team Leader.

10.7 Equipment Calibration/Maintenance

EOTI reviews equipment requirements and identifies equipment requiring daily tests and/or calibration. Calibration/testing of instruments may be accomplished as follows:

- Daily Quality Control Audits are conducted on all instruments and equipment that require calibration. They are checked prior to the start of each workday. Batteries are replaced during the daily equipment checks and the instruments are checked against a known source to assure functionality.

- Emergency equipment will be inspected daily, or as required by the manufacturer, to ensure that it is operating as designed as in good repair.
- UXO tools and equipment are inspected before use and at least weekly, to ensure that they are complete and in good repair. Tools and equipment that are not in good repair will be reported to the SUXOS and will be taken out of service until they can be repaired or replaced.
- Each morning, prior to beginning operations, communications equipment such as radios and cellular telephones are checked to ensure batteries are charged and that they are operational.
- Prior to use, geophysical equipment is checked and/or calibrated against a known source. Equipment is checked by emplacing an inert ordnance item or surrogate at the clearance depth, in a variety of positions within a test bed, to verify the standard indication and that the instruments are operating properly. Geophysical equipment is tested before operations in the morning and when operations are resumed after lunch break. Random checks are performed by the UXOQCS and/or the SUXOS during daily operations to ensure the equipment is functional and operated properly.
- Prior to use, Global Positioning System (GPS) receivers are tested with a functional check. The purpose of this check is to ensure that batteries are sufficiently charged, that the instrument is receiving sufficient data to compute three-dimensional positions, and that the instrument is properly configured. These checks are made by placing the instrument into operation over a known point and comparing the computed location displayed on the GPS receiver with the known coordinates of the test location.

10.8 Geophysical Instruments

Magnetometers are tested at least daily and at the beginning of each shift as described above to determine proper function. EOTI does not anticipate the use of any other geophysical equipment during this project.

10.9 Radios/ Cell Phones

As good communication equipment is vital to the safety of all personnel on the project, as well as to the successful completion of the project, all communications equipment such as radios and cellular telephones will be inspected prior to the start of operations each day. The batteries will be fully charged and the equipment will be fully operational. This equipment will be inspected again after the lunch break, prior to the start of the afternoon operations. If multiple shifts are operating, the communication equipment will be inspected at similar intervals on other shifts. If batteries are not fully charged, they will be replaced with fully charged batteries. If communication equipment is not functioning properly, it will be tagged out, removed from service, and replaced with an operational unit. Inoperable communications equipment that has been tagged out will not be stored with operational equipment. It will be sent for repair as soon as possible, at a facility approved for repair of the equipment. If it cannot be repaired, it will be removed from the site. All communications equipment inspections will be fully documented.

10.7.1 Vehicles/Machinery

Site vehicles, machinery and boats will be fully inspected on a weekly basis using the EOTI Vehicle Inspection Form. However, the operators will report any problems with the vehicles or equipment as they occur. Any reported problems will be immediately addressed. Minor maintenance may be performed on site, such as oil changes, lubricating, changing fluids, etc. If

major repairs are required, vehicles, machinery, and boats will be returned to the rental company and exchanged for equipment that is functioning properly. All vehicle, machinery and boat inspection records will be fully documented and maintained on site for the duration of site operations. At the conclusion of fieldwork, these records will be returned to the Project Manager for inclusion in the Final Report.

10.7.2 Personal Protective Equipment

Monitoring equipment for use in environmental monitoring such as heat monitoring, noise monitoring, chemical hazard exposure monitoring, etc. will be inspected daily prior to use. Calibration will be checked to assure it is current. Functionality will also be tested. Monitoring equipment that is not performing in accordance with its specifications will be tagged out of service until it can be repaired or replaced. Repairs to monitoring equipment will be made by authorized repair facilities, only. EOTI personnel are not authorized to make repairs to this equipment. Equipment that is not functioning properly will not be stored in the same area as functioning equipment. Records of inspections on monitoring equipment will be fully documented. They will be maintained on site for the duration of site operations. They will be returned to the Project Manager for use in the Final Report at the conclusion of site operations.

Personal protective equipment (PPE) will be ordered based on the recommendations of the Health and Safety Manager after an evaluation of the potential site hazards, to assure that the equipment ordered will provide the right level of protection for EOTI employees working at field site locations. The Health and Safety Manager will coordinate closely with the UXOSO at the individual project sites. The UXOSO will inspect all PPE when it arrives on site for condition and function. If the equipment is not what was ordered, or if there are defects in the PPE, he will notify the Health and Safety Manager of the situation, and the PPE will be returned to the vendor in exchange for the correct equipment that was ordered. Once PPE is given to site workers, they will be responsible for taking care of the equipment. All workers will inspect their PPE for fit and function daily prior to use. Equipment that is broken or not working properly will be turned in and replaced with properly working PPE. If the broken PPE is the disposable type, it will be disposed of, but if it can be repaired, it will be sent to a qualified repair facility. All sites operate on the "Buddy System." Throughout the day, buddies will check each other's PPE for rips, tears, correct use, etc. In addition, the UXOSO, the SUXOS, and the UXOQCS will be observing procedures as part of their inspections, and they will note if someone is not wearing their PPE properly as part of the inspection process and corrective action will be taken immediately.

10.8 Pass/Fail Criteria

Quality Control pass/fail criteria will be established to determine the effectiveness of field operations. These criteria will be at least as stringent as the client's Quality Assurance criteria. All audits will be based upon the designated pass/fail criteria, and immediate action will be taken on any item that fails. All such discrepancies will be fully documented in a corrective action log and tracked until completion of corrective actions. This information will be shared with the Project Manager, SUXOS, UXOSO, and the Corporate Quality Manager. Where applicable, this information will be shared with other similar EOTI operating sites by the Corporate Quality Manager in order to continually improve the level of quality on all EOTI project sites.

10.9 Quality Records

EOTI will maintain detailed quality records from field operations. These records include such items as the Daily Report, Audit Reports, Corrective Action Logs, etc. that document the quality process and how it was implemented on the project site. The records will be included with the final report and will be reviewed to capture lessons learned. Lessons learned from any project site will be applied to all similar EOTI project sites, both currently operating sites, and future site work.

10.10 Lessons Learned

Lessons learned are critical to the feedback required for continuous improvement. Lessons learned will be captured at the project level and submitted through the corporate Quality Manager for distribution to team members, other similar projects, and clients, as applicable. Lessons learned from other EOTI projects will also be applied in this project as applicable. Lessons learned will be a part of the final report for each EOTI project. The Quality Control Manager is a vital part of the planning loop for all projects. He will be responsible for assuring that lessons learned from past projects will be incorporated into the planning process for all future projects.

10.11 Submittals

As part of this project, a number of submittals are required. Among these, are the Work Plan and various sub-plans associated with it, various site reports, and the Final Report. In order to assure quality in our written work as well as our site work, a peer review process has been set up. This means that the author of any document must present it to a peer, who will read the entire document and provide comments regarding whether or not it meets contractual requirements and client expectations, format, grammar, etc.

A peer review form will be filled out by the reviewer and it will be maintained in the official project files in the Oak Ridge, TN office. The Peer Reviewer will be expected to provide comments to the document's author. When the comments are addressed in the document, the document will be sent back to be reviewed by the Peer Reviewer to approve of the changes made to the document, to assure that all of his or her concerns were met. If the changes did not fully address the concerns, the Peer Reviewer will take the document back to the original author and describe what was expected, so that the appropriate changes to the document can be made. In some particularly complex documents, there may be a number of specialized skills addressed, which might require a number of differing personnel perform the Peer Review for the section covering their area of expertise. In these cases the comments of multiple reviewers would have to be addressed on the same Peer Review form. This way the trail of the Peer Review can be seen in one document, and it can be easily noted if all Reviewers' comments were adequately addressed within the document.

10.12 Training

EOTI carefully screens all potential employees to ensure that they have the proper training and current qualifications to perform in their positions. All UXO qualified personnel must have a certificate from the Navy Explosive Ordnance Disposal (EOD) School or other recognized training program. All site workers must also have the OSHA 40 Hour Hazardous Waste Operations and Emergency Response (HAZWOPER) training and a current 8 Hour Refresher

Training, given once a year. Supervisory personnel are required to have taken OSHA HAZWOPER Supervisor Training. All applicable training documentation will be kept in the employee's file at the project site for the duration of project operations.

All employees will receive site-specific training to ensure that they understand the safety and quality requirements of the site. This is a combined classroom and OJT training that includes a review of the Work Plan and the Site Safety and Health Plan, as well as checking employees out in the proper use of all tools, and equipment that they will be expected to operate on the site. All training will be fully documented on the EOTI Documentation of Training Form. Training records will be maintained on the project site for the duration of project operations. At the conclusion of site work, the training records will be sent back to the Oak Ridge, TN office for inclusion in each employee's personnel file.

Daily Tailgate Safety Briefings will be given to site personnel each day prior to the start of operations. This training will discuss the operations expected to be completed that day, the hazards involved with those operations, PPE required, emergency procedures, weather conditions, and any other items appropriate for discussion. These sessions will be documented on the EOTI Documentation of Training Form, and will be maintained on site for the duration of fieldwork.

Visitor training is an important part of site operations. As much as possible, visitors to the site will be limited to the support zone, where the office area, break areas, public areas are located. If the visitor is required to enter the exclusion zone, they will be escorted at all times by an experienced, UXO-qualified EOTI employee, normally the UXOSO. Prior to entry into the exclusion zone, each visitor must have training on the hazards inherent in the project operations, which areas of the site they are permitted to enter, how to recognize an evacuation signal, evacuation procedures, and the fact that they must be escorted at all times while within the exclusion zone. The UXOSO will normally be the one providing the visitor with these briefings, and will normally be the escort. In addition to filling in the Visitor Log, the UXOSO will assure that documentation is made of the visitor, purpose of the visit, and briefing information presented. The EOTI Documentation of Training form can be used for this purpose. All records of visitors to the site will be maintained on the site for the duration of site operations. All other such records will be transferred to the Oak Ridge, TN office.

10.13 Final Report

All site documentation will remain on the project site for the duration of field activities. At the request of the client, this material can be made available for review at the project site. At the conclusion of site operations, all records from the Project will be turned over to the Project Manager in the EOTI Oak Ridge, TN office. The Project Manager will use all of this site information to assemble the Final Report for the project. The documentation from the site will become a part of the permanent record of this site, and after all of the data has been analyzed by the Project Manager and the Report has been developed, the site information will be attached to the Final Report as supporting materials.

11 ENVIRONMENTAL PROTECTION PLAN

Not Applicable to this Project

12 INVESTIGATIVE DERIVED WASTE PLAN

Not Applicable to this Project

13 INTERIM HOLDING FACILITY SITING PLAN FOR RCWM

Not Applicable to this Project

14 PHYSICAL SECURITY PLAN FOR RCWM

Not Applicable to this Project

15 REFERENCES

29 CFR 1910, Occupational Safety and Health Standards

DDESB TP-18, Minimum Qualifications for Unexploded Ordnance (UXO) Technicians and Personnel

DOD 6055.9-STD, DOD Ammunition and Explosives Safety Standards

EM 385-1-1, Safety - Safety and Health Requirements

EM 1110-1-4009, Ordnance and Explosives Response

EP 75-1-2, Munitions and Explosives of Concern (MEC) Support during Hazardous, Toxic, and Radioactive Waste (HTRW) and Construction Activities

EP 385-1-95a, Basic Safety Concepts and Considerations For Munitions and Explosives of Concern (MEC) Response Action Operations

EP 1110-1-18, Engineering and Design Ordnance and Explosives Response

FM 21-16, Unexploded Ordnance (UXO) Procedures

TM 60A-1-1-22, General EOD Safety Precautions

TM 60A-1-1-31, Explosive Ordnance Procedures

APPENDIX A
REACQUIRE POINTS

SITE SPECIFIC WORK PLAN

SUPPORT OF VALIDATION OF THE MARINE TOWED ARRAY DEMONSTRATION
at
FORMER ERIE ARMY DEPOT AND TOUSSAINT RIVER

EOTI
EXPLOSIVE ORDNANCE TECHNOLOGIES, INC.

ORDNANCE AND EXPLOSIVE REMEDIATION

105 W. Tennessee Ave. • Oak Ridge, TN 37830
Tel: (865) 220-8668 • Fax: (865) 220-8857

September 14, 2006,

AETC
Attention: Jim McDonald, PhD
120 Quade Dr.
Cary, NC 27513

Subject: UXO Support Work Plan, Toussaint River Survey

Dear Dr. McDonald:

Please find enclosed EOTI's Work Plan and Site Specific Safety and Health Plan for UXO Dive Support at Toussaint River.

The Work Plan anticipates that data for the points to be reacquired can be inserted as Appendix A when the data becomes available.

We look forward to supporting AETC on this project and on future projects. Please feel free to contact me at 865-220-8668 with any questions.

Sincerely,

Explosive Ordnance Technologies, Inc.

Wayne Lewallen
Vice President

Enclosure: Work Plan
Safety and Health Plan

EXPLOSIVE ORDNANCE TECHNOLOGIES, INC. (EOTI)
SITE SPECIFIC WORK PLAN

SUPPORT OF VALIDATION OF THE MARINE TOWED ARRAY DEMONSTRATION AT FORMER ERIE ARMY DEPOT AND TOUSSAINT RIVER

PRESENTED FOR:

AETC

AETC INCORPORATED
120 QUADE DRIVE
CARY, NC 27513

PRESENTED BY:

EOTI

EXPLOSIVE ORDNANCE TECHNOLOGIES, INC.
105 WEST TENNESSEE AVE.
OAK RIDGE, TN 37830

SEPTEMBER 14, 2006

EXPLOSIVE ORDNANCE TECHNOLOGIES, INC. (EOTI)
SITE SPECIFIC WORK PLAN

SUPPORT OF VALIDATION OF THE MARINE TOWED ARRAY DEMONSTRATION AT FORMER ERIE ARMY DEPOT AND TOUSSAINT RIVER

Submitted To:

AETC Incorporated
120 Quade Drive
Cary, NC 27513

Submitted By:

Explosive Ordnance Technologies, Inc. (EOTI)
105 W. Tennessee Ave.
Oak Ridge, TN 37830

September 14, 2006

TABLE OF CONTENTS

LIST OF ACRONYMS

AFB - Air Force Base
ASCII - American Standard Code for Information Interchange
CERCLA - Comprehensive Environmental Response, Compensation and Liability Act
CES - Civil Engineering Squadron
CFR - Code of Federal Regulations
CWM - Chemical Warfare Material
DGPS - Differential Global Positioning System
DID - Data Item Description
DD - Department of Defense
DGM - Digital Geophysical Mapping
DGPS - Differential Global Positioning System
DoD - Department of Defense
DQO - Data Quality Objective
EM - Electromagnetic
EM - Engineer Manual
EOD - Explosive Ordnance Disposal
EP - Engineer Pamphlet
ER - Engineer Regulation
ESRI - Environmental Systems Research Institute
EZ - Exclusion Zone
EOTI - Explosive Ordnance Technologies, Inc.
FGDC - Federal Geographic Data Committee
Frag - Fragmentation
FTP - File Transfer Protocol
GCS - Geographic Coordinate System
GIS - Geographic Information System
GPO - Geophysical Prove Out
GPS - Global Positioning System
HH - Hand Held
MEC - Munitions and Explosives of Concern
MPM - Most Probably Munition
MPPEH - Material Potentially Presenting Explosive Hazard
MR - Munitions Response
MSD - Minimum (safe) Separation Distance
MSDS - Materiel Safety Data Sheet
MV - Milli-volts
NA - Not Applicable
NAD - North American Datum
NCP National Contingency Plan
NTP - Notice to Proceed
NS - Not Seeded
OE - Ordnance and Explosives
OSHA - Occupational Safety and Health Administration
PBR – Precision Bombing Range

PC - Personal Computer
PDF - Portable Document File
POC - Point of Contact
PPE - Personal Protective Equipment
QC - Quality Control
RFP - Request for Proposal
RR - Range Residue
SDSFIE - Spatial Data Standards for Facilities, Infrastructure, and Environment
SOW - Statement of Work
SSHP - Site-specific Safety and Health Plan
SUXOS - Senior UXO Supervisor
USAF - United States Air Force
USACE - United States Army Corps of Engineers
UTM - Universal Transverse Mercator
UXO - Unexploded Ordnance
UXOQCS - UXO Quality Control Specialist
UXOSO - UXO Safety Officer
WP - Work Plan

INTRODUCTION

1.1 General Information

This Work Plan (WP) details the actions necessary to provide MEC/UXO support and dive operations required for reacquisition of marine based geophysical anomalies, identification and disposal of material potentially presenting an explosive hazard in designated areas of the former Erie Army Depot, Ottawa County, OH. A previous geophysical survey conducted in the study area revealed a number of anomalies that were potentially caused by munitions and explosives of concern (MEC). The purpose of the work described in this work plan is to safely reacquire and investigate designated anomalies in order to record data necessary to evaluate the effectiveness of the equipment and procedures used in Demonstration Validation results. Following the investigation of anomalies, EOTI will remediate potential explosive hazards and properly dispose of MEC scrap.

1.2 Site Location

The former Erie Army Depot, Ottawa County, OH, is located along the western shore of Lake Erie (Figure 1.1). This site and the associated impact areas are classified by the United States Government as a Formerly Used Defense Site (FUDS) under the Defense Environmental Restoration Program (DERP). This property was formerly used for artillery testing, resulting in impact areas on land and in Lake Erie. Ordnance and explosive waste (OEW) and potentially live or unexploded ordnance (UXO) have been found on the lake bottom, in the Federal navigation channel at the Toussaint River, in the marshland adjacent to the firing ranges, and along beaches fronting the former Depot. The impact areas were located in, near, or offshore of the FUDS beaches adjacent to Lake Erie. Ordnance found on or near the FUDS shore of Lake Erie appears to be mobile and may have originated from offshore or nearshore impact areas.

1.3 Site History

The subject study area consists of the beach and area of Lake Erie fronting the former Erie Army Depot (now called Erie Industrial Park), between Camp Perry Ohio National Guard Training Center and the mouth of the Toussaint River in northwest Ohio (Figure 1.1). This FUDS site is located in rural Carrol Township, Ottawa County, OH, on Lake Erie, approximately 37 miles east of Toledo, Ohio, and 6 miles east of Port Clinton, Ohio. The Erie Army Depot was initially established in 1918 as the Camp Perry Proving Grounds, and then redesignated as Erie Proving Grounds. For almost a half century (1918-1966) this site was used by the Department of the Army for testing and proof-firing of artillery and as an ordnance storage and issue center (USAED Rock Island 1993). Camp Perry was established in 1907 by the state of Ohio for the training of the state National Guard. Part of the camp was used to establish the Erie Army Depot in the spring of 1918. During the next 2 years, the site was used to proof fire (check for accuracy) thousands of pieces of artillery. Between World Wars I and II, the site was less active and was used primarily to warehouse and issue various items of ordnance. In 1941, the artillery test-firing mission of the site was reactivated in support of World War I1 and the name of the facility was changed to the Erie Proving Ground. During the next 5 years, 70 percent of the mobile artillery used by the U.S. Army or provided to Allied armies was tested and proof-accepted at Erie Proving Ground. Between 1946 and 1951, the site reverted to a peacetime role and was renamed the Erie Army Depot. Late in 195 1, the depot assumed the additional roles of anti-aircraft support testing and the overhauling of surface-to-air guided missiles (support to the Korean Conflict). Additional activities included logistical support to Regular Army and National

Guard anti-aircraft units training at Camp Perry (USAE District, Rock Island 1993a, 1993b; Bovia and Wirzylo 1992). Test firings of Vietnam-era munitions continued into the early and mid-1970s. Discussions with previous employees of the Erie Army Depot and present officials of Camp Perry indicate that the firing source and range patterns have been similar for other periods. The Erie Army Depot was excessed by the General Services Administration in 1966 and closed in 1967. However, ARES, Inc., a company under contract to the Federal Government, has continued to manufacture and test fire artillery and other large-caliber barrels on this property as a commercially owned and operated enterprise. The majority of acreage encompassing the former Erie Army Depot site is no longer Federal property and is now classified as a FUDS. Approximately 5.7 km2 (1,400 acres) of property at the former Erie Army is leased from the State of Ohio to private landowners. At present, the site is used still used for limited firing from Camp Perry and the Ares facility in the former Erie Army Depot. The immediate area near the Toussaint River is used for recreational and commercial boating.

1.4 Geology

The FUDS beach is a thin (less than 2- or 3-m (6.5- or 10-ft) -thick) blanket of sand, which sits on top of older lake clays. Layers of organic-rich silts and clays (including peat deposits) are intermingled within the sand body and may be exposed along the shore or in the nearshore, particularly in the troughs between bars. The peat deposits are the result of the relatively modern marsh deposits being exposed on the beach as the barrier migrates back over the marsh.
The shore northwest of the Toussaint River mouth is a wider and more stable sandy barrier beach than that which fronts the FUDS study site. This barrier includes several beach ridges which are crested by scrubs and trees suggesting previous beachlines and accretion cycles. The mouth of the Toussaint River is fronted by an extensive (460-m-wide by 920-m-long (1,500-ft-wide by 3,000-ft-long) shallow sand shoal, which is asymmetrical toward the east (Figure 7). This shoal represents a trapping of littoral sands which move from the northwest toward the river mouth and are then jetted into a delta-like shoal by river discharge and returning seiche (sudden rise and fall of water levels due to atmospheric conditions) waters which build up in the river during heavy winds from the north. It is probably the presence of this shoal which is responsible for trapping sand which would otherwise have nourished the unstable and eroding beach of the FUDS study area.

Three cores were taken by Buffalo District (USAE District, Buffalo 1989) along the proposed channel line lakeward of the Toussaint River mouth in support of the proposed navigation project. Logs from these cores suggest that the shoal consists of a 2- to 3-m (6.5- to 104) thickness of medium-to fine sand, which includes some coarser sand and a gravel zone overlying lacustrine clays. Lakeward of the FUDS study site, the shoreline is paralleled by a narrow band of fine-to-medium sandy material which extends approximately 150-300 m (500-1,000 ft) offshore to the 0.6- to 1.2-m (-2- to -44) (LWD) contour (Figure 7). This underwater sand extension of the beach includes a series of well-defined two to four shore-parallel sandbars. Lakeward of this sandy zone, the shallow, flat bottom (slope less than 1:300) is covered with a soft silty-mud layer out to approximately the 3-m (-104) (LWD) contour. This muddy layer pinches out toward the east and offshore, where the bottom becomes a firm blue-clay glacial till, which includes lag-deposit zones of sands and gravels.

The FUDS study site beach has exhibited shoreline retreat during all recorded shore position surveys (1877 to present). In establishing its Erosion Hazard Areas, the State of Ohio, Division of Geology used survey and aerial photographic data from 1877, 1973, and 1990 (Figure 8). Profiles were established at 30-m (100-ft) intervals and backbeach position was determined for each time interval. Profiles 10579 through 10759 cover the study area. These data (illustrated in Figure 8) document a shore which has experienced long-term recession rates, ranging from as little as 0.27 m/year (0.9 ft/year) (on the updrift side of the stone stick-out feature located near the Camp Perry border, profile 10625) to as much as 1.1 m/year (3.6 ft/year) (profile 10695). The average retreat rate for the study area is between 0.61 and 0.91 m/year (2 and 3 ft/year), or a total of 68.9 to 103.3 m (226 to 339 ft) since the 1877 baseline survey. The Buffalo District (USAE District, Buffalo 1989) conducted a shoreline change analysis in support of the design studies for the Toussaint River Navigation Project using additional aerial photography. They found an average recession rate for the shore southwest of the Toussaint River of 0.85 m/year (2.8 ft/year). Long-term shoreline retreat throughout the FUDS study site is exacerbated during periods of high water, when storms with winds from the north can drive the water level up the beach and over the low back beach causing the barrier to be breached. This type of impact occurred in 1986 during record high water levels on Lake Erie when the barrier near profile 10650 was inundated and flow between the lake and the backbeach marshes was unimpeded. This tenuous and eroding characteristic of the FUDS site beach has important implications in the evaluation of the ordnance distribution patterns. Since the Erie Army Depot was an active ordnance test facility (1918-1966) the beach has retreated 64 to 23 m (210 to 76 ft) to the present beach position. In addition, a breach occurred through the beach in 1986 which was in direct line with the dominant firing fan orientation (Figure 7). Thus, the beach which existed during the period of Erie Army Depot operation is now under water and the present beach is being eroded from what was an area 30.5 to 61 m (100 to 200 ft) landward of the former shore.

Figure 1.1, Project Site Location

2.0 TECHNICAL MANAGEMENT PLAN

2.1 Guidance, Regulations, and Policy

EOTI received a contract from AETC, Inc. to provide MEC support related to the Demonstration Validation efforts at the former Erie Army Depot and Toussaint River located in near the Port Clinton area, Ohio. The EOTI Dive SOP will govern diving operations. Based on the SOW, EOTI will conduct a subsurface clearance to identify and record required data for each anomaly identified in the demonstration. EOTI will perform all support activities as described in this work plan and consistent with the guidance and requirements ER 1110-1-8153 and other applicable requirements.

Unexploded Ordnance is a safety hazard and may constitute an imminent and substantial danger to personnel on the site. Unexploded Ordnance has been found in the project area and occurs due to military training activities that were conducted there. Since UXO Removal Operations will be conducted in accordance with the substantive requirements of CERCLA, 29 CFR 1910.120 applies. EOTI's work is to be performed in a manner consistent with CERCLA, Section 104 and the national Contingency Plan (NCP), Sections 300.120(d) and 300.400(e). Additional guidance and regulations used are listed in Section 15.

2.2 Chemical Warfare Material (CWM)

The areas covered under the Scope of Work for this project are not suspected to have CWM. However, a remote possibility exits that chemical warfare material could be encountered during the planned investigation and excavation activities at the Former Erie Army Depot and Toussaint River site. If suspected CWM is encountered during any work, the procedures listed below will be followed:

- The initial Exclusion Zone (EZ) for suspected CWM will be established and maintained a minimum of 450 feet upwind.
- Neither the suspect item nor the area will be disturbed further after discovery.
- The senior UXO qualified technician on site will immediately direct the dive team and all others working in the vicinity to stop work and evacuate the site in an upwind direction. Upon evacuation, the senior UXO qualified technician on site will account for all work site personnel.
- The senior UXO qualified technician on site will follow proper cordon procedures and immediately notify the Project Manager. Report emergencies by calling 911. .
- Before work resumes, the site plans will be reviewed for adequacy in consideration of the hazard discovered. The senior UXO qualified technician on site will provide a suspect CWM report including the following information:
    - Date and local time of event
    - Location
    - Preliminary identification of suspect CWM
    - A description of events

- A description of any property damage, personnel casualties, and/or injuries
- A description of whether medical services or facilities were required
- A list of immediate notification and support requirements identified during the initial emergency response assessment
- Any other pertinent information.

2.3 MEC Destruction and Unidentifiable MEC

All UXO disposal operations will be conducted in accordance with the SOW. If unidentifiable UXO is found, the default separation distance specified in DOD 6055.9-STD will be used to establish the exclusion zone. Unidentified UXO will not be disposed of until the munitions filler can be determined. CEHNC-OE-CX Interim Guidance 02-03 provides guidance in helping to determine unknown explosive fillers. The Site SUXOS will determine final disposition/disposal procedures.

If a UXO item is unacceptable-to-move (fuzed and fired) and is located in a work limits and the fragmentation zone does not include the public and buildings, it will be BIP. If the fragmentation zone is in the vicinity of the range boundary or extends beyond the range boundary in the vicinity of inhabited areas, and the fragmentation zone falls within any Schools or Neighborhoods "Safety Buffer Zones" then EOTI will utilize engineering controls to limit the fragment displacement distance thus reducing the fragmentation zone. All UXO discovered will be logged into the UXO Accountability Log. The log will be kept onsite and a digital copy will be transmitted to the EOTI Oak Ridge office for safe archiving.

Whenever possible, explosive destruction will be accomplished by electrical means to insure maximum control and safety.

Access to the areas where disposal operations are conducted is restricted and coordinated through ARES, Inc. and local authorities. If required, the Coast Guard will be contacted to assist in controlling access from the water. Barricades with signs will be placed on all roads that access the site to identify the exclusion area. Personnel deemed as non-essential to the demolition operation will be evacuated or assigned duties outside of the fragmentation zone.

The UXOSO is responsible for ensuring all personnel are accounted for during disposal operations and that the demolition operation is conducted in strict accordance with required procedures. The EOTI SUXOS and/or UXOSO will visually inspect the demolition site and announce all clear upon completion of demolition operations.

2.4 Technical Scope of the Project

The overall objective of this project is for EOTI to provide MEC support to AETC's Marine Geophysical Demonstration Validation project by reacquiring, excavating and recording detailed data related to anomalies previously identified and selected for investigation.

The Demonstration Validation project will take place at the former Erie Army Depot and Toussaint River site located in Port Clinton, OH. The former Erie Army Depot, Ottawa County, OH, is located along the western shore of Lake Erie (Figure 1). This site and the associated impact areas are classified by the United States Government as a Formerly Used Defense Site (FUDS) under the Defense Environmental Restoration Program (DERP). This property was formerly used for artillery testing, resulting in impact areas on land and in Lake Erie. Ordnance

and explosive waste (OEW) and potentially live or unexploded ordnance (UXO) have been found on the lake bottom, in the Federal navigation channel at the Toussaint River, in the marshland adjacent to the firing ranges, and along beaches fronting the former Depot. The impact areas were located in, near, or offshore of the FUDS beaches adjacent to Lake Erie. Ordnance found on or near the FUDS shore of Lake Erie appears to be mobile and may have originated from offshore or near shore impact areas. In FY06, ESTCP was directed by Congress to conduct work to characterize UXO contamination impacting the Toussaint River area.

The subject study area consists of the beach and area of Lake Erie fronting the former Erie Army Depot (now called Erie Industrial Park), between Camp Perry Ohio National Guard Training Center and the mouth of the Toussaint River in northwest Ohio (Figure 1). This FUDS site is located in rural Carrol Township, Ottawa County, OH, on Lake Erie, approximately 37 miles east of Toledo, Ohio, and 6 miles east of Port Clinton, Ohio. The Erie Army Depot was initially established in 1918 as the Camp Perry Proving Grounds, then re-designated as Erie Proving Grounds. For almost a half century (1918-1966) this site was used by the Department of the Army for testing and proof firing of artillery and as an ordnance storage and issue center (USAED Rock Island 1993). Camp Perry was established in 1907 by the state of Ohio for the training of the state National Guard. Part of the camp was used to establish the Erie Army Depot in the spring of 1918. During the next 2 years, the site was used to proof fire (check for accuracy) thousands of pieces of artillery. Between World Wars I and II, the site was less active and was used primarily to warehouse and issue various items of ordnance. In 1941, the artillery test-firing mission of the site was reactivated in support of World War I1 and the name of the facility was changed to the Erie Proving Ground. During the next 5 years, 70 percent of the mobile artillery used by the U.S. Army or provided to Allied armies was tested and proof-accepted at Erie Proving Ground. Between 1946 and 1951, the site reverted to a peacetime role and was renamed the Erie Army Depot. Late in 195 1, the depot assumed the additional roles of anti-aircraft support testing and the overhauling of surface-to-air guided missiles (support to the Korean Conflict). Additional activities included logistical support to Regular Army and National Guard anti-aircraft units training at Camp Perry (USAE District, Rock Island 1993a, 1993b; Bovia and Wirzylo 1992). Test firings of Vietnam-era munitions continued into the early and mid-1970s. Discussions with previous employees of the Erie Army Depot and present officials of Camp Perry indicate that the firing source and range patterns have been similar for other periods. The Erie Army Depot was listed as excess by the General Services Administration in 1966 and closed in 1967. However, ARES, Inc., a company under contract to the Federal Government, has continued to manufacture and test fire artillery and other large-caliber barrels on this property as a commercially owned and operated enterprise. The majority of acreage encompassing the former Erie Army Depot site is no longer Federal property and is now classified as a FUDS. Approximately 5.7 km2 (1,400 acres) of property at the former Erie Army is leased from the State of Ohio to private landowners.

At present, the site is used still used for limited firing from Camp Perry and the Ares facility in the former Erie Army Depot. The immediate area near the Toussaint River is used for recreational and commercial boating.

Digital Geophysical Mapping (DGM) was conducted in the area of the investigation using a variety of Marine based towed magnetometer arrays. These instruments were selected to validate their effectiveness as a marine geophysical tool. The results of the geophysical mapping

are used to select target anomalies that will be investigated under the SOW addressed in this work plan.

Based on the results of the previous geophysical investigation and data analysis approximately 200 anomalies will be reacquired and investigated. These discrete anomalies are shown in the figures located in Appendix A. A list of the anomalies, their location, and signal strength is also located in Appendix A. EOTI will navigate to the general location of each of the identified anomalies using a mapping grade GPS. EOTI will then pinpoint the predicted location of the anomaly using a magnetometer capable of underwater operation and place a marker. Each marker will be marked with a discreet number for that anomaly. During the subsurface investigation, the UXO team will then reacquire the anomaly with a hand-held underwater magnetometer.

Each anomaly will be investigated with a combination of air or water pumps and/or hand tools, depending on the depth of the anomaly and the bottom composition. Excavation will be to the side of the anomaly, within 12 inches of it. After that point, remaining excavation operations will be conducted carefully using hands and hand tools. The anomaly will be carefully uncovered, so that it can be examined to determine the item and its condition. Depending upon the visibility, identification may require that the examination be conducted by feeling the item with the hands. If the item can be moved, it will be brought to the surface, using lift bags or a winch as necessary. If the item cannot be moved, it will be marked and its location recorded for later disposal and it will be reported to the nearest local EOD unit. Each anomaly located will be immediately identified and recorded in the logbook. Information in the logbook entry will be used to complete the dig sheet (Appendix F). Information recorded will include: x, y, and z coordinates [UTM (meter), NAD83/NAVD88, Geoid03 system], description of the item and its condition, depth of the item, orientation, etc to the accuracy required to effectively assess the WAA technology. Each item recovered will also be documented with a digital photograph.

Maps, included in Appendix A of this work plan, identify the predicted location of each discrete anomaly identified for investigation. As anomalies are investigated, results will be displayed in the dig sheets and on a project specific GIS (see Chapter 7 of this work plan) displayed on a secured web-site.

EOTI will conduct demolition operations, as necessary to ensure that investigated items are free of explosive hazards prior to disposal. If items can be safely moved they will be consolidated in a bunker area provided by ARES, Inc. pending demolition operations. MEC scrap and Range Residue (RR) scrap created or recovered during the operation will be collected in secure containers for disposal after completion of the fieldwork. This scrap will disposed of through a local scrap dealer and will not be released to the public until it has been processed through a smelter or shredded. The turn-in of scrap will be documented on a DD Form 1348-1A, Issue Release / Receipt Document. The SUXOS will complete the DD Form 1348-1A in accordance with DoD 4160.21-M. A certificate will be prepared with the following statement: "*This certifies that the material listed has been 100 percent properly inspected and, to the best of our knowledge and belief, is free of explosive hazards, engine fluids, illuminating dials and other visible liquid HTRW materials*." The SUXOS and the UXO Safety Officer will sign the form.

EOTI will prepare a final report in accordance with Data Item Description (DID) MR-030. In addition to the DID requirements, EOTI will include all QC documentation in the Final Report.

EOTI will also include a cover letter signed by an authorized person of the company certifying, on behalf of the company, that the requirements of this Task Order have been met.

2.5 Changes in Site Conditions

Unforeseen circumstances, such as severe weather events, may create a change in site conditions that could temporarily affect the performance of this Task Order. Regardless of the reason for the change in site conditions, EOTI will immediately notify the AETC Project Manager of the change and of the action taken. Telephone/fax communications will be followed up by a hard copy communication.

2.6 Organization

EOTI is contracted by AETC to provide MEC support for the WAA assessment project as described above. EOTI's Project Manager will be the primary point of contact with the AETC project manager. He will be primarily responsible for project planning and execution and will make project related decisions. He directs and supports the Senior UXO Supervisor (SUXOS). The SUXOS is responsible for the safe execution of the Statement of Work (SOW). He coordinates with the AETC site manager and is supported by the UXO Safety Officer (UXOSO) and UXO Quality Control Specialist (UXOQCS). He directs the support teams. The UXOSO and UXOQCS are responsible to ensure compliance with the project safety and quality requirements, respectively. Each has a direct line to the EOTI corporate office. The EOTI Program Manager has overall responsibility for the project. He has contractual authority and will direct the project manager as required to ensure all project and contractual requirements are met. Figure 2.1 depicts key project personnel and their relationships and responsibilities with the project team.

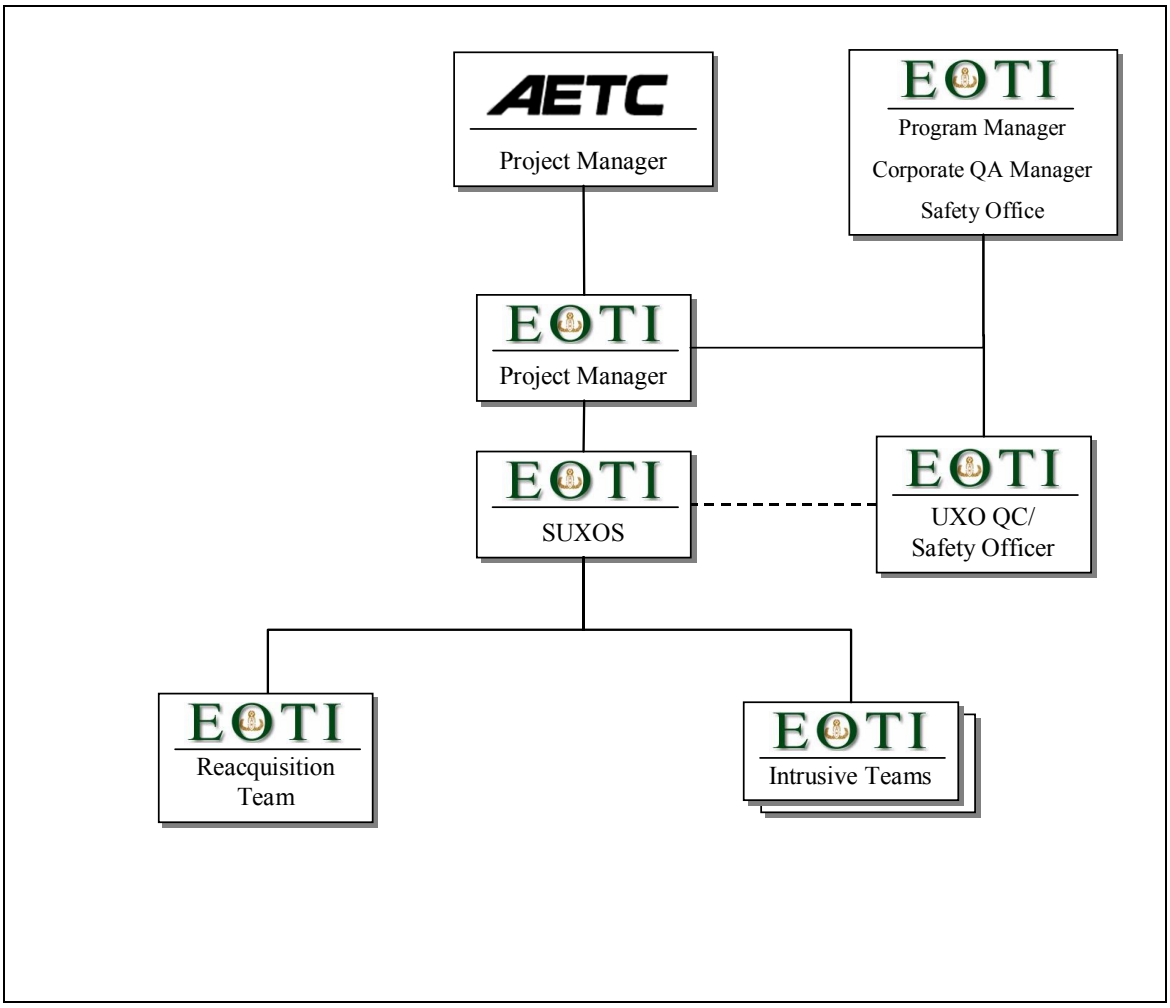

Figure 2.1 Project Organization Chart

2.6.1 Subcontractors

EOTI does not anticipate using subcontracting personnel in this operation. If it should become necessary to use any subcontractor personnel, they will be required to be familiar with and will comply with all requirements of the work plan.

2.6.2 Project Personnel

Program Manager
Mr. Wayne Lewallen is Vice President and EOTI Program Manager responsible for MEC operations. He has over 24 years experience managing UXO project sites.

Project Manager
Mr. Jim Daffron will be the EOTI Project Manager. Mr. Daffron is an EOTI Engineer and Project Manager. He has over 14 years experience managing MEC and construction projects.

Assistant Project Manager
Mr. Matthew Norris will be the Assistant Project Manager. Mr. Norris has over 4 years experience with ordnance/explosives operations and UXO project sites. In addition to assisting

the Project Manager, Mr. Norris will establish and maintain the web-based GIS associated with the project.

Safety and Health Manager
Mr. Chris Rinn will serve as the Corporate Safety and Health Manager of this project. He will oversee the preparation of the Accident Prevention Plan/Site Safety and Health Plan in accordance with Corps of Engineers, Department of Defense, OSHA and any additional state and local requirements.

Quality Control Manager
Mr. Dave Farmer will serve as the Quality Control Manager for this project. Mr. Farmer has over 15 years of EOD/UXO experience.

2.6.3 UXO Personnel and Qualifications

Senior UXO Supervisor (SUXOS)
The Senior UXO Supervisor has more than 15 years of EOD/UXO experience. The SUXOS will manage all on-site field activities. The SUXOS will keep the EOTI Project Manager apprised of activities requiring his notification. The responsibilities of the SUXOS include:

- Serving as Site Manager; Assisting in the development of operating procedures and the work plan;
- Identification of personnel and equipment requirements;
- Supervision of all daily field team activities;
- Early detection and identification of potential problem areas and institution of corrective measures;
- Overseeing project equipment maintenance program;
- Assisting with the preparation of all project reports;
- Preparation of a daily report, which will include man-hours expended, grids cleared, and any other information required by the Project Manager;
- Providing on-the-job training for selected UXO Supervisor(s) who may be called upon to temporarily perform SUXOS duties during his absence from the site, and;
- Supervision of UXO Technicians.

The SUXOS reports to the Project Manager and maintains day-to-day communications with him, assisting with the documentation of site conditions and activities, and interfacing with other personnel on site. His daily duties will include scheduling and executing a daily safety meeting, scheduling and coordinating field team activities, and oversight of all field activities.

UXO Safety Officer (UXOSO)
The UXOSO has more than ten years of military/civilian EOD/UXO experience. The UXOSO is responsible for implementing all site SSHP requirements, on-site training requirements and recommending changes to level of personal protection equipment (PPE) to the SUXOS as site conditions warrant. The UXOSO has Stop Work Authority for safety conditions. He will report all safety work stoppages immediately to the SUXOS and Corporate Safety Officer. The UXOSO evaluates and analyzes any potential safety problems, implements safety-related

corrective actions, and maintains a Daily Safety Log. The UXOSO reports to the Corporate Safety Manager. The UXOSO will:

- Perform on-the-job training for selected UXO technicians who may be called upon to temporarily perform the duties of UXOSO during his absence from the site
- Maintain daily liaison with the SUXOS
- Maintain Safety Log
- Coordinate issues with the Corporate Safety Manager and SUXOS

The position of UXO Safety Officer may be combined with the UXO Quality Control Specialist position for this project.

UXO Quality Control Specialist
The UXOQCS has more than ten years of military/civilian EOD/UXO experience. The UXOQCS will inspect/review all project operations, including explosives inventories, daily reports, time sheets and other documentation, and will inspect and approve each area prior to reporting it complete. The UXOQCS specific duties are outlined in Chapter 10.

UXO Supervisor (UXO Tech III)
This individual supervises a project team. This individual will have experience in OE clearance operations and supervising personnel, and shall have at least ten years combined active duty military EOD and contractor UXO experience. This individual will be able to fully perform all functions enumerated for UXO Sweep Personnel, UXO Technicians I and II. Specific duties of the UXO Technician III's include:

- Supervision of UXO teams during dive phase operations;
- Supervision of equipment maintenance;
- Supervision/performance of ordnance related scrap inspection;
- Determining whether OE items are acceptable to move; and
- Supervision of UXO Technician I and II.

UXO Technician II
These individuals will be graduates of a school listed in Paragraph 10.12. As an exception, a UXO Technician II may be a UXO Technician I with at least five years combined military EOD and contractor UXO experience. These individuals are able to fully perform all functions enumerated for UXO Sweep Personnel and UXO Technician I. The UXO Technician II's specific duties for this project will include:

- Performance of dive phase operations;
- Assisting in ordnance-related scrap inspections under the Technician III's direction; and
- Performing equipment maintenance.

UXO Technician I
These individuals will be graduates of the course listed in Paragraph 10.12. The UXO Technician I's specific duties (under the supervision of a UXO Technician III or a UXO-qualified individual of higher rank than the UXO Technician III) for this project will include:

- Assisting in ordnance-related scrap inspections.
- Assisting in performing equipment maintenance

2.6.4 Subcontractor Management

All subcontractors will be required to comply with requirements, provisions, and procedures in this Work Plan. EOTI does not anticipate using any subcontractors on this project.

2.7 Mobilization Plan

Mobilization will commence upon notification to proceed from AETC. Mobilization of all initially required personnel and equipment is expected to be complete within two weeks of notice to proceed. Once on site, the SUXOS will coordinate the following activities:

- Locate the hospital and confirm phone numbers and directions to facility;
- Establish contact with local POC's and verify contact information;
- Establish the scrap holding area; and

2.8 Site Preparation

2.8.1 Vegetation Removal

EOTI does not anticipate the need for significant vegetation removal. Some vegetation may be removed in the area immediately around the demolition area if one is required.

2.8.2 Field Test Plot

A field test plot will not be established for this project. Hand held magnetometers will be tested daily with a known metallic source in order to ensure that it is functioning properly.

2.9 Reporting and Disposition of MEC

2.9.1 Reporting

Any MEC item found will be carefully uncovered, so that it can be examined to determine the item and its condition. Each item will be identified in the logbook and on the dig sheet to include x, y, and z coordinates. Care will be taken when gathering and recording data to ensure the accuracy and completeness of data necessary to evaluate AETC technology.

2.9.2 Identification of MEC and Other Munitions

SUXOS – The SUXOS has overall responsibility for reporting and disposition of MEC. He will:

- Coordinate all disposal/demolition operations with the demolition team;
- Ensure a UXO Accountability Log is maintained.
- Assure that ordnance related scrap generated from any demolition operations is inspected prior to removal from the site.
- Inspect all recovered ordnance related scrap and non-ordnance related scrap.

UXOSO – The UXOSO is responsible for insuring all MEC operations meet safety requirements. He will:

- Verify the identification of MEC items;
- Assure the area is clear prior to capping in by the demolition team; and
- Insure compliance with all requirements of the SSHP.

UXOQCS - The UXOQCS is responsible for insuring that all OE operations meet quality requirements. He will:

- Verify processes by which scrap is inspected and certified to be free of OE; and
- Insure compliance with all requirements of the Quality Control Plan.
- Insure dig sheets are properly filled out with the accuracy and completeness required.

UXO Tech III – The UXO Tech III is responsible for the supervision of the UXO team. He will:

- Confirm the identification of MEC items;
- Post individuals at entry points (if required) during demolition operations;
- Assign team members to specific duties; and
- Check the area following each shot or series of shots.

UXO Tech II – The UXO Technicians II will:

- Provide tentative identification of MEC items; and
- Perform duties as assigned.

UXO Tech I – The UXO Technicians I will perform duties as assigned by the SUXOS and Team Chiefs.

2.9.3 Safety Precautions

Detailed specific safety procedures are described in the Site-Specific Safety and Health Plan (Appendix D.) The following general safety precautions will be followed during the execution of this project:

- Only UXO qualified personnel will perform MEC procedures.
- A minimum of two UXO-qualified personnel will be present during all MEC operations so that one UXO personnel may act as a safety observer.
- During all MEC operations, only the minimum number of personnel required to safely perform the task will be allowed on-site.
- Non-essential personnel will not be allowed on site during UXO operations. EOTI personnel may escort essential non-UXO qualified personnel as required and to the extent that they are not exposed to unnecessary risk. Visitors must coordinate with the SUXOS and will receive a safety briefing prior to entering the exclusion zone.
- Non-essential personnel will be briefed on site hazards prior to entering the project area.
- UXO operations will cease within EZ distance of non-essential personnel who are onsite.
- UXO personnel required for this project will include qualified UXO supervisors and technicians, all of whom possess the relevant United States military EOD or other approved qualifications and experience. Personnel for this project have been selected from a pool of available qualified UXO technicians.
- All UXO personnel assigned to this project will meet the personnel training and experience requirements set forth in the SOW and EP-1110-1-18, Engineering and Design, Ordnance and Explosives Response.
- Excavations will conform to EOTI's Corporate Safety and Health Program so that confined space hazards are not created.
- EOTI personnel will not attempt to remove any fuze(s) from the MEC and will not dismantle or strip components from any MEC.
- EOTI personnel are not authorized to inert any MEC items found on-site.
- MEC/UXO items will not be taken from the site as souvenirs.

2.9.4 Identification of MEC and Other Munitions

If any unexpected MEC item is located, the UXO Tech III will determine the item's status. All available data sources will be consulted prior to this determination. As live or suspected MEC is located, a detailed accounting will be accomplished. All live/suspected UXO or MEC items encountered will be entered on the working map and into the UXO Accountability Log (Appendix F). This accounting will include:

- Identification Number (a unique ID #)
- Location
- Nomenclature
- Fuze Description
- Fuze Condition
- Additional comments if required

Each type of live or suspect MEC item encountered will be identified using a unique numerical identifier. Photographs of live or suspect MEC items will be taken for documentation purposes. A ruler or some similar item, to show scale, should be placed adjacent to the item. The photographs will be utilized in the final report; thus, a focused, well thought out photograph, paying particular attention to lighting and shadows, is necessary.

2.9.5 Transportation

Ordnance that is determined to be safe to move will be brought to the surface and placed aboard the boat in a sand-filled box. These items will then be stored in a bunker area provided by ARES, Inc. pending demilitarization or demolition if deemed appropriate by the SUXOS.

2.9.6 Safe Holding Areas

All certified safe ordnance scrap will be stockpiled on site in a controlled secured area. Certification will follow the US Army Corps of Engineer requirements.

EOTI will provide a sealable container suitable for collection and disposal of anticipated metal scrap. The SUXOS will be responsible for siting and removal of the container and for disposal of the material collected. The container will be secured in such a way as to prevent unauthorized items from being added to it by non-project personnel.

2.9.7 Institutional Controls

EOTI will initially maintain a 500-foot separation distance between the site footprint and the general public acting as a safety cushion to protect the public against site hazards. This footprint will be expanded to the appropriate minimum safe distance (MSD) upon discovery of live ordnance. Controlling access to the site, closing roads, signs and barricades are all means of keeping the general public from accidentally wandering into the site during site operations. The Coast Guard will be contacted as appropriate to limit access by water. Continual training of all site workers in the hazards of MEC will be conducted periodically. If unauthorized personnel are observed in the Exclusion Zone, all MEC operations will cease until the area is cleared of unauthorized personnel.

2.9.8 Engineering Controls

EOTI may implement engineering controls, such as sand bag enclosures, if required to control the potential blast from a suspected UXO during disposal operations. The SUXOS will assess the situation and determine the appropriate engineering controls required. He will consider the type of item and the proximity of personnel and property that could be harmed by the potential detonation.

2.9.9 Post Demolition Operations

Upon completion of explosive demolition operations or explosive venting operations by the demolition team, the EOTI team will return to the demolition site(s) and verify that the shot hole and surrounding area is free of explosive hazards. A magnetometer assisted search will be completed to recover fragments or other Munitions Debris resulting from the demolition operation and to ensure complete destruction of energetic material.

2.10 MPPEH and Other Scrap

Inert items, including all Munitions Debris, metallic debris, shrapnel or fragments, and other scrap cleared will be collected and transported to the securable container location, and placed into securable/sealable containers.

2.10.1 Management of MPPEH and Scrap

Munitions Debris and scrap found while conducting dive operations will be inspected by a UXO Technician III to verify the item is inert and safe to handle before moving. It will then be collected at a pre-designated location on the boat. Before the collected material leaves the boat, the UXO Removal Team Leader (UXO Technician III) will perform an additional inspection of the scrap. Once the inspection is completed, the materials will be loaded onto a vehicle for transportation to the securable container location. The materials will then be downloaded and placed in securable/sealable containers. All MPPEH items will be investigated to insure that there are no explosives remaining in the items and that only inert filled or empty items are transported to the scrap area. A UXO Supervisor will double-check to ensure all items are inert prior to transportation to the demilitarization/securable container location. Redundancy is built into the investigation process to assure no live items are removed from the site.

2.10.2 Reporting/Accountability

The SUXOS will complete a DD Form 1348-1A in accordance with DoD 4160.21-M. A certificate will be prepared with the following statement:

"*This certifies that the material listed has been 100 percent properly inspected and, to the best of our knowledge and belief, is free of explosive hazards, engine fluids, illuminating dials and other visible liquid HTRW materials*."

The SUXOS and the UXO Safety Officer will sign the form.

2.10.3 Venting

EOTI will explosively vent intact ordnance items to insure that all ordnance is free of explosives prior to disposition.

2.10.4 Disposition

All inert ordnance and Munitions Debris will be turned-in to a local Scrap Dealer who will process it through a smelter or furnace prior to resale or release.

2.11 Additional Tasks

N/A

2.11.1 Public Affairs

EOTI personnel will refer all requests from media representatives for information to the appropriate AETC representative.

2.11.2 Community Relations and Access Control

Throughout the Dive phase of this project the EOTI SUXOS will be responsible to interact with agencies and stakeholders at the project location as required conducting operations with minimal impact upon the community as practicable. In order to protect other personnel and the general public, an initial exclusion zone will be established at a distance of 500 feet around the project footprint. This is the recommended safe separation distance. If a hazardous MEC is located, the exclusion zone will be reevaluated to determine whether it needs to be expanded. EOTI will maintain control of the project area until dive phase operations are complete. All MEC operations will halt for the duration of time any non-essential person is within the exclusion zone. Once they have departed the area, MEC operations may resume.

2.11.3 Dissemination of Data

All final text files generated by EOTI will be furnished to AETC in Word 6.0 or higher software, IBM PC compatible format. Tables will be provided in MS Excel spreadsheet format. EOTI will furnish copies of the plans, maps, and work plans to AETC in the quantities indicated in the RFP. EOTI will use express mail services for delivering final copies of submittals. E-mail submittals will be provided when preferred by AETC. Following each submittal, comments generated as a result of their review will be incorporated by EOTI. A detailed discussion of data processing and submittal is included in Chapter 7.

2.11.4 Status Reports

The SUXOS will coordinate with the AETC on-site representative to provide regular updates. Updates will include information relevant to progress, any problems encountered, and actions taken to solve any problems. The EOTI Project Manager will provide formal reports to the AETC Project Manager.

2.11.5 Final Report

EOTI will prepare a detailed final report in accordance with DID MR-030. The first draft of the final report will be submitted within 15 days after completion of fieldwork. The final report will be submitted 7 days after receipt of comments. The final report will include information regarding: site overview, technical approach to the project, documentation (i.e., drawings, logs,

reports, laboratory reports, etc.), submittals, maps, records of MEC, QC sweeps, documentation/receipts for disposition of munitions debris, photographs of major activities and MEC discoveries, dig sheets, reports, maps, lessons learned, and final conclusions. All Quality Control documentation will be included in the final report. EOTI will include a cover letter signed by an authorized person of the company, certifying on behalf of the company that the requirements of this Task Order have been met.

2.11.6 Lessons Learned

Lessons learned will be captured, documented, and submitted to AETC at the end of the project. In the event of an accident, the UXOSO will develop relevant lessons learned from the incident. If any lesson learned will affect the job by making it better, less expensive, faster, or safer, the SUXOS will compile it and present it to the AETC on-site representative during a regular update. In addition to lessons learned, EOTI will continually endeavor to improve methods and procedures. Changes to the WP will be submitted as appropriate.

3.0 EXPLOSIVE MANAGEMENT PLAN

The Explosive Management Plan details the management of explosives on site during the Marine Towed Array validation support project. The plan is written in accordance with DID MR-005-02.

3.1 Acquisition

Commercial explosives, if required for destruction of MPPEH will be acquired from a local licensed explosives dealer. The explosives will be delivered to the project location on the day that they are required and will be used on the day that they are delivered. No commercial explosives will be stored on site.

3.2 Initial Receipt

Explosives will be delivered to the project location by a DOT licensed transporter following approved routes. The transporter is responsible for providing copies of licenses, if requested, and for compliance with all DOT regulations. EOTI will inventory and record all explosives delivered and accepted at the site. The material will then be moved on site to required locations, as described below. The UXO team leader will inventory and account for explosive material used in the destruction of MPPEH. EOTI will only order the material required for the operation and all commercial explosives delivered to the site will be used in the operation.

3.3 Storage

Explosives will not be stored on site. All explosives will be delivered on scheduled demolition days in the quantity required to perform the planned demolition. The team leader will ensure that blasting caps and demolition material remain in suitable containers and are separated and sandbagged until used. Containers containing commercial explosives remain closed and under observation of a UXO qualified technician until demolition procedures are initiated. All demolition materials will be used on the day that it is delivered to the site and therefore no overnight storage of explosives is required.

3.4 Transportation

A licensed commercial transporter will deliver commercial explosives to the site. The transporter is required to possess required licenses and for coordination and compliance with all applicable transportation regulation and requirements. EOTI will inventory and take possession of the material at the site as described in Section 3.2 above.

If required, material will be transported on site by EOTI personnel in inspected and approved project vehicles. All explosives will be secured and sandbagged in the vehicles during transportation. Blasting caps will be physically separated from other explosives during transportation. Prior to transporting explosives on site, the Team Leader will inspect the vehicles intended to transport the material. Vehicles must be in good operating condition with no leaks or other conditions that could make the transportation of explosives unsafe. Vehicles will be properly marked with the required placards and will contain a fire extinguisher.

3.5 Receipt Procedures

All demolition materials will be inspected and inventoried by the team leader before it is accepted from the transporter. Incorrect orders and/or damaged material will not be accepted. Only the material required to complete the planned operation will be ordered and received.

The team leader will document the types and quantity of explosive material used and the type and quantity of MPPEH destroyed during demolition operations. The team leader is responsible for the proper issue and maintenance of explosives and explosive records. The team leader will verify that all explosives delivered to the site are consumed in the demolition operations and that no residue or packing material contains explosive material.

3.6 Inventory

The Team leader will conduct an initial inventory of explosives delivered to the site. Additional inventories will be conducted when explosives are issued for use in demolition operation and following demolition operations. All inventories will be documented and indicated in the daily log and included in the final report.

3.7 Lost, Stolen, and Unauthorized Use of Explosives

Only qualified employees will be permitted to use explosives at the project site. The Team Leader will ensure that unauthorized personnel remain clear of restricted areas. The Team Leader will conduct inventories each time explosives are used, transported or handled to insure accountability. If any of the explosive material is determined to be missing, the SUXOS will immediately report the loss to the EOTI Project manager. He will report the type and quantity of explosive missing, time that the items were discovered missing and any circumstances related to the incident or events leading up to the discovery of the missing items. The EOTI Project Manager will notify the AETC Project Manager, Bureau of Alcohol Tobacco and Firearms, and other local agencies of the incident. A written report will be submitted with 24 hours of the incident.

4.0 EXPLOSIVES SITING PLAN

4.1 Minimum Separation Distances

A minimum separation distance of 500 feet will be established to protect individual operating units in the event of an accidental detonation while excavation operations are underway. A minimum of 200 feet is per the EM 1110-1-4009 Engineering and Design Ordnance and Explosives Response, June 23, 2000, US Army Corps of Engineers (USACE), and Memorandum on the Determination of Appropriate Safety Distances on Ordnance and Explosives Project Sites. The 500-foot minimum distance will be used to allow an extra margin of safety. In the event that MEC is discovered, the EZ safe separation distance will be reevaluated and re-established based on the Material Potentially Presenting an Explosive Hazard (MPPEH) found or suspected. Essential personnel are generally considered the UXO Team, equipment operators, and site safety personnel and the Site Supervisor. The size of the EZ for excavation activities will be based on the criteria for unintentional/accidental detonations.

If during the conduct of the operation a hazardous MEC is recovered, an EZ for unintentional or accidental detonations will be established based on that item. This MEC item may be classified as the most probable munition (MPM) and minimum separation distance may be recalculated. If subsequently an MEC is recovered that has a greater fragmentation distance, the larger MEC may then become the MPM.

4.2 Planned or Established Demolition Areas

EOTI does not plan on establishing a Specific Demolition Area as any disposal operation will be conducted only as necessary to eliminate potential hazards and will not be an ongoing or repetitive endeavor. An area designated by ARES, Inc. will be used if it becomes necessary to conduct demolition operations. This area is shown in Figure 4-1.

4.3 Foot Print Areas

4.3.1 Blow-in-place

If a MEC that cannot be moved is identified EOTI will mark the item and record its location for disposal by EOD.

4.3.2 Collection Points

Non-Hazardous MEC-related items encountered during the completion of this project will be consolidated and secured by EOTI on-site for future disposal as scrap metal. The frequency of this disposal will be determined once dive phase begins.

4.3.3 Consolidation Shots

Any MEC that can be moved that is found and recovered will be secured in a bunker area provided by ARES, Inc. pending demolition. Consolidation Shots will be made by the SUXOS and will be governed by EOTI Standing Operating Procedures (SOP). The Detonation Area is shown in Figure 4-1.

4.3.4 Explosives Storage Magazines

No donor explosives will be stored on this site. Therefore, no Explosives Storage Magazines will be required.

4.4 MEC Storage Magazines

Any MEC that can be moved will be secured in a bunker area provided by ARES, Inc. pending demolition. Therefore, no additional MEC storage magazines will be required. The storage location is shown in Figure 4-1.

4.5 Site Map

An overall site map is included as Figure B1 in Appendix A. Other detailed working maps are also included in Appendix A. These maps show the planned work locations in detail.

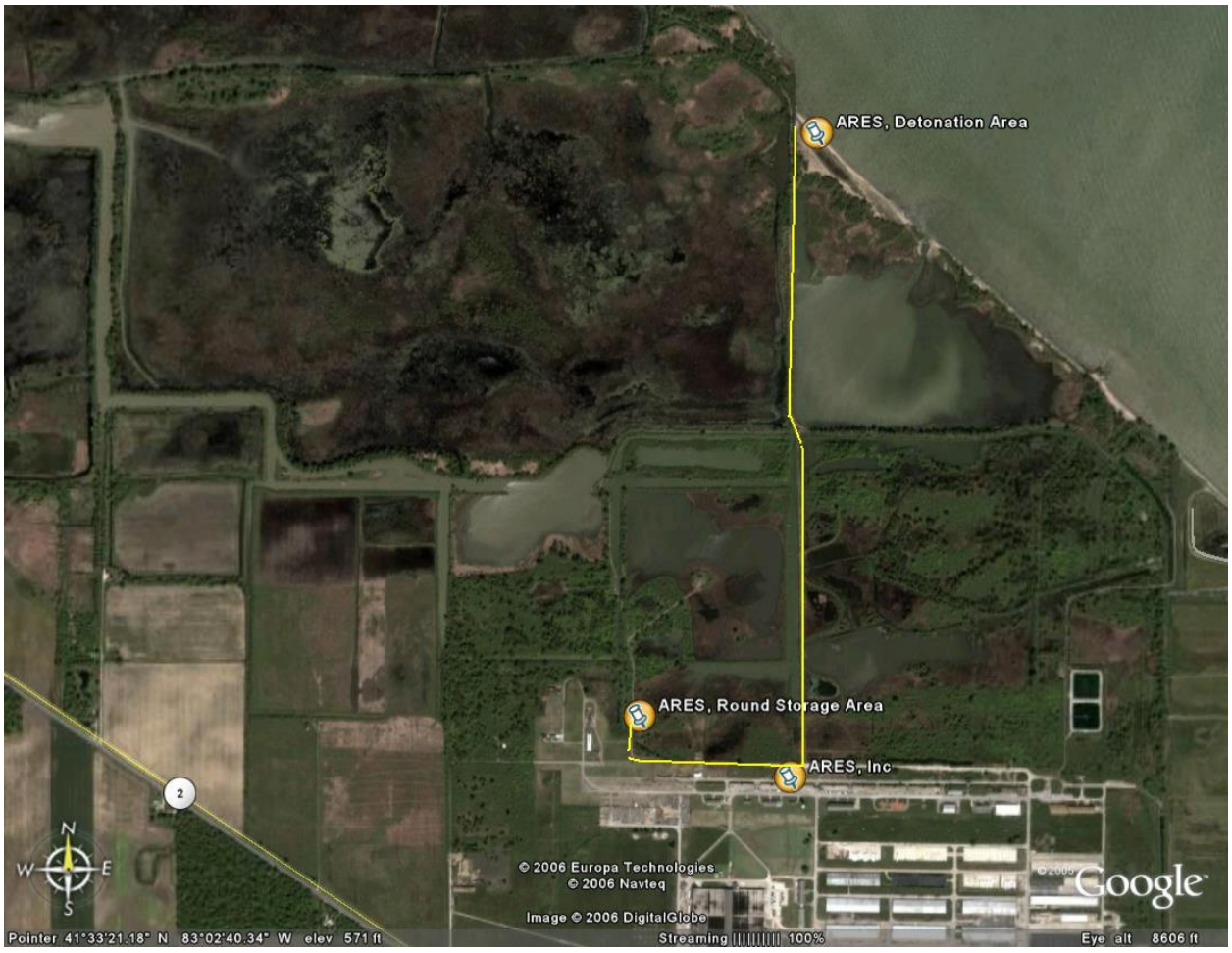

Figure 4-1.

5 GEOPHYSICAL PROVE-OUT PLAN

NO GEOPHYSICAL PROVE-OUT IS REQUIRED FOR THE COMPLETION OF THIS SOW

6 GEOPHYSICAL INVESTIGATION PLAN

NO GEOPHYSICAL INVESTIGATION IS REQUIRED IN EOTI'S SOW

7 GEOSPATIAL INFORMATION AND ELECTRONIC SUBMITTAL PLAN

7.1 General

GIS information provided by EOTI is currently not funded for this project.

8 MANAGEMENT PLAN

8.1 Project Management Approach

The SUXOS will be responsible for the day-to-day operations on-site. The SUXOS will accomplish the tasks, outlined in the SOW, in a timely manner. The SUXOS' duties are outlined in Section 2.6.3 and Section 2.9.2. The site UXOQCS is the key person to insure management is conforming to established procedures and work is completed in a timely manner. The UXOQCS will perform quality inspections of all work tasks as specified in Section 10.6. Any nonconformance that cannot be immediately resolved on site will be elevated to the Project Manager and / or the corporate Quality Manager.

Data will be collected from various operations on the work site and recorded on computer disks, in logbooks and on the various EOTI forms. Records of the limits of the areas cleared, the type and location of OE encountered, and description of OE will be recorded. The forms, logs, and disks will remain in the EOTI site office while portions of the data will be copied and sent to the PM for inclusion in reports. The site UXOQCS will review all data.

8.2 Schedule

EOTI has received a notice to proceed (NTP). Fieldwork consisting of target reacquisition is scheduled to commence with mobilization on or about 25 September 2006. Phase II investigation operations will commence the week of 2 October 2006. The order of reacquisition will be based on planned dive operations and the minimum separation distance (MSD) required between teams working during the dive phase. The SUXOS and Project Manager will plan and track progress of the reacquisition and dive operations and will adjust, as necessary, to ensure safe distances are maintained while progress is made toward completion of project.

EOTI will provide AETC with progress updates and revised schedules of activities throughout the project. EOTI will maintain an overall project schedule and will continually update a two-week schedule of tasks. The two week schedule will be created jointly between the SUXOS and Project Manager and will be used to plan the activities of each team and to ensure the proper personnel, equipment and other resources.

8.3 Cost Control

The PM and SUXOS will control and manage cost through the use of Purchase Orders (PO) and Travel Orders (TO). A record of expenditures will be tracked by the SUXOS and monitored by the PM. The PM will, using an Excel Cost Tracking Program, monitor man-hours and monies used.

EOTI will prepare and submit invoices in accordance with its contract with AETC. The EOTI project Manager will notify the AETC Project Manager immediately of any change in site condition or work requested outside of the SOW.

9 PROPERTY MANAGEMENT PLAN

Not Applicable to this Project

10 Quality Control Plan

10.1 Introduction

EOTI is committed to performing quality work and delivering quality products to our clients. This commitment to quality begins at the corporate level and is emphasized at every level down to the project level. Success is achieved through a total commitment of all team members at all levels of operation to continuous improvement resulting in exceeding the standard and expectations of our clients.

The EOTI Quality Control program is viewed as a dynamic program that is constantly changing and improving. All employees at all levels are encouraged to make suggestions on ways to improve operations, which ultimately improves the quality of our services. This continuous improvement requires the active participation of all employees and an effective lessons learned program.

10.2 Audit Procedures

The Corporate Quality Manager and other corporate personnel will audit all aspects of the project to ensure that quality objectives are met. The UXOQCS will verify that field procedures are completed in accordance with the Work Plan and are effective in achieving or exceeding quality standards. The UXOQCS will establish an audit frequency schedule of procedures, operations, equipment, etc. for use on the site to assure that all aspects of project operations are observed often enough to assure a continued increase in quality.

Equipment used at this site is dedicated solely to the project until its completion. If equipment field checks indicate that it is not operating correctly, and field repair cannot be made, the equipment is tagged and removed from service until it can be repaired or replaced. Replacement equipment will meet the specifications for accuracy and precision of the equipment it replaces. EOTI reviews equipment requirements and identifies equipment requiring daily tests and/or calibration.

Periodic Quality Control Audits are performed by the EOTI Corporate Quality Manager, to determine the effectiveness of the Quality Control measures performed at the site. A report of the audit will highlight any observed discrepancies, and will be sent to the SUXOS and the UXOQCS on the site. They will immediately work to take corrective action on all findings, and all corrective actions will be well documented through completion.

10.3 Corrective/Preventive Action Procedures

This Quality Control Plan allows for the immediate correction of quality deficiencies at the lowest level possible. The effectiveness of Quality Control measures and field techniques will be reviewed at least daily at the project level during daily debriefings. If deficiencies or better methods are identified, the UXOQCS and SUXOS will take corrective actions immediately as long as the change does not require a modification to the Work Plan. Changes to the Work Plan will be discussed with the Project Manager and approved by the client prior to implementation.

All deficiencies from project requirements that are observed are documented and reported. Deficiencies will be tracked to the point of corrective action. Examples of types of quality deficiencies could include:

- Delivery of items or services that do not meet the contractual requirements.
- Errors following work instructions or improper work instructions.
- Circumstances that result in items or services that do not meet quality/contractual/technical requirements.
- Technical modifications to the project by individuals that do not have proper authority.
- Errors in craftsmanship and trade skills.
- Directions to perform work outside the scope of work.

The Project Manager/SUXOS may take the following corrective actions:

- Identify the impact the deficiency may have on other project activities.
- Identify and implement the actions required to bring the project/activity back into compliance.
- Identify and implement procedures to preclude recurrence of the deficiency.

10.4 Data Management

Logbooks and records are periodically inspected by the UXOQCS. These inspections focus on the completeness, accuracy, and legibility of the entries and records. Results of these inspections are forwarded to the Project Manager. Logbooks are part of the official record and are maintained for the period directed by the contract. They are maintained on site for the duration of project operations and will be made available to the client for inspection at their request. After completion of the project, the logbooks and other site documentation become part of the Final Report. The following describes typical Quality Control documentation:

- A daily report of findings is generated and submitted to the SUXOS for each day of field activities. This report includes weather conditions, personnel on site, activities performed, directions received, deficiencies noted, problem areas, work plan modifications, injuries, start/stop times, tailgate safety briefs, equipment discrepancies, OE located, training conducted, visitors and any other appropriate project information. The UXOQCS will consult with the SUXOS on recommended corrective actions in cases where deficiencies are observed. All deficiencies will be documented in a corrective action log and will be followed up until completion.
- The SUXOS, UXOSO, UXOQCS and the UXO Team Leaders maintain field logbooks. These personnel use the books to record site activities and field data. The logbooks provide a record of site activities. The UXOSO maintains a log to record all safety matters associated with the project such as: safety briefings/meetings, safety training, safety audits, near-misses/accidents/incidents, causes and corrective actions taken, weather conditions and other related matters. The UXOQCS maintains a log to record the performance and results of Quality Control checks and audits. The SUXOS maintains a log to record site activities and progress made toward site goals. The SUXOS also maintains a photographic log. Photographs and/or videotapes are marked with a unique identifying number relating to the photographic log. Team Leaders maintain logs of the work accomplished by their team on a day-to-day basis.

- Other types of logs that may be found on a project site would include a Site Visitor Log, Confined Space Entry/Exit Log, or various types of Site Monitoring Logs. A Site Visitor Log is maintained, which includes a record of the visitor's name, company, date, time in/time out and a contact telephone number. Safety briefings and training for visitors are also recorded. Logs may also be maintained to keep track of entry and exit from the exclusion zone, or confined spaces, or areas where respiratory protection is required. Site monitoring logs may also be maintained in areas where exposure to site hazards has the potential for reaching the action level of an occupational hazard such as chemical exposure, heat or noise levels.
- The Project Manager and the SUXOS maintain training records for all site personnel. These records contain training certificates, licenses, and other qualifying data reflecting each individual's assigned position.
- The SUXOS maintains working maps of the operating areas throughout project execution. These maps document MEC finds, locations of sampling and other activities.
- Other types of documentation on site could include meeting minutes, inventory forms, various inspection forms, training forms, etc. These records will be audited as part of the official project site records.

10.5 Geophysical Reacquisition Program

EOTI will perform Quality Control on the geophysical reacquisition. Reacquisition includes the navigation to the location of the selected anomaly and reacquiring the anomaly with a hand held magnetometer. Positioning data will be recorded with mapping grade accuracy. Once the anomaly is investigated, detailed information will be carefully recorded on the dig sheets. The UXO Tech II will be responsible for insuring that the information is properly recorded on the dig sheet and the UXOQCS verify proper procedures for gathering and recording data through regular inspections. Target information from the reacquisition and excavation activities can be reviewed by the UXOQCS for Quality Control.

10.6 Field Operations

The UXOQCS performs random, unscheduled checks to ensure that personnel accomplish all work specified in the Work Plan. All procedures are well documented within the approved Work Plan, and all personnel on the site must be trained in these procedures. The UXOQCS conducts random observations of all UXO teams' search, clearance, and scrap inspection techniques to assure they are being done in accordance with accepted procedures.

Quality Control inspections are also performed for areas that are completed. When an area is completed, it is presented by the Team Leader to the UXOQCS for inspection. If any quality standard is not met, the area will be failed and turned back to the Team Leader.

10.7 Equipment Calibration/Maintenance

EOTI reviews equipment requirements and identifies equipment requiring daily tests and/or calibration. Calibration/testing of instruments may be accomplished as follows:

- Daily Quality Control Audits are conducted on all instruments and equipment that require calibration. They are checked prior to the start of each workday. Batteries are replaced during the daily equipment checks and the instruments are checked against a known source to assure functionality.

- Emergency equipment will be inspected daily, or as required by the manufacturer, to ensure that it is operating as designed as in good repair.
- UXO tools and equipment are inspected before use and at least weekly, to ensure that they are complete and in good repair. Tools and equipment that are not in good repair will be reported to the SUXOS and will be taken out of service until they can be repaired or replaced.
- Each morning, prior to beginning operations, communications equipment such as radios and cellular telephones are checked to ensure batteries are charged and that they are operational.
- Prior to use, geophysical equipment is checked and/or calibrated against a known source. Equipment is checked by emplacing an inert ordnance item or surrogate at the clearance depth, in a variety of positions within a test bed, to verify the standard indication and that the instruments are operating properly. Geophysical equipment is tested before operations in the morning and when operations are resumed after lunch break. Random checks are performed by the UXOQCS and/or the SUXOS during daily operations to ensure the equipment is functional and operated properly.
- Prior to use, Global Positioning System (GPS) receivers are tested with a functional check. The purpose of this check is to ensure that batteries are sufficiently charged, that the instrument is receiving sufficient data to compute three-dimensional positions, and that the instrument is properly configured. These checks are made by placing the instrument into operation over a known point and comparing the computed location displayed on the GPS receiver with the known coordinates of the test location.

10.8 Geophysical Instruments

Magnetometers are tested at least daily and at the beginning of each shift as described above to determine proper function. EOTI does not anticipate the use of any other geophysical equipment during this project.

10.9 Radios/ Cell Phones

As good communication equipment is vital to the safety of all personnel on the project, as well as to the successful completion of the project, all communications equipment such as radios and cellular telephones will be inspected prior to the start of operations each day. The batteries will be fully charged and the equipment will be fully operational. This equipment will be inspected again after the lunch break, prior to the start of the afternoon operations. If multiple shifts are operating, the communication equipment will be inspected at similar intervals on other shifts. If batteries are not fully charged, they will be replaced with fully charged batteries. If communication equipment is not functioning properly, it will be tagged out, removed from service, and replaced with an operational unit. Inoperable communications equipment that has been tagged out will not be stored with operational equipment. It will be sent for repair as soon as possible, at a facility approved for repair of the equipment. If it cannot be repaired, it will be removed from the site. All communications equipment inspections will be fully documented.

10.7.1 Vehicles/Machinery

Site vehicles, machinery and boats will be fully inspected on a weekly basis using the EOTI Vehicle Inspection Form. However, the operators will report any problems with the vehicles or equipment as they occur. Any reported problems will be immediately addressed. Minor maintenance may be performed on site, such as oil changes, lubricating, changing fluids, etc. If

major repairs are required, vehicles, machinery, and boats will be returned to the rental company and exchanged for equipment that is functioning properly. All vehicle, machinery and boat inspection records will be fully documented and maintained on site for the duration of site operations. At the conclusion of fieldwork, these records will be returned to the Project Manager for inclusion in the Final Report.

10.7.2 Personal Protective Equipment

Monitoring equipment for use in environmental monitoring such as heat monitoring, noise monitoring, chemical hazard exposure monitoring, etc. will be inspected daily prior to use. Calibration will be checked to assure it is current. Functionality will also be tested. Monitoring equipment that is not performing in accordance with its specifications will be tagged out of service until it can be repaired or replaced. Repairs to monitoring equipment will be made by authorized repair facilities, only. EOTI personnel are not authorized to make repairs to this equipment. Equipment that is not functioning properly will not be stored in the same area as functioning equipment. Records of inspections on monitoring equipment will be fully documented. They will be maintained on site for the duration of site operations. They will be returned to the Project Manager for use in the Final Report at the conclusion of site operations.

Personal protective equipment (PPE) will be ordered based on the recommendations of the Health and Safety Manager after an evaluation of the potential site hazards, to assure that the equipment ordered will provide the right level of protection for EOTI employees working at field site locations. The Health and Safety Manager will coordinate closely with the UXOSO at the individual project sites. The UXOSO will inspect all PPE when it arrives on site for condition and function. If the equipment is not what was ordered, or if there are defects in the PPE, he will notify the Health and Safety Manager of the situation, and the PPE will be returned to the vendor in exchange for the correct equipment that was ordered. Once PPE is given to site workers, they will be responsible for taking care of the equipment. All workers will inspect their PPE for fit and function daily prior to use. Equipment that is broken or not working properly will be turned in and replaced with properly working PPE. If the broken PPE is the disposable type, it will be disposed of, but if it can be repaired, it will be sent to a qualified repair facility. All sites operate on the "Buddy System." Throughout the day, buddies will check each other's PPE for rips, tears, correct use, etc. In addition, the UXOSO, the SUXOS, and the UXOQCS will be observing procedures as part of their inspections, and they will note if someone is not wearing their PPE properly as part of the inspection process and corrective action will be taken immediately.

10.8 Pass/Fail Criteria

Quality Control pass/fail criteria will be established to determine the effectiveness of field operations. These criteria will be at least as stringent as the client's Quality Assurance criteria. All audits will be based upon the designated pass/fail criteria, and immediate action will be taken on any item that fails. All such discrepancies will be fully documented in a corrective action log and tracked until completion of corrective actions. This information will be shared with the Project Manager, SUXOS, UXOSO, and the Corporate Quality Manager. Where applicable, this information will be shared with other similar EOTI operating sites by the Corporate Quality Manager in order to continually improve the level of quality on all EOTI project sites.

10.9 Quality Records

EOTI will maintain detailed quality records from field operations. These records include such items as the Daily Report, Audit Reports, Corrective Action Logs, etc. that document the quality process and how it was implemented on the project site. The records will be included with the final report and will be reviewed to capture lessons learned. Lessons learned from any project site will be applied to all similar EOTI project sites, both currently operating sites, and future site work.

10.10 Lessons Learned

Lessons learned are critical to the feedback required for continuous improvement. Lessons learned will be captured at the project level and submitted through the corporate Quality Manager for distribution to team members, other similar projects, and clients, as applicable. Lessons learned from other EOTI projects will also be applied in this project as applicable. Lessons learned will be a part of the final report for each EOTI project. The Quality Control Manager is a vital part of the planning loop for all projects. He will be responsible for assuring that lessons learned from past projects will be incorporated into the planning process for all future projects.

10.11 Submittals

As part of this project, a number of submittals are required. Among these, are the Work Plan and various sub-plans associated with it, various site reports, and the Final Report. In order to assure quality in our written work as well as our site work, a peer review process has been set up. This means that the author of any document must present it to a peer, who will read the entire document and provide comments regarding whether or not it meets contractual requirements and client expectations, format, grammar, etc.

A peer review form will be filled out by the reviewer and it will be maintained in the official project files in the Oak Ridge, TN office. The Peer Reviewer will be expected to provide comments to the document's author. When the comments are addressed in the document, the document will be sent back to be reviewed by the Peer Reviewer to approve of the changes made to the document, to assure that all of his or her concerns were met. If the changes did not fully address the concerns, the Peer Reviewer will take the document back to the original author and describe what was expected, so that the appropriate changes to the document can be made. In some particularly complex documents, there may be a number of specialized skills addressed, which might require a number of differing personnel perform the Peer Review for the section covering their area of expertise. In these cases the comments of multiple reviewers would have to be addressed on the same Peer Review form. This way the trail of the Peer Review can be seen in one document, and it can be easily noted if all Reviewers' comments were adequately addressed within the document.

10.12 Training

EOTI carefully screens all potential employees to ensure that they have the proper training and current qualifications to perform in their positions. All UXO qualified personnel must have a certificate from the Navy Explosive Ordnance Disposal (EOD) School or other recognized training program. All site workers must also have the OSHA 40 Hour Hazardous Waste Operations and Emergency Response (HAZWOPER) training and a current 8 Hour Refresher

Training, given once a year. Supervisory personnel are required to have taken OSHA HAZWOPER Supervisor Training. All applicable training documentation will be kept in the employee's file at the project site for the duration of project operations.

All employees will receive site-specific training to ensure that they understand the safety and quality requirements of the site. This is a combined classroom and OJT training that includes a review of the Work Plan and the Site Safety and Health Plan, as well as checking employees out in the proper use of all tools, and equipment that they will be expected to operate on the site. All training will be fully documented on the EOTI Documentation of Training Form. Training records will be maintained on the project site for the duration of project operations. At the conclusion of site work, the training records will be sent back to the Oak Ridge, TN office for inclusion in each employee's personnel file.

Daily Tailgate Safety Briefings will be given to site personnel each day prior to the start of operations. This training will discuss the operations expected to be completed that day, the hazards involved with those operations, PPE required, emergency procedures, weather conditions, and any other items appropriate for discussion. These sessions will be documented on the EOTI Documentation of Training Form, and will be maintained on site for the duration of fieldwork.

Visitor training is an important part of site operations. As much as possible, visitors to the site will be limited to the support zone, where the office area, break areas, public areas are located. If the visitor is required to enter the exclusion zone, they will be escorted at all times by an experienced, UXO-qualified EOTI employee, normally the UXOSO. Prior to entry into the exclusion zone, each visitor must have training on the hazards inherent in the project operations, which areas of the site they are permitted to enter, how to recognize an evacuation signal, evacuation procedures, and the fact that they must be escorted at all times while within the exclusion zone. The UXOSO will normally be the one providing the visitor with these briefings, and will normally be the escort. In addition to filling in the Visitor Log, the UXOSO will assure that documentation is made of the visitor, purpose of the visit, and briefing information presented. The EOTI Documentation of Training form can be used for this purpose. All records of visitors to the site will be maintained on the site for the duration of site operations. All other such records will be transferred to the Oak Ridge, TN office.

10.13 Final Report

All site documentation will remain on the project site for the duration of field activities. At the request of the client, this material can be made available for review at the project site. At the conclusion of site operations, all records from the Project will be turned over to the Project Manager in the EOTI Oak Ridge, TN office. The Project Manager will use all of this site information to assemble the Final Report for the project. The documentation from the site will become a part of the permanent record of this site, and after all of the data has been analyzed by the Project Manager and the Report has been developed, the site information will be attached to the Final Report as supporting materials.

11 ENVIRONMENTAL PROTECTION PLAN

Not Applicable to this Project

12 INVESTIGATIVE DERIVED WASTE PLAN

Not Applicable to this Project

13 INTERIM HOLDING FACILITY SITING PLAN FOR RCWM

Not Applicable to this Project

14 PHYSICAL SECURITY PLAN FOR RCWM

Not Applicable to this Project

15 REFERENCES

29 CFR 1910, Occupational Safety and Health Standards

DDESB TP-18, Minimum Qualifications for Unexploded Ordnance (UXO) Technicians and Personnel

DOD 6055.9-STD, DOD Ammunition and Explosives Safety Standards

EM 385-1-1, Safety - Safety and Health Requirements

EM 1110-1-4009, Ordnance and Explosives Response

EP 75-1-2, Munitions and Explosives of Concern (MEC) Support during Hazardous, Toxic, and Radioactive Waste (HTRW) and Construction Activities

EP 385-1-95a, Basic Safety Concepts and Considerations For Munitions and Explosives of Concern (MEC) Response Action Operations

EP 1110-1-18, Engineering and Design Ordnance and Explosives Response

FM 21-16, Unexploded Ordnance (UXO) Procedures

TM 60A-1-1-22, General EOD Safety Precautions

TM 60A-1-1-31, Explosive Ordnance Procedures

APPENDIX A
REACQUIRE POINTS

SITE SPECIFIC WORK PLAN

SUPPORT OF VALIDATION OF THE MARINE TOWED ARRAY DEMONSTRATION
at
FORMER ERIE ARMY DEPOT AND TOUSSAINT RIVER

Site Specific Safety and Health Plan
in
Support of Validation of the Marine
Towed Array Demonstration
at
Former Erie Army Depot and Toussaint River

Prepared For:

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SITE SPECIFIC SAFETY AND HEALTH PLAN (SSHP) IN SUPPORT OF VALIDATION OF THE MARINE TOWED ARRAY DEMONSTRATION AT Former Erie Army Depot and Toussaint River, OH

1.0 INTRODUCTION

EOTI strongly believes that our people are our most important and valuable asset. It is the actions of our personnel, working together as a team, which ultimately determines the success of our endeavors as a company. Accidental injuries and illnesses can cause needless pain and suffering of employees and their families, as well as increasing costs and decreasing productivity and morale among employees. EOTI is committed to providing a safe and healthful work environment for all of our employees in all locations. EOTI has never experienced a lost time accident. The company's goal is an accident-free work environment. The management of EOTI is committed to doing all in our power to make this a reality.

1.1 Safety and Health Expectations and Compliance.

All managers and supervisors are responsible for implementing the provisions of this SSHP and for answering team member questions about accident prevention. Management is responsible for ensuring that all safety and health policies and procedures are clearly communicated and understood by all team members. Managers and supervisors are expected to enforce the rules fairly and uniformly. This will be accomplished by:

- Informing team members of the provisions of the Safety and Health Program;
- Evaluating the safety performance of all team members;
- Recognizing team members who perform safe and healthful work practices;
- Providing training to team members whose safety performance is deficient; and
- Disciplining team members for failure to comply with safe and healthful work practices.

All team members are responsible for using safe work practices, for following all directives, policies and procedures, and for assisting in maintaining a safe work environment. EOTI recognizes that open, two-way communication between management and all team members on health and safety issues are essential to an injury-free, productive workplace. To facilitate a continuous flow of safety and health information between all team members that is readily understandable, the following will be accomplished:

- Training all new team members, during the site-specific training, on the site safety and health polices and procedures, which will include this SSHP;
- Training all new team members on the hazards associated with the job site;
- Conducting daily tailgate safety meeting for all team members;
- Conducting weekly supervisor safety meeting;
- Conducting quarterly refresher type training;

- Posting and, if applicable, distributing safety information; and
- Encouraging open communications;

Disregard for safety and health requirements will not be tolerated. If the UXO Safety Officer (UXOSO) and Project Manager determine that a team member is not sufficiently committed to conforming to established safety standards, the team member's employment agreement will be terminated.

2.0 STAFF ORGANIZATION

2.1 Vice President/UXO Program Manager is responsible for enforcement of the Corporate Safety and Health Program at all worksites within his area of responsibility. He must assure that personnel receive the required training, medical surveillance, and personal protective equipment necessary in order to perform their jobs in a safe and effective manner. The enforcement of the Corporate Safety and Health Program on the worksites will be a critical rating element for site personnel.

2.2 Corporate Health and Safety Manager is responsible for creating, updating, and managing the Corporate Safety and Health Program, as well as Site Specific Health and Safety Plans for individual worksites. She reports directly to the Vice President/UXO Program Manager of EOTI on all safety and health issues. She coordinates directly with the Project Manager, the Senior UXO Supervisor (SUXOS), and the UXO Safety Officer (UXOSO) routinely to answer technical questions and to provide assistance to the worksites. She also provides safety training, as needed, and performs safety and health program inspections to assure compliance with EOTI safety and health policy.

2.3 Project Manager (PM) is responsible for all day-to-day operations on the project site. He plans operating crews and schedules, and must assure all personnel are properly trained to perform their assigned tasks. The PM directly impacts the safety of the site by setting the tone for the job and encouraging safe performance among all team members. Any areas of concern or questions regarding safety and health issues are coordinated with the UXOSO. In instances of noncompliance with safety requirements, the PM issues warnings and/or provides disciplinary action up to and including removal of the employee from site operations, should this action be warranted. The PM assures that every accident on the work site is investigated in order to determine the root cause(s), the accident report is filled out, and takes steps necessary to prevent recurrences.

2.4 Senior UXO Supervisor (SUXOS) is responsible for the successful accomplishment of the work on the project site. He directly supervises all site work and personnel and assures they are operating in a safe manner. He coordinates directly with AETC site representatives to assure expectations are met and exceeded. He organizes and supervises ordnance related diving operations on the site and serves as the overall superintendent of the project. He reports directly to the Project Manager and he coordinates with the UXOSO and the Corporate Health and Safety Manager regarding safety concerns on the site.

2.5 UXO Safety Officer/QC (UXOSOQC) oversees the safe preparation and execution of the entire operation to include diving and demolition evolutions. He will focus on the ability of the team to perform the mission in a safe manner, while assuring the quality of the performance. He is granted the authority to administer the safety and health program on the worksite. He must assure that all personnel, to include visitors, are properly trained, qualified, equipped, and protected from the hazards associated with the worksite and site operations. The UXOSO/QC reports directly to the Project Manager on all project safety and health issues. He coordinates with the Corporate Health and Safety Manager for technical assistance on safety and health issues at the worksite, for assistance in ordering safety equipment, medical surveillance program issues, etc. The UXOSO/QC has stop work authority whenever an imminent danger situation is observed. The UXOSO/QC has numerous onsite responsibilities including, but not limited to:

- Coordinating with all applicable emergency response agencies to assure appropriate response should an emergency develop on site;
- Establish medical evacuation routes and emergency telephone number listing;
- Inventory first aid equipment, PPE, fire extinguishers and purchase replacements, as required, with concurrence from the PM;
- Survey the site for hazards;
- Provide daily safety briefings;
- Provide required safety training;
- Designate site control zones;
- Provide visitor briefing and training;
- Perform onsite monitoring, if required;
- Perform daily safety inspections of site activities to verify compliance with all safety and health requirements in this project SSHP as well as the Corporate Safety and Health Program and recording any deficiencies in the Safety Log; and
- Coordination of corrective actions for any deficiencies noted during safety inspections.

2.6 Team Members are responsible for performing their assigned tasks in a safe and effective manner. Questions must be immediately brought to the attention of their supervisor. Team members must not attempt to perform an assigned task for which they have not been properly trained. All personnel must attend required safety training and be aware of the operations going on around them at the work site. Any situations or conditions, which may affect the safety and health of any team member, must be immediately reported to their supervisor. Before, during, and after use, personnel must inspect each piece of personal protective equipment, as well as other tools and equipment, to assure it is in a safe operating condition. Any equipment that is deemed unsafe for use, must be immediately turned in for repair or replacement. Personnel must know how to properly use all equipment assigned to them and must use required personal protective equipment at all times.

3.0 SITE DESCRIPTION AND CONTAMINATION CHARACTERIZATION

3.1 Background

The former Erie Army Depot, Ottawa County, OH, is located along the western shore of Lake Erie (Figure 1). The site and the associated impact areas are classified by the United States Government as a Formerly Used Defense Sites (FUDS) under the Defense Environmental Restoration Program (DERP). This property was formerly used for artillery testing, resulting in impact areas on land and in Lake Erie. Ordnance and explosive waste (OEW) and potentially live or unexploded ordnance (UXO) have been found on the lake bottom, in the Federal navigation channel at the Toussaint River, in the marshland adjacent to the firing ranges, and along beaches fronting the former Depot. The impact areas were located in, near, or offshore of the FUDS beaches adjacent to Lake Erie. Ordnance found on or near the FUDS shore of Lake Erie appears to be mobile and may have originated from offshore or near-shore impact areas. In FY06, ESTCP was directed by Congress to conduct work to characterize UXO contamination that impacts the Toussaint River area.

3.2 Former Erie Army Depot

The subject study area consists of the beach and area of Lake Erie fronting the former Erie Army Depot (now called Erie Industrial Park), between Camp Perry Ohio National Guard Training Center and the mouth of the Toussaint River in northwest Ohio (Figure 1). This FUDS site is located in rural Carrol Township, Ottawa County, OH, on Lake Erie, approximately 37 miles east of Toledo, Ohio, and 6 miles east of Port Clinton, Ohio. The Erie Army Depot was initially established in 1918 as the Camp Perry Proving Grounds, then re-designated as Erie Proving Grounds. For almost a half century (1918-1966) this site was used by the Department of the Army for testing and proof firing of artillery and as an ordnance storage and issue center (USAED Rock Island 1993). Camp Perry was established in 1907 by the state of Ohio for the training of the state National Guard. Part of the camp was used to establish the Erie Army Depot in the spring of 1918. During the next 2 years, the site was used to proof fire (check for accuracy) thousands of pieces of artillery. Between World War I and II, the site was less active and was used primarily to warehouse and issue various items of ordnance. In 1941, the artillery test-firing mission of the site was reactivated in support of World War II and the name of the facility was changed to the Erie Proving Ground. During the next 5 years, 70 percent of the mobile artillery used by the U.S. Army or provided to allied armies was tested and proof-accepted at Erie Proving Ground. Between 1946 and 1951, the site reverted to a peacetime role and was renamed the Erie Army Depot. Late in 1951, the depot assumed the additional roles of anti-aircraft support testing and the overhauling of surface-to-air guided missiles (support to the Korean Conflict). Additional activities included logistical support to Regular Army and National Guard anti-aircraft units training at Camp Perry (USAE District, Rock Island 1993a, 1993b; Bovia and Wirzylo 1992). Test firings of Vietnam-era munitions continued into the early and mid-1970s. Discussions with previous employees of the Erie Army Depot and present officials of Camp Perry indicate that the firing source and range patterns have been similar for other periods. The Erie Army Depot was considered excess by the General Services Administration in 1966 and closed in 1967. However, ARES, Inc., a company under contract to the Federal Government, has continued to manufacture and test fire artillery and other large-caliber barrels on this property as a commercially owned and operated enterprise. The majority of acreage encompassing the former Erie Army Depot site is no longer Federal property and is now classified as a FUDS. Approximately 5.7 km2 (1,400 acres) of property at the former Erie Army is leased from the State of Ohio to private landowners.

3.3 Munitions Found in Previous Activities

Several previous activities have uncovered a variety of munitions types. These activities have included dredging, a Time Critical Removal Action (TCRA) and a beach removal action. The munitions types previously located are listed in Table 3-1. In addition, it has been anecdotally reported that munitions were dumped from barges in the vicinity of the impact area during the 1960s. The types of munitions and quantities were not documented.

Table 3-1. Compilation of Munitions found during previous activities.

Munitions Type	Comments
3.5 inch rocket	Found during dredging
60 mm mortar	Found during dredging and beach removal action and TCRA
106 mm projectile	Found during dredging and beach removal action and TCRA
M52 fuze	Found during dredging
M15 Smoke Grenade	Found during dredging
105-mm projectile	Found during dredging and beach removal action and TCRA
90-mm projectile	Found during dredging and TCRA
20 mm projectile	Found during Beach Removal Action
165 mm	Pieces found during Beach Removal Action
40 mm	Found during TCRA
75 mm	Found during TCRA
81 mm	Found during TCRA
155 mm	Found during TCRA

Other reported finds include 240mm projectiles, 3-inch Stokes mortar projectiles, and 4.2-inch mortar projectiles.

Present Operations
At present, the site is used still used for limited firing from Camp Perry and the Ares facility in the former Erie Army Depot. The immediate area near the Toussaint River is used for recreational and commercial boating.

4.0 HAZARD ANALYSIS AND RISK ASSESSMENT

4.1 Activity Hazard Analysis (AHA)

An AHA has been conducted and documented as outlined below for each activity warranted by the hazards associated with the activity. For the Former Erie Army Depot and Toussaint River

site, the following activity hazard analyses (AHA) have been prepared for all anticipated field operations:

- UXO Identification and Recovery
- Dive Station Operations
- Transportation of MEC
- Disposal of MEC

Should conditions, equipment, or types of operations change during the course of the project work, the Corporate Health and Safety Manager will update an existing AHA for continuing work, or prepare a new one for new types of operations. This SSHP has been prepared using an initial exclusion zone of 500 feet. Should a "live" ordnance item be encountered, fragmentation zones would be extended per the requirements of DoD 6055.9 STD.

4.2 Principles

Risk management is and will continue to be integrated into the planning, preparation, and execution of work at the Former Erie Army Depot and Toussaint River site. Risk management is a dynamic process, and is continuously improved upon, as personnel become more familiar with the site operations, equipment, environment, etc. Personnel are urged to continuously identify hazards and assess accident risks. Once identified, these hazards will be brought to the attention of the UXOSO/QC. Control measures will be developed and coordinated. All personnel are responsible to continuously assess variable hazards and implement risk controls.

ACTIVITY HAZARD ANALYSIS

ACTIVITY: MEC Identification and Recovery	**ANALYZED BY/DATE: D. Farmer 09/11/06**

PRINCIPLE STEPS	**POTENTIAL SAFETY/HEALTH HAZARDS**	**RECOMMENDED CONTROLS**
• Establish exclusion zone of 500 feet around project site footprint (Exclusion Zone). • Make notification to Coast Guard to keep boat traffic out of exclusion zone. • Dive Supervisor completes check sheet • Locate anomalies identified by buoys using sight, touch, and/or underwater ordnance locator equipment. • Carefully dig around the item, if buried or partially buried, so it can be identified and examined for condition. • If MEC is too large or unsafe to move, it will be marked by identifying buoys and left in place for the EOD unit to come back and perform blow in place disposal operations later. • Diver will follow the buoy line to assure it reaches the surface. • If MEC is safe to move, it will be brought to the surface and placed in a sand-filled box on the boat awaiting transport to staging location (ARES, Inc. facility) pending disposal	• MEC hazards • Drowning hazards • Decompression hazards • Muscle strain carrying instruments, MEC, and swimming • Biological hazards - mosquitoes, snakes, poisonous or carnivorous fish. • Unauthorized personnel entering EZ during operations • Sunburn	• Training on MEC on site. • All personnel dive qualified and good swimmers • Standby Diver to provide emergency assistance • US Navy No-Decompression tables. • Training in biological hazards avoidance; PPE. (CSHP Chap 21 and Chap 36) • Site control measures will be implemented, coordination with Coast Guard, site personnel will be watchful for intruders
EQUIPMENT TO BE USED	**INSPECTION REQUIREMENTS**	**TRAINING REQUIREMENTS**
• Appropriate underwater ordnance locator. • Communications equipment • Dive boat • Scuba tanks, B/C, regulator, weight belts and weights, digging gear • Mask, fins, knife, light, dive watch, gear bag, wet suit • First Aid kit and equipment • Lifting gear/salvage lift bag	**UXOSO/QC** will assure that all controls are being followed; all equipment is being utilized and that all personnel have received appropriate training. • Equipment inspected daily prior to use. • PPE inspected daily prior to use	• UXO personnel will be EODS graduates. • Qualified divers • Site-specific UXO training will be presented to all site personnel. • All UXO personnel will receive refresher training in excavating of anomalies. • Site-specific flora/fauna to include first aid. • All site personnel will have current HAZWOPER training.

ACTIVITY HAZARD ANALYSIS

ACTIVITY: Dive Station Operations	**ANALYZED BY/DATE: D. Farmer 09/11/06**

PRINCIPLE STEPS	**POTENTIAL SAFETY/HEALTH HAZARDS**	**RECOMMENDED CONTROLS**
• Establish exclusion zone of 500 feet around project site footprint (Exclusion Zone). • Make notification to Coast Guard to keep boat traffic out of exclusion zone. • Dive Supervisor completes check sheet • Dive Supervisor observes operations/maintains communications	• MEC hazards • Drowning hazards • Muscle strain carrying instruments, equipment, MEC • Biological hazards - mosquitoes, snakes, poisonous and carnivorous fish. • Unauthorized personnel entering EZ during operations • Sunburn • Heat stress • Slips, trips, falls	• Training on MEC on site. • All personnel dive qualified and good swimmers, life preservers • Standby Diver to provide emergency assistance • Use US Navy No-Decompression tables. • Training in biological hazards avoidance; PPE. (CSHP Chap 21 and Chap 36) • Site control measures will be implemented, coordination with Coast Guard, site personnel will be watchful for intruders • Sunscreen will be used • Drinking water • Non-slip footwear
EQUIPMENT TO BE USED	**INSPECTION REQUIREMENTS**	**TRAINING REQUIREMENTS**
• Surface Communications equipment • Dive boat • Stop watches • Diver recall systems • Handheld depth finders • Dive flags • Dive Tables and Manuals • First aid kit • Oxygen cylinder • Back board • Lights • Lift bags • Compass • Lines • Peanut buoys • 5 lb weights • Buoys • MEC box filled with sand	**UXOSO/QC** will assure that all controls are being followed; all equipment is being utilized and that all personnel have received appropriate training. • Equipment inspected daily prior to use. • PPE inspected daily prior to use	• UXO personnel will be EODS graduates. • Qualified divers • Site-specific UXO training will be presented to all site personnel. • All UXO personnel will receive refresher training in excavating of anomalies. • Site-specific flora/fauna to include first aid. • All site personnel will have current HAZWOPER training. • Heat stress symptoms and first aid.

• Drinking water/cups • Sunscreen • Non-slip footwear • Sunglasses/head protection • Life preservers		

ACTIVITY HAZARD ANALYSIS

ACTIVITY: Transport of MEC	**ANALYZED BY/DATE: D. Farmer 09/11/06**	
PRINCIPLE STEPS	**POTENTIAL SAFETY/HEALTH HAZARDS**	**RECOMMENDED CONTROLS**
• Inspect vehicles to ensure proper working condition. • Ensure vehicles are properly equipped with seat belts, placards, fire extinguishers, and equipment for securing load • MEC will be transported in sand-filled boxes, packed so items are not touching one another. • MEC boxes are secured to prevent shifting. • Transport from ARES, Inc. facility to designated disposal location	• MEC hazards • Vehicle accidents • Fire • Heat stress	• Complete motor vehicle inspection form. • Licensed driver • Driver and all passengers will use seat belts when vehicle is in operation. • Vehicle will be placarded while traveling with MEC on public roads. • MEC will be placed securely in back of vehicle and anchored to prevent movement. • Vehicles with MEC cargo will not be left unattended. • Driver will observe posted speed limits. • A minimum of 2 persons in vehicle during MEC transport.
EQUIPMENT TO BE USED	**INSPECTION REQUIREMENTS**	**TRAINING REQUIREMENTS**
• Vehicle • Safety Equipment: seat belts, first aid kit, two-way communication, emergency eyewash kit, bloodborne pathogen kit, Haz-Mat spill response kit, 2 fire extinguishers • Explosive placards • Explosive storage boxes • Roadside emergency markers • Level D PPE: Cotton clothing, leather gloves, leather work boots, safety glasses • Drinking water and cups	**UXOSO/QC** will assure that all controls are being followed; all equipment is being utilized and that all personnel have received appropriate training. • Equipment inspected daily prior to use. • PPE inspected daily prior to use	• UXO personnel will be EODS graduates. • Driver must have valid driver's license • Training in fire extinguisher usage and trained not to fight fire involving explosives. • Site-specific UXO training will be presented to all site personnel. • Heat stress training and first aid • Training in small quantity spill clean-up • All site personnel will have current HAZWOPER training.

ACTIVITY HAZARD ANALYSIS

ACTIVITY: Disposal of MEC	**ANALYZED BY/DATE: D. Farmer 09/11/06**	
PRINCIPLE STEPS	**POTENTIAL SAFETY/HEALTH HAZARDS**	**RECOMMENDED CONTROLS**
• If MEC is too large or unsafe to move, it will be marked by identifying buoys and left in place for the EOD unit to come back and perform blow in place disposal operations later. • Establish exclusion zone based on MEC item around disposal area (Exclusion Zone). • Make required notifications of demolition/venting operations. • Retrieve donor explosives. • Set up demolition charges IAW procedures • Use filled sandbags around demolition charge, if required, to reduce the fragment travel range. • Post sentries outside Fragmentation Zone on all access roads • Ensure sentries have a full view of demolition and access areas. • Contact sentries to ensure that no pedestrian traffic is in the vicinity • Evacuate demolition crew to a safe location • Demolition occurs. • Inspect demolition site to ensure that demolition/venting has been completed properly.	• UXO/OE hazards • Slips, trips and falls • Biological hazards – plants, spiders, ticks, mosquitoes, snakes, rodents, etc. • Heat stress • EMR/static electricity hazards • Overpressure hazards due to blast. • Fragmentation hazard due to blast. • Eye hazard • Noise hazard • Cuts and abrasions hazard • Unauthorized personnel entering EZ during operations • Sunburn	• Training on UXO/OE on site. • Be observant when walking, and wear leather work-boots with ankle support and non-slip soles. • Training in biological hazards avoidance; PPE and first aid (CSHP Chap 21) • WBGT readings, drinking water, work/rest schedule. • Cotton clothing, radios and cell phones will not be used in the area once the pit is primed or during the priming process, unless radios are at the firing point and the firing line is shunted. • Establish EZ to reduce blast and overpressure hazards. • Use PPE and distance to relieve fragmentation and overpressure hazards. • EZ sentries will be posted at access road barricades to prevent unauthorized entry. • EZ sentries will wear orange vests during operations and maintain radio communication with demolition team supervisor • Demolition crew will observe fragmentation distance when seeking shelter from blasting. • Hearing protection. • Procedures for demolition operations in Work Plan will be followed.
EQUIPMENT TO BE USED	**INSPECTION REQUIREMENTS**	**TRAINING REQUIREMENTS**
• Donor explosive materials • Blasting circuits • PPE (Orange safety vests, cotton clothing, leather gloves, leather work boots with non-slip soles, safety glasses, hearing	**UXOSO/QC** will assure that all controls are being followed; all equipment is being utilized and that all personnel have received appropriate training. • Equipment inspected daily prior	• UXO personnel will be EODS graduates. • Site-specific UXO training will be presented to all site personnel. • Heat stress training. • Site-specific flora/fauna to

protection. • Radio communications	to use. • PPE inspected daily prior to use	include first aid. • Training in safe operating procedures, emergency procedures and PPE requirements during demolition operations. • All site personnel will have current HAZWOPER training.

5.0 TRAINING

Prior to commencement of site activities, the Corporate Health and Safety Manager and the UXOSO/QC will ensure that all EOTI employees engaged in hazardous waste operations are informed of the nature and degree of exposure to chemical and physical hazards that are likely to result from participation in site operations. EOTI will accomplish this by ensuring that all personnel entering the site have received the appropriate OSHA and site-specific training, prior to participation in site activities. Other employees working on the site in other capacities not involving hazardous waste operations will receive training on the hazards of the MEC operations on site and on MEC recognition and avoidance procedures, as well as emergency procedures. This training will be held at the time of site mobilization and will be reinforced during the daily safety briefings, which all on-site workers are invited to attend.

5.1 OSHA Training for General Site Workers

All EOTI employees who are involved in hazardous waste site activities receive 40 hours of OSHA Hazardous Waste Operations and Emergency Response (HAZWOPER) training. If it has been more than a year since any worker has received the 40 Hour OSHA HAZWOPER training, he or she must also have a current HAZWOPER 8-Hour Refresher Training prior to working on the site. All workers will also receive three (3) days (24 hours) of site-specific on-the-job training (OJT) under the direct supervision of a trained/experienced supervisor when they mobilize at the site. Any visitor entering the Exclusion Zone during hazardous waste operations will also be required to have current HAZWOPER training. The Exclusion Zone, during hazardous waste activities would include the project footprint and an area around the footprint of 500 feet. If live MEC is encountered, the exclusion zone will be increased to the equivalent of the fragmentation range of the largest MEC item handled on the site.

The UXOSO/QC will conduct the three-day OJT. This training will include classroom type instruction covering the topics specified for site specific training, and on site participation in the following:

- Details of the Site Specific Health and Safety Plan;
- Employee rights and responsibilities;
- Safe work practices;
- Nature and extent of anticipated chemical and physical hazards;
- Measures and procedures for controlling site hazards;

- Emergency Response and Contingency Plan;
- Rules and regulations for vehicle use;
- Safe use of field equipment;
- Handling, storage, and transportation of hazardous materials;
- Use, care, and limitations of PPE;
- Hazard communication per OSHA 29 CFR 1910.1200.

5.2 OSHA HAZWOPER Manager and Supervisor Training

On-site managers and supervisors, who are responsible for directing others, will receive the same training as the general site workers for whom they are responsible. They will also receive an additional 8 hours of OSHA required supervisory training to enhance their ability to provide guidance and make informed decisions. This additional training includes the following:

- Review of the EOTI Corporate Safety and Health Program;
- Regulatory requirements;
- Management of hazardous waste site cleanup operations;
- Management of site work zones;
- How to communicate with the media and the public;
- PPE selection and limitations;
- Spill containment; and
- Monitoring site hazards.

The UXOSO/QC, with specific responsibilities for safety and health guidance on site, will receive the training provided to general site workers and their supervisors. He also will receive advanced training in safety and health issues, policies and techniques.

5.3 MEC Training

All EOTI employees performing work involving the handling and destruction of MEC must be graduates of the Naval Explosive Ordnance Disposal School (at a minimum Phase I, chemical; and Phase II, surface) or equivalent recognized training. A copy of their certificate of graduation will be kept on file at corporate headquarters. UXO qualified personnel shall have knowledge and experience in military ordnance, ordnance components, and explosives location, identification, render safe, recovery/removal, transportation, and disposal safety precautions. UXO personnel shall have the knowledge and experience to effect safe handling and transportation of found ordnance items.

5.4 Hazard Communication

All EOTI employees who will be performing work involving the handling of hazardous materials will receive Hazard Communication training detailing the hazards of the product, appropriate protective measures to prevent exposure to the product, as well as safe procedures for storage and handling of the product, and response to emergencies. Personnel may request an MSDS for

any hazardous material on the site at any time. The location of the MSDSs for this site will be in an MSDS binder maintained by the UXOSO/QC, and all EOTI personnel will be made aware of that fact. This training will occur as part of the initial mobilization training at the site.

5.5 Tailgate Safety Briefing

Tailgate Safety Briefings consist of providing short training sessions in various subjects that give the site worker knowledge and confidence in performing duties in a potentially hazardous environment. The EOTI Documentation of Training Form doubles as the Tailgate Safety Brief Log/Form. The Tailgate Safety Briefing will be given prior to commencing work each day and will include such items as:

- Expected weather conditions;
- General site hazards;
- Biological hazards on site;
- MEC hazards;
- PPE required at each site;
- Emergency evacuation procedures;
- Cold/heat stress precautions;
- Buddy system procedures;
- A review of any safety violations from the previous day; and
- Any other significant events involving safety.

Additional briefings will be provided as needed concerning the use of safety equipment, emergency medical procedures, emergency assistance notification procedures, accident prevention, the work plan, and site orientation to ensure that accomplishment of the project can be carried out in a safe and effective manner. The other workers working in the vicinity will be invited to attend the daily tailgate safety briefings each morning.

