

Law Enforcement use of Geophysical Methods

The goal of this questionnaire is to gather information on law enforcement use of geophysical methods, such as ground penetrating radar (GPR), electrical resistivity, and magnetometry to detect concealed targets as part of a criminal investigation (for example: homicide graves, drugs, or weapons). This questionnaire will ask which geophysical methods were used, the suspected targets, survey environment, information on the geophysical service providers and summaries of one (1) to three (3) geophysical survey conducted. *If you or your organization have not applied geophysical methods in law enforcement investigations or operational searches, there is no need to complete this questionnaire.*

Providing your identity, organizational affiliation, and contact information are **optional**. The results of this questionnaire may be used to understand how geophysical methods are applied to law enforcement investigations. If results from this questionnaire are published in scientific and/or law enforcement publications, identities, organization(s), and contact information will be **anonymized**.

Within this questionnaire, geophysical methods are grouped into the specific categories, in bold below, that would be more familiar for law enforcement personnel. Below are a few examples of geophysical methods **but are not limited to** the following:

- **Ground Penetrating Radar (GPR)**
 - Low-to-High frequency (10 MHz to (+) 2000 MHz) GPR antenna systems, Multichannel GPR
- **Electrical Methods**
 - Electrical Resistivity (ER), Electrical Resistivity Tomography (ERT), Capacitively-Coupled Resistivity (CCR)
 - Including Spontaneous (Self) Potential and Induced Polarization (IP)
- **Electromagnetics**
 - Electromagnetic (EM) Induction (e.g., EM38, Metal detectors), Ground Conductivity Meter
- **Magnetometry**
 - Proton precession magnetometer, Fluxgate magnetic gradiometer
- **Gravimetry (Gravity)**
 - Including microgravity surveys
 - Gravimeters and/or gravity gradiometer
- **Near Surface Seismic**
 - Seismic refraction and reflection surveys, multi-channel analysis of surface waves (M.A.S.W.)
 - Surface and subsurface (borehole) seismometers

Consent

- (i) By completing this questionnaire, you agree to allow FBI Laboratory Division to collect and use your responses. ***Required*** I consent & continue
- (ii) May researchers contact you if we have follow-up questions about this questionnaire and/or your geophysical survey(s)? **(Optional)** Yes No

(If yes)

- **Name:** _____
- **Preferred title:** _____
- **Law enforcement Organization/Company/Affiliation:** _____
- **Phone number:** _____
- **Email address:** _____

Do you wish to receive a notification of the results of this questionnaire after publication, check this box and provide the information above.

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Law Enforcement Background Information

- 1) Will you be answering as an individual or for your organization as a whole? ***Required***
 - Individual
 - Organization

- 2) If answering as an individual, how many years of experience in law enforcement do you have?
_____ years

- 3) What is the name of your current law enforcement organization? Note: The purpose of this question is to account for multiple participants from the same law enforcement organization. **(Optional):**

- 4) If answering as an individual and have been involved in geophysical surveys for multiple law enforcement organizations, list the names of the organizations you were working for at the time of each geophysical survey (omit the organization in question 3)? **(Optional):**

- 5) Which law enforcement description best describes you or your current organization? ***Required***
 - Federal Law enforcement
 - State Law enforcement
 - Tribal Law enforcement
 - County Law enforcement
 - Municipal
 - Other: _____

Information on Geophysical Service Providers

- 6) How did you or your organization select the geophysical service provider(s)? (Check all that apply)
 - Recommendation by State Soil Scientist
 - Recommendation by State Archaeologist
 - Recommendation by State Geologist
 - University or College Recommendation
 - Recommendation from law enforcement personnel &/or organization
 - Advertisement
 - Other: _____

- 9) How many geophysical surveys were conducted by individuals from the following professional organizations/affiliations?
 - University/College position/professor/faculty _____
 - State Government _____
 - Federal Government _____
 - Private Company _____
 - Geophysical Instrument Manufacturer ____
 - Law Enforcement _____
 - Other: _____

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10) What were the professional titles of the individuals conducting the geophysical survey(s)? Select all that apply.

