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DTC PROJECT NO. 8-CO-160-UXO-021
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STANDARDIZED

UXO TECHNOLOGY DEMONSTRATION SITE

OPEN FIELD SCORING RECORD NO. 249

SITE LOCATION:
U.S. ARMY YUMA PROVING GROUND

DEMONSTRATOR:
U.S. ARMY CORPS OF ENGINEERS
ENGINEERING RESEARCH AND
DEVELOPMENT CENTER
3909 HALLS FERRY ROAD
VICKSBURG, MS 39180-6199

TECHNOLOGY TYPE/PLATFORM:
EM63/PUSHCART

PREPARED BY:
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Prepared for:
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14. ABSTRACT
This scoring record documents the efforts of the U.S. Army Corps of Engineers Engineering Research and Development Center (ERDC) to detect and discriminate inert unexploded ordnance (UXO) utilizing the YPG Standardized UXO Technology Demonstration Site Open Field area. The scoring record was coordinated by Larry Overbay and by the Standardized UXO Technology Demonstration Site Scoring Committee. Organizations on the committee include the U.S. Army Corps of Engineers, the Environmental Security Technology Certification Program, the Strategic Environmental Research and Development Program, the Institute for Defense Analysis, the U.S. Army Environmental Center, and the U.S. Army Aberdeen Test Center.

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SECTION 1. GENERAL INFORMATION

1.1 BACKGROUND

Technologies under development for the detection and discrimination of unexploded ordnance (UXO) require testing so that their performance can be characterized. To that end, Standardized Test Sites have been developed at Aberdeen Proving Ground (APG), Maryland and U.S. Army Yuma Proving Ground (YPG), Arizona. These test sites provide a diversity of geology, climate, terrain, and weather as well as diversity in ordnance and clutter. Testing at these sites is independently administered and analyzed by the government for the purposes of characterizing technologies, tracking performance with system development, comparing performance of different systems, and comparing performance in different environments.

The Standardized UXO Technology Demonstration Site Program is a multi-agency program spearheaded by the U.S. Army Environmental Center (AEC). The U.S. Army Aberdeen Test Center (ATC) and the U.S. Army Corps of Engineers Engineering Research and Development Center (ERDC) provide programmatic support. The program is being funded and supported by the Environmental Security Technology Certification Program (ESTCP), the Strategic Environmental Research and Development Program (SERDP) and the Army Environmental Quality Technology Program (EQT).

1.2 SCORING OBJECTIVES

The objective in the Standardized UXO Technology Demonstration Site Program is to evaluate the detection and discrimination capabilities of a given technology under various field and soil conditions. Inert munitions and clutter items are positioned in various orientations and depths in the ground.

The evaluation objectives are as follows:

a. To determine detection and discrimination effectiveness under realistic scenarios that vary targets, geology, clutter, topography, and vegetation.

b. To determine cost, time, and manpower requirements to operate the technology.

c. To determine demonstrator's ability to analyze survey data in a timely manner and provide prioritized "Target Lists" with associated confidence levels.

d. To provide independent site management to enable the collection of high quality, ground-truth, geo-referenced data for post-demonstration analysis.

1.2.1 Scoring Methodology

a. The scoring of the demonstrator's performance is conducted in two stages. These two stages are termed the RESPONSE STAGE and DISCRIMINATION STAGE. For both stages, the probability of detection (P_d) and the false alarms are reported as receiver-operating

characteristic (ROC) curves. False alarms are divided into those anomalies that correspond to emplaced clutter items, measuring the probability of false positive (P_{fp}), and those that do not correspond to any known item, termed background alarms.

b. The RESPONSE STAGE scoring evaluates the ability of the system to detect emplaced targets without regard to ability to discriminate ordnance from other anomalies. For the open field RESPONSE STAGE, the demonstrator provides the scoring committee with the field location and signal strength of all anomalies that the demonstrator has deemed sufficient to warrant further investigation and/or processing as potential emplaced ordnance items. This list is generated with minimal processing and will only include signals that are above the system noise level.

c. The DISCRIMINATION STAGE evaluates the demonstrator's ability to correctly identify ordnance as such and to reject clutter. For the same field locations as in the RESPONSE STAGE anomaly list, the DISCRIMINATION STAGE list contains the output of the algorithms applied in the discrimination-stage processing. This list is prioritized based on the demonstrator's determination that an anomaly location is likely to contain ordnance. Thus, higher output values are indicative of higher confidence that an ordnance item is present at the specified location. For digital signal processing, priority ranking is based on algorithm output. For other discrimination approaches, priority ranking is based on human (subjective) judgment. The demonstrator also specifies the threshold in the prioritized ranking that provides optimum performance termed the Discrimination Stage Threshold (i.e. that is expected to retain all detected ordnance and reject the maximum amount of clutter).

d. The demonstrator is also scored on EFFICIENCY and REJECTION RATIO, which measure the effectiveness of the discrimination stage processing. The goal of discrimination is to retain the greatest number of ordnance detections from the anomaly list, while rejecting the maximum number of anomalies arising from non-ordnance items. EFFICIENCY measures the fraction of detected ordnance retained after discrimination, while the REJECTION RATIO measures the fraction of false alarms rejected. Both measures are defined relative to the entire response stage anomaly list, i.e., the maximum ordnance detectable by the sensor and its accompanying false positive rate or background alarm rate.

e. Based on configuration of the ground truth at the standardized sites and the defined scoring methodology, there exists the possibility of having anomalies within overlapping halos and/or multiple anomalies within halos. In these cases, the following scoring logic is implemented:

(1) In situations where multiple anomalies exist within a single R_{halo}, the anomaly with the strongest response or highest ranking will be assigned to that particular ground truth item.

(2) For overlapping R_{halo} situations, ordnance has precedence over clutter. The Anomaly with the strongest response or highest ranking that is closest to the center of a particular ground truth item gets assigned to that item. Remaining anomalies are retained until all matching is complete.

(3) Anomalies located within any R_{halo} that do not get associated with a particular ground truth item are thrown out and are not considered in the analysis.

f. All scoring factors are generated utilizing the Standardized UXO Probability and Plot Program, version 3.1.1.

1.2.2 Scoring Factors

Factors to be measured and evaluated as part of this demonstration include:

a. Response Stage ROC curves:

(1) Probability of Detection (P_d^{res}).

(2) Probability of False Positive (P_{fp}^{res}).

(3) Background Alarm Rate (BAR^{res}) or Probability of Background Alarm (P_{BA}^{res}).

b. Discrimination Stage ROC curves:

(1) Probability of Detection (P_d^{disc}).

(2) Probability of False Positive (P_{fp}^{disc}).

(3) Background Alarm Rate (BAR^{disc}) or Probability of Background Alarm (P_{BA}^{disc}).

c. Metrics:

(1) Efficiency (E).

(2) False Positive Rejection Rate (R_{fp}).

(3) Background Alarm Rejection Rate (R_{BA}).

d. Other:

(1) Probability of Detection by Size and Depth.

(2) Classification by type (i.e., 20-, 40-, 105-mm, etc.).

(3) Location accuracy.

(4) Equipment setup, calibration time and corresponding man-hour requirements.

(5) Survey time and corresponding man-hour requirements.

(6) Reacquisition/resurvey time and man-hour requirements (if any).

(7) Downtime due to system malfunctions and maintenance requirements.

1.3 STANDARD AND NONSTANDARD INERT ORDNANCE TARGETS

The standard and nonstandard ordnance items emplaced in the test areas are listed in Table 1. Standardized targets are members of a set of specific ordnance items that have identical properties to all other items in the set (caliber, configuration, size, weight, aspect ratio, material, filler, magnetic remanence, and nomenclature). Nonstandard targets are inert ordnance items having properties that differ from those in the set of standardized targets.

TABLE 1. INERT ORDNANCE TARGETS

Standard Type	Nonstandard (NS)
20-mm Projectile M55	20-mm Projectile M55
	20-mm Projectile M97
40-mm Grenades M385	40-mm Grenades M385
40-mm Projectile MKII Bodies	40-mm Projectile M813
BDU-28 Submunition	
BLU-26 Submunition	
M42 Submunition	
57-mm Projectile APC M86	
60-mm Mortar M49A3	60-mm Mortar (JPG)
	60-mm Mortar M49
2.75-inch Rocket M230	2.75-inch Rocket M230
	2.75-inch Rocket XM229
MK 118 ROCKEYE	
81-mm Mortar M374	81-mm Mortar (JPG)
	81-mm Mortar M374
105-mm Heat Rounds M456	
105-mm Projectile M60	105-mm Projectile M60
155-mm Projectile M483A1	155-mm Projectile M483A
	500-lb Bomb

JPG = Jefferson Proving Ground

SECTION 2. DEMONSTRATION

2.1 DEMONSTRATOR INFORMATION

2.1.1 Demonstrator Point of Contact (POC) and Address

POC: Mr. Ryan North
(601) 634-3486

Address: U.S. Army Corps of Engineers Engineering Research and Development Center
3909 Halls Ferry Road
Vicksburg, MS 39180-6199

2.1.2 System Description (provided by demonstrator)

a. The EM63/pushcart is a commercially available sensor (produced by Geonics, Ltd., of Mississauga, Ontario, Canada, who also produces the EM61). It is a high power, high sensitivity, wide bandwidth full time domain UXO detector. The EM63 consists of a powerful transmitter that generates a pulsed primary magnetic field, which induces eddy currents in nearby metallic objects. The time decay of the currents is accurately measured over a wide dynamic range of time. The second receiver coil axially mounted with the main coil, is used for target depth determination. The acquisition is controlled either by wheel odometer, manual fiducial, or free running.

b. Figure 1 shows an annotated photograph of the EM63 system consists of three major hardware sub-systems: (1) EM63 Control Console Sub-System; (2) Antenna Cart Sub-System; (3) Global Positioning System (GPS) Navigation Sub-System.

(1) The EM63 Control Console Sub-System consists of receiver and transmitter unit, controlled by an integrated field computer. The control console also houses the system battery.

(2) The Antenna Cart Sub-System consists of the transmitter antenna (the 1 meter by 1 meter bottom coil), and receiver coils.

(3) The GPS Navigation Sub-System - Local positioning and geo-referencing of the Geonics EM63 system is accomplished using a Trimble 5700 Real Time Kinematic (RTK) GPS system.

c. The navigational Trimble GPS consists of two receivers that are in radio communication with each other, the rover, and base station. A roving GPS antenna is mounted in the center of the EM63 coils two meters above the bottom coil. The operator or his assistant carries the controller for the roving antenna. The antenna is positioned so that it minimizes any influence on the EM63. The roving GPS is constantly receiving coordinate corrections from the base station.

Figure 1. Demonstrator's system, the EM63 pushcart.

2.1.3 Data Processing Description (provided by demonstrator)

EM63 and GPS data are merged in real time in the control console. The EM63 output files will be processed with Geonics' proprietary DAT63W software to convert the files from binary to American Standard Code for Information Interchange (ASCII). The ASCII data files will be imported into Geosoft's Oasis Montaj. There are no corrections required for positioning since the GPS antenna is centered with respect to the coils. The EM63 files will be combined in Oasis to create one file per area. The resulting area files exported by Oasis meet the requirements as the raw sensor data that must be delivered at the end of the demonstration. The following processing steps will be performed in Oasis:

a. Background removal or leveling.

b. Map generation.

c. Target picking.

2.1.4 Data Submission Format

Data were submitted for scoring in accordance with data submission protocols outlined in the Standardized UXO Technology Demonstration Site Handbook (app E, ref 1). These submitted data are not included in this report in order to protect ground truth information.

2.1.5 Demonstrator Quality Assurance (QA) and Quality Control (QC) (provided by demonstrator)

a. EM63 and GPS data are merged into real time in the control console. The EM63 output files are processed with Geonics' proprietary DAT63W software to convert the files from Binary to ASCII. There are no corrections required for positioning since the GPS antenna is centered with respect to the coils. The EM63 files were combined to create one file per area. The resulting area files exported met the requirements as the Raw Sensor Data that was delivered at the end of the demonstration. The following processing steps were performed: (1) Background removal or leveling; (2) Map generation; (3) Target picking.

b. Four levels of QC checks were performed the first day of the project: at the beginning of the day, multiple times each day, and whenever equipment was changed. The first day of the project, a 10-meter long line was laid out to orient North to South, and a 3-inch diameter steel sphere was placed at the center of the line. This line was well marked and used each time the instrument was tested or repositioned. Data was collected on the line with and without navigation equipment attached to the EM63 to test for any direct current (DC) shift caused by the navigation equipment. Then a test for instrument response over the steel sphere, as well as a position and a latency check were performed. The cart was towed along the line slowly in two directions, and then backed up until it was centered over the sphere. This set the location of the sphere as well as the instrument response, which was used every time the equipment was checked.

c. Each morning prior to testing, a functional check and visual inspection, for damage of all equipment, was conducted. Equipment was assembled and powered up. A check of the cable connections for shorts or broken pin-outs was also conducted. If any shorts or pin-outs were found, the broken cable was marked and removed from service. A static and instrument response test was performed to ensure that the data was stable when the instrument was in a static position over a marked location. These tests were performed after the instrument had sufficient time to warm up.

d. Every time the batteries were changed or data was dumped, the instrument, positioning, and latency tests were repeated. If equipment was changed, all of the previous tests were performed again.

e. A 0.5 meter line spacing on all grids while recording a reading approximately every 0.1-m along the survey line, was used. When the latency, positioning, and instrument response tests over the steel sphere were conducted, the estimated accuracy of the navigation system was also checked. The peak instrument response while moving was compared with the position established during the first day QC checks.

2.1.6 Additional Records

The following record(s) by this vendor can be accessed via the Internet as Microsoft Word documents at www.uxotestsites.org. The Blind Grid counterpart to this report is Scoring Record #216.

2.2 YPG SITE INFORMATION

2.2.1 Location

YPG is located adjacent to the Colorado River in the Sonoran Desert. The UXO Standardized Test Site is located south of Pole Line Road and east of the Countermine Testing and Training Range. The Open Field range, Calibration Grid, Blind Grid, Mogul and Desert Extreme area comprise the 350- by 500 meter general test site. The open field site is the largest of the test sites and measures approximately 200 by 350 meters. To the east of the open field range are the calibration and blind test grids that measure 30 by 40 meters and 40 by 40 meters, respectively. South of the open field is the 135- by 80-meter mogul area consisting of a sequence of man-made depressions. The Desert Extreme area is located southeast of the open field site and has dimensions of 50 by 100 meters. The Desert Extreme area, covered with desert type vegetation, is used to test the performance of different sensor platforms in a more severe desert conditions/environment.

2.2.2 Soil Type

Soil samples were collected at the YPG UXO Standardized Test Site by ERDC to characterize the shallow subsurface (<3 meters). Both surface grab samples and continuous soil borings were acquired. The soils were subjected to several laboratory analyses, including sieve/hydrometer, water content, magnetic susceptibility, dielectric permittivity, X-ray diffraction, and visual description.

There are two soil complexes present within the site, Riverbend-Carrizo and Cristobal-Gunsight. The Riverbend-Carrizo complex is comprised of mixed stream alluvium, whereas the Cristobal-Gunsight complex is derived from fan alluvium. The Cristobal-Gunsight complex covers the majority of the site. Most of the soil samples were classified as either a sandy loam or loamy sand, with most samples containing gravel-size particles. All samples had a measured water content less than 7 percent, except for two that contained 11-percent moisture. The majority of soil samples had water content between 1 to 2-percent. Samples containing more than 3 percent were generally deeper than 1 meter.

An X-ray diffraction analysis on four soil samples indicated a basic mineralogy of quartz, calcite, mica, feldspar, magnetite, and some clay. The presence of magnetite imparted a moderate magnetic susceptibility, with volume susceptibilities generally greater than 100 by 10-5 SI.

For more details concerning the soil properties at the YPG test site, go to www.uxotestsites.org on the web to view the entire soils description report.

2.2.3 Test Areas

A description of the test site areas at YPG is included in Table 2.

TABLE 2. TEST SITE AREAS

Area	Description
Calibration Grid	Contains the 15 standard ordnance items buried in six positions at various angles and depths to allow demonstrator equipment calibration.
Blind Grid	Contains 400 grid cells in a 0.16-hectare (0.39-acre) site. The center of each grid cell contains ordnance, clutter, or nothing.
Open Field	A 4-hectare (10-acre) site containing open areas, dips, ruts, and obstructions, including vegetation.

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SECTION 3. FIELD DATA

3.1 DATE OF FIELD ACTIVITIES (5-10, 12-17, 19-22, and 28-30 May 2003)

3.2 AREAS TESTED/NUMBER OF HOURS

Areas tested and number of hours operated at each site are summarized in Table 3.

TABLE 3. AREAS TESTED AND NUMBER OF HOURS

Area	Number of Hours
Calibration Lanes	17.35
Open Field	135.88

3.3 TEST CONDITIONS

3.3.1 Weather Conditions

An YPG weather station located approximately 2 miles west of the test site was used to record average temperature and precipitation on an hourly basis for each day of operation. The temperatures listed in Table 4 represent the average temperature during field operations from 0700 through 1700 hours while the precipitation data represents a daily total amount of rainfall. Hourly weather logs used to generate this summary are provided in Appendix B.

TABLE 4. TEMPERATURE/PRECIPITATION DATA SUMMARY

Date, 2003	Average Temperature, °F	Total Daily Precipitation, in.
May 5	N/A	0.00
May 6	76.5	0.00
May 7	66.1	0.00
May 8	59.4	0.00
May 9	68.2	0.00
May 10	N/A	N/A
May 12	87.4	0.00
May 13	N/A	N/A
May 14	88.9	0.00
May 15	78.3	0.00
May 16	91.3	0.00
May 17	N/A	N/A
May 19	93.2	0.00
May 20	N/A	N/A
May 21	N/A	N/A
May 22	N/A	N/A
May 28	N/A	N/A
May 29	N/A	N/A
May 30	N/A	N/A

3.3.2 Field Conditions

ERDC surveyed the Open Field area with the EM63 pushcart 5-10, 12-17, 19-22, and 28-30 May 2003 with field conditions remaining dry.

