PRELIMINARY HYDROGEOLOGIC INVESTIGATION

Conducted in Accordance with
Fauquier County's Subdivision Ordinance -- Section 18

ARRINGTON KNOLLS

FAUQUIER COUNTY, VIRGINIA

May 2007

Presented To:

Mr. James Sawyer
Fauquier County Department of
Community Development
&
Mr. Wayne Stephens
Fauquier County Water & Sanitation Authority

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New England **Mid-Atlantic** **South Atlantic**

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May 29, 2007

Mr. James Sawyer
Soil Scientist
Fauquier County Department of Community Development
29 Ashby Street, Suite 310
Warrenton, VA 20186

Re: Arrington Knolls Exploratory Test Well Proposal

Dear Mr. Sawyer,

In accordance with Section 18-1.B of the Fauquier County Subdivision Ordinance, please find enclosed Emery & Garrett Groundwater, Inc.'s (EGGI's) preliminary hydrogeologic investigation report for the proposed community water supply being developed at the Arrington Knolls project site in Fauquier County, Virginia.

Based upon the hydrogeologic data collected during this preliminary hydrogeologic investigation, EGGI has identified 12 exploratory test well drilling targets. These targets represent the best candidate opportunities that exist within the project site for drilling high-yield bedrock wells. The results of the remaining phases of work will be directed toward assessing the total volume of water that can be safely developed without adversely impacting off-site groundwater users.

We hope you find the information contained herein responsive to your needs. If you have any questions concerning this material, please do not hesitate to contact us.

Best regards,

Mark B. Wingsted
Geologist

John A. Brooks, Ph.D., PG
Senior Geologist

Cc: Wayne Stephens, Fauquier County Water & Sanitation Authority
Jeff Edelman, Land Feasibility Manager, Centex Homes - DC Metro

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PRELIMINARY HYDROGEOLOGIC INVESTIGATION

Conducted in Accordance with Fauquier County's Subdivision Ordinance -- Section 8

ARRINGTON KNOLLS FAUQUIER COUNTY, VIRGINIA

May 2007

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PRELIMINARY HYDROGEOLOGIC INVESTIGATION
COMMUNITY WATER SUPPLY
Performed in Accordance with
Fauquier County's Subdivision Ordinance -- Section 18

ARRINGTON KNOLLS
Fauquier County, Virginia
May 2007

I. INTRODUCTION / SUMMARY

This report summarizes Phases I and II of Emery & Garrett Groundwater, Inc.'s (EGGI's) groundwater investigation conducted on the Arrington Knolls property, Fauquier County, Virginia (Figure 1). This investigation is being conducted to develop groundwater resources for use as a community water supply and was completed in accordance with the Fauquier County Subdivision Ordinance, Section 18, Hydrogeologic Testing.

The 254-acre (0.4 square miles) Arrington Knolls Subdivision will be comprised of 300 lots (Figure 2). In accordance with Fauquier County Water & Sanitation Authority (WSA) guidelines, it is necessary to develop 1.6 gallons per minute (gpm) per residential connection, in order to provide redundancy in source supply. Fauquier County requires that 1 gpm per residential connection be developed with regard to assessing sustainability. The Virginia Water Works Regulations require that 0.5 gpm per residential connection be developed for constructing a community water system. The actual ***maximum*** demand for potable water is estimated to be approximately 500 gallons per day (gpd) per household.[1] Therefore, for the full build out of 300 lots, a maximum supply of 104 gpm or 150,000 gpd is anticipated to be actually used. It is the intent of this groundwater investigation to develop sufficient groundwater resources to meet all of these water supply guidelines.

The first part of this report summarizes the data collection and analysis conducted in the Phase I study. The second portion of this report reviews the geophysical investigations (Phase II). Data collected from these first two phases of this groundwater development program were analyzed and resulted in the selection of 12 exploratory test well sites. These wells are identified as AKN-1, AKN-2, AKN-3, AKN-4, AKN-5, AKN-6, AKN-7, AKN-8, AKN-9, AKN-10, AKN-11, and AKN-12. Subsequent phases of this groundwater exploration and development program will include the following:

[1] This is based upon Chapter 12 VAC 5-590-690 from the draft copy of Community Water Standards Fauquier County Water & Sanitation Authority.

Phase III	Drill exploratory test wells at identified geologic target sites.
Phase IV	Convert highest yielding test wells to larger diameter production wells.
Phase V	Conduct long-term yield and water quality tests on final production wells in accordance with Fauquier County regulations.
Phase VI	Prepare final Groundwater Use Management Plan/submittal of Hydrogeological Report.

II. PHASE I INVESTIGATIONS

A. Summary

The intent of the Phase I investigation was to identify sub-areas on the property that have the greatest likelihood (based upon hydrogeologic settings) of yielding significant volumes of groundwater.

Work efforts completed in Phase I included:

1) **Detailed investigation of the local bedrock geology:**
Detailed geologic field mapping was carried out to characterize the local bedrock geology in terms of mineral composition and texture; the pervasiveness, orientation, and dip of layering and folds; the presence of bedrock discontinuities resulting from compositional differences within subsurface rock units; the presence of contact zones between bedrock units of contrasting character; and the presence of fault zones.

2) **Delineation of fractured bedrock aquifers with the help of the following methods:**
   a) Lineament analysis (e.g. measurement of lineament length and orientation, assessment of lineament coincidence between one aerial platform and another, and correlation of lineaments to observed bedrock fractures).
   b) Fracture characterization (e.g. documentation and evaluation of bedrock fracture morphology, length, termination, roughness, density, and orientation).

3) **Identification of contributing watersheds.**

4) **Location of contaminant threats/existing land uses proximal to proposed groundwater development areas that could potentially degrade groundwater quality.**

5) Compilation and evaluation of data on existing wells within the study area.

B. Defining the Hydrogeologic Conditions

1) Bedrock Geology

Groundwater resources must be derived from available *bedrock aquifers* within the project site. Groundwater extracted from fractured bedrock aquifers is directly influenced by the bedrock's inherent chemical and physical characteristics. The *inherent* hydrogeologic factors known to most strongly influence the quality and quantity of groundwater derived from bedrock aquifers are: 1) the degree to which rock units are layered, foliated, or bedded; 2) the dip of the layering; 3) the presence of geologic contact surfaces of contrasting rock types; and 4) the chemical composition of the rocks.

The geology of the study area was investigated through a detailed program of geologic field mapping to provide insights into the spatial variation of the hydrogeologic factors listed above. A result of the mapping program was the compilation of a geologic base map for the study area (Plate 1, View B). This map was compiled through the evaluation of soil exposures and rock outcrops identified by EGGI geologists within the study area. The findings of EGGI's evaluations supplemented geologic mapping previously conducted by others proximal to the project site (Fauquier County GIS).

