

**Standard Operating Procedure  
DAGCAP-1**

**Geophysical Classification Organizations Demonstration of Capabilities at Aberdeen Proving  
Ground Demonstration Site**

**Version 4  
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**DoD Environmental Data Quality Workgroup**

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## 1 Introduction

DoD has successfully demonstrated Advanced Geophysical Classification, which has the potential to save billions of dollars by focusing on the removal of the explosive hazards while avoiding the unnecessary and costly excavation of non-explosive debris. The DoD Advanced Geophysical Classification Accreditation Program (DAGCAP) has been established to support the transition of advanced classification to common use in the field. A critical part of this accreditation program is the requirement for Geophysical Classification Organizations (CGO) to perform a witnessed demonstration of capability (DOC). The purpose of this standard operating procedure (SOP) is to specify the methods and procedures to be employed when a GCO uses the Aberdeen Proving Ground (APG) unexploded ordnance (UXO) test site for its DOC in conjunction with the DAGCAP.

## 2 Personnel, Equipment, and Materials

This section describes the personnel, equipment, and materials required to implement this SOP.

### 2.1 Personnel and Qualification

The following GCO personnel will be required for the DOC:

- Project Geophysicist
- QC Geophysicist
- Field Technicians
- Data Processor

Personnel involved in the DOC will meet the qualifications as described in the Geophysical Classification for Munitions Response Quality Assurance Project Plan (GCMR-QAPP) template as required.

The following additional personnel will be required:

- Accrediting Body (AB) representative(s)
- APG site personnel required for safety and security
- Any other personnel (e.g., DoD oversight personnel) as designated by the chair of the DoD Environmental Data Quality Workgroup (EDQW) Advanced Geophysical Classification Subgroup (AGCS)

### 2.2 Equipment and Materials

The following is a list of required equipment and materials to be provided by a GCO:

- Advanced electromagnetic induction sensor and all associated equipment and materials listed in each CGO's respective SOP

- Validated software package for data analysis and reporting (Prior to mobilization to the APG site, the GCO should consult with their AB representative to determine whether data analysis software planned for use at the demo has been validated by DOD.)
- SOPs for all operations to be performed as part of the DOC

### 3 Procedures

#### 3.1 *Prior to Arrival at the Site*

When a GCO (in consultation with their AB) is ready for the DOC, the AB will contact the Chair of the EDQW AGCS to schedule a demonstration slot.

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The EDQW will coordinate with the GCO's AB and the staff at Aberdeen Test Center (ATC) to schedule a time slot for the demonstration. For adequate flexibility to react to potential adverse weather, each GCO will request a primary week, and back-up week at the APG site.

Once a demonstration is scheduled, the GCO will receive a package of information from the ATC staff covering site access requirements, hours of operation, safety requirements, etc. This information is attached as Appendix A to this document, but the GCO should examine the package from ATC carefully in the event of any changes. Also included in the package from ATC will be the conceptual site model (CSM) for the site which is attached as Appendix B and data sheets for the three GPS monuments which are attached as Appendix C.

#### 3.2 *At the Site*

##### 3.2.1 Onsite Preparation

Upon arrival at the site, GCO personnel will participate in any required safety and operational briefings and be given an introductory tour of the demonstration site and office building. At this time the AB will provide a CD (obtained from APG personnel) identifying the actual 0.5-acre area, selected in advance by ATC staff, which will be the subject of the demonstration. In addition the CD will contain the IVS configuration and a CSV template that the GCO shall use to construct their table of detected locations. The QC geophysicist will also be provided the location, depth, orientation, and item description of the 2 QC seeds within the demonstration area. ATC personnel will mark the corners of the demonstration area with pin flags and provide corner coordinates (UTM Zone 18N, meters) electronically.