3.3.3 Soil Moisture

Five soil probes were placed at various locations of the site to capture soil moisture data: wet, wooded, and open areas, the calibration lanes, and the blind grid/moguls. Measurements were collected in percent moisture and were taken twice daily (morning and afternoon) from five different soil layers (0 to 6 in., 6 to 12 in., 12 to 24 in., 24 to 36 in., and 36 to 48 in.) from each probe. Soil moisture logs are included in Appendix C.

3.4 FIELD ACTIVITIES

3.4.1 Setup/Mobilization

These activities included initial mobilization and daily equipment preparation and breakdown. The four-person crew took 1-hour and 5 minutes to perform the initial setup and mobilization. There was 16 hours and 9 minutes of daily equipment preparation and end of day equipment break down lasted 2 hours and 4 minutes.

3.4.2 Calibration

ERDC spent a total of 17 hours and 21 minutes in the calibration lanes, 2 hours and 5 minutes of which were spent collecting data. In addition, the team revisited the calibration lanes in-between the Blind Grid and the Open Field areas, with a total time of 4 hours and 50 minutes, this time has been included in the calibration billing portion. The ERDC team also spent 1-hour and 35 minutes in the calibration pit, which has been charged to the Open Field area portion of billing.

3.4.3 Downtime Occasions

Occasions of downtime are grouped into five categories: equipment/data checks or equipment maintenance, equipment failure and repair, weather, Demonstration Site issues, or lunch/breaks. All downtime is included for the purposes of calculating labor costs (section 5) except for downtime due to Demonstration Site issues. Demonstration Site issues, while noted in the Daily Log, are considered non-chargeable downtime for the purposes of calculating labor costs and are not included. Breaks and lunches are included in this section and billed to the Open Field area.

3.4.3.1 Equipment/data checks, maintenance. Equipment/data checks and maintenance activities accounted for 17 hours and 15 minutes of site usage time. These activities included changing out batteries and routine data checks to ensure data were being properly recorded/collected. In addition, the ERDC team spent 5 hours and 57 minutes throughout test operations on breaks and lunches.

3.4.3.2 Equipment failure or repair. Two minor equipment failures occurred while surveying in the Open Field area. A brief computer malfunction occurred and a new battery was replaced to remedy the problem and field computer ran out of RAM which was replaced with a new computer. The total time for the failures was 9 minutes.

3.4.3.3 Weather. No delays occurred due to weather.

3.4.4 Data Collection

ERDC spent a total of 135 hours and 53 minutes in the calibration lanes, 92 hours and 43 minutes of which were spent collecting data. This time excludes break/lunches and downtimes described in section 3.4.3.

3.4.5 Demobilization

ERDC went on to survey the entire YPG Site. Therefore, actual demobilization did not occur until 30 May 2003. On that day, 2 hours and 10 minutes were spent demobilizing all of the equipment.

3.5 PROCESSING TIME

ERDC submitted the raw data from demonstration activities on a date required by the test director. The scoring submission data were also provided within the required 30-day timeframe.

3.6 DEMONSTRATOR'S FIELD PERSONNEL

Field Manager:	Ryan North
Field Engineers:	Eric Smith
	Stephen Billings
Quality Assurance:	Don Yule

3.7 DEMONSTRATOR'S FIELD SURVEYING METHOD

ERDC started surveying the Open Field area in the northeast portion and generally in the east/west direction. One lane was surveyed and then the demonstrator returned to the beginning of the next lane, until completion. Lanes were laid out in approximately 50 meter intervals, where appropriate.

3.8 SUMMARY OF DAILY LOGS

Daily logs capture all field activities during this demonstration and are located in Appendix D. Activities pertinent to this specific demonstration are indicated in highlighted text.

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SECTION 4. TECHNICAL PERFORMANCE RESULTS

4.1 ROC CURVES USING ALL ORDNANCE CATEGORIES

Figure 2 shows the probability of detection for the response stage (P_d^{res}) and the discrimination stage (P_d^{disc}) versus their respective P_{fp}. Figure 3 shows both probabilities plotted against their respective BAR. Both figures use a horizontal line to illustrate the performance of the demonstrator at the demonstrator's recommended discrimination stage threshold level, which defines the subset of targets the demonstrator would recommend digging based on discrimination. Note that all points have been rounded to protect the ground truth.

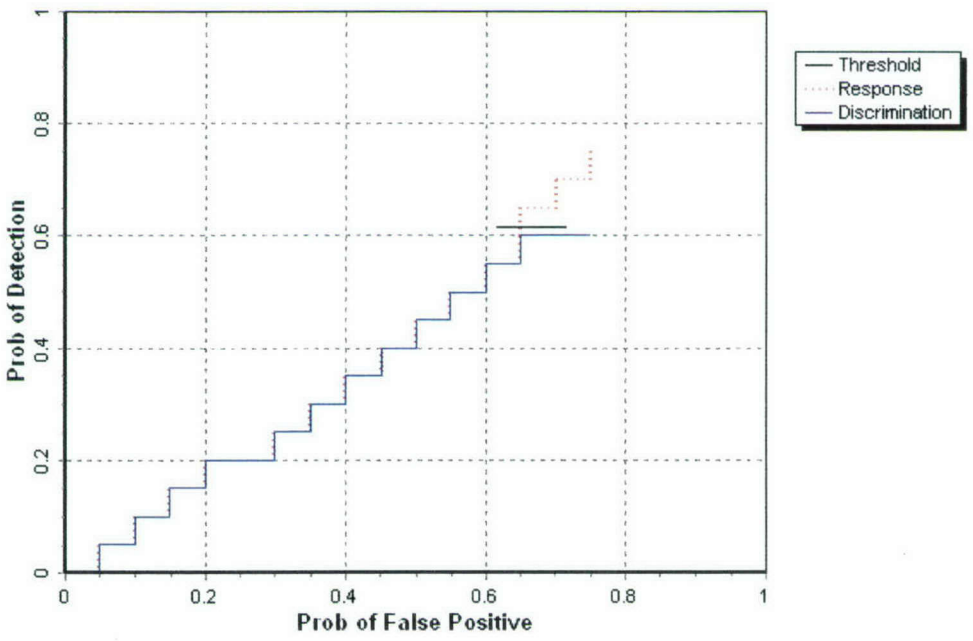

Figure 2. EM63 Open Field P_d^{res} and P_d^{disc} versus their respective over all ordnance categories combined.

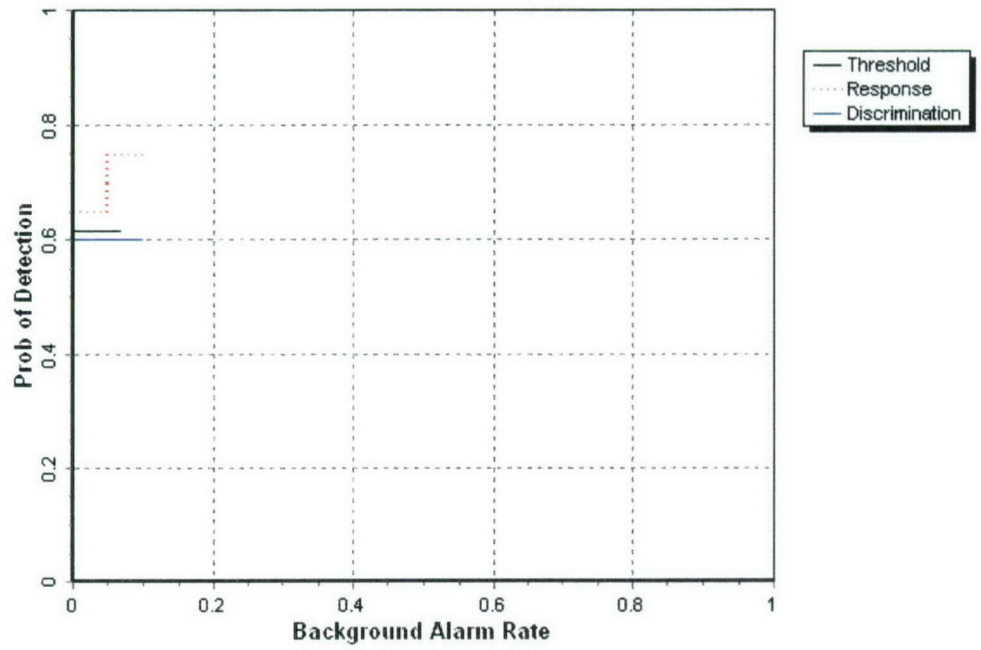

Figure 3. EM63 Open Field P_d^{res} and P_d^{disc} versus their respective BAR over all ordnance categories combined.

4.2 ROC CURVES USING ORDNANCE LARGER THAN 20 MM

Figure 4 shows the probability of detection for the response stage (P_d^{res}) and the discrimination stage (P_d^{disc}) versus their respective P_{fp} when only targets larger than 20 mm are scored. Figure 5 shows both probabilities plotted against their respective BAR. Both figures use a horizontal line to illustrate the performance of the demonstrator at the demonstrator's recommended discrimination stage threshold level, which defines the subset of targets the demonstrator would recommend digging based on discrimination. Note that all points have been rounded to protect the ground truth.

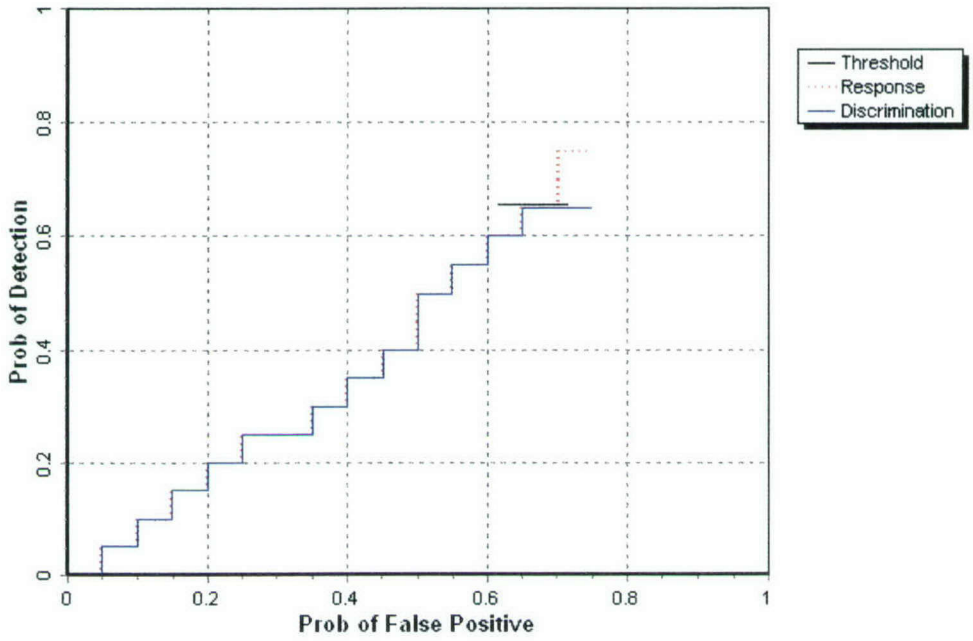

Figure 4. EM63 Open Field P_d^{res} and P_d^{disc} versus their respective P_{fp} for all ordnance larger than 20 mm.

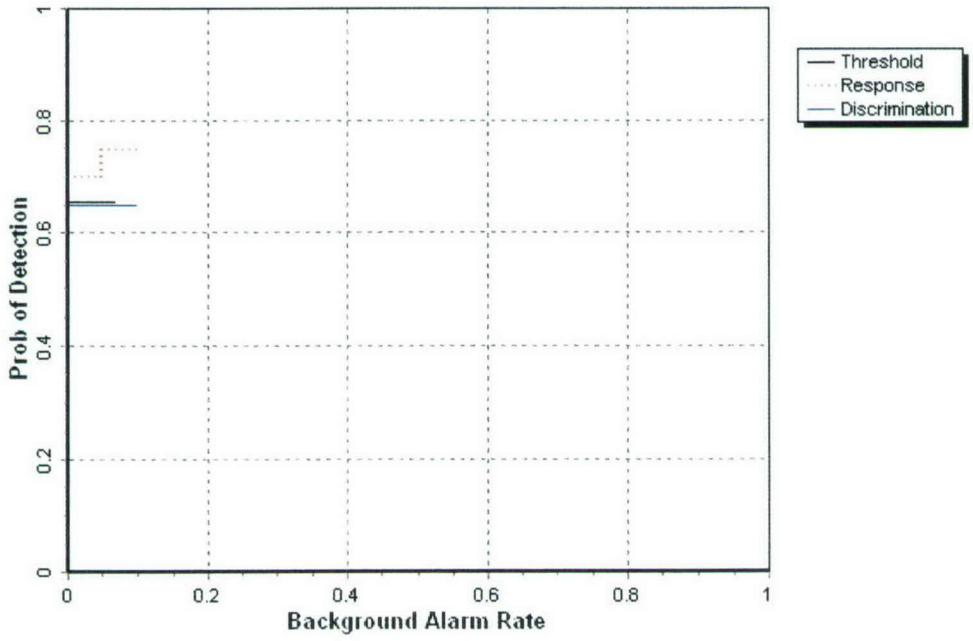

Figure 5. EM63 Open Field P_d^{res} and P_d^{disc} versus their respective BAR^{res} for all ordnance larger than 20 mm.

4.3 PERFORMANCE SUMMARIES

Results for the Open field test broken out by size, depth and nonstandard ordnance are presented in Table 5 (for cost results, see section 5). Results by size and depth include both standard and nonstandard ordnance. The results by size show how well the demonstrator did at detecting/discriminating ordnance of a certain caliber range (see app A for size definitions). The results are relative to the number of ordnance items emplaced. Depth is measured from the geometric center of anomalies.

The RESPONSE STAGE results are derived from the list of anomalies above the demonstrator-provided noise level. The results for the DISCRIMINATION STAGE are derived from the demonstrator's recommended threshold for optimizing UXO field cleanup by minimizing false digs and maximizing ordnance recovery. The lower 90 percent confidence limit on probability of detection and P_{fp} was calculated assuming that the number of detections and false positives are binomially distributed random variables. All results in Table 5 have been rounded to protect the ground truth. However, lower confidence limits were calculated using actual results.

TABLE 5. SUMMARY OF OPEN FIELD RESULTS FOR THE EM63

				By Size			By Depth, m		
Metric	**Overall**	**Standard**	**Non-Standard**	**Small**	**Medium**	**Large**	**< 0.3**	**0.3 to <1**	**>= 1**
RESPONSE STAGE									
P_d	0.75	0.75	0.75	0.70	0.70	0.90	0.80	0.75	0.40
P_d Low 90% Conf	0.71	0.69	0.71	0.68	0.65	0.82	0.74	0.70	0.31
P_{fp}	0.75	-	-	-	-	-	0.75	0.80	0.30
P_{fp} Low 90% Conf	0.72	-	-	-	-	-	0.71	0.75	0.12
BAR	0.10	-	-	-	-	-	-	-	-
DISCRIMINATION STAGE									
P_d	0.60	0.60	0.65	0.55	0.65	0.80	0.65	0.65	0.15
P_d Low 90% Conf	0.59	0.56	0.60	0.51	0.58	0.72	0.63	0.58	0.10
P_{fp}	0.65	-	-	-	-	-	0.65	0.70	0.10
P_{fp} Low 90% Conf	0.65	-	-	-	-	-	0.63	0.69	0.01
BAR	0.00	-	-	-	-	-	-	-	-

Response Stage Noise Level: 3.90
Recommended Discrimination Stage Threshold: 0.22

Note: The recommended discrimination stage threshold values are provided by the demonstrator.

4.4 EFFICIENCY, REJECTION RATES, AND TYPE CLASSIFICATION

Efficiency and rejection rates are calculated to quantify the discrimination ability at specific points of interest on the ROC curve: (1) at the point where no decrease in P_d is suffered (i.e., the efficiency is by definition equal to one) and (2) at the operator selected threshold. These values are reported in Table 6.

TABLE 6. EFFICIENCY AND REJECTION RATES FOR THE EM63

	Efficiency (E)	False Positive Rejection Rate	Background Alarm Rejection Rate
At Operating Point	0.83	0.10	0.79
With No Loss of P_d	1.00	0.00	1.00

At the demonstrator's recommended setting, the ordnance items that were detected and correctly discriminated were further scored on whether their correct type could be identified (table 7). Correct type examples include "20-mm projectile, 105-mm HEAT Projectile, and 2.75-inch Rocket". A list of the standard type declaration required for each ordnance item was provided to demonstrators prior to testing. For example, the standard type for the three example items are 20mmP, 105H, and 2.75in, respectively.

TABLE 7. CORRECT TYPE CLASSIFICATION OF TARGETS CORRECTLY DISCRIMINATED AS UXO

Size	% Correct
Small	0.00
Medium	0.00
Large	0.00
Overall	0.00

Note: The demonstrator did not attempt to identify ordnance type.

4.5 LOCATION ACCURACY

The mean and standard deviations of location accuracy are presented in Table 8 for each of the three dimensions of location. Location accuracy was calculated for those ordnance items correctly identified in the discrimination stage. Note that depth is measured from the closest point of the ordnance to the surface.

TABLE 8. MEAN LOCATION ACCURACY AND STANDARD DEVIATION FOR THE EM63

	Mean, m	Standard Deviation, m
Northing	0.02	0.13
Easting	0.00	0.14
Depth	-0.29	0.25

SECTION 5. ON-SITE LABOR COSTS

A standardized estimate for labor costs associated with this effort was calculated as follows: the first person at the test site was designated "supervisor", the second person was designated "data analyst", and the third and following personnel were considered "field support". Standardized hourly labor rates were charged by title: supervisor at $95.00/hour, data analyst at $57.00/hour, and field support at $28.50/hour.

Government representatives monitored on-site activity. All on site activities were grouped into one of ten categories: initial setup/mobilization, daily setup/stop, calibration, collecting data, downtime due to break/lunch, downtime due to equipment failure, downtime due to equipment/data checks or maintenance, downtime due to weather, downtime due to demonstration site issue, or demobilization. See Appendix D for the daily activity log. See section 3.4 for a summary of field activities.

The standardized cost estimate associated with the labor needed to perform the field activities is presented in Table 9. Note that calibration time includes time spent in the Calibration Lanes as well as field calibrations. "Site survey time" includes daily setup/stop time, collecting data, breaks/lunch, downtime due to equipment/data checks or maintenance, downtime due to failure, and downtime due to weather.

