ADVANCED GEOSCIENCE, INC.
Geology and Geophysics
Subsurface Exploration Non-Destructive Evaluation

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April 5, 2010

Sapphos Environmental, Inc.
430 North Halstead Street
Pasadena, California 91107

Attention: Mr. Karl Huebchen

Re: **Summary Report**
Subsurface Geophysical Surveys
For Archaeological Investigations at
Vasquez Rocks Interpretive Center
Agua Dulce, California

This report summarizes the subsurface geophysical surveys performed at the proposed Vasquez Rocks Interpretive Center. These remote-sensing surveys were used to investigate beneath the planned building area for possible Indian structures buried in the upper 1.5 meters with lateral dimension on the order of one meter or greater.

Two shallow geophysical profiling methods were used: 1) ground-penetrating radar (GPR) and magnetometer measurements. These geophysical surveys were performed during a three-day field program conducted on March 16, 17, and 18, 2010. The GPR profiles were recorded along a series of closely-spaced survey lines to generate plan view images of subsurface radar reflections. These radar images were evaluated for linear, rectangular, and/or circular reflection patterns which could indicate buried man-made structures. The magnetometer measurements were used to investigate the area for anomalous magnetic field patterns (magnetic anomalies) from buried igneous rocks or materials containing magnetite which could be associated with Indian structures such as fire pits, kilns, and hearths. The magnetite-bearing materials forming these structures could have become heated to a relatively high temperature to create a remanent magnetization which would create a strong localized magnetic anomaly easily detected by the magnetometer measurements.

The following sections provide a summary of our field survey and data processing procedures and a discussion of our resulting data evaluation.

Field Survey and Data Processing Procedures

A rectangular survey grid was first setup across the proposed building area as shown on the site map in Figure 1. A Brunton compass and 100-meter tape were used to layout and mark this grid on the ground surface. The magnetometer measurements and GPR profiling were performed within this survey grid in two accessible survey areas, designed as "Areas 1 and 2". These two survey areas were used to more efficiently record the magnetometer measurements and GPR profiles around the obstacles and trees located in the center of the building area.

The magnetometer measurements were performed across Areas 1 and 2 using a Geometrics G858 magnetic gradiometer. This instrument was setup in the vertical gradient mode with two sensors to measure the vertical gradient of the earth's magnetic field (in units of nanoTesla/meter). The measurements were recorded at closely-spaced intervals (at 0.5 second time intervals) as the instrument was walked along east-west grid lines spaced 1-meter apart. Several of these magnetic profiles had to be recorded in various segments along the grid lines to create gaps in data coverage where trees, buildings, and other obstacles prevented access.

The resulting magnetic gradiometer measurements were later downloaded to a computer in our office to prepare a contour mapping of the vertical magnetic gradient variations of the earth's magnetic field in Areas 1 and 2. These contour maps are shown in Figures 2 and 3. These color-contour maps show vertical gradient variations between -500 and 500 nanoTesla/meter to de-emphasize the stronger variations in vertical gradient caused by magnetic objects on the ground surface surrounding the survey areas.

The GPR profiles were recorded across Areas 1 and 2 using a 200-Mega Hertz GPR antenna. Initial testing of the 500 and 200-MHz antennas across Area 1 indicated that the 200-MHz GPR profiles showed clearer reflections from subsurface rock interfaces near the surface and down to a depth of beyond 5 feet. The 200-MHz profiles were therefore recorded along east-west grid lines spaced 1-meter apart. Several of these profiles also had to be recorded in various segments along the grid lines to create gaps in data coverage where trees, buildings and other obstacles prevented access.

The GPR profiles were digitally recorded using a Geo-Physical Survey Systems, Inc., SIR System-2000. This system recorded the radar signals in a 60-nanosecond time window in a continuous scanning mode (at 32 scans per second) with 16-bit analog to digital resolution. All of the profiles were recorded with the same signal gain amplification function.

After the surveys were completed the GPR profiles underwent computer processing in our office using GPR Slice™ software to enhance reflection patterns from subsurface

objects and prepare a 3D data base of GPR reflection amplitude variations. (More information on the 3D imaging capability of the GPR Slice software for the interpretation of subsurface structures is available at www.gpr-survey.com.) Time-slice windows were generated from this 3D data base to evaluate radar reflection amplitude variations in plan view. Figures 4, 5 and 6 show the time-slice windows generated across Areas 1 and 2 for the approximate depth intervals of 0.5 to 1.4 meters. These depth intervals were determined using an estimated radar wave velocity of 0.1 meters/nanosecond.