The existing geologic maps and EGGI's mapping indicate that the project site is underlain by greenstone of the Catoctin Formation (Zc). The greenstone is very poorly exposed at Arrington Knolls. However, based on the few outcrops observed, the greenstone is fine- to medium-grained, weakly foliated, and tends to have a massive appearance. Epidote, pyrite, and magnetite often occur as accessory minerals and relict vesicles are common.

Arrington Knolls is located on the eastern limb of the Blue Ridge Anticlinorium, with foliation trending north-northwest and dipping steeply (85 degrees) toward the west (Plate 1; View B). No faults were identified in the immediate confines of the project area.

2) Delineation of Fractured Bedrock Aquifers

a) Introduction

Besides being dependent on the physical and chemical composition of the bedrock units, the capacity of bedrock to be water bearing also depends on the occurrence of fractures, faults, or other bedrock discontinuities that provide avenues for the transmission of groundwater. The occurrence of bedrock discontinuities imparts secondary permeability to the rocks within the study area. Secondary permeability typically provides the main mechanism for groundwater movement in rocks.

EGGI used a two-fold approach in investigating these secondary characteristics: 1) remote-sensing analysis of the site using multiple scales and types of aerial photography and imagery; and 2) measurement of bedrock fracture characteristics at bedrock exposures present in the study area. It should be noted that the determination of secondary characteristics is separate and distinct from the evaluation of the bedrock's inherent capability to store and yield groundwater as described in the previous section.

Analysis of remote-sensing data provided 100% coverage of the study area. Data collected from bedrock exposures and geologic reports provided evidence regarding the orientation of fracture systems and the nature of the faults in and around the site. Remote-sensing data allows projection of local detail seen in bedrock exposures proximal to the project site.

b) Remote-Sensing Analysis

i) Introduction and Methods

"Fracture trace" or lineament analysis, in conjunction with detailed structural mapping of brittle deformation features, is routinely applied by remote-sensing scientists as a practical method of delineating water-bearing bedrock systems. Many subsurface features, such as fracture zones, bedrock discontinuities, faults, and geologic contacts, have a ground surface expression which can be detected through a remote-sensing analysis of photographic images and topographic maps. These surface expressions typically appear on the ground surface as topographic depressions, vegetation changes, or tonal anomalies (i.e., contrast changes), and are known as lineaments. A lineament can be loosely defined as a mappable linear feature, as seen on the terrain surface, whose parts are aligned in a rectilinear or curvilinear manner.

The approach used by EGGI to collect and analyze lineaments is to first draw lineaments on images of different scales and type. These lineaments are then digitized into a computer, and finally, analyzed using EGGI computer programs.

Lineaments in the study area were defined on four scales of platforms. *A total of 2381 lineaments were identified in this investigation.* Each lineament was described by its length, azimuth (trend in degrees east of north), and location.

EGGI's lineament analysis provides: 1) a synoptic rose diagram[2] of lineaments that graphically displays the orientations of the most common lineament trends in a study area (Plate 1); and 2) coincident lineaments[3] (Plate 1, View A). The rose diagram is later compared to

[2] The trend of each rose petal is posted in degrees east of north. Petal width is a measure of data scatter and petal length, a measure of relative numbers of data in each lineament family.

[3] Lineaments observed on images at different scales that have a similar trend (±5°) and similar location (±2 mm at the scale of the image) are referred to as coincident lineaments (Mabee, and others, 1994). The use of such coincident lineaments helps to remove the inherent subjectivity of lineament analysis (Wise, 1982) and facilitates the confident use of lineament mapping as a groundwater exploration tool.

bedrock fracture fabric data to identify lineaments that likely reflect actual fractures in the bedrock. Such a comparison is used to help define areas where wells are more likely to intercept water-bearing openings in the underlying rock, and can ultimately be used to help select specific test well targets.

ii) Results of Lineament Analysis

The synoptic rose diagram provided shows the prominent trends of lineaments observed within 2.7 kilometer (1.6 miles) of the study area (Plate 1). The most common trends shown by the diagram are, in decreasing order of prominence, 5°, 46°, 67°, 87°, 131°, and 163°. Note, however, that lineaments trending at orientations other than those shown on the rose diagram do occur locally, as shown on the map (Plate 1, View A).

From the original 2381 lineaments, 114 coincident lineaments were identified, 63 of which are shown on Plate 1, View A. Fifteen coincident lineaments shown in Plate 1 View A are considered to be bedrock fracture-supported[4]. Discontinuities in the rock that possess enhanced water-bearing properties often underlie coincident lineaments. Because of this, the presence of such lineaments was used as one factor in delineating locations for conducting geophysical surveys and was used in identifying preferred test well sites.

Those coincident lineaments that are sub-parallel with nearby bedrock fracture family orientations, bedding orientations, or lithologic contacts are highlighted in magenta as "fracture-supported" coincident lineaments on Plate 1, View A.

c) Bedrock Fracture Fabric Analysis

i) Introduction

Groundwater storage and transmission is related, in part, to secondary permeability associated with discontinuities in the bedrock such as fractures and faults. Therefore, EGGI's analysis of the groundwater potential of the property also involved detailed characterization of the bedrock fracture fabric. Fracture fabric data have two primary uses in EGGI's groundwater development studies: 1) they enable correlation of lineaments to ground features, thereby supporting extrapolation of features identified during fracture fabric mapping to areas where bedrock is not exposed; and 2) they provide a qualitative measure of the rock's ability to store and transmit groundwater. The ability to extrapolate is especially important at this site because it is estimated that bedrock is exposed in less than 1% of the study area.

[4] Reduction of raw lineament data to coincident lineaments and fracture-supported coincident lineaments follows the method described in Mabee and others (1994).

ii) Results/Key Observations about the Fracture Fabric of the Study Area

EGGI inspected bedrock fractures at the available bedrock exposures on and around the property (Plate 1, View A). Analysis focused on the characterization of structural features known to influence groundwater movement, such as fractures, brittle faults, and other structural discontinuities.

Plate 1, View A includes symbols depicting the trend and dip of bedrock fracture sets observed in the outcrops. The key fracture sets observed in outcrops on and around the project site trend about northeast to east-west.

Unfortunately, a lack of extensive exposures of bedrock precluded detailed and comprehensive analyses of the bedrock's fracture fabric on the project site. However, the remote-sensing data were used to compensate for the relative lack of bedrock exposure and provided guidance for Phase II efforts and test well site selection.

3) Delineation of Contributing Watersheds

The Arrington Knolls Subdivision is located entirely within the Upper Cedar Run/Licking Run Watershed[5] (Figure 3). In addition, the project site is located within an approximate 1,075-acre local watershed that extends to the north and west of the site. Approximately 254 acres of the watershed occur within the project site.

Since groundwater recharge to bedrock aquifers is not restricted to property boundaries, nearby drainage ways will contribute groundwater recharge to the underlying bedrock aquifer(s). However, the actual amount of groundwater recharge received by the local bedrock aquifer underlying the property is unknown. Therefore, not until wells are drilled and tested will it be determined whether sufficient recharge can be obtained to sustain sufficient long-term yields from the project site to meet desired yield supplies.