##### 3.2.2 Demonstration of Capability

The demonstration is designed to require approximately one week on site. The GCO shall conduct all survey and analysis operations on site, in accordance with their approved SOPs. All operations will be monitored by the AB to ensure that the SOPs are being followed and validated survey and analysis procedures are being employed. To ensure compliance with this provision, data transfer from the sensor

to the analyst will only be permitted using a removable drive controlled by the AB and all analysis computers will remain under control of the AB until the DOC is complete. At the end of the demonstration, all data generated by the GCO will be retained by the APG staff with no data to remain on the GCO computers. If the Navy owned TEMTADs and associated firmware is used by the GCO for the demonstration, the GCOs demonstration data set will be removed from the firmware at the conclusion of the demonstration prior to leaving the site.

The GCO QC geophysicist will monitor the detection and correct classification of the QC seeds, which will be placed by the government. The government will provide no feedback (for example, no training data will be provided) during the DOC. If the QC seeds are not included with a Dig Decision of 1 they will be counted as false negatives during scoring (see Section 4.1 – Scoring).

The GCO may employ plastic pin flags to mark locations on the demonstration site but no intrusive activities are allowed. The use of yellow pin flags is prohibited.

The AB will notify ATC staff as soon as possible if the DOC will extend beyond one week (5 working days) so that arrangements can be made for site access and appropriate resources.

## 4 Scoring of the Demonstration Results

### 4.1 Demonstrator Report for Scoring

At the conclusion of data analysis, the demonstrator shall submit a table of detected locations in order to accomplish the remedial objectives as outlined in the CSM. The table will be submitted on CD media generated, if necessary, from a CD burner provided by APG staff. The GCO shall construct the table of detected locations using the CSV template on the CD that the AB representative provided upon arrival at the test site. The table shall be formatted as follows:

1. The first four header rows should include the GCO name, GCO POC, AB Technical Representative, and AB Representative.
2. Each row in the table corresponds to one detected location.
3. The rows will be ordered according to priority (the first location is the location most likely to contain TOI).
4. The first column contains a Rank Number (beginning with 1 and ascending down).
5. The second and third columns hold easting and northing coordinates, respectively (UTM Zone 18N, meters).
6. The fourth column contains the Dig Decision (1 = dig, 0 = do not dig) for that location. All rows with 1s should be above all rows with 0s.
7. Columns five and beyond can contain any optional information the GCO wishes to include (depth, munition type, etc.). The contents of these columns do not affect the scoring.
8. The table must be in CSV format.

## 4.2 Scoring

The list submitted by the GCO will be compared to site ground truth and three values calculated: 1) the number of detected locations marked to be dug that were truly TOI (True Positives, TP), 2) the number of detected locations marked to be dug that were not truly TOI (False Positives, FP), and 3) the number of TOI that were not marked to be dug (False Negatives, FN). A successful demonstration of capabilities will require that all TOI are marked for digging (FN = 0) and that the total FPs are less than or equal to 40% of the emplaced clutter (rounded down to the nearest integer).

The following rules will be used to calculate the three values listed above.

1. For each location on the list with a “1” in the dig decision column:
  - a. The scoring software will draw a 0.25-m radius circular halo around the location from the list.
  - b. If there are 0 TOIs in or on the halo, then the scoring software will count the location as 1 FP (regardless of how many clutter items are in or on the halo).
  - c. If there is 1 TOI in or on the halo and
    - i. The TOI is outside the 0.5-acre test area, then the scoring software will ignore this location (the location will not be counted at all).
    - ii. The TOI is inside the 0.5m-acre test area and
      - A. If this TOI has already been found in or on another location’s halo further up the list (i.e., another location considered more likely to be TOI), then the scoring software will count this location as 1 FP.
      - B. If this TOI has not already been found in or on another location’s halo further up the list (i.e., another location considered more likely to be TOI), then the scoring software will count this location as 1 TP.
2. The scoring software will count each “leftover” TOI as 1 FN. A “leftover” TOI is a TOI in the 0.5-acre test area that was not in or on any location’s halo with a 1 in the Decision column.

## 4.3 Reporting

At the conclusion of scoring, APG personnel will report the DOC results (i.e., pass/fail) to the appropriate AB. APG staff will provide two copies of the report (one for the GCO and the other for the AB to retain for their records), which in addition to a pass/fail conclusion will provide a basis for failure. The AB will report to the GCO whether the DOC was successful or not as part of its demonstration outbrief.