5.6 Daily Debriefing

At the conclusion of each workday, a debrief for all employees will be held if appropriate, and the day's work will be discussed to determine if changes are warranted before commencing the next day's activities.

5.7 Periodic Site Training

On the first workday of each work week/period, or more frequently if needed, a pertinent topic will be selected and elaborated upon by the UXOSO/QC during the Tailgate Safety Briefing. These safety meetings will help ensure the safety and health of site personnel in the performance of regular work activities and in emergency situations. Safety meetings will be documented in the appropriate log and the EOTI Documentation of Training Form will be completed.

5.8 Visitors

All visitors to the site, even if escorted, must receive as a minimum, a briefing on site conditions, hazards and emergency response procedures. The UXOSO/QC will generally be the one providing the visitor briefing. All visitors to the exclusion zone will be escorted at all times. When visitors who are not UXO qualified enter the exclusion zone, all UXO operations will cease, and will resume again after the visitor has left the area. Visitors will not be permitted in the restricted work areas unless they have the appropriate level of OSHA training and are medically approved. Visitors not complying with the above requirements will not enter the restricted work areas; however, they may observe site conditions from a safe distance. All visitors will make appropriate entries in the Visitor's Log.

5.9 Training Documentation

A training record will be kept in each employee's individual file to confirm that adequate training for assigned tasks is provided and that training is current. In addition Documentation of Training Forms will be completed and kept on file at the work site for the duration of site activities.

5.10 First Responders

In accordance with 29 CFR 1910.120, there will be at least two personnel trained in First Aid and CPR on site if there is no medical facility within five minutes of the site. Personnel assigned as EMS first responders maintain current training in First Aid and CPR. First Responders also receive Bloodborne Pathogen Program training.

6.0 PERSONAL PROTECTIVE EQUIPMENT

Whenever feasible, engineering controls and work practices, or a combination thereof, shall be utilized to protect site workers from safety and health hazards and to maintain personal exposures to hazardous substances below established exposure limits. The exposure limits used by EOTI will be the lower of the OSHA Permissible Exposure Limits (PEL) found in 29 CFR 1910 Subpart G and 29 CFR 1910.1000, or the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLV). Other recognized published exposure levels, such as those found on MSDSs, will be used if the substance is not listed by OSHA or the ACGIH. EOTI will not utilize a system of employee rotation as a means of complying with the PPE, PEL, TLV or other published limits.

6.1. General Requirements

All personal protective equipment shall be provided, used, and maintained in a sanitary and reliable condition wherever it is necessary. PPE is required due to hazards of processes or environment, chemical hazards, or mechanical irritants encountered in a manner capable of

causing injury or impairment in the function of any part of the body through absorption, inhalation or physical contact. All PPE will be used in the manner for which it was designed. The assignment of PPE will be based upon hazard analysis, and the equipment will be selected based on its protection factor against site hazards. The level of PPE required at this site is expected to be Level D for personnel not participating in diving operations, as there are not expected to be any chemical hazards encountered. This PPE level may be raised by the Corporate Safety and Health Manager, in the event that additional hazards are encountered at the site. All dive personnel will wear standard diving gear.

6.2 Inspection

Each piece of PPE will be inspected daily prior to use. Defective or damaged personal protective equipment shall not be used. It will be removed from service and turned in for repair, or removed from the site for disposal and replaced with new PPE.

6.3 Training

EOTI will provide training to each employee who is required by this section to use PPE. Each affected employee will demonstrate an understanding of the training, and the ability to use PPE properly, before being allowed to perform work requiring the use of PPE. Each such employee will be trained to know at least the following:

- When PPE is necessary;
- What PPE is necessary;
- How to properly don, doff, adjust, and wear PPE;
- The limitations of the PPE; and,
- The proper care, maintenance, useful life and disposal of the PPE.

When the UXOSO/QC has reason to believe that any affected employee who has already been trained does not have the understanding and skill required he should retrain each such employee. Circumstances where retraining is required include, but are not limited to, situations where:

- Changes in the workplace render previous training obsolete; or
- Changes in the types of PPE to be used render previous training obsolete; or
- Inadequacies in an affected employee's knowledge or use of assigned PPE indicate that the employee has not retained the requisite understanding or skill.

6.4 Level D PPE

Due to the expected hazards at this site during most operations, level D PPE will be the requirement for personnel not participating in diving operations. Level D PPE is a work uniform affording minimal protection, used for nuisance contamination only. The following Level D equipment will be required on this site:

- Leather gloves.

- Safety glasses with side shields.
- Hearing protection, where required by high noise levels, in the vicinity of disposal operations.
- Leather, work boots with ankle support and non-slip soles.
- Cotton work clothes.
- Back supports (optional).
- Hat – Baseball cap or some type of head covering to keep the head from being exposed to the sun.
- Life preservers, when working in the dive boat.

6.4.1 Dive Operations PPE

EOTI personnel participating in dive operations will have the following PPE/equipment:

- Scuba tanks
- B/C
- Regulators
- Weight belts and weights
- Diving mask
- Fins
- Knife
- Diving light
- Dive watch
- Gear bag
- Wet suit
- Underwater ordnance locator
- Digging gear

6.5 Eye and Face Protection

All personnel will use appropriate eye or face protection when exposed to eye or face hazards from flying particles, liquid chemicals, or other eye hazards.

- All personnel will use eye protection that provides side protection when there is a hazard from flying objects. Detachable side protectors (e.g. clip-on or slide-on side shields) meeting the pertinent requirements of this section are acceptable. Due to the location and likelihood for glare, tinted safety glasses are recommended.
- All personnel who wear prescription lenses while engaged in operations that involve eye hazards shall wear eye protection that incorporates the prescription in its design, or wear eye protection that can be worn over the prescription lenses without disturbing the proper position of the prescription lenses or the protective lenses.
- Eye and face PPE will be distinctly marked to facilitate identification of the manufacturer.
- Protective eye and face devices purchased after July 5, 1994 shall comply with ANSI Z87.1-1989, "American National Standard Practice for Occupational and Educational Eye and Face Protection," which is incorporated by reference as specified in Sec. 1910.6.

6.6 Head Protection

While there is not expected to be a danger of impact to the head due to falling or flying objects during operations, it is recommended that personnel wear caps or some type of head covering for protection from the sun.

6.7 Foot Protection

Due to the uneven working surfaces and potential for tripping hazards common to an outdoor site and wet surfaces in boats, all EOTI personnel shall wear sturdy leather, work boots with ankle support and non-slip soles, except during dive operations.

6.8 Hand Protection

EOTI selects and requires employees to use appropriate hand protection when employees' hands are exposed to hazards such as those from skin absorption of harmful substances; severe cuts or lacerations; severe abrasions; punctures; thermal burns; and harmful temperature extremes. For most operations on this site, leather gloves will provide adequate protection against minor cuts, which are a hazard in most site operations.

6.9 Noise Exposure

Protection against the effects of noise exposure shall be provided when the sound levels exceed those shown below when measured on the A scale of a standard sound level meter at slow response. When employees are subjected to sound exceeding those listed in the following table, feasible administrative or engineering controls shall be utilized. If such controls fail to reduce sound levels to within these levels, personal protective equipment shall be provided and used to reduce sound levels within the levels of the table. If the variations in noise level involve maximal intervals of 1 second or less, it is to be considered continuous.

PERMISSIBLE NOISE EXPOSURES (1)	
Duration per Day, (Hours)	**Sound level DBA (Slow Response)**
8.00	90
6.00	92
4.00	95
3.00	97
2.00	100
1.50	102
1.00	105
0.50	110
0.25	115
Footnote (1). When the daily noise exposure is composed of two or more periods of noise exposure of different levels, their combined effect should be considered, rather than the individual effect of each. If the sum of the following fractions: C1./T1. + C2./T2. C(n)/T(n) exceeds unity, then, the mixed exposure should be considered to exceed the limit value. C(n) indicates the total time of exposure at a specified noise level, and T(n) indicates the total time of exposure permitted at that level. Exposure to impulsive or impact noise should not exceed 140 dB peak sound pressure level	

EOTI will make hearing protectors available to all employees exposed to an 8-hour time-weighted average of 85 decibels or greater at no cost to the employees. Hearing protectors will be replaced as necessary. Hearing protection with a NRR of 29 dB will be required for all personnel in the vicinity of demolition operations. Hearing protection will also be required for all personnel working in and around any other operations likely to produce high noise levels, such as boat motors.

6.10 Emergency Equipment

Emergency equipment will be maintained on site for the duration of site operations. An approved emergency first aid kit, bloodborne pathogen kit, and spill control kit will be kept in each site vehicle. Portable eyewashes will be located in the work area and in the site vehicles. A 5-lb. ABC fire extinguisher will be kept in each site vehicle for emergency use on site, and two fire extinguishers will be used during the transport of explosive materials.

Emergency equipment for the dive operations will be readily available in the dive boats. This equipment includes: Stop watches, diver recall system, handheld depth finder, dive flag, dive tables and manuals, first aid kit, oxygen cylinder, back board, surface communication system, lights, and compass.

7.0 MEDICAL SURVEILLANCE

Medical surveillance of EOTI employees will be conducted IAW the requirements of OSHA 29 CFR 1910.120(f), 29 CFR 1910.134(b)(10) and other established guidelines. Personnel to be included in the Medical Surveillance Program will be those who perform hazardous waste operations that may potentially expose the worker to hazardous substances or other significant safety and health threats. All EOTI personnel on the project site will be part of the EOTI Medical Surveillance Program. Visitors desiring entry into the exclusion zone must be on their employer's Medical Surveillance Program and must have a current physician's statement prior to entry.

A baseline health assessment physical or annual physical will be conducted prior to participating in site operations, to determine the worker's ability to perform hazardous waste operations in a safe and healthful manner. The Project Manager, in conjunction with the UXOSO/QC, will ensure that all health assessments address the site-specific health hazards to which workers may be exposed.

Physicals will be scheduled through the Corporate Health and Safety Manager, who will contract the services of a board certified occupational medicine physician in the vicinity of the employee's home or job site. The designated physician will perform the medical assessments and review medical examination results to determine each worker's ability to perform his assigned hazardous waste duties. The physician will also be responsible for determining if supplemental or follow-up examinations are required and for maintaining medical and exposure records IAW OSHA 29 CFR 1910.120(d).

The purposes of the Medical Surveillance Program are to:

- Assess the individual's health status prior to participation in hazardous waste operations; determine the individual's ability to perform work assignments requiring the use of personal protective equipment (PPE) and clothing;
- Establish baseline data for comparison to future medical data in order to provide a means of monitoring a worker's health status;
- Establish facilities and procedures for emergency and non-emergency medical treatment;
- Establish procedures for maintenance and storage of medical and exposure records.

7.1 Physician's Statement

The results of this examination will be made available to the employee and a written physician's statement will be sent to EOTI. A copy of the physician's statement will be kept in each employee's file at the project site for the duration of site operations. The physician's statement will include the following:

- The physician's opinion regarding any conditions which would place the employee at an increased risk from working in hazardous waste operations; The physician's recommended limitations upon the employee's assigned work, if any; and A statement that the employee has been informed by the physician of the results of the examination, and any conditions which may require further examination or treatment.

7.2 Supplemental Examination

Any site worker who has: been injured; received health impairment; developed signs or symptoms from possible over-exposure; or received a documented over-exposure without the use of respiratory protection, will undergo a supplemental examination. The contents of this examination will be based upon the type of injury, illness, signs or symptoms of exposure involved and will be determined by the physician. Prior to reassignment to site activities, the physician will certify that the employee is fit to return to work. If necessary, the physician will specify in writing any activity restrictions or additional tests, which may be required.

7.3 Follow-up Health Assessments

If, during any pre-assignment, annual or supplemental examination, a condition is detected which requires follow-up tests, the physician will notify EOTI and the employee as to the nature of the follow-up health assessment. The physician will determine the schedule and content of the follow-up health assessment. A statement outlining the employee's fitness for work will be provided to EOTI and the employee upon conclusion of the follow-up health assessment.

7.4 Emergency and Non-emergency Medical Treatment

The medical treatment facility for use at this project site will be: 1

Map and directions to the hospital can be found at paragraph 11.14.

7.5 Record Keeping

EOTI will retain and maintain copies of all physician statements, exposure records, and associated information for EOTI employees involved in hazardous waste operations. These records will be kept at the project site for the duration of site operations. When the site work is complete, the records will be retained by EOTI at the Oak Ridge, TN office. Examining physicians will be responsible for maintaining records related to laboratory and other tests for each EOTI employee examined. All records, whether maintained by EOTI or by the examining physician, will be kept on file for a period of thirty (30) years beyond an employee's termination IAW OSHA 29 CFR 1910.20(d).

8.0 ENVIRONMENTAL AND PERSONAL MONITORING

Due to the fact that there is not expected to be any significant exposure to hazardous chemicals at this site, chemical monitoring will not be required. As a result of the time of year this job is taking place, there may at times be a need for heat monitoring to prevent heat stress injuries from occurring. As the workers on this site will normally be in Level D PPE, heat stress monitoring will be required if the temperature goes above 75°F. Should it be required, site monitoring data will be recorded using the Site Monitoring Log and will be maintained as part of the project

record. Divers will be monitored to prevent decompression. Meteorological monitoring will be performed to assure the safety of site personnel on boats as well as those involved in MEC disposal operations on land.

8.1 Heat Stress Monitoring – Heat stress monitoring will be conducted in order to assure adequate work/rest cycles are implemented at the site. Pulse monitoring may also be used if workers appear stressed, particularly during acclimatization, to assure workers are adapting to the conditions safely. Monitoring will be performed by the UXOSO/QC and results will be documented. Heat stress monitoring will be used to determine work-rest cycles to be implemented on site.

8.2 Hypothermia Monitoring – In diving operations, hypothermia may become a health hazard. The UXOSO/QCS will monitor underwater times and conditions to prevent excessive body heat loss.

8.2 Meteorological Monitoring – Weather conditions can constitute a safety hazard to field operations at this site. The UXOSO/QC will monitor the weather closely. If the weather becomes so treacherous that an unacceptable level of risk exists for personnel who are working in proximity to MEC items, then MEC operations will cease until the UXOSO/QC determines it to be safe to continue.

No MEC operations will take place if an electrical storm is within ten miles of the site. An electrical storm monitor will be used to determine if an electrical storm is approaching. MEC operations will cease when an electrical storm is within ten miles of the site, and will not resume again until the UXOSO/QC determines that the electrical storm is at least ten miles past the site.

If small craft advisories have been issues in the area by the National Weather Service, then dive operations will cease until the advisory has been lifted.

8.3 Decompression Monitoring – The Dive Supervisor will be monitoring the divers time and depth underwater and referring to the U.S. Navy No-Decompression Tables to prevent decompression injuries.

9.0 SITE CONTROL

9.1 Site Map

A site map will be utilized by the UXOSO/QC during the Tailgate safety briefing to inform the workers of the location of hazardous areas on the site, the assembly areas to be used in the event of site evacuation, and any other information relevant to the day's activities. The site map will include:

- Site topography
- Site work zones
- Location of unusual/hazardous areas

- Prevailing winds
- Ingress and egress corridors
- Evacuation routes and assembly points
- Location of emergency supplies

9.2 Work Zone Delineation and Access Points

Site work zones will be established by the UXOSO/QC prior to initiating operations to control site access. Establishment of site work zones is based upon site conditions, activities and exposure potentials. A site Exclusion Zone will be set up, which includes the footprint of the area where work will take place and a 500-foot distance around that to protect areas and personnel outside the site from site hazards. If live MEC is encountered and is transported to the site designated for disposal, the exclusion zone will be increased to the fragmentation distance of the largest live round recovered. In the event that explosive operations are required onshore, site work zones will be marked using barricades and signage closing roads into the area to unauthorized vehicular traffic. Barricades and signs will remain in place for the duration of site work. The Coast Guard will be notified of areas on waterways that are included in the Exclusion Zone, in order that boat traffic can be warned of hazards. Site personnel will be watchful of boaters trying to access the area during site operations.

The UXOSO/QC will control access to each work zone and will ensure that all site workers and visitors have received the proper training and medical surveillance required to enter a specific zone. Access will be denied to any potential entrant not meeting these requirements. The following work zones will be established at this site:

- *Exclusion Zone (EZ)* – Area where significant hazard does or could occur and includes all areas where PPE is required to control worker exposure to chemical or physical hazards. All personnel entering the EZ will be logged in/out by the UXOSO/QC. All visitors to the EZ must be escorted by a UXO-qualified EOTI employee (normally this would be the UXOSO/QC). The EZ of this site will be designated as the footprint area of actual project operations and a distance of 500 feet surrounding the area. This distance is based on no live MEC being recovered. If live MEC is recovered, it will be brought to the ARES, Inc. facility for storage pending disposal. At the designated disposal site, the EZ will be extended to the fragmentation distance of the largest live MEC item found. Entry into the project area will be under the control of EOTI and AETC. EOTI will coordinate with ARES, Inc. and local authorities whenever roads will be required to be closed. The Coast Guard will be made aware of restrictions on boat traffic due to site operations. When non UXO-qualified personnel are required to enter within the exclusion zone in order to access other areas of the installation, all UXO operations will cease until all unrelated personnel are beyond the exclusion zone.
- A 500- foot exclusion zone has been established to provide a margin of protection to the general public from the potential hazards of the MEC operations. If live MEC is found, the fragmentation distance of the largest live item found will become the exclusion zone. The chart below lists some of the fragmentation distances of the types of MEC that have been used on the site in the past.

Munition	Fragmentation Distance
155mm projectile	2577 feet
2.75-inch Rocket	1,375 feet
3.5-inch Rocket	2,326 feet
5.0-inch Rocket	2,772 feet

- *Support Zone (SZ)* – Area outside the EZ where site support activities are conducted. Onshore, this zone includes break areas and sanitation facilities. Visitors desiring entry into the EZ must first meet with the UXOSO/QC and receive the appropriate safety and emergency procedures briefing in the SZ before gaining admittance to the EZ, and they will be escorted at all times by a UXO-qualified employee while in the EZ.

9.3 On and Off-Site Communication System

If on or off site telephone communication is required, it will be established through the use of cellular telephones, and all personnel will have emergency phone numbers and understand how and under what conditions they are to be used. Cell phones will not be used around MEC where EMR may present a hazard, but will remain in the site vehicles with the emergency telephone number list for access during operating hours. Radio communication may also be used particularly during MEC disposal operations, to handle communication between the disposal supervisor and the sentries. Radio communication/cell phones may also be used in dive boats during dive operations.

9.4 Site Access Controls

Site access control will be implemented by the UXOSO/QC and will be accomplished through a program that limits movement and activities of people and equipment at the project site. This control will be based on site-specific characteristics to include:

- Potential chemical, biological, physical or explosive hazards
- Terrain
- Expected weather conditions
- Planned site activities
- Site proximity to populated areas

The degree of site access control will include the following:

- Controlled site ingress/egress points – Work area will be clearly visible to anyone approaching the site and vice versa. The access road leading into the area will be closed and barricaded. Signs will be posted to warn unauthorized personnel against entry into the area. Anyone entering the work area must clear access through EOTI and/or AETC. Only authorized personnel will be permitted within the EZ during MEC operations. All others will remain in the SZ.

- Worker/visitor registration – All personnel working on the site sign in daily at the time of their daily safety briefing in the morning. All visitors to the site must sign the visitor log when they report to the site for their visitor briefing.
- Escort of visitors – All visitors to the site will be escorted by a UXO-qualified EOTI employee. Visitors will be briefed on site hazards, PPE requirements, and emergency procedures. Visitors who are not UXO-qualified will not be permitted within the EZ during UXO operations. If visitors need to access the EZ, all UXO operations will cease while they are in the area, and the visitors will be escorted at all times.
- PPE requirements – PPE requirements have been established based on the site hazards. Personnel working in areas requiring PPE will wear required PPE for the duration of the operation. Visitors to the area will be required to have the required PPE for the area they will be visiting.

10.0 PERSONNEL AND EQUIPMENT DECONTAMINATION

Sanitation facilities will be provided in the support zone area so that employees can wash prior to eating, drinking, smoking, or engaging in any other hand-to-face activities. Plumbed toilets and washing facilities will be available in the support zone of the work area. As chemical contamination is not expected to be an issue at this site, basic washing of equipment and standard hygiene practices are all that will be required.

11.0 EMERGENCY RESPONSE AND CONTINGENCY PROCEDURES (ERCP)

The ERCP address the emergencies, which could occur during site operations, and outlines the appropriate response actions.

11.1 Pre-Emergency Planning and Incident Reporting

The UXOSO/QC will perform the following pre-emergency tasks before starting field activities and during the mobilization and site specific training phase of the project, and will coordinate emergency response with EMT/police/fire personnel or other emergency response personnel when appropriate:

- Locate telephone stations;
- Post emergency telephone numbers at accessible telephone locations;
- Inspect all emergency equipment and supplies to ensure they are in proper working order;
- Provide a site map marked with planned evacuation routes, assembly points, and emergency equipment and supplies;
- Provide a map with the route to the hospital marked and highlighted, with copies of this map posted in the office/break trailer, in the emergency evacuation vehicle and all other site vehicles;
- Conduct an emergency response drill to test the effectiveness of the ERCP; and
- Review and revise the ERCP in the event of a failure of the plan in an actual or staged emergency, or when changes in site conditions or scope of work affect the ERCP.

11.2 Follow-Up and Documentation

Before normal activities are resumed, onsite personnel must be prepared and equipped to handle another emergency. These follow-up activities should be completed:

- The Health and Safety Manager will notify appropriate government agencies as required (Reminder: OSHA must be notified if there have been any fatalities or three or more hospitalizations).
- All equipment and supplies restocked, serviced and inspected; and
- Review and revise all aspects of the SSHP as necessary to address and prevent future emergencies of this type.

Investigation and documentation of emergency responses shall be initiated by the UXOSO/QC. This is important in all cases, but especially so when the incident has resulted in personal injury, property damage, or environmental impact. The documentation will be a written report and will be inclusive of the following:

- Accurate, concise and objectively recorded information;
- Authentic Information: Each person making an entry must sign and date that entry. Nothing is to be removed or erased. If details are changed or revised, the person making the change should strike out the old material with a single line and initial and date the change;
- Titles and names of personnel involved;
- Actions taken, decisions made, orders given, to whom, by whom, when, what, where, and how, as appropriate;
- Summary of data available;
- Possible exposure of personnel; and
- Copies of the Employer's Report of Occupational Injury or Illness (OSHA 300) or the EOTI Accident Report, as appropriate will be completed and forwarded to the Health and Safety Manager.

11.3 Accident Reporting

Reportable injury and occupational illnesses fall into one of the following categories:

- Fatality, including missing and presumed dead
- Permanent total disability
- Lost workday case involving days away from work
- Recordable case without lost workdays
- Recordable first-aid case
- Non-recordable injury/illness

The following unplanned events will also be investigated and reported:

- Damage to contractor property
- Unplanned functioning of UXO.

[29 CFR 1904.8] Within 8 hours after the death of any employee from a work-related incident or the in-patient hospitalization of three or more employees as a result of work-related incident, the employer shall orally report the fatality/multiple hospitalization by telephone or in person to the nearest Area Office of OSHA. The Health and Safety Manager will make these notifications.

All recordable and reportable accidents will be recorded on the OSHA Form 300, Log of Federal Occupational Injuries and Illnesses, which will be maintained at the EOTI Safety Office. [29 CFR 1904.2]

All accidents will be investigated and immediate steps will be taken to prevent recurrence. The client will be notified of any accidents occurring on this project site.

11.4 Lines of Authority

In the event of an emergency, the UXOSO/QC will be designated as the On-Scene Incident Commander and will have the overall responsibility for implementation of the ERCP and coordination with responding off site emergency services.

Once an emergency has occurred, the UXOSO/QC will report the incident to the client representative, the Project Manager and the Health and Safety Manager as soon as the situation is under control.

If the emergency involves employee injury, the UXOSO/QC will complete the EOTI Accident Report. The Health and Safety Manager will be responsible for notifying applicable Federal, state and local authorities/agencies. Once the emergency has been resolved, the UXOSO/QC, Project Manager and Health and Safety Manager will conduct a follow-up investigation and critique. Actions will be taken to prevent recurrence.

11.5 Emergency Contacts

Emergency resources are as follows:

- Ambulance: 911
- Fire: 911
- Police: 911
- Hospital (H. B. Magruder Memorial) (419) 734-3131 (For emergency assistance dial 911)
- Poison Control Hotline: 1-800-222-1222
- EPA National Response Center: 1-800-424-8802
- CHEMTREC: 1-800-424-9300
- Federal OSHA Emergency Hotline: 1-800-321-OSHA (6742)
- Live Ordnance Emergency:
- TEU (duty hours) (410) 671-3601
- TEU (after duty hours) (410) 671-2773
- EOTI Program Manager, Wayne Lewallen (732) 345-8099
- EOTI Health and Safety Manager,

Chris Rinn (732) 345-8099

11.6 Standard Procedure for Reporting Emergencies

In the event of an emergency requiring off site assistance, the UXOSO/QC or other designated site personnel will provide the following information:

- Name of person making call;
- Telephone number at location of person making call;
- Nature of emergency;
- Name of person(s) exposed or injured; and
- Actions already taken.

11.7 Emergency Prevention, Recognition and Notification

Prevention of emergencies will be aided by the effective implementation of this Site Specific Safety and Health Plan, personnel awareness, contingency planning, and onsite safety meetings. Anticipated emergencies may include physical injury, fire, explosion, chemical spill or release, inclement weather and natural disasters. The UXOSO/QC will use the site-specific briefing and/or the Tailgate Safety Briefings to inform site workers of the recognition, prevention, and response procedures for each anticipated emergency.

In the event of an emergency, site personnel will be notified by either visual/verbal communication. Personnel will be notified to:

- Stop work activities;
- Evacuate to the designated assembly point;
- Begin emergency procedures; and
- Notify off site emergency response organizations.

11.8 Fires

The decision on whether or not to try to extinguish a fire at the designated disposal site using available site personnel and equipment will be made by the UXOSO/QC and based on whether the fire is small, large or involves explosives.

11.8.1 Fire Protection

Portable fire extinguishers are rated and classified with NUMERAL and LETTER designations, based on fire tests conducted by the Underwriters Laboratories, Inc. (UL) or other nationally recognized testing laboratories. The numeral rating indicates the relative extinguishing effectiveness of extinguishers classified for Class A and B fires only. The Letter classified coincides with the Class of Fire. Extinguishers found to be effective on more than one Class of fire have multiple Letter classifications. Example: B:C

The rating of hand-portable fire extinguishers is based on the following:

- Class A fire extinguisher is used for ordinary combustible materials.
- Class B fire extinguisher is for flammable liquids.
- Class C fire extinguisher is for electrical fires.
- Class D fire extinguisher is for combustible metal fires.

Many fires are small at origin and may be extinguished by the use of proper hand-portable fire extinguishers. It is strongly recommended that the fire department be notified as soon as fire is discovered. This alarm should not be delayed awaiting result of application of portable fire extinguishers.

Fire extinguishers can represent an important segment of any overall fire protection program. However, their successful functioning depends upon the following conditions having been met:

- The extinguisher is properly located and in working order.
- The extinguisher is of proper type for a fire, which may occur.
- The fire is discovered while still small enough for the extinguisher to be effective.
- The fire is discovered by a person ready, willing, and able to use the extinguisher.
- Class A fires can be readily extinguished by quenching-cooling with water or a water-mixture agent. Class B fires are more effectively extinguished by an agent that blankets-smothers the fire through exclusion of oxygen surrounding the fire area. Those extinguishers containing bromochlorodifluoromethane, monobromotrifluoromethane, carbon dioxide, or dry chemical are generally best suited for extinguishing Class B fires. For Class C fires, the primary consideration in extinguishing this type of fire is the selection of nonconductive extinguishing agent to prevent dangerous electrical shock and possible death to user.
- Water or water-mixture type extinguishing agent must not be used under any circumstances on energized electrical equipment (Class C) fires. Whenever possible, electrical equipment and circuits should be de-energized before attacking a Class C fire.
- Due to its corrosive nature, dry chemical is not recommended for use on computerized, electronic or other equipment with extensive circuitry.

11.8.2 Small Fires

A small fire is defined as a fire that can most likely be extinguished by site personnel using portable extinguishers. A small fire must also be free and clear of explosive materials, especially MEC. If a small fire occurs, the UXOSO/QC will direct site personnel to perform the following, if safe to do so:

- Evacuate unnecessary personnel to an upwind position;
- Attempt to extinguish the fire using portable fire extinguishers or by smothering;
- Remove any essential or flammable items from the path of the fire; and
- Notify emergency response services (fire, police, ambulance, hospital, etc.) as needed.

If a fire extinguisher is used, this must be immediately reported to the UXOSO/QC. The fire extinguisher must be immediately removed from service until it can be recharged. Another fire extinguisher must be made available to the operating area. The area around where the fire occurred must be watched for a minimum of 30 minutes after the fire has been extinguished to

assure re-ignition does not occur. If personnel are not working in the area, the UXOSO/QC should check the area of the fire periodically to assure re-ignition does not occur.

11.8.3 Large Fires

A large fire is defined as a fire, which cannot be extinguished, or which, due to its size, cannot be extinguished using portable fire extinguishers. In the event that a large fire occurs and the fire does not involve explosive materials, the UXOSO/QC will direct personnel to conduct the following, if safe to do so:

- Evacuate all non-essential personnel from the site to an upwind location;
- Notify the Fire Department and other emergency response services (police, ambulance, hospital, etc.) as needed;
- Order the appropriate level of protective equipment to be worn by personnel responding to the fire;
- Attempt to control the fire to the extent possible; and
- Remove any essential or flammable items from the path of the fire.

11.8.4 Fires Involving Explosive Materials

If a fire occurs which involves explosive materials such as chemicals, fuels or MEC, the UXOSO/QC will order the immediate evacuation of all site personnel to an upwind assembly point at least fragmentation distance from the fire site. The UXOSO/QC will then notify the Fire Department and any other emergency services (police, ambulance, hospital, etc.) as needed. At no time will EOTI personnel fight a fire involving explosive materials, nor will they allow outside emergency personnel to do so. The Fire Department personnel may not enter any closer than fragmentation distance from the fire and they may spray water to surrounding buildings, structures, etc. in order to prevent the spread of fire.

After the fire has burned itself out, the site must be barricaded and entry prohibited until adequate cooling time has passed (at least 24 hours for a large fire). Explosive materials that may not have discharged during the fire may still be liable to function in the presence of extreme heat. After the site has cooled down, the UXOSO/QC will inspect the site and condition of MEC involved in the fire and make a determination as to whether or not the site is safe for others to enter.

If MEC is still intact, the UXOSO/QC will determine whether or not it is safe to move to an approved disposal site. If it is considered unsafe to move, the Wright Patterson EOD will be called and it will be destroyed in place. All MEC must be either removed or destroyed in place before non-UXO qualified personnel are permitted to enter the area.

If non-UXO qualified personnel must enter the site for purposes of fire investigation, etc. they must receive a briefing on the potential hazards of MEC on the site. They must be accompanied at all times by a UXO qualified employee of EOTI. NO OUTSIDE PERSONNEL WILL BE PERMITTED ONTO THE SITE WHILE THERE IS A KNOWN MEC HAZARD PRESENT. If during the course of the investigation MEC is observed, the site will be evacuated of all non-UXO qualified personnel until the site can be rendered safe for re-entry.

11.9 Explosions

In the event of an explosion, the UXOSO/QC will order the evacuation of all site personnel to a safe, upwind assembly point at least fragmentation distance away. The UXOSO/QC will then notify all necessary emergency response services. After an explosion has occurred the site will remain barricaded a minimum of 30 minutes before entry is permitted. The UXOSO/QC will enter the site with another UXO-qualified EOTI employee and inspect for presence and condition of MEC. If MEC is safe to move to an approved disposal site, it will be removed. If not, the EOD Unit will be notified and the MEC will be destroyed in place. Non-UXO qualified personnel may not enter the area until all known MEC has been removed or destroyed. If non-UXO qualified personnel need to enter the site, they must first be briefed on the potential hazards of the site. They must be accompanied at all times by an UXO-qualified employee. If MEC is discovered during the course of their visit, they must immediately leave the site until it can be rendered safe for re-entry.

11.10 Spill or Leak of Hazardous Materials

In the event of a spill or leak of any potentially harmful material (regardless of quantity) on site personnel will:

- Notify the UXOSO/QC immediately;
- The UXOSO/QC shall notify the Project Manager of the spill/leak with relative information (location, time, chemical identity, quantity, hazards listed on the MSDS), and any corrective actions/measures taken;
- Locate the source and stop the leak/spill if it can be done safely (as dictated by the UXOSO/QC);
- Begin containment and recovery of spilled material (as directed by the UXOSO/QC), using appropriate PPE and spill clean-up equipment and materials; and
- Once notified, the EOTI Project Manager will in turn notify the Client Project Manager and the Contracting Officer. The Client Project Manager will advise EOTI if any additional actions are necessary, or provide emergency response team notification, if required.

11.11 Site Topography, Layout, and Prevailing Weather Conditions

A site map will be prepared by the UXOSO/QC prior to start of demolition operations, which shows topography, site layout, and prevailing weather conditions. The location of first aid supplies and equipment will also be noted on the map, as will the route to the nearest hospital. The site map will be used to provide training to site staff, and a copy of it will be kept in each site vehicle for emergency use.

11.11.1 Inclement Weather Plan

Rain, high winds, or other inclement weather can constitute a safety hazard to field operations at the site. The UXOSO/QC will monitor the weather closely. If the area becomes so wet, muddy or slippery that an unacceptable level of risk exists for personnel who are working in proximity to MEC items, then MEC operations will cease until the UXOSO/QC determines it to be safe to

continue. The UXOSO/QC has the authority to halt operations for any inclement weather conditions, which could negatively impact on the safety of field personnel.

No MEC operations will take place if an electrical storm is within ten miles of the site. An electrical storm monitor will be used to determine if an electrical storm is approaching. MEC operations will cease when an electrical storm is within ten miles of the site, and will not resume again until the UXOSO/QC determines that the electrical storm is at least ten miles past the site. The UXOSO/QC will also be alert for National Weather Service Small Craft Advisories. If a Small Craft Advisory is in effect, all dive operations will cease until the advisory has been lifted.

11.12 Site Evacuation Procedures

In the event of an emergency that requires evacuation of the site, verbal instruction will be given by the UXOSO/QC to evacuate the area. Personnel will exit the area to the pre-designated assembly point..

After evacuation, the UXOSO/QC will account for all personnel, ascertain information about the emergency and advise responding onsite personnel. The UXOSO/QC will contact, advise and coordinate with responding off-site emergency personnel if deemed necessary by the situation.

In all situations that require evacuation, personnel shall not re-enter the work area until:

- The conditions causing the emergency have been corrected;
- The hazard has been reassessed;
- The Site Specific Safety and Health Plan has been revised and reviewed with onsite personnel, if needed; and
- Instructions have been given for authorized re-entry by the UXOSO/QC.

11.13 Emergency Medical Treatment and First Aid

In the event of an emergency involving personal injury or illness, EOTI will have two site personnel qualified in CPR/First Aid who will be the first responders to a site emergency until professional medical assistance arrives on the scene. Emergency medical services will be summoned, if deemed necessary by the UXOSO/QC. A first aid kit will be placed in the site vehicle and the office. A bloodborne pathogen kit will also be kept with each first aid kit. The UXOSO/QC will have final authority on the decision to require additional professional medical services (i.e., paramedics, hospital visit, etc.) for any illness or injury.

11.14 Route to Nearest Medical Facility

The nearest medical facility is: H. B. Magruder Memorial Hospital

All Supervisory personnel shall maintain a phone listing of the nearest available medical assistance in the event of an accident. This telephone listing will be kept beside each telephone. The UXOSO/QC will ensure that the Emergency Medical Assistance list is updated and provided to all supervisors. Directions to the nearest medical facility will be kept in each vehicle.

The hospital address is: H. B. Magruder Memorial Hospital
615 Fulton Street
Port Clinton, OH 43452

DISTANCE TO THE HOSPITAL: 6.5 miles

ROUTE TO THE HOSPITAL: Start out going west on OH-2W. Make a U-turn onto OH-2E for 3.8 miles. Take the OH-53 S. exit toward Fremont Road and turn left onto OH-53. Stay straight to take W. Fremont Rd/CR-52 for approximately 1 mile. Turn right onto Lay Drive and almost immediately left onto W. 6th Street for 0.9 mile. Turn right onto Fulton Street and the hospital.

11.15 Criteria for Initiating Community Alert Program

In the event an incident on the site has the potential to impact the general community or bring adverse attention or publicity to the client, the EOTI Program Manager will be notified. The EOTI Program Manager will notify the ESTCP Project Manager, in turn, who will provide any statements to the public or the media at their discretion.

11.16 MSDS

As part of the EOTI Hazard Communication Program, an MSDS binder will be maintained onsite, which includes copies of MSDSs for all hazardous materials brought onto the site by EOTI. It will be kept in the UXOSO/QC's site vehicle during operations. This MSDS binder will be available on request to all site personnel during all working hours of the site. If site workers have further questions about any of the hazardous materials they come into contact with, the EOTI Health and Safety Manager will locate the required information and pass it on to the employee.

12.0 CONFINED SPACE ENTRY

According to OSHA 29 CFR 1910.146, a confined space is defined as having all of the following criteria:

- It is large enough and so configured that an employee can bodily enter and perform assigned work.
- Is not designed for continuous human occupancy.
- Has limited or restricted means for entry or exit.

As work on this site involves underwater MEC identification and recovery, and surface disposal, confined space entry work is not expected to apply.

13.0 SPILL CONTAINMENT

Major spills are not expected on this site. Hazardous materials, where necessary, are being brought to the site in small quantity containers. This will minimize the amount of material involved, should a spill occur, as well as reducing the amount of hazardous material on hand to the minimum amount consistent with efficient operations. If a small amount of liquid hazardous material is spilled, it will be cleaned up with absorbent material by site personnel wearing appropriate chemical resistant gloves. It will then be containerized, labeled, and sent for disposal at an approved facility.

14.0 TEMPERATURE EXTREMES

Heat stress is one of the most common (and potentially serious) illnesses that affect hazardous waste site workers. When site personnel are engaged in operations involving hot environments and/or the use of semi- or impermeable clothing, a number of physiological responses can occur which may seriously affect the health and safety of the workers. These affects can be eliminated or controlled through the use of a comprehensive heat stress prevention and monitoring program.

Level D PPE is being used at this site, so the heat stress program will be implemented if the ambient temperature exceeds 75°F.

14.1 Causes of Heat Stress

The most common cause of heat stress during site activities is the affect that PPE has on the body's natural cooling mechanism. Impermeable PPE interferes with the evaporation of perspiration and causes the body to retain metabolic and environmentally induced heat. Individuals will vary in their susceptibility and degree of response to the stress induced by increased body heat. Heat stress can result in health effects ranging from transient heat fatigue to serious illness or death. Heat stress is caused by a number of interacting factors including environmental condition, clothing, workload, and the individual characteristics of the worker. Because heat stress is probably one of the most common (and potentially serious) illnesses at hazardous waste sites, regular monitoring and other preventive precautions are vital.

Factors, which may predispose a worker to heat stress, include:

- Lack of physical fitness.
- Lack of acclimatization to hot environments.
- Degree of hydration.
- Level of obesity.
- Current health status (i.e., having an infection, chronic disease, diarrhea, etc.).
- Alcohol or drug use.
- The worker's age and sex.
- Sunburn.

Prior to initiating site activities each day, and periodically throughout the day, the UXOSO/ will inspect the site personnel for evidence of the previously mentioned factors to determine those personnel who are at increased risk for heat stress related disorders. Evidence of extreme dehydration, illness or drug or alcohol use may require the UXOSO/QC to restrict the worker's activities until such time as the worker is fit for duty. Personnel identified as being at high risk

for heat stress, who are allowed to participate in site operations, will be monitored frequently by the UXOSO/QC throughout the day.

14.2 Heat Stress Disorders

This Section outlines the major heat related illnesses that may result from exposure to high heat environments and/or the use of semi- or impermeable clothing. For the purpose of this Program, reference to "liquids" will indicate the use of water or an electrolyte replacement solution, and not tea or coffee (unless it is decaffeinated) or carbonated soft drinks.

14.2.1 Heat Rash

Heat rash is caused by continuous exposure to heat and humid air and is aggravated by wet chafing clothes. This condition can decrease a worker's ability to tolerate hot environments.

Symptoms: Mild red rash, especially in areas of the body, which sweat heavily.

Treatment: Decrease the amount of time in protective gear and provide powder such as cornstarch or baby powder to help absorb moisture and decrease chafing. Maintain good personal hygiene standards and change into dry clothes if needed.

14.2.2 Heat Cramps

Heat cramps are caused by a profuse rate of perspiration that is not balanced by adequate fluid and electrolyte intake. The occurrence of heat related cramps are often an indication that excessive water and electrolyte loss has occurred, which can further develop into heat exhaustion or heat stroke.

Symptoms: Acute, painful spasms of voluntary muscles such as the back, abdomen and extremities.

Treatment: Remove victim to a cool area and loosen restrictive clothing. Stretch and massage affected muscles to increase blood flow to the area. Have patient drink one to two cups of liquids immediately, and every twenty minutes thereafter. Consult with physician if condition does not improve. If available, an electrolyte replacement solution should be taken along with liquids. For maximum benefit, this should be taken in at least a 2:1 ratio with at least two glasses of water to one glass of electrolyte replacement liquid.

14.2.3 Heat Exhaustion

Heat exhaustion is a state of very definite weakness or exhaustion caused by increased stress on various organs to meet increased demands to cool the body due to excessive loss of fluids from the body. This condition leads to inadequate blood supply and cardiac insufficiency. Heat exhaustion is less dangerous than heat stroke, but nonetheless must be treated. If allowed to go untreated, heat exhaustion can quickly develop into heat stroke.

Symptoms: Pale or flushed, clammy, moist skin, profuse perspiration, and extreme weakness. Body temperature is basically normal or slightly elevated, the pulse is weak and rapid, and breathing is shallow. The individual may have a headache, be dizzy or nauseated.

Treatment: Remove the individual to a cool, air-conditioned place, loosen clothing, elevate feet and allow individual to rest. Consult physician, especially in severe cases. Have patient drink one to two cups of liquids immediately, and every twenty minutes thereafter. Total liquid consumption should be about one to two gallons per day. If the signs and symptoms of heat exhaustion do not subside, or become more severe, immediate medical attention will be required.

14.2.4 Heat Stroke

Heat stroke is an acute and dangerous reaction to heat stress caused by a failure of the heat regulating mechanisms of the body. The failure of the individual's temperature control system causes the perspiration system to stop working correctly. When this occurs, the body core temperature rises very rapidly to a point (105+°F) where brain damage and death will result if the person is not cooled quickly.

Symptoms: The victim's skin is hot, and may or may not be red and dry, (due to the fact that the individual may still be wet from having sweat while wearing protective clothing earlier), nausea, dizziness, confusion, extremely high body temperatures, rapid respiratory and pulse rate, delirium, convulsions, unconsciousness or coma.

Treatment: Cool the victim immediately. If the body temperature is not brought down quickly, permanent brain damage or death may result. The victim should be moved to a shady area; lie down and keep the head elevated. Gradually cool the victim by either sponging or immersing the victim in cool water to reduce the core temperature to a safe level (<102°F). If conscious, give the victim cool liquids to drink. Observe the victim and obtain immediate medical help. Do not give the victim caffeinated or alcoholic beverages. Heat stroke is considered a medical emergency. Medical emergency assistance must be summoned.

14.3 Preventive Measures

Proper training and preventive measures will help avert serious illness and loss of work productivity. Preventing heat stress is particularly important because once someone suffers from heat exhaustion, that person may become predisposed to additional heat injuries. In order to avoid heat related illnesses, proper preventive measures will be implemented whenever environmental conditions dictate the need. These preventive measures represent the minimal steps to be taken and will include the following procedures:

- The UXOSO/QC will examine each site worker prior to start of daily operations to determine the individuals susceptible to heat induced stress. Workers exhibiting factors, which make them susceptible to heat stress, will be closely monitored by the UXOSO/QC.
- Site workers will be trained to recognize and treat heat-related illnesses. This training will include the signs, symptoms and treatment of heat stress disorders as outlined in this Program.

- In order to maintain workers' body fluids at normal levels, workers will be encouraged to drink, as a minimum, approximately sixteen ounces of liquids prior to start of work in the morning, after lunch and prior to leaving the site at the conclusion of the day's activities. Disposable four (4) to twelve (12) ounce cups and liquids will be provided on site. Acceptable liquids will include water and an electrolyte replacement solution, with the recommended intake being two cups of water to each cup of electrolyte replacement solution. Liquids containing caffeine are to be avoided.
- When ambient conditions and site workload requirements dictate, as determined by the UXOSO/QC, workers will be required to drink a minimum of sixteen (16) to thirty-two (32) ounces of liquids during each rest cycle. The normal thirst mechanism is not sensitive enough to ensure that enough water will be taken to replace lost sweat. When heavy sweating occurs, workers should be encouraged to drink even though they may not be thirsty. The following strategies may useful in encouraging fluid intake:
- Maintain water temperature at 50°F to 60°F (10°C to 15.6°C).
- Provide small disposable cups that hold about 4 ounces (0.1 liter).
- Have workers drink 16 ounces (0.5) liters) of fluids (preferably water or dilute drinks) before beginning work.
- Urge workers to drink a cup or two every 15 to 20 minutes, or at each monitoring break. A total of 1 to 1.6 gallons (4 to 6 liters) of fluid per day are recommended, but more may be necessary to maintain body weight.
- A shelter or shaded area will be provided where workers may be protected from direct sunlight during rest periods.
- Monitoring of ambient or physiological heat stress indices will be conducted to allow prevention and/or early detection of heat induced stress. Monitoring will be conducted in accordance with applicable paragraphs of this Program.
- Site workers will be given time to acclimatize to site work conditions, temperature, and workload. Acclimatization usually takes about a week of continued work in hot environments, and allows the worker's body to become adjusted to this level and type of work. This process involves a gradual increase in the workload over the required period, the length of which depends upon the nature of the work performed, the ambient temperatures and the individual's susceptibility to heat stress.
- Work schedules will be adjusted as follows:
- Modify work/rest schedules according to monitoring requirements.
- Mandate work slowdowns as needed.
- Rotate personnel: alternate job functions to minimize overstress or overexertion at one task.
- Add additional personnel to work teams.
- Perform work during cooler hours of the day if possible or at night if adequate lighting can be provided.

14.3.1 Supplemental Preventive Measures

Workers will be encouraged to achieve and maintain an optimum level of physical fitness. Increased physical fitness will allow workers to better tolerate and respond to hot environments

and heavy workloads. In comparison to an unfit person, a fit person will have: less physiological strain; a lower heart rate and body temperature; and a more efficient sweating mechanism.

14.4 Administrative Controls and Work Practices

Training is the key to good work practices. Unless all employees understand the reasons for new or changing old, work practices, the chances of such a program succeeding are greatly reduced. The following will be discussed during the site-specific training and repeatedly, as determined by the UXOSO/QC:

- Knowledge of the hazards of heat stress;
- Recognition of predisposing factors, danger signs, and symptoms;
- Awareness of first-aid procedures for, and the potential health effects of, heat stroke;
- Employee responsibilities in avoiding heat stress;
- Dangers of using drugs, including therapeutic ones, and alcohol in hot work environments;
- Use of protective clothing and equipment;
- Purpose and coverage of environmental and medical surveillance programs and the advantages of worker participation in such programs; and
- Dietary effects on heat stress.

14.5 Heat Stress Monitoring

Because the incidence of heat stress depends on a variety of factors, all workers, even those not wearing protective equipment, should be monitored. Initially, the frequency of physiological monitoring depends on the air temperature adjusted for solar radiation and the level of physical work (see Table 1). The length of the work cycle will be governed by the frequency of the required physiological monitoring.

For workers wearing permeable clothing (e.g., standard cotton or synthetic work clothes), follow recommendations for monitoring requirements and suggested work/rest schedules in the current American Conference of Governmental Industrial Hygienists' (ACGIH) Threshold Limit Values for Heat Stress. If the actual clothing worn differs from the ACGIH standard ensemble in insulation value and/or wind and vapor permeability, change the monitoring requirements and work/rest schedules accordingly.

The goal of all heat stress monitoring is to ensure that the worker's body temperature does not exceed 100.4°F. The physiological monitoring methods listed below are to be implemented based upon the severity of the heat and workload. The UXOSO/QCS may choose to monitor the worker's heart rate as an indication of potential heat stress. The frequency of physiological monitoring will be determined using the information presented in Table 1.

14.5.1 Heart Rate Monitoring

The worker's baseline heart rate should be recorded prior to initiation of site activities by measuring the radial pulse rate for thirty seconds. After each work cycle, the heart rate should be measured by taking the pulse rate (PR) for 30 seconds as early as possible into the resting period.

Taking the radial (wrist) pulse rate is the preferred method, however the carotid (neck) pulse rate may be taken if a worker has difficulty finding the radial pulse. The PR at the beginning of the rest period should not exceed one hundred and ten (110) beats per minute (bpm). If the PR is higher than 110 bpm, the next work period should be shortened by thirty-three percent, while the length of the rest period stays the same. If the PR exceeds 110 bpm at the beginning of the next rest period, the work cycle should be further shortened by thirty-three percent. This procedure will be continued until the worker's PR at the beginning of the rest cycle is maintained below 110 bpm.

14.5.2 Wet Bulb, Dry Globe Temperature (WBGT) Monitoring

For site conditions where personnel are working in Level D PPE, and the ambient temperature is greater than 75°F, the UXOSO/QC will conduct WBGT monitoring to assist in controlling the potential for site workers experiencing heat related adverse health affects. The UXOSO/QC will use WBGT monitor readings obtained from the construction contractor, and after estimating the workload, use the values expressed in Table 2, to determine the work/rest schedule to be implemented. The values outlined in this table are designed such that nearly all acclimatized, fully clothed workers with adequate salt and water intake will be able to function without the body temperature exceeding 100.4°F.

Acclimatization is the adaptive process that results in a decrease of the physiological response produced by the application of a constant environmental stress. On initial exposure to a hot environment, there is an impaired ability to work and evidence of physiological strain. If the exposure is repeated on several successive days, there is a gradual return of the ability to work and a decrease in physiological strain. Within 4 to 7 days following initiation of the acclimatization process, a dramatic improvement in the ability to perform work is noticed: subjective discomfort practically disappears; body temperature and heart rate are lower; there is a more stable blood pressure; and the sweat is more profuse and dilute.

Alcohol should not be consumed in a hot environment because the loss of body fluids increases the risk of heat stress.

14.6 Heat Stress Documentation

Should it be required due to site conditions, the UXOSO/QC will be responsible for recording all heat stress related information. This will include training sessions and monitoring data. Training sessions will be documented using the Documentation of Training Form. Pulse rate monitoring data will be recorded on the Heat Stress Monitoring Log, with the WBGT being recorded in the Site Safety Log, and/or Site Monitoring Log.

TABLE 1
SUGGESTED FREQUENCY OF PHYSIOLOGICAL MONITORING FOR FIT AND ACCLIMATIZED WORKERS[a]

ADJUSTED TEMPERATURE[b]	NORMAL WORK ENSEMBLE[c]	IMPERMEABLE ENSEMBLE
90°F (32.2°C) or above	After each 45 minutes of work	After each 15 minutes of work
87.5°-90°F (30.8°-32.2°C)	After each 60 minutes of work	After each 30 minutes of work
82.5°-87.5°F (28.1°-28.1°C)	After each 90 minutes of work	After each 60 minutes of work
77.5°-82.5°F (25.3°-28.1°C)	After each 120 minutes of work	After each 90 minutes of work
72.5°-77.5°F (22.5°-25.3°C)	After each 150 minutes of work	After each 120 minutes of work

[a] For work levels of 250 kilocalories/hour.

[b] Calculate the adjusted air temperature (at adj) by using this equation: at adj °F = ta °F + (13 x % sunshine). Measure air temperature (at) with a standard mercury-in-glass thermometer, with the bulb shielded from radiant heat. Estimate percent sunshine by judging what percent time the sun is not covered by clouds that are thick enough to produce a shadow. (100 percent sunshine = no cloud cover and a sharp, distinct shadow; 0 percent sunshine = no shadows.)

[c] A normal work ensemble consists of cotton coveralls or other cotton clothing with long sleeves and pants.

TABLE 2
PERMISSIBLE WBGT HEAT EXPOSURE THRESHOLD LIMIT VALUES

Work - Rest Regimen	WORK LOAD Light*	Moderate	Heavy
Continuous work	86 (30.0)	80 (26.7)	77 (25.0)
75% Work - 25% Rest, each hour	87 (30.6)	82 (28.0)	78 (25.9)
50% Work - 50% Rest, each hour	89 (31.4)	85 (29.4)	82 (27.9)
25% Work - 75% Rest, each hour	90 (32.2)	88 (31.1)	86 (30.0)

Consult the ACGIH TLV booklet for definitions of Light, Moderate and Heavy workloads. Values are given in ^{0}F and (^{0}C) WBGT, and are intended for workers wearing single layer summer type clothing. Use of semi or totally impermeable clothing requires monitoring IAW the EOTI Heat Stress Prevention Program. As workload increases, the heat stress impact on a non-acclimated worker is exacerbated. For un-acclimatized workers performing a moderate level of work, the permissible heat exposure TLV should be reduced by approximately 2.5^{0}C.

15.0 STANDARD OPERATING PROCEDURES, ENGINEERING CONTROLS, AND WORK PRACTICES

Using common sense and following safe practices can reduce hazards due to normal site activities. Personnel must keep the prudent guidelines listed below in mind when conducting field activities.

- Hazard assessment is a continuous process. Personnel must be aware of their surroundings and constantly be aware of the MEC, chemical and physical hazards that are or may be present.
- The number of personnel in the exclusion zone will be the minimum number necessary to perform work tasks in a safe and efficient manner.
- Team members will be familiar with the physical characteristics of each site including wind direction, site access, and the location of communication devices and safety/emergency equipment.
- The location of overhead power lines and underground utilities must be established.
- Contact with potentially contaminated surfaces, walking through puddles or pools of liquid, kneeling on the ground, or leaning, sitting, or placing equipment on the contaminated soil should be avoided.

- Detection or appearance of unusual liquids, odors or discolored soil could indicate the presence of contaminants and should be reported to the UXOSO/QC immediately.
- Site personnel are to report any other unusual or potentially hazardous condition to the UXOSO/QC for investigation and/or corrective action.

All personnel on site will be required to follow the safe work practices contained in this Program, as they relate to the hazards encountered during site activities. All site personnel will be required to read, understand and comply with the provisions of this SSHP. If new tasks or hazards are identified during site operations, which pose additional hazards, the SSHP will be amended by the Health and Safety Manager to include additional safe work practices and other control methods as needed.

15.1 Hand Tool Operation

Use of improper or defective tools can contribute significantly to the occurrence of accidents on site. Therefore, the safe work practices listed below shall be observed when using hand tools:

- Hand tools will be inspected for defects prior to each use.
- Defective hand tools will be removed from service and repaired or discarded.
- Tools will be selected and used in the manner for which they were designed.
- Be sure of footing and grip before using any tool.
- Do not use tools that have split handles, mushroom heads, worn jaws, or other defects.
- Gloves will be worn whenever they increase gripping ability or if cut, laceration or puncture hazards may exist during the use of hand tools.
- Safety glasses with side shields, goggles, or a face shield will be used if tool use presents an eye/face hazard.
- Do not use makeshift tools or other improper tools.
- Use non-sparking tools where there are explosive vapors, gases, or residue.

15.2 Material Lifting

Many types of objects are handled in normal day to day operations. Care shall be taken in lifting and handling heavy or bulky items because they are the cause of many joint and back injuries. The following fundamentals address the proper lifting of materials to avoid joint and back injuries:

- The size, shape and weight of the object to be lifted must be considered. Site personnel will not lift more than they can handle comfortably.
- A firm grip on the object is essential; therefore the hands and object shall be free of oil, grease and water, which might prevent a firm grip.
- The hands and especially the fingers shall be kept away from any points that cause them to be pinched or crushed, especially when setting the object down.
- The item shall be inspected for metal slivers, jagged edges, burrs, rough or slippery surfaces and pinch points, and gloves shall be used, if necessary, to protect the hands.
- The feet shall be placed far enough apart for good balance and stability.
- Personnel will ensure that solid footing is available prior to lifting the object.

- When lifting, get as close to the load as possible, bend the legs at the knees, making sure that the back is kept as straight as possible.
- To lift the object, the legs are straightened from their bending position.
- Never carry a load that cannot be seen over or around.
- When placing an object down, the stance and position are identical to that for lifting, with the back kept straight, the legs bent at the knees and the object lowered.
- If the item to be lifted is too large, bulky, or heavy for one person to safely lift, ask a co-worker for assistance. If a piece of material handling equipment is available that can do the job, use the equipment instead of trying to lift it yourself.
- When two or more people are required to handle an object, coordination is essential to ensure that the load is lifted uniformly and that the weight is equally divided between the individuals carrying the load. When carrying the object, each person, if possible, shall face the direction in which the object is being carried.

15.3 Sanitation Practices

Adequate sanitation facilities will be provided at each work site to ensure proper personal hygiene. Site sanitation will be established and maintained in accordance with OSHA 29 CFR 1910.120(n).

15.3.1 Potable Water Supply

An adequate supply of potable (drinkable) water shall be provided on site at all times, and will be supplied in accordance with the following provisions:

- Containers used for potable water shall be capable of being tightly closed, equipped with a tap and maintained in a clean and sanitary condition.
- A container used for distribution of drinking water shall be clearly labeled as to its contents and not used for any other purpose.
- Water shall not be dipped from the container and use of a common cup will not be allowed.
- Where single service cups are provided, separate sanitary containers will be provided for the storage of the unused cups and for the disposal of the used cups.

15.3.2 Non-potable Water

Outlets and storage containers for non-potable water, such as water for fire fighting or decontamination will be clearly labeled to indicate that the water is not suitable for drinking, washing or cooking. There shall at no time be a cross connection or open potential between a system furnishing potable water and a system furnishing non-potable water.

15.3.3 Toilet Facilities

Chemical toilet facilities are being provided on the boat. Hand/face washing facilities will be set up nearby.

15.3.4 Washing Facilities

Hand and face washing facilities will be set up in the support zone of the work area. Washing facilities will be utilized by all personnel exiting the exclusion zone prior to eating, drinking, tobacco use or other hand to face activities. Washing facilities will consist of potable running water, soap and drying towels. Portable eyewash will be available in site vehicles, and the office trailer.

15.4 Site Housekeeping

All work areas will be maintained in a clean/neat fashion, free of loose debris and scrap. Any materials/equipment not being used will be removed and stored or disposed of accordingly. All work areas will be supplied with a trash receptacle with lid, the contents of which will be emptied daily.

15.5 Site Illumination

Conducting MEC operations in poorly illuminated conditions is inherently dangerous. As a general rule, personnel will only work during the hours of daylight, and no field activities will be scheduled during the period of thirty minutes before dusk to thirty minutes after dawn. There will be no MEC operations conducted during the hours of darkness unless specifically requested by the client and with sufficient lighting to attain a candlepower rating of 5-foot candles in the work zone. Work on this site will not be conducted during hours of darkness. Portable underwater lights may be used during dive operations.

15.6 Biological Hazards

Biological hazards, which may be found at the disposal site, include insects, such as ticks, spiders, poisonous snakes and hazardous plants. The divers are not expected to face any additional biological hazards. Employee awareness and the safe work practices outlined in the following paragraphs should reduce the risk associated with these hazards.

15.6.1 Hazardous Plants

During the conduct of site activities the number and variety of plants that may be encountered is large and extensive. However the plants presenting the greatest degree of risk to site personnel (i.e.. potential for contact vs. affect produced) are those, which produce skin reactions and skin and tissue injury.

15.6.1.1 Plants Causing Skin and Tissue Injury

Contact with splinters, thorns and sharp leaf edges is of special concern to site personnel, as is the contact with the pointed surfaces found on branches, limbs and small trunks. This concern stems from the fact that punctures, cuts and even minor scrapes caused by accidental contact may result in non-infectious skin lesions, and the introduction of fungi or bacteria through the skin or eye. Personnel receiving any of the injuries listed above, even minor scrapes, shall report immediately to the UXOSO/QC for initial and continued observation and care of the injury.

15.6.1.2 Plants Causing Skin Reactions

The poisonous plants of greatest concern are poison ivy and poison oak. Both poison ivy and poison oak thrive in all types of light and usually grow in the form of a trailing vine; however, it can also grow as a bush and can attain heights of 10 feet or more. Poison ivy has shiny pointed leaves that grow in clusters of three. Poison oak can have shiny or dull, pointed leaves that grow in clusters of three. Poison oak leaves are more rounded rather than jagged, and the underside of poison oak leaves are covered with hair.

The skin reaction associated with contacting these plants is caused by the body's allergic reaction to toxins contained in oils produced by the plant. Becoming contaminated with the oils does not require contact with just the leaves. Contamination can be achieved through contact with other parts of the plant such as the branches, stems or berries, or contact with contaminated items such as tools and clothing. The allergic reaction associated with exposure to these plants will generally cause the following signs and symptoms:

- Blistering at the site of contact, usually occurring within 12 to 48 hours after contact.
- Reddening, swelling, itching and burning at the site of contact.
- Pain, if the reaction is severe.
- Conjunctivitis, asthma, and other allergic reactions if the person is extremely sensitive to the poisonous plant toxin.

If the rash is scratched, secondary infections can occur. The rash usually disappears in 1 to 2 weeks in cases of mild exposure and up to 3 weeks when exposure is severe. Preventive measures, which can prove effective for most site personnel, are:

- Avoid contact with any poisonous plants on site, and keep a steady watch to identify, report and mark poisonous plants found on site.
- Wash hands, face or other exposed areas at the beginning of each break period and at the end of each workday.
- Avoid contact with, and wash on a daily basis, contaminated tools, equipment and clothing.
- Barrier creams, detoxification/wash solutions and orally administered desensitization may prove effective and should be tried to find the best preventive solution.
- Keeping the skin covered as much as possible (i.e., long pants and long sleeved shirts) in areas where these plants are known to exist will limit much of the potential exposure.
- If burning of these plants occurs, make sure personnel are located upwind of the smoke, as inhalation of the smoke or contact with airborne particles from these plants can still cause a reaction to occur.

15.6.2 Snakes

When site activities are conducted in warm weather on sites that are located in wooded, grassy or rocky environments, the potential for contact with poisonous snakes becomes a very real danger. Normally, if a person is approaching a snake, the noise created by the person is usually sufficient to frighten the snake off. However, during the warm months, extreme caution must be exercised when conducting site operations around areas where snakes might be found (i.e. rocks, bushes, logs, or in holes, crevices, and abandoned pipes). If poisonous snakes are identified on site, EOTI will issue protective clothing, such as snake leggings, to site personnel. The rules to follow if a snake bites someone are:

- **DO NOT** cut "Xs" over the bite area, as this will intensify the effect of the venom.
- **DO NOT** apply suction to the wound since this has a minimal effective in removing venom.
- **DO NOT** apply a tourniquet since this will concentrate the venom and increase the amount of tissue damage in the immediate area.
- If possible, try to get a good look at the snake so it can be identified for proper selection of anti-venom.
- **DO NOT** allow the victim to run for help since running increases the heart rate and will increase the spread of the venom throughout the body.
- Keep the victim calm and immobile.
- Have the victim hold the affected extremity lower than the heart while waiting for medical assistance. Do not delay evacuation.
- Transport the victim to medical attention immediately.

15.6.3 Tick Bites

The Centers for Disease Control (CDC) has noted the increase of Lyme Disease and Rocky Mountain Spotted Fever (RMSF) which are caused by bites from infected ticks that live in and near wooded areas, tall grass, and brush. Ticks are small, ranging from the size of a comma up to about one quarter inch. They are sometimes difficult to see. The tick season extends from spring through summer. When embedded in the skin, they may look like a freckle.
Lyme disease has occurred in 43 states, with the heaviest concentrations in the Northeast, the upper Midwest, and along the northern California coast. It is caused by deer ticks and the lone star ticks which have become infected with spirochetes. Female deer ticks are about one quarter inch in size, and are black and brick red in color. Male deer ticks are smaller, and completely black. Lone star ticks are larger and chestnut brown in color.

RMSF has occurred in 36 states, with the heaviest concentrations in Oklahoma, North Carolina, South Carolina, and Virginia. It is caused by Rocky Mountain wood ticks, and dog ticks which have become infected with rickettsia. Both are black in color.

The first symptoms of either disease are flu like chills, fever, headache, dizziness, fatigue, stiff neck, and bone pain. If immediately treated by a physician, most individuals recover fully in a short period of time. If not treated, more serious symptoms can occur.

If you believe a tick has bitten you, or if any of the signs and symptoms noted above appear, contact the UXOSO/QC, who will authorize you to visit a physician for an examination and possible treatment.

15.6.3.1 Protective Measures

Standard field gear (work boots, socks and light-colored coveralls) provide good protection against tick bites, particularly if the joints are taped. However, even when wearing field gear, the following precautions shall be taken when working in areas that might be infested with ticks:

- When in the field, check yourself often for ticks, particularly on your lower legs and areas covered with hair.

- Spray outer clothing, particularly your pant legs and socks, **BUT NOT YOUR SKIN**, with an insect repellent that contains permethrin or permanone. Apply deet (vapor-active repellent) to any exposed skin surface (except eyes and lips), and apply permethrin repellent spray to field clothing. Allow the pertmethrin to dry before using treated clothing. The repellent system, deet and permethrin, offer maximum protection.
- When walking in wooded areas, wear a hard hat, and avoid contact with bushes, tall grass, or brush as much as possible.
- If you find a tick, remove it by pulling on it gently with tweezers.
- If the tick resists, cover the tick with salad oil for about 15 minutes to asphyxiate it, then remove it with tweezers.
- **DO NOT** use matches, a lit cigarette, nail polish or any other type of chemical to "coax" the tick out.
- Be sure to remove all parts of the tick's body, and disinfect the area with alcohol or a similar antiseptic after removal.
- For several days to several weeks after removal of the tick, look for the signs of the onset of Lyme disease, such as a rash that looks like a bulls-eye or an expanding red circle surrounding a light area, frequently seen with a small welt in the center.
- Also look for the signs of the onset of RMSF, such as an inflammation which is visible in the form of a rash comprising many red spots under the skin, which appears 3 to 10 days after the tick bite.

15.6.4 Bees, Hornets and Wasps

Contact with stinging insects like bees, hornets and wasps may result in site personnel experiencing adverse health affects that range from being mildly uncomfortable to being life threatening. Therefore, stinging insects present a serious hazard to site personnel, and extreme caution must be exercised whenever site and weather conditions increase the risk of encountering stinging insects. Some of the factors related to stinging insects that increase the degree of risk associated with accidental contact are as follows:

- The nests for these insects are frequently found in remote wooded or grassy areas.
- The nests can be situated in trees, rocks, and bushes or in the ground, and are usually difficult to see.
- Accidental contact with these insects is highly probable, especially during warm weather conditions when the insects are most active.
- If a site worker accidentally disturbs a nest, the worker may be inflicted with multiple stings, causing extreme pain and swelling which can leave the worker incapacitated and in need of medical attention.
- Some people are hypersensitive to the toxins injected by a sting, and when stung, experience a violent and immediate allergic reaction resulting in a life-threatening condition known as anaphylactic shock.
- Anaphylactic shock manifests itself very rapidly and is characterized by extreme swelling of the body, eyes, face, mouth and respiratory passages.
- The hypersensitivity needed to cause anaphylactic shock, can in some people, accumulate over time and exposure, therefore even if someone has been stung previously, and not

experienced an allergic reaction, there is no guarantee that they will not have an allergic reaction if they are stung again.

With these things in mind, and with the high probability of contact with stinging insects, all site personnel will comply with the following safe work practices:

- If a worker knows that he is hypersensitive to bee, wasp or hornet stings, he must inform the UXOSO/QC of this condition prior to participation in site activities.
- All site personnel will be watchful for the presence of stinging insects and their nests, and will advise the UXOSO/QC if a stinging insect nest is located or suspected in the area.
- Any nests located on site will be flagged off and site personnel will be notified of its presence.
- If stung, site personnel will immediately report to the UXOSO/QC to obtain first aid treatment and to allow the UXOSO/QC to observe them for signs of allergic reaction. If a breathing emergency (anaphylactic shock) occurs as a result of the sting, immediately call 911.
- Site personnel with a known hypersensitivity to stinging insects will keep required emergency medication on or near their person at all times, and will let the UXOSO/QC and co-workers know where it is kept.

15.6.5 Spiders

A large variety of spiders may be encountered during site activities. While most spider bites merely cause localized pain, swelling, reddening and in some cases, tissue damage, there are a few spiders that, due to the severity of the physiological affects caused by their venom, are dangerous. These species include the black widow and the brown or violin spiders.
The black widow is a coal-black bulbous spider about ¾-inch in length, with a bright red hourglass on the under side of the abdomen. The black widow is usually found in dark moist locations, especially under rocks, rotting logs and may even be found in outdoor toilets where they inhabit the underside of the seat. Victims of a black widow bite may exhibit the following signs or symptoms:

- Sensation of pinprick or minor burning at the time of the bite.
- Appearance of small punctures (but sometimes none are visible).
- After 15 to 60 minutes, intense pain is felt at the site of the bite which spreads quickly, and is followed by profuse sweating, rigid abdominal muscles, muscle spasms, breathing difficulty, slurred speech, poor coordination, dilated pupils and generalized swelling of face and extremities.

The brown or violin spider is brownish to tan in color, rather flat, about 5/8-inch long with a dark brown “violin” shape on the top. Of the brown spider, there are three varieties found in the United States, which present a problem to site personnel. These are the brown recluse, the desert violin and the Arizona violin. These spiders may be found in a variety of locations including trees, rocks or in dark locations. Victims of a brown or violin spider bite may exhibit the following signs or symptoms:

- Blistering at the site of the bite, followed by a local burning at the site 30 to 60 minutes after the bite.
- Formation of a large, red, swollen, postulating lesion with a bull’s-eye appearance.

- Systemic affects may include a generalized rash, joint pain, chills, fever, nausea and vomiting.
- Pain may become severe after 8 hours, with the onset of tissue necrosis.

There is no effective first aid treatment for either of these bites. Except for very young, very old or weak victims, these spider bites are not considered to be life threatening; however, medical treatment must be sought to reduce the extent of damage caused by the injected toxins.
If either of these spiders are suspected or known to be on site, the UXOSO/QC will brief site personnel as to the identification and avoidance of the spiders. As with stinging insects, site personnel shall report to the UXOSO/QC if they locate either of these spiders on site or notice any type of bite while involved in site activities.

15.6.6 Hantavirus Pulmonary Syndrome (HPS)

15.6.6.1 Basic Transmission Cycle – some rodents are infected with a type of Hantavirus that causes HPS. In the United States, deer mice (plus cotton rats and rice rats in the southeastern states and the white-footed mouse in the Northeast) are the rodents carrying hantaviruses that cause hantavirus pulmonary syndrome. Common house mice do not carry Hantavirus.

These rodents shed the virus in their urine, droppings and saliva. The virus is mainly transmitted to people when they breathe in air contaminated with the virus. This happens when fresh rodent urine, droppings or nesting materials are stirred up. When tiny droplets containing the virus get into the air, this process is known as aerosolization.
There are several other ways rodents may spread Hantavirus to people:

- If a rodent with the virus bites them, the virus may be spread this way – but this is very rare.
- Researchers believe that you may be able to get the virus if you touched something that had been contaminated with rodent urine, droppings, or saliva, and then touched your nose or mouth.
- Researchers also suspect that if virus-infected rodent urine, droppings or saliva contaminates food that you eat, you could also become sick.

15.6.6.2 Symptoms of HPS

Early symptoms include fatigue, fever, and muscle aches, especially the large muscle groups – thighs, hips, back, sometimes shoulders. These symptoms are universal. There may also be headaches, dizziness, chills and/or abdominal problems, such as nausea, vomiting, diarrhea and abdominal pain. About half of all HPS patients experience these symptoms.

How long could it be between the time you get the virus, and the time you start showing these symptoms? Because there have been so few cases of HPS, it is not quite clear what this "incubation time" is. However, it appears right now that it may be between one to five weeks after you are exposed to potentially infected rodents and the rodent's droppings before you will show any symptoms.

Late symptoms – 4-10 days later – symptoms include coughing and shortness of breath, with the sensation of, as one survivor put it, a "tight band around my chest and a pillow over my face" as lungs fill with fluid.

MINIMIZE RISK - do not disturb rodents, burrows, or dens.

15.6.6.3 Preventive Measures

If there are signs of a rodent nest or rodent droppings, make it known to the UXOSO/QC. To clean and disinfect the area, spray a disinfectant on the area and leave a waiting time of 20 minutes. Then clean it up using rubber or plastic gloves, coveralls, rubber boots or disposable shoe covers, protective goggles, and a half-face mask air-purifying respirator with a high-efficiency particulate air (HEPA) filter. Bag the cleaning materials and dispose of it. Then, re-clean the area with disinfectant.

15.6.7 Mosquitoes

Mosquitoes are responsible for transmitting diseases such as malaria and West Nile Virus through bites to the skin. While malaria is much more contagious, it is not normally found in North America. West Nile virus is commonly found in Africa, West Asia and the Middle East. In recent years, West Nile virus has been increasingly found in the continental United States. It is believed to have first appeared in the United States in 1999. It is most common in late summer or early fall, which is the active season for mosquitoes, but in warmer southern climates where the temperatures are milder, West Nile virus can be transmitted year round.

15.6.7.1 Transmission Cycle

Mosquitoes become infected with the virus when they feed on infected birds, which may circulate the virus in their blood for a few days. Infected mosquitoes can then transmit the virus to humans and animals while biting to take blood. The virus is located in the mosquito's salivary glands, and may be injected into the animal or human, where it can multiply, possibly causing illness. Even in areas where the virus is circulating, few mosquitoes are infected with the West Nile virus. Even if the mosquito is infected, less than 1% of people who get bitten and become infected will get seriously ill. The majority of cases of West Nile virus have been identified in birds, it has also been found in horses, cats, bats, chipmunks, skunks, squirrels, and domestic rabbits. Once West Nile virus has been contracted, the survivor of this illness is believed to carry a lifelong immunity to it. At this time there is no vaccine against West Nile virus.

15.6.7.2 Symptoms

West Nile virus is an encephalitis, which causes an inflammation of the brain. Following transmission by an infected mosquito, West Nile virus multiplies in the person's blood system and crosses the blood-brain barrier to reach the brain. The virus interferes with normal central nervous system functioning and causes inflammation of the brain tissue. Fatality rates range from 3%-15% of persons who develop severe illness, and rates are highest among persons over

50 years of age and those with weakened immune systems. This disease is not transmitted from person-to-person, so touching or working in the vicinity of someone with the disease will not increase the risk.

The incubation period for West Nile virus is normally 3-15 days. Most infections are mild, and symptoms include fever, headache, and body aches, occasionally with skin rash and swollen lymph glands. More severe infection may be marked by headache, high fever, neck stiffness, stupor, disorientation, coma, tremors, convulsions, muscle weakness, paralysis, and, rarely, death.

If symptoms develop, seek medical attention immediately.

15.6.7.3 Preventive Measures

Prevention and control of West Nile virus is most effectively accomplished through vector management programs. Be alert for dead animals on the site, particularly birds. If a dead bird or other animal is found on site, bare-handed contact should be avoided. Using gloves or double plastic bags, wrap animal and call the Health Department. If the Health Department wants to test the bird, they will come and pick it up. If they are not testing the bird, it should remain wrapped in the plastic and disposed of in accordance with established procedures.

Other ways of reducing risk of becoming infected with West Nile Virus include:

- Implement mosquito control measures on the site.
- Make sure that there are no open containers of standing water on the site in which mosquitoes can breed.
- Wear long sleeved shirts and long pants while outdoors.
- Stay indoors at dawn, dusk, and in the early evening when mosquitoes are most active.
- Spray clothing with repellants containing permethrin or DEET.
- Apply insect repellant sparingly to exposed skin. An effective repellant will contain 35% DEET. Higher concentrations of DEET provide no additional protection. Always read the manufacturer's directions on the repellant prior to applying it to the skin.
- Vitamin B and "ultrasonic" devices are NOT considered to be an effective deterrent to mosquito bites.

15.6.7.4 Treatment

If symptoms have developed that are consistent with West Nile virus, a blood sample will be taken and sent for analysis. There is currently no specific therapy. In more severe cases, intensive supportive therapy is indicated, normally involving hospitalization, intravenous fluids, airway management, respiratory support (ventilator), prevention of secondary infections (pneumonia, urinary tract, etc.) and nursing care.

15.7 MEC

MEC is present and will be located during site activities. UXO qualified personnel will follow the requirements of the EOTI Safety Program, and the Basic Safety Concepts and Considerations for Ordnance and Explosives Operations, which outline the safety and health precautions to be taken if MEC are encountered and/or destroyed. All non-UXO qualified personnel will follow the safe work practices listed below:

- Non-UXO qualified personnel will receive site-specific MEC recognition training prior to participation in site activities.
- Non-UXO qualified personnel will be escorted on site by UXO qualified personnel, until such time as the area is cleared.
- Once an area has been cleared and flagged, non-UXO qualified personnel may perform duties in the area unescorted, but shall not leave the cleared area unescorted.
- Non-UXO qualified personnel will not touch or disturb any object which could potentially be UXO/OE related, and will immediately notify the nearest UXO qualified person of the presence of the object.
- In order to protect the general public, an exclusion zone will be set up at a distance of 500 feet all around the project footprint area. This is a separation distance established to protect the general public from potential hazards of site operations. This distance is not based on live MEC being encountered. If live MEC is found and brought to the designated site for disposal, the EZ will be changed to the fragmentation distance of the largest item of live MEC located. EOTI will have control of the entrance to the project area. Coordination will be made with ARES, Inc. and local authorities to close off the access roads to the work areas at a distance of at least 500 feet from the project site and potentially up to the fragmentation distance of the largest live MEC item found. Should personnel not associated with the project operations need to enter the exclusion zone in order to gain access to the area, they will be made aware of the hazards and will be continuously escorted by a UXO qualified person. All MEC operations will halt for the duration of time the person is within the exclusion zone. Once they have departed the area, MEC operations may resume.
- Underwater blow in place UXO disposal operations will be performed by the nearest EOD Unit.
- MEC that can be brought to the surface will be taken to a bunker area provided by ARES, Inc., and EOTI personnel will perform disposal operations later at a site to be designated.

If live MEC is found that is acceptable to move, it will be brought to the surface and placed in a sand-filled container for transport to the disposal area. The container will be brought to shore and transported .in a designated and properly placarded transport vehicle.to the designated ARES storage facility pending disposal.

Demolition explosives will be required to be brought onto the site in order to perform disposal operations. Current plans are to contact the explosive supplier and have him deliver the required demolition explosives for a final disposal operation. This increases the safety on the site, as explosive materials would not be required to be stored overnight at the site. As long as operations can move along efficiently in this manner, that is the plan for the disposal operations.

If the amount of MEC requiring disposal is too great or too unpredictable, the second plan would be to rent a BATF-approved storage magazine to be placed on the site. Explosives would be stored there and used as needed by site activities. The magazine would be properly grounded and placarded. Coordination would be made with the local police and Fire Department, so that they would know its location. The magazine would be secured and it would have a fence surrounding it that was also secured. One person and an alternate would be authorized to receive explosives from the supplier and that person would be responsible for continually updating the inventory cards. Explosive materials brought onto the site will be carefully tracked, with frequent inventories conducted. Any missing explosive material would be immediately reported to the BATF.

16.0 LOGS, REPORTS AND RECORD KEEPING

16.1 Training Logs

Each person on the site will have an individual file folder, which contains a copy of the following:

- 40 hr HAZWOPER Certificate.
- Current 8 hr HAZWOPER Annual Refresher Certificate.
- 8 hr HAZWOPER Supervisor Certificate, if applicable.
- EOD Training Certificate
- Any other applicable training certificates.

Personnel folders will be maintained by the UXOSO/QC on-site. Training/Tailgate Safety Record will be completed for all on-site training. The UXOSO/QC will maintain the file, which will be made available for the client as requested. This form may be completed in ink, but it is preferred that it be completed with a computer in Word.

16.2 Daily Safety Inspection Logs

The UXOSO/QC will perform daily inspections on a scheduled and non-scheduled basis, of all site operations. The UXOSO/QC will conduct non-scheduled safety and health inspections as deemed appropriate based upon the ongoing site activities. Scheduled safety and health inspections will be conducted as outlined below. All inspections will be documented. When discrepancies are observed, follow-up will be documented in the UXOSO/QC log until the corrective actions required have been completed.

AREA	FREQUENCY
Sanitation	Daily
Medical and First Aid	Daily
Temporary Facilities	Weekly
Personal Protective and Safety Equipment	Daily

Hazardous Substances, Agents, and Environments	Weekly
Lighting	Monthly
Accident Prevention Signs, Tags, Labels, and Signals and Piping System Identification	Monthly
Fire Prevention and Protection	Weekly
Hand and Power Tools	Daily, if applicable
Material Handling, Storage and Disposal	Weekly
Machinery and Mechanized Equipment	Daily, if applicable
Motor Vehicles	Daily
Safe Access and Fall Protection	Weekly, if applicable
HTRW	Daily, if applicable

16.3 Visitor Log

The Visitor's Log will be maintained by the UXOSO/QC. The log will document the visitor's name, company name, date, time, and reason for visit. There will also be documentation that the visitor was given a visitor safety briefing prior to being permitted to enter the EZ of the site. Visitors will be escorted at all times within the EZ and MEC operations will cease during the time they are within the EZ.

16.4 Medical Surveillance Records and Certifications

A copy of the Physician Statement from a licensed physician who is certified in Occupational Medicine by the American Board of Preventive Medicine, regarding the current annual HAZWOPER physical examination will be maintained in the personnel folder with the other HAZWOPER certificates.

16.5 Site Monitoring Results

All site-monitoring results will be documented. This will be kept in a file at the project site for reference, and will become a part of the permanent site record at the conclusion of site activities. At this site, heat exposure monitoring is anticipated to occur, and that is dependent upon the site temperature. Decompression monitoring of the divers will also be taking place.

16.6 Accident Reporting Records

Should an accident occur on the site, all reports and records will be documented. Copies will be maintained on site for the duration of site activities. A permanent copy will be maintained in the Oak Ridge EOTI Office.

17.0 PRE-ENTRY BRIEFINGS

As detailed in the training section of this SSHP, the UXOSO/QC will conduct daily tailgate safety briefings prior to the start of operations. These briefings will cover the operations expected to be performed that day including particular safety and health concerns, explosive safety issues, personal protective equipment issues, expected weather conditions, etc. These briefings are documented daily in the Documentation of Training forms. Additional briefings may be required based on unanticipated hazards at the site.

Visitor briefings will be given for all visitors to the site who plan to enter the exclusion zone. These briefings will include MEC recognition and hazards, emergency procedures, site safety and health requirements, etc. These briefings will be documented.

18.0 INSPECTION PROGRAM

As detailed in this SSHP, the UXOSO/QC will be conducting daily safety and health inspections on this site covering all issues of this SSHP. All inspections will be documented and any findings or discrepancies will be reported and tracked to completion. In situations involving imminent danger to personnel, operations would be immediately stopped, supervisors contacted, and the problem will be resolved prior to starting operations back up again.

19.0 COMMUNITY AIR MONITORING PLAN

As work involving the removal of MEC from the water does not involve the release of hazardous chemicals into the atmosphere, chemical monitoring will not be required for EOTI's work on this project.

However, this work does present explosive hazards that could potentially impact the general public in the vicinity of this project. If live MEC is recovered and brought to shore for disposal, the fragmentation distances can be extensive. An exclusion zone of 500 feet around the footprint of the project is being established as a separation distance, however if live MEC is recovered and disposal required, the exclusion zone will be expanded to the fragmentation distance of the largest live round recovered. Unauthorized personnel will not be permitted within this area during operations. If a visitor has a reason to enter the area during operations, all operations within the exclusion zone will cease for the duration of the visit. All visitors will receive pre-entry briefings regarding MEC recognition and hazards, as well as safety and emergency procedures of the site, and visitors will be escorted by a UXO-qualified EOTI employee for the duration of their visit.

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EOTI
EXPLOSIVE ORDNANCE TECHNOLOGIES, INC.

ORDNANCE AND EXPLOSIVE REMEDIATION
105 W. Tennessee Ave. • Oak Ridge, TN 37830
Tel: (865) 220-8668 • Fax: (865) 8857

October 27, 2006

AETC
Attention: Jim McDonald, PhD
120 Quade Dr.
Cary, NC 27513

SUBJECT: FINAL REPORT AND INVOICE - UXO SUPPORT FOR VALIDATION OF THE MARINE TOWED ARRAY DEMONSTRATION AT FORMER ERIE ARMY DEPOT AND TOUSSAINT RIVER

Dear Dr. McDonald.

Please find enclosed the final report for the UXO support of the For Validation of The Marine Towed Array Demonstration at Former Erie Army Depot and Toussaint River. The report describes the activities that EOTI conducted while on site and includes all related data. The dig sheets and photographs of anomalies are included electronically as Appendix C of the final report. One hard copy and one electronic copy of the report are included.

Also enclosed is the invoice for the work associated with the Erie Army Depot and Toussaint River field activities.

Please feel free to contact me at 865-220-8668 with any questions or comments concerning this Final Report.

Sincerely,

Explosive Ordnance Technologies, Inc.

Wayne Lewallen,
VP/UXO Program Manager

Enclosures:

1. Site Specific Final Report

EXPLOSIVE ORDNANCE TECHNOLOGIES, INC. (EOTI)
SITE SPECIFIC FINAL REPORT

SUPPORT OF VALIDATION OF THE MARINE TOWED ARRAY DEMONSTRATION AT FORMER ERIE ARMY DEPOT AND TOUSSAINT RIVER

Port Clinton, Ohio

Submitted To:

AETC Incorporated
120 Quade Drive
Cary, NC 27513

Submitted By:

Explosive Ordnance Technologies, Inc. (EOTI)
105 W. Tennessee Ave.
Oak Ridge, TN 37830

27 October 2006

TABLE OF CONTENTS

LIST OF ACRONYMS

AFB - Air Force Base
ASCII - American Standard Code for Information Interchange
CERCLA - Comprehensive Environmental Response, Compensation and Liability Act
CES - Civil Engineering Squadron
CFR - Code of Federal Regulations
CWM - Chemical Warfare Material
DERP – Defense Environmental Restoration Program
DGPS - Differential Global Positioning System
DID - Data Item Description
DD - Department of Defense
DGM - Digital Geophysical Mapping
DGPS - Differential Global Positioning System
DoD - Department of Defense
DQO - Data Quality Objective
EM - Electromagnetic
EM - Engineer Manual
EOD - Explosive Ordnance Disposal
EP - Engineer Pamphlet
ER - Engineer Regulation
ESRI - Environmental Systems Research Institute
EZ - Exclusion Zone
EOTI - Explosive Ordnance Technologies, Inc.
FGDC - Federal Geographic Data Committee
Frag - Fragmentation
FTP - File Transfer Protocol
FUDS – Formerly Used Defense Site
GCS - Geographic Coordinate System
GIS - Geographic Information System
GPO - Geophysical Prove Out
GPS - Global Positioning System
HH - Hand Held
MEC - Munitions and Explosives of Concern
MPM - Most Probably Munition
MPPEH - Material Potentially Presenting Explosive Hazard
MR - Munitions Response
MSD - Minimum (safe) Separation Distance
MSDS - Materiel Safety Data Sheet
MV - Milli-volts
NA - Not Applicable
NAD - North American Datum
NCP National Contingency Plan
NTP - Notice to Proceed
NS - Not Seeded
OEW - Ordnance and Explosives Waste

OSHA - Occupational Safety and Health Administration
PBR – Precision Bombing Range
PC - Personal Computer
PDF - Portable Document File
POC - Point of Contact
PPE - Personal Protective Equipment
QC - Quality Control
RFP - Request for Proposal
RR - Range Residue
SDSFIE - Spatial Data Standards for Facilities, Infrastructure, and Environment
SOW - Statement of Work
SSHP - Site-specific Safety and Health Plan
SUXOS - Senior UXO Supervisor
USAF - United States Air Force
USACE - United States Army Corps of Engineers
UTM - Universal Transverse Mercator
UXO - Unexploded Ordnance
UXOQCS - UXO Quality Control Specialist
UXOSO - UXO Safety Officer
WAA – Wide Area Assessment
WP - Work Plan

1.0 Introduction

The former Erie Army Depot, Ottawa County, OH, is located along the western shore of Lake Erie (Figure 1.1). This site and the associated impact areas are classified by the United States Government as a Formerly Used Defense Site (FUDS) under the Defense Environmental Restoration Program (DERP). This property was formerly used for artillery testing, resulting in impact areas on land and in Lake Erie. Ordnance and explosive waste (OEW) and potentially live or unexploded ordnance (UXO) have been found on the lake bottom, in the Federal navigation channel at the Toussaint River, in the marshland adjacent to the firing ranges, and along beaches fronting the former Depot. The impact areas were located in, near, or offshore of the FUDS beaches adjacent to Lake Erie. Ordnance found on or near the FUDS shore of Lake Erie appears to be mobile and may have originated from offshore or nearshore impact areas.

EOTI received a contract from AETC, Inc. to provide MEC support related to the Demonstration Validation efforts at the former Erie Army Depot and Toussaint River located near the Port Clinton area, Ohio. A Copy of EOTI's contract with AETC to conduct this work is included in Appendix A. Based on the SOW, EOTI conducted a subsurface clearance to identify and record required data for each anomaly identified in the demonstration. EOTI performed all support activities as described in a previously submitted work plan and consistent with the guidance and requirements ER 1110-1-8153 and other applicable requirements of AETC, Inc.

Prior to this phase of the project, Digital Geophysical Mapping (DGM) was conducted using a marine-based towed magnetometer array and an airborne magnetometer array. The purpose of this phase of the project was to validate their effectiveness as marine geophysical tools. Based on the data collected, a number of targets were identified with predicted location, size, and depth. The objective of this project was to collect specific, accurate data related to the actual location, depth and size of the target so that the effectiveness of the various technologies can be evaluated.

2.0 Discussion

Based on the results of the previous geophysical investigation and data analysis approximately 217 anomalies were initially identified for investigation (See Map B-1, Appendix B). An additional 20 anomalies were identified in the West Sister Island area. and added to the dig list (see Map B-2, Appendix B). Another 18 anomalies were identified from the helicopter-mounted array and added to the dig list (See Map B-3, Appendix B). Predicted data for each anomaly, including location, size and depth are included in Table B-1 in Appendix B. A total of 255 anomalies were identified for investigation.

The fieldwork was performed in three phases. Initially, small advance party of UXO Technicians mobilized to the site and arranged logistical support. This party also refined operational procedures and began investigation of the anomalies. Additional UXO Technicians were then mobilized to conduct the investigation and documentation of anomalies. Following the investigation and documentation phase, a partial demobilization of personnel was conducted and a closeout party remained to conduct disposal operations and other closeout tasks. During

this phase, following the explosive demilitarization of recovered MPPEH, the scrap was collected, inspected, certified free of explosive hazard, and transferred to a recycling facility.

EOTI initially mobilized personnel and equipment on 25 September 2006. A subsequent mobilization of additional personnel and equipment occurred on 1 October 2006. Final site work was complete on 20 October 2006.

EOTI navigated to the location of each of the identified anomalies using a Trimble Geo XT hand-held GPS capable of sub-meter accuracy. Daily Quality Control checks of the device revealed that it achieved sub-foot accuracy when tested against known benchmark locations. EOTI then pinpointed the predicted location of each anomaly using the GPS unit, reacquired the anomaly with a magnetometer capable of underwater detection (Schonstedt MG-230 Gradiometer), and placed a buoy marked with a discreet number for that anomaly. A UXO Diver then verified the anomaly with a Fisher Model 1280-X hand-held underwater metal detector.

A diver with his hands or with hand tools, depending on the depth of the anomaly, investigated each anomaly. Each anomaly was carefully uncovered, if possible, so that it could be examined to determine the item and its condition. In some cases, the bottom composition precluded access and identification of the anomaly. In some other cases, the bottom composition allowed enough access to identify the anomaly, but recovery of the item was not feasible. Whenever possible, the anomaly was raised to the surface and marked with tape bearing the anomaly number. Each anomaly item found was documented on a dig list spreadsheet. These sheets are included on the DVD enclosed as Appendix C. Information recorded includes predicted x and y coordinates [UTM (meter), NAD83/NAVD88, Geoid03 system], depth of water, depth in the bottom, description of the item and its condition, orientation, etc to the accuracy required to effectively assess the Marine Towed Array technology. Additionally, recovered item were photographed. Photographs are included electronically in Appendix C. The file names for the photographs relate to the anomaly that they represent (for example, File TRU-358.jpg, is a photograph of the item identified as Anomaly TRU-358.

An EOTI Diver returns to the surface with a 90mm projectile.

Throughout the project, as anomalies were investigated, results were displayed in the dig sheets that were placed on a project specific secured website. The project website will be maintained until the final results of the validation are presented or until no longer required for the project.

All recovered items were carefully inspected to ensure that they did not present an explosive hazard. Several of the recovered items required demolition operations to ensure that they were free of explosive hazards prior to disposal. Demolition operations were conducted on 85 items at a facility designated by ARES, Inc. on 18 October 2006. Explosive shaped-charge perforators for venting were obtained from Halliburton Corporation in Alvarado, TX. Cast boosters,

Detonating Cord, non-electric detonators, and associated materials needed for the demolition operations were obtained from Hilltop Energy, Inc., Mineral City, OH. Certified MEC scrap and other scrap recovered during the operation were collected and transported directly for disposal after completion of the fieldwork. This scrap was disposed of through a local recycling facility, Burns Iron and Metal Company, Inc., Fremont, Ohio and will not be released to the public until it has been processed through a smelter or shredded. A total of 3320 pounds of scrap was turned in. The turn-in of scrap is documented on a DD Form 1348-1A, Issue Release / Receipt Document (see Appendix D). The SUXOS completed the DD Form 1348-1A in accordance with DoD 4160.21-M. Both the SUXOS and the Project Manager inspected the scrap and signed the form.

Removal of unfused 155mm projectile.

A total of 33 MEC items were located and identified but were not recovered, either because they were fuzed or because they were not sufficiently accessible. These items were reported to LT Patrick Gerhardstein at EODMU Two Det Crane in Crane, IN for disposal as permitted by the Unit's mission load. These items are shown in the table below. This table was furnished to LT Gerhardstein along with contact information for LTC Clemens at Camp Perry. EODMU TWO Det Crane is a detachment of the U. S. Navy EOD Mobile Unit Two.

MEC Items Not Recovered

ID	UTM_X	UTM_Y	OE_Type	Attitude	Photo #	Narrative
TRU-55	326030.440	4623667.580	155mm	Straight Down		155mm fuzing not determined/ too deep in mud
TRU-66	325019.610	4622233.600	250 lb Bomb	Horizontal		250 lb general purpose bomb/ deep in mud
TRU-69	327096.150	4622346.010	155mm	Straight Down		155mm fuzing not determined/ too deep in mud
TRH-101	329434.6533	4604793.8046	155mm	180		155mm below 2ft (not recovered)
TRH-104	329518.4742	4604589.2594	2.75 Rocket	60 Degree Angle Down		Hard mud (Not Recovered - Assume Fuzed)
TRH-105	329574.4137	4604481.3543	2.75 Rocket	Horizontal		Mud (Not Recovered Assume Fuzed)

TRH-106	329345.5646	4604761.7710	155mm Fuzed	Horizontal		Not Recovered-Fuzed
TRH-110	329360.1026	4604665.3388	155mm	Straight Down		Unable to Recover
TRH-111	329426.1369	4604551.1723	155mm Fuzed	Horizontal		Not recovered-Fuzed
TRU-225	331690.780	4613767.080	155mm	Straight Down		155mm/ stuck in rocks/ unknown fuzing
TRU-227	332308.400	4613761.810	155mm	Under Rock		155mm/ stuck in rocks/ unknown fuzing
TRU-262	329347.690	4606837.200	155mm Fuzed			155mm fuzed
TRU-268	329587.700	4606831.980	155mm Fuzed	Horizontal		155 fuzed
TRU-272	329723.750	4606831.900	4.2 inch Mortar Fuzed	Horizontal		4.2 mortar fuzed
TRU-281	330529.890	4606837.000	4.2 inch Mortar Fuzed	Horizontal		4.2 mortar fuzed
TRU-282	330538.730	4606836.260	4.2 inch Mortar Fuzed	Horizontal		4.2 mortar fuzed
TRU-283	330654.190	4606837.010	90mm Fuzed	Horizontal		90mm fuzed
TRU-294	331944.940	4606836.090	155mm Fuzed	Horizontal		155mm fuzed
TRU-295	332082.330	4606838.960	155mm Fuzed	Horizontal		155mm fuzed
TRU-296	332127.620	4606837.390	155mm Fuzed	Horizontal		155mm fuzed

TRU-298	332192.400	4606831.910	4.2 inch Mortar Fuzed	Horizontal		4.2 mortar fuzed
TRU-303	332912.680	4606835.260	155mm Fuzed	Horizontal		155mm fuzed
TRU-307	327216.620	4615746.320	155mm	Nose Down		155mm fuzing not determined/ too deep in mud
TRU-308	327396.150	4615740.680	155mm	Nose Down		155mm fuzing not determined/ too deep in mud
TRU-309	328177.260	4615743.930	155mm	Nose Down		155mm fuzing not determined/ too deep in mud
TRU-311	328655.620	4615741.720	155mm	Nose Down		155mm fuzing not determined/ too deep in mud
TRU-313	328889.860	4615756.550	155mm	Nose Down		155mm fuzing not determined/ too deep in mud
TRU-315	330156.620	4615740.110	155mm	Nose Down		155mm fuzing not determined/ too deep in mud
TRU-317	330223.620	4615741.340	90mm Fuzed	Horizontal		90mm fuzing not determined/ too deep in mud
TRU-321	331097.690	4615740.340	155mm	Nose Down		155mm fuzing not determined/ too deep in mud
TRU-323	331230.120	4615746.290	155mm	Nose Down		155mm fuzing not determined/ too deep in mud
TRU-324	331283.410	4615746.890	155mm	Horizontal		155mm fuzing not determined/ too deep in mud
TRU-326	331727.850	4615744.030	155mm	Nose Down		155mm fuzing not determined/ too deep in mud

In order to more efficiently complete the project, EOTI initially mobilized a three-person team, consisting of a UXO Tech II, UXOSO/QCS and SUXOS to arrange logistical support, conduct site-specific equipment training, and begin field work. EOTI also maintained either the Project Manager or an additional QCS or both at the site during the first week. After one week of

effort, EOTI mobilized additional personnel consisting of 3 UXO Tech II's and 2 UXO Tech II's to complete the project. The Project Manager was also onsite at various times during the project.

3.0 Documentation

Each day's activities and progress were reported in the Daily Report for the site. The Daily Reports were posted on the website and are included electronically in Appendix E of this report.

The investigative results for each anomaly were documented on a Dig Sheet completed by the SUXOS or his designee. Photos were also taken to document the results of anomaly investigations. Dig Sheets and photographs are included in Appendix C.

4.0 Quality Control

Prior to beginning fieldwork, each team member was briefed by the UXOSO and SUXOS. The briefings addressed site-specific hazards and work procedures described in the Work Plan. Special emphasis was placed on the data quality requirements and requirements for accurately recording data on dig sheets.

EOTI conducted at least daily quality control checks of equipment, including GPS equipment and magnetometers. When checking the GPS units, the operator checked the positional accuracy at known control points on land. Known metal sources were used to verify the proper functioning of magnetometers.

The SUXOS conducted daily checks to ensure the quality of the work performed and the documentation of the data collected. He monitored field operations to verify compliance with the Work Plan and to ensure that the location, depth, orientation, and description of each item were properly recorded on the dig sheets. The UXOQCS reviewed each completed dig sheet for completeness and accuracy.

All scrap was carefully inspected by the UXO Technician to ensure that it was free of explosive hazards and was re-inspected by the UXOSO. The scrap also inspected and certified by the SUXOS and by the Project Manager prior to recycling. Documentation of this certification (DD Form 1348-1A) is included in Appendix D.

5.0 Financial Breakdown

EOTI performed this work on a Firm Fixed Price contract basis.

6.0 Summary

A total of 255 anomalies were identified for investigation. A total of 229 anomalies were reacquired, investigated, and documented during this project. In 6 instances, the

EOTI prepares for demolition of recovered MEC items.

investigation produced more than 1 item. One anomaly was identified twice and was investigated twice as two different anomaly numbers. All scrap recovered during the intrusive investigation was inspected using a multi-level process to insure that no explosive components were released from the site. The scrap was turned in to Burns Iron & Metal Company, Inc. for final and proper disposal. No explosive components were recovered during the site work at Lake Erie. However, 33 MEC items were identified that could not be recovered either because they were fuzed or they were not sufficiently accessible and 85 MEC items were explosively vented or demilitarized prior to final disposal. All explosives that were ordered and delivered were consumed in demolition operations.

7.0 Conclusion

The purpose of this phase of the project was to validate the effectiveness of various technologies and platforms. Based on the data collected, a number of targets were identified with predicted locations and sizes. Specific data collected during this phase of the Marine Towed Array Demonstration Project can be used to evaluate and refine the various technologies and platforms used for navigation and identification of anomalies.

APPENDIX A
CONTRACT
SITE SPECIFIC FINAL REPORT

SUPPORT OF VALIDATION OF THE MARINE TOWED ARRAY DEMONSTRATION AT FORMER ERIE ARMY DEPOT AND TOUSSAINT RIVER

AETC Incorporated

Purchase Order No. 2452-NC

PURCHASE ORDER

VENDOR

Name	EOTI
Address	185 Rumson Rd
City	Rumson **ST** NJ **ZIP** 07760
Phone	732-345-8099 Wayne Lewallen

SHIP TO

Name	AETC Incorporated
Address	120 Quade Drive
City	Cary **ST** NC **ZIP** 27513
Phone	919-653-0215 Attn: Jim McDonald

JOB CODE: 4047040/3115112
Direct Charge ? Yes

BILL TO

Name	AETC Incorporated
Address	8910 University Center Lane, #900
City	San Diego **ST** CA **ZIP** 92122-1012
Phone	(858) 450-1211

Qty	Units	Description	Unit Price	TOTAL
		Subcontract for UXO Dive Support at Lake Erie, Toussaint River/ Port Clinton, OH. Performance in accordance with AETC Cost Proposal Dated July 24, 2006		
1	ea	Mobilization/Demobilization	$10,049.73	$10,049.73
1	ea	UXO Support (Labor, ODC's & Travel)	$39,490.00	$39,490.00
1	ea	Demobilization /Remobilization	$2,442.90	$2,442.90
		Period of Performance: 14 August - 30 September 2006		
		Providing onsite labor at Port Clinton, OH (Lake Erie for MTA demonstration)		
		EOTI may invoice weekly for services completed		
			SubTotal	$51,982.63
			TOTAL	$51,982.63

Payment Details

- (●) Check
- ( ) Cash
- ( ) Account No.
- ( ) Credit Card

Name _____
CC # _____
Exp Date _____

Shipping Date

Approval

Steve Sands

PO Issue Date 8/3/2006
Sales Rep Wayne Lewallen
Acceptance Signature _____
Date 08-04-06

Notes/Remarks

See Attached:
Attachment 1: Purchase Order Terms and Conditions,
Attachment 2: Representations and Warranites,
Attachment 3: EOTI Certificate of Insurance

Vendor Copy

AETC Incorporated

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Attachment 3: EOTI Certificate of Insurance

AETC Copy

PURCHASE ORDER TERMS AND CONDITIONS ATTACHMENT

1. DEFINITIONS. As used herein, including Paragraph 28, "Buyer" means AETC Incorporated: "Seller" means the party identified on the face of this order, "Subcontract" work or services to be furnished by Seller under this order. Unless indicated otherwise in a specific paragraph or clause, "FAR" means Federal Acquisition Regulation, "DFARS" means Department of Defense Federal Acquisition Regulation Supplement, "NFS" or "NASA FAR SUPP" means the NASA FAR Supplement in effect on the date of this order. "Buyer's Authorized Procurement Representative" means the person or persons authorized by Buyer to alter, modify, or change the provisions of this order.

2. UPON ACCEPTANCE. This order becomes the exclusive agreement between the parties subject to the terms and conditions herein. Any of the following shall constitute Seller's unqualified acceptance of this order: (a) acknowledgment of this order, (b) furnishing of any supplies under this order, (c) acceptance of any payment under this order, or (d) commencement of performance under this order. Additional or different terms or conditions proposed by Seller, or included in Seller's acknowledgment hereof, shall be void and of no effect unless accepted in writing by Buyer. No change in, modification of, or revision to, this order shall be valid unless in writing and signed by Buyer's Authorized Procurement Representative.

3. PACKING AND SHIPMENT.
(a) Unless otherwise specified, all packing and packaging shall comply with good commercial practice and applicable carrier's tariffs. Supplies shall be prepared for shipment and packed to prevent damage or deterioration and to give optimum protection of the supplies during shipment and in plant handling and storage. The packaging, preparation, labeling and shipping of all HAZARDOUS SUBSTANCES, including DANGEROUS MATERIALS, RADIOACTIVE MATERIALS, and EXPLOSIVES must conform with all applicable international, federal, and state laws and regulations. For EXPLOSIVES, each part must be identified with the "Part Number" and Loading Date" at a minimum. Shorting devices must be supplied on appropriate items. The price includes all charges for packing and packaging and for transportation to the F.O.B point.

(b) If the items of this order require delivery F.O.B. place of shipment, the Seller must at that place bear the expense and risk of putting them into the possession of the carrier and at its risk and expense load the supplies on board.

(c) If the terms of this order are based on F.O.B. place of destination, the Seller must at his own expense and risk transport the supplies to that place and tender delivery of them to the Buyer.

(d) Failure to comply with Buyer's requirements or other shipping instructions will result in a debit to Seller for the excess costs and may result in the imposition of an administrative charge not to exceed $25.00.

4. QUALITY CONTROL AND INSPECTION.
(a) Quality System: Seller shall provide and maintain a Quality Control system acceptable to Buyer. During performance of this order, Seller's Quality Control, Inspection System, and Manufacturing Processes are subject to review, verification, and analysis by Buyer and, if this order is issued pursuant to a U.S. Government prime contract, Government representatives.

(b) Government Source Inspection: (Applicable only if this order is issued pursuant to a U.S. Government prime contract.) If Government source inspection or acceptance prior to shipment is required, immediately, upon receipt of this order, notify the Government representative who normally services Seller's plant to effect such inspection or acceptance. In the event a Government representative is unavailable, Seller shall immediately notify Buyer.

(c) Inspection Verification: Notwithstanding any prior payment or inspection and preliminary acceptance, all supplies ordered may be subject to (i) inspection, verification and/or testing during the period of manufacture, (ii) inspection and/or verification prior to shipment, and (iii) final inspection and acceptance at destination. Such inspection and verification rights shall extend to the Government if this order is issued pursuant to a U.S. Government prime contract. If any inspection or test is made on the premises of Seller or its lower-tier suppliers, Seller shall, without additional cost, provide and require its lower-tier suppliers to provide all reasonable facilities and assistance for the safety and convenience of Buyer and Government inspectors in the performance of their duties.

(d) Rejected Supplies: Buyer may reject and hold at Seller's expense, subject to Seller's reasonable disposal instructions, supplies which do not conform to applicable specifications, drawings, samples, or descriptions or which are defective in material, workmanship, or design unless of Buyer's detailed design. If within fifteen (15) days after Buyer has notified Seller of the rejected Supplies, Seller has not provided Buyer with reasonable disposition instructions including agreement to pay expenses incurred by Buyer, Buyer may at its option continue to hold the rejected supplies at Seller's expenses, or return them to seller's facility at Seller's expense. Without limiting any other rights Buyers may have, Buyer at its option may require Seller (i) to repair or replace at Seller's expense any supplies or items thereof which fail to meet the requirements of applicable design, specifications, drawings, samples, descriptions or other requirements of this order, or (ii) to refund the price of any such item. Previously rejected supplies reworked to specifications, or replaced, shall not be retendered to Buyer by Seller unless notification of such past rejection is submitted with the retender and Buyer has consented to such retender.

(e) Inspections and tests by Buyer or Government do not relieve Seller of responsibility for defects or other failures to meet contract requirements discovered before acceptance. Acceptance shall be conclusive, except for latent defects, fraud, gross mistakes amounting to fraud, or as otherwise provided in these terms and conditions.

5. DELIVERY, ADVANCE MANUFACTURING, AND PROCUREMENT. Delivery according to schedule is a major condition of this order. Seller shall not, without Buyer's prior written consent, manufacture or procure materials in advance of Seller's normal flow time or deliver in advance of schedule. In the event of termination or change, no claim will be allowed for any such manufacture or procurement in advance of such normal flow time unless Buyer's prior written consent has been obtained. Buyer may return or store at Seller's expense any items delivered in advance of delivery dates as specified for such items. If at any time it appears to Seller that any delivery schedule cannot be met, Seller shall notify Buyer as soon as possible as to the cause or causes therefor, action being taken to remove such cause or causes, when on-schedule status will be achieved, and at Seller's expense, shall take reasonable action necessary, with or without request of Buyer, to meet such schedules as set forth herein or to recover to the maximum extent possible any delay in meeting such schedules. Such reasonable action by the Seller shall include but shall not be limited to shipment via expedited routing and carrier. Notification under this clause shall in no way limit Buyer's rights under the TERMINATIONS-STOP WORK clause.

6. WARRANTY. Seller warrants that all supplies furnished hereunder will be free from defects in material and workmanship, conform to applicable specifications, drawings, samples and descriptions and/or other requirements of this order and unless of Buyer's detailed design, be free from design defects. If there is a breach of warranty, Buyer may return such supplies, at Seller's expense, for correction, replacement or credit as Buyer may elect. Supplies required to be corrected or replaced shall be subject to the provisions of this clause and the clause herein entitled "Quality Control and Inspection." All warranties shall run to Buyer and its customers.

7. CHANGES.
(a) Buyer may at any time by written notice, and without notice to sureties or assignees, make changes within the general scope of this order in any one or more of the following: (i) drawings, designs, or specifications; (ii) method of shipping or packing; (iii) place of inspection, acceptance, or point of delivery; and (iv) delivery schedule. Should any such change increase or decrease the cost of, or the time required for, performance of this order, an equitable adjustment may be requested by Seller or Buyer in the price, or delivery schedule, or both. No request by Seller for adjustment will be valid unless submitted to Buyer in a form acceptable to Buyer within twenty-five (25) days from the date of notice of such change, and accompanied by an estimate of charges for redundant material or work in process, if any.

(b) Should any change cause, or result in, redundant material or work in process, any claim covering such redundant material or work in process must be submitted within six (6) months from the date of receipt of written notification of the change and be on the forms and in the detail prescribed by Subpart 49.6 and 53.3 for FAR. Any adjustment due Seller, including adjustments on an order not placed under a U.S. Government prime contract, will be determined in accordance with the provisions of Parts 31 and 49 of FAR relating to terminations for convenience as in effect on the date of this order. Where the cost of property made redundant as a result of a change is included in Seller's claim for adjustment, Buyer shall have the right to prescribe the manner of disposition of such property.

(c) SELLER AGREES THAT ITS FAILURE TO SUBMIT SUCH CLAIM OR CLAIMS WITHIN THE APPLICABLE TIME PERIOD SHALL CONSTITUTE A WAIVER THEREOF UNLESS, FOR GOOD CAUSE, SELLER REQUESTS IN WRITING, PRIOR TO EXPIRATION OF THE APPLICABLE TIME PERIOD, THAT A TIME EXTENSION FOR FILING ITS CLAIM OR CLAIMS BE GRANTED BY BUYER AND BUYER GRANTS SUCH EXTENSION. ANY SUCH EXTENSIONS, IF APPROVED, SHALL BE EFFECTIVE ONLY IF AUTHORIZED IN WRITING BY BUYER'S AUTHORIZED PROCUREMENT REPRESENTATIVE. PRIOR TO FINAL SETTLEMENT OF ANY TIMELY FILED CLAIM OR CLAIMS, SELLER MAY SUBMIT REVISIONS TO SUCH CLAIM OR CLAIMS PROVIDED THAT SUCH REVISIONS TO SUCH CLAIM OR CLAIMS PROVIDED THAT SUCH REVISIONS DO NOT INTRODUCE DIFFERENT AREAS OF COST OR CLAIM ELEMENTS.

PURCHASE ORDER TERMS AND CONDITIONS ATTACHMENT

(d) Any clarification, direction, approval, or assistance as may be provided by Buyer's Program, engineering, or technical personnel concerning the work to be performed or the supplies to be furnished pursuant to t his order shall not constitute or be construed as a change tot his order and no change order, express or implied, will be binding unless it is issued by written notice by Buyer's authorized Procurement representative in accordance with paragraph (a) of this clause.

(e) Nothing contained in this clause shall relieve Seller from proceeding without delay in the performance of this order as changed.

8. RESPONSIBILITY FOR PROPERTY. Unless otherwise specified, Seller shall be liable for any loss or destruction or damage to property of the Buyer or Government property furnished to Seller by the Government or Buyer and shall be responsible for returning any such property in as good condition as when received except for reasonable wear and tear and for the utilization of it in accordance with the provisions of this order. Seller shall not include in this price any direct charges for insurance covering loss or destruction of, or damage to, property of the Government or Buyer. Title thereto shall not be affected, by the incorporation or attachment thereof to any property not owned by Buyer or the Government, nor shall any such property, or any part thereof, be or become a fixture or lose its identity as personalty by reason of affixation to any realty. Seller shall comply with the provisions of FAR Subpart 45.5 and DFARS 245.5 or NFS 1845.5. Buyer and the Government shall have the right to enter Seller's premises at all reasonable times to inspect its property and Seller's records with respect thereto.

9. USE OF BUYER'S DATA. Seller shall not reproduce, use, or disclose any data, designs, or other information belonging to or supplied by or on behalf of Buyer, except as necessary in the performance of orders for Buyer (or, if this order is issued pursuant to a U.S. Government prime contract, for the U.S. Government.) Upon Buyer's request, such data, designs, or other information, and any copies thereof, shall be returned to Buyer. Buyer shall be considered the "person for whom the work was prepared" for the purpose of authorship in any copyrightable work created by Seller under this order. Notwithstanding any other provision of this order, to the extent the Government has received from Buyer the right to authorize such use by Seller, Seller may utilize Buyer's data and information in the manufacture of supplies for direct sale to the Government: provided, however, that Seller shall (a) give Buyer prior written notice of each such proposed use, (b) prominently identify, to the extent possible, each article being manufactured by Seller in the performance of orders for the government, and (c) make no claim against Buyer which arises out of use by Seller of such data and information. Where Buyer's data, designs, or other information are furnished to Seller's suppliers for procurement of supplies by Seller for use in the performance of Buyer's orders, Seller shall insert tbe substance of this provision in its orders. "Government" as used in this clause means the United States Government.

10. ASSIGNMENT.

(a) Neither this order nor any duty or right under it shall be delegated or assigned by Seller without the prior written notice to and consent of Buyer, except that claims for monies due or to become due under this order may be assigned to a bank, trust company, or other financing institution, including any federal lending agency, by Seller without such consent. Buyer shall be furnished with two signed copies of any such assignment. Payment to an assignee of any such claim shall be subject to set-off or recoupment for any present or future claim or claims which Buyer may have against Seller. Buyer reserves the right to make settlements and/or adjustments in price, with Seller under the terms of this order, notwithstanding any assignment of claims for monies due or to become due hereunder and witbout notice to the assignee.

(b) In the event of any such assignment of monies, the assignee shall forward to Buyer two copies of a written notice of assignment and two copies of the instrument of assignment, all copies signed by the assignor and assignee.

(c) Any claim under this order which has been assigned pursuant to the foregoing probision of this clause may be further assigned only with the prior written consent of Buyer to a bank, trust companu or other financing institution, including any federal lending agency. In the event of such further assignment or rassignment the assignee shall be required to file one signed copy of a written notice of the further assignment or reassignment, together with a true copy of the instruement of further or reassignment with Seller, and shall file two (2) signed copies of such written notice, together with tow (2) copies of such instrument, with Buyer.

(d) No assignee shall divulge any information concerning this order except to those persons concerned with the transaction. In no event shall copies of this order or of any plans, specifications, or other similar documents relating to work under this order, if marked "Top Secret", "Secret," or "Confidential," be furnished to any assignee of any claim arising under this order or to any other person not entitled to receive the same; provided, that a copy of any part or all of this order so marked may be furnished, or any information contained herein may be disclosed, to such assignee upon prior written authorization of AETC Incorporated.*

(e) Indication of the assignment of claim and of any further assignment thereof and the name of the assignee shall be made on all vouchers or invoices certified by Seller.

11. TERMINATIONS - STOP WORK.

(a) This order may be terminated by Buyer:

(i) For convenience in accordance with the clause set forth at FAR 52-249-2 which is hereby incorporated herein by reference.

(ii) For default in accordance with the clause set forth at FAR 52.249-8 which is hereby incorporated herein by reference.

(b) For the purpose of stopping work under this order, the clause set forth at FAR 52-212-13 is incorporated herein by reference.

(c) For the purpose of the Clause 11, in FAR clauses incorporated by reference, the terms "Government" and "Contracting Officer" shall mean Buyer; the term "Contractor" shall mean Seller, and further, the provisions of said clauses incorporated herein by reference which provide that a failure to agree shall be a dispute within the meaning of the Government contract clause entitled "Disputes" shall have no force or effect.

(d) Seller shall not include in any claim submitted bereunder any cost of design engineering or development or any cost for special tooling or special test equipment, unless specifically ordered by Buyer as a separate item of work separately priced, notwithstanding any provision of Parts 31 or 49 of FAR to the contrary.

(e) SELLER AGREES THAT ITS FAILURE TO SUBMIT SUCH CLAIM OR CLAIMS WITHIN THE APPLICABLE TIME PERIOD SHALL CONSTITUTE A WAIVER THEREOF UNLESS SELLER, IN WRITING AND PRIOR TO EXPIRATION OF THE APPLICABLE TIME PERIOD, REQUESTS AN EXTENSION OF TIME FOR FILING ITS CLAIM OR CLAIMS AND SUCH AN EXTENSION IS GRANTED BY BUYER. ANY SUCH EXTENSION(S), IF GRANTED, SHALL BE EFFECTIVE ONLY IF AUTHORIZED IN WRITING BY BUYER'S AUTHORIZED PROCUREMENT REPRESENTATIVE. PRIOR TO FINAL SETTLEMENT OF ANY TIMELY FILED CLAIM OR CLAIMS, SELLER MAY SUBMIT REVISIONS TO SUCH CLAIM OR CLAIMS PROVIDED THAT SUCH REVISIONS DO NOT INTRODUCE DIFFERENT AREAS OF COSTS OR CLAIM ELEMENTS.

12. INDEMNIFICATION. In the event Seller, its officers, employees, agents, suppliers, or subcontractors at any tier enter premises occupied by or under the control of Buyer, the indemnify, and bold harmless Buyer, its officers, employees and agents from any claim, suit, loss, cost, damage, expense (including attorney's fees), or liability by reason of property damage or personal injury (including death) to any person, including Seller's employees, of whatsoever nature or kind arising out of, as a result of, or in connection with such performance occasioned in whole or in part by the actions or omissions or Seller, its officers, employees, agent, suppliers, or subcontractors at any tier. Seller shall take all precautions necessary, special or otherwise and shall be responsible for compliance with all federal, state and local safety and environmental laws in performance of work hereunder. Without in any way limiting the foregoing undertakings, Seller and its suppliers and subcontractors at any tier shall maintain public liability and property damage insurance in prudent and reasonable limits covering the obligations set forth and shall maintain, to the statutory limits required by law, proper Worker's Compensation Insurance or approved self insurance program, and employer's liability insurance covering all employees performing this order. Insurance maintained pursuant to this clause shall be considered primary as respects the interest of Buyer and is not contributory with any insurance Buyer may carry. The requirement to provide insurance under this clause shall not in any manner limit or qualify the liabilities the obligations assumed by Seller under this order.

13. PATENT INDEMNITY, TRADEMARKS, AND COPYRIGHTS. To the extent that the supplies are produced to detailed designs not originated and furnished by Buyer or by a process or method, the use of which is not specifically directed by Buyer, Buyer shall have no responsibility to Seller for infringement or misappropriation of patent, trademark, copyright, or trade secret rights of third parties and Seller guarantees that the sale or use of such supplies or the use of such process or method hereunder will not infringe or be a misappropriation of any United States or foreign patents, trademarks, copyrights, or trade secrets. Seller shall defend, indemnify, and hold Buyer and its customers harmless from any loss, cost, damage, expense (including attorney's fees), or liability which may be incurred on account of infringement or misappropriation, (actual or alleged), of patent right, trademarks, copyrights, or trade secrets with respect to such supplies, and defend, at its own expense, any action or claim in which such infringement or misappropriation is alleged by third parties, provided Seller is notified of such actions or claims against Buyer.

14. EQUAL OPPORTUNITY. Unless exempt under the provisions of FAR 22.807, the clause at FAR 52.222-26 is incorporated herein by reference. As used in this clause, "Contractor" means Seller. Unless this order is so exempted, the applicable Equal Employment Opportunity Compliance Certificate previously submitted by Seller to Buyer is by reference, also incorporated in.

PURCHASE ORDER TERMS AND CONDITIONS ATTACHMENT

15. AFFIRMATION ACTION FOR HANDICAPPED WORKERS. Unless exempt under the provisions of FAR 22.1408, the clause at FAR 52.222-36 is incorporated herein by reference, unless this order is under $2,500. As used in said clause, "Contractor" means Seller.

16. AFFIRMATIVE ACTION FOR DISABLED VETERANS AND VETERANS OF THE VIETNAM ERA. Unless exempt under the provisions of FAR 22.308, the clause at FAR 52.222-35 is incorporated herein by reference, unless this order is under $10,000. As used in said clauses, "Contractor" means Seller, and "Contract" means this order.

17. LABOR DISPUTES. Whenever any actual or potential labor dispute develops or threatens to delay the timely performance of this order, Seller shall immediately give notice thereof to Buyer. Seller shall insert the substance of this provision on its orders issued hereunder.

18. NONDISCLOSURE OF INFORMATION. Seller shall not, without prior written consent of Buyer (through Buyer's Public Relations organization), disclose any information relative to this order.

19. GRATUITIES. Buyer may, by written notice to Seller, terminate for default the right of Seller to proceed under this order if Buyer has reasonable cause to believe that gratuities (in the form of entertainment, gifts or otherwise) were offered or given by Seller, or any agent or representative of Seller, to any officer or employee of Buyer with a view toward securing this order or securing favorable treatment with respect to the award or amendment of this order or the making of any determination with respect to the performance of this order. The rights and remedies of Buyer provided in this clause shall bot be exclusive and are in addition to any other rights and remedies provided by law or under this order.

20. INTERPRETATION OF ORDER.
(a) If this order is placed pursuant to a U.S. Government prime contract, the provisions of Clauses 4, 7, 11, 14, 15, 16, and 28 of this purchase order and any other U.S. Government FAR clause expressly made a part of this order by reference or otherwise, shall be governed by and construed in accordance with the law of U.S. Government contracts as set forth by statute and applicable regulations, and decisions by the appropriate courts and Boards of Contract Appeals. To the extent that the law referred to in the foregoing sentence is not determinative of an issue arising out of those specific clauses of this order referred to above in this paragraph (a), recourse shall be to the law of the State of California.

(b) All provisions of this order not expressly governed or construed pursuant to the provisions of paragraph (a) of this clause shall be governed by and construed in their entirety in accordance with the law of the State of California.

21. COMPLIANCE WITH LOCAL, STATE, AND FEDERAL LAW. In the performance of this order, Seller agrees to comply with all applicable local, state, and federal laws and executive orders and regulations issued pursuant thereto and agrees to defend, indemnify and hold Buyer harmless against any loss, cost, damage, expense (including attorney's fees), or liability by reason of Seller's violation hereof.

22. REMEDIES. The rights and remedies of Buyer provided herein shall be cumulative and in addition to any other rights and remedies provided by law or equity.

23. WAIVER. The failure of Buyer in any one or more instances to insist on performance of any of the provisions of this order shall in no way be construed to be a waiver of such provisions in the future.

24. PAYMENT. Unless otherwise specifically provided for elsewhere in this order, payment shall be made within thirty (30) days after proper delivery of the supplies or performance of the services specified in this order or receipt and approval of a proper invoice, whichever is later.

25. INDEPENDENT CONTRACTOR. It is understood and agreed that Seller shall be an independent contractor in all its operations and activities hereunder, that the employee furnished by Seller to perform work under this order shall be Seller's employees exclusively without any relation whatever to AETC Incorporated as employees, agents or as independent contractors; that such employees shall be paid by Seller for all services in this connection; that Seller shall carry worker's compensation insurance and that Seller shall be responsible for all obligations and reports covering social security, unemployment insurance, worker's compensation, income tax, and other reports and deductions required by Local, State and/or Federal law.

26. OFFSET. If AETC Incorporated is fined or penalized as a result of any violation of any Public Law or Federal Regulation by Seller or Seller's lower-tier suppliers, or, where this order is pursuant to an AETC Incorporated prime contract, the Contracting Officer who has cognizance over AETC Incorporated's prime contract reduces AETC Incorporated's prime contract as a result of actions by Seller or Seller's lower-tier suppliers, AETC Incorporated shall reduce the amount of this purchase order by the same amount. If AETC Incorporated has already paid Seller, Seller shall, upon demand from AETC Incorporated promptly repay to AETC Incorporated the amount of the offset. Exercise of AETC Incorporated's right under this clause shall not be a waiver of any rights AETC Incorporated has under any other clause or provision in this purchase order.

27. UTILIZATION OF SMALL AND SMALL DISADVANTAGED BUSINESS CONCERNS AND WOMEN OWNED SMALL BUSINESSES. Seller hereby agrees to use its best efforts to ensure that small and small disadvantaged businesses, and women-owned small businesses, as defined in statute or regulation by the Small Business Administration, have the maximum practicable opportunity, consistent with the efficient performance of this order, to participate in lower-tier orders issued pursuant to this order.

CLAUSES APPLICABLE ONLY TO PURCHASES UNDER U.S. GOVERNMENT PRIME CONTRACTS:

28. FAR, OTHER REGULATIONS AND LAWS.
(a) This clause 28 is applicable only if the face of this order contains a prime contract number in the "Government contract number" block or otherwise indicates that this order is placed pursuant to a U.S. Government Prime Contract. As used below and unless otherwise noted or the context of a clause requires otherwise, "Contracting Officer" shall mean the Contracting Officer who has cognizance of Buyer's prime contacts; "contract" shall mean this order; "subcontracts" shall mean subcontracts and purchase orders issued under this order by Seller' "Contractor" shall mean Seller. Copies of all notices or reports required to be furnished under the clauses incorporated below shall be furnished to Buyer.

(b) If AETC Incorporated submits to the Government any contract claim, request for equitable adjustment to contract terms, request for relief under Public Law 85-804, or other similar request exceeding $100,000, and such claim or request includes or is based upon a claim or request exceeding $100,000 made by Seller to AETC Incorporated, Seller shall, at the request of AETC Incorporated, submit the following certificate executed by a senior company official in charge at Seller's plant or location involved:

"I certify that the claim is made in good faith, that the supporting data are accurate and complete to the best of my knowledge and belief, and that the amount requested accurately reflects the purchase order adjustment for which the Seller believes the Government is liable to AETC Incorporated."

(1) In conjunction with the certification above, Seller shall provide full disclosure to all relevant facts, including cost or pricing data.

(2) Seller hereby agrees to defend, indemnify and hold harmless AETC Incorporated; its directors, officers, employees, agents and servants, from and against any claim, suit, loss, cost, damage or expense (including attorney's fees) arising out of, in connection with, or as a result of any claim, determination, prosecution, suit or other action by the Government alleging that any claim or request certified by Seller under this clause is fraudulent, overstated, or in violation of any law or regulation.

(3) The rights and obligations provided herein shall survive termination, completion, and final payment of this order.

(c) Rights in Technical Data: The following clauses are incorporated by reference. Buyer shall have the right to reproduce and use for the performance of its prime contract any data delivered by Seller under this order. If this order is for commercial off-the-shelf software, any license agreement provided with the software will be governed by the applicable FAR/DFARS/NFS clause(s) listed below.

1) DOD:

252.227-7013	Rights in Technical Data and Computer Software (and Alt. I if this order is placed under a Pre-1987 prime contract)
252.227-7018	Restrictive Markings on Technical Data
252.227-7026	Deferred Delivery of Technical Data or Computer Software
252.227-7027	Deferred Ordering of Technical Data or Computer Software
252.227-7029	Identification of Technical Data (if Technical data is to be delivered under this order)
252.227-7030	Technical Data - Withholding of Payment
252.227-7036	Certification of Technical Data Conformity

2) NASA:

52.227.14	Rights in Data - General
52.227-19	Commercial Computer Software - Restricted rights
52.227-21	Technical Data Certification
1852.227-14	Rights in Data - General

PURCHASE ORDER TERMS AND CONDITIONS ATTACHMENT

1852.227-19 Commercial Computer Software - Restricted Rights
1852.227-86 Commercial Computer Software - Licensing

(D) The FAR/DFARS/NFS clauses listed on the reverse side in effect on the date of this order are incorporated herein hy reference as if fully set forth and as may be modified as indicated. Unless otherwise indicated, FAR clauses apply to all orders; DFARS clauses apply to DOD orders; NFS clauses apply to NASA orders. Dollar amounts in parentheses refer to the dollar threshold at which the clause becomes effective. Clauses which are self-deleting, as where the dollar value of the purchase order does not meet a required threshold, or where the clause is not applicable to the items being purchased, shall have no force or effect. DFARS citations in parentheses reference the same clause in the DFARS prior to the December 1991 issuance of the DFARS.

(e) CLAUSES INCORPORATED BY REFERENCE:

FAR CLAUSES

52.203-6 Restriction on Subcontractor Sales to the Government
52.230-7 Anti-Kickback Procedures (The definitions of paragraph 28a shall apply only to Subparagraphs (c) (2), (3), (4) and (5). Any report made pursuant to Subparagraph (c) (2) shall be sent simultaneously to AETC Incorporated in care of: Vice President, Administration. Subparagraph (c) (4) is revised to delete the phrase "the Contracting Officer may" in the first sentence and insert the phrase "after the Contracting Officer under the Prime Contract has effected an offset at the prime contract level, or has directed AETC Incorporated to withhold any sum from the subcontractor, AETC shall". The definitions in paragraph 28a shall not apply to this phrase.)
52.203-12 Limitations on Payments to Influence Certain Federal Transactions ($100,000)
52.204-2 Security Requirements
52.206-1 Required Source for Jewel Bearing and Related Items
52.210-5 New Material
52.210-7 Used or Reconditioned Material, Residual Inventory, and Former Government Surplus Property
52.212-8 Defense Priority and Allocation Requirements
52.215-1 Examination of Records by Controller General (10,000) [(d)(1) shall be changed to read "Appeals under the Disputes clause of the prime contract under which this purchase order was issued."]
52.215-2 Audit-Negotiation ($10,000)
52.215-26 Integrity of Unit Prices, with Alternate I ($25,000)
52.215-27 Termination of Defined Pension Benefits Plans (if certified cost or pricing data was submitted)
52.215-39 Reversion of Adjustment of Plans for Post-Retirement Benefits other than Pensions (PRB) (if certified cost or pricing data was submitted)
52.219-8 Utilization of Small Business Concerns and Small Disadvantaged Business concerns ($25,000)
52.219-9 Small Business and Small Disadvantaged Business Subcontracting Plan ($500,000) [Seller shall provide Buyer with copies of SF 294 reports submitted pursuant to (d)(10)(iii) and the address to which the SF 295 was sent.]
52.219-13 Utilization of Women-Owned Small Business ($25,000)
52.220-3 Utilization of Labor Surplus Area Concerns ($25,000)
52.220-4 Labor Surplus Area Subcontracting Program ($500,000)
52.224-4 Contract Work Hours and Safety Standards Act - Overtime Compensation - General ($2,500 and not otherwise exempt under FAR 22.305) Supplier shall indemnify AETC Incorporated against and hold AETC Incorporated harmless from any claim, suit, cost, damage, expense, (including attorney's fees, liability or withholding arising from Seller's non-compliance therewith.)
52.222-20 Walsh-Healey Public Contracts Act ($10,000)
52.222-26 Equal Opportunity as used in this clause, "Contractor" means "Seller."
52.222-35 Affirmative Action for Disabled Veterans of the Vietnam Era ($10,000)
52.222-36 Affirmative Action for Handicapped Workers ($2,500)
52.222-37 Employment Reports on Special Disabled Veterans and Veterans of the Vietnam Era ($10,000)
52.222-41 Application of the Service Contract Act of 1965, as amended
52.223-2 Clean Air and Water -($100,000) Unless otherwise exempt, this order has been awarded by Buyer in reliance upon a prior Clean Air and Water Certification executed by Seller and submitted to Buyer. Said Certification is by this reference herein incorporated in this order. Seller shall obtain like Certification from its suppliers prior to the award of nonexempt orders hereunder and shall incorporate the Clean Air and Water clause and the Certification requirements in such orders.
52.223-3 Hazardous Material Identification and Material Safety Data (252.223-7004)(And Alt I for other than DoD)
52.223-7 Notice of Radioactive Materials (insert "30" in blank)
52.225-9 Buy American Act and Balance of Payments Program (NASA only)
52.225-10 Duty-Free Entry ($10,000)("Contract Administration Office" shall mean "AETC Incorporated" except in (b)(2); delete (f))
52.225-11 Restrictions on Certain Foreign Purchases
52.226-1 Utilization of Indian Organizations and Indian Owned Economic Enterprises
52.227-2 Notice and Assistance Regarding Patent and Copyright Infringement ($25,000)
52.227-10 Filing of Patent Applications - Classified Subject Matter
52.232-17 Interest (delete: "[Net of any applicable tax credit under the Internal Revenue Code")
52.244-5 Competition in Subcontracting ($25,000)(as prescribed in FAR 44.204(e))
52.246-23 Limitation of Liability (if such clause is contained in the prime contract under which this order is issued; "acceptance" shall mean "acceptance by the Government"; and in paragraphs (a) and (c), "delivered under this contract" shall mean "delivered to AETC Incorporated or the Government.")
52.246-25 Limitation of Liability - Services (if such clause is contained in the prime contract under which this order is issued; "acceptance" shall mean "acceptance by the Government.")
52.247-63 Preference for U.S. Flag Carriers
52.247-64 Preference for Privately Owned U.S. Flag Commercial Vessels (and Alt I) (The numbers "20" and "30" in (c) (2) are changed to "10" and "15" respectively)

DFARS CLAUSES

252.203-7001 Special Prohibition on Employment (The definitions of 28(a) apply to (c)(d)(e) only; "Government" in (d) shall mean "AETC Incorporated")
252.204-7000 Disclosure of Information ("45" days shall change to "60")
252.204-7008 Security of Contractor Telecommunications
252.209-7000 Acquisitions from Subcontractors Subject to On-Site Inspection under the INF Treaty ($25,000)(252.209-7001)
252.210-7003 Acquisition Streamlining 1,000,000)(252.210-7005)
252.215-7000 Pricing Adjustments
252.219-7003 Small business and Small Disadvantaged Business Subcontracting Plan (DoD Prime Contracts)
252.223-7701 Hazard Warning Labels
252.223-7702 Safety Precautions For Ammunition and Explosives (252.223-7001)
252.225-7001 Buy American Act, Balance of Payments Program
252.225-7002 Qualifying Country Sources As Subcontractors
252.225-7706 Buy American Act, Trade Agreements Act, Balance of Payments Program Certificate (252.225.-7005)
252.225-7007 Trade Agreements Act (252.225-7006)
252.225-7009 Duty-Free Entry - Qualifying Country End Products and Supplies ($2,500)("Contracting Officer" and "Contract Administration Office" shall mean "AETC Incorporated" except in (b)(2)(c): "Contract" in (k) shall mean "the prime contract under which this purchase order is issued"; delete (f).(252.225-7008)
252.225-7010 Duty-Free Entry - Additional Provisions ($100,000) (Contracting Officer" shall mean "AETC Incorporated") (252.225-7014)
252.225-7014 Preference for Domestic Specialty Metals (Major Programs) (252.225-7011)
252.225-7025 Foreign Source Restrictions (252.208-7000 252.208-7001 252.208-7002 252.208-7003 252.208-7005 252.208-7006)
252.225-7026 Overseas Distribution of Defense Subcontracts ($100,000) (252.204-7005)
252.228-7005 Accident Reporting and Investigations Involving Aircraft, Missiles and Space Launch Vehicles (252.228-7006)
252.231-7000 Supplemental Cost Principles
252.235-7003 Frequency Authorization (252.235-7004)
252.239-7016 Telecommunications Security Equipment, Devices, Techniques, and Services
252.243-7001 Pricing of (Sub)Contract Modifications
252.247-7023 Transportation of Supplies by Sea ($25,000)
252.247-7024 Notification of Transportation of Supplies by Sea
252.249-7001 Notification of Substantial Impact on Employment ($500,000)
252.270-7000 Recovery of Non-Recurring Costs on Commercial Sales ($1,000,000; as prescribed at DFARS 271.004) (252.271-7001)

NFS CLAUSES

1852.204-70 Report on NASA Subcontracts. ($50,000)(Seller shall report directly to NASA Code HM-1, Washington, D.C. 20546)
1852.210-75 Packaging and Marking (and Alt I and II as applicable)
1852.219-74 Use of Rural Areas Small Business Concerns
1852.223-70 Safety and Health (as required by paragraph (e) of this clause.)
1852.223-71 Frequency Authorization
1852.223-75 Potentially Hazardous Items
1852.227-72 Designation of New Technology Representative (if this order incorporates 1852.227-70 or 1852.227-11)
1852.228-72 InterParty Waiver of Liability During STS Operations
1852.228-76 Cross Waiver of Liability for Space Station Activities
1852.231-70 Pricing of Adjustment
1852.244-70 Geographic Participation in the Aerospace Program ($100,000)
1852.247-71 Protection of the Florida Manatee
1852.252-70 Compliance with NASA Far Supplement

General Representations and Warranties – Attachment 2

Representations and Warranties.

Supplier represents and warrants:

(a) All obligations shall be performed in a prompt and professional manner in accordance with industry standards and the Agreement (including any milestones, service levels, or dates set forth therein), free of errors or defects in design, material and workmanship.

(b) It owns all right, title, and interest in and to, or has sufficient right, title, and interest in, the Services and Supplier Intellectual Property to provide the Services as set forth in the Agreement.

(c) In the event of breach of the warranties set forth in this Representations and Warranties Section, Supplier, at its expense, shall. correct (by repair, replacement or re-performance) such breach as soon as possible, but not more than ten (10) days after notice from AETC. If the breach is not so corrected, then AETC, at its option, may either: (i) extend the time for Supplier to correct such breach, if correction is commercially reasonable; (ii) negotiate an appropriate reduction in or refund of Supplier's compensation; or (iii) terminate the Agreement, in which case, in addition to any other right or remedy AETC may have, Supplier shall immediately refund to AETC all amounts paid hereunder. If AETC selects option (1) but the breach is still not corrected within the extended time, AETC shall have the same options again.

(d) **EXCEPT AS PROVIDED IN THE AGREEMENT, SUPPLIER MAKES NO IMPLIED WARRANTIES REGARDING THE SERVICES AND SPECIFICALLY DISCLAIMS THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE**.

General Indemnity.

Each Party ("Indemnitor") shall, to the extent permitted by law, indemnify, defend and hold harmless the other Party from and against any and all claims, demands, complaints or actions of third parties (including employees of the Parties or government agencies) arising from or relating to the Agreement (including personal injury, death, property damage or damage to the environment), to the extent caused or arising out of the negligence, willful misconduct, breach of this Agreement or a related agreement, or violation of law of or by the Indemnitor or any subcontractor of the Indemnitor. Further, in the event the Parties are jointly at fault or negligent, they agree to indemnify each other in proportion to their relative fault or negligence. The claims, demands, complaints and actions covered hereunder include all settlements, losses, liabilities, judgments, court costs, reasonable attorneys' fees, fines, penalties and other litigation costs and expenses arising from or related to such claims, demands, complaints or actions

Infringement Indemnity By Supplier.

Supplier will indemnify, defend and hold harmless AETC from and against any and all claims, demands, complaints, or actions of third parties (including employees of the Parties or government agencies) arising from or relating to the Agreement brought against AETC alleging that the Service or use of Supplier Intellectual Property infringes any patent, copyright, trade secret or other intellectual property right. The claims, demands, complaints and actions covered hereunder include all settlements, losses, liabilities, judgments, court costs, reasonable attorneys' fees, fines, penalties and other litigation costs and expenses arising from or related to such claims, demands, complaints or actions.

If such a claim is brought against AETC, AETC shall give prompt written notice thereof to the Supplier. At Supplier's cost, (a) Supplier shall immediately take control of the defense of such claim and shall engage attorneys acceptable to AETC to defend such claim and (b) AETC shall cooperate with Supplier (and its attorneys) in the defense of such claim, provided, however, that AETC may, at its own cost, participate (through its attorneys or otherwise) in such defense. No settlement of a claim that involves a remedy other than the payment of money by the Supplier shall be entered into without the consent of AETC. If Supplier does not assume control over the defense of a claim as provided in this Section, AETC may defend the claim in such manner as it may deem appropriate, at the cost of the Supplier. Should use of the Service or Supplier Intellectual Property become, or in the opinion of Supplier be likely to become, the subject of such an infringement claim, Supplier may, at its expense and option, (i) procure for AETC the right to continue using or receiving the Service or Supplier Intellectual Property free of any liability, or (ii) replace or modify, in whole or in part, the Services or Supplier Intellectual Property to make them non-infringing without degradation.

Insurance.

a) Supplier, at its expense, shall carry and maintain in force at all times relevant hereto the following insurance, on policy forms and with insurance companies authorized to do business in the jurisdiction(s) where work is to be performed and acceptable to AETC at the indicated minimum coverage limits, or such higher limits as AETC may require, or the limits provided under insurance currently held by Supplier as of the Effective Date of the Agreement, whichever is greater.

(i) Workers' Compensation - Statutory; Employer's Liability - $500,000 per accident/per employee; and such other insurance as may be required by Statutory law. This policy shall include a waiver of subrogation to AETC.

(ii) Commercial General Liability (Occurrence Form), including Contractual Liability and liability for Products and Completed Operations, in a combined limit for Bodily Injury and Property Damage - $1,000,000 per occurrence. This policy shall name AETC as additional insured.

(iii) Business Automobile Liability, in a combined single limit for Bodily Injury and Property Damage - $1,000,000 per occurrence.

(iv) Other insurance appropriate for Supplier's business or as required by law.

(b) Supplier shall maintain in force the insurance required by this Section and shall seasonably renew all required coverage during the term of the Agreement.

(c) Upon the request of AETC, Supplier shall provide AETC with certificates of insurance evidencing the coverage. Such certificates shall provide that the insurer will give AETC at least thirty (30) days advance notice of any changes in, or cancellation or non-renewal of, coverage and note any exclusions. If, in connection with the performance of Services under the Agreement, Supplier will not use motor vehicles on the Site other than parking areas, a letter so stating is acceptable in lieu of the automobile insurance certificate.

(d) Supplier shall require that any subcontractor it employs carry' the same coverage in the same limits as set out above, and other coverage as Supplier deems appropriate and shall provide proof.

(e) Neither failure of Supplier to comply with any or all of the insurance Sections of the Agreement, nor the failure to secure endorsements on polices as may be necessary to cant' out the terns and Sections of the Agreement, shall be construed to limit or relieve Supplier from any of its obligations under the Agreement, including the Insurance Section.

Attachment 3

ACORD CERTIFICATE OF LIABILITY INSURANCE

OP ID LC EXPLO-1 | DATE (MM/DD/YYYY) 08/01/06

PRODUCER
York-Jersey Underwriters, Inc.
185 Newman Springs Road
PO Box 810
Red Bank NJ 07701
Phone: 732-842-2012 Fax: 732-530-7080

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW.

INSURED
Explosive Ordnance Tech Inc
185 Rumson Rd
Rumson NJ 07760

INSURERS AFFORDING COVERAGE		NAIC #
INSURER A	Evanston Insurance Company	
INSURER B	Zurich-American	
INSURER C		
INSURER D		
INSURER E		

COVERAGES

THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. AGGREGATE LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	ADD'L INSRD	TYPE OF INSURANCE	POLICY NUMBER	POLICY EFFECTIVE DATE (MM/DD/YY)	POLICY EXPIRATION DATE (MM/DD/YY)	LIMITS	
A	X	GENERAL LIABILITY	05ELF00959	05/25/06	05/25/07	EACH OCCURRENCE	$ 5000000
		X COMMERCIAL GENERAL LIABILITY				DAMAGE TO RENTED PREMISES (Ea occurence)	$ 50000
		X CLAIMS MADE ☐ OCCUR				MED EXP (Any one person)	$ 5000
		X HIRED/NON OWNED				PERSONAL & ADV INJURY	$ 5000000
		X AUTO				GENERAL AGGREGATE	$ 5000000
		GEN'L AGGREGATE LIMIT APPLIES PER:				PRODUCTS - COMP/OP AGG	$ 5000000
		☐ POLICY ☐ PRO-JECT ☐ LOC					
		AUTOMOBILE LIABILITY				COMBINED SINGLE LIMIT (Ea accident)	$
		☐ ANY AUTO				BODILY INJURY (Per person)	$
		☐ ALL OWNED AUTOS				BODILY INJURY (Per accident)	$
		☐ SCHEDULED AUTOS				PROPERTY DAMAGE (Per accident)	$
		☐ HIRED AUTOS					
		☐ NON-OWNED AUTOS					
		GARAGE LIABILITY				AUTO ONLY - EA ACCIDENT	$
		☐ ANY AUTO				OTHER THAN AUTO ONLY: EA ACC	$
						AGG	$
		EXCESS/UMBRELLA LIABILITY				EACH OCCURRENCE	$
		☐ OCCUR ☐ CLAIMS MADE				AGGREGATE	$
		☐ DEDUCTIBLE					$
		☐ RETENTION $					$
B		WORKERS COMPENSATION AND EMPLOYERS' LIABILITY	6ZZUB4038B51806	02/07/06	02/07/07	WC STATU-TORY LIMITS X OTH-ER	
		ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED?				E.L. EACH ACCIDENT	$ 500000
		If yes, describe under SPECIAL PROVISIONS below				E.L. DISEASE - EA EMPLOYEE	$ 500000
						E.L. DISEASE - POLICY LIMIT	$ 500000
		OTHER					

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES / EXCLUSIONS ADDED BY ENDORSEMENT / SPECIAL PROVISIONS

RE: AETC INCORPORATED IS LISTED AS ADDITIONAL INSURED WITH RESPECTS TO GENERAL LIABILITY PURPOSES ONLY

CERTIFICATE HOLDER

AETCCIN

AETC INCORPORATED
FAX: 865-220-8857
120 QUADE DRIVE
CARY NC 27513

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, THE ISSUING INSURER WILL ENDEAVOR TO MAIL 10 DAYS WRITTEN NOTICE TO THE CERTIFICATE HOLDER NAMED TO THE LEFT, BUT FAILURE TO DO SO SHALL IMPOSE NO OBLIGATION OR LIABILITY OF ANY KIND UPON THE INSURER, ITS AGENTS OR REPRESENTATIVES.

AUTHORIZED REPRESENTATIVE

AETC Incorporated

Purchase Order No. 2456-NC

PURCHASE ORDER

VENDOR

Name	EOTI
Address	185 Rumson Rd
City	Rumson **ST** NJ **ZIP** 07760
Phone	732-345-8099 Wayne Lewallen

SHIP TO

Name	AETC Incorporated
Address	120 Quade Drive
City	Cary **ST** NC **ZIP** 27513
Phone	919-653-0215 Attn: Jim McDonald

JOB CODE: 4047040/3107114
Direct Charge ? Yes

BILL TO

Name	AETC Incorporated
Address	8910 University Center Lane, #900
City	San Diego **ST** CA **ZIP** 92122-1012
Phone	(858) 450-1211

Qty	Units	Description	Unit Price	TOTAL
		Subcontract for UXO Dive Support at Lake Erie, Toussaint River/ Port Clinton, OH. This support includes the reacquisition, investigation and recovery of selected underwater targets. Description: Dive OE Removal. Performance in accordance with EOTI Proposal Cover sheet dated Aug 7, Cost Break Down- Aug 2, 2006		
1	ea	Work Plan	$3,540.04	$3,540.04
1	ea	Reacquisition and Site Set-Up	$32,296.74	$32,296.74
1	ea	Mob/demob & UXO dive support	$193,456.13	$193,456.13
		Period of Performance:11 September - 30 September 2006		
		EOTI may invoice weekly for services completed		
			SubTotal	$229,292.91
			TOTAL	$229,292.91

Payment Details

- (●) Check
- ( ) Cash
- ( ) Account No.
- ( ) Credit Card

Name _____
CC # _____
Exp Date _____

Shipping Date

Approval

Steve Sands

PO Issue Date 8/7/2006
Sales Rep Wayne Lewallen
Acceptance Signature _____
Date 8-8-06

Notes/Remarks

See Attached:
Attachment 1: Purchase Order Terms and Conditions,
Attachment 2: Representations and Warranties,
Attachment 3: EOTI Certificate of Insurance

AETC Copy

AETC Incorporated

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Date 08-08-06

Notes/Remarks

See Attached:
Attachment 1: Purchase Order Terms and Conditions,
Attachment 2: Representations and Warranties,
Attachment 3: EOTI Certificate of Insurance

Vendor Copy

PURCHASE ORDER TERMS AND CONDITIONS ATTACHMENT

1. DEFINITIONS. As used herein, including Paragraph 28, "Buyer" means AETC Incorporated: "Seller" means the party identified on the face of this order, "Subcontract" work or services to be furnished by Seller under this order. Unless indicated otherwise in a specific paragraph or clause, "FAR" means Federal Acquisition Regulation. "DFARS" means Department of Defense Federal Acquisition Regulation Supplement, "NFS" or "NASA FAR SUPP" means the NASA FAR Supplement in effect on the date of this order. "Buyer's Authorized Procurement Representative" means the person or persons authorized by Buyer to alter, modify, or change the provisions of this order.

2. UPON ACCEPTANCE. This order becomes the exclusive agreement between the parties subject to the terms and conditions herein. Any of the following shall constitute Seller's unqualified acceptance of this order: (a) acknowledgment of this order, (b) furnishing of any supplies under this order, (c) acceptance of any payment under this order, or (d) commencement of performance under this order. Additional or different terms or conditions proposed by Seller, or included in Seller's acknowledgment hereof, shall be void and of no effect unless accepted in writing by Buyer. No change in, modification of, or revision to, this order shall be valid unless in writing and signed by Buyer's Authorized Procurement Representative.

3. PACKING AND SHIPMENT.
(a) Unless otherwise specified, all packing and packaging shall comply with good commercial practice and applicable carrier's tariffs. Supplies shall be prepared for shipment and packed to prevent damage or deterioration and to give optimum protection of the supplies during shipment and in plant handling and storage. The packaging, preparation, labeling and shipping of all HAZARDOUS SUBSTANCES, including DANGEROUS MATERIALS, RADIOACTIVE MATERIALS, and EXPLOSIVES must conform with all applicable international, federal, and state laws and regulations. For EXPLOSIVES, each part must be identified with the "Part Number" and Loading Date" at a minimum. Shorting devices must be supplied on appropriate items. The price includes all charges for packing and packaging and for transportation to the F.O.B point.

(b) If the items of this order require delivery F.O.B. place of shipment, the Seller must at that place bear the expense and risk of putting them into the possession of the carrier and at its risk and expense load the supplies on board.

(c) If the terms of this order are based on F.O.B. place of destination, the Seller must at his own expense and risk transport the supplies to that place and tender delivery of them to the Buyer.

(d) Failure to comply with Buyer's requirements or other shipping instructions will result in a debit to Seller for the excess costs and may result in the imposition of an administrative charge not to exceed $25.00.

4. QUALITY CONTROL AND INSPECTION.
(a) Quality System: Seller shall provide and maintain a Quality Control system acceptable to Buyer. During performance of this order, Seller's Quality Control, Inspection System, and Manufacturing Processes are subject to review, verification, and analysis by Buyer and, if this order is issued pursuant to a U.S. Government prime contract, Government representatives.

(b) Government Source Inspection: (Applicable only if this order is issued pursuant to a U.S. Government prime contract.) If Government source inspection or acceptance prior to shipment is required, immediately, upon receipt of this order, notify the Government representative who normally services Seller's plant to effect such inspection or acceptance. In the event a Government representative is unavailable, Seller shall immediately notify Buyer.

(c) Inspection Verification: Notwithstanding any prior payment or inspection and preliminary acceptance, all supplies ordered may be subject to (i) inspection, verification and/or testing during the period of manufacture, (ii) inspection and/or verification prior to shipment, and (iii) final inspection and acceptance at destination. Such inspection and verification rights shall extend to the Government if this order is issued pursuant to a U.S. Government prime contract. If any inspection or test is made on the premises of Seller or its lower-tier suppliers, Seller shall, without additional cost, provide and require its lower-tier suppliers to provide all reasonable facilities and assistance for the safety and convenience of Buyer and Government inspectors in the performance of their duties.

(d) Rejected Supplies: Buyer may reject and hold at Seller's expense, subject to Seller's reasonable disposal instructions, supplies which do not conform to applicable specifications, drawings, samples, or descriptions or which are defective in material, workmanship, or design unless of Buyer's detailed design. If within fifteen (15) days after Buyer has notified Seller of the rejected Supplies, Seller has not provided Buyer with reasonable disposition instructions including agreement to pay expenses incurred by Buyer, Buyer may at its option continue to hold the rejected supplies at Seller's expenses, or return them to seller's facility at Seller's expense. Without limiting any other rights Buyers may have, Buyer at its option may require Seller (i) to repair or replace at Seller's expense any supplies or items thereof which fail to meet the requirements of applicable design, specifications, drawings, samples, descriptions or other requirements of this order, or (ii) to refund the price of any such item. Previously rejected supplies reworked to specifications, or replaced, shall not be retendered to Buyer by Seller unless notification of such past rejection is submitted with the retender and Buyer has consented to such retender.

(e) Inspections and tests by Buyer or Government do not relieve Seller of responsibility for defects or other failures to meet contract requirements discovered before acceptance. Acceptance shall be conclusive, except for latent defects, fraud, gross mistakes amounting to fraud, or as otherwise provided in these terms and conditions.

5. DELIVERY, ADVANCE MANUFACTURING, AND PROCUREMENT. Delivery according to schedule is a major condition of this order. Seller shall not, without Buyer's prior written consent, manufacture or procure materials in advance of Seller's normal flow time or deliver in advance of schedule. In the event of termination or change, no claim will be allowed for any such manufacture or procurement in advance of such normal flow time unless Buyer's prior written consent has been obtained. Buyer may return or store at Seller's expense any items delivered in advance of delivery dates as specified for such items. If at any time it appears to Seller that any delivery schedule cannot be met, Seller shall notify Buyer as soon as possible as to the cause or causes therefor, action being taken to remove such cause or causes, when on-schedule status will be achieved, and at Seller's expense, shall take reasonable action necessary, with or without request of Buyer, to meet such schedules as set forth herein or to recover to the maximum extent possible any delay in meeting such schedules. Such reasonable action by the Seller shall include but shall not be limited to shipment via expedited routing and carrier. Notification under this clause shall in no way limit Buyer's rights under the TERMINATIONS-STOP WORK clause.

6. WARRANTY. Seller warrants that all supplies furnished hereunder will be free from defects in material and workmanship, conform to applicable specifications, drawings, samples and descriptions and/or other requirements of this order and unless of Buyer's detailed design, be free from design defects. If there is a breach of warranty, Buyer may return such supplies, at Seller's expense, for correction, replacement or credit as Buyer may elect. Supplies required to be corrected or replaced shall be subject to the provisions of this clause and the clause herein entitled "Quality Control and Inspection." All warranties shall run to Buyer and its customers.

7. CHANGES.
(a) Buyer may at any time by written notice, and without notice to sureties or assignees, make changes within the general scope of this order in any one or more of the following: (i) drawings, designs, or specifications; (ii) method of shipping or packing; (iii) place of inspection, acceptance, or point of delivery; and (iv) delivery schedule. Should any such change increase or decrease the cost of, or the time required for, performance of this order, an equitable adjustment may be requested by Seller or Buyer in the price, or delivery schedule, or both. No request by Seller for adjustment will be valid unless submitted to Buyer in a form acceptable to Buyer within twenty-five (25) days from the date of notice of such change, and accompanied by an estimate of charges for redundant material or work in process, if any.

(b) Should any change cause, or result in, redundant material or work in process, any claim covering such redundant material or work in process must be submitted within six (6) months from the date of receipt of written notification of the change and be on the forms and in the detail prescribed by Subpart 49.6 and 53.3 for FAR. Any adjustment due Seller, including adjustments on an order not placed under a U.S. Government prime contract, will be determined in accordance with the provisions of Parts 31 and 49 of FAR relating to terminations for convenience as in effect on the date of this order. Where the cost of property made redundant as a result of a change is included in Seller's claim for adjustment, Buyer shall have the right to prescribe the manner of disposition of such property.

(c) SELLER AGREES THAT ITS FAILURE TO SUBMIT SUCH CLAIM OR CLAIMS WITHIN THE APPLICABLE TIME PERIOD SHALL CONSTITUTE A WAIVER THEREOF UNLESS, FOR GOOD CAUSE, SELLER REQUESTS IN WRITING, PRIOR TO EXPIRATION OF THE APPLICABLE TIME PERIOD, THAT A TIME EXTENSION FOR FILING ITS CLAIM OR CLAIMS BE GRANTED BY BUYER AND BUYER GRANTS SUCH EXTENSION. ANY SUCH EXTENSIONS, IF APPROVED, SHALL BE EFFECTIVE ONLY IF AUTHORIZED IN WRITING BY BUYER'S AUTHORIZED PROCUREMENT REPRESENTATIVE. PRIOR TO FINAL SETTLEMENT OF ANY TIMELY FILED CLAIM OR CLAIMS, SELLER MAY SUBMIT REVISIONS TO SUCH CLAIM OR CLAIMS PROVIDED THAT SUCH REVISIONS TO SUCH CLAIM OR CLAIMS PROVIDED THAT SUCH REVISIONS DO NOT INTRODUCE DIFFERENT AREAS OF COST OR CLAIM ELEMENTS.

PURCHASE ORDER TERMS AND CONDITIONS ATTACHMENT

(d) Any clarification, direction, approval, or assistance as may be provided by Buyer's Program, engineering, or technical personnel concerning the work to be performed or the supplies to be furnished pursuant to t his order shall not constitute or be construed as a change tot his order and no change order, express or implied, will be binding unless it is issued by written notice by Buyer's authorized Procurement representative in accordance with paragraph (a) of this clause.

(e) Nothing contained in this clause shall relieve Seller from proceeding without delay in the performance of this order as changed.

8. RESPONSIBILITY FOR PROPERTY. Unless otherwise specified, Seller shall be liable for any loss or destruction or damage to property of the Buyer or Government property furnished to Seller by the Government or Buyer and shall be responsible for returning any such property in as good condition as when received except for reasonable wear and tear and for the utilization of it in accordance with the provisions of this order. Seller shall not include in this price any direct charges for insurance covering loss or destruction of, or damage to, property of the Government or Buyer. Title thereto shall not be affected, by the incorporation or attachment thereof to any property not owned by Buyer or the Government, nor shall any such property, or any part thereof, be or become a fixture or lose its identity as personalty by reason of affixation to any realty. Seller shall comply with the provisions of FAR Subpart 45.5 and DFARS 245.5 or NFS 1845.5. Buyer and the Government shall have the right to enter Seller's premises at all reasonable times to inspect its property and Seller's records with respect thereto.

9. USE OF BUYER'S DATA. Seller shall not reproduce, use, or disclose any data, designs, or other information belonging to or supplied by or on behalf of Buyer, except as necessary in the performance of orders for Buyer (or, if this order is issued pursuant to a U.S. Government prime contract, for the U.S. Government.) Upon Buyer's request, such data, designs, or other information, and any copies thereof, shall be returned to Buyer. Buyer shall be considered the "person for whom the work was prepared" for the purpose of authorship in any copyrightable work created by Seller under this order. Notwithstanding any other provision of this order, to the extent the Government has received from Buyer the right to authorize such use by Seller, Seller may utilize Buyer's data and information in the manufacture of supplies for direct sale to the Government: provided, however, that Seller shall (a) give Buyer prior written notice of each such proposed use, (b) prominently identify, to the extent possible, each article being manufactured by Seller in the performance of orders for the government, and (c) make no claim against Buyer which arises out of use by Seller of such data and information. Where Buyer's data, designs, or other information are furnished to Seller's suppliers for procurement of supplies by Seller for use in the performance of Buyer's orders, Seller shall insert the substance of this provision in its orders. "Government" as used in this clause means the United States Government.

10. ASSIGNMENT.

(a) Neither this order nor any duty or right under it shall be delegated or assigned by Seller without the prior written notice to and consent of Buyer, except that claims for monies due or to become due under this order may be assigned to a bank, trust company, or other financing institution, including any federal lending agency, by Seller without such consent. Buyer shall be furnished with two signed copies of any such assignment. Payment to an assignee of any such claim shall be subject to set-off or recoupment for any present or future claim or claims which Buyer may have against Seller. Buyer reserves the right to make settlements and/or adjustments in price, with Seller under the terms of this order, notwithstanding any assignment of claims for monies due or to become due hereunder and without notice to the assignee.

(b) In the event of any such assignment of monies, the assignee shall forward to Buyer two copies of a written notice of assignment and two copies of the instrument of assignment, all copies signed by the assignor and assignee.

(c) Any claim under this order which has been assigned pursuant to the foregoing probision of this clause may be further assigned only with the prior written consent of Buyer to a bank, trust companu or other financing institution, including any federal lending agency. In the event of such further assignment or rassignment the assignee shall be required to file one signed copy of a written notice of the further assignment or reassignment, together with a true copy of the instruement of further or reassignment with Seller, and shall file two (2) signed copies of such written notice, together with tow (2) copies of such instrument, with Buyer.

(d) No assignee shall divulge any information concerning this order except to those persons concerned with the transaction. In no event shall copies of this order or of any plans, specifications, or other similar documents relating to work under this order, if marked "Top Secret", "Secret," or "Confidential," be furnished to any assignee of any claim arising under this order or to any other person not entitled to receive the same; provided, that a copy of any part or all of this order so marked may be furnished, or any information contained herein may be disclosed, to such assignee upon prior written authorization of AETC Incorporated.*

(e) Indication of the assignment of claim and of any further assignment thereof and the name of the assignee shall be made on all vouchers or invoices certified by Seller.

11. TERMINATIONS - STOP WORK.

(a) This order may be terminated by Buyer:

(i) For convenience in accordance with the clause set forth at FAR 52-249-2 which is hereby incorporated herein by reference.

(ii) For default in accordance with the clause set forth at FAR 52.249-8 which is hereby incorporated herein by reference.

(b) For the purpose of stopping work under this order, the clause set forth at FAR 52-212-13 is incorporated herein by reference.

(c) For the purpose of the Clause 11, in FAR clauses incorporated by reference, the terms "Government" and "Contracting Officer" shall mean Buyer; the term "Contractor" shall mean Seller, and further, the provisions of said clauses incorporated herein by reference which provide that a failure to agree shall be a dispute within the meaning of the Government contract clause entitled "Disputes" shall have no force or effect.

(d) Seller shall not include in any claim submitted hereunder any cost of design engineering or development or any cost for special tooling or special test equipment, unless specifically ordered by Buyer as a separate item of work separately priced, notwithstanding any provision of Parts 31 or 49 of FAR to the contrary.

(e) SELLER AGREES THAT ITS FAILURE TO SUBMIT SUCH CLAIM OR CLAIMS WITHIN THE APPLICABLE TIME PERIOD SHALL CONSTITUTE A WAIVER THEREOF UNLESS SELLER, IN WRITING AND PRIOR TO EXPIRATION OF THE APPLICABLE TIME PERIOD, REQUESTS AN EXTENSION OF TIME FOR FILING ITS CLAIM OR CLAIMS AND SUCH AN EXTENSION IS GRANTED BY BUYER. ANY SUCH EXTENSION(S), IF GRANTED, SHALL BE EFFECTIVE ONLY IF AUTHORIZED IN WRITING BY BUYER'S AUTHORIZED PROCUREMENT REPRESENTATIVE. PRIOR TO FINAL SETTLEMENT OF ANY TIMELY FILED CLAIM OR CLAIMS, SELLER MAY SUBMIT REVISIONS TO SUCH CLAIM OR CLAIMS PROVIDED THAT SUCH REVISIONS DO NOT INTRODUCE DIFFERENT AREAS OF COSTS OR CLAIM ELEMENTS.

12. INDEMNIFICATION. In the event Seller, its officers, employees, agents, suppliers, or subcontractors at any tier enter premises occupied by or under the control of Buyer, the indemnify, and hold harmless Buyer, its officers, employees and agents from any claim, suit, loss, cost, damage, expense (including attorney's fees), or liability by reason of property damage or personal injury (including death) to any person, including Seller's employees, of whatsoever nature or kind arising out of, as a result of, or in connection with such performance occasioned in whole or in part by the actions or omissions or Seller, its officers, employees, agent, suppliers, or subcontractors at any tier. Seller shall take all precautions necessary, special or otherwise and shall be responsible for compliance with all federal, state and local safety and environmental laws in performance of work hereunder. Without in any way limiting the foregoing undertakings, Seller and its suppliers and subcontractors at any tier shall maintain public liability and property damage insurance in prudent and reasonable limits covering the obligations set forth and shall maintain, to the statutory limits required by law, proper Worker's Compensation Insurance or approved self insurance program, and employer's liability insurance covering all employees performing this order. Insurance maintained pursuant to this clause shall be considered primary as respects the interest of Buyer and is not contributory with any insurance Buyer may carry. The requirement to provide insurance under this clause shall not in any manner limit or qualify the liabilities the obligations assumed by Seller under this order.

13. PATENT INDEMNITY, TRADEMARKS, AND COPYRIGHTS. To the extent that the supplies are produced to detailed designs not originated and furnished by Buyer or by a process or method, the use of which is not specifically directed by Buyer, Buyer shall have no responsibility to Seller for infringement or misappropriation of patent, trademark, copyright, or trade secret rights of third parties and Seller guarantees that the sale or use of such supplies or the use of such process or method hereunder will not infringe or be a misappropriation of any United States or foreign patents, trademarks, copyrights, or trade secrets. Seller shall defend, indemnify, and hold Buyer and its customers harmless from any loss, cost, damage, expense (including attorney's fees), or liability which may be incurred on account of infringement or misappropriation, (actual or alleged), of patent right, trademarks, copyrights, or trade secrets with respect to such supplies, and defend, at its own expense, any action or claim in which such infringement or misappropriation is alleged by third parties, provided Seller is notified of such actions or claims against Buyer.

14. EQUAL OPPORTUNITY. Unless exempt under the provisions of FAR 22.807, the clause at FAR 52.222-26 is incorporated herein by reference. As used in this clause, "Contractor" means Seller. Unless this order is so exempted, the applicable Equal Employment Opportunity Compliance Certificate previously submitted by Seller to Buyer is by reference, also incorporated in.

PURCHASE ORDER TERMS AND CONDITIONS ATTACHMENT

15. AFFIRMATION ACTION FOR HANDICAPPED WORKERS. Unless exempt under the provisions of FAR 22.1408, the clause at FAR 52.222-36 is incorporated herein by reference, unless this order is under $2,500. As used in said clause, "Contractor" means Seller.

16. AFFIRMATIVE ACTION FOR DISABLED VETERANS AND VETERANS OF THE VIETNAM ERA. Unless exempt under the provisions of FAR 22.308, the clause at FAR 52.222-35 is incorporated herein by reference, unless this order is under $10,000. As used in said clauses, "Contractor" means Seller, and "Contract" means this order.

17. LABOR DISPUTES. Whenever any actual or potential labor dispute develops or threatens to delay the timely performance of this order, Seller shall immediately give notice thereof to Buyer. Seller shall insert the substance of this provision on its orders issued hereunder.

18. NONDISCLOSURE OF INFORMATION. Seller shall not, without prior written consent of Buyer (through Buyer's Public Relations organization), disclose any information relative to this order.

19. GRATUITIES. Buyer may, by written notice to Seller, terminate for default the right of Seller to proceed under this order if Buyer has reasonable cause to believe that gratuities (in the form of entertainment, gifts or otherwise) were offered or given by Seller, or any agent or representative of Seller, to any officer or employee of Buyer with a view toward securing this order or securing favorable treatment with respect to the award or amendment of this order or the making of any determination with respect to the performance of this order. The rights and remedies of Buyer provided in this clause shall bot be exclusive and are in addition to any other rights and remedies provided by law or under this order.

20. INTERPRETATION OF ORDER.
(a) If this order is placed pursuant to a U.S. Government prime contract, the provisions of Clauses 4, 7, 11, 14, 15, 16, and 28 of this purchase order and any other U.S. Government FAR clause expressly made a part of this order by reference or otherwise, shall be governed by and construed in accordance with the law of U.S. Government contracts as set forth by statute and applicable regulations, and decisions by the appropriate courts and Boards of Contract Appeals. To the extent that the law referred to in the foregoing sentence is not determinative of an issue arising out of those specific clauses of this order referred to above in this paragraph (a), recourse shall be to the law of the State of California.

(b) All provisions of this order not expressly governed or construed pursuant to the provisions of paragraph (a) of this clause shall be governed by and construed in their entirety in accordance with the law of the State of California.

21. COMPLIANCE WITH LOCAL, STATE, AND FEDERAL LAW. In the performance of this order, Seller agrees to comply with all applicable local, state, and federal laws and executive orders and regulations issued pursuant thereto and agrees to defend, indemnify and hold Buyer harmless against any loss, cost, damage, expense (including attorney's fees), or liability by reason of Seller's violation hereof.

22. REMEDIES. The rights and remedies of Buyer provided herein shall be cumulative and in addition to any other rights and remedies provided by law or equity.

23. WAIVER. The failure of Buyer in any one or more instances to insist on performance of any of the provisions of this order shall in no way be construed to be a waiver of such provisions in the future.

24. PAYMENT. Unless otherwise specifically provided for elsewhere in this order, payment shall be made within thirty (30) days after proper delivery of the supplies or performance of the services specified in this order or receipt and approval of a proper invoice, whichever is later.

25. INDEPENDENT CONTRACTOR. It is understood and agreed that Seller shall be an independent contractor in all its operations and activities hereunder, that the employee furnished by Seller to perform work under this order shall be Seller's employees exclusively without any relation whatever to AETC Incorporated as employees, agents or as independent contractors; that such employees shall be paid by Seller for all services in this connection; that Seller shall carry worker's compensation insurance and that Seller shall be responsible for all obligations and reports covering social security, unemployment insurance, worker's compensation, income tax, and other reports and deductions required by Local, State and/or Federal law.

26. OFFSET. If AETC Incorporated is fined or penalized as a result of any violation of any Public Law or Federal Regulation by Seller or Seller's lower-tier suppliers, or, where this order is pursuant to an AETC Incorporated prime contract, the Contracting Officer who has cognizance over AETC Incorporated's prime contract reduces AETC Incorporated's prime contract as a result of actions by Seller or Seller's lower-tier suppliers, AETC Incorporated shall reduce the amount of this purchase order by the same amount. If AETC Incorporated has already paid Seller, Seller shall, upon demand from AETC Incorporated promptly repay to AETC Incorporated the amount of the offset. Exercise of AETC Incorporated's right under this clause shall not be a waiver of any rights AETC Incorporated has under any other clause or provision in this purchase order.

27. UTILIZATION OF SMALL AND SMALL DISADVANTAGED BUSINESS CONCERNS AND WOMEN OWNED SMALL BUSINESSES. Seller hereby agrees to use its best efforts to ensure that small and small disadvantaged businesses, and women-owned small businesses, as defined in statute or regulation by the Small Business Administration, have the maximum practicable opportunity, consistent with the efficient performance of this order, to participate in lower-tier orders issued pursuant to this order.

CLAUSES APPLICABLE ONLY TO PURCHASES UNDER U.S. GOVERNMENT PRIME CONTRACTS:

28. FAR, OTHER REGULATIONS AND LAWS.
(a) This clause 28 is applicable only if the face of this order contains a prime contract number in the "Government contract number" block or otherwise indicates that this order is placed pursuant to a U.S. Government Prime Contract. As used below and unless otherwise noted or the context of a clause requires otherwise, "Contracting Officer" shall mean the Contracting Officer who has cognizance of Buyer's prime contacts; "contract" shall mean this order; "subcontracts" shall mean subcontracts and purchase orders issued under this order by Seller' "Contractor" shall mean Seller. Copies of all notices or reports required to be furnished under the clauses incorporated below shall be furnished to Buyer.

(b) If AETC Incorporated submits to the Government any contract claim, request for equitable adjustment to contract terms, request for relief under Public Law 85-804, or other similar request exceeding $100,000, and such claim or request includes or is based upon a claim or request exceeding $100,000 made by Seller to AETC Incorporated, Seller shall, at the request of AETC Incorporated, submit the following certificate executed by a senior company official in charge at Seller's plant or location involved:

"I certify that the claim is made in good faith, that the supporting data are accurate and complete to the best of my knowledge and belief, and that the amount requested accurately reflects the purchase order adjustment for which the Seller believes the Government is liable to AETC Incorporated."

(1) In conjunction with the certification above, Seller shall provide full disclosure to all relevant facts, including cost or pricing data.

(2) Seller hereby agrees to defend, indemnify and hold harmless AETC Incorporated; its directors, officers, employees, agents and servants, from and against any claim, suit, loss, cost, damage or expense (including attorney's fees) arising out of, in connection with, or as a result of any claim, determination, prosecution, suit or other action by the Government alleging that any claim or request certified by Seller under this clause is fraudulent, overstated, or in violation of any law or regulation.

(3) The rights and obligations provided herein shall survive termination, completion, and final payment of this order.

(c) Rights in Technical Data: The following clauses are incorporated by reference, Buyer shall have the right to reproduce and use for the performance of its prime contract any data delivered by Seller under this order. If this order is for commercial off-the-shelf software, any license agreement provided with the software will be governed by the applicable FAR/DFARS/NFS clause(s) listed below.

1) DOD:

252.227-7013	Rights in Technical Data and Computer Software (and Alt. I if this order is placed under a Pre-1987 prime contract)
252.227-7018	Restrictive Markings on Technical Data
252.227-7026	Deferred Delivery of Technical Data or Computer Software
252.227-7027	Deferred Ordering of Technical Data or Computer Software
252.227-7029	Identification of Technical Data (if Technical data is to be delivered under this order)
252.227-7030	Technical Data - Withholding of Payment
252.227-7036	Certification of Technical Data Conformity

2) NASA:

52.227.14	Rights in Data - General
52.227-19	Commercial Computer Software - Restricted rights
52.227-21	Technical Data Certification
1852.227-14	Rights in Data - General

PURCHASE ORDER TERMS AND CONDITIONS ATTACHMENT

1852.227-19 Commercial Computer Software - Restricted Rights
1852.227-86 Commercial Computer Software - Licensing

(D) The FAR/DFARS/NFS clauses listed on the reverse side in effect on the date of this order are incorporated herein by reference as if fully set forth and as may be modified as indicated. Unless otherwise indicated, FAR clauses apply to all orders; DFARS clauses apply to DOD orders; NFS clauses apply to NASA orders. Dollar amounts in parentheses refer to the dollar threshold at which the clause becomes effective. Clauses which are self-deleting, as where the dollar value of the purchase order does not meet a required threshold, or where the clause is not applicable to the items being purchased, shall have no force or effect. DFARS citations in parentheses reference the same clause in the DFARS prior to the December 1991 issuance of the DFARS.

(e) CLAUSES INCORPORATED BY REFERENCE:

FAR CLAUSES

52.203-6 Restriction on Subcontractor Sales to the Government

52.230-7 Anti-Kickback Procedures (The definitions of paragraph 28a shall apply only to Subparagraphs (c) (2), (3), (4) and (5). Any report made pursuant to Subparagraph (c) (2) shall be sent simultaneously to AETC Incorporated in care of: Vice President, Administration. Subparagraph (c) (4) is revised to delete the phrase "the Contracting Officer may" in the first sentence and insert the phrase "after the Contracting Officer under the Prime Contract has effected an offset at the prime contract level, or has directed AETC Incorporated to withhold any sum from the subcontractor, AETC shall". The definitions in paragraph 28a shall not apply to this phrase.)

52.203-12 Limitations on Payments to Influence Certain Federal Transactions ($100,000)

52.204-2 Security Requirements

52.206-1 Required Source for Jewel Bearing and Related Items

52.210-5 New Material

52.210-7 Used or Reconditioned Material, Residual Inventory, and Former Government Surplus Property

52.212-8 Defense Priority and Allocation Requirements

52.215-1 Examination of Records by Controller General (10,000) [(d)(1) shall be changed to read "Appeals under the Disputes clause of the prime contract under which this purchase order was issued."]

52.215-2 Audit-Negotiation ($10,000)

52.215-26 Integrity of Unit Prices, with Alternate I ($25,000)

52.215-27 Termination of Defined Pension Benefits Plans (if certified cost or pricing data was submitted)

52.215-39 Reversion of Adjustment of Plans for Post-Retirement Benefits other than Pensions (PRB) (if certified cost or pricing data was submitted)

52.219-8 Utilization of Small Business Concerns and Small Disadvantaged Business concerns ($25,000)

52.219-9 Small Business and Small Disadvantaged Business Subcontracting Plan ($500,000) [Seller shall provide Buyer with copies of SF 294 reports submitted pursuant to (d)(10)(iii) and the address to which the SF 295 was sent.]

52.219-13 Utilization of Women-Owned Small Business ($25,000)

52.220-3 Utilization of Labor Surplus Area Concerns ($25,000)

52.220-4 Labor Surplus Area Subcontracting Program ($500,000)

52.224-4 Contract Work Hours and Safety Standards Act - Overtime Compensation - General ($2,500 and not otherwise exempt under FAR 22.305) Supplier shall indemnify AETC Incorporated against and hold AETC Incorporated harmless from any claim, suit, cost, damage, expense, (including attorney's fees, liability or withholding arising from Seller's non-compliance therewith.)

52.222-20 Walsh-Healey Public Contracts Act ($10,000)

52.222-26 Equal Opportunity as used in this clause, "Contractor" means "Seller."

52.222-35 Affirmative Action for Disabled Veterans of the Vietnam Era ($10,000)

52.222-36 Affirmative Action for Handicapped Workers ($2,500)

52.222-37 Employment Reports on Special Disabled Veterans and Veterans of the Vietnam Era ($10,000)

52.222-41 Application of the Service Contract Act of 1965, as amended

52.223-2 Clean Air and Water -($100,000) Unless otherwise exempt, this order has been awarded by Buyer in reliance upon a prior Clean Air and Water Certification executed by Seller and submitted to Buyer. Said Certification is by this reference herein incorporated in this order. Seller shall obtain like Certification from its suppliers prior to the award of nonexempt orders hereunder and shall incorporate the Clean Air and Water clause and the Certification requirements in such orders.

52.223-3 Hazardous Material Identification and Material Safety Data (252.223-7004)(And Alt I for other than DoD)

52.223-7 Notice of Radioactive Materials (insert "30" in blank)

52.225-9 Buy American Act and Balance of Payments Program (NASA only)

52.225-10 Duty-Free Entry ($10,000)("Contract Administration Office" shall mean "AETC Incorporated" except in (b)(2); delete (f))

52.225-11 Restrictions on Certain Foreign Purchases

52.226-1 Utilization of Indian Organizations and Indian Owned Economic Enterprises

52.227-2 Notice and Assistance Regarding Patent and Copyright Infringement ($25,000)

52.227-10 Filing of Patent Applications - Classified Subject Matter

52.232-17 Interest (delete: "[Net of any applicable tax credit under the Internal Revenue Code")

52.244-5 Competition in Subcontracting ($25,000)(as prescribed in FAR 44.204(e))

52.246-23 Limitation of Liability (if such clause is contained in the prime contract under which this order is issued; "acceptance" shall mean "acceptance by the Government"; and in paragraphs (a) and (c), "delivered under this contract" shall mean "delivered to AETC Incorporated or the Government.")

52.246-25 Limitation of Liability - Services (if such clause is contained in the prime contract under which this order is issued; "acceptance" shall mean "acceptance by the Government.")

52.247-63 Preference for U.S. Flag Carriers

52.247-64 Preference for Privately Owned U.S. Flag Commercial Vessels (and Alt I) (The numbers "20" and "30" in (c) (2) are changed to "10" and "15" respectively)

DFARS CLAUSES

252.203-7001 Special Prohibition on Employment (The definitions of 28(a) apply to (c)(d)(e) only; "Government" in (d) shall mean "AETC Incorporated")

252.204-7000 Disclosure of Information ("45" days shall change to "60")

252.204-7008 Security of Contractor Telecommunications

252.209-7000 Acquisitions from Subcontractors Subject to On-Site Inspection under the INF Treaty ($25,000)(252.209-7001)

252.210-7003 Acquisition Streamlining 1,000,000)(252.210-7005)

252.215-7000 Pricing Adjustments

252.219-7003 Small business and Small Disadvantaged Business Subcontracting Plan (DoD Prime Contracts)

252.223-7701 Hazard Warning Labels

252.223-7702 Safety Precautions For Ammunition and Explosives (252.223-7001)

252.225-7001 Buy American Act, Balance of Payments Program

252.225-7002 Qualifying Country Sources As Subcontractors

252.225-7706 Buy American Act, Trade Agreements Act, Balance of Payments Program Certificate (252.225.-7005)

252.225-7007 Trade Agreements Act (252.225-7006)

252.225-7009 Duty-Free Entry - Qualifying Country End Products and Supplies ($2,500)("Contracting Officer" and "Contract Administration Office" shall mean "AETC Incorporated" except in (b)(2)(c): "Contract" in (k) shall mean "the prime contract under which this purchase order is issued"; delete (f).(252.225-7008)

252.225-7010 Duty-Free Entry - Additional Provisions ($100,000) (Contracting Officer" shall mean "AETC Incorporated") (252.225-7014)

252.225-7014 Preference for Domestic Specialty Metals (Major Programs) (252.225-7011)

252.225-7025 Foreign Source Restrictions (252.208-7000 252.208-7001 252.208-7002 252.208-7003 252.208-7005 252.208-7006)

252.225-7026 Overseas Distribution of Defense Subcontracts ($100,000) (252.204-7005)

252.228-7005 Accident Reporting and Investigations Involving Aircraft, Missiles and Space Launch Vehicles (252.228-7006)

252.231-7000 Supplemental Cost Principles

252.235-7003 Frequency Authorization (252.235-7004)

252.239-7016 Telecommunications Security Equipment, Devices, Techniques, and Services

252.243-7001 Pricing of (Sub)Contract Modifications

252.247-7023 Transportation of Supplies by Sea ($25,000)

252.247-7024 Notification of Transportation of Supplies by Sea

252.249-7001 Notification of Substantial Impact on Employment ($500,000)

252.270-7000 Recovery of Non-Recurring Costs on Commercial Sales ($1.000,000; as prescribed at DFARS 271.004) (252.271-7001)

NFS CLAUSES

1852.204-70 Report on NASA Subcontracts. ($50,000)(Seller shall report directly to NASA Code HM-1, Washington, D.C. 20546)

1852.210-75 Packaging and Marking (and Alt I and II as applicable)

1852.219-74 Use of Rural Areas Small Business Concerns

1852.223-70 Safety and Health (as required by paragraph (e) of this clause.)

1852.223-71 Frequency Authorization

1852.223-75 Potentially Hazardous Items

1852.227-72 Designation of New Technology Representative (if this order incorporates 1852.227-70 or 1852.227-11)

1852.228-72 InterParty Waiver of Liability During STS Operations

1852.228-76 Cross Waiver of Liability for Space Station Activities

1852.231-70 Pricing of Adjustment

1852.244-70 Geographic Participation in the Aerospace Program ($100,000)

1852.247-71 Protection of the Florida Manatee

1852.252-70 Compliance with NASA Far Supplement

General Representations and Warranties

Representations and Warranties.

Supplier represents and warrants:

(a) All obligations shall be performed in a prompt and professional manner in accordance with industry standards and the Agreement (including any milestones, service levels, or dates set forth therein), free of errors or defects in design, material and workmanship.

(b) It owns all right, title, and interest in and to, or has sufficient right, title, and interest in, the Services and Supplier Intellectual Property to provide the Services as set forth in the Agreement.

(c) In the event of breach of the warranties set forth in this Representations and Warranties Section, Supplier, at its expense, shall. correct (by repair, replacement or re-performance) such breach as soon as possible, but not more than ten (10) days after notice from AETC. If the breach is not so corrected, then AETC, at its option, may either: (i) extend the time for Supplier to correct such breach, if correction is commercially reasonable; (ii) negotiate an appropriate reduction in or refund of Supplier's compensation; or (iii) terminate the Agreement, in which case, in addition to any other right or remedy AETC may have, Supplier shall immediately refund to AETC all amounts paid hereunder. If AETC selects option (1) but the breach is still not corrected within the extended time, AETC shall have the same options again.

(d) **EXCEPT AS PROVIDED IN THE AGREEMENT, SUPPLIER MAKES NO IMPLIED WARRANTIES REGARDING THE SERVICES AND SPECIFICALLY DISCLAIMS THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.**

General Indemnity.

Each Party ("Indemnitor") shall, to the extent permitted by law, indemnify, defend and hold harmless the other Party from and against any and all claims, demands, complaints or actions of third parties (including employees of the Parties or government agencies) arising from or relating to the Agreement (including personal injury, death, property damage or damage to the environment), to the extent caused or arising out of the negligence, willful misconduct, breach of this Agreement or a related agreement, or violation of law of or by the Indemnitor or any subcontractor of the Indemnitor. Further, in the event the Parties are jointly at fault or negligent, they agree to indemnify each other in proportion to their relative fault or negligence. The claims, demands, complaints and actions covered hereunder include all settlements, losses, liabilities, judgments, court costs, reasonable attorneys' fees, fines, penalties and other litigation costs and expenses arising from or related to such claims, demands, complaints or actions

Infringement Indemnity By Supplier.

Supplier will indemnify, defend and hold harmless AETC from and against any and all claims, demands, complaints, or actions of third parties (including employees of the Parties or government agencies) arising from or relating to the Agreement brought against AETC alleging that the Service or use of Supplier Intellectual Property infringes any patent, copyright, trade secret or other intellectual property right. The claims, demands, complaints and actions covered hereunder include all settlements, losses, liabilities, judgments, court costs, reasonable attorneys' fees, fines, penalties and other litigation costs and expenses arising from or related to such claims, demands, complaints or actions.

If such a claim is brought against AETC, AETC shall give prompt written notice thereof to the Supplier. At Supplier's cost, (a) Supplier shall immediately take control of the defense of such claim and shall engage attorneys acceptable to AETC to defend such claim and (b) AETC shall cooperate with Supplier (and its attorneys) in the defense of such claim, provided, however, that AETC may, at its own cost, participate (through its attorneys or otherwise) in such defense. No settlement of a claim that involves a remedy other than the payment of money by the Supplier shall be entered into without the consent of AETC. If Supplier does not assume control over the defense of a claim as provided in this Section, AETC may defend the claim in such manner as it may deem appropriate, at the cost of the Supplier. Should use of the Service or Supplier Intellectual Property become, or in the opinion of Supplier be likely to become, the subject of such an infringement claim, Supplier may, at its expense and option, (i) procure for AETC the right to continue using or receiving the Service or Supplier Intellectual Property free of any liability, or (ii) replace or modify, in whole or in part, the Services or Supplier Intellectual Property to make them non-infringing without degradation.

Insurance.

a) Supplier, at its expense, shall carry and maintain in force at all times relevant hereto the following insurance, on policy forms and with insurance companies authorized to do business in the jurisdiction(s) where work is to be performed and acceptable to AETC at the indicated minimum coverage limits, or such higher limits as AETC may require, or the limits provided under insurance currently held by Supplier as of the Effective Date of the Agreement, whichever is greater.

(i) Workers' Compensation - Statutory; Employer's Liability - $500,000 per accident/per employee; and such other insurance as may be required by Statutory law. This policy shall include a waiver of subrogation to AETC.

(ii) Commercial General Liability (Occurrence Form), including Contractual Liability and liability for Products and Completed Operations, in a combined limit for Bodily Injury and Property Damage - $1,000,000 per occurrence. This policy shall name AETC as additional insured.

(iii) Business Automobile Liability, in a combined single limit for Bodily Injury and Property Damage - $1,000,000 per occurrence.

(iv) Other insurance appropriate for Supplier's business or as required by law.

(b) Supplier shall maintain in force the insurance required by this Section and shall seasonably renew all required coverage during the term of the Agreement.

(c) Upon the request of AETC, Supplier shall provide AETC with certificates of insurance evidencing the coverage. Such certificates shall provide that the insurer will give AETC at least thirty (30) days advance notice of any changes in, or cancellation or non-renewal of, coverage and note any exclusions. If, in connection with the performance of Services under the Agreement, Supplier will not use motor vehicles on the Site other than parking areas, a letter so stating is acceptable in lieu of the automobile insurance certificate.

(d) Supplier shall require that any subcontractor it employs carry' the same coverage in the same limits as set out above, and other coverage as Supplier deems appropriate and shall provide proof.

General Representations and Warranties

(e) Neither failure of Supplier to comply with any or all of the insurance Sections of the Agreement, nor the failure to secure endorsements on polices as may be necessary to cant' out the terns and Sections of the Agreement, shall be construed to limit or relieve Supplier from any of its obligations under the Agreement, including the Insurance Section.

ACORD CERTIFICATE OF LIABILITY INSURANCE

OP ID LC EXPLO-1

DATE (MM/DD/YYYY) 08/01/06

PRODUCER
York-Jersey Underwriters, Inc.
185 Newman Springs Road
PO Box 810
Red Bank NJ 07701
Phone: 732-842-2012 Fax: 732-530-7080

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW.

INSURED
Explosive Ordnance Tech Inc
185 Rumson Rd
Rumson NJ 07760

INSURERS AFFORDING COVERAGE		NAIC #
INSURER A:	Evanston Insurance Company	
INSURER B:	Zurich-American	
INSURER C:		
INSURER D:		
INSURER E:		

COVERAGES

THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. AGGREGATE LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	ADD'L INSRD	TYPE OF INSURANCE	POLICY NUMBER	POLICY EFFECTIVE DATE (MM/DD/YY)	POLICY EXPIRATION DATE (MM/DD/YY)	LIMITS	
A	X	GENERAL LIABILITY X COMMERCIAL GENERAL LIABILITY X CLAIMS MADE ☐ OCCUR X HIRED/NON OWNED X AUTO GEN'L AGGREGATE LIMIT APPLIES PER: ☐ POLICY ☐ PRO-JECT ☐ LOC	05ELF00959	05/25/06	05/25/07	EACH OCCURRENCE	$ 5000000
						DAMAGE TO RENTED PREMISES (Ea occurence)	$ 50000
						MED EXP (Any one person)	$ 5000
						PERSONAL & ADV INJURY	$ 5000000
						GENERAL AGGREGATE	$ 5000000
						PRODUCTS - COMP/OP AGG	$ 5000000
		AUTOMOBILE LIABILITY ☐ ANY AUTO ☐ ALL OWNED AUTOS ☐ SCHEDULED AUTOS ☐ HIRED AUTOS ☐ NON-OWNED AUTOS				COMBINED SINGLE LIMIT (Ea accident)	$
						BODILY INJURY (Per person)	$
						BODILY INJURY (Per accident)	$
						PROPERTY DAMAGE (Per accident)	$
		GARAGE LIABILITY ☐ ANY AUTO				AUTO ONLY - EA ACCIDENT	$
						OTHER THAN AUTO ONLY: EA ACC	$
						AGG	$
		EXCESS/UMBRELLA LIABILITY ☐ OCCUR ☐ CLAIMS MADE ☐ DEDUCTIBLE ☐ RETENTION $				EACH OCCURRENCE	$
						AGGREGATE	$
							$
							$
							$
B		WORKERS COMPENSATION AND EMPLOYERS' LIABILITY ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? If yes, describe under SPECIAL PROVISIONS below	6ZZUB4038B51806	02/07/06	02/07/07	☐ WC STATU-TORY LIMITS X OTH-ER	
						E.L. EACH ACCIDENT	$ 500000
						E.L. DISEASE - EA EMPLOYEE	$ 500000
						E.L. DISEASE - POLICY LIMIT	$ 500000
		OTHER					

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES / EXCLUSIONS ADDED BY ENDORSEMENT / SPECIAL PROVISIONS

RE: AETC INCORPORATED IS LISTED AS ADDITIONAL INSURED WITH RESPECTS TO GENERAL LIABILITY PURPOSES ONLY

CERTIFICATE HOLDER

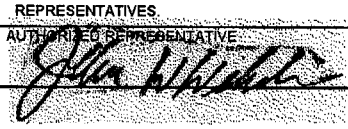
AETCCIN

AETC INCORPORATED
FAX: 865-220-8857
120 QUADE DRIVE
CARY NC 27513

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, THE ISSUING INSURER WILL ENDEAVOR TO MAIL 10 DAYS WRITTEN NOTICE TO THE CERTIFICATE HOLDER NAMED TO THE LEFT, BUT FAILURE TO DO SO SHALL IMPOSE NO OBLIGATION OR LIABILITY OF ANY KIND UPON THE INSURER, ITS AGENTS OR REPRESENTATIVES.

AUTHORIZED REPRESENTATIVE



EOTI
EXPLOSIVE ORDNANCE TECHNOLOGIES, INC.

ORDNANCE AND EXPLOSIVE REMEDIATION

105 W. Tennessee Ave. • Oak Ridge, TN 37830
Tel: (865) 220-8668 • Fax: (865) 220-8857

August 7, 2006

Sept'

AETC
Attention: Jim McDonald, PhD
120 Quade Dr.
Cary, NC 27513

Subject: UXO Support, Toussaint River Survey

Dear Dr. McDonald:

In response to your request, EOTI has prepared a cost estimate for providing UXO Dive support. This support includes the reacquisition, investigation and recovery of selected underwater targets. Our costs are based on the following:

- Standard hourly rates are based on SCA Wage Determination, wage requirements and standard EOTI multipliers
- EOTI proposes to use 3, 3-person dive teams (1 UXO Tech III and 2 UXO Tech II, each)
- The project duration is expected to be 3 weeks. The first week will include site setup and target reacquisition. The first week will consist of 3, 10-hour workdays with no overtime. The next two weeks will include 5, 10-hour days with overtime and dive pay.
- EOTI divers are assumed to be completing dive operations approximately 80% of the time the 2-week investigation and removal phase.
- Per diem / lodging rates are based on May 2006(current) rates.

A summary of EOTI's proposed cost is provided below. A detailed break down of travel and labor cost is included in the attached cost proposal.

Work Plan – $3,540.04
Reacquisition and Site Set-up – $ 32,296.74
Mob/demob & UXO dive Support - $193,456.13

We look forward to supporting AETC on this project and on future projects. Please feel free to contact me at 865-220-8668 with any questions.

Sincerely,

Explosive Ordnance Technologies, Inc.

Wayne Lewallen
Vice President

Enclosure: Cost Estimate

Site/Project Name: Toussiant River
Job Description: Dive OE Removal
Date Prepared: 08/02/06

COST BREAKDOWN BY TASK

Task 1, Work Plan

	Labor	$	3,425.86
	ODC's		$114.18
	Travel	$	-
Sub Total		$	3,540.04

Task 2, Site Setup and Reacquisition

	Labor	$	17,555.41
	ODC's		$5,022.14
	Travel	$	9,719.19
Sub Total		$	32,296.74

Task 3, Mob/Demob & UXO Support

	Labor	$	115,983.15
	ODC's		$46,946.89
	Travel	$	30,526.10
Sub Total		$	193,456.13

TOTAL PROJECT COST **$ 229,292.90**

Task 1, Work Plan

FFP

LABOR CATEGORY	Qty	RATE	Hrs.	Cost	HPD Hrs.	HPD 4%	HPD Hrs.	HPD 8%	Cost with Fee
Project Manager	1	$75.97	25	$1,899.25					$2,051.19
Quality Manager	1	$53.28	2	$106.56					$115.08
SUXOS	1	$64.21	8	$513.68					$554.77
UXOSO/QC		$54.23							
UXO Tech III		$49.30							
UXO Tech II		$41.13							
UXO Tech I / Sweep		$34.00							
UXOSO/QC - Dive		$103.03							
UXO Tech III - Dive		$93.67							
UXO Tech II - Dive		$78.15							
UXO Tech I/Sweep-Dive		$64.59							
SUXOS - OT		$96.32							
UXOSO/QC - OT		$81.34							
UXO Tech III - OT		$73.95							
UXO Tech II - OT		$61.69							
UXO Tech I / Sweep - OT		$51.00							
UXOSO/QC - Dive - OT		$154.55							
UXO Tech III - Dive - OT		$140.50							
UXO Tech II - Dive - OT		$117.22							
UXO Tech I/Sweep-Dive - OT		$96.89							
GIS Manager	1	$61.40	4	$245.60					$265.25
Certified Ind Hyg	1	$101.75	4	$407.00					$439.56

Total Labor: 3,425.86

Trvl/Lodg/Per Diem		RATE	Units	Cost with Hndlg fee
Lodging (Man Days)		$76.00		
Per Diem (Man Days)		$41.00		
Lodging (Man Days)		$76.00		
Per Diem (Man Days)		$41.00		
Rental Vehicle (Daily)		$82.00		
Gas/Tolls		$15.00		
POV Mileage		$0.375		
Parking (daily)		$10.00		
Air Fare		$700.00		
From: Oak Ridge				
To:				

Total Travel:

Total for Task : **$3,540.04**

ODC's	Qty	RATE	Units	Cost	Cost w/G&A & Fee
Map Reproduction	3	$2.85	3	$25.65	$30.96
B&W Copies	3	$0.06	40.00	$7.20	$8.69
Color Copies	3	$0.85	5	$12.75	$15.39
CDs	1	$1.00	1	$1.00	$1.21
Binders	3	$5.00	1	$15.00	$18.10
FedEx (each)	1	$33.00	1	$33.00	$39.83
Schonstedts		$5.00			
Truck / work day		$87.00			
Explosives / delivery (ea)		$920.00			
Demo Kit / work day		$5.00			
Scrap Disposal		$1,000.00			
Camera / photo		$20.00			
Field Tool Kit / work day		$5.00			
Field Supplies / work day		$5.00			
Dive Equipment (per day)		$216.00			
Equipment Mob/demob		$1,100.00			
Fuel/oil/lubricants		$10.00			
Boat - Large (per day)		$250.00			
Boat - Small (per day)		$50.00			
Sanbags / enclosure		$180.00			
Phone (per month)		$60.00			
Radio (per month)		$60.00			
Underwater Metal Detector/Gradiometer		$111.00			
Explosive Storage Locker		$100.00			
Explosive Locker Delivery		$1,000.00			

Total ODCs: $114.18

Site/Project Name: Toussiant River
Job Description: Dive OE Removal
Date Prepared: 08/02/06

Type: FFP
Handling Fee: 6.50%
Fee: 8.00%

Task 2, Site Setup and Reacquisition

FFP

LABOR CATEGORY					HPD		HPD		
(Regular Time)	Qty	RATE	Hrs.	Cost	Hrs.	HPD 4%	Hrs.	HPD 8%	Cost with Fee
Project Manager		$75.97							
Quality Manager		$53.28							
SUXOS	1	$64.21	30	$1,926.30					$2,080.40
UXOSO/QC	1	$54.23	30	$1,626.82			24	$104.12	$1,869.41
UXO Tech III	3	$49.30	30	$4,436.79			72	$283.95	$5,098.40
UXO Tech II	6	$41.13	30	$7,403.22			144	$473.81	$8,507.19
UXO Tech I / Sweep		$34.00							
UXOSO/QC - Dive		$103.03							
UXO Tech III - Dive		$93.67							
UXO Tech II - Dive		$78.15							
UXO Tech I/Sweep-Dive		$64.59							
SUXOS - OT		$96.32							
UXOSO/QC - OT		$81.34							
UXO Tech III - OT		$73.95							
UXO Tech II - OT		$61.69							
UXO Tech I / Sweep - OT		$51.00							
UXOSO/QC - Dive - OT		$154.55							
UXO Tech III - Dive - OT		$140.50							
UXO Tech II - Dive - OT		$117.22							
UXO Tech I/Sweep-Dive - OT		$96.89							
GIS Manager		$61.40							
Certified Ind Hyg		$101.75							

Total Labor: 17,555.41

Trvl/Lodg/Per Diem		RATE	Units	Cost with Hndlg fee
Lodging (Man Days)	12	$76.00	6.0	5,827.68
Per Diem (Man Days)	12	$41.00	6.0	3,143.88
Lodging (Man Days)	1	$76.00	6	485.64
Per Diem (Man Days)	1	$41.00	6	261.99
Rental Vehicle (Daily)		$82.00		
Gas/Tolls		$15.00		
POV Mileage		$0.375		
Parking (daily)		$10.00		
Air Fare		$700.00		
From:				
To:				

Total Travel: 9,719.19

Total for Task : $32,296.74

ODC's	Qty	RATE	Units	Cost	Cost w/G&A & Fee
Map Reproduction		$2.85			
B&W Copies		$0.06			
Color Copies		$0.85			
CDs		$1.00			
Binders		$5.00			
FedEx (each)	1	$33.00	1	$33.00	$39.83
Schonstedts	6	$5.00	3	$90.00	$108.63
Truck / work day	4	$87.00	3	$1,044.00	$1,260.06
Explosives / delivery (ea)		$1,240.00			
Demo Kit / work day		$5.00			
Scrap Disposal		$1,200.00			
Camera / photo	2	$20.00	3	$120.00	$144.83
Field Tool Kit / work day	3	$5.00	3	$45.00	$54.31
Field Supplies / work day	3	$5.00	3	$45.00	$54.31
Dive Equipment (per day)		$216.00			
Equipment Mob/demob		$2,400.00			
Fuel/oil/lubricants	4	$10.00	3	$120.00	$144.83
Boat - Large (per day)	1	$325.00	3.0	$975.00	$1,176.78
Boat - Small (per day)	1	$210.00	3.0	$630.00	$760.38
Sanbags / enclosure		$180.00			
Phone (per month)	2	$60.00	0.25	$30.00	$36.21
Radio (per month)	2	$60.00	0.25	$30.00	$36.21
Underwater Metal Detector/Gradiometer	3	$111.00	3	$999.00	$1,205.75
Explosive Storage Locker		$125.00			
Explosive Locker Delivery		$1,200.00			

Total ODCs: $5,022.14

Site/Project Name: Toussiant River
Job Description: Dive OE Removal
Date Prepared: 08/02/06

Type: FFP
Handeling Fee: 6.50%
Fee: 8.00%

Task 3, Mob/Demob & UXO Support

FFP

LABOR CATEGORY (Regular Time)	Qty	RATE	Hrs.	Cost	HPD Hrs.	HPD 4%	HPD Hrs.	HPD 8%	Cost with Fee
Project Manager	1	$75.97	40	$3,038.80					$3,281.90
Quality Manager		$53.28							
SUXOS	1	$64.21	96	$6,164.16					$6,657.29
UXOSO/QC	1	$54.23	72	$3,904.37			57.6	$249.88	$4,486.59
UXO Tech III	3	$49.30	32	$4,732.57			76.8	$302.88	$5,438.29
UXO Tech II	6	$41.13	32	$7,896.77			153.6	$505.39	$9,074.34
UXO Tech I / Sweep		$34.00							
UXOSO/QC - Dive	1	$103.03	24	$2,472.77			24	$197.82	$2,884.24
UXO Tech III - Dive	3	$93.67	64	$17,983.78			192	$1,438.70	$20,976.28
UXO Tech II - Dive	6	$78.15	64	$30,007.74			384	$2,400.62	$35,001.02
UXO Tech I/Sweep-Dive		$64.59							
SUXOS - OT	1	$96.32	20	$1,926.30					$2,080.40
UXOSO/QC - OT	1	$81.34	14.0	$1,138.78			11.2	$72.88	$1,308.59
UXO Tech III - OT	3	$73.95	4.0	$887.36			9.6	$56.79	$1,019.68
UXO Tech II - OT	6	$61.69	4.0	$1,480.64			19.2	$94.76	$1,701.44
UXO Tech I / Sweep - OT		$51.00							
UXOSO/QC - Dive - OT	1	$154.55	6.0	$927.29			6	$74.18	$1,081.59
UXO Tech III - Dive - OT	3	$140.50	16.0	$6,743.92			48	$539.51	$7,866.10
UXO Tech II - Dive - OT	6	$117.22	16.0	$11,252.90			96	$900.23	$13,125.38
UXO Tech I/Sweep-Dive - OT		$96.89							
GIS Manager		$61.40							
Certified Ind Hyg		$101.75							

Total Labor: **115,983.15**

Trvl/Lodg/Per Diem		RATE	Units	Cost with Hndlg fee
Lodging (Man Days)	12	$76.00	13.0	12,626.64
Per Diem (Man Days)	12	$41.00	14.0	7,335.72
Lodging (Man Days)	1	$76.00	7	566.58
Per Diem (Man Days)	1	$41.00	7	305.66
Rental Vehicle (Daily)		$82.00		
Gas/Tolls		$15.00		
POV Mileage		$0.375		
Parking (daily)		$10.00		
Air Fare	13	$700.00	1	9,691.50
From:				
To:				

Total Travel: **30,526.10**

Total for Task : **$193,456.13**

ODC's	Qty	RATE	Units	Cost	Cost w/G&A & Fee
Map Reproduction		$2.85			
B&W Copies		$0.06			
Color Copies		$0.85			
CDs		$1.00			
Binders		$5.00			
FedEx (each)	3	$33.00	1	$99.00	$119.49
Schonstedts	6	$5.00	10	$300.00	$362.09
Truck / work day	4	$87.00	13	$4,524.00	$5,460.26
Explosives / delivery (ea)	1	$1,240.00	2	$2,480.00	$2,993.25
Demo Kit / work day	1	$5.00	10	$50.00	$60.35
Scrap Disposal	1	$1,200.00	1	$1,200.00	$1,448.34
Camera / photo	2	$20.00	10	$400.00	$482.78
Field Tool Kit / work day	3	$5.00	10	$150.00	$181.04
Field Supplies / work day	3	$5.00	10	$150.00	$181.04
Dive Equipment (per day)	10	$216.00	8	$17,280.00	$20,856.17
Equipment Mob/demob	1	$2,400.00	1	$2,400.00	$2,896.69
Fuel/oil/lubricants	1	$10.00	5	$50.00	$60.35
Boat - Large (per day)	1	$325.00	8.0	$2,600.00	$3,138.08
Boat - Small (per day)	1	$210.00	8.0	$1,680.00	$2,027.68
Sanbags / enclosure	1	$180.00	2	$360.00	$434.50
Phone (per month)	2	$60.00	0.25	$30.00	$36.21
Radio (per month)	2	$60.00	0.25	$30.00	$36.21
Underwater Metal Detector/Gradiometer	3	$111.00	8	$2,664.00	$3,215.33
Explosive Storage Locker	1	$125.00	10	$1,250.00	$1,508.69
Explosive Locker Delivery	1	$1,200.00	1	$1,200.00	$1,448.34

Total ODCs: **$46,946.89**

Site/Project Name: Toussiant River
Job Description: Dive OE Removal
Date Prepared: 08/02/06

Type: FFP
Handeling Fee: 6.50%
Fee: 8.00%

APPENDIX B
MAPS AND TARGET DATA
SITE SPECIFIC FINAL REPORT

SUPPORT OF VALIDATION OF THE MARINE TOWED ARRAY DEMONSTRATION AT FORMER ERIE ARMY DEPOT AND TOUSSAINT RIVER

322742.456642 323931.179020 325119.901397 326308.623774 327497.346152 328686.068529 329874.790907 331063.513284 332252.235662 333440.958039 334629.680417 335818.402794 337007.125171

4616359.449738 4615170.127360 4613982.004983 4612793.882605 4611604.760228 4610415.637850 4609227.515473 4608038.393095 4606849.270718 4605660.148341

TRU-307 X= 327216.6 Y= 4615746.3
TRU-308 X= 327396.2 Y= 4615740.7
TRU-309 X= 328177.3 Y= 4615743.9
TRU-310 X= 328363.9 Y= 4615745.6
TRU-312 X= 328709.3 Y= 4615752.7
TRU-313 X= 328889.9 Y= 4615756.6
TRU-316 X= 330176.3 Y= 4615741
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TRU-320 X= 330670.8 Y= 4615741.8
TRU-322 X= 331114.8 Y= 4615740.6
TRU-324 X= 331283.4 Y= 4615746.9
TRU-325 X= 331476.4 Y= 4615747.8
TRU-326 X= 331727.9 Y= 4615744
TRU-327 X= 332095.1 Y= 4615738.4
TRU-328 X= 332388.5 Y= 4615742.6
TRU-329 X= 333526.4 Y= 4615744.8
TRU-229 X= 331782.1 Y= 4615077.3
TRU-230 X= 331980.8 Y= 4615086.3
TRU-232 X= 332009.7 Y= 4615086.7
TRU-233 X= 332105.8 Y= 4615086.9
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TRU-202 X= 329161.9 Y= 4614425.9
TRU-203 X= 329534.9 Y= 4614429.4
TRU-204 X= 329655.6 Y= 4614428
TRU-216 X= 322741.2 Y= 4613106
TRU-217 X= 323463.1 Y= 4613104.4
TRU-218 X= 324095.1 Y= 4613107.2
TRU-219 X= 330814.9 Y= 4613769.9
TRU-220 X= 331175.4 Y= 4613765.4
TRU-223 X= 331417.5 Y= 4613761.5
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TRU-208 X= 324531.1 Y= 4610143.5
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TRU-302 X= 332732.1 Y= 4606835.5
TRU-304 X= 333674.4 Y= 4606838
TRU-305 X= 333938.5 Y= 4606838
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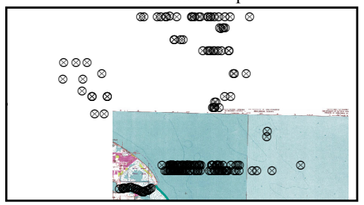
Legend

⊗ AETC Anomalies

Location Map



10°42'
MN TN

UTM Zone 17 NAD 1983

Data Source:
AETC - Geophysic Targets

Meters
0 595 1,190 2,380 3,570

0 1,950 3,900 7,800 11,700
Feet

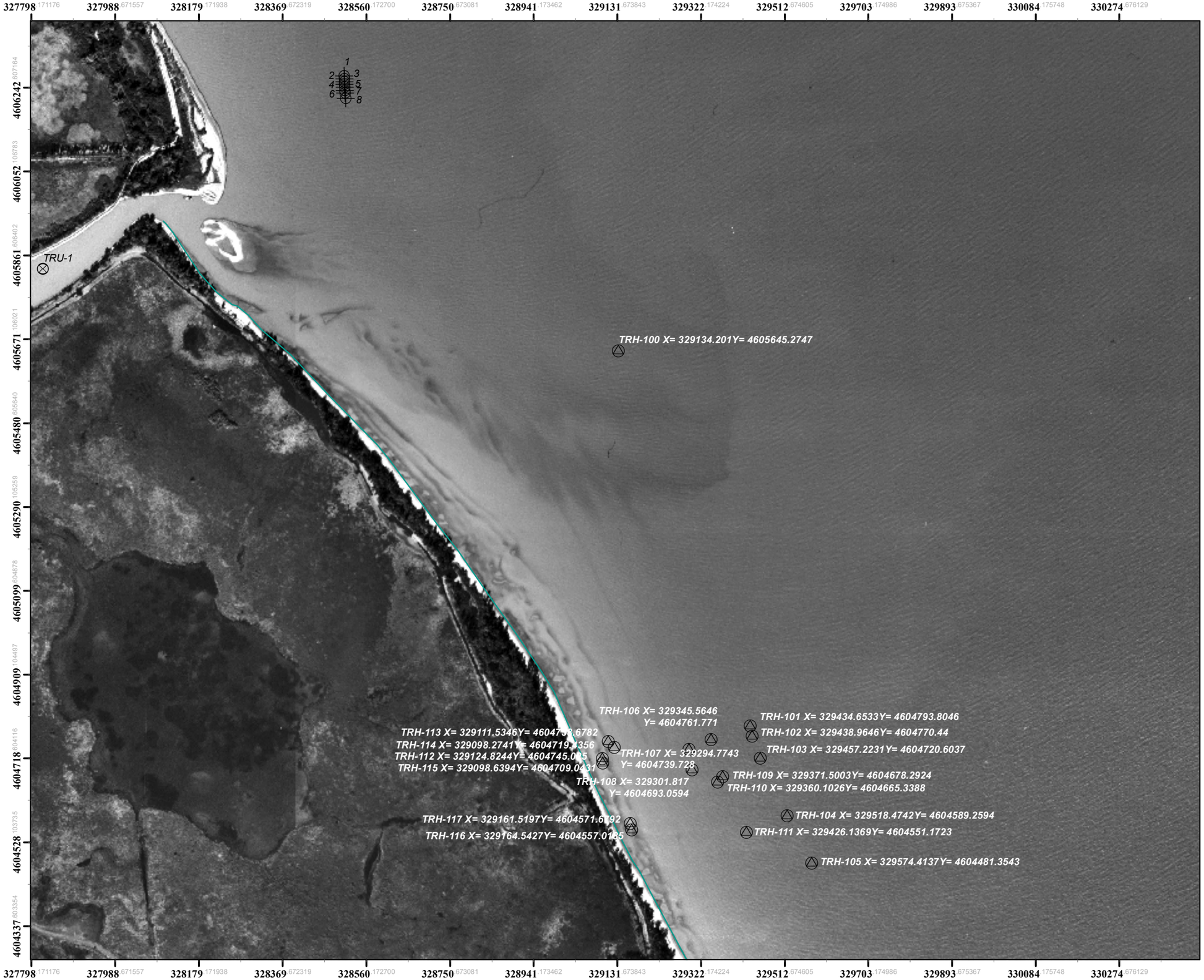
Geophysical Targets
Toussaint River Anomaly Verification
Initial Investigation Anomolies
Port Clinton, OH

Prepared For:
AETC

AETC

Prepared By:
EOTI EXPLOSIVE ORDNANCE TECHNOLOGIES, INC.
Explosive Ordnance Technologies, Inc.

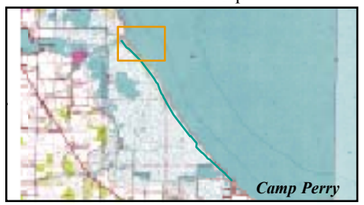
Date: Sept 25, 2006	Scale:1:47,846
Created By: M.Norris	Rev #. 0



Legend

- AETC Anomalies
- Rebar Target GPO
- River Helicopter Targets

Location Map



UTM Zone 17 NAD 1983

Data Source:
AETC - Geophysic Targets

Meters

0 106.5 213 426 639

0 350 700 1,400 2,100

Feet

Geophysical Targets
Toussaint River Anomaly Verification
Helicopter-Mounted Array
Port Clinton, OH

Prepared For:
AETC

AETC

Prepared By:
EOTI
EXPLOSIVE ORDNANCE TECHNOLOGIES, INC.
Explosive Ordnance Technologies, Inc.

Date: Sept 25, 2006	Scale: 1:8,400
Created By: M.Norris	Rev #. 0

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4624438.798571 4624133.997961 4623829.197351 4623524.396742 4623219.596132 4622914.795523 4622609.994913 4622305.194303 4622000.393694 4621695.593084

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TRU-54
X= 325134.8 Y= 4623663.3

TRU-55
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TRU-56
X= 326076.2 Y= 4623667.7

TRU-57
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TRU-58
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TRU-59
X= 323709.2 Y= 4622348.4

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TRU-61
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TRU-66
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TRU-68
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TRU-69
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Legend

- AETC Anomalies
- AETC West Sister Anomalies

Location Map

10°42'
MN
TN

UTM Zone 17 NAD 1983

Data Source:
AETC - Geophysic Targets

Meters
0 152 304 608 912

0 500 1,000 2,000 3,000
Feet

Geophysical Targets
Toussaint River Anomaly Verification
West Sister Island
Port Clinton, OH

Prepared For:
AETC

AETC

Prepared By:
Explosive Ordnance Technologies, Inc.

EOTI
EXPLOSIVE ORDNANCE TECHNOLOGIES, INC.

Date: Sept 25, 2006	Scale: 1:12,143
Created By: M.Norris	Rev #. 0

EOTI Dig List for the AETC Toussaint River Lake Erie Demonstration
Primary Coordinate System UTM Zone 17N NAD 1983 Meters
Developed from the Toussaint_River_Targets_For_Remediation.xls dated 9-25-06

GPS ID	ID	UTM_X	UTM_Y	Est_Depth_ Water(Ft)	Est_Depth (In)	Size (In)	OE_Type	Time	Date	Orientation	Weight LB	Attitude	Photo #	Narrative
1	TRU-1	327823.810	4605831.960										TRU-1	
2	TRU-2	327754.840	4605770.890										TRU-2	
3	TRU-3	327687.060	4605743.410										TRU-3	
4	TRU-4	327631.780	4605710.160										TRU-4	
5	TRU-5	327563.140	4605688.720										TRU-5	
6	TRU-6	327552.880	4605690.610										TRU-6	
7	TRU-7	327399.100	4605631.160										TRU-7	
8	TRU-8	327393.110	4605628.320										TRU-8	
9	TRU-9	327367.740	4605606.560										TRU-9	
10	TRU-10	327300.090	4605624.130										TRU-10	
11	TRU-11	327224.230	4605666.650										TRU-11	

OEType: UXO(UXO),OS(Ordnance Scrap),S(Scrap),NC(No Contact),O(Other)

EOTI Dig List for the AETC Toussaint River Lake Erie Demonstration
Primary Coordinate System UTM Zone 17N NAD 1983 Meters
Developed from the Toussaint_River_Targets_For_Remediation.xls dated 9-25-06

GPS ID	ID	UTM_X	UTM_Y	Est_Depth_ Water(Ft)	Est_Depth (In)	Size (In)	OE_Type	Time	Date	Orientation	Weight LB	Attitude	Photo #	Narrative
12	TRU-12	327153.990	4605715.480										TRU-12	
13	TRU-13	327039.960	4605758.480										TRU-13	
14	TRU-14	327031.770	4605759.460										TRU-14	
15	TRU-15	326962.980	4605770.470										TRU-15	
16	TRU-16	326893.180	4605784.720										TRU-16	
17	TRU-17	326793.190	4605812.800										TRU-17	
18	TRU-18	326668.490	4605860.290										TRU-18	
19	TRU-19	326652.140	4605865.020										TRU-19	
20	TRU-20	326555.860	4605878.840										TRU-20	
21	TRU-21	326448.010	4605853.600										TRU-21	
22	TRU-22	326310.980	4605849.460										TRU-22	

OEType: UXO(UXO),OS(Ordnance Scrap),S(Scrap),NC(No Contact),O(Other)

EOTI Dig List for the AETC Toussaint River Lake Erie Demonstration
Primary Coordinate System UTM Zone 17N NAD 1983 Meters
Developed from the Toussaint_River_Targets_For_Remediation.xls dated 9-25-06

GPS ID	ID	UTM_X	UTM_Y	Est_Depth_ Water(Ft)	Est_Depth (In)	Size (In)	OE_Type	Time	Date	Orientation	Weight LB	Attitude	Photo #	Narrative
23	TRU-23	326303.080	4605829.300										TRU-23	
24	TRU-24	326268.730	4605834.710										TRU-24	
25	TRU-25	326200.250	4605814.550										TRU-25	
26	TRU-26	326194.190	4605811.900										TRU-26	
27	TRU-27	326189.440	4605814.960										TRU-27	
28	TRU-28	325982.650	4605807.900										TRU-28	
	TRU-55	326030.440	4623667.580										TRU-55	155mm fuzing not determined/ to deep in mud
	TRU-66	325019.610	4622233.600										TRU-66	250 lb general purpose bomb/ deep in mud
	TRU-69	327096.150	4622346.010										TRU-69	155mm fuzing not determined/ to deep in mud
29	TRU-201	329154.600	4614425.640										TRU-201	
30	TRU-202	329161.880	4614425.900										TRU-202	

OEType: UXO(UXO),OS(Ordnance Scrap),S(Scrap),NC(No Contact),O(Other)

EOTI Dig List for the AETC Toussaint River Lake Erie Demonstration
Primary Coordinate System UTM Zone 17N NAD 1983 Meters
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GPS ID	ID	UTM_X	UTM_Y	Est_Depth_ Water(Ft)	Est_Depth (In)	Size (In)	OE_Type	Time	Date	Orientation	Weight LB	Attitude	Photo #	Narrative
31	TRU-203	329534.910	4614429.390										TRU-203	
32	TRU-204	329655.590	4614428.030										TRU-204	
33	TRU-205	332577.840	4612447.270										TRU-205	
34	TRU-206	332640.770	4612446.440										TRU-206	
35	TRU-207	333327.740	4612452.090										TRU-207	
36	TRU-208	324531.090	4610143.480										TRU-208	
37	TRU-209	325092.600	4610137.630										TRU-209	
38	TRU-210	324395.860	4611125.750										TRU-210	
39	TRU-211	325270.800	4611126.550										TRU-211	
40	TRU-212	323816.910	4611456.030										TRU-212	
41	TRU-213	322692.440	4612115.430										TRU-213	

OEType: UXO(UXO),OS(Ordnance Scrap),S(Scrap),NC(No Contact),O(Other)

GPS ID	ID	UTM_X	UTM_Y	Est_Depth_ Water(Ft)	Est_Depth (In)	Size (In)	OE_Type	Time	Date	Orientation	Weight LB	Attitude	Photo #	Narrative
42	TRU-214	323853.500	4612114.430										TRU-214	
43	TRU-215	324967.510	4612445.280										TRU-215	
44	TRU-216	322741.230	4613105.970										TRU-216	
45	TRU-217	323463.080	4613104.420										TRU-217	
46	TRU-218	324095.140	4613107.220										TRU-218	
47	TRU-219	330814.900	4613769.880										TRU-219	
48	TRU-220	331101.830	4613764.930										TRU-220	
49	TRU-221	331175.380	4613765.410										TRU-221	
50	TRU-222	331245.040	4613765.690										TRU-222	
51	TRU-223	331417.540	4613761.450										TRU-223	
52	TRU-224	331483.960	4613751.690										TRU-224	

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GPS ID	ID	UTM_X	UTM_Y	Est_Depth_ Water(Ft)	Est_Depth (In)	Size (In)	OE_Type	Time	Date	Orientation	Weight LB	Attitude	Photo #	Narrative
53	TRU-225	331690.780	4613767.080										TRU-225	155mm/ stuck in rocks/ unkown fuzing
54	TRU-226	331892.740	4613766.870										TRU-226	
55	TRU-227	332308.400	4613761.810										TRU-227	155mm/ stuck in rocks/ unkown fuzing
56	TRU-228	332327.840	4613765.480										TRU-228	
57	TRU-229	331782.140	4615077.250										TRU-229	
58	TRU-230	331869.590	4615073.850										TRU-230	
59	TRU-231	331980.750	4615086.280										TRU-231	
60	TRU-232	332009.730	4615086.670										TRU-232	
61	TRU-233	332105.790	4615086.890										TRU-233	
62	TRU-234	334514.140	4608815.880										TRU-234	
63	TRU-235	334545.640	4609137.500										TRU-235	

OEType: UXO(UXO),OS(Ordnance Scrap),S(Scrap),NC(No Contact),O(Other)

GPS ID	ID	UTM_X	UTM_Y	Est_Depth_ Water(Ft)	Est_Depth (In)	Size (In)	OE_Type	Time	Date	Orientation	Weight LB	Attitude	Photo #	Narrative
64	TRU-236	331371.460	4610466.530										TRU-236	
65	TRU-237	331412.850	4610467.910										TRU-237	
66	TRU-238	331462.740	4610465.050										TRU-238	
67	TRU-239	331482.930	4610465.610										TRU-239	
68	TRU-240	331492.560	4610466.300										TRU-240	
69	TRU-241	331757.790	4610466.570										TRU-241	
70	TRU-242	331487.760	4610796.680										TRU-242	
71	TRU-243	331568.560	4610796.030										TRU-243	
72	TRU-244	324395.860	4611125.750										TRU-244	
73	TRU-245	325270.800	4611126.550										TRU-245	
74	TRU-246	332072.370	4611129.230										TRU-246	

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GPS ID	ID	UTM_X	UTM_Y	Est_Depth_ Water(Ft)	Est_Depth (In)	Size (In)	OE_Type	Time	Date	Orientation	Weight LB	Attitude	Photo #	Narrative
75	TRU-247	332430.850	4611129.710										TRU-247	
76	TRU-248	328613.630	4606837.020										TRU-248	
77	TRU-249	328708.890	4606832.870										TRU-249	
78	TRU-250	328799.250	4606833.460										TRU-250	
79	TRU-251	328886.350	4606836.420										TRU-251	
80	TRU-252	328923.370	4606832.960										TRU-252	
81	TRU-253	328947.280	4606832.660										TRU-253	
82	TRU-254	328987.630	4606832.390										TRU-254	
83	TRU-255	329065.460	4606836.760										TRU-255	
84	TRU-256	329145.160	4606831.640										TRU-256	
85	TRU-257	329156.030	4606833.080										TRU-257	

GPS ID	ID	UTM_X	UTM_Y	Est_Depth_ Water(Ft)	Est_Depth (In)	Size (In)	OE_Type	Time	Date	Orientation	Weight LB	Attitude	Photo #	Narrative
86	TRU-258	329187.060	4606840.410										TRU-258	
87	TRU-259	329205.540	4606839.340										TRU-259	
88	TRU-260	329230.870	4606833.770										TRU-260	
89	TRU-261	329294.630	4606834.420										TRU-261	
90	TRU-262	329347.690	4606837.200										TRU-262	155mm fuzed
91	TRU-263	329359.810	4606834.490										TRU-263	
92	TRU-264	329377.650	4606835.780										TRU-264	
93	TRU-265	329439.540	4606837.330										TRU-265	
94	TRU-266	329448.260	4606835.480										TRU-266	
95	TRU-267	329474.120	4606833.180										TRU-267	
96	TRU-268	329587.700	4606831.980										TRU-268	155 fuzed

GPS ID	ID	UTM_X	UTM_Y	Est_Depth_ Water(Ft)	Est_Depth (In)	Size (In)	OE_Type	Time	Date	Orientation	Weight LB	Attitude	Photo #	Narrative
97	TRU-269	329601.970	4606831.980										TRU-269	
98	TRU-270	329606.640	4606832.730										TRU-270	
99	TRU-271	329673.120	4606836.170										TRU-271	
100	TRU-272	329723.750	4606831.900										TRU-272	4.2 mortar fuzed
101	TRU-273	329800.610	4606838.140										TRU-273	
102	TRU-274	329851.890	4606837.420										TRU-274	
103	TRU-275	330027.440	4606834.830										TRU-275	
104	TRU-276	330056.380	4606835.280										TRU-276	
105	TRU-277	330061.790	4606836.870										TRU-277	
106	TRU-278	330328.380	4606835.940										TRU-278	
107	TRU-279	330385.570	4606837.380										TRU-279	

GPS ID	ID	UTM_X	UTM_Y	Est_Depth_ Water(Ft)	Est_Depth (In)	Size (In)	OE_Type	Time	Date	Orientation	Weight LB	Attitude	Photo #	Narrative
108	TRU-280	330483.290	4606837.110										TRU-280	
109	TRU-281	330529.890	4606837.000										TRU-281	4.2 mortar fuzed
110	TRU-282	330538.730	4606836.260										TRU-282	4.2 mortar fuzed
111	TRU-283	330654.190	4606837.010										TRU-283	155mm fuzed
112	TRU-284	331183.300	4606834.570										TRU-284	
113	TRU-285	331296.360	4606834.900										TRU-285	
114	TRU-286	331495.960	4606837.130										TRU-286	
115	TRU-287	331526.340	4606835.800										TRU-287	
116	TRU-288	331683.340	4606837.660										TRU-288	
117	TRU-289	331718.670	4606834.180										TRU-289	
118	TRU-290	331762.030	4606835.460										TRU-290	

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GPS ID	ID	UTM_X	UTM_Y	Est_Depth_ Water(Ft)	Est_Depth (In)	Size (In)	OE_Type	Time	Date	Orientation	Weight LB	Attitude	Photo #	Narrative
119	TRU-291	331785.230	4606837.740										TRU-291	
120	TRU-292	331845.650	4606838.370										TRU-292	
121	TRU-293	331889.300	4606836.520										TRU-293	
122	TRU-294	331944.940	4606836.090										TRU-294	155mm fuzed
123	TRU-295	332082.330	4606838.960										TRU-295	155mm fuzed
124	TRU-296	332127.620	4606837.390										TRU-296	155mm fuzed
125	TRU-297	332169.820	4606832.730										TRU-297	
126	TRU-298	332192.400	4606831.910										TRU-298	4.2 mortar fuzed
127	TRU-299	332208.470	4606832.670										TRU-299	
128	TRU-300	332263.440	4606834.820										TRU-300	
129	TRU-301	332619.990	4606838.370										TRU-301	

OEType: UXO(UXO),OS(Ordnance Scrap),S(Scrap),NC(No Contact),O(Other)

GPS ID	ID	UTM_X	UTM_Y	Est_Depth_ Water(Ft)	Est_Depth (In)	Size (In)	OE_Type	Time	Date	Orientation	Weight LB	Attitude	Photo #	Narrative
130	TRU-302	332732.130	4606835.470										TRU-302	
131	TRU-303	332912.680	4606835.260										TRU-303	155mm fuzed
132	TRU-304	333674.360	4606837.950										TRU-304	
133	TRU-305	333938.530	4606837.980										TRU-305	
134	TRU-306	334814.940	4606837.280										TRU-306	
135	TRU-307	327216.620	4615746.320										TRU-307	155mm fuzing not determined/ to deep in mud
136	TRU-308	327396.150	4615740.680										TRU-308	155mm fuzing not determined/ to deep in mud
137	TRU-309	328177.260	4615743.930										TRU-309	155mm fuzing not determined/ to deep in mud
138	TRU-310	328363.850	4615745.580										TRU-310	
139	TRU-311	328655.620	4615741.720										TRU-311	155mm fuzing not determined/ to deep in mud
140	TRU-312	328709.320	4615752.650										TRU-312	

GPS ID	ID	UTM_X	UTM_Y	Est_Depth_ Water(Ft)	Est_Depth (In)	Size (In)	OE_Type	Time	Date	Orientation	Weight LB	Attitude	Photo #	Narrative
141	TRU-313	328889.860	4615756.550										TRU-313	155mm fuzing not determined/ to deep in mud
142	TRU-314	329294.320	4615751.920										TRU-314	
143	TRU-315	330156.620	4615740.110										TRU-315	155mm fuzing not determined/ to deep in mud
144	TRU-316	330176.300	4615741.030										TRU-316	
145	TRU-317	330223.620	4615741.340										TRU-317	90mm fuzing not determined/ to deep in mud
146	TRU-318	330313.470	4615753.050										TRU-318	
147	TRU-319	330587.900	4615741.670										TRU-319	
148	TRU-320	330670.800	4615741.770										TRU-320	
149	TRU-321	331097.690	4615740.340										TRU-321	155mm fuzing not determined/ to deep in mud
150	TRU-322	331114.770	4615740.590										TRU-322	
151	TRU-323	331230.120	4615746.290										TRU-323	155mm fuzing not determined/ to deep in mud

GPS ID	ID	UTM_X	UTM_Y	Est_Depth_ Water(Ft)	Est_Depth (In)	Size (In)	OE_Type	Time	Date	Orientation	Weight LB	Attitude	Photo #	Narrative
152	TRU-324	331283.410	4615746.890										TRU-324	155mm fuzing not determined/ to deep in mud
153	TRU-325	331476.390	4615747.750										TRU-325	
154	TRU-326	331727.850	4615744.030										TRU-326	155mm fuzing not determined/ to deep in mud
155	TRU-327	332095.090	4615738.360										TRU-327	
156	TRU-328	332388.540	4615742.570										TRU-328	
157	TRU-329	333526.360	4615744.760										TRU-329	
158	TRU-330	328448.280	4607166.980										TRU-330	
159	TRU-331	328849.760	4607165.940										TRU-331	
160	TRU-332	328897.750	4607166.180										TRU-332	
161	TRU-333	328937.760	4607169.000										TRU-333	
162	TRU-334	328945.870	4607168.290										TRU-334	

GPS ID	ID	UTM_X	UTM_Y	Est_Depth_ Water(Ft)	Est_Depth (In)	Size (In)	OE_Type	Time	Date	Orientation	Weight LB	Attitude	Photo #	Narrative
163	TRU-335	328954.490	4607167.290										TRU-335	
164	TRU-336	328960.110	4607168.880										TRU-336	
165	TRU-337	328966.440	4607167.250										TRU-337	
166	TRU-338	329012.260	4607166.510										TRU-338	
167	TRU-339	329042.910	4607164.630										TRU-339	
168	TRU-340	329061.100	4607165.120										TRU-340	
169	TRU-341	329067.490	4607163.870										TRU-341	
170	TRU-342	329100.390	4607165.930										TRU-342	
171	TRU-343	329122.970	4607165.900										TRU-343	
172	TRU-344	329131.660	4607166.030										TRU-344	
173	TRU-345	329332.110	4607166.420										TRU-345	

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GPS ID	ID	UTM_X	UTM_Y	Est_Depth_ Water(Ft)	Est_Depth (In)	Size (In)	OE_Type	Time	Date	Orientation	Weight LB	Attitude	Photo #	Narrative
174	TRU-346	329339.680	4607163.770										TRU-346	
175	TRU-347	329348.410	4607165.610										TRU-347	
176	TRU-348	329433.150	4607167.200										TRU-348	
177	TRU-349	329530.310	4607165.270										TRU-349	
178	TRU-350	329615.250	4607166.310										TRU-350	
179	TRU-351	329623.570	4607166.820										TRU-351	
180	TRU-352	329630.890	4607165.860										TRU-352	
181	TRU-353	329720.260	4607165.930										TRU-353	
182	TRU-354	329727.000	4607166.500										TRU-354	
183	TRU-355	329848.520	4607167.490										TRU-355	
184	TRU-356	329889.890	4607168.250										TRU-356	

OEType: UXO(UXO),OS(Ordnance Scrap),S(Scrap),NC(No Contact),O(Other)

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GPS ID	ID	UTM_X	UTM_Y	Est_Depth_ Water(Ft)	Est_Depth (In)	Size (In)	OE_Type	Time	Date	Orientation	Weight LB	Attitude	Photo #	Narrative
185	TRU-357	329896.650	4607165.840										TRU-357	
186	TRU-358	329925.180	4607165.970										TRU-358	
187	TRU-359	329932.140	4607162.400										TRU-359	
188	TRU-360	329940.340	4607164.700										TRU-360	
189	TRU-361	330035.210	4607166.440										TRU-361	
190	TRU-362	330044.000	4607167.030										TRU-362	
191	TRU-363	330046.710	4607166.140										TRU-363	
192	TRU-364	330141.210	4607162.650										TRU-364	
193	TRU-365	330292.690	4607163.210										TRU-365	
194	TRU-366	330341.220	4607164.620										TRU-366	
195	TRU-367	330441.620	4607166.960										TRU-367	

OEType: UXO(UXO),OS(Ordnance Scrap),S(Scrap),NC(No Contact),O(Other)

GPS ID	ID	UTM_X	UTM_Y	Est_Depth_ Water(Ft)	Est_Depth (In)	Size (In)	OE_Type	Time	Date	Orientation	Weight LB	Attitude	Photo #	Narrative
196	TRU-368	330552.250	4607163.420										TRU-368	
197	TRU-369	330594.690	4607160.540										TRU-369	
198	TRU-370	330606.700	4607161.420										TRU-370	
199	TRU-371	330632.310	4607162.330										TRU-371	
200	TRU-372	330695.570	4607161.270										TRU-372	
201	TRU-373	331318.320	4607164.570										TRU-373	
202	TRU-374	331339.650	4607164.090										TRU-374	
203	TRU-375	331364.360	4607165.100										TRU-375	
204	TRU-376	331371.140	4607164.020										TRU-376	
205	TRU-377	331604.970	4607166.230										TRU-377	
206	TRU-378	331611.490	4607166.570										TRU-378	

GPS ID	ID	UTM_X	UTM_Y	Est_Depth_ Water(Ft)	Est_Depth (In)	Size (In)	OE_Type	Time	Date	Orientation	Weight LB	Attitude	Photo #	Narrative
207	TRU-379	331625.480	4607165.270										TRU-379	
208	TRU-380	331639.490	4607165.240										TRU-380	
209	TRU-381	331713.790	4607164.180										TRU-381	
210	TRU-382	331721.740	4607165.430										TRU-382	
211	TRU-383	331775.440	4607166.450										TRU-383	
212	TRU-384	331960.240	4607167.520										TRU-384	
213	TRU-385	332442.210	4607165.310										TRU-385	
214	TRU-386	332741.970	4607163.800										TRU-386	
215	TRU-387	332836.200	4607164.510										TRU-387	
216	TRU-388	332917.480	4607168.190										TRU-388	
217	TRU-389	336477.420	4607163.710										TRU-389	

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GPS ID	ID	UTM_X	UTM_Y	Est_Depth_ Water(Ft)	Est_Depth (In)	Size (In)	OE_Type	Time	Date	Orientation	Weight LB	Attitude	Photo #	Narrative
1	TRU-50	323790.970	4623669.750											
2	TRU-51	323974.500	4623665.580											
3	TRU-52	324127.600	4623667.480											
4	TRU-53	324666.620	4623668.140											
5	TRU-54	325134.790	4623663.330											
6	TRU-55	326030.440	4623667.580											
7	TRU-56	326076.200	4623667.690											
8	TRU-57	326548.650	4623661.110											
9	TRU-58	323597.650	4622345.540											
10	TRU-59	323709.190	4622348.360											
11	TRU-60	324074.230	4622346.670											

OEType: UXO(UXO),OS(Ordnance Scrap),S(Scrap),NC(No Contact),O(Other)

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Primary Coordinate System UTM Zone 17N NAD 1983 Meters
Developed from the Toussaint_River_Targets_For_Remediation.xls dated 9-25-06

GPS ID	ID	UTM_X	UTM_Y	Est_Depth_ Water(Ft)	Est_Depth (In)	Size (In)	OE_Type	Time	Date	Orientation	Weight LB	Attitude	Photo #	Narrative
12	TRU-61	324501.230	4622344.520											
13	TRU-62	324576.890	4622344.710											
14	TRU-63	324830.770	4622327.240											
15	TRU-64	324862.020	4622318.330											
16	TRU-65	325015.320	4622232.350											
17	TRU-66	325019.610	4622233.600											
18	TRU-67	325024.180	4622233.060											
19	TRU-68	325581.260	4622346.790											
20	TRU-69	327096.150	4622346.010											

OEType: UXO(UXO),OS(Ordnance Scrap),S(Scrap),NC(No Contact),O(Other)

ID	UTM_X	UTM_Y	Priority	Est_Depth_ Water(Ft)	Est_Depth (In)	Size (In)	OE_Type	Time	Date
TRH-100	329134.2010	4605645.2747	1	12	na	na	na	11:00	10/18/2006
TRH-101	329434.6533	4604793.8046	1	7	24	24	155mm	9:12	10/18/2006
TRH-102	329438.9646	4604770.4400	1	7	na	na	na	9:00	10/18/2006
TRH-103	329457.2231	4604720.6037	1	7	6	24	155mm	8:43	10/18/2006
TRH-104	329518.4742	4604589.2594	1	10	26	48	2.75 Rocket Moter	8:34	10/18/2006
TRH-105	329574.4137	4604481.3543	1	10	6	48	2.75 Rocket Moter	8:25	10/18/2006
TRH-106	329345.5646	4604761.7710	2						
TRH-107	329294.7743	4604739.7280	2						
TRH-108	329301.8170	4604693.0594	2						
TRH-109	329371.5003	4604678.2924	2						
TRH-110	329360.1026	4604665.3388	2						
TRH-111	329426.1369	4604551.1723	2						
TRH-112	329124.8244	4604745.0250	2						
TRH-113	329111.5346	4604758.6782	2						
TRH-114	329098.2741	4604719.4356	2						
TRH-115	329098.6394	4604709.0431	2						
TRH-116	329164.5427	4604557.0185	2						
TRH-117	329161.5197	4604571.6792	2						

Orientation	Attitude	Photo #	Narrative
na	na	na	contact below 2ft
Straight Down	180	na	155mm below 2ft (not recovered)
na	na	na	strange contact below 2ft
North	Hoizantal	TRH-103	Mud bottom
60 Degree Angle Down	60 Degree Angle Down	na	Hard mud (notrecovered Fuzed)
East	Hoizantal	na	Mud (not Rovered Fuzed)

APPENDIX C
COMPLETED DIG SHEETS AND TARGET PHOTOS
SITE SPECIFIC FINAL REPORT

SUPPORT OF VALIDATION OF THE MARINE
TOWED ARRAY DEMONSTRATION
AT
FORMER ERIE ARMY DEPOT AND TOUSSAINT RIVER

EOTI Dig List for the AETC Toussaint River Lake Erie Demonstration
Primary Coordinate System UTM Zone 17N NAD 1983 Meters

GPS ID	ID	UTM_X	UTM_Y	Est_Depth_ Water(Ft)	Est_Depth (In)	Size (In)	OE_Type	Time	Date	Orientation	Weight LB	Attitude	Photo #	Narrative	AETC_Narrative
1	TRU-1	327823.810	4605831.960	4.0	NA	NA	NA	1049	10/5/2006	NA	NA	NA		Silt and mud bottom - contact below 2 feet	very large target
2	TRU-2	327754.840	4605770.890	4.0	NA	NA	NA	1107	10/5/2006	NA	NA	NA		Silt and mud bottom - contact below 2 feet	good target
3	TRU-3	327687.060	4605743.410	4.0	14.0	48.0	Scrap	1118	10/5/2006	South	8.0	Horizontal	TRU-3	Silt and mud bottom - metal fence post	good target
4	TRU-4	327631.780	4605710.160	4.0	NA	NA	NA	1138	10/5/2006	NA	NA	NA		Silt bottom -contact located below 2 feet	large target, large remnant moment
5	TRU-5	327563.140	4605688.720	6.0	24.0	24.0	Scrap	1115	10/5/2006	North	150.0	Horizontal		Silt and mud bottom - metal box 2 ft by 2ft - too heavy to move	good target
6	TRU-6	327552.880	4605690.610	6.0	24.0	NA	Scrap	1107	10/5/2006	North	NA	NA		Silt and mud bottom - aluminum cans - contact below 2 feet	very large target
7	TRU-7	327399.100	4605631.160	8.0	12.0	48.0	Scrap	1149	10/5/2006	North	1.0	Horizontal	TRU-7	Silt and mub bottom - ball of wire - small sample in picture	small target, likely too deep to dig
8	TRU-8	327393.110	4605628.320	8.0	10.0	3.0	Scrap	1202	10/5/2006	North	0.3	Horizontal	TRU-8	Silt and mud bottom - shotgun shell	good target
9	TRU-9	327367.740	4605606.560	6.0	12.0	25.0	Scrap	1211	10/5/2006	South	30.0	Horizontal	TRU-9	Silt bottom - steel belted tire	target south edge of channel, strong remnant moment
10	TRU-10	327300.090	4605624.130	4.0	24.0	NA	NA	1207	10/5/2006	NA	NA	NA		Silt bottom - contact below 2 feet	good target north edge of channel
11	TRU-11	327224.230	4605666.650	4.0	24.0	NA	Scrap	1152	10/5/2006	NA	NA	NA		Silt bottom - cans	good target in center of channel
12	TRU-12	327153.990	4605715.480	6.0	12.0	8.0	Scrap	1230	10/5/2006	North	0.3	Horizontal	TRU-12	Silt and mud bottom - cans	good target
13	TRU-13	327039.960	4605758.480	6.0	0.0	10.0	Scrap	1242	10/5/2006	NA	20.0	Horizontal	TRU-13	Silt and mud bottom - metal anchor	very small target, north edge of channel
14	TRU-14	327031.770	4605759.460	4.0	24.0	10.0	Scrap	1254	10/5/2006	North	0.3	Horizontal	TRU-14	Silt and mud bottom - wire	small target, north edge of channel
15	TRU-15	326962.980	4605770.470	4.0	24.0	NA	NA	1253	10/5/2006	NA	NA	NA		Silt and mud bottom - contact below 2 feet	small target

OEType: UXO(UXO),OS(Ordnance Scrap),S(Scrap),NC(No Contact),O(Other)

GPS ID	ID	UTM_X	UTM_Y	Est_Depth_ Water(Ft)	Est_Depth (In)	Size (In)	OE_Type	Time	Date	Orientation	Weight LB	Attitude	Photo #	Narrative	AETC_Narrative
16	TRU-16	326893.180	4605784.720	4.0	24.0	NA	NA	1235	10/5/2006	NA	NA	NA		Silt and mud bottom - contact below 2 feet	good target, north edge of channel
17	TRU-17	326793.190	4605812.800	8.0	24.0	NA	NA	0821	10/6/2006	NA	NA	NA		Mud bottom - contact below 2 feet	large target, center of channel
18	TRU-18	326668.490	4605860.290	4.0	20.0	11.0	Scrap	0843	10/6/2006	North	25.0	Horizontal	TRU-18	Mud bottom - metal clump 11 in by 3 in	good target, south edge of channel
19	TRU-19	326652.140	4605865.020	8.0	24.0	NA	NA	0904	10/6/2006	NA	NA	NA		Mud bottom - contact below 2 feet	good target, middle of channel
20	TRU-20	326555.860	4605878.840	8.0	24.0	NA	NA	0931	10/6/2006	NA	NA	NA		Soft mud bottom - contact below 2 feet	small target in center of channel, likely too deep to dig
21	TRU-21	326448.010	4605853.600	2.0	36.0	NA	NA	0845	10/6/2006	NA	NA	NA		Soft mud bottom - contact below 3 feet	eastmost of a group of small clutter targets
22	TRU-22	326310.980	4605849.460	8.0	24.0	NA	NA	0835	10/6/2006	NA	NA	NA		Silt and mud bottom - contact below 2 feet	small target, mostly remnant
23	TRU-23	326303.080	4605829.300	4.0	24.0	NA	NA	1014	10/6/2006	NA	NA	NA		Mud bottom - contact below 2 feet	good target
24	TRU-24	326268.730	4605834.710	6.0	6.0	4.0	Scrap	0951	10/6/2006	South	0.3	Horizontal	TRU-24	Soft mud bottom - small can (4in by 4in)	good target, center of channel
25	TRU-25	326200.250	4605814.550	4.0	36.0	NA	NA	0955	10/6/2006	NA	NA	NA		Soft mud bottom - contact below 3 feet	good target
26	TRU-26	326194.190	4605811.900	4.0	24.0	36.0	Scrap	1006	10/6/2006	South	300.0	Straight down		Soft silt and mud bottom - concrete block 3 ft by 3 ft - not recovered	clutter target
27	TRU-27	326189.440	4605814.960	4.0	24.0	NA	NA	1015	10/6/2006	NA	NA	NA		Soft mud bottom - contact below 2 feet	good small target
28	TRU-28	325982.650	4605807.900	10.0	24.0	NA	NA	0940	10/6/2006	NA	NA	NA		Soft silt and mud bottom - contact below 2 feet	partial signature
29	TRU-201	329154.600	4614425.640	30.0	NA	NA	NA	1119	10/9/2006	NA	NA	NA		Sand / rock bottom - contact below 2 feet	large target, dig
30	TRU-202	329161.880	4614425.900	30.0	3.0	20.0	4.2 in Mortar	1106	10/9/2006	North	50.0	Horizontal	TRU-202	Sand / rock bottom	large target dig, 2nd target 5m West

GPS ID	ID	UTM_X	UTM_Y	Est_Depth_ Water(Ft)	Est_Depth (In)	Size (In)	OE_Type	Time	Date	Orientation	Weight LB	Attitude	Photo #	Narrative	AETC_Narrative
31	TRU-203	329534.910	4614429.390	30.0	NA	NA	NA	1124	10/9/2006	NA	NA	NA		Sand / rock bottom - contact below 2 feet	projo?
32	TRU-204	329655.590	4614428.030	30.0	NA	NA	NA	1149	10/9/2006	NA	NA	NA	TRU-204	Sand / rock bottom - contact not found within 36 ft dia circle	155mm?
33	TRU-205	332577.840	4612447.270	15.0	0.0	24.0	155mm	1403	10/9/2006	North	90.0	Horizontal	TRU-205	Sand / rock bottom	155mm?
34	TRU-206	332640.770	4612446.440	12.0	0.0	24.0	155mm	1438	10/9/2006	North	90.0	Horizontal	TRU-206	Hard sand / clay bottom	105mm?
35	TRU-207	333327.740	4612452.090	15.0	NA	NA	NA	1426	10/9/2006	NA	NA	NA		Sand / rock bottom - contact not found	projo?
36	TRU-208	324531.090	4610143.480	8.0	0.0	48.0	Other	1115	10/16/2006	North	1000.0	Horizontal		Rocky bottom - large hot rock - unable to recover	small target
37	TRU-209	325092.600	4610137.630	10.0	0.0	10.0	Other	1605	10/15/2006	North	10.0	Horizontal	TRU-209	Rocky bottom - hot rock (10 in by 10 in)	105mm?
38	TRU-210	324395.860	4611125.750	20.0	0.0	36.0	Scrap	1031	10/15/2006	East	50.0	Horizontal	TRU-210	Rocky bottom - anchor - same item as target TRU-244	155mm?
39	TRU-211	325270.800	4611126.550	20.0	0.0	18.0	Scrap	1008	10/16/2006	South	20.0	Horizontal	TRU-211	Rocky bottom - metal scrap	155mm?
40	TRU-212	323816.910	4611456.030	20.0	0.0	30.0	Scrap	1100	10/16/2006	East	15.0	Horizontal	TRU-212	Rocky bottom - anchor	155mm+?
41	TRU-213	322692.440	4612115.430	20.0	0.0	12.0	Scrap	0916	10/16/2006	North	15.0	Horizontal	TRU-213	Rocky bottom - steel round anchor	105mm?
42	TRU-214	323853.500	4612114.430	20.0	6.0	14.0	Scrap	0930	10/16/2006	South	20.0	Horizontal	TRU-214	Rocky bottom - scrap metal piece (14 in by 18 in)	155mm?
43	TRU-215	324967.510	4612445.280	20.0	0.0	8.0	Scrap	0950	10/16/2006	South	6.0	Horizontal	TRU-215	Rocky bottom - boat carburetor	155mm?
44	TRU-216	322741.230	4613105.970	15.0	NA	NA	NA	0903	10/16/2006	NA	NA	NA		Rocky bottom - contact under 10 ft wide bolder - not recovered	good target
45	TRU-217	323463.080	4613104.420	15.0	NA	NA	NA	1540	10/15/2006	NA	NA	NA		Hard clay / rock bottom - no contact	105mm?

GPS ID	ID	UTM_X	UTM_Y	Est_Depth_ Water(Ft)	Est_Depth (In)	Size (In)	OE_Type	Time	Date	Orientation	Weight LB	Attitude	Photo #	Narrative	AETC_Narrative
46	TRU-218	324095.140	4613107.220	15.0	0.0	48.0	Scrap	1516	10/15/2006	South	20.0	Horizontal	TRU-218	Hard clay / rock bottom - old boat anchor	155mm?
47	TRU-219	330814.900	4613769.880	32.0	6.0	24.0	155mm	1130	10/9/2006	NW	90.0	Horizontal	TRU-219	Hard clay / rock bottom	155mm?
48	TRU-220	331101.830	4613764.930	32.0	20.0	NA	Scrap	1154	10/9/2006	North	50.0	NA		Clay / rock bottom - big anchor stuck on rock bottom - not recovered	very large target, 2nd target 5m West
49	TRU-221	331175.380	4613765.410	30.0	4.0	18.0	75mm	1215	10/9/2006	North	40.0	Horizontal	TRU-221	Sand / rock	240mm?
50	TRU-222	331245.040	4613765.690	30.0	3.0	18.0	75mm	1229	10/9/2006	North	40.0	Horizontal	TRU-222	Sand / rock	105mm?
51	TRU-223	331417.540	4613761.450	30.0	3.0	24.0	155mm	1239	10/9/2006	North	90.0	Horizontal	TRU-223	Sand / rock	240mm?
52	TRU-224	331483.960	4613751.690	32.0	24.0	NA	Scrap	1245	10/9/2006	Straight down	NA	Straight down		Rock bottom - anchor stuck on rock - not recovered	155mm?
53	TRU-225	331690.780	4613767.080	32.0	24.0	24.0	155mm	1230	10/9/2006	North	90.0	Straight down		Silt and mud bottom - 155mm stuck on rock bottom - not recovered	155mm?
54	TRU-226	331892.740	4613766.870	30.0	NA	NA	NA	1309	10/9/2006	NA	NA	NA		Sand / rock - contact below 2 feet	105mm?
55	TRU-227	332308.400	4613761.810	30.0	24.0	24.0	155mm	1340	10/9/2006	Straight down	90.0	NA		Sand / rock - unable to recover	large target, dig
56	TRU-228	332327.840	4613765.480	30.0	3.0	20.0	105mm	1106	10/9/2006	North	50.0	Horizontal	TRU-228	Sand bottom	155mm?
57	TRU-229	331782.140	4615077.250	33.0	NA	NA	NA	1036	10/9/2006	NA	NA	NA		Sand bottom - contact below 2 feet - not recovered	105mm?
58	TRU-230	331869.590	4615073.850	33.0	3.0	24.0	155mm	1018	10/9/2006	North	90.0	Horizontal	TRU-230	Sand bottom	projo?
59	TRU-231	331980.750	4615086.280	33.0	2.0	24.0	155mm	1005	10/9/2006	North	90.0	Straight up		Sand bottom	155mm?
60	TRU-232	332009.730	4615086.670	33.0	NA	NA	NA	0956	10/9/2006	NA	NA	NA		Sand bottom - contact below 2 feet - not recovered	projo?

GPS ID	ID	UTM_X	UTM_Y	Est_Depth_ Water(Ft)	Est_Depth (In)	Size (In)	OE_Type	Time	Date	Orientation	Weight LB	Attitude	Photo #	Narrative	AETC_Narrative
61	TRU-233	332105.790	4615086.890	33.0	6.0	6.0	155mm	0943	10/9/2006	North	90.0	Horizontal	TRU-233	Sand bottom	large projo, dig
62	TRU-234	334514.140	4608815.880	20.0	12.0	NA	NA	1212	10/16/2006	NA	NA	NA		Rock bottom - contact under rocks (12 inches or more) - unable to recover	bigger than155mm, dig
63	TRU-235	334545.640	4609137.500	20.0	NA	NA	NA	1145	10/16/2006	North	NA	NA		Recky bottom - multiple targets under rocks - unable to recover	may be 2 targets,dig anyway
64	TRU-236	331371.460	4610466.530	8.0	0.0	20.0	90mm	1544	10/9/2006	East	40.0	Horizontal	TRU-236	Rock bottom	155mm?, 2nd target 3m NE
65	TRU-237	331412.850	4610467.910	15.0	4.0	24.0	155mm	1616	10/9/2006	North	90.0	Horizontal	TRU-237	Rock / sand bottom	boat anchor with chain?, dig
66	TRU-238	331462.740	4610465.050	15.0	6.0	20.0	105mm	1600	10/9/2006	North	50.0	Horizontal	TRU-238	Rock / sand bottom	small target
67	TRU-239	331482.930	4610465.610	8.0	0.0	48.0	Scrap	1516	10/9/2006	NA	80.0	Horizontal		Rocky bottom - 55 gal drum - not recovered	105mm (or larger)
68	TRU-240	331492.560	4610466.300	12.0	0.0	18.0	90mm	1510	10/9/2006	NA	40.0	Horizontal	TRU-240	Rocky bottom	small target
69	TRU-241	331757.790	4610466.570	15.0	NA	NA	NA	1539	10/9/2006	NA	NA	NA		Rock / sand bottom - no contact	105mm?
70	TRU-242	331487.760	4610796.680	15.0	4.0	8.0	Frag	1517	10/9/2006	North	5.0	Horizontal	TRU-242	Rock / sand bottom - 155mm frag	105mm? In geology, 2nd target 5m East
71	TRU-243	331568.560	4610796.030	15.0	NA	NA	NA	1504	10/9/2006	NA	NA	NA		Rocky / sand bottom - contact below 2 feet	105mm?
72	TRU-244	324395.860	4611125.750	20.0	NA	NA	Scrap	1050	10/16/2006	NA	NA	NA		Rocky bottom - anchor - same item as target TRU-210	155mm?, large remnant moment
73	TRU-245	325270.800	4611126.550	20.0	0.0	8.0	Other	1014	10/16/2006	South	8.0	Horizontal	TRU-245	Rocky bottom - hot rock (8 in dia)	155mm?
74	TRU-246	332072.370	4611129.230	12.0	NA	NA	NA	1419	10/9/2006	NA	NA	NA		Hard rocky / concrete bottom - contact found - item unknown - not recovered	105mm?
75	TRU-247	332430.850	4611129.710	12.0	0.0	20.0	105mm	1432	10/9/2006	West	50.0	Horizontal	TRU-247	Rocky bottom	105mm?

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76	TRU-248	328613.630	4606837.020	14.0	4.0	36.0	Scrap	0952	10/9/2006	North	2.0	Horizontal	TRU-248	Metal rod - 36 in by 0.25 in	Remnant Moment
77	TRU-249	328708.890	4606832.870	20.0	6.0	24.0	155mm	1300	10/9/2006	NA	90.0	Horizontal	TRU-249	Sandy / clay bottom	105mm?
78	TRU-250	328799.250	4606833.460	18.0	NA	NA	NA	1410	9/29/2006	NA	NA	NA		Hard clay - dug to 18 in - anomaly was deeper	105mm?
79	TRU-251	328886.350	4606836.420	18.0	36.0	10.0	Frag	1215	10/7/2006	North	2.0	Horizontal	TRU-251	Soft mud bottom	81mm?
80	TRU-252	328923.370	4606832.960	20.0	6.0	24.0	155mm	1241	10/7/2006	North	90.0	Horizontal		Sand / clay bottom	105-155mm?, 2nd target 6m West
81	TRU-253	328947.280	4606832.660	20.0	8.0	24.0	155mm	1200	10/7/2006	North	90.0	Horizontal	TRU-253	Sand / clay bottom	155mm size, nice target
82	TRU-254	328987.630	4606832.390	20.0	24.0	24.0	Scrap	1100	10/7/2006	North	NA	Straight down		Flat sheet of metal - unable to recover	81mm?
83	TRU-255	329065.460	4606836.760	20.0	0.0	24.0	155mm	1125	10/7/2006	East	90.0	Horizontal	TRU-255	Soft clay bottom	155mm maybe
84	TRU-256	329145.160	4606831.640	20.0	NA	NA	NA	1139	10/7/2006	NA	NA	NA		Sand / clay bottom - nothing found	155mm ?
85	TRU-257	329156.030	4606833.080	20.0	6.0	14.0	90mm	1129	10/7/2006	North	40.0	Horizontal	TRU-257	Sand / clay bottom -90mm APHE, unfuzed	105mm ?
86	TRU-258	329187.060	4606840.410	20.0	8.0	24.0	155mm	1112	10/7/2006	North	90.0	Horizontal	TRU-258	Sand / clay bottom	105mm?
87	TRU-259	329205.540	4606839.340	20.0	8.0	24.0	155mm	1044	10/7/2006	North	90.0	Horizontal	TRU-259	Sand / clay bottom	155mm ?
88	TRU-260	329230.870	4606833.770	18.0	24.0	NA	NA	1153	10/7/2006	NA	NA	NA		Hard clay bottom - contact below 2 feet unable to recover	155mm ?
89	TRU-261	329294.630	4606834.420	18.0	24.0	NA	NA	1010	10/7/2006	NA	NA	NA		Hard clay / sand bottom - contact below 2 feet - unable to recover	155mm, 2nd target 3 m NW
90	TRU-262	329347.690	4606837.200	20.0	6.0	24.0	155mm	1021	10/7/2006	North	90.0	Horizontal		Sand / clay bottom - 155mm fuzed - not recovered	155mm ?

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91	TRU-263	329359.810	4606834.490	20.0	8.0	24.0	155mm	1008	10/7/2006	North	90.0	Horizontal	TRU-263	Sabd / clay bottom	155mm ?
92	TRU-264	329377.650	4606835.780	20.0	12.0	4.0	Frag	0954	10/7/2006	South	2.0	Horizontal	TRU-264	Mud / caly bottom - 90mm nose cone	105mm ?
93	TRU-265	329439.540	4606837.330	20.0	26.0	4.0	Frag	0937	10/7/2006	Straight down	1.0	Straight down	TRU-265	Sand / clay bottom - nose cone	155mm?, targ 33&34 9m apart
94	TRU-266	329448.260	4606835.480	18.0	12.0	24.0	155mm	0855	10/7/2006	North	90.0	Horizontal	TRU-266	Hard clay / sand bottom	155mm ?
95	TRU-267	329474.120	4606833.180	18.0	1.0	6.0	Frag	0910	10/7/2006	North	0.3	Horizontal	TRU-267	Hard clay / sand bottom - dug four holes - all frag - projectile cone	105mm ?
96	TRU-268	329587.700	4606831.980	20.0	6.0	24.0	155mm	0910	10/7/2006	North	90.0	Horizontal		Sand / clay bottom - 155mm fuzed - not recovered	220mm projo?, target 44 6m West
97	TRU-269	329601.970	4606831.980	20.0	8.0	24.0	155mm	0848	10/7/2006	North	90.0	Horizontal	TRU-269	Sandy / clay bottom	155mm?, target 46&47 4m apart
98	TRU-270	329606.640	4606832.730	22.0	6.0	14.0	90mm	0858	10/7/2006	North	30.0	Horizontal	TRU-270	Sand / clay bottom	155mm ?
99	TRU-271	329673.120	4606836.170	12.0	8.0	16.0	Frag	1536	10/3/2006	North	2.0	Horizontal	TRU-271	Mud bottom - 155mm rotating band	155mm ?
100	TRU-272	329723.750	4606831.900	18.0	6.0	20.0	4.2 in Mortar	1548	10/3/2006	North	40.0	Horizontal		4.2 in mortar, fuzed - not recovered	155mm, clutter around
101	TRU-273	329800.610	4606838.140	18.0	0.0	6.0	Frag	1602	10/3/2006	North	2.0	Horizontal		Frag - not recovered	105mm?
102	TRU-274	329851.890	4606837.420	18.0	3.0	20.0	90mm	1537	10/3/2006	North	40.0	Horizontal	TRU-274	Sandy bottom - 90mm AP	105mm ?
103	TRU-275	330027.440	4606834.830	18.0	8.0	7.0	37mm	1548	10/3/2006	North	2.0	Horizontal	TRU-275	Sandy bottom	105-155mm, lots ofclutter
104	TRU-276	330056.380	4606835.280	18.0	NA	NA	NA	1527	10/3/2006	NA	NA	NA		No contact found	105mm?, target 87&88 5m apart
105	TRU-277	330061.790	4606836.870	12.0	5.0	16.0	105mm	1549	10/3/2006	West	30.0	Horizontal	TRU-277	Mud bottom	155mm?, in clutter

GPS ID	ID	UTM_X	UTM_Y	Est_Depth_ Water(Ft)	Est_Depth (In)	Size (In)	OE_Type	Time	Date	Orientation	Weight LB	Attitude	Photo #	Narrative	AETC_Narrative
106	TRU-278	330328.380	4606835.940	10.0	8.0	8.0	37mm	1431	10/3/2006	Straight down	2.0	Straight down		Hard sandy bottom - 37mm unfuzed	strong remnant moment, 155mm?
107	TRU-279	330385.570	4606837.380	15.0	0.0	24.0	155mm	1443	10/3/2006	West	90.0	Horizontal		Hard gravel bottom	8 in ?
108	TRU-280	330483.290	4606837.110	10.0	8.0	24.0	155mm	1505	10/3/2006	South	90.0	Horizontal	TRU-280	Mud bottom	105mm?
109	TRU-281	330529.890	4606837.000	18.0	2.0	20.0	4.2 in Mortar	1459	10/3/2006	North	40.0	Horizontal		Sandy bottom - 4.2 in mortar, fuzed - not recovered	105mm?, 122 &123 10m apart
110	TRU-282	330538.730	4606836.260	18.0	6.0	20.0	4.2 in Mortar	1548	10/3/2006	North	40.0	Horizontal		Sandy bottom - 4.2 in mortar, fuzed - not recovered	155mm ?
111	TRU-283	330654.190	4606837.010	14.0	5.0	20.0	90mm	1355	10/3/2006	East	40.0	Horizontal		Hard sandy bottom - 90mm fuzed - not recovered	155mm?, 2nd target 3m SW
112	TRU-284	331183.300	4606834.570												155mm ?
113	TRU-285	331296.360	4606834.900												105mm ?
114	TRU-286	331495.960	4606837.130												155mm?
115	TRU-287	331526.340	4606835.800												105mm?, targets 5m East & West
116	TRU-288	331683.340	4606837.660												155mm?
117	TRU-289	331718.670	4606834.180												155mm?
118	TRU-290	331762.030	4606835.460												105mm?
119	TRU-291	331785.230	4606837.740												155mm,strong remnant moment
120	TRU-292	331845.650	4606838.370												105mm?

GPS ID	ID	UTM_X	UTM_Y	Est_Depth_ Water(Ft)	Est_Depth (In)	Size (In)	OE_Type	Time	Date	Orientation	Weight LB	Attitude	Photo #	Narrative	AETC_Narrative
121	TRU-293	331889.300	4606836.520												155mm?
122	TRU-294	331944.940	4606836.090	20.0	6.0	24.0	155mm	1450	10/7/2006	North	90.0	Horizontal		Soft mud bottom - 155mm & M48 fuze - not recovered	small target
123	TRU-295	332082.330	4606838.960	20.0	6.0	24.0	155mm	1507	10/7/2006	North	90.0	Horizontal		155mm, fuzed - not recovered	105mm?
124	TRU-296	332127.620	4606837.390	20.0	3.0	24.0	155mm	1520	10/7/2006	North	90.0	Horizontal		155mm, fuzed - not recovered	105mm?
125	TRU-297	332169.820	4606832.730	20.0	8.0	4.0	Frag	1518	10/7/2006	NA	0.5	Horizontal	TRU-297	Sand / clay bottom - 4.2 in mortar rotation disc	small target
126	TRU-298	332192.400	4606831.910	20.0	20.0	20.0	4.2 in Mortar	1502	10/7/2006	North	30.0	Horizontal		Sand / clay bottom - 4.2 in mortar, fuzed - not recovered	105mm?
127	TRU-299	332208.470	4606832.670	20.0	24.0	20.0	Frag	1446	10/7/2006	NE	1.0	Horizontal	TRU-299	Sand / clay bottom	small tartget
128	TRU-300	332263.440	4606834.820	20.0	6.0	24.0	155mm	14110	10/7/2006	North	90.0	Horizontal	TRU-300	Soft mud and gravel bottom	large for a 155mm
129	TRU-301	332619.990	4606838.370	20.0	6.0	8.0	Scrap	1334	10/7/2006	NA	0.5	NA	TRU-301	Clay / sand bottom - top of paint thiner can	105mm, good target
130	TRU-302	332732.130	4606835.470	20.0	24.0	NA	NA	1350	10/7/2006	NA	NA	NA		sand / clay bottom - Contact below 2 feet	105mm?
131	TRU-303	332912.680	4606835.260	20.0	28.0	24.0	155mm	1412	10/7/2006	NE	90.0	Horizontal		Sand / clay bottom - 155mm fuzed - not recovered	105mm?
132	TRU-304	333674.360	4606837.950	15.0	8.0	6.0	Scrap	1334	10/16/2006	NE	0.5	Horizontal	TRU-304	Mud bottom - sheet metal (6 in x 6 in x 1/8 in) & 50 caliber	small target
133	TRU-305	333938.530	4606837.980	15.0	15.0	14.0	75mm	1311	10/16/2006	North	20.0	Horizontal	TRU-305	Mud bottom -75mm, unfuzed	small target
134	TRU-306	334814.940	4606837.280	15.0	2.0	96.0	Scrap	1248	10/16/2006	South	1500.0	Horizontal		Sand bottom - big metal plate 8ft by 4 ft 1.5 in - not recovered	larger than a 155mm
135	TRU-307	327216.620	4615746.320	30.0	36.0	24.0	155mm	0917	10/8/2006	Straight down	90.0	Straight down		Very soft mud bottom - unable to recover	good target

GPS ID	ID	UTM_X	UTM_Y	Est_Depth_ Water(Ft)	Est_Depth (In)	Size (In)	OE_Type	Time	Date	Orientation	Weight LB	Attitude	Photo #	Narrative	AETC_Narrative
136	TRU-308	327396.150	4615740.680	30.0	24.0	24.0	155mm	0925	10/8/2006	Straight down	90.0	Straight down		Very soft mud bottom - unable to recover	good target
137	TRU-309	328177.260	4615743.930	30.0	32.0	24.0	155mm	0957	10/8/2006	Straight down	90.0	Straight down		Soft mud - not recovered	155mm?
138	TRU-310	328363.850	4615745.580	30.0	15.0	12.0	Scrap	1010	10/8/2006	North	20.0	Horizontal		Soft mud - not recovered	large target on 8 sensors, use
139	TRU-311	328655.620	4615741.720	30.0	36.0	24.0	155mm	1012	10/8/2006	Straight down	90.0	Straight down		Soft mud - felt with hand - 155mm base - three feet deep - not recovered	large target, does not look like UXO, Dig Anyway
140	TRU-312	328709.320	4615752.650	30.0	36.0	24.0	155mm	0955	10/8/2006	North	90.0	Straight down	TRU-312	Soft mud	large target, 155mm?, use
141	TRU-313	328889.860	4615756.550	30.0	24.0	24.0	155mm	1037	10/8/2006	Straight down	90.0	Straight down		Soft mud - not recovered	good target, 105mm?
142	TRU-314	329294.320	4615751.920	30.0	24.0	24.0	155mm	1104	10/8/2006	Up	90.0	Straight up	TRU-314	Soft mud	good target, 105mm?
143	TRU-315	330156.620	4615740.110	30.0	30.0	24.0	155mm	1122	10/8/2006	Straight down	90.0	Straight down		Soft mud - not recovered	good target, 155mm?
144	TRU-316	330176.300	4615741.030	30.0	32.0	24.0	155mm	1138	10/8/2006	West	90.0	Horizontal	TRU-316	Soft mud bottom	good target 155mm?
145	TRU-317	330223.620	4615741.340	30.0	24.0	14.0	90mm	1130	10/8/2006	East	40.0	Horizontal		Soft mud bottom - 90mm, fuzed - not recovered	good target, 155mm?
146	TRU-318	330313.470	4615753.050	30.0	24.0	24.0	155mm	1105	10/8/2006	North	90.0	Straight Down	TRU-318	Soft mud bottom	good target on 7 sensors, 155mm?
147	TRU-319	330587.900	4615741.670	30.0	0.0	NA	Scrap	1200	10/8/2006	West	NA	NA		Soft mud bottom - trash, cans, metal motor - not recovered	good target 105mm?
148	TRU-320	330670.800	4615741.770	30.0	32.0	24.0	155mm	1216	10/8/2006	West	90.0	Straight down	TRU-320	Very soft mud	good target, 105mm?
149	TRU-321	331097.690	4615740.340	30.0	30.0	24.0	155mm	1243	10/8/2006	Straight down	90.0	Straight down		Soft mud bottom - 155mm - not recovered	partial signal, 105mm?
150	TRU-322	331114.770	4615740.590	32.0	24.0	NA	Frag	1253	10/8/2006	Straight down	NA	Straight down		Soft mud bottom - frag - not recovered	good target, 155mm?

GPS ID	ID	UTM_X	UTM_Y	Est_Depth_ Water(Ft)	Est_Depth (In)	Size (In)	OE_Type	Time	Date	Orientation	Weight LB	Attitude	Photo #	Narrative	AETC_Narrative
151	TRU-323	331230.120	4615746.290	30.0	24.0	24.0	155mm	1234	10/8/2006	North	90.0	Straight down		Very soft mud - 155mm - not recovered	good target 105mm?
152	TRU-324	331283.410	4615746.890	30.0	24.0	24.0	155mm	1215	10/8/2006	Straight down	90.0	Horizontal		Soft mud bottom - 155mm - not recovered	good target, 105mm?
153	TRU-325	331476.390	4615747.750	32.0	36.0	24.0	155mm	1312	10/8/2006	North	90.0	Horizontal	TRU-325	Soft mud bottom	good target, 155mm?
154	TRU-326	331727.850	4615744.030	32.0	32.0	24.0	155mm	1332	10/8/2006	North	90.0	Straight down		Soft mud bottom - not recovered	good target, larger than 155mm
155	TRU-327	332095.090	4615738.360	32.0	8.0	14.0	90mm	1040	10/9/2006	North	30.0	Straight up	TRU-327	Hard clay bottom - 90mm nose up	good target, 105mm?
156	TRU-328	332388.540	4615742.570	32.0	32.0	NA	NA	1349	10/8/2006	NA	NA	NA		Soft mud - dug 32 in but contact was deeper	good target, 105mm?
157	TRU-329	333526.360	4615744.760	30.0	0.0	1.0	Scrap	1407	10/8/2006	NA	NA	NA		Soft mud - ball of 1 in diameter cable - not recovered	good target
158	TRU-330	328448.280	4607166.980	13.0	1.0	14.0	105mm	1355	9/29/2006	North	35.0	Horizontal	TRU-330		good target
159	TRU-331	328849.760	4607165.940	13.0	0.0	24.0	155mm	1024	10/1/2006	NE	90.0	Horizontal	TRU-331	Hard clay bottom - 155mm	155mm?
160	TRU-332	328897.750	4607166.180	12.0	NA	NA	NA	1119	10/1/2006	NA	NA	NA		Soft clay bottom - contact below 2 feet	larger than a 155mm, dig
161	TRU-333	328937.760	4607169.000	12.0	NA	NA	NA	1053	10/1/2006	NA	NA	NA		Contact below 2 feet	155mm?, target 12&13 8m apart
162	TRU-334	328945.870	4607168.290	13.0	0.0	24.0	155mm	1239	10/1/2006	North	90.0	Horizontal		Hard clay bottom	155mm, clutter to East
163	TRU-335	328954.490	4607167.290	14.0	3.0	24.0	2 ea 155mm	1545	10/1/2006	North	180.0	Horizontal	TRU-335	2 ea, 155mm	155mm?, Targets 14, 15, 16 within 10m
164	TRU-336	328960.110	4607168.880	18.0	8.0	24.0	155mm + Scrap	1312	10/1/2006	East	90.0	Horizontal		Soft bottom, 155mm located under ball of metal cable - cable not recovered	155mm in clutter
165	TRU-337	328966.440	4607167.250	15.0	0.0	24.0	155mm	1330	10/1/2006	North	90.0	Horizontal	TRU-337	Hard clay bottom	155mm in clutter

GPS ID	ID	UTM_X	UTM_Y	Est_Depth_ Water(Ft)	Est_Depth (In)	Size (In)	OE_Type	Time	Date	Orientation	Weight LB	Attitude	Photo #	Narrative	AETC_Narrative
166	TRU-338	329012.260	4607166.510	14.0	0.0	24.0	155mm	1357	10/1/2006	North	90.0	Horizontal	TRU-338	one other contact (small) near by	155mm?
167	TRU-339	329042.910	4607164.630	18.0	NA	NA	NA	1127	10/2/2006	NA	NA	NA		Anomaly located - unable to recover - deeper than one foot	105mm?
168	TRU-340	329061.100	4607165.120	13.0	2.0	14.0	105mm	0851	10/1/2006	North	40.0	Straight down	TRU-340	Clay bottom	very large target dig?
169	TRU-341	329067.490	4607163.870	13.0	8.0	14.0	90mm	0825	10/1/2006	North	40.0	Horizontal	TRU-341	Hard clay bottom	155mm?, clutter 3m East
170	TRU-342	329100.390	4607165.930	10.0	1.0	24.0	155mm	0935	10/1/2006	NE	90.0	Horizontal	TRU-342	Clay bottom	very large target in clutter, dig?
171	TRU-343	329122.970	4607165.900	14.0	3.0	24.0	155mm	0913	10/1/2006	North	90.0	Horizontal	TRU-343	Clay bottom	155mm?, Target 22, 23 7m apart
172	TRU-344	329131.660	4607166.030	13.0	NA	NA	NA	0957	10/1/2006	NA	NA	NA		Hard clay - contact below 2 feet	105mm?
173	TRU-345	329332.110	4607166.420	20.0	4.0	24.0	155mm	1103	10/2/2006	West	90.0	Horizontal	TRU-345	Sand bottom	155mm, Targets 37, 38, 39 clustered together
174	TRU-346	329339.680	4607163.770	12.0	0.0	24.0	155mm	0853	10/3/2006	North	90.0	Horizontal	TRU-346	Hard sand bottom	155mm?
175	TRU-347	329348.410	4607165.610	10.0	0.0	24.0	155mm	1000	10/3/2006	North	90.0	Horizontal	TRU-347	Sand bottom	155mm?
176	TRU-348	329433.150	4607167.200	18.0	16.0	24.0	155mm	0935	10/3/2006	North	90.0	Horizontal	TRU-348	Sandy bottom	155mm?
177	TRU-349	329530.310	4607165.270	18.0	5.0	24.0	155mm	0924	10/3/2006	North	90.0	Horizontal	TRU-349	Sandy bottom	105mm?, dig
178	TRU-350	329615.250	4607166.310	18.0	4.0	24.0	155mm	0950	10/3/2006	North	90.0	Horizontal	TRU-350	Sandy bottom	155mm?
179	TRU-351	329623.570	4607166.820	18.0	3.0	24.0	155mm	1116	10/3/2006	North	90.0	Horizontal	TRU-351	Sand and mud bottom	target in clutter
180	TRU-352	329630.890	4607165.860	18.0	3.0	24.0	155mm	1017	10/3/2006	North	90.0	Horizontal	TRU-352	Sandy bottom	155mm? other targets East and West

GPS ID	ID	UTM_X	UTM_Y	Est_Depth_ Water(Ft)	Est_Depth (In)	Size (In)	OE_Type	Time	Date	Orientation	Weight LB	Attitude	Photo #	Narrative	AETC_Narrative
181	TRU-353	329720.260	4607165.930	18.0	3.0	24.0	155mm	1126	10/3/2006	North	90.0	Horizontal	TRU-353	Sandy bottom	large target, 65&66 5m apart
182	TRU-354	329727.000	4607166.500	10.0	18.0	9.0	90mm	0945	10/3/2006	North	40.0	Horizontal	TRU-354	Hard sand bottom	155mm?
183	TRU-355	329848.520	4607167.490	16.0	8.0	7.0	37mm	1033	10/3/2006	North	2.0	Horizontal		Unfuzed	155mm?
184	TRU-356	329889.890	4607168.250	18.0	6.0	20.0	90mm	1150	10/3/2006	North	40.0	Horizontal	TRU-356	Sandy bottom	mortar?, targets 81&82 5m apart
185	TRU-357	329896.650	4607165.840	18.0	6.0	20.0	105mm	1054	10/3/2006	North	30.0	Horizontal	TRU-357	Sand bottom	two sensors see, mortar?
186	TRU-358	329925.180	4607165.970	12.0	12.0	20.0	90mm	1040	10/3/2006	East	40.0	Horizontal	TRU-358	Sandy bottom	155mm?, Targets 84,85&86 clustered together
187	TRU-359	329932.140	4607162.400	10.0	6.0	2.0	Fuze	1046	10/3/2006	North	0.5	Horizontal	TRU-359	Hard sand bottom	very large target, dig?
188	TRU-360	329940.340	4607164.700	12.0	5.0	24.0	155mm	1140	10/3/2006	North	90.0	Horizontal	TRU-360	Sandy bottom - half burried	very large target, dig
189	TRU-361	330035.210	4607166.440	12.0	5.0	24.0	155mm	1130	10/3/2006	NW	90.0	Horizontal	TRU-361	Sandy / mud bottom	155mm?
190	TRU-362	330044.000	4607167.030	18.0	2.0	24.0	155mm	1210	10/3/2006	North	90.0	Horizontal	TRU-362	Sandy bottom	155mm?, target 94 2m East
191	TRU-363	330046.710	4607166.140	18.0	2.0	24.0	155mm	1210	10/3/2006	North	90.0	Horizontal	TRU-363	Sandy bottom	155mm?, target 93 2m West
192	TRU-364	330141.210	4607162.650	20.0	6.0	24.0	155mm	0812	10/7/2006	North	90.0	Horizontal	TRU-364	Sandy bottom	155mm,dig
193	TRU-365	330292.690	4607163.210	18.0	6.0	24.0	155mm	1248	10/3/2006	North	90.0	Horizontal	TRU-365	Sandy bottom	155mm, dig
194	TRU-366	330341.220	4607164.620	12.0	8.0	20.0	Fuze, 90mm & Frag	1230	10/3/2006	North	40.0	Horizontal	TRU-366	All three items were 2 feet apart - more contacts around	155mm?dig
195	TRU-367	330441.620	4607166.960	12.0	NA	NA	NA	1219	10/3/2006	NA	NA	NA		Hard clay - contact below 2 feet	155mm? dig

GPS ID	ID	UTM_X	UTM_Y	Est_Depth_ Water(Ft)	Est_Depth (In)	Size (In)	OE_Type	Time	Date	Orientation	Weight LB	Attitude	Photo #	Narrative	AETC_Narrative
196	TRU-368	330552.250	4607163.420	18.0	4.0	20.0	90mm	1314	10/3/2006	North	40.0	Horizontal	TRU-368	Sand bottom	105mm?
197	TRU-369	330594.690	4607160.540	18.0	NA	NA	NA	1602	10/3/2006	NA	NA	NA		Sandy bottom - item below 2 feet	105mm? dig
198	TRU-370	330606.700	4607161.420	18.0	3.0	10.0	57mm & 37mm	1337	10/3/2006	North	6.0	Horizontal	TRU-370	Sandy bottom	105mm? dig
199	TRU-371	330632.310	4607162.330	12.0	0.0	24.0	155mm	1324	10/3/2006	North	90.0	Horizontal	TRU-371	Sandy bottom	105mm? dig
200	TRU-372	330695.570	4607161.270	18.0	NA	NA	NA	1442	10/3/2006	NA	NA	NA		Sandy bottom - contact below 2 feet	155mm? dig
201	TRU-373	331318.320	4607164.570												155mm? dig
202	TRU-374	331339.650	4607164.090												155mm?
203	TRU-375	331364.360	4607165.100												large target, dig
204	TRU-376	331371.140	4607164.020												105mm?
205	TRU-377	331604.970	4607166.230												155mm?, Target 131, 132 7m apart
206	TRU-378	331611.490	4607166.570												155mm dig
207	TRU-379	331625.480	4607165.270												105mm?dig
208	TRU-380	331639.490	4607165.240												105mm? dig
209	TRU-381	331713.790	4607164.180												155mm, Targets 136, 137 7m apart
210	TRU-382	331721.740	4607165.430												105mm? dig

GPS ID	ID	UTM_X	UTM_Y	Est_Depth_ Water(Ft)	Est_Depth (In)	Size (In)	OE_Type	Time	Date	Orientation	Weight LB	Attitude	Photo #	Narrative	AETC_Narrative
211	TRU-383	331775.440	4607166.450												155mm? dig
212	TRU-384	331960.240	4607167.520												155mm? dig
213	TRU-385	332442.210	4607165.310												105mm?
214	TRU-386	332741.970	4607163.800												105mm?
215	TRU-387	332836.200	4607164.510												105mm?
216	TRU-388	332917.480	4607168.190												81mm?
217	TRU-389	336477.420	4607163.710	25.0	14.0	20.0	90mm	1230	10/16/2006	East	30.0	Horizontal		Mud and silt bottom - unfuzed	105mm?

