OSAC Research Needs Assessment Form

Title of research need: Validation studies of technologies (e.g. ground penetrating radar, remote sensing), and recovery techniques in forensic anthropology.

Keywords: Geophysics, Validation, false positive, false negative, recovery techniques

Submitting subcommittee(s): Anthropology **Date Approved:**

(If SAC review identifies additional subcommittees, add them to the box above.)

Background information:

1. Description of research need:

Geophysical methods (e.g. ground penetrating radar, magnetics, conductivity, resistivity, and metal detecting) are increasingly used in forensics to locate clandestine graves or buried evidence. The methods do not find graves, but disturbed soil or anomalies. Controlled experimentation is needed in different environmental and soil contexts to better determine which geophysical method(s) are reliable in identifying anomalies consistent with graves or other clandestinely buried features or evidence, and provide the smallest potential for false positive or fals negative feedback.

2. Key bibliographic references relating to this research need:

Dick, HC J. K. Pringle, B. Sloane, J. Carver, K. D. Wisneiwski, A. Haffenden, S. Porter, D. Roberts, and N. J. Cassidy
2015 Detection and characterization of Black Death burials by multi-proxy geophysical methods. *Journal of Archaeological Sciences* 59: 132–141.

Pringle, J. K., A. Ruffell, J. R. Jervis, L. Donnelly, J. McKinley, J. Hansen, R. Morgan, D. Pirrie, and M. Harrison
2012 The use of geoscience methods for terrestrial forensic searches. *Earth Science Reviews* 114: 108–123.

Pringle, Jamie K., John R. Jervis, James D. Hansen, Glenda M. Jones, Nigel J. Cassidy and John P. Cassella
2012 Geophysical Monitoring of Simulated Clandestine Graves Using Electrical and Ground-Penetrating Radar Methods: 0–3 Years After Burial. *Journal of Forensic Sciences* 57: 1467-1386.

Rezos, Mary M., John J. Schultz, Ronald A. Murdock II and Stephen A. Smith
2011 Utilizing a Magnetic Locator to Search for Buried Firearms and Miscellaneous Weapons at a Controlled Research Site. *Journal of Forensic Sciences* 57:1289-1295.

Sonderman, Robert C.
2001 Looking for a Needle in a Haystack: Developing Closer Relationships between Law Enforcement Specialists and Archaeology. *Historical Archaeology* 35(1):70-78.

3a. In what ways would the research results improve current laboratory capabilities?

There are various geophysical techniques for forensic investigations in which the targets are buried and have different dimensions (from weapons or metallic barrels to human burials and bunkers). Geophysical methods have the potential to aid the search and the recovery of these targets because they can non-destructively and rapidly investigate large areas where a suspect, illegal burial or, in general, a forensic target is hidden in the subsoil. Soil disturbances and buried materials have contrast between a target and the material in which it is buried therefore it is possible to define the buried location of a target. It is also possible to recognize evidences of human soil occupation or excavation, both recent and older. Forensic geophysics is an evolving field that is gaining popularity with law enforcement and scene investigators. Establishing a quantifiable and acceptable range of false positive and false negative returns from geophysical instruments will enhance the ability to delineate credible targets.

3b. In what ways would the research results improve understanding of the scientific basis for the subcommittee(s)?

Soils have chemical and geophysical properties that are clearly delineated by various geophysical instruments. Targets, (burials, weapons, cached evidence, etc.) when buried disturb the parent soils leaving a contrast between the disturbance and the undisturbed area. At present the current instrumentation can find anomalies that are natural features which mimic clandestine disturbances or anomalies. Comprehensive testing of various instruments capabilities to find cultural anomalies and differentiate them from natural anomalies as well as assign acceptable limits of false positive and negative target identification will allow for more accurate identification of buried target locations.

3c. In what ways would the research results improve services to the criminal justice system?

Recent research over known buried and below-water surface simulated forensic targets have gained some insight into optimum search technique(s) and/or equipment configuration(s). Most commonly, this involves the burial of porcine cadavers and long-term monitoring for soilwater, seasonal effects on electrical resistivity surveys, burial in walls and beneath concrete. A more accurate and quantifiable determination of false positive and false negative rates in geophysical applications at crime scenes and other investigations will provide better models to determine the most appropriate geophysical approaches to scene investigations. A better understanding of the strengths and limitations of geophysical instrument capabilities will result in higher probability of remains or evidence recovery to support investigations and court testimony.

4. Status assessment (I, II, III, or IV): I

	Major gap in current knowledge	**Minor** gap in current knowledge
No or limited current research is being conducted	**I**	**III**
Existing current research is being conducted	**II**	**IV**

This research need has been identified by one or more subcommittees of OSAC and is being provided as an informational resource to the community.

Subcommittee Approval date:

(Approval is by majority vote of subcommittee. Once approved, forward to SAC.)

SAC

1. Does the SAC agree with the research need? Yes ◯ No ◯

2. Does the SAC agree with the status assessment? Yes ◯ No ◯

If no, what is the status assessment of the SAC:

Approval date:

(Approval is by majority vote of SAC. Once approved, forward to NIST for posting.)