## 4.4 Failure of APG Demo

The basis for failure in the report from APG staff will be expressed as, “too many false positives (FPs)” and/or “one or more false negatives (FNs).” A Failure due to FNs will be further explained as “one or more false negatives (FNs) caused by a failure to detect”; or “one or more false negatives (FNs) caused by misclassification”; or “one or more false negatives (FNs) caused by failure to detect and misclassification”. Scoring results presented at the APG demo site will be considered final when reported at the outbrief – no rework of data or reporting will be entertained. If the GCO subsequently wishes to achieve a pass for the APG demo, there are two options after the AB and DOD EDQW accept the Root Cause Analysis/Corrective Action Plan/Corrective Action:

(1) DOD EDQW determines that the failure was not related to the data collection activities and the data set is appropriate for reanalysis without remobilizing to the APG site, in which case the GCO makes arrangements with the AB for a time and location for the data set to be made available for reanalysis; or (2) the original data set is determined by DOD to be inadequate for reanalysis, in which case the GCO requests a follow-up appointment at APG for a full demonstration.

## Acronyms

AB	Accrediting Body
APG	Aberdeen Proving Ground, MD
ATC	Aberdeen Test Center
CSM	conceptual site model
DAGCAP	DoD Advanced Geophysical Classification Accreditation Program
DOC	demonstration of capability
DoD	Department of Defense
EDQW	DoD Environmental Data Quality Workgroup
FN	false negative
FP	false positive
GCMR-QAPP	Geophysical Classification for Munitions Response Quality Assurance Project Plan
GCO	geophysical classification organization
JHA	job hazard analysis
QC	quality control
SOP	standard operating procedure
TOI	target of interest. Items including munitions, QC seeds, validation seeds, etc. that must be removed from the site to accomplish the remedial objective.
TP	true positive
UXO	unexploded ordnance

## Appendix A.

### A1. Site Access

#### ***A1.1 Hours of Operation***

The US Army Aberdeen Test Center (ATC) operates under a condensed work schedule resulting in a regular day off (RDO) every other Friday. The hours of operation for Monday through Thursday are 0700 to 1630. For the working Fridays, the hours of operation are 0700 to 1530.

In addition, ATC observes the following federal holidays:

1. New Year's Day
2. Birthday of Martin Luther King, Jr.
3. Washington's Birthday
4. Memorial Day
5. Independence Day
6. Labor Day
7. Columbus Day
8. Veterans Day
9. Thanksgiving Day
10. Christmas Day

Lastly, at the discretion of the commander, ATC may be under a reduced operations or mandatory safety stand downs. As a result, early coordination with ATC personnel is recommended.

#### ***A1.2 Security Considerations***

The UXO test site is located within a restricted area on Aberdeen Proving Ground, MD. As a result, all personnel desiring access must submit a visit request. In addition, additional coordination may be required for any Foreign Nationals who wish to gain access to the test site. Below is a link with additional information.

[http://www.atc.army.mil/visitorGuide/visitor\\_badge.html](http://www.atc.army.mil/visitorGuide/visitor_badge.html)

[No photos may be taken by anyone other than APG staff. APG staff can be requested to take photos necessary for the demonstration \(e.g. sensor assembly photo as may be required in a GCO SOP\) and provide to the GCO team.](#)

### A2. Safety Considerations

ATC has conducted a Job Hazard Analysis (JHA) for the UXO Site. Upon arrival, all GCO personnel must read the JHA and agree to follow the corrective measures to mitigate the risk of injury. An example of a corrective measure is wearing appropriate safety shoes. In addition, the UXO Site has an Emergency Action Plan that will be followed in case of emergency.



## Appendix B. Abbreviated Conceptual Site Model

The demonstration of capability (DOC) site at Aberdeen Proving Ground is comprised of two subareas as shown in the image below.