- Geologist
- Geophysicist
- Archeologist
- Anthropologist
- Environmental Scientist
- Soil Scientist
- Forensic Scientist
- Civil Engineer
- Electrical Engineer
- Construction/Utility scanner
- Law Enforcement Personnel
- Unknown
- Other: _____

11) What percent of the geophysical surveys conducted for investigations were financially supported by law enforcement organizations (including implementation, acquisition, analysis, and/or interpretation)? _____

12) ***Optional*** If you are willing and able, provide the contact information for the entity(s) that conducted the geophysical survey(s):

	NAME(S)	ORGANIZATION / AFFILIATION (PRIVATE COMPANY, UNIVERSITY NAME, ETC.)	PHONE NUMBER(S)	EMAIL ADDRESS(ES)	ADDITIONAL COMMENTS
GROUND PENETRATING RADAR					
ELECTRICAL METHODS					
ELECTROMAGNETICS					
MAGNETOMETRY					
GRAVIMETRY					
NS SEISMIC					
OTHER: _____					

ALL Geophysical Surveys Conducted

11) Based on the total number of geophysical surveys conducted, how many times was each geophysical method deployed? If possible, provide supplemental information. Leave blank or write (N/A) if not applicable. Example: *“Geophysical service providers deployed a ground penetrating radar (method) three times (times deployed) at different locations within a forest, a building, a lake (environment) in attempts to locate clandestine grave, hidden weapons (targets) concealed by forest soil, concrete, water (concealment material).”*

Required answer

Ground Penetrating Radar:

- Total number of times deployed* _____
- Suspected target(s): _____
- Material(s) concealing target(s): _____
- Survey environment(s): _____

Electrical Methods:

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Total number of times deployed* _____
Suspected target(s): _____
Material(s) concealing target(s): _____
Survey environment(s): _____

Electromagnetics:

Total number of times deployed* _____
Suspected target(s): _____
Material(s) concealing target(s): _____
Survey environment(s): _____

Magnetometry:

Total number of times deployed* _____
Suspected target(s): _____
Material(s) concealing target(s): _____
Survey environment(s): _____

Gravimetry:

Total number of times deployed* _____
Suspected target(s): _____
Material(s) concealing target(s): _____
Survey environment(s): _____

Near Surface (NS) Seismic:

Total number of times deployed* _____
Suspected target(s): _____
Material(s) concealing target(s): _____
Survey environment(s): _____

Other: _____

Total number of times deployed _____
Suspected target(s): _____
Material(s) concealing target(s): _____
Survey environment(s): _____

12) Prior to deployment of geophysical methods, approximately what percent of survey sites used the following search strategies? Leave blank if not applicable.

Human intelligence -confessions, witness statements, etc.: _____
Reconnaissance searches-walk throughs: _____
Dog searches: _____
Soil Probes: _____
Aerial imaging: _____
Other: _____

13) Prior to a geophysical survey, approximately what percent of survey sites did you or your organization plan to excavate regardless of the results of the geophysical methods? _____

Post Geophysical Survey

14) After a geophysical method was conducted to find a suspected target, how many times did the following outcomes occur at a geophysical survey area? Leave blank if not applicable.