Data Evaluation and Results

The contour maps of the vertical magnetic gradient in Areas 1 and 2 (in Figures 2 and 3) revealed several stronger-amplitude magnetic anomalies which we interpret to be caused by interfering magnetic structures on the ground surface and underground steel pipelines. Several of these broader magnetic anomaly patterns are identified on Figures 2 and 3. Note the linear pattern of stronger magnetic anomalies extending across Area 1. This linear pattern is associated with an underground steel pipeline which connects to the utility lines on the ground surface on the north edge of this survey area.

The contour maps in Figures 2 and 3 also show weaker-amplitude and spatially-smaller magnetic anomalies that appear to be caused by smaller pieces of buried steel debris, possibly sections of abandoned pipelines.

Two areas are interpreted where the contour maps show isolated magnetic anomalies indicating "unknown subsurface structures" designated as "Structures A and B". These two magnetic anomalies are identified in Figures 2 and 3. Both magnetic anomaly patterns indicate possible areas where magnetite-bearing materials forming Indian structures could have become heated to a sufficient temperature to create remanent magnetization.

The time-slice windows generated from the 3D GPR data base for Area 2 (in Figures 5 and 6) detected a circular-like pattern of radar reflections near the location the strong magnetic anomaly associated with Structure A. This correlation suggests a circular alignment of magnetite-bearing materials at this location possibly associated with an Indian cooking structure. The onset of these reflection patterns indicates the upper surface of this structure is buried about 0.8 to 1 meter below the ground surface.

The GPR time-slice windows for Area 1 (in Figure 4) also detected a slightly-arch shaped, north-south pattern of reflections near the locations of the magnetic anomalies associated with Structure B. This correlation also suggests a possible alignment of magnetite-bearing materials in this area. The upper surface of this structure is estimated to be buried about 0.7 to 0.9 meters below the ground surface.

In Area 1 the GPR time-slice windows detected one additional area where a partial circular pattern of radar reflections could indicate a possible man-made structure designated as "Structure C" (in Figure 4). The upper surface of this structure is estimated to be buried about 0.6 to 0.8 meters below the ground surface. However, no magnetic anomaly appears to be associated with this structure.

The GPR time-slice windows across Area 1 also detected linear patterns of reflections associated with the steel pipeline and former road way crossing beneath this area.

In summary, the magnetometer and GPR profiling detected evidence of three possible unknown subsurface structures (designated as Structures A, B, and C) which could be of archaeological significance. Figure 1 shows the estimated lateral bounds of these subsurface structures and the estimated depth to their upper surfaces.

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Advanced Geoscience appreciates the opportunity to be of service to Sapphos Environmental and the County of Los Angeles. If you have any questions or additional requests concerning these geophysical surveys please contact the undersigned.

Sincerely,

Advanced Geoscience, Inc.

Mark G. Olson
Principal Geophysicist
California Registered Professional Geophysicist No. GP970
California Registered Professional Geologist No. 6239

Attachments:

- Figure 1- Site Plan
- Figure 2- Area 1 Magnetometer Survey Results
- Figure 3- Area 2 Magnetometer Survey Results
- Figure 4- Area 1 GPR Survey Results
- Figure 5- Area 2 GPR Survey Results
- Figure 6- Area 2 GPR Survey Results

Site Map Showing Results of Subsurface Geophysical Surveys for Archaeological Investigations at Vasquez Rocks Interpretive Center Agua Dulce, California

VASQUEZ ROCKS NATURAL AREA PARK
INTERPRETIVE CENTER AREA GRID MAP

2M 10Meters

N

MAP LEGEND

- Tree
- Wash
- Dirt Path
- Trail
- Gravel/Loose Rocks
- Large Rocks
- Metal Poles
- Fence
- Filled in from memory
- Concrete with vertical pipes
- L Colored Grass Indicating Line Below
- PT Picnic Table
- PP Porta-Potty
- C Concrete
- G Geologic Building

Possible Subsurface Structure "B" Buried 0.7 to 0.9 m

Possible Subsurface Structure "C" Buried 0.6 to 0.8 m

Possible Subsurface Structure "A" Buried 0.8 to 1 m

AREA 1

AREA 2

Scraper

Metal Storage Container

Trash Bin

58N 54N 50N 46N 42N 38N 34N 30N 26N 22N 18N 14N 10N 6N 2N 0N

0E 2E 6E 10E 14E 18E 22E 26E 30E 34E 38E 42E 46E 50E 54E 58E 62E 66E 70E 74E 78E 82E 86E 90E 94E

Original Base Map Prepared by Sapphos Environmental, Inc.