Figure B-1 - Aerial photo of the demonstration of capabilities site showing the two subareas and the location of the IVS

The area containing the DOC site has been used for training and testing for many years. There have been numerous, overlapping ranges at various times at this site. Based on historical records and the Remedial Investigation, at a minimum, the following munitions are expected to be found on the site, although this list may not be comprehensive. Both subareas are expected to have similar munitions.

Munitions Expected on the Site	
Name	Mark/Mod
37mm	M74 HETP
37mm	M74 AT,TP
37mm	M55A1
37mm	M59
37mm	M80A1
60mm	M49A4
81mm	M82
105mm	M1
105mm	M84

The site has been surfaced cleared allowing non-intrusive work to be performed without a UXO escort. There is a small building (shown in the upper right of the image above) set up for storage of equipment, battery charging, and data analysis.

An instrument verification strip (IVS) has been established on the site containing a 37-mm projectile and two small ISO80s. Location and depths of the IVS items will be provided to GCO analysts on site. Small ISO80s have been emplaced as QC seeds. The positions and depths of these QC seeds will be provided to the team QC Geophysicist. Additional validation seeds have been emplaced on the site. The details of these items will remain blind to the GCO.

The remedial objective for 37-mm projectiles is removal to 30 cm below ground level. Any munition detected using a threshold designed to accomplish this objective must also be marked for removal. For the purposes of the DOC, the smallest munition of concern is a 37-mm projectile. At this site, fuzes are not considered TOI.

## Appendix C. Data Sheets

### Survey Control Card

MONUMENT NUMBER: 477

HORIZONTAL ORDER: FIRST

MONUMENT NAME: 477

VERTICAL ORDER: +/- 6cm

STATE: MARYLAND

AREA: ABERDEEN

APG GRID:

**Horizontal information:** Method Established: GPS NETWORK

UTM DATUM: NAD83

STATE PLANE DATUM: NAD83

GEOGRAPHIC DATUM: NAD83

UTM UNITS: METERS

STATE PLANE UNITS: US SURVEY FEET

UTM ZONE: 18 NORTH

STATE PLANE ZONE: MARYLAND 1900

UTM NORTHING: 4369749.013

STATE PLANE NORTHING: 658613.109

LATITUDE: 39 28 18.63880

UTM EASTING: 402810.038

STATE PLANE EASTING: 1557961.953

LONGITUDE: 76 07 47.71815

**Vertical Information:** Method Established: GPS OBSERVATION

METHOD ESTABLISHED (ELLIPSOID HT):

VERTICAL DATUM: NAVD88

VERTICAL UNITS: METERS

ELLIPSOIDAL HT UNITS:

ELEVATION: 10.669

ELLIPSOIDAL HT:

**Local Coordinate Systems:**

B1 DU UNITS:

B1 NONDU UNITS:

B2 POPUP UNITS:

B1 DU NORTHING:

B1 NONDU NORTHING:

B2 POPUP NORTHING:

B1 DU EASTING:

B1 NONDU EASTING:

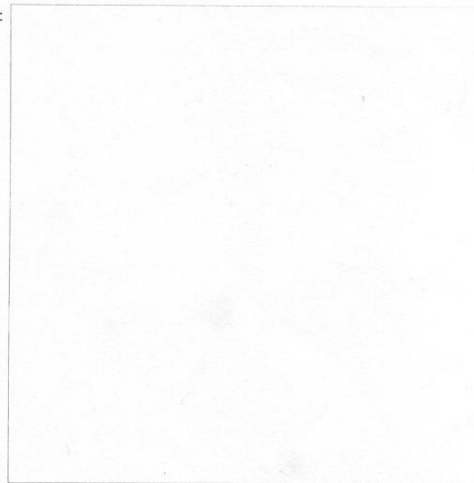
B2 POPUP EASTING:

TW2 UNITS:

TW2 NORTHING:

TW2 EASTING:

IMAGE:



**Survey Control Card**

**MONUMENT NUMBER:** 478  
**MONUMENT NAME:** 478  
 STATE: MARYLAND  
 AREA: ABERDEEN  
 APG GRID:

HORIZONTAL ORDER: FIRST  
 VERTICAL ORDER: +/- 6cm

**Horizontal information:** Method Established: GPS NETWORK

UTM DATUM: NAD83	STATE PLANE DATUM: NAD83	GEOGRAPHIC DATUM: NAD83
UTM UNITS: METERS	STATE PLANE UNITS: US SURVEY FEET	
UTM ZONE: 18 NORTH	STATE PLANE ZONE: MARYLAND 1900	
UTM NORTHING: 4369305.416	STATE PLANE NORTHING: 657155.914	LATITUDE: 39 28 04.24219
UTM EASTING: 402785.686	STATE PLANE EASTING: 1557914.178	LONGITUDE: 76 07 48.50439

**Vertical information:** Method Established: GPS OBSERVATION

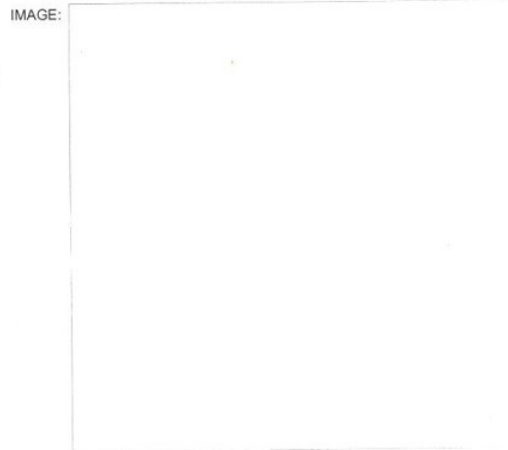
VERTICAL DATUM: NAVD88  
 VERTICAL UNITS: METERS  
 ELEVATION: 11.747

METHOD ESTABLISHED (ELLIPSOID HT):

ELLIPSOIDAL HT UNITS:  
 ELLIPSOIDAL HT:

**Local Coordinate Systems:**

B1 DU UNITS:	B1 NONDU UNITS:	B2 POPUP UNITS:
B1 DU NORTHING:	B1 NONDU NORTHING:	B2 POPUP NORTHING:
B1 DU EASTING:	B1 NONDU EASTING:	B2 POPUP EASTING:
TW2 UNITS:		
TW2 NORTHING:		
TW2 EASTING:		



**Survey Control Card**

MONUMENT NUMBER: 515  
 MONUMENT NAME: TRAV PT #6 TW MILE LOOP  
 STATE: MARYLAND  
 AREA: ABERDEEN  
 APG GRID: 12-5

HORIZONTAL ORDER: FIRST  
 VERTICAL ORDER: FIRST, CLASS I

Horizontal information: Method Established: GPS NETWORK

UTM DATUM: WGS84	STATE PLANE DATUM: NAD83	GEOGRAPHIC DATUM: WGS84
UTM UNITS: METERS	STATE PLANE UNITS: METERS	
UTM ZONE: 18 NORTH	STATE PLANE ZONE: MARYLAND 1900	
UTM NORTHING: 4369642.555	STATE PLANE NORTHING: 200643.761	LATITUDE: 39 28 15.26982
UTM EASTING: 403015.999	STATE PLANE EASTING: 475076.073	LONGITUDE: 76 07 39.04383

Vertical Information: Method Established: ELECTRONIC LEVELING METHOD (ELLIPSOID HT): GEOID 03 (CONUS)

VERTICAL DATUM: NAVD88	ELLIPSOIDAL HT UNITS: METERS
VERTICAL UNITS: METERS	ELLIPSOIDAL HT: -21.652
ELEVATION: 11.555	

Local Coordinate Systems:

B1 DU UNITS:	B1 NONDU UNITS	TW2 UNITS:
B1 DU NORTHING:	B1 NONDU NORTHING:	TW2 NORTHING:
B1 DU EASTING:	B1 NONDU EASTING:	TW2 EASTING:
B3 DU UNITS:	B3 NONDU UNIT	
B3 DU NORTHING:	B3 NONDU NORTHING	
B3 DU EASTING:	B3 NONDU EASTING:	