4) Contaminant Threats to Groundwater Quality

The quality of groundwater resources can be adversely affected by land uses involving groundwater contaminants that can migrate into underlying bedrock aquifers. Therefore, one element of EGGI's groundwater resource investigation is to review the presence of potential contaminant threats to groundwater quality. Two sources were used to investigate potential threats to groundwater quality:

a) Environmental Data Resources (EDR) of Southport, Connecticut (a private firm that conducts contaminant threat searches) compiled contaminant threat information for a 1-mile radius around the project site (Appendix A).

[5] Based on the Fauquier County Water Supply Plan (Draft 2007).

b) EGGI conducted windshield surveys to a distance of at least 2,000 feet around the study area.

Although the Arrington Knolls property is primarily well-maintained farmland, it is located just outside the Town limits of Warrenton near a commercial area with light industry. As a result, several potential threats to groundwater quality were identified within 2,000 feet of the property (Plate 1, View C). Home Depot and Wal-Mart are located immediately adjacent to the proposed subdivision to the northeast (it should be noted that EDR report shows Wal-Mart approximately 3,000 feet south of its actual location). Stock Building Supply (called Wilson Brothers, Inc. in the EDR report) is located across Route 17 from Arrington Knolls. In addition, along Route 17 and Route 15 to the north, there are a number of commercial businesses (including several schools, an industrial park, a residency shop for VDOT, and car repair shops). However, according to the records contained in the EDR report, there is no evidence to suggest that contamination of the groundwater has occurred from any of these potential contaminant threats.

A potential contaminant threat identified by EDR is the Fauquier County Landfill. The landfill is located approximately 1,500 feet from the southeast corner of Arrington Knolls. It is an unlined landfill that began operating in 1975 and stopped accepting municipal solid waste in 1997. Thereafter, this landfill began accepting construction and demolition waste. The landfill has a number of monitoring wells on the property and several volatile organic compounds (VOC's) have been detected in the groundwater contained in some of the monitoring wells. However, based on the 2004 Annual Groundwater Monitoring Report that was reviewed by EGGI, the groundwater contamination appears to be contained locally.

Overall, with the possible exception of the Fauquier County Landfill, EGGI considers the property reasonably safe from potential sources of groundwater contamination. However, only after test wells have been drilled and representative samples of the groundwater have been chemically analyzed will the quality of the available groundwater resources be fully known. EGGI recommends that observation wells at the landfill be monitored carefully during the long-term pumping tests performed on proposed on-site production wells to ensure that interference or possible interaction with the landfill will not occur.

5) Existing Wells

The homes located outside the Town of Warrenton are served by bedrock wells. Data for wells compiled from Fauquier County GIS are shown on Plate 1, View C. Reported airlift yields from the wells range from 5 to 30 gpm and the total well depths range from 185 to 750 feet. These data show that the occurrence of groundwater resources in the area is highly variable, and that wells are typically only moderately productive.

III. PHASE II INVESTIGATIONS

A. Geophysical Methods

As previously discussed in the Phase I section of this report, geologic contacts, bedrock fractures, and faults are often the primary pathways for groundwater migration and storage in otherwise impermeable bedrock, such as that underlying the study area. These geologic features commonly cause changes in the physical characteristics of bedrock that can be detected "remotely" using geophysical instruments. Specific drilling targets were generally sited through the use of geophysical investigation.

Variations in the magnetic characteristics of rocks, caused by various geologic discontinuities, result in measurable deflections in the earth's magnetic field. Similarly, local variations in the electrical resistivity of the bedrock (and the overlying unconsolidated regolith) create measurable deviations in electromagnetic fields that propagate from Very Low Frequency (VLF) radio transmitters. Changes in bedrock resistivity can also be measured using electrical resistivity methods. See Telford, et al., 1983; Wright, 1988; Loke and Barker; 1996; and Loke, 2000 for detailed descriptions of magnetic, VLF, and resistivity geophysical methods.

An ENVI MAG/VLF instrument equipped with a magnetometer and VLF receiver was used in this study to measure the earth's magnetic field and the VLF electromagnetic field. ***Magnetic and VLF measurements were obtained along approximately 26,656 feet (≈5 miles) of survey lines (Plate 1, View C; Appendix B).*** The earth's magnetic field and the electromagnetic fields associated with the VLF stations were measured along these survey lines at 10 pace (approximately 28 foot) intervals.

Electrical resistivity surveys were conducted using automated electrical resistivity equipment. ***Approximately 19,000 (≈3.6 miles) feet of resistivity surveys were conducted on the project site.*** The locations of these resistivity surveys are shown on Plate 1, View C; selected profiles of the data are provided on Plate 1 and a complete set of the electrical resistivity profiles are in Appendix B. This geophysical method involves the measurement of induced electrical flow through subsurface materials, which serve to define the depth to bedrock and type of subsurface material (e.g., unconsolidated sediment, saprolite, bedrock). Electrical resistivity measurements of the subsurface materials were taken along the survey lines using arrays of 41 or more stainless steel electrodes spaced at ten-meter intervals. The Dipole-Dipole and Gradient method of collecting electrical resistivity data used in this study resulted in the collection of as many as 1,085 electrical resistivity measurements for each completed survey line.

These resistivity data were analyzed using computer-modeling software. The results of the analyses are displayed in color contoured cross-sectional resistivity models of the subsurface areas investigated (Appendix B). The higher resistivity values displayed in the models (shown as green to purple-brown color contour intervals) represent competent bedrock. The lower resistivity values (shown as blue colored contour intervals) have electrical resistivity values typical of saturated unconsolidated sediments, saprolite (bedrock weathering residuum) or fractured bedrock.

B. Findings of the Magnetometer/ VLF Surveys

Analysis of the magnetic field measurements collected during this survey shows that the magnetic field generally ranged between 52,000 and 55,000 gammas (the unit used to express the strength of the earth's magnetic field). Some significant variation is associated with anthropogenic sources of magnetic interference such as power lines or metal refuse.

The magnetic field is highly variable over the greenstone of the Catoctin Formation. However, north-northwest trending magnetic anomalies can be traced from one survey line to adjacent survey lines, which assisted in mapping discrete packages or layers of more highly magnetic rocks.

The analysis of the VLF data also resulted in the identification of electromagnetic anomalies. These anomalies are thought to relate to subtle compositional differences in the rocks, discrete fracture zones, or faults. Some of these features may be representative of water-bearing geologic and structural discontinuities.

Several exploratory test well sites were targeted based upon the geophysical anomalies that were detected in the VLF and magnetic survey data. These data and associated drilling targets are presented in Appendix B.