Shows Estimated Lateral Bounds of Areas Showing Evidence of Possible Unknown Subsurface Structures

Figure 1
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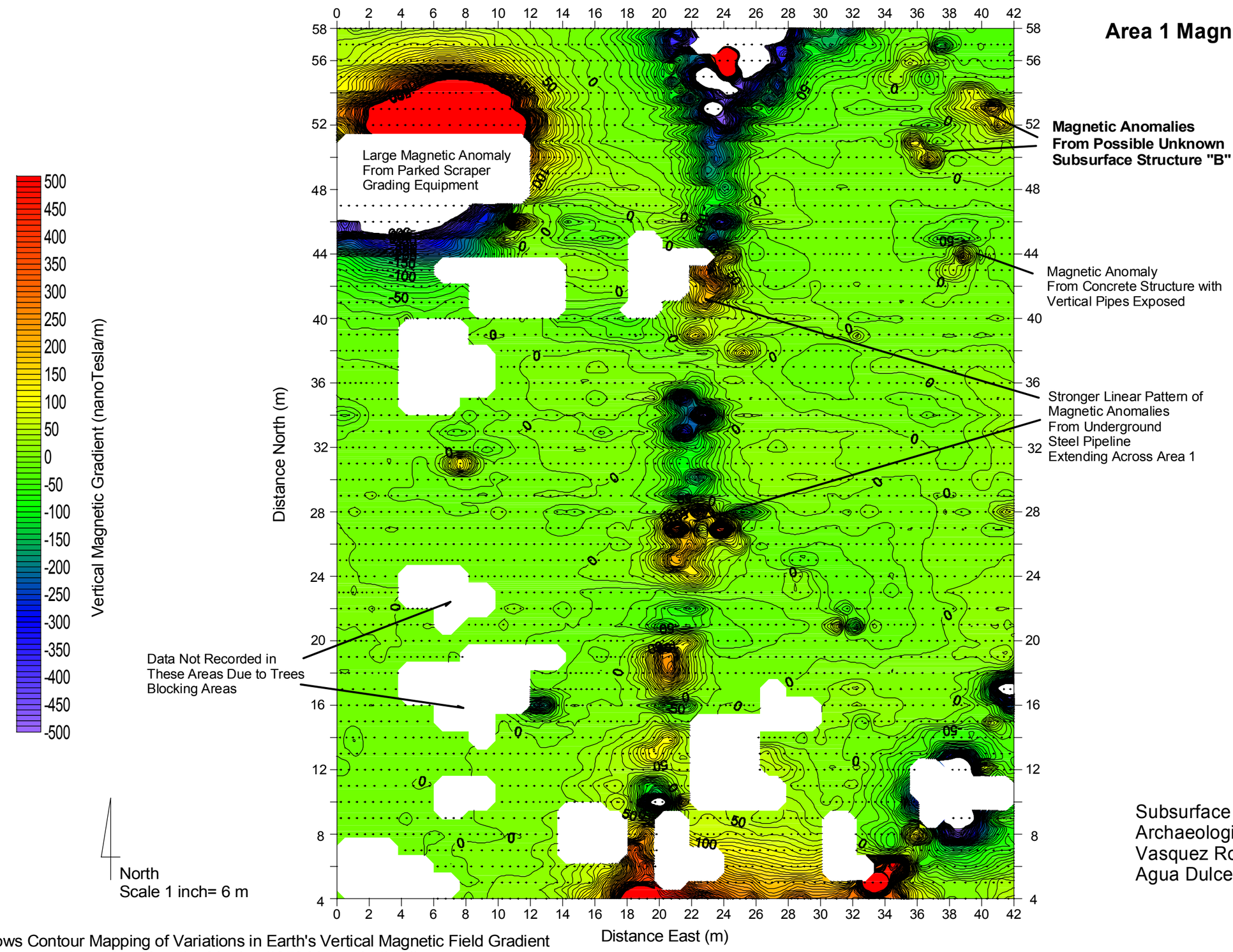
Area 1 Magnetometer Survey Results



Shows Contour Mapping of Variations in Earth's Vertical Magnetic Field Gradient
Measurements made with a GeoMetrics G858 Magnetic Gradiometer
Contour Interval= 10 nanoTesla/m