TABLE 9. ON-SITE LABOR COSTS

	No. People	Hourly Wage	Hours	Cost
INITIAL SETUP				
Supervisor	1	$95.00	1.08	$102.60
Data Analyst	1	57.00	1.08	61.56
Field Support	2	28.50	1.08	61.56
Subtotal				**$225.72**
CALIBRATION				
Supervisor	1	$95.00	17.35	$1,648.25
Data Analyst	1	57.00	17.35	988.95
Field Support	2	28.50	17.35	988.95
Subtotal				**$3,626.15**
SITE SURVEY				
Supervisor	1	$95.00	135.88	$12,908.60
Data Analyst	1	57.00	135.88	7,745.16
Field Support	2	28.50	135.88	7,745.16
Subtotal				**$28,398.92**

See notes at end of table.

TABLE 9 (CONT'D)

	No. People	Hourly Wage	Hours	Cost
DEMOBILIZATION				
Supervisor	1	$95.00	2.16	$205.20
Data Analyst	1	57.00	2.16	122.55
Field Support	2	28.50	2.16	122.55
Subtotal				**$450.30**
Total				**$32,701.09**

Notes: Calibration time includes time spent in the Calibration Lanes as well as calibration before each data run.

Site Survey time includes daily setup/stop time, collecting data, breaks/lunch, downtime due to system maintenance, failure, and weather.

SECTION 6. COMPARISON OF RESULTS TO BLIND GRID DEMONSTRATION

6.1 SUMMARY OF RESULTS FROM BLIND GRID DEMONSTRATION

Table 10 shows the results from Blind Grid survey conducted prior to surveying the open field during the same site visit in May of 2003. For more details on the Blind Grid survey results reference section 2.1.6.

TABLE 10. SUMMARY OF BLIND GRID RESULTS FOR THE EM63

Metric	Overall	Standard	Nonstandard	By Size			By Depth, m		
				Small	Medium	Large	< 0.3	0.3 to <1	>= 1
RESPONSE STAGE									
P_d	0.80	0.80	0.80	0.80	0.75	0.95	0.90	0.80	0.30
P_d Low 90% Conf	0.74	0.73	0.67	0.70	0.59	0.75	0.82	0.65	0.08
P_{fp}	0.95	-	-	-	-	-	0.95	0.95	0.00
P_{fp} Low 90% Conf	0.90	-	-	-	-	-	0.89	0.82	-
P_{ba}	0.00	-	-	-	-	-	-	-	-
DISCRIMINATION STAGE									
P_d	0.80	0.80	0.80	0.80	0.75	0.95	0.90	0.80	0.30
P_d Low 90% Conf	0.74	0.73	0.67	0.70	0.59	0.75	0.82	0.65	0.08
P_{fp}	0.95	-	-	-	-	-	0.95	0.95	0.00
P_{fp} Low 90% Conf	0.90	-	-	-	-	-	0.89	0.82	-
P_{ba}	0.00	-	-	-	-	-	-	-	-

6.2 COMPARISON OF ROC CURVES USING ALL ORDNANCE CATEGORIES

Figure 6 shows P_d^{res} versus the respective P_{fp} over all ordnance categories. Figure 7 shows P_d^{disc} versus their respective P_{fp} over all ordnance categories. Figure 7 uses horizontal lines to illustrate the performance of the demonstrator at the recommended discrimination threshold levels, defining the subset of targets the demonstrator would recommend digging based on discrimination.

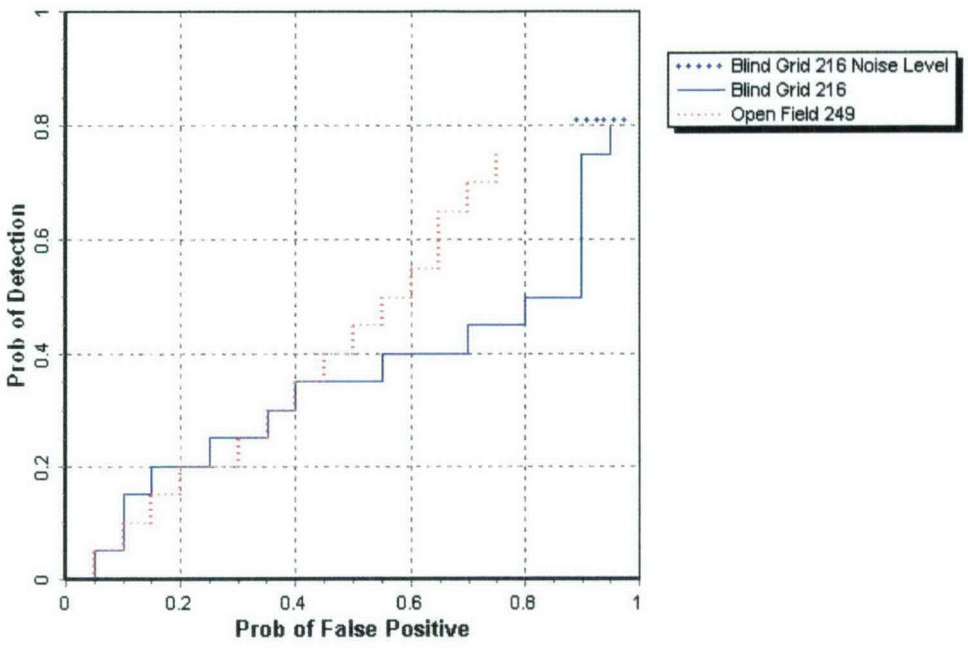

Figure 6. EM63 P_d^{res} stages versus the respective P_{fp} over all ordnance categories combined.

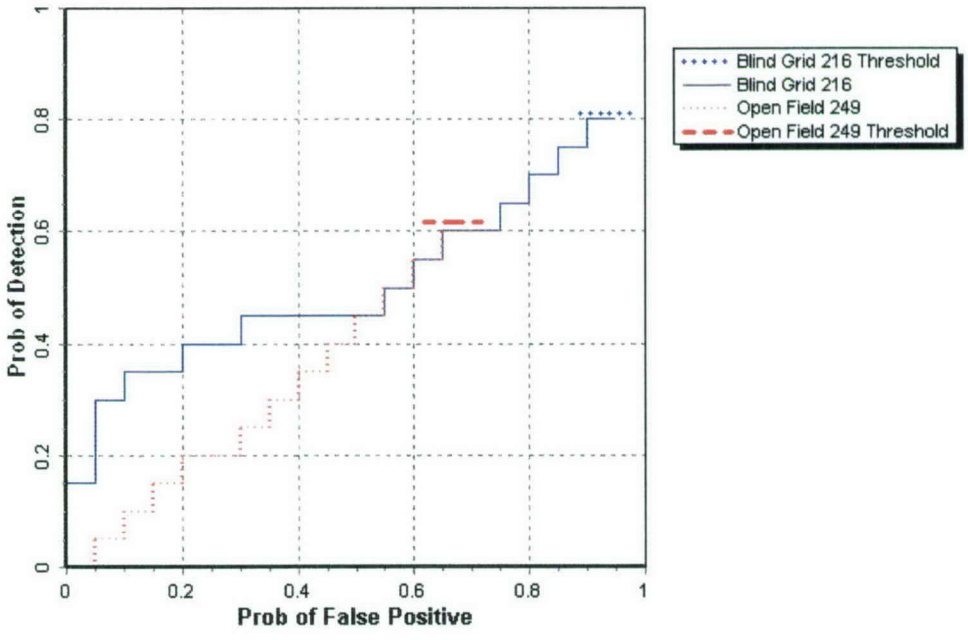

Figure 7. EM63 P_d^{disc} versus the respective P_{fp} over all ordnance categories combined.

6.3 COMPARISON OF ROC CURVES USING ORDNANCE LARGER THAN 20 MM

Figure 8 shows the P_d^{res} versus the respective probability of P_{fp} over ordnance larger than 20 mm. Figure 9 shows P_d^{disc} versus the respective P_{fp} over ordnance larger than 20 mm. Figure 9 uses horizontal lines to illustrate the performance of the demonstrator at the recommended discrimination threshold levels, defining the subset of targets the demonstrator would recommend digging based on discrimination.

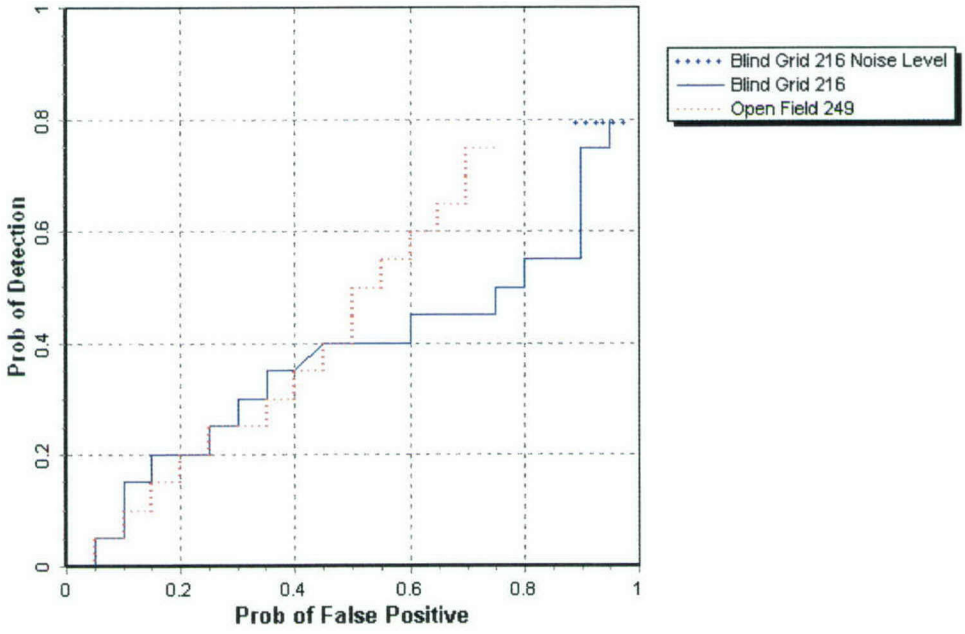

Figure 8. EM63 P_d^{res} versus the respective P_{fp} for ordnance larger than 20 mm.

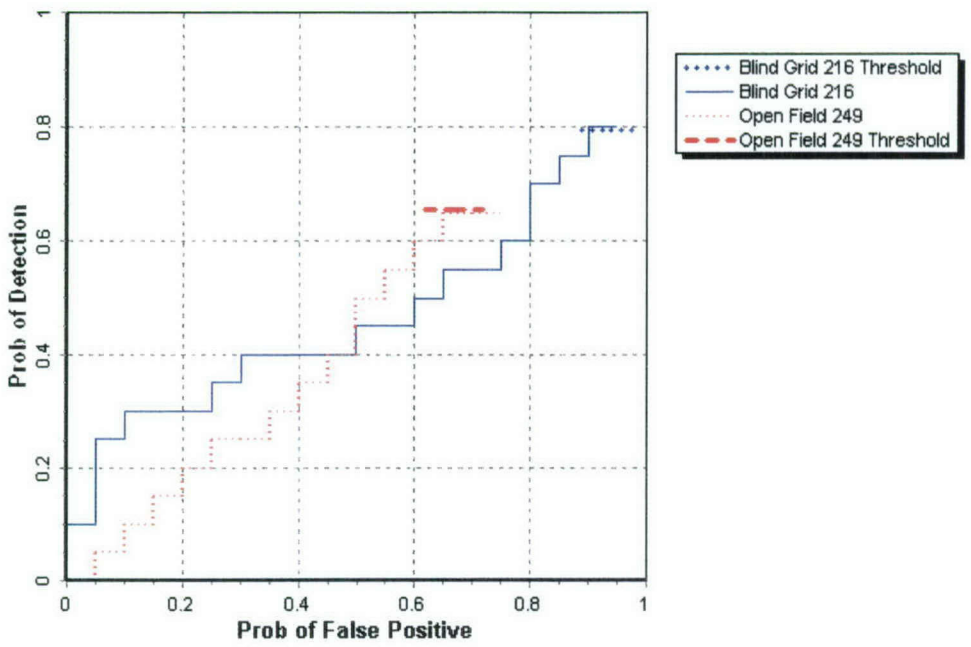

Figure 9. EM63 P_d^{disc} versus the respective P_{fp} for ordnance larger than 20 mm.

6.4 STATISTICAL COMPARISONS

Statistical Chi-square significance tests were used to compare results between the Blind Grid and Open Field scenarios. The intent of the comparison is to determine if the feature introduced in each scenario has a degrading effect on the performance of the sensor system. However, any modifications in the UXO sensor system during the test, like changes in the processing or changes in the selection of the operating threshold, will also contribute to performance differences.

The Chi-square test for comparison between ratios was used at a significance level of 0.05 to compare Blind Grid to Open Field with regard to P_d^{res}, P_d^{disc}, P_{fp}^{res} and P_{fp}^{disc}, Efficiency and Rejection Rate. These results are presented in Table 11. A detailed explanation and example of the Chi-square application is located in Appendix A.

TABLE 11. CHI-SQUARE RESULTS - BLIND GRID VERSUS OPEN FIELD

Metric	Small	Medium	Large	Overall
P_d^{res}	Not Significant	Not Significant	Not Significant	Not Significant
P_d^{disc}	Significant	Not Significant	Not Significant	Significant
P_{fp}^{res}	Not Significant	Not Significant	Not Significant	Significant
P_{fp}^{disc}	-	-	-	Significant
Efficiency	-			Significant
Rejection rate	-	-	-	Not Significant

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SECTION 7. APPENDIXES

APPENDIX A. TERMS AND DEFINITIONS

GENERAL DEFINITIONS

Anomaly: Location of a system response deemed to warrant further investigation by the demonstrator for consideration as an emplaced ordnance item.

Detection: An anomaly location that is within R_{halo} of an emplaced ordnance item.

Emplaced Ordnance: An ordnance item buried by the government at a specified location in the test site.

Emplaced Clutter: A clutter item (i.e., non-ordnance item) buried by the government at a specified location in the test site.

R_{halo}: A pre-determined radius about the periphery of an emplaced item (clutter or ordnance) within which a location identified by the demonstrator as being of interest is considered to be a response from that item. For the purpose of this program, a circular halo 0.5 meters in radius will be placed around the center of the object for all clutter and ordnance items less than 0.6 meters in length. When ordnance items are longer than 0.6 meters, the halo becomes an ellipse where the minor axis remains 1 meter and the major axis is equal to the projected length of the ordnance onto the ground plane plus 1 meter.

Small Ordnance: Caliber of ordnance less than or equal to 40 mm (includes 20-mm projectile, 40-mm projectile, submunitions BLU-26, BLU-63, and M42).

Medium Ordnance: Caliber of ordnance greater than 40 mm and less than or equal to 81-mm (includes 57-mm projectile, 60-mm mortar, 2.75-inch Rocket, MK118 Rockeye, 81-mm mortar).

Large Ordnance: Caliber of ordnance greater than 81-mm (includes 105-mm HEAT, 105-mm projectile, 155-mm projectile, 500-lb bomb).

Shallow: Items buried less than 0.3 meter below ground surface.

Medium: Items buried greater than or equal to 0.3 meter and less than 1 meter below ground surface.

Deep: Items buried greater than or equal to 1 meter below ground surface.

Response Stage Noise Level: The level that represents the point below which anomalies are not considered detectable. Demonstrators are required to provide the recommended noise level for the Blind Grid test area.

Discrimination Stage Threshold: The demonstrator selects the threshold level that they believe provides optimum performance of the system by retaining all detectable ordnance and rejecting the maximum amount of clutter. This level defines the subset of anomalies the demonstrator would recommend digging based on discrimination.

Binomially Distributed Random Variable: A random variable of the type which has only two possible outcomes, say success and failure, is repeated for n independent trials with the probability p of success and the probability 1-p of failure being the same for each trial. The number of successes x observed in the n trials is an estimate of p and is considered to be a binomially distributed random variable.

RESPONSE AND DISCRIMINATION STAGE DATA

The scoring of the demonstrator's performance is conducted in two stages. These two stages are termed the RESPONSE STAGE and DISCRIMINATION STAGE. For both stages, the probability of detection (P_d) and the false alarms are reported as receiver-operating characteristic (ROC) curves. False alarms are divided into those anomalies that correspond to emplaced clutter items, measuring the probability of false positive (P_{fp}) and those that do not correspond to any known item, termed background alarms.

The RESPONSE STAGE scoring evaluates the ability of the system to detect emplaced targets without regard to ability to discriminate ordnance from other anomalies. For the RESPONSE STAGE, the demonstrator provides the scoring committee with the location and signal strength of all anomalies that the demonstrator has deemed sufficient to warrant further investigation and/or processing as potential emplaced ordnance items. This list is generated with minimal processing (e.g., this list will include all signals above the system noise threshold). As such, it represents the most inclusive list of anomalies.

The DISCRIMINATION STAGE evaluates the demonstrator's ability to correctly identify ordnance as such, and to reject clutter. For the same locations as in the RESPONSE STAGE anomaly list, the DISCRIMINATION STAGE list contains the output of the algorithms applied in the discrimination-stage processing. This list is prioritized based on the demonstrator's determination that an anomaly location is likely to contain ordnance. Thus, higher output values are indicative of higher confidence that an ordnance item is present at the specified location. For electronic signal processing, priority ranking is based on algorithm output. For other systems, priority ranking is based on human judgment. The demonstrator also selects the threshold that the demonstrator believes will provide "optimum" system performance (i.e., that retains all the detected ordnance and rejects the maximum amount of clutter).

Note: The two lists provided by the demonstrator contain identical numbers of potential target locations. They differ only in the priority ranking of the declarations.

RESPONSE STAGE DEFINITIONS

Response Stage Probability of Detection (P_d^{res}): P_d^{res} = (No. of response-stage detections)/ (No. of emplaced ordnance in the test site).

Response Stage False Positive (fp^{res}): An anomaly location that is within R_{halo} of an emplaced clutter item.

Response Stage Probability of False Positive (P_{fp}^{res}): P_{fp}^{res} = (No. of response-stage false positives)/(No. of emplaced clutter items).