After excavation, targets were successfully **found** within areas of interest detected by the geophysical methods: _____

After excavation, targets were **found** even if geophysical methods were effectively conducted and **did not** identify areas of interest: _____

After excavation, targets were **not found** even if the geophysical method identified areas of interest: _____

After excavation, targets were **not found** even if geophysical methods were effectively conducted, and **did not** identify areas of interest: _____

No excavation conducted due to geophysical methods results: _____

Other: _____

15) For the geophysical methods ineffective in detect a suspected target, what do you believe is the rationale for the geophysical methods being ineffective in detecting a suspected target? *Examples: Target was not there, target too small to detect, target too deep to detect, surface or subsurface interference, user error, equipment failure... etc.*

16) For the geophysical methods deployed for law enforcement missions, select reasons why you would or would not use this method again. Check all that apply. Leave blank if not applicable:

	Ground Penetrating Radar	Electrical Methods	Electromagnetics	Magnetometry	Gravimetry	NS Seismic	Other: _____
Reasons why you would use the method again							
Saved time	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Confirmed regions to excavate based on prior knowledge	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Found suspected target(s) in survey environment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Justified excavation based on survey results	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Saved money on excavation costs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Less destruction during excavation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Perceived as standard practice	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Reasons why you would <u>not</u> use the method again							
Cost time	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Failed to find target	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Insufficient time to conduct adequate survey	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ground conditions limited imaging capabilities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cost of survey	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Describe additional reasons why you would or would not use geophysical methods again:

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17) Provide details on 1 to 3 geophysical surveys conducted for your law enforcement organization. **At least one (1) summary of a geophysical survey is required for submission.** Include the geophysical method(s) deployed, the environmental setting of the survey, suspected target(s) in the questions below:

- i. **Search strategies:** Human intelligence, dog searches, soil probes
- ii. **Survey Site Environment:** Forest, rocky mountainous terrains, beach, croplands, residential backyard ... etc.
- iii. **Material in which the suspected target was presumed to be concealed:** Concrete, dry wall, topsoil/organic rich soil, tall grass, (fresh/salt) water, volcanic soil...etc.
- iv. **Geophysical methods:** Ground penetrating radar, Electrical Methods, Electromagnetic Methods, Magnetometry, Gravimetry, Near Surface Seismic, Other
- v. **Rationale for ineffectiveness of geophysical method(s):** Target was not there, insufficient resolution for target detection, insufficient penetration for target detection, surface/subsurface interference...

If you wish to provide information on more than 5 geophysical surveys, contact geophysics@fbi.gov.

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(1) Geophysical Survey 1: *Required*

Prior to Geophysical Survey

1. What search strategies were conducted prior to or in conjunction with the geophysical survey? not applicable
2. Did warrants limit the time allowed for a geophysical survey? Yes No
 1. If yes, what was the allotted time: _____
3. Did warrants limit the area or perimeters of search for the geophysical survey? Yes No
4. Were you or your organization attempting to *locate* a suspected target or searching to *exclude* a target from a survey area? Locate Exclude
5. Suspected Target(s): _____
6. At the time of the geophysical survey, how long was the suspected target estimated to be concealed? (Example: Homicide weapon buried in residential backyard approximately 5 years prior to survey): _____

During the Geophysical Survey

7. What year was this geophysical survey completed? _____
8. Environment of Survey Site:
 1. Describe the search environments where the geophysical method was deployed: _____
 2. Material(s) in which the target was presumed to be concealed: _____
9. Geophysical Method
 1. Method (1): _____ deployed on the ground, from the air, in/on water
 2. Did you deploy more than one geophysical method? If so, list the additional method: (2) _____ deployed on the ground, from the air, in/on water
 3. If known, list the specific geophysical equipment deployed: _____

Interpretation of Geophysical Survey

10. Were there areas identified by the geophysical survey of interest to your law enforcement organization? Yes No (if no, precede the excavation.)
 1. If yes, and if multiple geophysical methods were used, which geophysical method identified areas of interest within the survey area? _____

Excavation

11. If the geophysical survey area was excavated, was the excavation conducted with the guidance from the geophysical survey results? Yes No (If no, skip to results)
12. Was the target found with assistance of the geophysical method(s)? Yes No
 1. If you found the target with the geophysical method(s), briefly describe the conditions of the discovered target(s). Include the depth (or thickness of concealment material), target's condition (well preserved, highly deteriorated) ... etc. : _____