C. Findings of the ABEM Resistivity Surveys

The color-contoured cross-sections of the modeled electrical resistivity data show that the electrical resistivities of the geologic materials below the project site range between approximately 50 and 20,000 ohmmeters. The transition from less resistive materials (such as unconsolidated sediments, weathered bedrock, or fracture zones) to competent bedrock occurs at approximately 400 ohmmeters (Plate 1, View C; Appendix B).

Analyses of the electrical resistivity data indicated the presence of significant resistivity changes in the bedrock beneath the project site. Similar to the magnetic anomalies, many of the resistivity anomalies that can be traced from one survey line to the next trend north-northwest. Many proposed exploratory test well targets have been selected on these electrical resistivity anomalies (Appendix B).

D. Results

Analysis of the geophysical data generated during this investigation, combined with the hydrogeologic and contaminant threat information, resulted in the identification of 12 exploratory test well sites (Plate 1, View C and Figure 2). EGGI believes that these test well sites represent the locations with the highest likelihood of yielding significant quantities of groundwater suitable for developing a community water system. These exploratory well sites are identified as Wells AKN-1, AKN-2, AKN-3, AKN-4, AKN-5, AKN-6, AKN-7, AKN-8, AKN-9, AKN-10, AKN-11, and AKN-12 (Plate 1 and Figure 2).

IV. RECOMMENDATIONS

Based upon the hydrogeologic data collected to date, EGGI recommends that this groundwater exploration program proceed to Phase III (exploratory test well drilling). The hydrogeologic conditions as defined by the Phase I and II investigations suggest that moderate to significant groundwater resources can be obtained at this study site. Twelve (12) specific test well drilling targets (AKN-1 through AKN-12) have been identified based upon the hydrogeologic and geophysical data collected.

EGGI has staked each proposed well site in the field based on pertinent geophysical and hydrogeologic data. Before test well drilling commences, each proposed test well site should be surveyed by a Virginia licensed surveyor to ensure that the well locations are compatible with the site layout and Fauquier County setback requirements. Each site must then be inspected and approved by representatives of the Fauquier County Health Department *and* Virginia Department of Health-Office of Water Programs. There are several proposed exploratory drilling targets that may interfere with the proposed layout of the site plan. If sufficient groundwater resources are developed from wells that are located within the subdivision that do not maintain the required County or State setback buffers, the site plan will need to be modified to ensure that all the proper setback requirements are met.

EGGI recommends that the exploratory wells be drilled in the order in which they were labeled. In other words, Well AKN-1 should be drilled prior to drilling Well AKN-2 and Well AKN-2 should be drilled prior to Well AKN-3, etc. However, the well drilling priority may change as the drilling progresses and additional insights into the bedrock aquifer are gained.

It is very difficult to predict the ultimate yields of wells targeted for drilling, or even the total capacity of the study site to produce water prior to subsurface investigation (i.e., drilling, Phase III). However, based upon the hydrogeologic data collected during this preliminary hydrogeologic investigation, EGGI believes that it is possible to develop a significant supply (>200 gpm). This yield would be based upon the combined production of a series of wells drilled on site. The results of the remaining phases of work will be directed toward assessing the total volume of water that can be safely developed without adversely impacting off-site groundwater users.

The remaining work phases will be completed as follows:

- Phase III – Exploratory test well drilling. Preliminary yields will be measured with the drill rig by airlifting water from the borehole.[6]
- Phase IV – Conversion of test wells to production wells. Test wells yielding the greatest quantities of water with the highest quality will be converted to larger diameter (8-inch) production wells.

[6] Airlift tests involve using the drill rig to "air-lift" water out of the well during the drilling process, such that a preliminary measurement can be made of the well's yield. Subsurface data collected while drilling exploratory test wells may be used to modify the priority ranking of test well targets.

- Phase V – Yield and quality testing. The estimated sustainable yield and quality of each well will be determined with the aid of properly conducted long-term pumping tests. All testing programs will be conducted in accordance with Fauquier County and State of Virginia regulations.
- Phase VI – Preparation of Groundwater Use Management Program. Submittal of Final Hydrogeologic Report to Virginia Department of Health, Fauquier Department of Health, Fauquier County Water and Sanitation Authority, and Fauquier County Department of Community Development.

V. LIMITATIONS

The recommendations and conclusions provided herein represent EGGI's professional opinion based upon the hydrogeologic data collected and do not constitute a warranty written or implied.