Response Stage Background Alarm: An anomaly in a blind grid cell that contains neither emplaced ordnance nor an emplaced clutter item. An anomaly location in the open field or scenarios that is outside R_{halo} of any emplaced ordnance or emplaced clutter item.

Response Stage Probability of Background Alarm (P_{ba}^{res}): Blind Grid only: P_{ba}^{res} = (No. of response-stage background alarms)/(No. of empty grid locations).

Response Stage Background Alarm Rate (BAR^{res}): Open Field only: BAR^{res} = (No. of response-stage background alarms)/(arbitrary constant).

Note that the quantities P_d^{res}, P_{fp}^{res}, P_{ba}^{res}, and BAR^{res} are functions of t^{res}, the threshold applied to the response-stage signal strength. These quantities can, therefore, be written as $P_d^{res}(t^{res})$, $P_{fp}^{res}(t^{res})$, $P_{ba}^{res}(t^{res})$, and $BAR^{res}(t^{res})$.

DISCRIMINATION STAGE DEFINITIONS

Discrimination: The application of a signal processing algorithm or human judgment to response-stage data that discriminates ordnance from clutter. Discrimination should identify anomalies that the demonstrator has high confidence correspond to ordnance, as well as those that the demonstrator has high confidence correspond to non-ordnance or background returns. The former should be ranked with highest priority and the latter with lowest.

Discrimination Stage Probability of Detection (P_d^{disc}): P_d^{disc} = (No. of discrimination-stage detections)/(No. of emplaced ordnance in the test site).

Discrimination Stage False Positive (fp^{disc}): An anomaly location that is within R_{halo} of an emplaced clutter item.

Discrimination Stage Probability of False Positive (P_{fp}^{disc}): P_{fp}^{disc} = (No. of discrimination stage false positives)/(No. of emplaced clutter items).

Discrimination Stage Background Alarm: An anomaly in a blind grid cell that contains neither emplaced ordnance nor an emplaced clutter item. An anomaly location in the open field or scenarios that is outside R_{halo} of any emplaced ordnance or emplaced clutter item.

Discrimination Stage Probability of Background Alarm (P_{ba}^{disc}): P_{ba}^{disc} = (No. of discrimination-stage background alarms)/(No. of empty grid locations).

Discrimination Stage Background Alarm Rate (BAR^{disc}): BAR^{disc} = (No. of discrimination-stage background alarms)/(arbitrary constant).

Note that the quantities P_d^{disc}, P_{fp}^{disc}, P_{ba}^{disc}, and BAR^{disc} are functions of t^{disc}, the threshold applied to the discrimination-stage signal strength. These quantities can, therefore, be written as $P_d^{disc}(t^{disc})$, $P_{fp}^{disc}(t^{disc})$, $P_{ba}^{disc}(t^{disc})$, and $BAR^{disc}(t^{disc})$.

RECEIVER-OPERATING CHARACERISTIC (ROC) CURVES

ROC curves at both the response and discrimination stages can be constructed based on the above definitions. The ROC curves plot the relationship between P_d versus P_{fp} and P_d versus BAR or P_{ba} as the threshold applied to the signal strength is varied from its minimum (t_{min}) to its maximum (t_{max}) value.[1] Figure A-1 shows how P_d versus P_{fp} and P_d versus BAR are combined into ROC curves. Note that the "res" and "disc" superscripts have been suppressed from all the variables for clarity.

Figure A-1. ROC curves for open-field testing. Each curve applies to both the response and discrimination stages.

[1]Strictly speaking, ROC curves plot the P_d versus P_{ba} over a predetermined and fixed number of detection opportunities (some of the opportunities are located over ordnance and others are located over clutter or blank spots). In an open field scenario, each system suppresses its signal strength reports until some bare-minimum signal response is received by the system. Consequently, the open field ROC curves do not have information from low signal-output locations, and, furthermore, different contractors report their signals over a different set of locations on the ground. These ROC curves are thus not true to the strict definition of ROC curves as defined in textbooks on detection theory. Note, however, that the ROC curves obtained in the Blind Grid test sites are true ROC curves.

METRICS TO CHARACTERIZE THE DISCRIMINATION STAGE

The demonstrator is also scored on efficiency and rejection ratio, which measure the effectiveness of the discrimination stage processing. The goal of discrimination is to retain the greatest number of ordnance detections from the anomaly list, while rejecting the maximum number of anomalies arising from non-ordnance items. The efficiency measures the amount of detected ordnance retained by the discrimination, while the rejection ratio measures the fraction of false alarms rejected. Both measures are defined relative to the entire response list, i.e., the maximum ordnance detectable by the sensor and its accompanying false positive rate or background alarm rate.

Efficiency (E): $E = P_d^{disc}(t^{disc})/P_d^{res}(t_{min}^{res})$: measures (at a threshold of interest), the degree to which the maximum theoretical detection performance of the sensor system (as determined by the response stage t_{min}) is preserved after application of discrimination techniques. Efficiency is a number between 0 and 1. An efficiency of 1 implies that all of the ordnance initially detected in the response stage was retained at the specified threshold in the discrimination stage, t^{disc}.

False Positive Rejection Rate (R_{fp}): $R_{fp} = 1 - [P_{fp}^{disc}(t^{disc})/P_{fp}^{res}(t_{min}^{res})]$: measures (at a threshold of interest), the degree to which the sensor system's false positive performance is improved over the maximum false positive performance (as determined by the response stage t_{min}). The rejection rate is a number between 0 and 1. A rejection rate of 1 implies that all emplaced clutter initially detected in the response stage were correctly rejected at the specified threshold in the discrimination stage.

Background Alarm Rejection Rate (R_{ba}):

Blind Grid: $R_{ba} = 1 - [P_{ba}^{disc}(t^{disc})/P_{ba}^{res}(t_{min}^{res})]$
Open Field: $R_{ba} = 1 - [BAR^{disc}(t^{disc})/BAR^{res}(t_{min}^{res})])$

Measures the degree to which the discrimination stage correctly rejects background alarms initially detected in the response stage. The rejection rate is a number between 0 and 1. A rejection rate of 1 implies that all background alarms initially detected in the response stage were rejected at the specified threshold in the discrimination stage.

CHI-SQUARE COMPARISON EXPLANATION:

The Chi-square test for differences in probabilities (or 2 x 2 contingency table) is used to analyze two samples drawn from two different populations to see if both populations have the same or different proportions of elements in a certain category. More specifically, two random samples are drawn, one from each population, to test the null hypothesis that the probability of event A (some specified event) is the same for both populations (ref 4, pages 144 through 151).

A 2 x 2 contingency table is used in the Standardized UXO Technology Demonstration Site Program to determine if there is reason to believe that the proportion of ordnance correctly detected/discriminated by demonstrator X's system is significantly degraded by the more

challenging terrain feature introduced. The test statistic of the 2 x 2 contingency table is the Chi-square distribution with one degree of freedom. Since an association between the more challenging terrain feature and relatively degraded performance is sought, a one-sided test is performed. A significance level of 0.05 is chosen which sets a critical decision limit of 2.71 from the Chi-square distribution with one degree of freedom. It is a critical decision limit because if the test statistic calculated from the data exceeds this value, the two proportions tested will be considered significantly different. If the test statistic calculated from the data is less than this value, the two proportions tested will be considered not significantly different.

An exception must be applied when either a 0 or 100 percent success rate occurs in the sample data. The Chi-square test cannot be used in these instances. Instead, Fischer's test is used and the critical decision limit for one-sided tests is the chosen significance level, which in this case is 0.05. With Fischer's test, if the test statistic is less than the critical value, the proportions are considered to be significantly different.

Standardized UXO Technology Demonstration Site examples, where blind grid results are compared to those from the open field and open field results are compared to those from one of the scenarios, follow. It should be noted that a significant result does not prove a cause and effect relationship exists between the two populations of interest; however, it does serve as a tool to indicate that one data set has experienced a degradation in system performance at a large enough level than can be accounted for merely by chance or random variation. Note also that a result that is not significant indicates that there is not enough evidence to declare that anything more than chance or random variation within the same population is at work between the two data sets being compared.

Demonstrator X achieves the following overall results after surveying each of the three progressively more difficult areas using the same system (results indicate the number of ordnance detected divided by the number of ordnance emplaced):

	Blind Grid	Open Field	Moguls
P_d^{res}	100/100 = 1.0	8/10 = .80	20/33 = .61
P_d^{disc}	80/100 = 0.80	6/10 = .60	8/33 = .24

P_d^{res}: BLIND GRID versus OPEN FIELD. Using the example data above to compare probabilities of detection in the response stage, all 100 ordnance out of 100 emplaced ordnance items were detected in the blind grid while 8 ordnance out of 10 emplaced were detected in the open field. Fischer's test must be used since a 100 percent success rate occurs in the data. Fischer's test uses the four input values to calculate a test statistic of 0.0075 that is compared against the critical value of 0.05. Since the test statistic is less than the critical value, the smaller response stage detection rate (0.80) is considered to be significantly less at the 0.05 level of significance. While a significant result does not prove a cause and effect relationship exists between the change in survey area and degradation in performance, it does indicate that the detection ability of demonstrator X's system seems to have been degraded in the open field relative to results from the blind grid using the same system.

P_d^{disc}: BLIND GRID versus OPEN FIELD. Using the example data above to compare probabilities of detection in the discrimination stage, 80 out of 100 emplaced ordnance items were correctly discriminated as ordnance in blind grid testing while 6 ordnance out of 10 emplaced were correctly discriminated as such in open field testing. Those four values are used to calculate a test statistic of 1.12. Since the test statistic is less than the critical value of 2.71, the two discrimination stage detection rates are considered to be not significantly different at the 0.05 level of significance.

P_d^{res}: OPEN FIELD versus MOGULS. Using the example data above to compare probabilities of detection in the response stage, 8 out of 10 and 20 out of 33 are used to calculate a test statistic of 0.56. Since the test statistic is less than the critical value of 2.71, the two response stage detection rates are considered to be not significantly different at the 0.05 level of significance.

P_d^{disc}: OPEN FIELD versus MOGULS. Using the example data above to compare probabilities of detection in the discrimination stage, 6 out of 10 and 8 out of 33 are used to calculate a test statistic of 2.98. Since the test statistic is greater than the critical value of 2.71, the smaller discrimination stage detection rate is considered to be significantly less at the 0.05 level of significance. While a significant result does not prove a cause and effect relationship exists between the change in survey area and degradation in performance, it does indicate that the ability of demonstrator X to correctly discriminate seems to have been degraded by the mogul terrain relative to results from the flat open field using the same system.

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APPENDIX B. DAILY WEATHER LOGS

TABLE B-1. WEATHER LOG

Weather Data from Yuma Proving Ground				
Date	Time, EDST	Average Temperature, °F	RH, %	Precipitation, in.
5/7/2003	01:00	66.1	33	0.00
5/7/2003	02:00	64.8	35	0.00
5/7/2003	03:00	63.2	36	0.00
5/7/2003	04:00	62.0	37	0.00
5/7/2003	05:00	61.2	37	0.00
5/7/2003	06:00	60.2	38	0.00
5/7/2003	07:00	62.1	37	0.00
5/7/2003	08:00	63.4	38	0.00
5/7/2003	09:00	66.0	36	0.00
5/7/2003	10:00	69.2	33	0.00
5/7/2003	11:00	72.1	30	0.00
5/7/2003	12:00	74.6	26	0.00
5/7/2003	13:00	76.5	25	0.00
5/7/2003	14:00	77.4	24	0.00
5/7/2003	15:00	77.4	23	0.00
5/7/2003	16:00	77.9	23	0.00
5/7/2003	17:00	76.6	25	0.00
5/7/2003	18:00	74.7	26	0.00
5/7/2003	19:00	71.8	33	0.00
5/7/2003	20:00	69.5	36	0.00
5/7/2003	21:00	67.8	40	0.00
5/7/2003	22:00	65.8	45	0.00
5/7/2003	23:00	64.9	46	0.00
5/7/2003	24:00	63.8	47	0.00
5/8/2003	01:00	62.6	47	0.00
5/8/2003	02:00	61.8	45	0.00
5/8/2003	03:00	59.7	45	0.00
5/8/2003	04:00	58.0	48	0.00
5/8/2003	05:00	56.8	53	0.00
5/8/2003	06:00	55.5	56	0.00
5/8/2003	07:00	57.5	53	0.00
5/8/2003	08:00	60.5	47	0.00
5/8/2003	09:00	65.1	40	0.00
5/8/2003	10:00	67.3	36	0.00
5/8/2003	11:00	71.1	30	0.00
5/8/2003	12:00	72.9	29	0.00
5/8/2003	13:00	74.4	27	0.00
5/8/2003	14:00	76.4	24	0.00
5/8/2003	15:00	77.2	23	0.00
5/8/2003	16:00	78.1	22	0.00
5/8/2003	17:00	77.3	24	0.00
5/8/2003	18:00	76.2	22	0.00
5/8/2003	19:00	73.5	22	0.00

TABLE B-1 (CONT'D)

Weather Data from Yuma Proving Ground				
Date	Time, EDST	Average Temperature, °F	RH, %	Precipitation, in.
5/8/2003	20:00	69.5	29	0.00
5/8/2003	21:00	67.3	28	0.00
5/8/2003	22:00	64.5	32	0.00
5/8/2003	23:00	62.8	32	0.00
5/8/2003	24:00	60.8	38	0.00
5/9/2003	01:00	58.6	43	0.00
5/9/2003	02:00	57.9	45	0.00
5/9/2003	03:00	56.1	49	0.00
5/9/2003	04:00	54.6	52	0.00
5/9/2003	05:00	55.1	52	0.00
5/9/2003	06:00	55.0	51	0.00
5/9/2003	07:00	56.7	49	0.00
5/9/2003	08:00	59.7	45	0.00
5/9/2003	09:00	62.9	39	0.00
5/9/2003	10:00	65.8	33	0.00
5/9/2003	11:00	67.7	29	0.00
5/9/2003	12:00	69.8	26	0.00
5/9/2003	13:00	71.4	22	0.00
5/9/2003	14:00	72.2	17	0.00
5/9/2003	15:00	73.0	18	0.00
5/9/2003	16:00	75.0	16	0.00
5/9/2003	17:00	76.0	14	0.00
5/9/2003	18:00	75.8	12	0.00
5/9/2003	19:00	73.5	20	0.00
5/9/2003	20:00	71.4	20	0.00
5/9/2003	21:00	68.5	22	0.00
5/9/2003	22:00	66.4	24	0.00
5/9/2003	23:00	65.9	23	0.00
5/9/2003	24:00	63.4	27	0.00
5/10/2003	01:00	60.5	34	0.00
5/10/2003	02:00	59.6	39	0.00
5/10/2003	03:00	56.9	42	0.00
5/10/2003	04:00	54.6	44	0.00
5/10/2003	05:00	53.2	43	0.00
5/10/2003	06:00	51.0	44	0.00
5/10/2003	07:00	58.1	32	0.00
5/10/2003	08:00	64.8	31	0.00
5/10/2003	09:00	68.4	25	0.00
5/10/2003	10:00	72.5	20	0.00
5/10/2003	11:00	76.3	15	0.00
5/10/2003	12:00	77.8	12	0.00
5/10/2003	13:00	79.8	13	0.00
5/10/2003	14:00	81.7	12	0.00
5/10/2003	15:00	81.8	12	0.00
5/10/2003	16:00	83.2	10	0.00

TABLE B-1 (CONT'D)

Weather Data from Yuma Proving Ground				
Date	Time, EDST	Average Temperature, °F	RH, %	Precipitation, in.
5/10/2003	17:00	83.3	10	0.00
5/10/2003	18:00	82.7	10	0.00
5/10/2003	19:00	81.6	10	0.00
5/10/2003	20:00	78.1	13	0.00
5/10/2003	21:00	75.4	15	0.00
5/10/2003	22:00	72.8	15	0.00
5/10/2003	23:00	68.9	18	0.00
5/10/2003	24:00	66.1	19	0.00
5/12/2003	01:00	71.2	21	0.00
5/12/2003	02:00	69.7	21	0.00
5/12/2003	03:00	67.2	23	0.00
5/12/2003	04:00	63.2	24	0.00
5/12/2003	05:00	63.4	25	0.00
5/12/2003	06:00	61.7	26	0.00
5/12/2003	07:00	65.9	21	0.00
5/12/2003	08:00	74.7	15	0.00
5/12/2003	09:00	81.7	14	0.00
5/12/2003	10:00	86.5	12	0.00
5/12/2003	11:00	89.3	10	0.00
5/12/2003	12:00	90.8	11	0.00
5/12/2003	13:00	93.0	8	0.00
5/12/2003	14:00	94.3	8	0.00
5/12/2003	15:00	95.7	8	0.00
5/12/2003	16:00	95.0	8	0.00
5/12/2003	17:00	94.7	9	0.00
5/12/2003	18:00	94.7	9	0.00
5/12/2003	19:00	92.2	9	0.00
5/12/2003	20:00	89.5	9	0.00
5/12/2003	21:00	85.3	10	0.00
5/12/2003	22:00	83.4	16	0.00
5/12/2003	23:00	80.4	17	0.00
5/12/2003	24:00	79.1	19	0.00
5/14/2003	01:00	76.0	21	0.00
5/14/2003	02:00	74.1	21	0.00
5/14/2003	03:00	72.4	22	0.00
5/14/2003	04:00	73.2	21	0.00
5/14/2003	05:00	71.8	21	0.00
5/14/2003	06:00	73.4	18	0.00
5/14/2003	07:00	73.2	19	0.00
5/14/2003	08:00	77.0	15	0.00
5/14/2003	09:00	82.6	13	0.00
5/14/2003	10:00	85.0	12	0.00
5/14/2003	11:00	88.9	10	0.00
5/14/2003	12:00	92.4	9	0.00
5/14/2003	13:00	94.8	8	0.00

TABLE B-1 (CONT'D)