Results

13. Did the geophysical service providers create a formal, written report of the survey results? Yes No
 1. If yes, was the report later submitted into to the courts? Yes No
14. Overall effectiveness
 1. Was geophysical method 1 effective at detecting the suspected target(s)? Yes No
 2. Was geophysical method 2 effective at detecting the suspected target(s)? Yes No
15. Rationale for why these methods were ineffective at detecting target(s) (check all that apply). Skip if not applicable:

<input type="checkbox"/> Target was not there	<input type="checkbox"/> Inadequate survey area-correct location but outside geophysical survey area	<input type="checkbox"/> User failure or error
<input type="checkbox"/> Target was too deep to detect	<input type="checkbox"/> Inappropriate geophysical equipment deployed for material concealing suspected target	<input type="checkbox"/> Equipment failure
<input type="checkbox"/> Target was too small to detect	<input type="checkbox"/> Subsurface interference- e.g. roots, rebar, cables, debris	<input type="checkbox"/> Weather conditions -prior to survey
<input type="checkbox"/> Surface interference - debris or surface vegetation	<input type="checkbox"/> Target's composition too similar to overlying material concealing target	<input type="checkbox"/> Weather conditions - during the survey
<input type="checkbox"/> Other: _____		

For additional information:

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(2) Geophysical Survey 2:

Prior to Geophysical Survey

1. What search strategies were conducted prior to or in conjunction with the geophysical survey? not applicable
2. Did warrants limit the time allowed for a geophysical survey? Yes No
 1. If yes, what was the allotted time: _____
3. Did warrants limit the area or perimeters of search for the geophysical survey? Yes No
4. Were you or your organization attempting to *locate* a suspected target or searching to *exclude* a target from a survey area? Locate Exclude
5. Suspected Target(s): _____
6. At the time of the geophysical survey, how long was the suspected target estimated to be concealed? (Example: Homicide weapon buried in residential backyard approximately 5 years prior to survey): _____

During the Geophysical Survey

7. What year was this geophysical survey completed? _____
8. Environment of Survey Site:
 1. Describe the search environments where the geophysical method was deployed: _____
 2. Material(s) in which the target was presumed to be concealed: _____
9. Geophysical Method
 1. Method (1): _____ deployed on the ground, from the air, in/on water
 2. Did you deploy more than one geophysical method? If so, list the additional method: (2) _____ deployed on the ground, from the air, in/on water
 3. If known, list the specific geophysical equipment deployed: _____

Interpretation of Geophysical Survey

10. Were there areas identified by the geophysical survey of interest to your law enforcement organization? Yes No (if no, precede the excavation.)
 1. If yes, and if multiple geophysical methods were used, which geophysical method identified areas of interest within the survey area? _____

Excavation

11. If the geophysical survey area was excavated, was the excavation conducted with the guidance from the geophysical survey results? Yes No (If no, skip to results)
12. Was the target found with assistance of the geophysical method(s)? Yes No
 1. If you found the target with the geophysical method(s), briefly describe the conditions of the discovered target(s). Include the depth (or thickness of concealment material), target's condition (well preserved, highly deteriorated) ... etc. : _____

Results

13. Did the geophysical service providers create a formal, written report of the survey results? Yes No
 1. If yes, was the report later submitted into to the courts? Yes No
14. Overall effectiveness
 1. Was geophysical method 1 effective at detecting the suspected target(s)? Yes No
 2. Was geophysical method 2 effective at detecting the suspected target(s)? Yes No
15. Rationale for why these methods were ineffective at detecting target(s) (check all that apply). Skip if not applicable:

<input type="checkbox"/> Target was not there	<input type="checkbox"/> Inadequate survey area-correct location but outside geophysical survey area	<input type="checkbox"/> User failure or error
<input type="checkbox"/> Target was too deep to detect	<input type="checkbox"/> Inappropriate geophysical equipment deployed for material concealing suspected target	<input type="checkbox"/> Equipment failure
<input type="checkbox"/> Target was too small to detect	<input type="checkbox"/> Subsurface interference- e.g. roots, rebar, cables, debris	<input type="checkbox"/> Weather conditions -prior to survey
<input type="checkbox"/> Surface interference - debris or surface vegetation	<input type="checkbox"/> Target's composition too similar to overlying material concealing target	<input type="checkbox"/> Weather conditions - during the survey
<input type="checkbox"/> Other: _____		

For additional information:

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(3) Geophysical Survey 3:

Prior to Geophysical Survey

1. What search strategies were conducted prior to or in conjunction with the geophysical survey? not applicable
2. Did warrants limit the time allowed for a geophysical survey? Yes No
 1. If yes, what was the allotted time: _____
3. Did warrants limit the area or perimeters of search for the geophysical survey? Yes No
4. Were you or your organization attempting to *locate* a suspected target or searching to *exclude* a target from a survey area? Locate Exclude
5. Suspected Target(s): _____
6. At the time of the geophysical survey, how long was the suspected target estimated to be concealed? (Example: Homicide weapon buried in residential backyard approximately 5 years prior to survey): _____

During the Geophysical Survey

7. What year was this geophysical survey completed? _____
8. Environment of Survey Site:
 1. Describe the search environments where the geophysical method was deployed: _____
 2. Material(s) in which the target was presumed to be concealed: _____
9. Geophysical Method
 1. Method (1): _____ deployed on the ground, from the air, in/on water
 2. Did you deploy more than one geophysical method? If so, list the additional method: (2) _____ deployed on the ground, from the air, in/on water
 3. If known, list the specific geophysical equipment deployed: _____

Interpretation of Geophysical Survey

10. Were there areas identified by the geophysical survey of interest to your law enforcement organization? Yes No (if no, precede the excavation.)
 1. If yes, and if multiple geophysical methods were used, which geophysical method identified areas of interest within the survey area? _____

Excavation

11. If the geophysical survey area was excavated, was the excavation conducted with the guidance from the geophysical survey results? Yes No (If no, skip to results)
12. Was the target found with assistance of the geophysical method(s)? Yes No
 1. If you found the target with the geophysical method(s), briefly describe the conditions of the discovered target(s). Include the depth (or thickness of concealment material), target's condition (well preserved, highly deteriorated) ... etc. : _____

Results

13. Did the geophysical service providers create a formal, written report of the survey results? Yes No
 1. If yes, was the report later submitted into to the courts? Yes No
14. Overall effectiveness
 1. Was geophysical method 1 effective at detecting the suspected target(s)? Yes No
 2. Was geophysical method 2 effective at detecting the suspected target(s)? Yes No
15. Rationale for why these methods were ineffective at detecting target(s) (check all that apply). Skip if not applicable:

<input type="checkbox"/> Target was not there	<input type="checkbox"/> Inadequate survey area-correct location but outside geophysical survey area	<input type="checkbox"/> User failure or error
<input type="checkbox"/> Target was too deep to detect	<input type="checkbox"/> Inappropriate geophysical equipment deployed for material concealing suspected target	<input type="checkbox"/> Equipment failure
<input type="checkbox"/> Target was too small to detect	<input type="checkbox"/> Subsurface interference- e.g. roots, rebar, cables, debris	<input type="checkbox"/> Weather conditions -prior to survey
<input type="checkbox"/> Surface interference - debris or surface vegetation	<input type="checkbox"/> Target's composition too similar to overlying material concealing target	<input type="checkbox"/> Weather conditions - during the survey
<input type="checkbox"/> Other: _____		

For additional information:

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Overview-Exit review:

- 18) ***Optional*** If you wish to include additional information on you or your organization's use of geophysical methods, please respond in the box below:

If you have any questions regarding the questionnaire, please contact [geophysics@fbi.gov].