VI. REFERENCES

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FIGURES

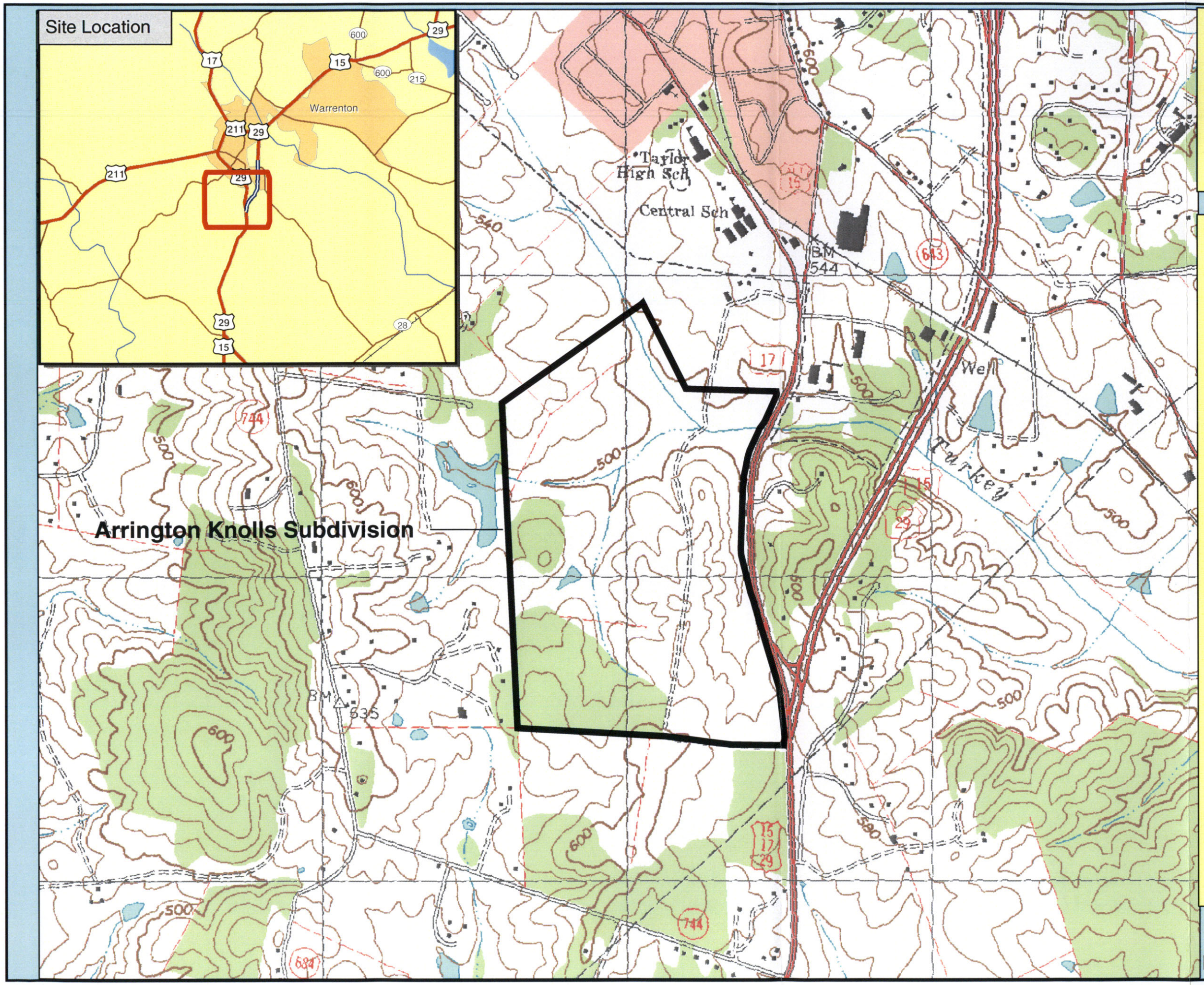


FIGURE 1

Topographic Setting of the Arrington Knolls Subdivision, Fauquier County, Virginia

Legend

Arrington Knolls Subdivision

N

Scale is 1:12,000

1 inch equals 1,000 feet

Base Map: USGS Warrenton Topographic quadrangle map.
UTM Zone 18N, NAD 27, meters.
Topographic contours interval: 10 feet.

Kilometers: 0, 0.25, 0.5, 1

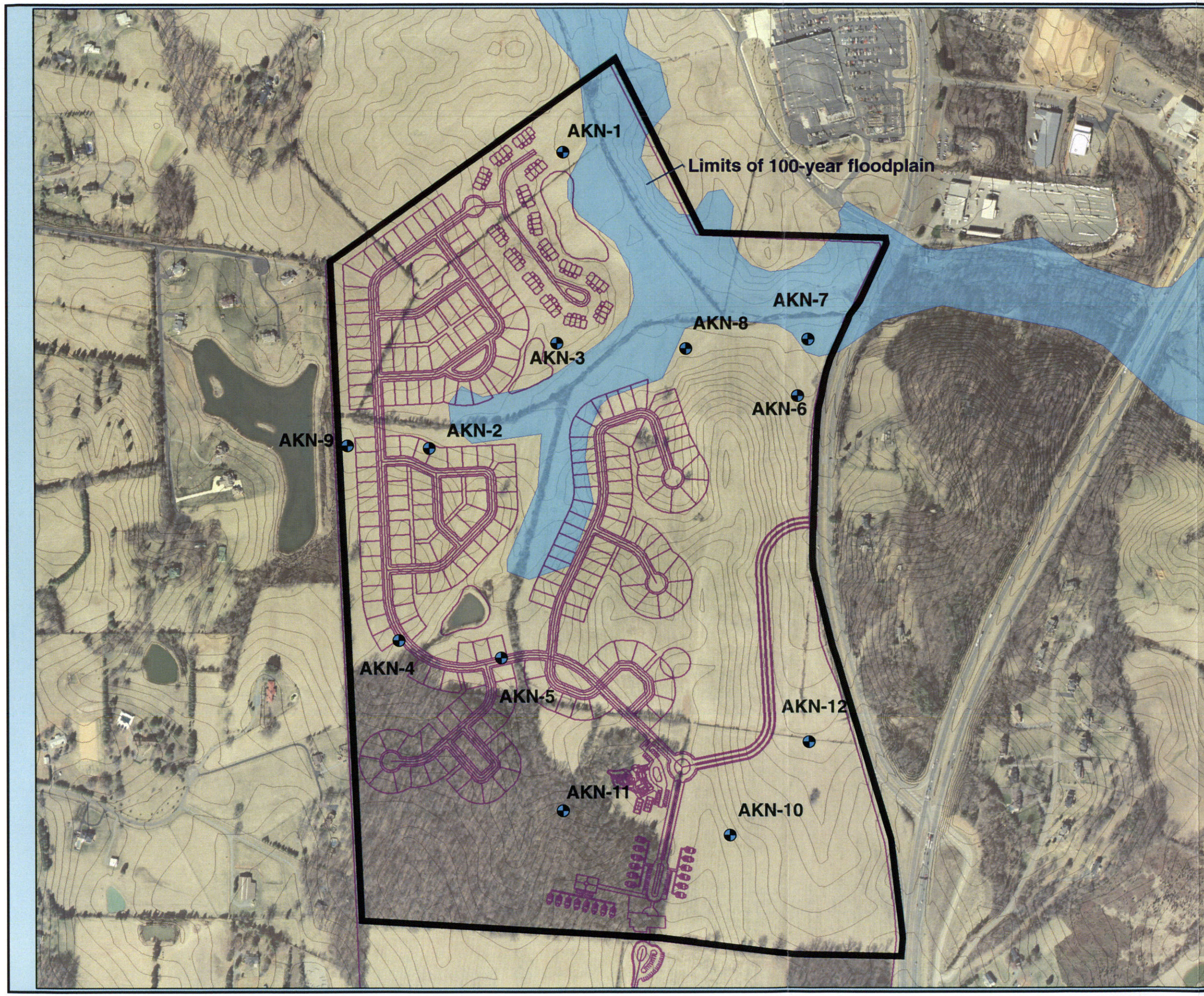
Miles: 0, 0.15, 0.3, 0.6

FIGURE 1

Emery & Garrett Groundwater, Inc.

FIGURE 2

Proposed ExploratoryTest Wells and Draft Site Plan[1] at the Arrington Knolls Subdivision, Fauquier County, Virginia



Legend

Arrington Knolls Subdivision

AKN-1 *Proposed Exploratory Test Well Site*

Aerial photograph, floodplain delineations, and 5-foot contour topographic map obtained by Fauquier County GIS database.

[1] Draft site plan obtained from Centex Homes on April 23, 2007. This site plan is subject to change based on the results of exploratory test well drilling.

If sufficient groundwater resources are developed from wells that are located within the subdivision that do not maintain the required County and /or State set-back buffers, the site plan will need to be modified to ensure all the proper set-back requirements are met.