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Figure 2
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Area 2 Magnetometer Survey Results

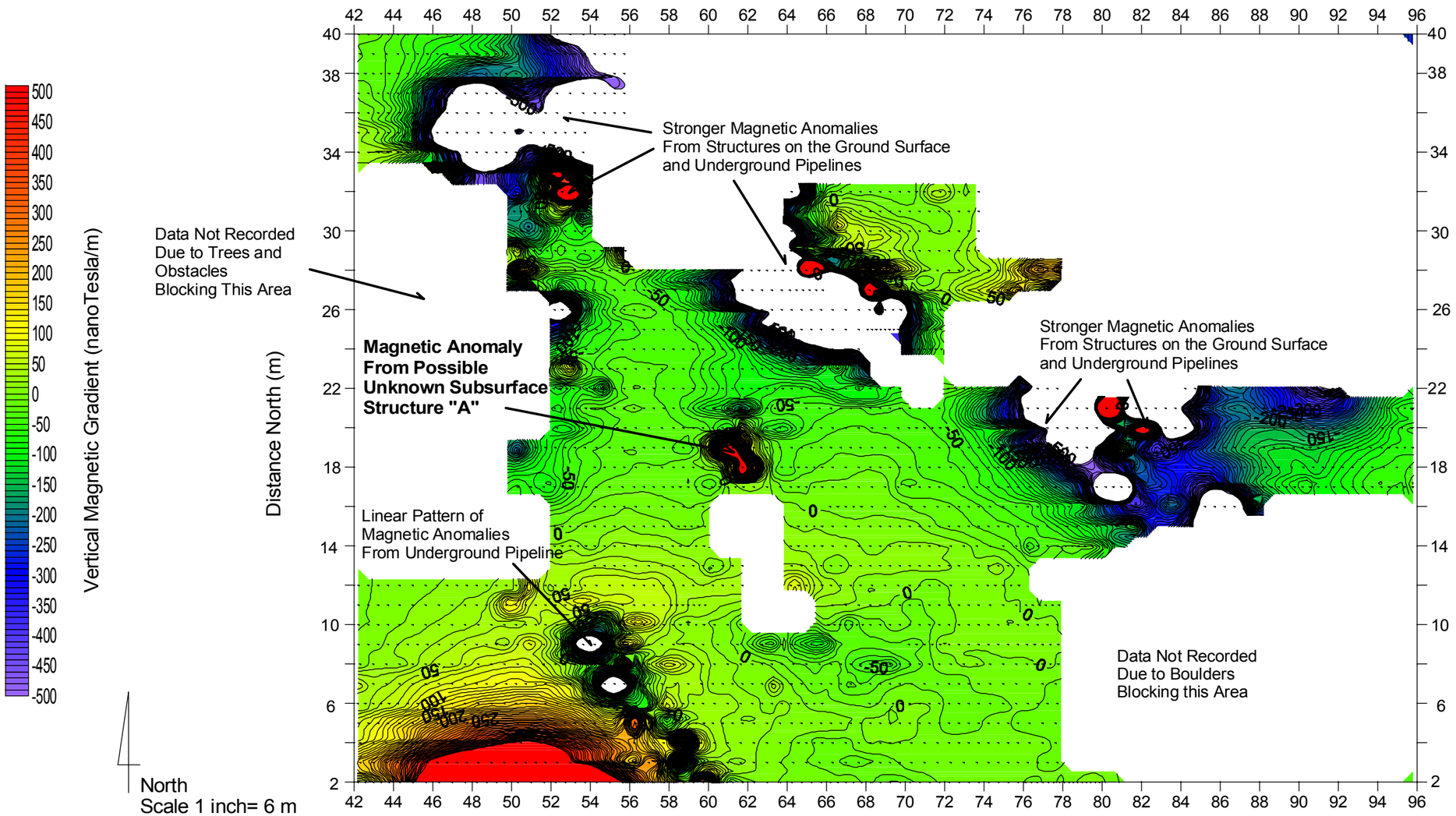

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Figure 3