Weather Data from Yuma Proving Ground				
Date	Time, EDST	Average Temperature, °F	RH, %	Precipitation, in.
5/14/2003	14:00	97.4	7	0.00
5/14/2003	15:00	96.2	6	0.00
5/14/2003	16:00	96.5	7	0.00
5/14/2003	17:00	94.6	9	0.00
5/14/2003	18:00	93.8	7	0.00
5/14/2003	19:00	92.0	8	0.00
5/14/2003	20:00	87.9	10	0.00
5/14/2003	21:00	84.4	11	0.00
5/14/2003	22:00	81.9	11	0.00
5/14/2003	23:00	79.4	12	0.00
5/14/2003	24:00	78.6	12	0.00
5/15/2003	01:00	62.5	39	0.00
5/15/2003	02:00	61.1	40	0.00
5/15/2003	03:00	60.0	44	0.00
5/15/2003	04:00	58.1	49	0.00
5/15/2003	05:00	57.9	51	0.00
5/15/2003	06:00	57.0	52	0.00
5/15/2003	07:00	60.8	46	0.00
5/15/2003	08:00	64.5	45	0.00
5/15/2003	09:00	68.3	37	0.00
5/15/2003	10:00	73.1	31	0.00
5/15/2003	11:00	78.0	26	0.00
5/15/2003	12:00	81.0	23	0.00
5/15/2003	13:00	83.4	22	0.00
5/15/2003	14:00	85.7	20	0.00
5/15/2003	15:00	87.5	18	0.00
5/15/2003	16:00	89.7	17	0.00
5/15/2003	17:00	89.8	17	0.00
5/15/2003	18:00	89.9	17	0.00
5/15/2003	19:00	88.4	18	0.00
5/15/2003	20:00	86.0	19	0.00
5/15/2003	21:00	83.4	21	0.00
5/15/2003	22:00	80.2	22	0.00
5/15/2003	23:00	75.7	25	0.00
5/15/2003	24:00	73.7	26	0.00
5/16/2003	01:00	73.9	29	0.00
5/16/2003	02:00	70.8	32	0.00
5/16/2003	03:00	69.2	32	0.00
5/16/2003	04:00	68.5	33	0.00
5/16/2003	05:00	66.7	35	0.00
5/16/2003	06:00	65.4	35	0.00
5/16/2003	07:00	70.5	30	0.00
5/16/2003	08:00	79.3	23	0.00
5/16/2003	09:00	86.4	17	0.00
5/16/2003	10:00	90.0	14	0.00

TABLE B-1 (CONT'D)

Weather Data from Yuma Proving Ground				
Date	Time, EDST	Average Temperature, °F	RH, %	Precipitation, in.
5/16/2003	11:00	92.0	14	0.00
5/16/2003	12:00	94.0	13	0.00
5/16/2003	13:00	95.5	12	0.00
5/16/2003	14:00	97.9	11	0.00
5/16/2003	15:00	98.9	11	0.00
5/16/2003	16:00	99.9	11	0.00
5/16/2003	17:00	99.4	12	0.00
5/16/2003	18:00	99.1	10	0.00
5/16/2003	19:00	97.7	11	0.00
5/16/2003	20:00	93.1	12	0.00
5/16/2003	21:00	87.8	14	0.00
5/16/2003	22:00	86.1	16	0.00
5/16/2003	23:00	83.0	18	0.00
5/16/2003	24:00	80.4	19	0.00
5/19/2003	01:00	79.3	19	0.00
5/19/2003	02:00	77.6	19	0.00
5/19/2003	03:00	75.2	20	0.00
5/19/2003	04:00	73.4	21	0.00
5/19/2003	05:00	71.6	24	0.00
5/19/2003	06:00	68.4	25	0.00
5/19/2003	07:00	74.2	23	0.00
5/19/2003	08:00	80.5	25	0.00
5/19/2003	09:00	84.5	24	0.00
5/19/2003	10:00	89.7	14	0.00
5/19/2003	11:00	94.4	11	0.00
5/19/2003	12:00	97.3	10	0.00
5/19/2003	13:00	99.8	8	0.00
5/19/2003	14:00	101.0	8	0.00
5/19/2003	15:00	101.1	8	0.00
5/19/2003	16:00	101.3	7	0.00
5/19/2003	17:00	101.9	7	0.00
5/19/2003	18:00	101.0	7	0.00
5/19/2003	19:00	99.1	8	0.00
5/19/2003	20:00	95.2	9	0.00
5/19/2003	21:00	91.4	11	0.00
5/19/2003	22:00	88.1	11	0.00
5/19/2003	23:00	83.8	13	0.00
5/19/2003	24:00	81.7	15	0.00
6/4/2003	01:00	81.0	19	0.00
6/4/2003	02:00	80.0	22	0.00
6/4/2003	03:00	78.0	22	0.00
6/4/2003	04:00	75.5	28	0.00
6/4/2003	05:00	75.1	32	0.00
6/4/2003	06:00	74.3	34	0.00
6/4/2003	07:00	77.1	32	0.00

TABLE B-1 (CONT'D)

Weather Data from Yuma Proving Ground				
Date	Time, EDST	Average Temperature, °F	RH, %	Precipitation, in.
6/4/2003	08:00	82.1	27	0.00
6/4/2003	09:00	87.3	22	0.00
6/4/2003	10:00	89.9	19	0.00
6/4/2003	11:00	93.9	15	0.00
6/4/2003	12:00	95.8	14	0.00
6/4/2003	13:00	98.5	13	0.00
6/4/2003	14:00	100.8	12	0.00
6/4/2003	15:00	102.5	12	0.00
6/4/2003	16:00	103.5	11	0.00
6/4/2003	17:00	103.4	10	0.00
6/4/2003	18:00	102.5	10	0.00
6/4/2003	19:00	100.0	10	0.00
6/4/2003	20:00	96.6	11	0.00
6/4/2003	21:00	94.1	11	0.00
6/4/2003	22:00	90.9	12	0.00
6/4/2003	23:00	86.7	14	0.00
6/4/2003	24:00	84.1	16	0.00

APPENDIX C. SOIL MOISTURE

SOIL MOISTURE LOGS (6 through 17, 19 through 22, and 28 through 30 May 2003)

Date	Time	Calibration Area Readings (%)					Time	Mogul Area Readings (%)					Time	Desert Extreme Area Readings (%)				
		0 to 6 in.	6 to 12 in.	12 to 24 in.	24 to 36 in.	36 to 48 in.		0 to 6 in.	6 to 12 in.	12 to 24 in.	24 to 36 in.	36 to 48 in.		0 to 6 in.	6 to 12 in.	12 to 24 in.	24 to 36 in.	36 to 48 in.
5/6/2003	0748	1.8	2.2	3.7	3.6	4.0	0807	1.7	2.0	3.4	4.0	4.1	800	1.7	2.0	3.5	3.9	4.0
	1237	1.8	2.2	3.6	3.6	4.0	1246	1.6	2.0	3.6	3.9	4.0	1254	1.7	2.0	3.4	3.9	4.1
5/7/2003	0723	1.8	2.2	3.6	3.6	3.9	0740	1.6	2.0	3.6	3.9	3.9	733	1.7	2.0	3.4	3.9	4.1
	1255	1.8	2.2	3.7	3.6	4.0	1310	1.6	2.0	3.5	3.9	4.0	1305	1.7	2.0	3.4	3.9	4.1
5/8/2003	0715	1.8	2.2	3.6	3.6	3.9	0724	1.6	2.0	3.6	4.0	3.9	732	1.7	2.0	3.4	3.9	4.1
	1243	1.8	2.2	3.7	3.6	3.9	1250	1.6	2.0	3.5	4.0	4.0	1258	1.7	2.0	3.4	3.9	4.1
5/9/2003	0623	1.8	2.2	3.6	3.6	3.9	0638	1.6	2.0	3.5	3.9	3.9	631	1.7	2.0	3.4	3.9	4.1
	1306	1.8	2.2	3.6	3.6	3.9	1315	1.6	2.0	3.5	3.9	3.9	1324	1.7	2.0	3.4	3.9	4.1
5/10/2003	0618	1.8	2.2	3.7	3.6	3.9	0626	1.6	2.0	3.5	3.9	4.0	634	1.7	2.0	3.4	3.9	4.1
	1203	1.8	2.2	3.6	3.6	3.9	1212	1.6	2.0	3.6	3.9	4.0	1221	1.7	2.0	3.4	3.9	4.1
5/12/2003	0630	1.8	2.2	3.7	3.6	3.9	0638	1.6	2.0	3.6	3.9	4.0	644	1.7	2.0	3.4	3.9	4.1
	1256	1.8	2.2	3.6	3.6	3.9	1305	1.6	2.0	3.5	3.9	4.0	1313	1.7	2.0	3.4	3.9	4.1
5/13/2003	0711	1.8	2.2	3.6	3.6	3.9	0719	1.7	2.0	3.6	3.9	4.0	726	1.7	2.0	3.4	3.9	4.1
	1312	1.8	2.2	3.7	3.6	4.0	1323	1.6	2.0	3.6	3.9	4.0	1332	1.7	2.0	3.4	3.9	4.1
5/14/2003	0630	1.8	2.2	3.7	3.6	4.0	0639	1.7	2.0	3.6	3.9	4.0	647	1.7	2.0	3.4	3.9	4.1
	1302	1.8	2.2	3.7	3.6	3.9	1312	1.7	2.0	3.6	4.0	4.0	1318	1.7	2.0	3.4	3.9	4.1
5/15/2003	0626	1.8	2.2	3.6	3.6	3.9	0640	1.7	2.0	3.6	3.9	4.0	648	1.7	2.0	3.4	3.9	4.1
	1302	1.8	2.2	3.7	3.6	4.0	1310	1.6	2.0	3.6	4.0	4.0	1318	1.7	2.0	3.4	3.9	4.1
5/16/2003	0622	1.8	2.2	3.7	3.6	3.9	0629	1.7	2.0	3.6	4.0	4.0	0637	1.7	2.0	3.4	3.9	4.1
	1250	1.8	2.2	3.6	3.6	3.9	1258	1.6	2.0	3.5	3.9	4.0	1305	1.7	2.0	3.4	3.9	4.1
5/17/2003	0610	1.8	2.2	3.7	3.6	3.9	0618	1.6	2.0	3.6	3.9	4.0	0626	1.7	2.0	3.4	3.9	4.1
	1319	1.8	2.2	3.6	3.6	4.0	1327	1.6	2.0	3.6	3.9	4.0	1334	1.7	2.0	3.4	3.9	4.1
5/19/2003	0600	1.8	2.2	3.6	3.6	4.0	0608	1.6	1.9	3.6	3.9	4.0	0615	1.7	2.0	3.4	4.0	4.1
	1306	1.8	2.2	3.7	3.6	4.0	1316	1.6	2.0	3.6	3.9	4.0	1324	1.7	2.0	3.4	4.0	4.1
5/20/2003	0534	1.8	2.2	3.7	3.6	4.0	0542	1.6	2.0	3.6	3.9	4.0	0550	1.7	2.0	3.4	3.9	4.1
	1311	1.8	2.2	3.7	3.6	4.0	1320	1.6	2.0	3.6	3.9	4.0	1326	1.7	2.0	3.4	4.0	4.1
5/21/2003	0547	1.8	2.2	3.7	3.6	4.0	0555	1.6	2.0	3.6	4.0	4.1	0603	1.7	2.0	3.4	4.0	4.1
	1301	1.8	2.2	3.7	3.6	4.0	1309	1.6	2.0	3.6	4.0	4.0	1316	1.7	2.0	3.4	4.0	4.1
5/22/2003	0535	1.8	2.2	3.7	3.6	4.0	0543	1.6	2.0	3.6	4.0	4.0	0550	1.7	2.0	3.4	4.0	4.1
	1303	1.8	2.2	3.7	3.6	4.0	1311	1.6	2.0	3.6	4.0	4.0	1318	1.7	2.0	3.4	4.0	4.1
5/28/2003	0722	1.8	2.2	3.7	3.6	4.0	0730	1.6	2.0	3.6	4.0	4.0	0743	1.7	2.0	3.4	4.0	4.1
	1210	1.8	2.2	3.7	3.6	4.0	1218	1.6	2.0	3.6	4.0	4.0	1225	1.7	2.0	3.4	4.0	4.1
5/29/2003	0645	1.8	2.2	3.7	3.6	4.0	0653	1.6	2.0	3.6	4.0	4.0	0700	1.7	2.0	3.4	4.0	4.1
	1222	1.8	2.2	3.7	3.6	4.0	1230	1.6	2.0	3.6	4.0	4.0	1237	1.7	2.0	3.4	4.0	4.1
5/30/2003	0600	1.8	2.2	3.7	3.6	4.0	0609	1.6	2.0	3.6	4.0	4.0	0616	1.7	2.0	3.4	4.0	4.1
	1239	1.8	2.2	3.7	3.6	4.0	1248	1.6	2.0	3.6	4.0	4.0	1255	1.7	2.0	3.4	4.0	4.1

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Date	No. of People	Area Tested	Status Start Time	Status Stop Time	Duration, min	Op Stat Code	Operational Status	Operational Status-Comments	Track Method	Pattern	Field Conditions	
20030505	4	INITIAL SETUP	1110	1215	65	1	SET-UP MOBILIZATION	SETTING UP EQUIPMENT	NA	NA	HOT	DRY
20030505	4	CALIBRATION LANES	1215	1330	75	3	BREAK/LUNCH	LUNCH	NA	NA	HOT	DRY
20030505	4	INITIAL SETUP	1330	1535	125	1	SET-UP MOBILIZATION	SETTING UP EQUIPMENT	NA	NA	HOT	DRY
20030505	4	CALIBRATION LANES	1535	1600	25	1	SET-UP MOBILIZATION	EQUIPMENT BREAKDOWN EOD	NA	NA	HOT	DRY
20030506	4	CALIBRATION LANES	730	915	105	1	SET-UP MOBILIZATION	SETTING UP EQUIPMENT	NA	LINER	HOT	DRY
20030506	4	CALIBRATION LANES	915	940	25	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	NA	HOT	DRY
20030506	4	CALIBRATION LANES	940	1030	50	5	DOWNTIME DUE TO EQUIP MAINT/CHECK	CHECKING DOWNLOADING DATA	GPS	NA	HOT	DRY
20030506	4	CALIBRATION LANES	1030	1055	25	1	SET-UP/ MOBILIZATION	SETTING UP EQUIPMENT ROPED LANES	NA	NA	HOT	DRY
20030506	4	CALIBRATION LANES	1055	1145	50	3	BREAK/LUNCH	LUNCH	NA	NA	HOT	DRY
20030506	4	CALIBRATION LANES	1145	1210	25	1	SET-UP MOBILIZATION	SETTING UP EQUIPMENT	NA	NA	HOT	DRY
20030506	4	CALIBRATION LANES	1210	1400	110	2	COLLECTING DATA	RUNNING CAL. LANE BIDIRECTIONAL WEST/EAST	GPS	LINER	HOT	DRY
20030506	4	CALIBRATION LANES	1400	1500	60	5	DOWNTIME DUE TO EQUIP MAINT/CHECK	CHECKING DOWNLOADING DATA	GPS	NA	HOT	DRY
20030506	4	BLIND TEST GRID	1500	1515	15	1	SET-UP MOBILIZATION	SETTING UP EQUIPMENT	GPS	NA	HOT	DRY
20030506	4	BLIND TEST GRID	1515	1530	15	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY

Note: Activities pertinent to this specific demonstration are indicated in highlighted text.

Date	No. of People	Area Tested	Status Start Time	Status Stop Time	Duration, min	Op Stat Code	Operational Status	Operational Status-Comments	Track Method	Pattern	Field Conditions	
20030506	4	BLIND TEST GRID	1530	1545	15	2	COLLECTING DATA	RUNNING BTG LANE BIDIRECTIONAL EAST/ WEST	GPS	LINER	HOT	DRY
20030506	4	BLIND TEST GRID	1545	1550	5	5	DOWNTIME DUE TO EQUIP MAINT/CHECK	CHECKING DOWNLOADING DATA	GPS	NA	HOT	DRY
20030506	4	BLIND TEST GRID	1550	1600	10	1	SET-UP/ MOBILIZATION	EQUIPMENT BREAKDOWN EOD	NA	NA	HOT	DRY
20030507	4	BLIND TEST GRID	755	840	45	1	SET-UP MOBILIZATION	SETTING UP EQUIPMENT	NA	NA	COOL WINDY	DRY
20030507	4	BLIND TEST GRID	840	905	20	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	COOL WINDY	DRY
20030507	4	BLIND TEST GRID	905	1105	120	2	COLLECTING DATA	RUNNING BTG LANE BIDIRECTIONAL EAST/WEST	GPS	LINER	COOL WINDY	DRY
20030507	4	BLIND TEST GRID	1105	1120	15	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	COOL WINDY	DRY
20030507	4	BLIND TEST GRID	1120	1150	30	5	DOWNTIME DUE TO EQUIP MAINT/CHECK	CHECKING DOWNLOADING DATA	GPS	NA	COOL WINDY	DRY
20030507	4	BLIND TEST GRID	1150	1220	30	3	BREAK/LUNCH	LUNCH	NA	NA	COOL WINDY	DRY
20030507	4	CALIBRATION LANES	1220	1335	75	1	SET-UP MOBILIZATION	SETTING UP EQUIPMENT ROPED LANES	NA	NA	COOL WINDY	DRY
20030507	4	CALIBRATION LANES	1335	1400	85	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	COOL WINDY	DRY
20030507	4	CALIBRATION LANES	1400	1420	20	2	COLLECTING DATA	RUNNING CAL LANE BIDIRECTIONAL N/S	GPS	LINER	COOL WINDY	DRY
20030507	4	CALIBRATION LANES	1420	1435	15	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	NA	COOL WINDY	DRY

Note: Activities pertinent to this specific demonstration are indicated in highlighted text.

Date	No. of People	Area Tested	Status Start Time	Status Stop Time	Duration, min	Op Stat Code	Operational Status	Operational Status-Comments	Track Method	Pattern	Field Conditions	
20030507	4	CALIBRATION LANES	1435	1535	60	2	COLLECTING DATA	RUNNING CAL LANE BIDIRECTIONAL N/S	GPS	LINER	COOL WINDY	DRY
20030507	4	CALIBRATION LANES	1535	1552	17	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	COOL WINDY	DRY
20030507	4	CALIBRATION LANES	1552	1556	4	1	SET-UP MOBILIZATION	EQUIPMENT BREAKDOWN EOD	NA	NA	COOL WINDY	DRY
20030508	4	CALIBRATION LANES	700	740	40	1	SET-UP MOBILIZATION	SETTING UP EQUIPMENT	NA	NA	COOL WINDY	DRY
20030508	4	CALIBRATION LANES	740	758	18	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	COOL WINDY	DRY
20030508	4	CALIBRATION LANES	758	857	59	2	COLLECTING DATA	RUNNING CAL LANE BIDIRECTIONAL N/S	GPS	LINER	COOL WINDY	DRY
20030508	4	CALIBRATION LANES	857	905	8	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	COOL WINDY	DRY
20030508	4	CALIBRATION LANES	905	945	40	5	DOWNTIME DUE TO EQUIP MAINT/CHECK	CHECKING DOWNLOADING DATA	GPS	NA	COOL WINDY	DRY
20030508	4	OPEN RANGE AREA	945	1015	30	1	SET-UP/ MOBILIZATION	SETTING UP EQUIPMENT	NA	NA	COOL WINDY	DRY
20030508	4	OPEN RANGE AREA	1015	1023	7	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	COOL WINDY	DRY
20030508	4	OPEN RANGE AREA	1023	1310	167	2	COLLECTING DATA	RUNNING OPEN RANGE GRID A2 BIDIRECTIONAL	GPS	LINER	COOL WINDY	DRY
20030508	4	OPEN RANGE AREA	1310	1315	5	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	COOL WINDY	DRY
20030508	4	OPEN RANGE AREA	1315	1355	40	3	BREAK/LUNCH	LUNCH	NA	NA	COOL WINDY	DRY
20030508	4	OPEN RANGE AREA	1355	1415	20	5	DOWNTIME DUE TO EQUIP MAINT/CHECK	CHECKING DOWNLOADING DATA	GPS	NA	COOL WINDY	DRY

Note: Activities pertinent to this specific demonstration are indicated in highlighted text.

Date	No. of People	Area Tested	Status Start Time	Status Stop Time	Duration, min	Op Stat Code	Operational Status	Operational Status-Comments	Track Method	Pattern	Field Conditions	
20030508	4	OPEN RANGE AREA	1415	1427	12	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	COOL WINDY	DRY
20030508	4	OPEN RANGE AREA	1427	1510	43	2	COLLECTING DATA	RUNNING OPEN RANGE GRID A2 BIDIRECTIONAL	GPS	LINER	COOL WINDY	DRY
20030508	4	OPEN RANGE AREA	1510	1517	7	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	COOL WINDY	DRY
20030508	4	OPEN RANGE AREA	1517	1600	43	5	DOWNTIME DUE TO EQUIP MAINT/CHECK	CHECKING DOWNLOADING DATA	GPS	NA	COOL WINDY	DRY
20030508	4	OPEN RANGE AREA	1600	1610	10	1	SET-UP MOBILIZATION	EQUIPMENT BREAKDOWN EOD	NA	NA	COOL WINDY	DRY
20030509	4	OPEN RANGE AREA	630	705	35	1	SET-UP MOBILIZATION	SETTING UP EQUIPMENT	NA	NA	COOL WINDY	DRY
20030509	4	OPEN RANGE AREA	705	752	47	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	COOL WINDY	DRY
20030509	2	OPEN RANGE AREA	752	915	83	2	COLLECTING DATA	RUNNING OPEN RANGE GRID A3 BIDIRECTIONAL	GPS	LINER	COOL WINDY	DRY
20030509	2	OPEN RANGE AREA	915	930	15	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	COOL WINDY	DRY
20030509	2	OPEN RANGE AREA	930	935	5	3	BREAK/LUNCH	BREAK	NA	NA	COOL WINDY	DRY
20030509	2	OPEN RANGE AREA	935	940	5	4	DOWNTIME DUE TO EQUIPMENT FAILURE	FIELD COMPUTER WAS MALFUNTIONING	GPS	NA	COOL WINDY	DRY
20030509	2	OPEN RANGE AREA	940	1050	70	5	DOWNTIME DUE TO EQUIP MAINT/CHECK	SWAPPED FIELD COMPUTER BATTERY	NA	NA	COOL WINDY	DRY

Note: Activities pertinent to this specific demonstration are indicated in highlighted text.

Date	No. of People	Area Tested	Status Start Time	Status Stop Time	Duration, min	Op Stat Code	Operational Status	Operational Status-Comments	Track Method	Pattern	Field Conditions	
20030509	2	OPEN RANGE AREA	1050	1102	12	1	SET-UP/ MOBILIZATION	SETTING UP EQUIPMENT	NA	NA	COOL WINDY	DRY
20030509	2	OPEN RANGE AREA	1102	1220	78	2	COLLECTING DATA	RUNNING OPEN RANGE GRID A3 BIDIRECTIONAL	GPS	LINER	COOL WINDY	DRY
20030509	2	OPEN RANGE AREA	1220	1230	10	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	COOL WINDY	DRY
20030509	2	OPEN RANGE AREA	1230	1330	60	5	DOWNTIME DUE TO EQUIP MAINT/CHECK	CHECKING/ DOWNLOADING DATA	GPS	NA	COOL WINDY	DRY
20030509	2	OPEN RANGE AREA	1330	1400	30	3	BREAK/LUNCH	LUNCH	NA	NA	COOL WINDY	DRY
20030509	4	OPEN RANGE AREA	1400	1436	36	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	COOL WINDY	DRY
20030509	4	OPEN RANGE AREA	1436	1512	36	2	COLLECTING DATA	RUNNING OPEN RANGE GRID A2 BIDIRECTIONAL	GPS	LINER	COOL WINDY	DRY
20030509	4	OPEN RANGE AREA	1512	1521	9	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	COOL WINDY	DRY
20030509	4	OPEN RANGE AREA	1521	1535	14	5	DOWNTIME DUE TO EQUIP MAINT/CHECK	CHECKING DOWNLOADING DATA	GPS	NA	COOL WINDY	DRY
20030509	4	OPEN RANGE AREA	1535	1540	5	1	SET-UP MOBILIZATION	EQUIPMENT BREAKDOWN EOD	NA	NA	COOL WINDY	DRY
20030510	4	OPEN RANGE AREA	630	725	55	1	SET-UP/ MOBILIZATION	SETTING UP EQUIPMENT	NA	NA	COOL	DRY
20030510	4	OPEN RANGE AREA	725	740	15	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	COOL	DRY
20030510	4	OPEN RANGE AREA	740	900	80	2	COLLECTING DATA	RUNNING OPEN RANGE GRID F2 BIDIECTIONAL	GPS	LINER	COOL	DRY

Note: Activities pertinent to this specific demonstration are indicated in highlighted text.

Date	No. of People	Area Tested	Status Start Time	Status Stop Time	Duration, min	Op Stat Code	Operational Status	Operational Status-Comments	Track Method	Pattern	Field Conditions	
20030510	4	OPEN RANGE AREA	900	910	10	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	COOL	DRY
20030510	4	OPEN RANGE AREA	910	1035	85	2	COLLECTING DATA	RUNNING OPEN RANGE GRID F2 BIDIRECTIONAL	GPS	LINER	COOL	DRY
20030510	4	OPEN RANGE AREA	1035	1040	5	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY
20030510	4	OPEN RANGE AREA	1040	1042	2	5	DOWNTIME DUE TO EQUIP MAINT/CHECK	SWAPPED OUT MAIN BATTERY	NA	NA	HOT	DRY
20030510	2	OPEN RANGE AREA	1042	1100	18	5	DOWNTIME DUE TO EQUIP MAINT/CHECK	CHECKING DOWNLOADING DATA	GPS	NA	HOT	DRY
20030510	2	OPEN RANGE AREA	1100	1130	30	3	BREAK/LUNCH	LUNCH	NA	NA	HOT	DRY
20030510	2	BLIND TEST GRID	1130	1132	2	1	SET-UP MOBILIZATION	SETTING UP EQUIPMENT	NA	NA	HOT	DRY
20030510	2	BLIND TEST GRID	1132	1144	12	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY
20030510	2	BLIND TEST GRID	1144	1252	68	2	COLLECTING DATA	RUNNING BTG BIDIRECTIONAL NORTH/SOUTH	GPS	LINER	HOT	DRY
20030510	2	BLIND TEST GRID	1252	1302	10	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY
20030510	2	BLIND TEST GRID	1302	1310	8	2	COLLECTING DATA	RUNNING BTG BIDIRECTIONAL NORTH/SOUTH	GPS	LINER	HOT	DRY
20030510	2	BLIND TEST GRID	1310	1320	10	5	DOWNTIME DUE TO EQUIP MAINT/CHECK	FIELD COMPUTER FULL/OUT OF RAM	GPS	LINER	HOT	DRY

Note: Activities pertinent to this specific demonstration are indicated in highlighted text.

Date	No. of People	Area Tested	Status Start Time	Status Stop Time	Duration, min	Op Stat Code	Operational Status	Operational Status-Comments	Track Method	Pattern	Field Conditions	
20030510	2	BLIND TEST GRID	1320	1345	25	5	DOWNTIME DUE TO EQUIP MAINT/CHECK	CHECKING DOWNLOADING DATA	GPS	NA	HOT	DRY
20030510	2	BLIND TEST GRID	1345	1350	5	1	SET-UP MOBILIZATION	EQUIPMENT BREAKDOWN EOD	NA	NA	HOT	DRY
20030512	4	BLIND TEST GRID	735	800	25	1	SET-UP/ MOBILIZATION	SETTING UP EQUIPMENT	NA	NA	HOT	DRY
20030512	4	BLIND TEST GRID	800	825	25	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY
20030512	4	BLIND TEST GRID	825	930	65	2	COLLECTING DATA	RUNNING BTG GRID F3 BIDIRECTIONAL E/W	GPS	LINER	HOT	DRY
20030512	4	BLIND TEST GRID	930	940	10	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY
20030512	4	BLIND TEST GRID	940	1025	45	5	DOWNTIME DUE TO EQUIP MAINT/CHECK	CHECKING/ DOWNLOADING DATA	GPS	LINER	HOT	DRY
20030512	4	OPEN RANGE AREA	1025	1045	20	1	SET-UP MOBILIZATION	SETTING UP EQUIPMENT	NA	NA	HOT	DRY
20030512	4	OPEN RANGE AREA	1045	1050	5	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY
20030512	4	OPEN RANGE AREA	1050	1206	76	2	COLLECTING DATA	RUNNING OPEN RANGE GRID F3 EAST/WEST	GPS	LINER	HOT	DRY
20030512	4	OPEN RANGE AREA	1206	1215	9	5	DOWNTIME DUE TO EQUIP MAINT/CHECK	FIELD COMPUTER FULL/ OUT OF RAM	NA	NA	HOT	DRY
20030512	4	OPEN RANGE AREA	1215	1230	15	5	DOWNTIME DUE TO EQUIP MAINT/CHECK	SWAPPED OUT FIELD COMPUTER	NA	NA	HOT	DRY
20030512	4	OPEN RANGE AREA	1230	1245	15	5	DOWNTIME DUE TO EQUIP MAINT/CHECK	CHECKING/ DOWNLOADING DATA	GPS	NA	HOT	DRY
20030512	4	OPEN RANGE AREA	1245	1320	20	3	BREAK/LUNCH	LUNCH	NA	NA	HOT	DRY

Note: Activities pertinent to this specific demonstration are indicated in highlighted text.

Date	No. of People	Area Tested	Status Start Time	Status Stop Time	Duration, min	Op Stat Code	Operational Status	Operational Status-Comments	Track Method	Pattern	Field Conditions	
20030512	4	OPEN RANGE AREA	1320	1330	10	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	NA	HOT	DRY
20030512	3	OPEN RANGE AREA	1330	1520	110	2	COLLECTING DATA	RUNNING OPEN RANGE GRID F3 EAST/WEST	GPS	LINER	HOT	DRY
20030512	3	OPEN RANGE AREA	1520	1530	10	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY
20030512	3	OPEN RANGE AREA	1530	1555	25	5	DOWNTIME DUE TO EQUIP MAINT/CHECK	CHECKING/ DOWNLOADING DATA	GPS	NA	HOT	DRY
20030512	3	OPEN RANGE AREA	1555	1600	5	1	SET-UP MOBILIZATION	BREAKING DOWN EQUIPMENT EOD	NA	NA	HOT	DRY
20030513	3	OPEN RANGE AREA	700	810	70	1	SET-UP MOBILIZATION	SETTING UP EQUIPMENT	NA	NA	HOT	DRY
20030513	3	OPEN RANGE AREA	810	820	10	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	NA	HOT	DRY
20030513	3	OPEN RANGE AREA	820	940	80	2	COLLECTING DATA	RUNNING OPEN RANGE GRID F3 EAST/WEST	GPS	LINER	HOT	DRY
20030513	3	OPEN RANGE AREA	940	945	5	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY
20030513	3	OPEN RANGE AREA	945	1000	15	5	DOWNTIME DUE TO EQUIP MAINT/CHECK	CHECKING/ DOWNLOADING DATA	GPS	NA	HOT	DRY
20030513	3	OPEN RANGE AREA	1000	1005	5	5	DOWNTIME DUE TO EQUIP MAINT/CHECK	SWAPPED OUT FIELD COMPUTER	NA	NA	HOT	DRY
20030513	3	OPEN RANGE AREA	1005	1020	15	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY
20030513	3	OPEN RANGE AREA	1020	1050	30	2	COLLECTING DATA	RUNNING OPEN RANGE GRID F4 EAST/WEST	GPS	LINER	HOT	DRY

Note: Activities pertinent to this specific demonstration are indicated in highlighted text.

Date	No. of People	Area Tested	Status Start Time	Status Stop Time	Duration, min	Op Stat Code	Operational Status	Operational Status-Comments	Track Method	Pattern	Field Conditions	
20030513	3	OPEN RANGE AREA	1050	1058	8	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY
20030513	3	OPEN RANGE AREA	1058	1111	13	1	SETUP/ MOBILIZATION	SETTING UP EQUIPMENT	NA	NA	HOT	DRY
20030513	3	OPEN RANGE AREA	1111	1115	4	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY
20030513	3	OPEN RANGE AREA	1115	1155	40	2	COLLECTING DATA	RUNNING OPEN RANGE GRID F4 EAST/WEST	GPS	LINER	HOT	DRY
20030513	3	OPEN RANGE AREA	1155	1202	7	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY
20030513	3	OPEN RANGE AREA	1202	1220	18	5	DOWNTIME DUE TO EQUIP MAINT/CHECK	CHECKING DOWNLOADING DATA	GPS	NA	HOT	DRY
20030513	3	OPEN RANGE AREA	1220	1254	34	3	BREAK/LUNCH	LUNCH	NA	NA	HOT	DRY
20030513	3	OPEN RANGE AREA	1254	1307	13	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY
20030513	3	OPEN RANGE AREA	1307	1453	106	2	COLLECTING DATA	RUNNING OPEN RANGE GRID F4 EAST/WEST	GPS	LINER	HOT	DRY
20030513	3	OPEN RANGE AREA	1453	1510	17	5	DOWNTIME DUE TO EQUIP MAINT/CHECK	SWAPPED OUT MAIN BATTERY	NA	NA	HOT	DRY
20030513	3	OPEN RANGE AREA	1510	1513	3	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY

Note: Activities pertinent to this specific demonstration are indicated in highlighted text.

Date	No. of People	Area Tested	Status Start Time	Status Stop Time	Duration, min	Op Stat Code	Operational Status	Operational Status-Comments	Track Method	Pattern	Field Conditions	
20030513	3	OPEN RANGE AREA	1513	1544	31	2	COLLECTING DATA	RUNNING OPEN RANGE GRID E4 EAST/WEST	GPS	LINER	HOT	DRY
20030513	3	OPEN RANGE AREA	1544	1550	6	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY
20030513	3	OPEN RANGE AREA	1550	1600	10	1	SET-UP MOBILIZATION	BREAKING DOWN EQUIPMENT EOD	NA	NA	HOT	DRY
20030514	4	OPEN RANGE AREA	630	725	55	1	SET-UP MOBILIZATION	SETTING UP EQUIPMENT	NA	NA	WARM	HUMID
20030514	4	OPEN RANGE AREA	725	750	25	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	WARM	HUMID
20030514	4	OPEN RANGE AREA	750	905	75	2	COLLECTING DATA	RUNNING OPEN RANGE GRID E4 EAST/WEST	GPS	LINER	WARM	HUMID
20030514	4	OPEN RANGE AREA	905	913	8	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	WARM	HUMID
20030514	4	OPEN RANGE AREA	913	931	18	2	COLLECTING DATA	RUNNING OPEN RANGE GRID E4 EAST/WEST	GPS	LINER	WARM	HUMID
20030514	4	OPEN RANGE AREA	931	936	5	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	WARM	HUMID
20030514	4	OPEN RANGE AREA	936	1036	60	2	COLLECTING DATA	RUNNING OPEN RANGE GRID E4 EAST/WEST	GPS	LINER	WARM	HUMID
20030514	4	OPEN RANGE AREA	1036	1043	7	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	WARM	HUMID
20030514	4	OPEN RANGE AREA	1043	1055	12	1	SET-UP MOBILIZATION	SETTING UP EQUIPMENT	NA	NA	WARM	HUMID
20030514	4	OPEN RANGE AREA	1055	1105	10	5	DOWNTIME DUE TO EQUIP MAINT/CHECK	SWAPPED OUT FIELD COMPUTER	NA	NA	WARM	HUMID

Note: Activities pertinent to this specific demonstration are indicated in highlighted text.

Date	No. of People	Area Tested	Status Start Time	Status Stop Time	Duration, min	Op Stat Code	Operational Status	Operational Status-Comments	Track Method	Pattern	Field Conditions	
20030514	4	OPEN RANGE AREA	1105	1115	10	1	SET-UP MOBILIZATION	RUNNING OPEN RANGE GRID A4 EAST/WEST	GPS	LINER	WARM	HUMID
20030514	4	OPEN RANGE AREA	1115	1124	9	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	WARM	HUMID
20030514	4	OPEN RANGE AREA	1124	1225	61	2	COLLECTING DATA	RUNNING OPEN RANGE GRID A4 EAST/WEST	GPS	LINER	WARM	HUMID
20030514	4	OPEN RANGE AREA	1225	1232	7	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	WARM	HUMID
20030514	4	OPEN RANGE AREA	1232	1253	21	5	DOWNTIME DUE TO EQUIP MAINT/CHECK	CHECKING DOWNLOADING DATA	GPS	LINER	WARM	HUMID
20030514	4	OPEN RANGE AREA	1253	1328	35	3	BREAK/LUNCH	LUNCH	NA	NA	WARM	HUMID
20030514	4	OPEN RANGE AREA	1328	1340	12	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	WARM	HUMID
20030514	4	OPEN RANGE AREA	1340	1504	84	2	COLLECTING DATA	RUNNING OPEN RANGE GRID A4 EAST/WEST	GPS	LINER	WARM	HUMID
20030514	4	OPEN RANGE AREA	1504	1513	9	5	DOWNTIME DUE TO EQUIP MAINT/CHECK	SWAPPED OUT FIELD COMPUTER	NA	NA	WARM	HUMID
20030514	4	OPEN RANGE AREA	1513	1516	3	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	WARM	HUMID
20030514	4	OPEN RANGE AREA	1516	1535	19	2	COLLECTING DATA	RUNNING OPEN RANGE GRID A4 EAST/WEST	GPS	LINER	WARM	HUMID
20030514	4	OPEN RANGE AREA	1535	1540	5	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	WARM	HUMID

Note: Activities pertinent to this specific demonstration are indicated in highlighted text.

Date	No. of People	Area Tested	Status Start Time	Status Stop Time	Duration, min	Op Stat Code	Operational Status	Operational Status-Comments	Track Method	Pattern	Field Conditions	
20030514	4	OPEN RANGE AREA	1540	1549	9	2	COLLECTING DATA	RUNNING OPEN RANGE GRID A4 EAST/WEST	GPS	LINER	WARM	HUMID
20030514	4	OPEN RANGE AREA	1549	1552	3	2	COLLECTING DATA	EQUPIMENT WAS CLAIBRATED USING CAL DISK	GPS	LINER	WARM	HUMID
20030515	4	OPEN RANGE AREA	715	729	14	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	COOL	DRY
20030515	4	OPEN RANGE AREA	729	750	21	2	COLLECTING DATA	RUNNING OPEN RANGE GRID A5 EAST/WEST	GPS	LINER	COOL	DRY
20030515	4	OPEN RANGE AREA	750	755	5	4	DOWNTIME DUE TO EQUIPMENT FAILURE	LOST GPS	NA	LINER	WARM	DRY
20030515	4	OPEN RANGE AREA	755	1025	150	2	COLLECTING DATA	RUNNING OPEN RANGE GRID A5 EAST/WEST	GPS	LINER	HOT	DRY
20030515	4	OPEN RANGE AREA	1025	1030	5	1	SET-UP MOBILIZATION	SETTING UP EQUIPMENT	GPS	LINER	HOT	DRY
20030515	4	OPEN RANGE AREA	1030	1050	20	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY
20030515	4	OPEN RANGE AREA	1050	1120	30	2	COLLECTING DATA	RUNNING OPEN RANGE GRID E5 EAST/WEST	GPS	LINER	HOT	DRY
20030515	4	OPEN RANGE AREA	1120	1130	10	5	DOWNTIME DUE TO EQUIP MAINT/CHECK	SWAPPED OUT MAIN BATTERY	NA	NA	HOT	DRY
20030515	4	OPEN RANGE AREA	1130	1215	45	3	BREAK/LUNCH	LUNCH	NA	NA	HOT	DRY
20030515	4	OPEN RANGE AREA	1215	1220	5	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY
20030515	4	OPEN RANGE AREA	1220	1345	85	2	COLLECTING DATA	RUNNING OPEN RANGE GRID E5 EAST/WEST	GPS	LINER	HOT	DRY

Note: Activities pertinent to this specific demonstration are indicated in highlighted text.

Date	No. of People	Area Tested	Status Start Time	Status Stop Time	Duration, min	Op Stat Code	Operational Status	Operational Status-Comments	Track Method	Pattern	Field Conditions	
20030515	4	OPEN RANGE AREA	1345	1350	5	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY
20030515	4	OPEN RANGE AREA	1350	1405	15	5	DOWNTIME DUE TO EQUIP MAINT/CHECK	CHECKING/ DOWNLOADING DATA	GPS	NA	HOT	DRY
20030515	4	OPEN RANGE AREA	1405	1430	25	1	SET-UP MOBILIZATION	SETTING UP EQUIPMENT	NA	NA	HOT	DRY
20030515	4	OPEN RANGE AREA	1430	1437	7	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY
20030515	4	OPEN RANGE AREA	1437	1535	58	2	COLLECTING DATA	RUNNING OPEN RANGE GRID E3 EAST/WEST	GPS	LINER	HOT	DRY
20030515	4	OPEN RANGE AREA	1535	1540	5	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY
20030515	4	OPEN RANGE AREA	1540	1600	20	1	SET-UP MOBILIZATION	BREAKING DOWN EQUIPMENT EOD	NA	NA	HOT	DRY
20030516	4	OPEN RANGE AREA	630	704	34	1	SET-UP MOBILIZATION	SETTING UP EQUIPMENT	NA	NA	WARM	DRY
20030516	4	OPEN RANGE AREA	704	714	10	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY
20030516	4	OPEN RANGE AREA	714	839	85	2	COLLECTING DATA	RUNNING OPEN RANGE GRID E3 EAST/WEST	GPS	LINER	HOT	DRY
20030516	4	OPEN RANGE AREA	839	842	3	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY
20030516	4	OPEN RANGE AREA	842	903	21	5	DOWNTIME DUE TO EQUIP MAINT/CHECK	CHECKING/ DOWNLOADING DATA	GPS	NA	HOT	DRY
20030516	4	OPEN RANGE AREA	903	910	7	5	DOWNTIME DUE TO EQUIP MAINT/CHECK	SWAPPED OUT FIELD COMPUTER	NA	NA	HOT	DRY

Note: Activities pertinent to this specific demonstration are indicated in highlighted text.

Date	No. of People	Area Tested	Status Start Time	Status Stop Time	Duration, min	Op Stat Code	Operational Status	Operational Status-Comments	Track Method	Pattern	Field Conditions	
2030516	4	OPEN RANGE AREA	910	920	10	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY
20030516	4	OPEN RANGE AREA	920	1050	90	2	COLLECTING DATA	RUNNING OPEN RANGE GRID C5 EAST/WEST	GPS	LINER	HOT	DRY
20030516	4	OPEN RANGE AREA	1050	1100	10	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY
20030516	4	OPEN RANGE AREA	1100	1130	30	5	DOWNTIME DUE TO EQUIP MAINT/CHECK	CHECKING DOWNLOADING DATA	GPS	NA	HOT	DRY
20030516	4	OPEN RANGE AREA	1130	1134	4	5	DOWNTIME DUE TO EQUIP MAINT/CHECK	SWAPPED OUT FIELD COMPUTER	NA	NA	HOT	DRY
20030516	4	OPEN RANGE AREA	1134	1136	2	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY
20030516	4	OPEN RANGE AREA	1136	1226	50	2	COLLECTING DATA	RUNNING OPEN RANGE GRID C5 EAST/WEST	GPS	LINER	HOT	DRY
20030516	4	OPEN RANGE AREA	1226	1236	10	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY
20030516	4	OPEN RANGE AREA	1236	1245	9	5	DOWNTIME DUE TO EQUIP MAINT/CHECK	SWAPPED OUT MAIN BATTERY	NA	NA	HOT	DRY
20030516	4	OPEN RANGE AREA	1245	1250	5	5	DOWNTIME DUE TO EQUIP MAINT/CHECK	SWAPPED OUT FIELD COMPUTER	NA	NA	HOT	DRY
20030516	4	OPEN RANGE AREA	1250	1318	28	3	BREAK/LUNCH	LUNCH	NA	NA	HOT	DRY
20030516	4	OPEN RANGE AREA	1318	1330	12	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY
20030516	4	OPEN RANGE AREA	1330	1351	21	2	COLLECTING DATA	RUNNING OPEN RANGE GRID C5 EAST/WEST	GPS	LINER	HOT	DRY

Note: Activities pertinent to this specific demonstration are indicated in highlighted text.

Date	No. of People	Area Tested	Status Start Time	Status Stop Time	Duration, min	Op Stat Code	Operational Status	Operational Status-Comments	Track Method	Pattern	Field Conditions	
20030516	4	OPEN RANGE AREA	1351	1403	12	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY
20030516	4	OPEN RANGE AREA	1403	1504	61	2	COLLECTING DATA	RUNNING OPEN RANGE GRID C4 EAST/WEST	GPS	LINER	HOT	DRY
20030516	4	OPEN RANGE AREA	1504	1520	16	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY
20030516	4	OPEN RANGE AREA	1520	1545	25	2	COLLECTING DATA	RUNNING OPEN RANGE GRID C4 EAST/WEST	GPS	LINER	HOT	DRY
20030516	4	OPEN RANGE AREA	1545	1550	5	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY
20030516	4	OPEN RANGE AREA	1550	1600	10	1	SET-UP MOBILIZATION	BREAKING DOWN EQUIPMENT EOD	NA	NA	HOT	DRY
20030517	4	OPEN RANGE AREA	650	720	30	1	SET-UP MOBILIZATION	SETTING UP EQUIPMENT	NA	NA	HOT	DRY
20030517	4	OPEN RANGE AREA	720	730	10	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY
20030517	4	OPEN RANGE AREA	730	900	90	2	COLLECTING DATA	RUNNING OPEN RANGE GRID C4 EAST/WEST	GPS	LINER	HOT	DRY
20030517	4	OPEN RANGE AREA	900	907	7	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY
20030517	4	OPEN RANGE AREA	907	923	16	1	SET-UP MOBILIZATION	SETTING UP EQUIPMENT	NA	NA	HOT	DRY
20030517	4	OPEN RANGE AREA	923	932	9	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	NA	HOT	DRY
20030517	4	OPEN RANGE AREA	932	1200	148	2	COLLECTING DATA	RUNNING OPEN RANGE GRID D5 BIDIRECTIONAL	GPS	NA	HOT	DRY
20030517	4	OPEN RANGE AREA	1200	1210	10	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	NA	HOT	DRY

Note: Activities pertinent to this specific demonstration are indicated in highlighted text.

Date	No. of People	Area Tested	Status Start Time	Status Stop Time	Duration, min	Op Stat Code	Operational Status	Operational Status-Comments	Track Method	Pattern	Field Conditions	
20030517	4	OPEN RANGE AREA	1210	1213	3	1	SET-UP MOBILIZATION	SETTING UP EQUIPMENT	NA	NA	HOT	DRY
20030517	4	OPEN RANGE AREA	1213	1220	7	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY
20030517	4	OPEN RANGE AREA	1220	1238	18	2	COLLECTING DATA	RUNNING OPEN RANGE GRID D4 BIDIRECTIONAL	GPS	LINER	HOT	DRY
20030517	4	OPEN RANGE AREA	1238	1250	12	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY
20030517	4	OPEN RANGE AREA	1250	1255	5	5	DOWNTIME DUE TO EQUIP MAINT/CHECK	SWAPPED OUT MAIN BATTERY	NA	NA	HOT	DRY
20030517	4	OPEN RANGE AREA	1255	1301	6	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY
20030517	4	OPEN RANGE AREA	1301	1400	59	2	COLLECTING DATA	RUNNING OPEN RANGE GRID D4 BIDIRECTIONAL	GPS	LINER	HOT	DRY
20030517	4	OPEN RANGE AREA	1400	1405	5	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY
20030517	4	OPEN RANGE AREA	1405	1415	10	2	COLLECTING DATA	CONDUCTED EQUIPMENT INTERFERENCE TEST	GPS	LINER	HOT	DRY
20030517	4	OPEN RANGE AREA	1415	1430	15	1	SET-UP MOBILIZATION	BREAKING DOWN EQUIPMENT EOD	NA	NA	HOT	DRY
20030519	4	OPEN RANGE AREA	645	730	45	1	SET-UP MOBILIZATION	SETTING UP EQUIPMENT	NA	NA	HOT	DRY
20030519	4	OPEN RANGE AREA	730	735	5	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY
20030519	4	OPEN RANGE AREA	735	915	100	2	COLLECTING DATA	RUNNING OPEN RANGE GRID D4 BIDIRECTIONAL	GPS	LINER	HOT	DRY
20030519	4	OPEN RANGE AREA	915	923	8	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY

Note: Activities pertinent to this specific demonstration are indicated in highlighted text.

Date	No. of People	Area Tested	Status Start Time	Status Stop Time	Duration, min	Op Stat Code	Operational Status	Operational Status-Comments	Track Method	Pattern	Field Conditions	
20030519	4	OPEN RANGE AREA	923	1000	37	5	DOWNTIME DUE TO EQUIP MAINT/CHECK	CHECKING DOWNLOADING DATA	GPS	NA	HOT	DRY
20030519	4	OPEN RANGE AREA	1000	1012	12	5	DOWNTIME DUE TO EQUIP MAINT/CHECK	SWAPPED OUT FIELD COMPUTER BATTERY	NA	NA	HOT	DRY
20030519	4	OPEN RANGE AREA	1012	1029	17	1	SET-UP MOBILIZATION	SETTING UP EQUIPMENT	NA	NA	HOT	DRY
20030519	4	OPEN RANGE AREA	1029	1033	4	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY
20030519	4	OPEN RANGE AREA	1033	1157	84	2	COLLECTING DATA	RUNNING OPEN RANGE GRID E2 BIDIRECTIONAL	GPS	LINER	HOT	DRY
20030519	4	OPEN RANGE AREA	1157	1205	8	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY
20030519	4	OPEN RANGE AREA	1205	1225	20	5	DOWNTIME DUE TO EQUIP MAINT/CHECK	CHECKING/ DOWNLOADING DATA	GPS	NA	HOT	DRY
20030519	4	OPEN RANGE AREA	1225	1237	12	5	DOWNTIME DUE TO EQUIP MAINT/CHECK	SWAPPED OUT FIELD COMPUTER BATTERY	NA	NA	HOT	DRY
20030519	4	OPEN RANGE AREA	1237	1240	3	5	DOWNTIME DUE TO EQUIP MAINT/CHECK	SWAPPED OUT MAIN BATTERY	NA	NA	HOT	DRY
20030519	4	OPEN RANGE AREA	1240	1300	20	3	BREAK/LUNCH	LUNCH	NA	NA	HOT	DRY
20030519	4	OPEN RANGE AREA	1300	1310	10	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY
20030519	4	OPEN RANGE AREA	1310	1420	70	2	COLLECTING DATA	RUNNING OPEN RANGE GRID E2 BIDIRECTIONAL	GPS	LINER	HOT	DRY

Note: Activities pertinent to this specific demonstration are indicated in highlighted text.

Date	No. of People	Area Tested	Status Start Time	Status Stop Time	Duration, min	Op Stat Code	Operational Status	Operational Status-Comments	Track Method	Pattern	Field Conditions	
20030519	4	OPEN RANGE AREA	1420	1425	5	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY
20030519	4	OPEN RANGE AREA	1425	1525	60	5	DOWNTIME DUE TO EQUIP MAINT/CHECK	CHECKING DOWNLOADING DATA	GPS	NA	HOT	DRY
20030519	4	OPEN RANGE AREA	1525	1530	5	1	SET-UP MOBILIZATION	BREAKING DOWN EQUIPMENT EOD	NA	NA	HOT	DRY
20030520	4	OPEN RANGE AREA	530	608	38	1	SET-UP MOBILIZATION	SETTING UP EQUIPMENT	NA	NA	HOT	DRY
20030520	4	OPEN RANGE AREA	608	616	8	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY
20030520	4	OPEN RANGE AREA	616	912	176	2	COLLECTING DATA	RUNNING OPEN RANGE GRID B5 BIDIRECTIONAL	GPS	LINER	HOT	DRY
20030520	4	OPEN RANGE AREA	912	916	4	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY
20030520	4	OPEN RANGE AREA	916	924	8	1	SET-UP MOBILIZATION	SETTING UP EQUIPMENT	NA	NA	HOT	DRY
20030520	4	OPEN RANGE AREA	924	1010	46	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY
20030520	4	OPEN RANGE AREA	1010	1015	5	5	DOWNTIME DUE TO EQUIP MAINT/CHECK	CHECKING DOWNLOADING DATA	GPS	NA	HOT	DRY
20030520	4	OPEN RANGE AREA	1015	1025	10	3	BREAK/LUNCH	BREAK	NA	NA	HOT	DRY
20030520	4	OPEN RANGE AREA	1025	1035	10	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY
20030520	4	OPEN RANGE AREA	1035	1047	12	2	COLLECTING DATA	RUNNING OPEN RANGE GRID B4 BIDIRECTIONAL	GPS	LINER	HOT	DRY

Note: Activities pertinent to this specific demonstration are indicated in highlighted text.

Date	No. of People	Area Tested	Status Start Time	Status Stop Time	Duration, min	Op Stat Code	Operational Status	Operational Status-Comments	Track Method	Pattern	Field Conditions	
20030520	4	OPEN RANGE AREA	1047	1152	5	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY
20030520	4	OPEN RANGE AREA	1152	1228	36	5	DOWNTIME DUE TO EQUIP MAINT/CHECK	CHECKING DOWNLOADING DATA	GPS	NA	HOT	DRY
20030520	4	OPEN RANGE AREA	1228	1258	30	3	BREAK/LUNCH	BREAK	NA	NA	HOT	DRY
20030520	4	OPEN RANGE AREA	1258	1308	10	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY
20030520	4	OPEN RANGE AREA	1308	1330	22	5	DOWNTIME DUE TO EQUIP MAINT/CHECK	SWAPPED OUT GPS BATTERY	NA	NA	HOT	DRY
20030520	4	OPEN RANGE AREA	1330	1530	120	2	COLLECTING DATA	RUNNING OPEN RANGE GRID B4 BIDIRECTIONAL	GPS	LINER	HOT	DRY
20030520	4	OPEN RANGE AREA	1530	1535	5	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY
20030520	4	OPEN RANGE AREA	1535	1555	20	5	DOWNTIME DUE TO EQUIP MAINT/CHECK	CHECKING DOWNLOADING DATA	GPS	NA	HOT	DRY
20030520	4	OPEN RANGE AREA	1555	1600	5	1	SET-UP MOBILIZATION	BREAKING DOWN EQUIPMENT EOD	NA	NA	HOT	DRY
20030521	3	OPEN RANGE AREA	540	610	30	1	SET-UP MOBILIZATION	SETTING UP EQUIPMENT	NA	NA	HOT	DRY
20030521	3	OPEN RANGE AREA	610	622	12	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY
20030521	3	OPEN RANGE AREA	622	800	98	2	COLLECTING DATA	RUNNING OPEN RANGE GRID B3 BIDIRECTIONAL	GPS	LINER	HOT	DRY
20030521	3	OPEN RANGE AREA	800	804	4	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY

Note: Activities pertinent to this specific demonstration are indicated in highlighted text.