N

Scale is 1:6,000

1 inch equals 500 feet

Kilometers: 0, 0.125, 0.25, 0.5

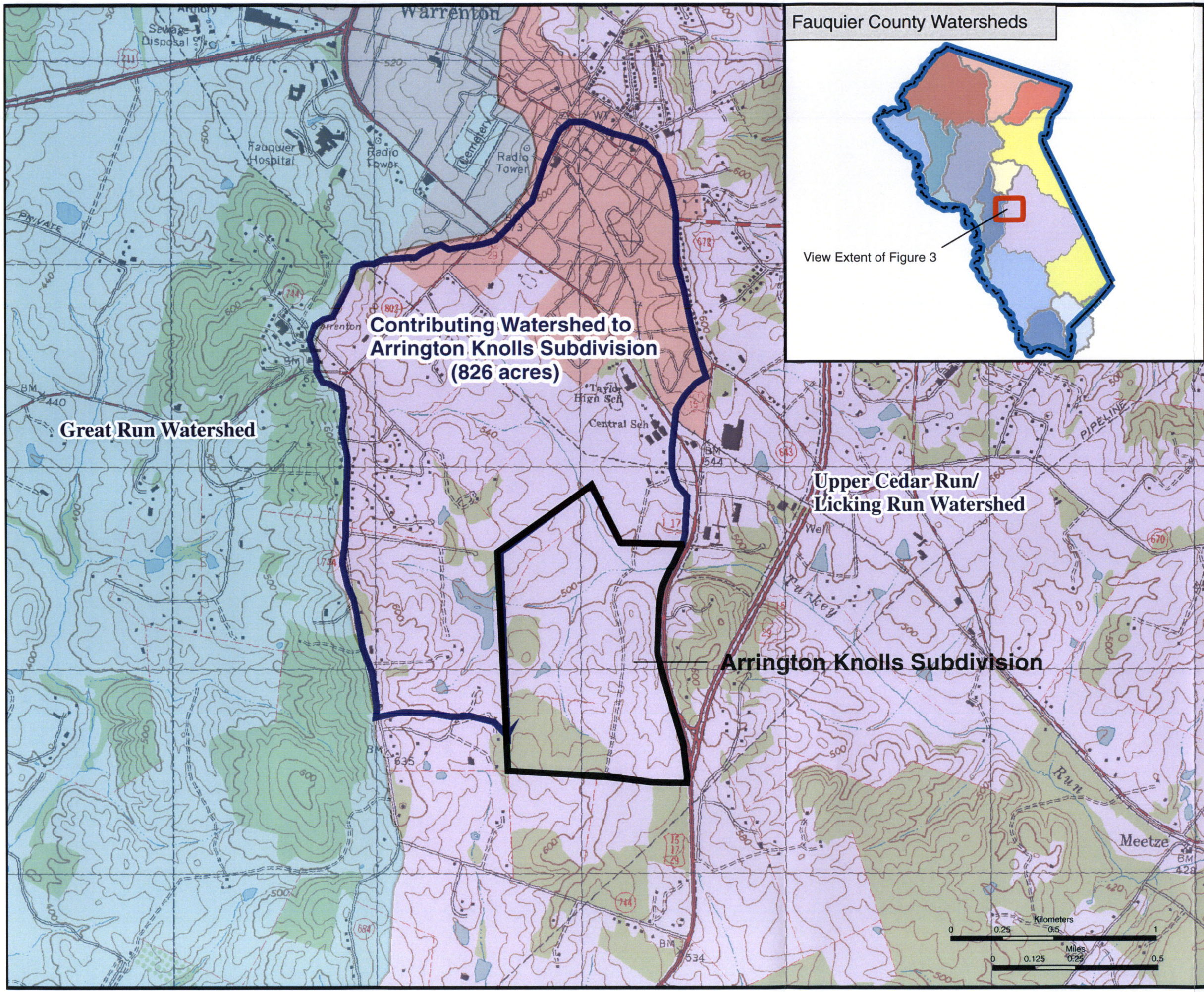
Miles: 0, 0.05, 0.1, 0.2, 0.3

FIGURE 2

Emery & Garrett Groundwater, Inc.

FIGURE 3

Local Watersheds Surrounding the Arrington Knolls Subdivision, Fauquier County, Virginia



Legend

- Arrington Knolls Subdivision
- Contributing Watershed to Arrington Knolls

Fauquier County Watersheds
(Data from Fauquier County Water Supply Plan (Draft 2007))

- Upper Cedar Run/Licking Run Watershed
- Great Run Watershed

N

Scale is 1:18,000
1 inch equals 1,500 feet

Base Map: USGS WarrentonTopographic quadrangle map.
UTM Zone 18N, NAD 27, meters.
Topographic contours interval: 10 feet.

FIGURE 3

Emery & Garrett Groundwater, Inc.

APPENDIX A

EXECUTIVE SUMMARY – ENVIRONMENTAL DATA RESOURCES, INC. (EDR) CONTAMINANT THREATS INVENTORY (THE ENTIRE EDR REPORT CAN BE FOUND ON THE ENCLOSED CD)

The EDR Radius Map™ Report

Arrington Knolls
Route 17
Warrenton, VA 20186

Inquiry Number: 1931300.1s

May 18, 2007

EDR® Environmental Data Resources Inc

The Standard in Environmental Risk Information

440 Wheelers Farms Road
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Nationwide Customer Service

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GEOCHECK ADDENDUM

GeoCheck - Not Requested

Thank you for your business.
Please contact EDR at 1-800-352-0050
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EXECUTIVE SUMMARY

A search of available environmental records was conducted by Environmental Data Resources, Inc (EDR). The report was designed to assist parties seeking to meet the search requirements of EPA's Standards and Practices for All Appropriate Inquiries (40 CFR Part 312), the ASTM Standard Practice for Environmental Site Assessments (E 1527-05) or custom requirements developed for the evaluation of environmental risk associated with a parcel of real estate.

TARGET PROPERTY INFORMATION

ADDRESS

ROUTE 17
WARRENTON, VA 20186

COORDINATES

Latitude (North):	38.690200 - 38' 41' 24.7"
Longitude (West):	77.794400 - 77' 47' 39.8"
Universal Tranverse Mercator:	Zone 18
UTM X (Meters):	256948.9
UTM Y (Meters):	4285898.0
Elevation:	519 ft. above sea level

USGS TOPOGRAPHIC MAP ASSOCIATED WITH TARGET PROPERTY

Target Property Map:	38077-F7 WARRENTON, VA
Most Recent Revision:	1994

TARGET PROPERTY SEARCH RESULTS

The target property was not listed in any of the databases searched by EDR.