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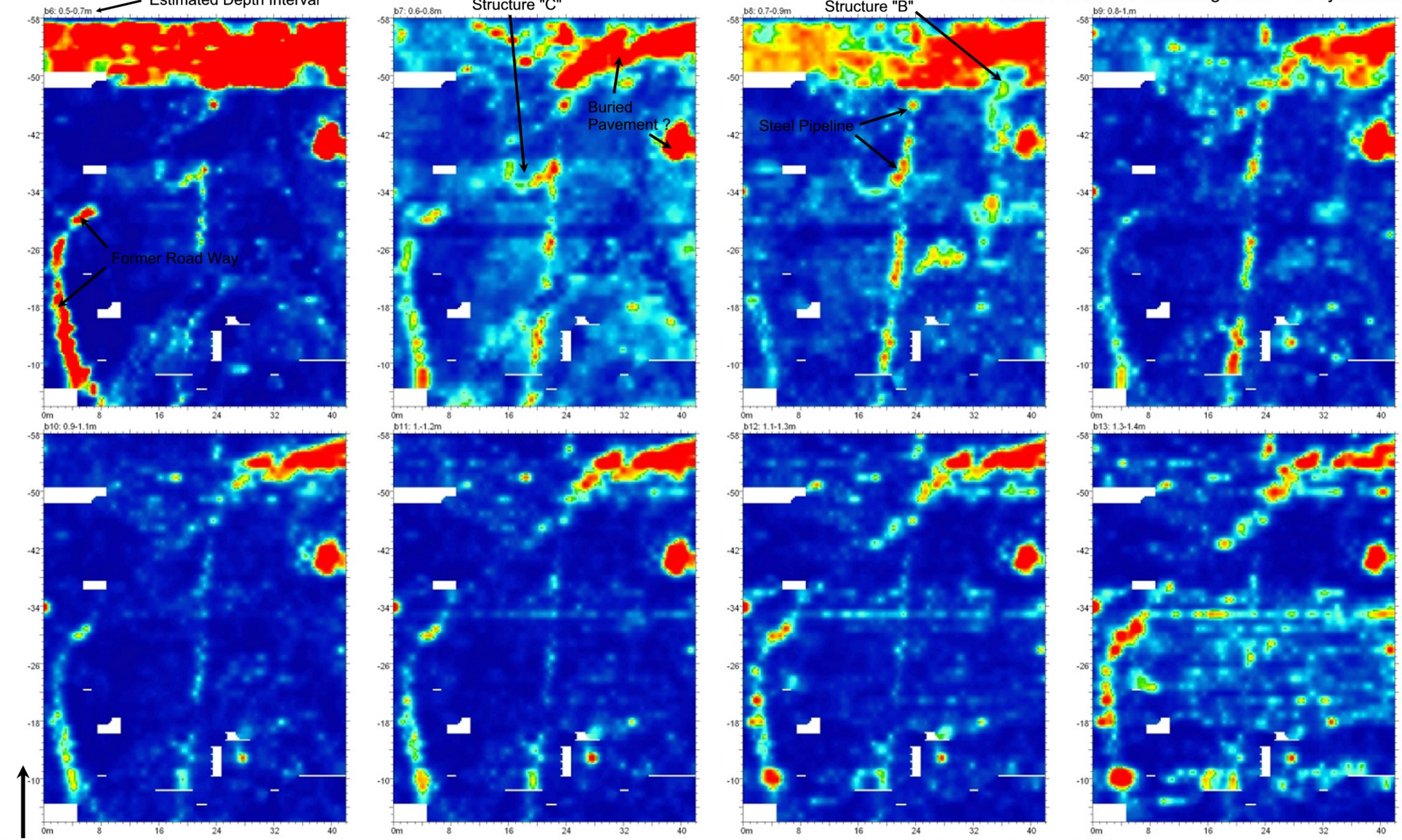
Area 1 Ground-Penetrating Radar Survey Results



Shows Plan View Images of 200-MHz GPR Reflection Amplitude Variations
From 3D GPR Data Base Time-Slice Windows For Various Depth Intervals
Red Indicates Higher-Amplitude Reflections