EOTI Dig List for the AETC Toussaint River Lake Erie Demonstration
Primary Coordinate System UTM Zone 17N NAD 1983 Meters
Developed from the Toussaint_River_Targets_For_Remediation.xls dated 9-25-06

GPS ID	ID	UTM_X	UTM_Y	Est_Depth_ Water(Ft)	Est_Depth (In)	Size (In)	OE_Type	Time	Date	Orientation	Weight LB	Attitude	Photo #	Narrative	AETC_Narrative
1	TRU-50	323790.970	4623669.750	35.0	24.0	NA	NA	0945	10/15/2006	NA	NA	NA	NA	Soft Silt and mud bottom - contact below 2 feet - soda can on surface	partial signature
2	TRU-51	323974.500	4623665.580	30.0	12.0	NA	NA	0926	10/15/2006	NA	NA	NA	NA	Not recovered - big pile of metal trash 12 inches deep	single object, much too big for UXO
3	TRU-52	324127.600	4623667.480	30.0	NA	NA	NA	0913	10/15/2006	NA	NA	NA	NA	Silt and mud bottom - No contact	likely too small for UXO
4	TRU-53	324666.620	4623668.140	35.0	36.0	NA	NA	1012	10/15/2006	NA	NA	NA	NA	Soft mud bottom and contact below 3 feet	small target
5	TRU-54	325134.790	4623663.330	35.0	36.0	NA	NA	1034	10/15/2006	NA	NA	NA	NA	Soft silt and mud - contact below 2 feet	large target, could be projectile
6	TRU-55	326030.440	4623667.580	35.0	36.0	24.0	155mm	1110	10/15/2006	straight down	90.0	Straight Down	NA	Soft mud - item (155mm) base down 36 inches - not recovered	could be 155mm
7	TRU-56	326076.200	4623667.690	35.0	NA	NA	NA	1055	10/15/2006	NA	NA	NA	NA	Very soft mud and contact below 2 feet	looks like a boat anchor
8	TRU-57	326548.650	4623661.110	35.0	36.0	NA	NA	1130	10/15/2006	NA	NA	NA	NA	Soft mud and contact below 3 feet	Large inverted target, projo?
9	TRU-58	323597.650	4622345.540	35.0	24.0	NA	NA	1420	10/15/2006	NA	NA	NA	NA	Soft mud - Small hit in area - contact below two feet	multiple clutter objects
10	TRU-59	323709.190	4622348.360	35.0	NA	NA	NA	1436	10/15/2006	NA	NA	NA	NA	Soft mud - contact below 2 feet	good target, projo?
11	TRU-60	324074.230	4622346.670	31.0	19.0	5.0	Scrap	0817	10/11/2006	Horizontal	2.0	Horizontal	TRU-60	Old broken metal box 5 inches by 5 inches	likely clutter
12	TRU-61	324501.230	4622344.520	31.0	0.0	NA	NA	0848	10/11/2006	NA	NA	NA	NA	Lots of smal signal detector - no major contacts	strongly inverted, likely clutter
13	TRU-62	324576.890	4622344.710	35.0	NA	NA	NA	1358	10/15/2006	NA	NA	NA	NA	Soft mud bottom - contact below 2 feet	excellent target, projo?
14	TRU-63	324830.770	4622327.240	35.0	8.0	10.0	Scrap	1322	10/15/2006	South	3.0	Horizontal	TRU-63	Soft mud - metal piece of junk 10 inches by 10 inches	clutter

OEType: UXO(UXO),OS(Ordnance Scrap),S(Scrap),NC(No Contact),O(Other)

GPS ID	ID	UTM_X	UTM_Y	Est_Depth_ Water(Ft)	Est_Depth (In)	Size (In)	OE_Type	Time	Date	Orientation	Weight LB	Attitude	Photo #	Narrative	AETC_Narrative
15	TRU-64	324862.020	4622318.330	35.0	NA	NA	NA	1337	10/15/2006	NA	NA	NA	NA	Soft mud - contact below 2 feet	clutter over reef
16	TRU-65	325015.320	4622232.350	30.0	24.0	NA	NA	1240	10/15/2006	NA	NA	NA	NA	Soft mud - contact below 2 feet	part of 4-target group over reef
17	TRU-66	325019.610	4622233.600	30.0	24.0	36.0	250 lb Bomb	1251	10/15/2006	North	250.0	Horizontal	NA	Soft mud - 250 lb bomb - 24 inches down - not recovered	4-target group, looks like boat anchor
18	TRU-67	325024.180	4622233.060	30.0	24.0	36.0	NA	1257	10/15/2006	South	10.0	Horizontal	TRU-67	Soft mud - big piece of metal - 36 inches by 28 inches	part of 4-target group over reef
19	TRU-68	325581.260	4622346.790	30.0	36.0	NA	NA	1220	10/15/2006	NA	NA	NA	NA	Soft mud - contact below 2 feet	good target, possible 155mm
20	TRU-69	327096.150	4622346.010	30.0	36.0	24.0	155mm	1156	10/15/2006	straight down	90.0	Straight Down	NA	Soft mud bottom - 155mm nose down - 36 inches down - not recovered	very good target, large projo?

EOTI Dig List for the AETC Toussaint River Lake Erie Demonstration
Primary Coordinate System UTM Zone 17N NAD 1983 Meters
Developed from the Toussaint_River_Targets_For_Remediation.xls dated 9-25-06

GPS ID	UTM_X	UTM_Y	Priority	Est_Depth_ Water(Ft)	Est_Depth (In)	Size (In)	OE_Type	Time	Date	Orientation	Weight LB	Attitude	Photo #	Narrative	AETC_Narrative
TRH-100	329134.2010	4605645.2747	1	12	NA	NA	NA	1100	10/18/2006	NA	NA	NA	NA	Contact below 2 feet	
TRH-101	329434.6533	4604793.8046	1	7	24	24	155mm	0921	10/18/2006	Straight Down	90	Vert	NA	155mm below 2 Feet - Not recovered	
TRH-102	329438.9646	4604770.4400	1	7	NA	NA	NA	0900	10/18/2006	NA	NA	NA	NA	Strong contact below 2 feet	
TRH-103	329457.2231	4604720.6037	1	7	6	24	155mm	0843	10/18/2006	North	90	Hor	TRH-103	Mud Bottom	
TRH-104	329518.4742	4604589.2594	1	10	26	48	2.75 in Rocket	0834	10/18/2006	60 Deg Down	25	60 Deg Down	NA	Hard Mud - Not Recovered - Assumed Fuzed	
TRH-105	329574.4137	4604481.3543	1	10	6	48	2.75 in Rocket	0825	10/18/2006	E	25	Hor	NA	Mud - Not Recovered - Fuzed	
TRH-106	329345.5646	4604761.7710	2	4	12	24	155mm	0935	10/18/2006	N	90	Hor	NA	Sand - Not Recovered - Fuzed	
TRH-107	329294.7743	4604739.7280	2	3	12	24	155mm	0951	10/18/2006	N	90	Hor	TRH-107	Sand	
TRH-108	329301.8170	4604693.0594	2	6	0	72	Scrap	1029	10/18/2006	E	5	Hor	TRH-108	Sand - Metal Rod	
TRH-109	329371.5003	4604678.2924	2	6	8	24	155mm	1002	10/18/2006	N	90	Hor	TRH-109	Sand / Mud	
TRH-110	329360.1026	4604665.3388	2	5	30	24	155mm	1013	10/18/2006	Straight Down	90	Vert	NA	Mud - Not Recovered	
TRH-111	329426.1369	4604551.1723	2	6	6	24	155mm	1040	10/18/2006	N	90	Hor	NA	Sand - Not Recovered - Fuzed	
TRH-112	329124.8244	4604745.0250	2	1.5	6	96	scrap	1118	10/18/2006	W	40	Hor	NA	Sand - 12 in dia pipe - too big to dig out	
TRH-113	329111.5346	4604758.6782	2	1.5	12	6	Scrap	1122	10/18/2006	E	1	Hor	TRH-113	Steel Can - Sand	
TRH-114	329098.2741	4604719.4356	2	0.25	NA	NA	NA	1133	10/18/2006	NA	NA	NA	NA	No Contact	

OEType: UXO(UXO),OS(Ordnance Scrap),S(Scrap),NC(No Contact),O(Other)

TRH-115	329098.6394	4604709.0431	2	0.08333333	NA	NA	NA	1140	10/18/2006	NA	NA	NA	NA	No Contact	
TRH-116	329164.5427	4604557.0185	2	0.66666667	16	96	Scrap	1145	10/18/2006	N		Hor	NA	Steel I-beam - too big to dig out	
TRH-117	329161.5197	4604571.6792	2	0.08333333	NA	NA	NA	1150	10/18/2006	NA	NA	NA	NA	No Contact	

APPENDIX D
ISSUE / RECEIPT FORM
SITE SPECIFIC FINAL REPORT

SUPPORT OF VALIDATION OF THE MARINE TOWED ARRAY DEMONSTRATION AT FORMER ERIE ARMY DEPOT AND TOUSSAINT RIVER

DD FORM 1348-1A, JUL 91 (EG) ISSUE RELEASE/RECEIPT DOCUMENT

DI OD CTRL	RI FROM	M&S	UI	QUANTITY	SUPPLEMENTARY ADDRESS	SIG	FUND	DISTRIBUTION	PROJECT	PRI	REQD DATE	ADV	RI	O/P	COND	MGT	UNIT PRICE DOLLARS	UNIT PRICE CTS	1. TOTAL PRICE DOLLARS	1. TOTAL PRICE CTS

2. SHIP FROM

3. SHIP TO

4. MARK FOR

5. DOC DATE	6. NMFC	7. FRT RATE	8. TYPE CARGO	9. PS

10. QTY. REC'D	11. UP	12. UNIT WEIGHT	13. UNIT CUBE	14. UFC	15. SL
		3320#			

16. FREIGHT CLASSIFICATION NOMENCLATURE

17. ITEM NOMENCLATURE
Metal Scrap, Ordnance Related

18. TY CONT	19. NO CONT	20. TOTAL WEIGHT	21. TOTAL CUBE

22. RECEIVED BY
Burns Iron & Metal Co. Inc

23. DATE RECEIVED
10/19/06

24. DOCUMENT NUMBER & SUFFIX (80-44)

25. NATIONAL STOCK NO. & ADD (8-22)

26. RIC (1-6) UI (23-24) QTY (25-29) CON CODE (71) DIST (55-66) UP (74-80)

27. ADDITIONAL DATA

This certifies that the material listed has been 100 percent inspected, and that to the best of our knowledge and belief, are free of explosive hazards, engine fluids, illuminating dials, and other visible liquid HTRW materials.

Wayne Lutton, EOTI

, EOD

PREVIOUS EDITION MAY BE USED

PerFORM (DLA)

RECEIVER NO. 46066

RECEIVED FROM EOJ

DATE 10·19·06

BURNS IRON & METAL CO., INC.
911 FRONT STREET • FREMONT, OH 43420

TRUCK Black Chevy

CLARK ASSOCIATES, INC. FREMONT

MATERIAL DESCRIPTION	PRICE	AMOUNT
Artillary Shells		
GROSS 6960		
TARE 5300		
NET 1660		

BUYERS OF SCRAP IRON AND METALS (419) 332-2653 NEW AND USED STRUCTURAL STEEL

RECEIVER NO. 46063

RECEIVED FROM EOJ

DATE 10·19·06

BURNS IRON & METAL CO., INC.
911 FRONT STREET • FREMONT, OH 43420

TRUCK Black Chevy

CLARK ASSOCIATES, INC. FREMONT

MATERIAL DESCRIPTION	PRICE	AMOUNT
Artillary Shells		
GROSS 7160		
TARE 5500		
NET 1660		

BUYERS OF SCRAP IRON AND METALS (419) 332-2653 NEW AND USED STRUCTURAL STEEL

APPENDIX E
DAILY SITE REPORTS
SITE SPECIFIC FINAL REPORT

SUPPORT OF VALIDATION OF THE MARINE TOWED ARRAY DEMONSTRATION AT FORMER ERIE ARMY DEPOT AND TOUSSAINT RIVER

EOTI
EXPLOSIVE ORDNANCE TECHNOLOGIES, INC.

EOTI DAILY SITE REPORT

Project Name: ESTCP WAA Pilot Program

Explosive Ordnance Technologies, Inc. (EOTI)
105 W. Tennessee Ave.
Oak Ridge, TN 37830

Project Location: Lake Erie, Toussaint River
Project #:
Report #: 11 Date: 9-Oct-06

Weather Conditions: **Sunny/ 73 degrees/ 5 winds**

Major Equipment Items on Site

ITEM	Quantity	Hrs Used	ITEM	Quantity	Hrs Used
Boat	2	20	Boat (Cruiser)	1	10
GPS Units	1	10	Boat (Barge)	1	10
			Boat (Chase)	1	0
			Underwater Metal Detectors	2	20
Dive Gear	5	30	Magnetometers	1	0

Personnel on Site

Name	Position	Hrs (today)	Name	Position	Hrs (today)
Wayne Lewallen	Project Manager	0	Eric Gonzalez	Tech I	12
Kevin Osborne	UXOSO	12	Joe Remington	Tech I	12
Blair Oakes	SUXOS	13	Mike Shoop	Tech II	12
Kim Tapley	Tech II	13	Dana Winslow	Tech III	12
David Farmer	UXOQCS		Charles Armstrong	Tech II	12

Exposure Data

Previous Hours	626	Hours Today	98	Hours to Date	724
Previous Accidents	0	Accidents Today		Accidents to Date	0
Prev. Lost Work Days	0	Lost Workdays Today	0	Lost Work Days to Date	0

Ordnance Data

Previous UXO Found	94	# UXO Today	19	# UXO to Date	113

Note: See UXO Log for description / disposition of ordnance items.

Anomaly Clearance Data

Prev. Anomalies Reaquired	139	# Anomalies Reaq Today	33	# Anomalies Reaq to Date	172
Prev. Digs Completed	139	Digs Completed Today	33	Digs Completed to Date	172

Note: Numbers include only those anomalies/Digs passing QC inspection.

Verbal Instructions Received or Given: (Instructions received from client or given by EOTI and corresponding action taken.)

Changed Conditions/Delays/Conflicts Encountered: (List conditions which have hindered ID removal or disposal of UXO.)

Other comments or additional information.

Contractor's Verification: The above report is complete and correct. All equipment used and work performed during

Work performed today. Indicate location and include equipment used.

Team met in lobby at 0630 for operational procedures discussion and daily plan of attack. Team proceeded to CP 11 and validated GPS unit. Lake wave height was small to one foot. Dive operations were conducted for 6 hours. 33 anomalies were prosocuted. 2 UXO items were located but unrecoverable due to the depth of the silt/ mud bottom (TR 225 and 227}. The fuzing could not be determined due to attitude of items. items were nose in. Diver Using replacement cruiser from this date on. Old cruiser is not repairable at this point. AETC arrived this day. Will have to gi up one diver to support them start 10/10/06. Small 16 foot chase boat has been arranged for them.

Contractor's Verification: The above report is complete and correct. All equipment used and work performed during this reporti period are in compliance with the plans and specifications except as noted above.

Original Signed

On site Representative- Stewart B. Oakes Date: 9-Oct-06

EOTI DAILY SITE REPORT

EXPLOSIVE ORDNANCE TECHNOLOGIES, INC.

Project Name: ESTCP WAA Pilot Program

Explosive Ordnance Technologies, Inc. (EOTI)
105 W. Tennessee Ave.
Oak Ridge, TN 37830

Project Location: Lake Erie, Toussaint River
Project #:
Report #: 12 Date: 10-Oct-06

Weather Conditions: Cloudy/ 63 degrees/ 20 mph winds

Major Equipment Items on Site

ITEM	Quantity	Hrs Used	ITEM	Quantity	Hrs Used
Boat	2	0	Boat (Cruiser)	1	0
GPS Units	1	0	Boat (Barge)	1	0
			Boat (Chase)	1	0
			Underwater Metal Detectors	2	0
Dive Gear	5	0	Magnetometers	1	0

Personnel on Site

Name	Position	Hrs (today)	Name	Position	Hrs (today)
Wayne Lewallen	Project Manager	3	Eric Gonzalez	Tech I	2.5
Kevin Osborne	UXOSO	2.5	Joe Remington	Tech I	1.5
Blair Oakes	SUXOS	5	Mike Shoop	Tech II	1.5
Kim Tapley	Tech II	2.5	Dana Winslow	Tech III	1.5
David Farmer	UXOQCS		Charles Armstrong	Tech II	1.5

Exposure Data

Previous Hours	724	Hours Today	22	Hours to Date	746
Previous Accidents	0	Accidents Today		Accidents to Date	0
Prev. Lost Work Days	0	Lost Workdays Today	0	Lost Work Days to Date	0

Ordnance Data

Previous UXO Found	113	# UXO Today	0	# UXO to Date	113

Note: See UXO Log for description / disposition of ordnance items.

Anomaly Clearance Data

Prev. Anomalies Reaquired	172	# Anomalies Reaq Today	0	# Anomalies Reaq to Date	172
Prev. Digs Completed	172	Digs Completed Today	0	Digs Completed to Date	172

Note: Numbers include only those anomalies/Digs passing QC inspection.

Verbal Instructions Received or Given: (Instructions received from client or given by EOTI and corresponding action taken.)

Changed Conditions/Delays/Conflicts Encountered: (List conditions which have hindered ID removal or disposal of UXO.)

Other comments or additional information.

Contractor's Verification: The above report is complete and correct. All equipment used and work performed during

Work performed today. Indicate location and include equipment used.

Team met in lobby at 0630 for operational procedures discussion and daily plan of attack. Team proceeded Wild Wings dock area. Lake wave conditions were to heavy for safe boating operations. Team proced back to hotel. At 1700 4 personnel attempted to take pictures of ordnance items at storage point but in was secured and not accessible. Wayne Lewallen on site this evening. Meeting occured concerning West Sister points. 19 points were not done in that area. W attempt to collect data on those points at first available dive day.

Contractor's Verification: The above report is complete and correct. All equipment used and work performed during this reporti period are in compliance with the plans and specifications except as noted above.

Original Signed

On site Representative- Stewart B. Oakes Date: 10-Oct-06

EOTI DAILY SITE REPORT

EXPLOSIVE ORDNANCE TECHNOLOGIES, INC.

Project Name: ESTCP WAA Pilot Program

Explosive Ordnance Technologies, Inc. (EOTI)
105 W. Tennessee Ave.
Oak Ridge, TN 37830

Project Location: Lake Erie, Toussaint River
Project #:
Report #: 16 Date: 14-Oct-06

Weather Conditions: **Partly cloudy/ 47 degrees/ 15-20 mph winds/**

Major Equipment Items on Site

ITEM	Quantity	Hrs Used	ITEM	Quantity	Hrs Used
Boat	1	0	Boat (Cruiser)	1	0
GPS Units	1	0	Boat (Barge)	1	0
			Boat (Chase)	1	0
			Underwater Metal Detectors	1	0
Dive Gear	0	0	Magnetometers	1	0

Personnel on Site

Name	Position	Hrs (today)	Name	Position	Hrs (today)
Wayne Lewallen	Project Manager	3	Eric Gonzalez	Tech I	2.5
Kevin Osborne	UXOSO	2	Joe Remington	Tech I	2
Blair Oakes	SUXOS	2.5	Mike Shoop	Tech II	0
Kim Tapley	Tech II	2	Dana Winslow	Tech III	3
David Farmer	UXOQCS		Charles Armstrong	Tech II	0

Exposure Data

Previous Hours	848	Hours Today	17	Hours to Date	865
Previous Accidents	0	Accidents Today		Accidents to Date	0
Prev. Lost Work Days	0	Lost Workdays Today	0	Lost Work Days to Date	0

Ordnance Data

Previous UXO Found	113	# UXO Today	0	# UXO to Date	113

Note: See UXO Log for description / disposition of ordnance items.

Anomaly Clearance Data

Prev. Anomalies Reaquired	174	# Anomalies Reaq Today	0	# Anomalies Reaq to Date	174
Prev. Digs Completed	174	Digs Completed Today	0	Digs Completed to Date	174

Note: Numbers include only those anomalies/Digs passing QC inspection.

Verbal Instructions Received or Given: (Instructions received from client or given by EOTI and corresponding action taken.)

Changed Conditions/Delays/Conflicts Encountered: (List conditions which have hindered ID removal or disposal of UXO.)

Other comments or additional information.

Contractor's Verification: The above report is complete and correct. All equipment used and work performed during

Work performed today. Indicate location and include equipment used.

Weather day. Waves to rough on lake. Team checked on boats/ dive gear etc/ GPS data/ completed last two weeks time sheets.

Contractor's Verification: The above report is complete and correct. All equipment used and work performed during this reporti period are in compliance with the plans and specifications except as noted above.

Original Signed

On site Representative- Stewart B. Oakes Date: 14-Oct-06

EOTI DAILY SITE REPORT

EXPLOSIVE ORDNANCE TECHNOLOGIES, INC.

Project Name: ESTCP WAA Pilot Program

Explosive Ordnance Technologies, Inc. (EOTI)
105 W. Tennessee Ave.
Oak Ridge, TN 37830

Project Location: Lake Erie, Toussaint River
Project #:
Report #: 18 Date: 16-Oct-06

Weather Conditions: **Partly Cloudy/ 58 degrees/ 5 mph winds**

Major Equipment Items on Site

ITEM	Quantity	Hrs Used	ITEM	Quantity	Hrs Used
Boat	1	7	Boat (Cruiser)	1	7
GPS Units	1	7	Boat (Barge)	1	0
			Boat (Chase)	1	0
			Underwater Metal Detectors	1	5
Dive Gear	2	10	Magnetometers	1	0

Personnel on Site

Name	Position	Hrs (today)	Name	Position	Hrs (today)
Wayne Lewallen	Project Manager	10	Eric Gonzalez	Tech I	9.5
Kevin Osborne	UXOSO	8	Joe Remington	Tech I	8
Blair Oakes	SUXOS	9.5	Mike Shoop	Tech II	0
Kim Tapley	Tech II	8	Dana Winslow	Tech III	8
David Farmer	UXOQCS		Charles Armstrong	Tech II	0

Exposure Data

Previous Hours	939	Hours Today	61	Hours to Date	1000
Previous Accidents	0	Accidents Today		Accidents to Date	0
Prev. Lost Work Days	0	Lost Workdays Today	0	Lost Work Days to Date	0

Ordnance Data

Previous UXO Found	113	# UXO Today	2	# UXO to Date	115

Note: See UXO Log for description / disposition of ordnance items.

Anomaly Clearance Data

Prev. Anomalies Reaquired	195	# Anomalies Reaq Today	16	# Anomalies Reaq to Date	211
Prev. Digs Completed	195	Digs Completed Today	16	Digs Completed to Date	211

Note: Numbers include only those anomalies/Digs passing QC inspection.

Verbal Instructions Received or Given: (Instructions received from client or given by EOTI and corresponding action taken.)

Changed Conditions/Delays/Conflicts Encountered: (List conditions which have hindered ID removal or disposal of UXO.)

Other comments or additional information.

Contractor's Verification: The above report is complete and correct. All equipment used and work performed during this

Work performed today. Indicate location and include equipment used.

Team met in lobby at 0730 for operational procedures discussion and daily plan of attack. Team proceeded to CP 11 and validated GPS unit. Investigation of water conditions indicated that diving operations on the lake Erie were possible. Lake wave height was one foot.. Dive operations were conducted for 5 hours. 16 anomalies were prosocuted. Two UXO items located and recovered. Received data and loaded in to Trimble for 18 new points. Weather may be an issue tomorrow as a front is to enter area. Crew is doing extremely well. Very safety oriented and hard working.

Contractor's Verification: The above report is complete and correct. All equipment used and work performed during this reporting period are in compliance with the plans and specifications except as noted above.

Original Signed

On site Representative - Stewart B. Oakes Date: 16-Oct-06

EOTI DAILY SITE REPORT

EXPLOSIVE ORDNANCE TECHNOLOGIES, INC.

Project Name: ESTCP WAA Pilot Program

Explosive Ordnance Technologies, Inc. (EOTI)
105 W. Tennessee Ave.
Oak Ridge, TN 37830

Project Location: Lake Erie, Toussaint River
Project #:
Report #: 19 Date: 17-Oct-06

Weather Conditions: Rain/ 63degrees/ 15-30 mph winds

Major Equipment Items on Site

ITEM	Quantity	Hrs Used	ITEM	Quantity	Hrs Used
Boat	1	2	Boat (Cruiser)	1	2
GPS Units	1	2	Boat (Barge)	1	0
			Boat (Chase)	1	0
			Underwater Metal Detectors	1	0
Dive Gear	2	0	Magnetometers	1	0

Personnel on Site

Name	Position	Hrs (today)	Name	Position	Hrs (today)
Wayne Lewallen	Project Manager	10	Eric Gonzalez	Tech I	4
Kevin Osborne	UXOSO	3	Joe Remington	Tech I	3
Blair Oakes	SUXOS	4	Mike Shoop	Tech II	0
Kim Tapley	Tech II	3	Dana Winslow	Tech III	3
David Farmer	UXOQCS		Charles Armstrong	Tech II	0

Exposure Data

Previous Hours	1000	Hours Today	30	Hours to Date	1030
Previous Accidents	0	Accidents Today		Accidents to Date	0
Prev. Lost Work Days	0	Lost Workdays Today	0	Lost Work Days to Date	0

Ordnance Data

Previous UXO Found	115	# UXO Today	0	# UXO to Date	115

Note: See UXO Log for description / disposition of ordnance items.

Anomaly Clearance Data

Prev. Anomalies Reaquired	211	# Anomalies Reaq Today	0	# Anomalies Reaq to Date	211
Prev. Digs Completed	211	Digs Completed Today	0	Digs Completed to Date	211

Note: Numbers include only those anomalies/Digs passing QC inspection.

Verbal Instructions Received or Given: (Instructions received from client or given by EOTI and corresponding action taken.)

Changed Conditions/Delays/Conflicts Encountered: (List conditions which have hindered ID removal or disposal of UXO.)

Other comments or additional information.

Contractor's Verification: The above report is complete and correct. All equipment used and work performed during this

Work performed today. Indicate location and include equipment used.

Team met in lobby at 0730 for operational procedures discussion and daily plan of attack. Team proceeded to CP 11 and CP 6 and validated GPS unit. Double validation of control points this date as new data was was loaded into Trimble for additional points. Investigation of water conditions indicated that diving operations on the lake Erie were maybe possible. Lake wave height was one to three feet at Wild Wings. Dive boat proceeded to dive site. Onsite conditions were three to four feet. Not possible to safely conduct operations. Secured operations. Dana Winslow to depart tomorrow. Intend to conduct demolition operations tomorrow.

Contractor's Verification: The above report is complete and correct. All equipment used and work performed during this reporting period are in compliance with the plans and specifications except as noted above.

Original Signed

On site Representative - Stewart B. Oakes Date: 17-Oct-06

EOTI DAILY SITE REPORT

EXPLOSIVE ORDNANCE TECHNOLOGIES, INC.

Project Name: ESTCP WAA Pilot Program

Explosive Ordnance Technologies, Inc. (EOTI)
105 W. Tennessee Ave.
Oak Ridge, TN 37830

Project Location: Lake Erie, Toussaint River
Project #:
Report #: 20 Date: 18-Oct-06

Weather Conditions: **Partly cloudy/ 67 degrees/ 5 mph winds**

Major Equipment Items on Site

ITEM	Quantity	Hrs Used	ITEM	Quantity	Hrs Used
Boat	1	7	Boat (Cruiser)	1	5
GPS Units	1	5	Boat (Barge)	1	2
			Boat (Chase)	1	0
			Underwater Metal Detectors	1	5
Dive Gear	2	10	Magnetometers	1	0

Personnel on Site

Name	Position	Hrs (today)	Name	Position	Hrs (today)
Wayne Lewallen	Project Manager	12	Eric Gonzalez	Tech I	12
Kevin Osborne	UXOSO	12	Joe Remington	Tech I	12
Blair Oakes	SUXOS	12	Mike Shoop	Tech II	0
Kim Tapley	Tech II	12	Dana Winslow	Tech III	0
David Farmer	UXOQCS		Charles Armstrong	Tech II	0

Exposure Data

Previous Hours	1030	Hours Today	72	Hours to Date	1102
Previous Accidents	0	Accidents Today		Accidents to Date	0
Prev. Lost Work Days	0	Lost Workdays Today	0	Lost Work Days to Date	0

Ordnance Data

Previous UXO Found	115	# UXO Today	8	# UXO to Date	123

Note: See UXO Log for description / disposition of ordnance items.

Anomaly Clearance Data

Prev. Anomalies Reaquired	211	# Anomalies Reaq Today	18	# Anomalies Reaq to Date	229
Prev. Digs Completed	211	Digs Completed Today	18	Digs Completed to Date	229

Note: Numbers include only those anomalies/Digs passing QC inspection.

Verbal Instructions Received or Given: (Instructions received from client or given by EOTI and corresponding action taken.)

Changed Conditions/Delays/Conflicts Encountered: (List conditions which have hindered ID removal or disposal of UXO.)

Other comments or additional information.

Contractor's Verification: The above report is complete and correct. All equipment used and work performed during this

Work performed today. Indicate location and include equipment used.

Team met in lobby at 0630 for operational procedures discussion and daily plan of attack. Dive team proceeded to CP 11 and validated GPS unit. Demo team proceed to Aries site and began prepping for demolition operations. La Dive boat proceeded to dive site. Onsite conditions were excellent. 18 anomolies were prosocuted. 3 UXO items were recovered. Five UXO items were left in place. They were to deep to recover or were fuzed items (TRH 101/ TRH 104/ TRH 105/ TRH 106 and TRH 111). Note: TRH 112- TRH 117 anomolies were located in a shifting sand bar area possibly explaining some of the no contacts. Rest of day was spent conducting demolition operations. All UXO recovered during this project was destroyed or demiled explosively. All ordered explosives were utilized. Demo opertaions were concluded at 1745.

Contractor's Verification: The above report is complete and correct. All equipment used and work performed during this reporting period are in compliance with the plans and specifications except as noted above.

Original Signed

On site Representative - Stewart B. Oakes Date: 18-Oct-06

EOTI DAILY SITE REPORT

EXPLOSIVE ORDNANCE TECHNOLOGIES, INC.

Project Name: ESTCP WAA Pilot Program

Explosive Ordnance Technologies, Inc. (EOTI)
105 W. Tennessee Ave.
Oak Ridge, TN 37830

Project Location: Lake Erie, Toussaint River
Project #:
Report #: 21 Date: 19-Oct-06

Weather Conditions: **Cloudy/ rain/ 55 degrees/ 15-20 mph winds**

Major Equipment Items on Site

ITEM	Quantity	Hrs Used	ITEM	Quantity	Hrs Used
Boat	1	2	Boat (Cruiser)	1	0
GPS Units	1	0	Boat (Barge)	1	2
			Boat (Chase)	1	0
			Underwater Metal Detectors	1	0
Dive Gear	2	0	Magnetometers	1	0

Personnel on Site

Name	Position	Hrs (today)	Name	Position	Hrs (today)
Wayne Lewallen	Project Manager	9	Eric Gonzalez	Tech I	13
Kevin Osborne	UXOSO	12	Joe Remington	Tech I	12
Blair Oakes	SUXOS	14	Mike Shoop	Tech II	0
Kim Tapley	Tech II	12	Dana Winslow	Tech III	0
David Farmer	UXOQCS		Charles Armstrong	Tech II	0

Exposure Data

Previous Hours	1102	Hours Today	72	Hours to Date	1174
Previous Accidents	0	Accidents Today		Accidents to Date	0
Prev. Lost Work Days	0	Lost Workdays Today	0	Lost Work Days to Date	0

Ordnance Data

Previous UXO Found	123	# UXO Today	0	# UXO to Date	123

Note: See UXO Log for description / disposition of ordnance items.

Anomaly Clearance Data

Prev. Anomalies Reaquired	229	# Anomalies Reaq Today	0	# Anomalies Reaq to Date	229
Prev. Digs Completed	229	Digs Completed Today	0	Digs Completed to Date	229

Note: Numbers include only those anomalies/Digs passing QC inspection.

Verbal Instructions Received or Given: (Instructions received from client or given by EOTI and corresponding action taken.)

Changed Conditions/Delays/Conflicts Encountered: (List conditions which have hindered ID removal or disposal of UXO.)

Other comments or additional information.

Contractor's Verification: The above report is complete and correct. All equipment used and work performed during this

Work performed today. Indicate location and include equipment used.

Team met in lobby at 0700 for operational procedures discussion and daily plan of attack. Day was spent removing demiled ordnance from the Aries demolition site. Attempted to use the barge but water depth and waves procluded its use. Long process ensued due to the ordnance being 200 yds for closest vehicle access. All OE was hauled by hand to vehicles. Demiled OE scrap was hauled by vehicle to a San Duskey scrap dealer. UXO operations secured at 1530. Rest of the day was spent turning in items to various rental vendors and packing up remaining items for shipment to EOTI. Wayne Lewallen departs this date. Remaining crew will demob tomorrow.

Contractor's Verification: The above report is complete and correct. All equipment used and work performed during this reporting period are in compliance with the plans and specifications except as noted above.

Original Signed

On site Representative - Stewart B. Oakes Date: 19-Oct-06

EOTI DAILY SITE REPORT

EXPLOSIVE ORDNANCE TECHNOLOGIES, INC.

Project Name: ESTCP WAA Pilot Program

Explosive Ordnance Technologies, Inc. (EOTI)
105 W. Tennessee Ave.
Oak Ridge, TN 37830

Project Location: Lake Erie, Toussaint River
Project #:
Report #: 7 Date: 4-Oct-06

Weather Conditions: **Cloudy/ Rain/ Thunderstorms**

Major Equipment Items on Site

ITEM	Quantity	Hrs Used	ITEM	Quantity	Hrs Used
Boat	3	0	Boat (Cruiser)	1	
GPS Units	1	0	Boat (Barge)	1	0
			Boat (Chase)	1	0
			Underwater Metal Detectors	2	0
Dive Gear	5	0	Magnetometers	1	0

Personnel on Site

Name	Position	Hrs (today)	Name	Position	Hrs (today)
Wayne Lewallen	Project Manager	6	Eric Gonzalez	Tech I	4
Kevin Osborne	UXOSO	4	Joe Remington	Tech I	1
Blair Oakes	SUXOS	5	Mike Shoop	Tech II	2
Kim Tapley	Tech II	2	Dana Winslow	Tech II	4
David Farmer	UXOQCS		Charles Armstrong	Tech II	2

Exposure Data

Previous Hours	304	Hours Today	30	Hours to Date	334
Previous Accidents	0	Accidents Today		Accidents to Date	0
Prev. Lost Work Days	0	Lost Workdays Today	0	Lost Work Days to Date	0

Ordnance Data

Previous UXO Found	53	# UXO Today	0	# UXO to Date	53

Note: See UXO Log for description / disposition of ordnance items.

Anomaly Clearance Data

Prev. Anomalies Reaquired	57	# Anomalies Reaq Today	0	# Anomalies Reaq to Date	57
Prev. Digs Completed	57	Digs Completed Today	0	Digs Completed to Date	57

Note: Numbers include only those anomalies/Digs passing QC inspection.

Verbal Instructions Received or Given: (Instructions received from client or given by EOTI and corresponding action taken.)

Changed Conditions/Delays/Conflicts Encountered: (List conditions which have hindered ID removal or disposal of UXO.)

Other comments or additional information.

Contractor's Verification: The above report is complete and correct. All equipment used and work performed during this

Work performed today. Indicate location and include equipment used.

Team met in lobby at 0900 for operational procedures discussion and daily plan of attack. Heavy thunderstorms in area. Decision made to cancel diving operations for this date due to safety concerns. Used time in morning to do maintenance on diving gear and work on weather shelter for barge.

Contractor's Verification: The above report is complete and correct. All equipment used and work performed during this reporting period are in compliance with the plans and specifications except as noted above.

Original Signed

On site Representative - Stewart B. Oakes Date: 4-Oct-06

EOTI DAILY SITE REPORT

EXPLOSIVE ORDNANCE TECHNOLOGIES, INC.

Project Name: ESTCP WAA Pilot Program

Explosive Ordnance Technologies, Inc. (EOTI)
105 W. Tennessee Ave.
Oak Ridge, TN 37830

Project Location: Lake Erie, Toussaint River
Project #:
Report #: 8 Date: 5-Oct-06

Weather Conditions: **Partly Cloudy/ 58 degrees/ 25-30 MPH winds**

Major Equipment Items on Site

ITEM	Quantity	Hrs Used	ITEM	Quantity	Hrs Used
Boat	2	6	Boat (Cruiser)	1	0
GPS Units	1	3	Boat (Barge)	1	3
			Boat (Chase)	1	3
			Underwater Metal Detectors	2	6
Dive Gear	5	15	Magnetometers	1	0

Personnel on Site

Name	Position	Hrs (today)	Name	Position	Hrs (today)
Wayne Lewallen	Project Manager	0	Eric Gonzalez	Tech I	8
Kevin Osborne	UXOSO	8	Joe Remington	Tech I	8
Blair Oakes	SUXOS	9	Mike Shoop	Tech II	8
Kim Tapley	Tech II	8	Dana Winslow	Tech II	8
David Farmer	UXOQCS		Charles Armstrong	Tech II	8

Exposure Data

Previous Hours	334	Hours Today	65	Hours to Date	399
Previous Accidents	0	Accidents Today		Accidents to Date	0
Prev. Lost Work Days	0	Lost Workdays Today	0	Lost Work Days to Date	0

Ordnance Data

Previous UXO Found	53	# UXO Today	0	# UXO to Date	53

Note: See UXO Log for description / disposition of ordnance items.

Anomaly Clearance Data

Prev. Anomalies Reaquired	57	# Anomalies Reaq Today	16	# Anomalies Reaq to Date	73
Prev. Digs Completed	57	Digs Completed Today	16	Digs Completed to Date	73

Note: Numbers include only those anomalies/Digs passing QC inspection.

Verbal Instructions Received or Given: (Instructions received from client or given by EOTI and corresponding action taken.)

Changed Conditions/Delays/Conflicts Encountered: (List conditions which have hindered ID removal or disposal of UXO.)

Other comments or additional information.

Contractor's Verification: The above report is complete and correct. All equipment used and work performed during this

Work performed today. Indicate location and include equipment used.

Team met in lobby at 0630 for operational procedures discussion and daily plan of attack. Team proceeded to CP 11 and validated GPS unit. Investigation of water conditions indicated that diving operations on the lake Erie were impossible. Wave hieghts on the lake were 3 to 5 feet. Decision made to dive points in the river. Mike's Dockside Service was contacted to move boat Beef Creek Marina. Dive operations were conducted for 3 hours. 16 anomalies were prosocuted. No ordnance items located. River bottom is extremely silty. Many of the contacts well below 2 feet. Indications are that the weather will be the same or worse tomorrow. Intend to finish river points tomorrow. All equipment and crew working well.

Contractor's Verification: The above report is complete and correct. All equipment used and work performed during this reporting period are in compliance with the plans and specifications except as noted above.

Original Signed

On site Representative - Stewart B. Oakes Date: 5-Oct-06

EOTI DAILY SITE REPORT

EXPLOSIVE ORDNANCE TECHNOLOGIES, INC.

Project Name: ESTCP WAA Pilot Program

Explosive Ordnance Technologies, Inc. (EOTI)
105 W. Tennessee Ave.
Oak Ridge, TN 37830

Project Location: Lake Erie, Toussaint River
Project #:
Report #: 13 Date: 11-Oct-06

Weather Conditions: **Cloudy/ 60 degrees/ 20 mph winds**

Major Equipment Items on Site

ITEM	Quantity	Hrs Used	ITEM	Quantity	Hrs Used
Boat	1	3	Boat (Cruiser)	1	3
GPS Units	1	0	Boat (Barge)	1	0
			Boat (Chase)	1	0
			Underwater Metal Detectors	1	1
Dive Gear	2	2	Magnetometers	1	0

Personnel on Site

Name	Position	Hrs (today)	Name	Position	Hrs (today)
Wayne Lewallen	Project Manager	8	Eric Gonzalez	Tech I	7
Kevin Osborne	UXOSO	9.5	Joe Remington	Tech I	7
Blair Oakes	SUXOS	10	Mike Shoop	Tech II	7
Kim Tapley	Tech II	7	Dana Winslow	Tech III	9.5
David Farmer	UXOQCS		Charles Armstrong	Tech II	9.5

Exposure Data

Previous Hours	746	Hours Today	75	Hours to Date	821
Previous Accidents	0	Accidents Today		Accidents to Date	0
Prev. Lost Work Days	0	Lost Workdays Today	0	Lost Work Days to Date	0

Ordnance Data

Previous UXO Found	113	# UXO Today	0	# UXO to Date	113

Note: See UXO Log for description / disposition of ordnance items.

Anomaly Clearance Data

Prev. Anomalies Reaquired	172	# Anomalies Reaq Today	2	# Anomalies Reaq to Date	174
Prev. Digs Completed	172	Digs Completed Today	2	Digs Completed to Date	174

Note: Numbers include only those anomalies/Digs passing QC inspection.

Verbal Instructions Received or Given: (Instructions received from client or given by EOTI and corresponding action taken.)

Changed Conditions/Delays/Conflicts Encountered: (List conditions which have hindered ID removal or disposal of UXO.)

Other comments or additional information.

Contractor's Verification: The above report is complete and correct. All equipment used and work performed during

Work performed today. Indicate location and include equipment used.

Dive team met in lobby at 0630 for operational procedures discussion and daily plan of attack. Team proceeded to CP 11 and verified GPS. Lake wave conditions were good. Dive team proceed to West Sister Island. Weather conditions there much rougher. Two anomalies were dove and then dive ops were canceled do to safety concerns. Dive gear was turned into vendor as weather will be rough the next few days. Rest of day was spent filling sand bags/ prepping demo site and taking pictures of anomalies that were recovered during the week.

Contractor's Verification: The above report is complete and correct. All equipment used and work performed during this report period are in compliance with the plans and specifications except as noted above.

Original Signed

On site Representative- Stewart B. Oakes Date: 11-Oct-06

EOTI DAILY SITE REPORT

EXPLOSIVE ORDNANCE TECHNOLOGIES, INC.

Project Name: ESTCP WAA Pilot Program

Explosive Ordnance Technologies, Inc. (EOTI)
105 W. Tennessee Ave.
Oak Ridge, TN 37830

Project Location: Lake Erie, Toussaint River
Project #:
Report #: 14 Date: 12-Oct-06

Weather Conditions: **Cloudy/ 38 degrees/ 20-35 mph winds/ wind chill 27 degrees**

Major Equipment Items on Site

ITEM	Quantity	Hrs Used	ITEM	Quantity	Hrs Used
Boat	1	0	Boat (Cruiser)	1	0
GPS Units	1	0	Boat (Barge)	1	0
			Boat (Chase)	1	0
			Underwater Metal Detectors	1	0
Dive Gear	0	0	Magnetometers	1	0

Personnel on Site

Name	Position	Hrs (today)	Name	Position	Hrs (today)
Wayne Lewallen	Project Manager	0	Eric Gonzalez	Tech I	4
Kevin Osborne	UXOSO	2	Joe Remington	Tech I	2
Blair Oakes	SUXOS	5	Mike Shoop	Tech II	2
Kim Tapley	Tech II	4	Dana Winslow	Tech III	5
David Farmer	UXOQCS		Charles Armstrong	Tech II	2

Exposure Data

Previous Hours	821	Hours Today	26	Hours to Date	847
Previous Accidents	0	Accidents Today		Accidents to Date	0
Prev. Lost Work Days	0	Lost Workdays Today	0	Lost Work Days to Date	0

Ordnance Data

Previous UXO Found	113	# UXO Today	0	# UXO to Date	113

Note: See UXO Log for description / disposition of ordnance items.

Anomaly Clearance Data

Prev. Anomalies Reaquired	174	# Anomalies Reaq Today	0	# Anomalies Reaq to Date	174
Prev. Digs Completed	174	Digs Completed Today	0	Digs Completed to Date	174

Note: Numbers include only those anomalies/Digs passing QC inspection.

Verbal Instructions Received or Given: (Instructions received from client or given by EOTI and corresponding action taken.)

Changed Conditions/Delays/Conflicts Encountered: (List conditions which have hindered ID removal or disposal of UXO.)

Other comments or additional information.

Contractor's Verification: The above report is complete and correct. All equipment used and work performed during

Work performed today. Indicate location and include equipment used.

Dive team met in lobby a 0800 due to weather day. Administrative time to complete expense sheets/ time sheets/ verify dig lists and anomalie picture correlation. All items removed from barge and barge turned back into vendor as it will no longer be needed. Wind so strong to day it forced water out of both Beef Creek and Wild wings and no boats could leave.

Contractor's Verification: The above report is complete and correct. All equipment used and work performed during this report period are in compliance with the plans and specifications except as noted above.

Original Signed

On site Representative- Stewart B. Oakes Date: 12-Oct-06

EOTI DAILY SITE REPORT

EXPLOSIVE ORDNANCE TECHNOLOGIES, INC.

Project Name: ESTCP WAA Pilot Program

Explosive Ordnance Technologies, Inc. (EOTI)
105 W. Tennessee Ave.
Oak Ridge, TN 37830

Project Location: Lake Erie, Toussaint River
Project #:
Report #: 9 Date: 6-Oct-06

Weather Conditions: **Partly Cloudy/ 45 degrees/ 25-30 MPH winds**

Major Equipment Items on Site

ITEM	Quantity	Hrs Used	ITEM	Quantity	Hrs Used
Boat	2	6	Boat (Cruiser)	1	0
GPS Units	1	3	Boat (Barge)	1	3
			Boat (Chase)	1	3
			Underwater Metal Detectors	2	4
Dive Gear	5	10	Magnetometers	1	0

Personnel on Site

Name	Position	Hrs (today)	Name	Position	Hrs (today)
Wayne Lewallen	Project Manager	0	Eric Gonzalez	Tech I	5
Kevin Osborne	UXOSO	5	Joe Remington	Tech I	6
Blair Oakes	SUXOS	6	Mike Shoop	Tech II	5
Kim Tapley	Tech II	5	Dana Winslow	Tech II	5
David Farmer	UXOQCS		Charles Armstrong	Tech II	5

Exposure Data

Previous Hours	399	Hours Today	42	Hours to Date	441
Previous Accidents	0	Accidents Today		Accidents to Date	0
Prev. Lost Work Days	0	Lost Workdays Today	0	Lost Work Days to Date	0

Ordnance Data

Previous UXO Found	53	# UXO Today	0	# UXO to Date	53

Note: See UXO Log for description / disposition of ordnance items.

Anomaly Clearance Data

Prev. Anomalies Reaquired	73	# Anomalies Reaq Today	12	# Anomalies Reaq to Date	85
Prev. Digs Completed	73	Digs Completed Today	12	Digs Completed to Date	85

Note: Numbers include only those anomalies/Digs passing QC inspection.

Verbal Instructions Received or Given: (Instructions received from client or given by EOTI and corresponding action taken.)

Changed Conditions/Delays/Conflicts Encountered: (List conditions which have hindered ID removal or disposal of UXO.)

Other comments or additional information.

Contractor's Verification: The above report is complete and correct. All equipment used and work performed during this

Work performed today. Indicate location and include equipment used.

Team met in lobby at 0630 for operational procedures discussion and daily plan of attack. Team proceeded to CP 11 and validated GPS unit. Investigation of water conditions indicated that diving operations on the lake Erie were impossible. Wave hieghts on the lake were 3 to 5 feet. Dive operations were conducted for 2 hours. 12 anomalies were prosocuted. No ordnance items located. River bottom is extremely silty. Many of the contacts well below 2 feet. All river points are completed. Indications are that the weather will be better tomorrow. All equipment and crew working well.

Contractor's Verification: The above report is complete and correct. All equipment used and work performed during this reporting period are in compliance with the plans and specifications except as noted above.

Original Signed

On site Representative - Stewart B. Oakes Date: 6-Oct-06

EOTI DAILY SITE REPORT

EXPLOSIVE ORDNANCE TECHNOLOGIES, INC.

Project Name: ESTCP WAA Pilot Program

Explosive Ordnance Technologies, Inc. (EOTI)
105 W. Tennessee Ave.
Oak Ridge, TN 37830

Project Location: Lake Erie, Toussaint River
Project #:
Report #: 10 Date: 7-Oct-06

Weather Conditions: **Partly Cloudy/ 62 degrees/ 5/10 MPH winds**

Major Equipment Items on Site

ITEM	Quantity	Hrs Used	ITEM	Quantity	Hrs Used
Boat	3	30	Boat (Cruiser)	1	10
GPS Units	1	10	Boat (Barge)	1	10
			Boat (Chase)	1	10
			Underwater Metal Detectors	2	14
Dive Gear	5	35	Magnetometers	1	0

Personnel on Site

Name	Position	Hrs (today)	Name	Position	Hrs (today)
Wayne Lewallen	Project Manager	0	Eric Gonzalez	Tech I	12
Kevin Osborne	UXOSO	12	Joe Remington	Tech I	12
Blair Oakes	SUXOS	12	Mike Shoop	Tech II	12
Kim Tapley	Tech II	12	Dana Winslow	Tech III	12
David Farmer	UXOQCS		Charles Armstrong	Tech II	12

Exposure Data

Previous Hours	441	Hours Today	96	Hours to Date	537
Previous Accidents	0	Accidents Today		Accidents to Date	0
Prev. Lost Work Days	0	Lost Workdays Today	0	Lost Work Days to Date	0

Ordnance Data

Previous UXO Found	53	# UXO Today	25	# UXO to Date	78

Note: See UXO Log for description / disposition of ordnance items.

Anomaly Clearance Data

Prev. Anomalies Reaquired	85	# Anomalies Reaq Today	32	# Anomalies Reaq to Date	117
Prev. Digs Completed	85	Digs Completed Today	32	Digs Completed to Date	117

Note: Numbers include only those anomalies/Digs passing QC inspection.

Verbal Instructions Received or Given: (Instructions received from client or given by EOTI and corresponding action taken.)

Changed Conditions/Delays/Conflicts Encountered: (List conditions which have hindered ID removal or disposal of UXO.)

Other comments or additional information.

Contractor's Verification: The above report is complete and correct. All equipment used and work performed during this

Work performed today. Indicate location and include equipment used.

Team met in lobby at 0630 for operational procedures discussion and daily plan of attack. Team proceeded to CP 11 and validated GPS unit. Investigation of water conditions indicated that diving operations on the lake Erie were possible. Wave heights on the lake were 1 to 2 feet. Dive operations were conducted for 7 hours. 32 anomalies were prosocuted. Seven fuzed UXO items located and left on the bottom. (TRU 262/ 268/ 294/ 295/ 296/ 298 and 303) Indications are that the weather will be good tomorrow. Intend to prosoocute outlying targets if weather permits due to storms anticipated midweek. Chase boat broke timing chain and is no longer operable. Chase boat had to be towed home. Chase boat issue needs addressed due to requriement by ARIE's next week. Crew is doing extremely well. Very safety oriented and hard working.

Contractor's Verification: The above report is complete and correct. All equipment used and work performed during this reporting period are in compliance with the plans and specifications except as noted above.

Original Signed

On site Representative - Stewart B. Oakes Date: 7-Oct-06

EOTI DAILY SITE REPORT

EXPLOSIVE ORDNANCE TECHNOLOGIES, INC.

Project Name: ESTCP WAA Pilot Program

Explosive Ordnance Technologies, Inc. (EOTI)
105 W. Tennessee Ave.
Oak Ridge, TN 37830

Project Location: Lake Erie, Toussaint River
Project #:
Report #: 10 Date: 8-Oct-06

Weather Conditions: **Partly Cloudy/ 73 degrees/ 5 winds**

Major Equipment Items on Site

ITEM	Quantity	Hrs Used	ITEM	Quantity	Hrs Used
Boat	2	16	Boat (Cruiser)	1	8
GPS Units	1	8	Boat (Barge)	1	8
			Boat (Chase)	1	0
			Underwater Metal Detectors	2	10
Dive Gear	5	25	Magnetometers	1	0

Personnel on Site

Name	Position	Hrs (today)	Name	Position	Hrs (today)
Wayne Lewallen	Project Manager	0	Eric Gonzalez	Tech I	11
Kevin Osborne	UXOSO	14	Joe Remington	Tech I	10
Blair Oakes	SUXOS	12	Mike Shoop	Tech II	10
Kim Tapley	Tech II	11	Dana Winslow	Tech III	10.5
David Farmer	UXOQCS		Charles Armstrong	Tech II	10.5

Exposure Data

Previous Hours	537	Hours Today	89	Hours to Date	626
Previous Accidents	0	Accidents Today		Accidents to Date	0
Prev. Lost Work Days	0	Lost Workdays Today	0	Lost Work Days to Date	0

Ordnance Data

Previous UXO Found	78	# UXO Today	16	# UXO to Date	94

Note: See UXO Log for description / disposition of ordnance items.

Anomaly Clearance Data

Prev. Anomalies Reaquired	117	# Anomalies Reaq Today	22	# Anomalies Reaq to Date	139
Prev. Digs Completed	117	Digs Completed Today	22	Digs Completed to Date	139

Note: Numbers include only those anomalies/Digs passing QC inspection.

Verbal Instructions Received or Given: (Instructions received from client or given by EOTI and corresponding action taken.)

Changed Conditions/Delays/Conflicts Encountered: (List conditions which have hindered ID removal or disposal of UXO.)

Other comments or additional information.

Contractor's Verification: The above report is complete and correct. All equipment used and work performed during this

Work performed today. Indicate location and include equipment used.

Team met in lobby at 0630 for operational procedures discussion and daily plan of attack. Team proceeded to CP 11 and validated GPS unit. Investigation of water conditions indicated that diving operations on the lake Erie were possible. Lake wave height was small to none. Dive operations were conducted for 5 hours. 22 anomalies were prosocuted. One fuzed UXO item was located and not recovered (TRU 317). Ten UXO items were located but unrecoverable due to the depth of the silt/ mud bottom (TRU 307/ 308/ 309/ 311/ 313/ 315/ 321/ 323/ 324/ 326). Other than TRU 317 items left on bottom fuzing could not be determined due to attitude of items. Most items were nose in. Divers could identify them by feel in the silt at two or three feet below the bottom depth. Calm weather and it being Sunday caused a tremendous amount of boat traffic. Estimate there were 200 boats in our immediate area during the day, at all times, which slowed operations. Cruiser baot broke down while returning to Wild Wings harbor and had to be towed home by barge. Boat was looked at by rental company and will not be able to be fixed until tomorrow. Replacement boat was supplied (26 foot

Contractor's Verification: The above report is complete and correct. All equipment used and work performed during this reporting period are in compliance with the plans and specifications except as noted above.

Original Signed

On site Representative - Stewart B. Oakes Date: 8-Oct-06

TRA
IO
3H
1

TRU-7


TRH
10
QUARTET

TRU 215

TRU-267

TRU 304

TRU 320

TRU 3447


TRU 363
QUARTET


RPM
DEPTH IND.
PILOT STN


national dairy
EOTI
850