DATABASES WITH NO MAPPED SITES

No mapped sites were found in EDR's search of available ("reasonably ascertainable ") government records either on the target property or within the search radius around the target property for the following databases:

FEDERAL RECORDS

NPL..... National Priority List
Proposed NPL..... Proposed National Priority List Sites
Delisted NPL..... National Priority List Deletions
NPL LIENS..... Federal Superfund Liens
CERCLIS..... Comprehensive Environmental Response, Compensation, and Liability Information System
CERC-NFRAP..... CERCLIS No Further Remedial Action Planned
CORRACTS..... Corrective Action Report
RCRA-TSDF..... Resource Conservation and Recovery Act Information
RCRA-LQG..... Resource Conservation and Recovery Act Information

EXECUTIVE SUMMARY

HMIRS..... Hazardous Materials Information Reporting System
US ENG CONTROLS..... Engineering Controls Sites List
US INST CONTROL..... Sites with Institutional Controls
DOD..... Department of Defense Sites
FUDS..... Formerly Used Defense Sites
US BROWNFIELDS..... A Listing of Brownfields Sites
CONSENT..... Superfund (CERCLA) Consent Decrees
ROD..... Records Of Decision
UMTRA..... Uranium Mill Tailings Sites
ODI..... Open Dump Inventory
TRIS..... Toxic Chemical Release Inventory System
TSCA..... Toxic Substances Control Act
FTTS..... FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fungicide, & Rodenticide Act)/TSCA (Toxic Substances Control Act)
SSTS..... Section 7 Tracking Systems
LUCIS..... Land Use Control Information System
DOT OPS..... Incident and Accident Data
HIST FTTS..... FIFRA/TSCA Tracking System Administrative Case Listing
US CDL..... Clandestine Drug Labs
RADINFO..... Radiation Information Database
LIENS 2..... CERCLA Lien Information
PADS..... PCB Activity Database System
MINES..... Mines Master Index File
RAATS..... RCRA Administrative Action Tracking System

STATE AND LOCAL RECORDS

SHWS..... This state does not maintain a SHWS list. See the Federal CERCLIS list and Federal NPL list.
SWF/LF..... Solid Waste Management Facilities
ENG CONTROLS..... Engineering Controls Sites Listing
INST CONTROL..... Voluntary Remediation Program Database
VA VRP..... Voluntary Remediation Program
BROWNFIELDS..... Brownfields Site Specific Assessments
CEDS..... Comprehensive Environmental Data System
AIRS..... Permitted Airs Facility List

TRIBAL RECORDS

INDIAN RESERV..... Indian Reservations
INDIAN LUST..... Leaking Underground Storage Tanks on Indian Land
INDIAN UST..... Underground Storage Tanks on Indian Land

EDR PROPRIETARY RECORDS

Manufactured Gas Plants... EDR Proprietary Manufactured Gas Plants

SURROUNDING SITES: SEARCH RESULTS

Surrounding sites were identified in the following databases.

Elevations have been determined from the USGS Digital Elevation Model and should be evaluated on a relative (not an absolute) basis. Relative elevation information between sites of close proximity should be field verified. Sites with an elevation equal to or higher than the target property have been differentiated below from sites with an elevation lower than the target property.
Page numbers and map identification numbers refer to the EDR Radius Map report where detailed data on individual sites can be reviewed.

Sites listed in ***bold italics*** are in multiple databases.

Unmappable (orphan) sites are not considered in the foregoing analysis.

EXECUTIVE SUMMARY

FEDERAL RECORDS

RCRAInfo: RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. RCRAInfo replaces the data recording and reporting abilities of the Resource Conservation and Recovery Information System(RCRIS). The database includes selective information on sites which generate, transport, store , treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Conditionally exempt small quantity generators (CESQGs) generate less than 100 kg of hazardous waste, or less than 1 kg of acutely hazardous waste per month. Small quantity generators (SQGs) generate between 100 kg and 1,000 kg of hazardous waste per month Large quantity generators generate over 1,000 kilograms (kg) of hazardous waste, or over 1 kg of acutely hazardous waste per month. Transporters are individuals or entities that move hazardous waste from the generator offsite to a facility that can recycle, treat, store, or dispose of the waste. TSDFs treat, store, or dispose of the waste.

A review of the RCRA-SQG list, as provided by EDR, and dated 06/13/2006 has revealed that there are 22 RCRA-SQG sites within approximately 2 miles of the target property.

Equal/Higher Elevation	Address	Dist / Dir	Map ID	Page
WAL MART STORE 2437	***8278 JAMES MADISON HWY***	***1/4 - 1/2 ESE***	***A3***	***8***
CARTER MACHINERY COMPANY INCOR	***721 INDUSTRIAL ROAD***	***1/2 - 1 NE***	***5***	***9***
HOME DEPOT 8552	267 ALWINGTON BLVD	1/2 - 1 NNE	B8	25
WATERLOO MOTORS	***317 E SHIRLEY AVE***	***1/2 - 1 N***	***21***	***40***
FAUQUIER CO. LANDFILL-DEPT.OF	6438 COLLEGE ST.	1/2 - 1 SE	E24	42
WARRENTON AUTO SVC INC	***281 E SHIRLEY AVE***	***1/2 - 1 N***	***F29***	***48***
WARRENTON PUBLIC WORKS TOWN OF	***360 FALMOUTH ST***	***1 - 2 NNE***	***L58***	***90***
VILLAGE BODY & PAINT	***81 SOUTH 5TH STREET***	***1 - 2 N***	***N70***	***107***
WARRENTON LAUNDRY COMPANY	***9 SOUTH 5TH STREET***	***1 - 2 N***	***P78***	***113***
DOMINION DRY CLEANERS	***133 A WEST SHIRLEY AVEN***	***1 - 2 NNW***	***Q83***	***115***
FAUQUIER TIMES DEMOCRAT COMPAN	***39 CULPEPER STREET***	***1 - 2 N***	***R87***	***118***
PIEDMONT PRESS	***30 SOUTH 2ND STREET***	***1 - 2 N***	***R89***	***119***
CARRIAGE HOUSE CLEANERS	***64 WEST LEE STREET***	***1 - 2 N***	***S96***	***122***
SUDDUTH PRINTING	***35 MAIN STREET***	***1 - 2 N***	***T97***	***123***
VERIZON	***87 LEE STREET***	***1 - 2 N***	***V101***	***124***
FAUQUIER WATER SEWER AUTHORITY	***14 MAIN STREET***	***1 - 2 N***	***T102***	***125***
FAUQUIER CNTY MAINT	***221 W SHIRLEY AVE***	***1 - 2 NNW***	***W110***	***132***
FAUQUIER COUNTY PUBLIC SCHOOLS	***225 WEST SHIRLEY AVENUE***	***1 - 2 NNW***	***W111***	***133***
FAUQUIER HOSPITAL INC THE	***500 HOSPITAL DR***	***1 - 2 NNW***	***116***	***147***
HERITAGE OLDS BUICK	***250 WEST SHIRLEY AVENUE***	***1 - 2 NNW***	***W119***	***150***
BLUE RIDGE ORTHOPAEDIC ASSOCIA	***550 HOSPITAL DRIVE***	***1 - 2 NNW***	***121***	***151***

Lower Elevation	Address	Dist / Dir	Map ID	Page
7-ELEVEN #19048	***US RTE 29 & RTS 211 & 1***	***1 - 2 NNW***	***Z131***	***156***

ERNS: The Emergency Response Notification System records and stores information on reported releases of oil and hazardous substances. The source of this database is the U.S. EPA.

A review of the ERNS list, as provided by EDR, and dated 12/31/2006 has revealed that there is 1 ERNS site within approximately 2 miles of the target property.