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Figure 4
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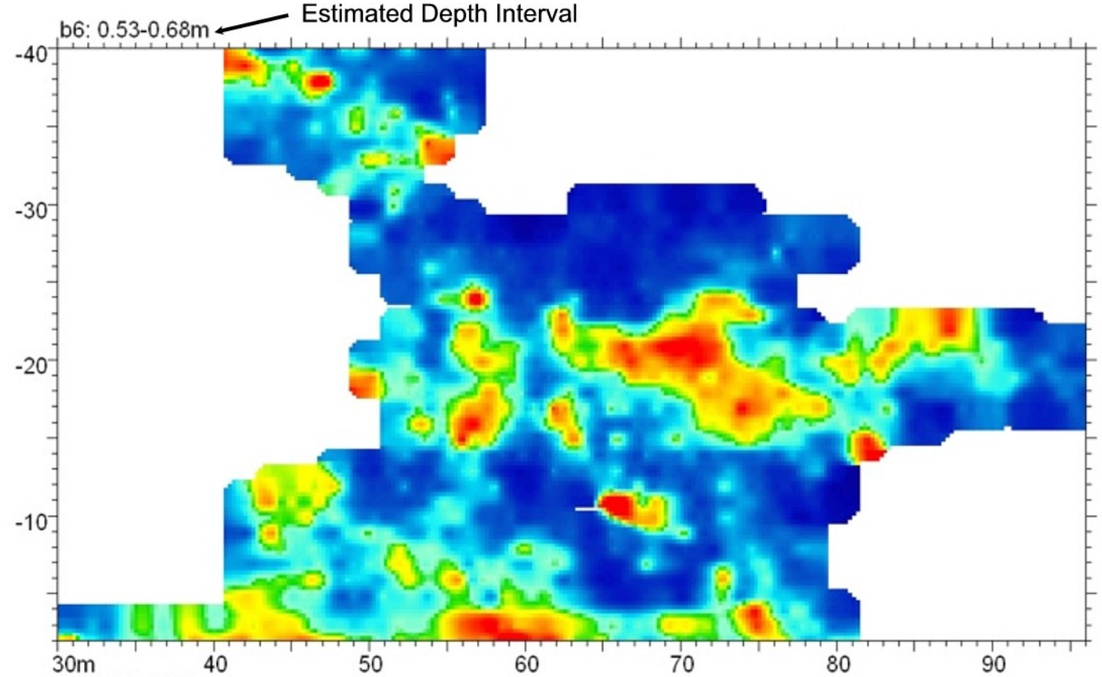
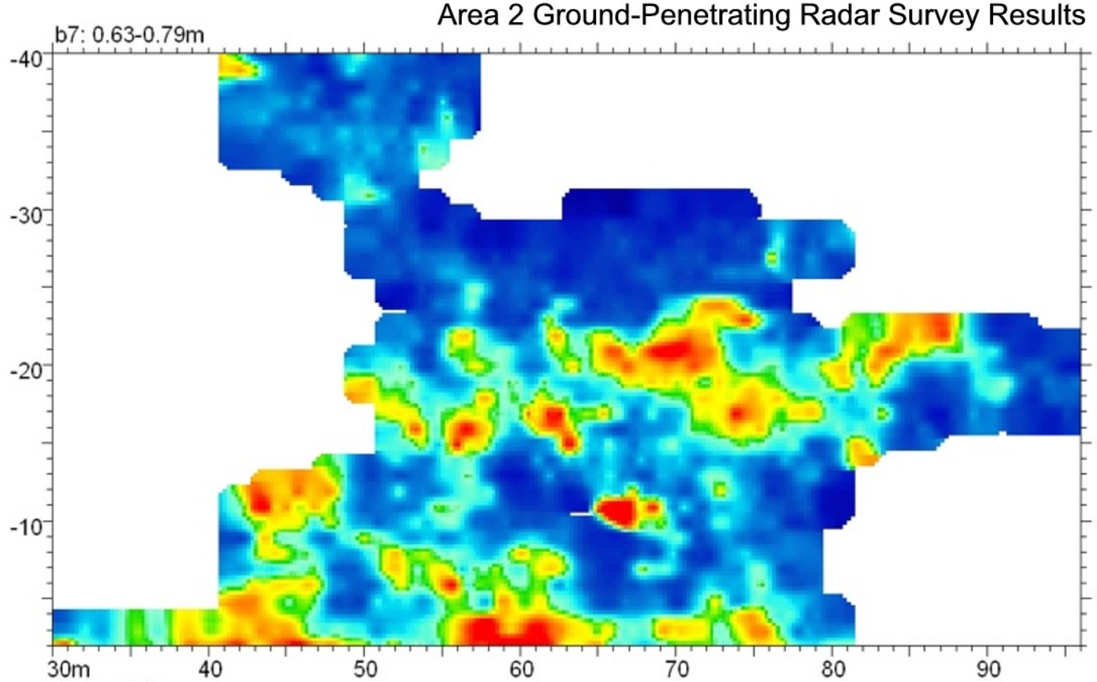
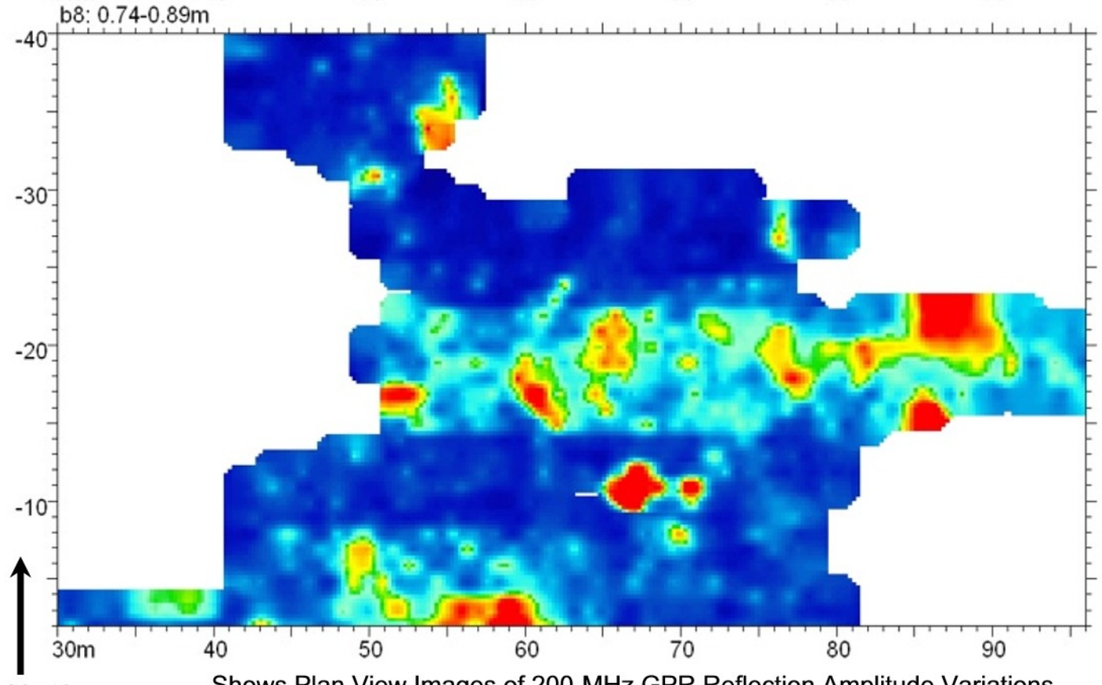
Area 2 Ground-Penetrating Radar Survey Results







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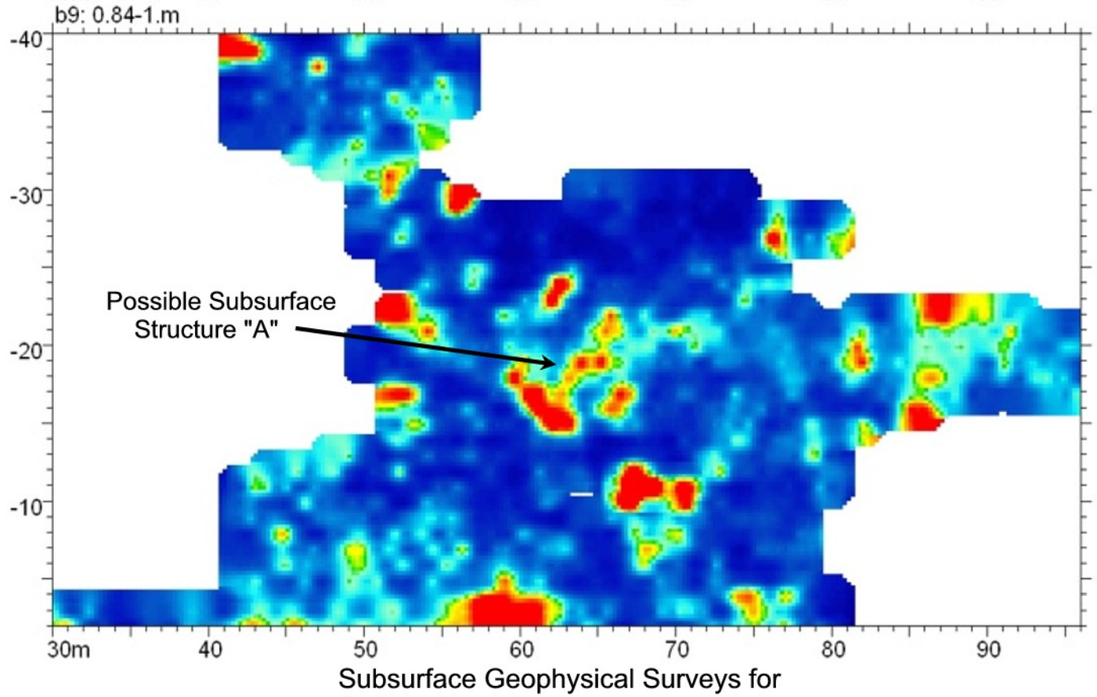

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Figure 5
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Area 2 Ground-Penetrating Radar Survey Results

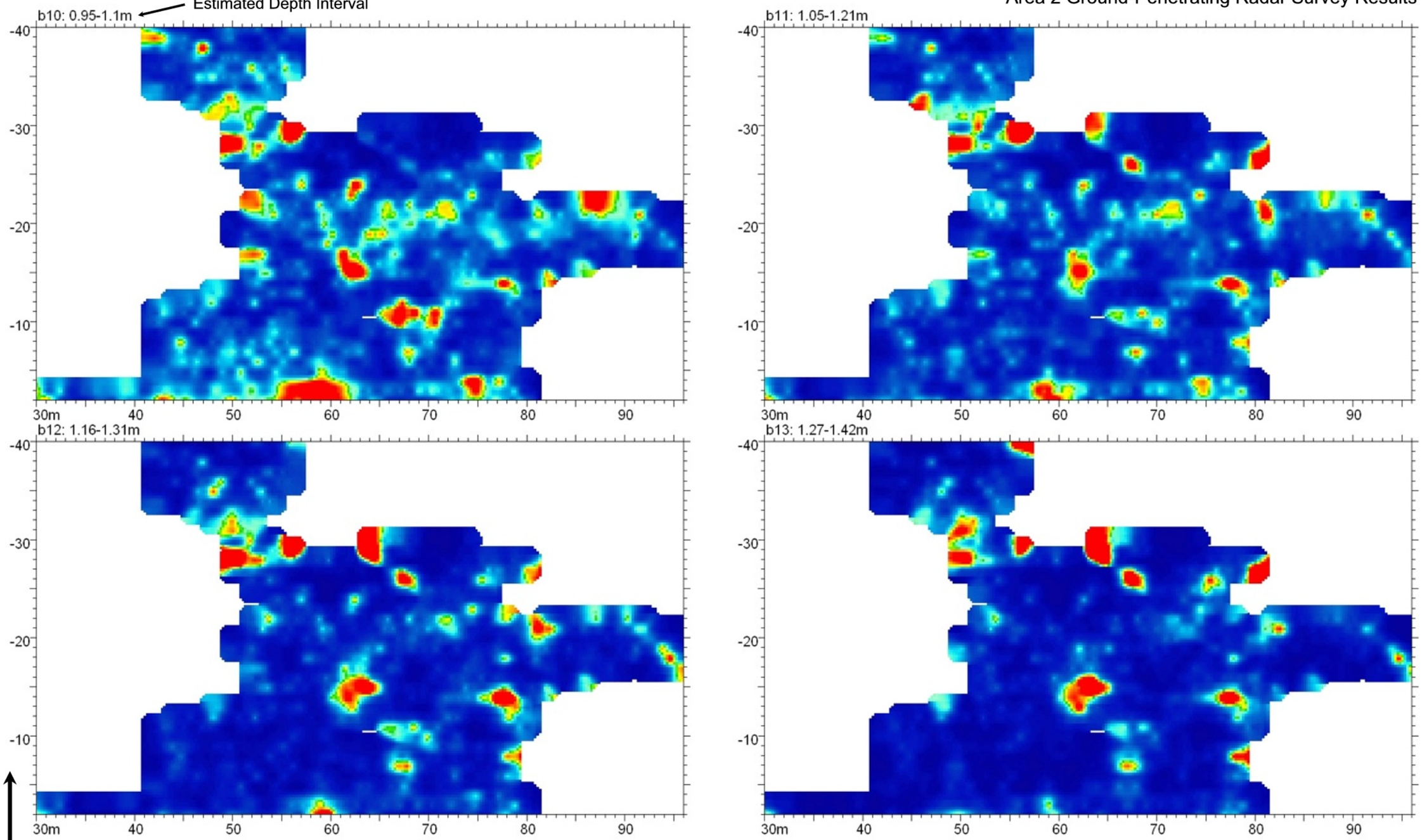

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Figure 6
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