Date	No. of People	Area Tested	Status Start Time	Status Stop Time	Duration, min	Op Stat Code	Operational Status	Operational Status-Comments	Track Method	Pattern	Field Conditions	
20030521	3	OPEN RANGE AREA	804	820	16	5	DOWNTIME DUE TO EQUIP MAINT/CHECK	SWAPPED OUT FIELD COMPUTER BATTERY	NA	NA	HOT	DRY
20030521	3	OPEN RANGE AREA	820	829	9	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY
20030521	3	OPEN RANGE AREA	829	945	76	2	COLLECTING DATA	RUNNING OPEN RANGE GRID B3 BIDIRECTIONAL	GPS	LINER	HOT	DRY
20030521	3	OPEN RANGE AREA	945	950	5	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY
20030521	3	OPEN RANGE AREA	950	958	8	5	DOWNTIME DUE TO EQUIP MAINT/CHECK	SWAPPED OUT MAIN BATTERY	NA	NA	HOT	DRY
20030521	3	OPEN RANGE AREA	958	1003	5	5	DOWNTIME DUE TO EQUIP MAINT/CHECK	SWAPPED OUT FIELD COMPUTER	NA	NA	HOT	DRY
20030521	3	OPEN RANGE AREA	1003	1013	10	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY
20030521	3	OPEN RANGE AREA	1013	1315	182	2	COLLECTING DATA	RUNNING OPEN RANGE GRID B2 BIDIRECTIONAL	GPS	LINER	HOT	DRY
20030521	3	OPEN RANGE AREA	1315	1320	5	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY
20030521	3	OPEN RANGE AREA	1320	1355	35	5	DOWNTIME DUE TO EQUIP MAINT/CHECK	CHECKING DOWNLOADING DATA	GPS	NA	HOT	DRY
20030521	3	OPEN RANGE AREA	1355	1400	5	1	SET-UP MOBILIZATION	BREAKING DOWN EQUIPMENT EOD	NA	NA	HOT	DRY
20030522	3	OPEN RANGE AREA	535	605	30	1	SET-UP MOBILIZATION	SETTING UP EQUIPMENT	NA	NA	HOT	DRY
20030522	3	OPEN RANGE AREA	605	615	10	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY

Note: Activities pertinent to this specific demonstration are indicated in highlighted text.

Date	No. of People	Area Tested	Status Start Time	Status Stop Time	Duration, min	Op Stat Code	Operational Status	Operational Status-Comments	Track Method	Pattern	Field Conditions	
20030522	3	OPEN RANGE AREA	615	627	12	2	COLLECTING DATA	RUNNING OPEN RANGE GRID B2 BIDIRECTIONAL	GPS	LINER	HOT	DRY
20030522	3	OPEN RANGE AREA	627	637	10	1	SET-UP MOBILIZATION	SETTING UP EQUIPMENT	NA	NA	HOT	DRY
20030522	3	OPEN RANGE AREA	637	641	4	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY
20030522	3	OPEN RANGE AREA	641	925	164	2	COLLECTING DATA	RUNNING OPEN RANGE GRID G2 BIDIRECTIONAL	GPS	LINER	HOT	DRY
20030522	3	OPEN RANGE AREA	925	930	5	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY
20030522	3	OPEN RANGE AREA	930	940	10	1	SET-UP MOBILIZATION	SETTING UP EQUIPMENT	NA	NA	HOT	DRY
20030522	3	OPEN RANGE AREA	940	952	12	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY
20030522	3	OPEN RANGE AREA	952	1100	68	2	COLLECTING DATA	RUNNING OPEN RANGE GRID G3 BIDIRECTIONAL	GPS	LINER	HOT	DRY
20030522	3	OPEN RANGE AREA	1100	1112	12	5	DOWNTIME DUE TO EQUIP MAINT/CHECK	CHECKING DOWNLOADING DATA	GPS	NA	HOT	DRY
20030522	3	OPEN RANGE AREA	1112	1117	5	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY
20030522	3	OPEN RANGE AREA	1117	1340	143	2	COLLECTING DATA	RUNNING OPEN RANGE GRID G3 BIDIRECTIONAL	GPS	LINER	HOT	DRY
20030522	3	OPEN RANGE AREA	1340	1350	10	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY
20030522	3	OPEN RANGE AREA	1350	1440	50	5	DOWNTIME DUE TO EQUIP MAINT/CHECK	CHECKING DOWNLOADING DATA	GPS	NA	HOT	DRY
20030522	3	OPEN RANGE AREA	1440	1450	10	1	SET-UP MOBILIZATION	BREAKING DOWN EQUIPMENT EOD	NA	NA	HOT	DRY

Note: Activities pertinent to this specific demonstration are indicated in highlighted text.

Date	No. of People	Area Tested	Status Start Time	Status Stop Time	Duration, min	Op Stat Code	Operational Status	Operational Status-Comments	Track Method	Pattern	Field Conditions	
20030528	4	OPEN RANGE AREA	715	805	50	1	SET-UP MOBILIZATION	SETTING UP EQUIPMENT	NA	NA	HOT	DRY
20030528	4	OPEN RANGE AREA	805	820	15	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY
20030528	4	OPEN RANGE AREA	820	928	68	2	COLLECTING DATA	RUNNING OPEN RANGE GRIDS G3,G4 EAST/WEST	GPS	LINER	HOT	DRY
20030528	4	OPEN RANGE AREA	928	932	4	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY
20030528	4	OPEN RANGE AREA	932	945	13	1	SET-UP MOBILIZATION	SETTING UP EQUIPMENT	NA	NA	HOT	DRY
20030528	4	OPEN RANGE AREA	945	955	10	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY
20030528	4	OPEN RANGE AREA	955	1120	85	2	COLLECTING DATA	RUNNING OPEN RANGE GRID C2 EAST/WEST	GPS	LINER	HOT	DRY
20030528	4	OPEN RANGE AREA	1120	1126	6	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY
20030528	4	OPEN RANGE AREA	1126	1132	6	5	DOWNTIME DUE TO EQUIP MAINT/CHECK	SWAPPED OUT FIELD COMPUTER	NA	NA	HOT	DRY
20030528	4	OPEN RANGE AREA	1132	1140	8	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY
20330528	4	OPEN RANGE AREA	1140	1320	100	2	COLLECTING DATA	RUNNING OPEN RANGE GRID C2 EAST/WEST	GPS	LINER	HOT	DRY
20030528	4	OPEN RANGE AREA	1320	1326	6	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY
20030528	4	OPEN RANGE AREA	1326	1350	24	5	DOWNTIME DUE TO EQUIP MAINT/CHECK	CHECKING DOWNLOADING DATA	GPS	NA	HOT	DRY

Note: Activities pertinent to this specific demonstration are indicated in highlighted text.

Date	No. of People	Area Tested	Status Start Time	Status Stop Time	Duration, min	Op Stat Code	Operational Status	Operational Status-Comments	Track Method	Pattern	Field Conditions	
20030528	4	OPEN RANGE AREA	1350	1358	8	5	DOWNTIME DUE TO EQUIP MAINT/CHECK	SWAPPED OUT FIELD COMPUTER BATTERY	NA	NA	HOT	DRY
20030528	4	OPEN RANGE AREA	1358	1405	7	5	DOWNTIME DUE TO EQUIP MAINT/CHECK	SWAPPED OUT MAIN BATTERY	NA	NA	HOT	DRY
20030528	4	OPEN RANGE AREA	1405	1415	10	1	SET-UP MOBILIZATION	SETTING UP EQUIPMENT	NA	NA	HOT	DRY
20030528	4	OPEN RANGE AREA	1415	1422	7	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY
20030528	4	OPEN RANGE AREA	1422	1540	78	2	COLLECTING DATA	RUNNING OPEN RANGE GRID D2 EAST/WEST	GPS	LINER	HOT	DRY
20030528	4	OPEN RANGE AREA	1540	1550	10	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY
20030528	4	OPEN RANGE AREA	1550	1620	30	5	DOWNTIME DUE TO EQUIP MAINT/CHECK	CHECKING DOWNLOADING DATA	GPS	NA	HOT	DRY
20030528	4	OPEN RANGE AREA	1620	1630	10	1	SET-UP MOBILIZATION	BREAKING DOWN EQUIPMENT EOD	NA	NA	HOT	DRY
20030529	4	OPEN RANGE AREA	610	645	35	1	SET-UP MOBILIZATION	SETTING UP EQUIPMENT	NA	NA	HOT	DRY
20030529	4	OPEN RANGE AREA	645	655	10	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY
20030529	4	OPEN RANGE AREA	655	937	162	2	COLLECTING DATA	RUNNING OPEN RANGE GRID D2 EAST/WEST	GPS	LINER	HOT	DRY
20030529	4	OPEN RANGE AREA	937	941	4	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY

Note: Activities pertinent to this specific demonstration are indicated in highlighted text.

Date	No. of People	Area Tested	Status Start Time	Status Stop Time	Duration, min	Op Stat Code	Operational Status	Operational Status-Comments	Track Method	Pattern	Field Conditions	
20030529	4	OPEN RANGE AREA	941	957	16	5	DOWNTIME DUE TO EQUIP MAINT/CHECK	CHECKING DOWNLOADING DATA	GPS	NA	HOT	DRY
20030529	4	OPEN RANGE AREA	957	1000	3	5	DOWNTIME DUE TO EQUIP MAINT/CHECK	SWAPPED OUT FIELD COMPUTER	NA	NA	HOT	DRY
20030529	4	OPEN RANGE AREA	1000	1005	5	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY
20030529	4	OPEN RANGE AREA	1005	1105	60	2	COLLECTING DATA	RUNNING OPEN RANGE GRID C3 EAST/WEST	GPS	LINER	HOT	DRY
20030529	4	OPEN RANGE AREA	1105	1111	6	5	DOWNTIME DUE TO EQUIP MAINT/CHECK	SWAPPED OUT FIELD COMPUTER	NA	NA	HOT	DRY
20030529	4	OPEN RANGE AREA	1111	1122	11	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY
20030529	4	OPEN RANGE AREA	1122	1205	43	2	COLLECTING DATA	RUNNING OPEN RANGE GRID C3 EAST/WEST	GPS	LINER	HOT	DRY
20030529	4	OPEN RANGE AREA	1205	1210	5	5	DOWNTIME DUE TO EQUIP MAINT/CHECK	SWAPPED OUT MAIN BATTERY	NA	NA	HOT	DRY
20030529	4	OPEN RANGE AREA	1210	1216	6	5	DOWNTIME DUE TO EQUIP MAINT/CHECK	SWAPPED OUT GPS BATTERY	NA	NA	HOT	DRY
20030529	4	OPEN RANGE AREA	1216	1222	6	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY
20030529	4	OPEN RANGE AREA	1222	1350	88	2	COLLECTING DATA	RUNNING OPEN RANGE GRID C3 EAST/WEST	GPS	LINER	HOT	DRY
20030529	4	OPEN RANGE AREA	1350	1358	8	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY

Note: Activities pertinent to this specific demonstration are indicated in highlighted text.

Date	No. of People	Area Tested	Status Start Time	Status Stop Time	Duration, min	Op Stat Code	Operational Status	Operational Status-Comments	Track Method	Pattern	Field Conditions	
20030529	4	OPEN RANGE AREA	1358	1420	22	5	DOWNTIME DUE TO EQUIP MAINT/CHECK	CHECKING DOWNLOADING DATA	GPS	NA	HOT	DRY
20030529	4	OPEN RANGE AREA	1420	1425	5	5	DOWNTIME DUE TO EQUIP MAINT/CHECK	SWAPPED OUT FIELD COMPTER BATTERY	NA	NA	HOT	DRY
20030529	4	CALIBRATION PIT	1425	1437	12	1	SET-UP MOBILIZATION	SETTING UP EQUIPMENT	NA	NA	HOT	DRY
20030529	4	CALIBRATION PIT	1437	1447	10	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY
20030529	4	CALIBRATION PIT	1447	1519	32	2	COLLECTING DATA	RUNNING SIGNATURE DATA ON 155MM	GPS	LINER	HOT	DRY
20030529	4	CALIBRATION PIT	1519	1536	17	2	COLLECTING DATA	RUNNING SIGNATURE DATA ON 105MM	GPS	LINER	HOT	DRY
20030529	4	CALIBRATION PIT	1536	1548	12	2	COLLECTING DATA	RUNNING SIGNATURE DATA ON ATC 44	GPS	LINER	HOT	DRY
20030529	4	CALIBRATION PIT	1548	1550	2	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY
20030529	4	CALIBRATION PIT	1550	1555	5	1	SET-UP MOBILIZATION	BREAKING DOWN EQUIPMENT EOD	NA	NA	HOT	DRY
20030530	4	OPEN RANGE AREA	615	650	35	1	SETUP/ MOBILIZATION	SETTING UP EQUIPMENT	NA	NA	HOT	DRY
20030530	4	OPEN RANGE AREA	650	655	5	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY
20030530	4	OPEN RANGE AREA	655	1010	195	2	COLLECTING DATA	RUNNING OPEN RANGE GRID D3 EAST/WEST	GPS	LINER	HOT	DRY
20030530	4	OPEN RANGE AREA	1010	1020	10	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY

Note: Activities pertinent to this specific demonstration are indicated in highlighted text.

Date	No. of People	Area Tested	Status Start Time	Status Stop Time	Duration, min	Op Stat Code	Operational Status	Operational Status-Comments	Track Method	Pattern	Field Conditions	
20030530	4	OPEN RANGE AREA	1020	1040	20	5	DOWNTIME DUE TO EQUIP MAINT/CHECK	CHECKING DOWNLOADING DATA	GPS	NA	HOT	DRY
20030530	4	OPEN RANGE AREA	1040	1048	8	5	DOWNTIME DUE TO EQUIP MAINT/CHECK	SWAPPED OUT FIELD COMPUTER BATTERY	NA	NA	HOT	DRY
20030530	4	OPEN RANGE AREA	1048	1053	5	5	DOWNTIME DUE TO EQUIP MAINT/CHECK	SWAPPED OUT MAIN BATTERY	NA	NA	HOT	DRY
20030530	4	CALIBRATION PIT	1053	1115	22	1	SET-UP MOBILIZATION	SETTING UP EQUIPMENT	NA	NA	HOT	DRY
20030530	4	CALIBRATION PIT	1115	1125	10	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY
20030530	4	CALIBRATION PIT	1125	1210	45	2	COLLECTING DATA	RUNNING SIGNATURE DATA AT A ZERO DEGREE ANGLE	GPS	LINER	HOT	DRY
20030530	4	CALIBRATION PIT	1210	1225	15	1	SET-UP MOBILIZATION	SETTING UP EQUIPMENT FOR 90 DEGREE ANGLE	NA	NA	HOT	DRY
20030530	4	CALIBRATION PIT	1225	1250	25	2	COLLECTING DATA	RUNNING SIGNATURE DATA AT A 90 DEGREE ANGLE	GPS	LINER	HOT	DRY
20030530	4	CALIBRATION PIT	1250	1300	10	1	SETUP/ MOBILIZATION	SETTING UP EQUIPMENT FOR 45 DEGREE ANGLE	NA	NA	HOT	DRY
20030530	4	CALIBRATION PIT	1300	1320	20	2	COLLECTING DATA	RUNNING SIGNATURE DATA AT A 45 DEGREE ANGLE	GPS	LINER	HOT	DRY
20030530	4	CALIBRATION PIT	1320	1330	10	2	COLLECTING DATA	EQUIPMENT WAS CALIBRATED USING CAL DISK	GPS	LINER	HOT	DRY
20030530	4	CALIBRATION PIT	1330	1350	20	5	DOWNTIME DUE TO EQUIP MAINT/CHECK	CHECKING/DOWNLOADING DATA	GPS	NA	HOT	DRY
20030530	4	CALIBRATION PIT	1350	1600	130	7	DEMOBILIZE	END OF TEST	NA	NA	HOT	DRY

Note: Activities pertinent to this specific demonstration are indicated in highlighted text.

APPENDIX E. REFERENCES

1. Standardized UXO Technology Demonstration Site Handbook, DTC Project No. 8-CO-160-000-473, Report No. ATC-8349, March 2002.

2. Aberdeen Proving Ground Soil Survey Report, October 1998.

3. Data Summary, UXO Standardized Test Site: APG Soils Description, May 2002.

4. Data Summary, UXO standardized Test Site: YPG Soils Description, May 2003.

5. Practical Nonparametric Statistics, W.J. Conover, John Wiley & Sons, 1980, pages 144 through 151.

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APPENDIX F. ABBREVIATIONS

AEC	=	U.S. Army Environmental Center
APG	=	Aberdeen Proving Ground
ASCII	=	American Standard Code for International Interchange
ATC	=	U.S. Army Aberdeen Test Center
DC	=	direct current
ERDC	=	U.S. Army Corps of Engineers Engineering Research and Development Center
ESTCP	=	Environmental Security Technology Certification Program
EQT	=	Army Environmental Quality Technology Program
GPS	=	Global Positioning System
JPG	=	Jefferson Proving Ground
NS	=	nonstandard
POC	=	point of contact
QA	=	quality assurance
QC	=	quality control
ROC	=	receiver-operating characteristic
RTK	=	real time kinematic
SERDP	=	Strategic Environmental Research and Development Program
UXO	=	unexploded ordnance
YPG	=	U.S. Army Yuma Proving Ground

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APPENDIX G. DISTRIBUTION LIST

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