Equal/Higher Elevation	Address	Dist / Dir	Map ID	Page
54 EAST LEE ST.	54 EAST LEE ST.	1 - 2 N	O76	112

EXECUTIVE SUMMARY

ICIS: The Integrated Compliance Information System (ICIS) supports the information needs of the national enforcement and compliance program as well as the unique needs of the National Pollutant Discharge Elimination System (NPDES) program.

A review of the ICIS list, as provided by EDR, and dated 02/21/2007 has revealed that there are 2 ICIS sites within approximately 2 miles of the target property.

Equal/Higher Elevation	Address	Dist / Dir		Map ID	Page
RANDOLPH RIDGE, LLC	170 W SHIRLEY AVE	1 - 2	NNW	Q90	119
FAUQUIER COUNTY BOARD OF EDUCA	10 HOTEL STREET	1 - 2	N	R95	122

MLTS: The Material Licensing Tracking System is maintained by the Nuclear Regulatory Commission and contains a list fo approximately 8,100 sites which possess or use radioactive materials and are subject to NRC licensing requirements.

A review of the MLTS list, as provided by EDR, and dated 01/11/2007 has revealed that there is 1 MLTS site within approximately 2 miles of the target property.

Equal/Higher Elevation	Address	Dist / Dir		Map ID	Page
FAUQUIER HOSPITAL	500 HOSPITAL DRIVE	1 - 2	NNW	X115	147

FINDS: The Facility Index System contains both facility information and "pointers" to other sources of information that contain more detail. These include: RCRIS; Permit Compliance System (PCS); Aerometric Information Retrieval System (AIRS); FATES (FIFRA [Federal Insecticide Fungicide Rodenticide Act] and TSCA Enforcement System, FTTS [FIFRA/TSCA Tracking System]; CERCLIS; DOCKET (Enforcement Docket used to manage and track information on civil judicial enforcement cases for all environmental statutes); Federal Underground Injection Control (FURS); Federal Reporting Data System (FRDS); Surface Impoundments (SIA); TSCA Chemicals in Commerce Information System (CICS); PADS; RCRA-J (medical waste transporters/disposers); TRIS; and TSCA. The source of this database is the U.S. EPA/NTIS.

A review of the FINDS list, as provided by EDR, and dated 01/18/2007 has revealed that there are 37 FINDS sites within approximately 2 miles of the target property.

Equal/Higher Elevation	Address	Dist / Dir		Map ID	Page
WAL MART STORE 2437	***8278 JAMES MADISON HWY***	***1/4 - 1/2***	***ESE***	***A3***	***8***
CARTER MACHINERY COMPANY INCOR	***721 INDUSTRIAL ROAD***	***1/2 - 1***	***NE***	***5***	***9***
HOME DEPOT 8552	267 ALWINGTON BLVD	1/2 - 1	NNE	B7	24
JAMES G. BRUMFIELD ELEM	550 ALWINGTON BLVD	1/2 - 1	N	11	28
SIVACO FASTENING SYSTEMS	615 FALMOUTH STREET	1/2 - 1	NNE	15	33
W. C. TAYLOR MIDDLE	350 E SHIRLEY AVE	1/2 - 1	NNE	D18	34
WATERLOO MOTORS	***317 E SHIRLEY AVE***	***1/2 - 1***	***N***	***21***	***40***
FAUQUIER CO. LANDFILL-DEPT.OF	6438 COLLEGE ST.	1/2 - 1	SE	E22	41
FAUQUIER COUNTY LANDFILL GAS L	BINGHAM RD	1/2 - 1	SE	E25	43
WARRENTON AUTO SVC INC	***281 E SHIRLEY AVE***	***1/2 - 1***	***N***	***F29***	***48***
E E WINE INCORPORATED - MADISO	82 MADISON STREET	1/2 - 1	NNE	36	71
AFTER HOURS AUTOMOTIVE	241 E. SHIRLEY AVE	1 - 2	N	G40	76
E E WINE INCORPORATED - FALMOU	***416 FALMOUTH STREET***	***1 - 2***	***NNE***	***I47***	***79***
WARRENTON PUBLIC WORKS TOWN OF	***360 FALMOUTH ST***	***1 - 2***	***NNE***	***L58***	***90***
VILLAGE BODY & PAINT	***81 SOUTH 5TH STREET***	***1 - 2***	***N***	***N70***	***107***
WARRENTON LAUNDRY COMPANY	***9 SOUTH 5TH STREET***	***1 - 2***	***N***	***P78***	***113***
WARRENTON LAUNDRY COMPANY	***9 S 5TH ST***	***1 - 2***	***N***	***P82***	***115***
DOMINION DRY CLEANERS	***133 A WEST SHIRLEY AVEN***	***1 - 2***	***NNW***	***Q83***	***115***
DOMINION VALLEY CLEANERS	133A W SHIRLEY AVE	1 - 2	NNW	Q84	116
FAUQUIER TIMES DEMOCRAT COMPAN	***39 CULPEPER STREET***	***1 - 2***	***N***	***R87***	***118***

EXECUTIVE SUMMARY

Equal/Higher Elevation	Address	Dist / Dir		Map ID	Page
PIEDMONT PRESS	***30 SOUTH 2ND STREET***	***1 - 2***	***N***	***R89***	***119***
RANDOLPH RIDGE, LLC	170 W SHIRLEY AVE	1 - 2	NNW	Q91	120
FAUQUIER COUNTY BOARD OF EDUCA	10 HOTEL STREET	1 - 2	N	R94	121
CARRIAGE HOUSE CLEANERS	***64 WEST LEE STREET***	***1 - 2***	***N***	***S96***	***122***
SUDDUTH PRINTING	***35 MAIN STREET***	***1 - 2***	***N***	***T97***	***123***
WARRENTON, TOWN OF	18 COURT STREET	1 - 2	N	U98	123
VERIZON	***87 LEE STREET***	***1 - 2***	***N***	***V101***	***124***
FAUQUIER WATER SEWER AUTHORITY	***14 MAIN STREET***	***1 - 2***	***N***	***T102***	***125***
FAUQUIER CNTY MAINT	***221 W SHIRLEY AVE***	***1 - 2***	***NNW***	***W110***	***132***
FAUQUIER COUNTY PUBLIC SCHOOLS	***225 WEST SHIRLEY AVENUE***	***1 - 2***	***NNW***	***W111***	***133***
FAUQUIER HOSPITAL INC THE	***500 HOSPITAL DR***	***1 - 2***	***NNW***	***116***	***147***
HERITAGE OLDS BUICK	***250 WEST SHIRLEY AVENUE***	***1 - 2***	***NNW***	***W119***	***150***
BLUE RIDGE ORTHOPAEDIC ASSOCIA	***550 HOSPITAL DRIVE***	***1 - 2***	***NNW***	***121***	***151***
WARRENTON MIDDLE SCHOOL	244 WATERLOO ST	1 - 2	NNW	128	155

Lower Elevation	Address	Dist / