FACT SHEET

The Benefits of One-Pass Advanced Geophysical Classification in the Cleanup of Department of Defense Facilities

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Purpose

This fact sheet discusses advanced geophysical classification (AGC) and, more specifically, one-pass AGC as a tool to support investigation, decision-making, and cleanup of munitions at facilities managed by the Department of Defense (DoD).

Magnitude of the Cleanup

The cleanup of munitions at DoD facilities is massive in scale, with an estimated 10 million acres of land involved across approximately 1,400 sites (Defense Science Board, 2003). Extensive data acquired from previous and ongoing cleanup operations indicates approximately 95 percent of excavated objects are not munitions but nonhazardous metallic items that may be left in the ground. Figure 1 provides an example of the magnitude of the cleanup when all subsurface metal items must be removed from the ground to achieve munitions cleanup goals.

Figure 1. Example of the magnitude of the cleanup when all metal objects in the subsurface require removal by digging. Sensor shown is a non-AGC metal detector (Courtesy of Defense Science Board, 2003).

Advanced Geophysical Classification Solution

Following many years of research, development, and testing, the ability of AGC to reliably classify munitions (termed targets of interest [TOI]) from nonhazardous metal items (non-TOI) has been conclusively established. Use of AGC technology can significantly reduce the number of excavations required for munitions cleanup. This equates to an estimated savings in the tens of billions of dollars for the total cleanup process (Defense Science Board, 2003). Additionally, the reduction in excavations achieved using AGC may result in other benefits, such as less ecological damage, heightened safety, fewer required evacuations, and faster cleanup.

Advanced Geophysical Classification Process

The AGC process involves collection of data using complex electromagnetic induction sensors to detect anomalies and use of specialized software to classify them. AGC sensors and software used for cleanup of munitions at DoD facilities have been rigorously tested and validated for use through the DoD AGC Accreditation Program.

The AGC process consists of the following three general steps:

- Measuring the response of a metal item to an electromagnetic field using an AGC sensor.
- Analyzing the measured response to determine the metal item's depth, size, aspect ratio (that is, its height compared to length and width), and thickness.
- Using the results to decide: 1) whether the metal item has the characteristics of a munition item and thus must be removed; 2) if the metal item may be safely left in the ground because it is not a munition item and does not pose an explosive hazard; or 3) the item cannot be resolved through classification (is inconclusive) and must be removed (Figure 2).

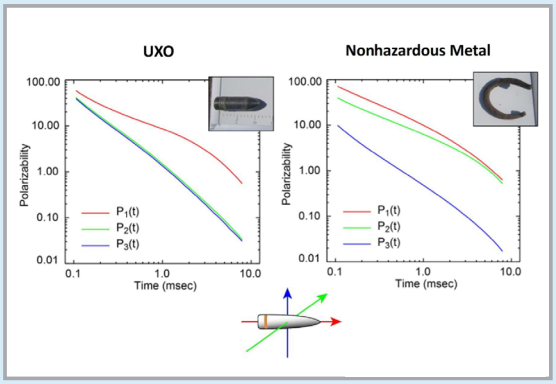

Figure 2. Classification of munition (left) and nonhazardous metal (in this case a horseshoe, right) by AGC is based on the physical properties of the metal item (Courtesy of AcornSI and Geosoft, 2015).

One-Pass AGC (Continued)

One-Pass Advanced Geophysical Classification

When AGC use began on DoD facilities in the early 2010s, classification of munitions items was a two-step process including: 1) a dynamic geophysical survey performed to detect metal items, and 2) a stationary geophysical survey performed over the detected items to classify them as potential munitions. Recent innovations have led to AGC sensors and software that allow classification in a single dynamic survey (often referred to as a "one-pass" survey). This allows the achievement of the same results, while reducing the time and expense of the classification process. One-pass AGC can significantly reduce the costs of site characterization and cleanup as the number of excavations is reduced, and classification no longer requires two separate geophysical surveys. Figure 3 shows the use of a one-pass AGC sensor for data collection at a DoD facility and Figure 4 shows the results of a one-pass AGC survey. Visual comparison of the number of items classified as potential munitions items to nonhazardous metal items demonstrates the substantial reduction in the number of excavations required for cleanup.

Conclusions

The use of AGC optimizes the cleanup of munitions at DoD facilities by enabling the classification of subsurface metal items as either TOI (potential munition item) or non-TOI (nonhazardous item). The ability to classify potential munitions items from nonhazardous items reduces the number of excavations required. One-pass AGC further reduces the time and cost of cleanup by allowing for the classification of metal items in one geophysical survey.

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References

AcornSI and Geosoft. 2015. Classification of Unexploded Ordnance using Geophysics - A Practical Reality. National Association of Ordnance Contractors Annual Meeting, Savannah, Georgia. November.

Defense Science Board. 2003. Report of the Defense Science Board Task Force on Unexploded Ordnance. December. https://www.denix.osd.mil/mmrp/denix-files/sites/46/2023/02/02_DSB-Report-Task-Force.pdf

Naval Facilities Engineering Systems Command (NAVFAC). 2023. Moving Target Mortar Range – North Remedial Investigation Munitions Response Program Site Unexploded Ordnance 13 at Naval Air Station Oceana Dam Neck Annex.

Figure 3. Operation of a one-pass AGC sensor at a DoD facility (Courtesy of Jacobs).

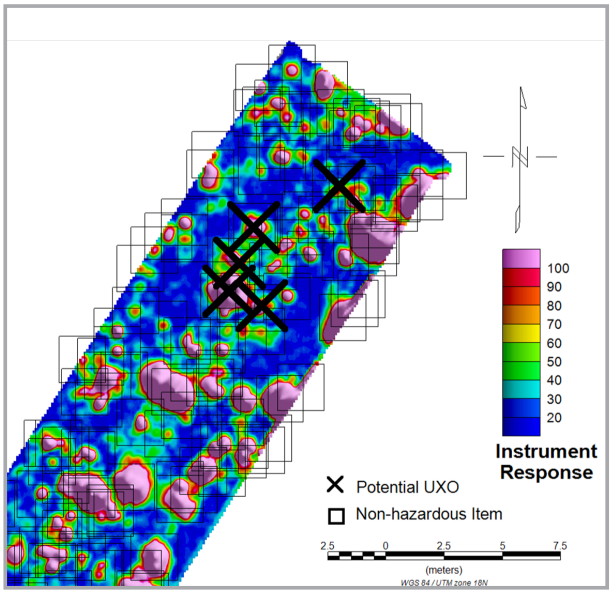

Figure 4. Results of a one-pass AGC survey where Xs denote an item classified as potential munition item that requires excavation, and squares denote a nonhazardous metal item that may be left in the ground (Courtesy of NAVFAC, 2023).

For more information, please visit the NAVFAC Environmental Restoration and BRAC website:

https://exwc.navfac.navy.mil/go/erb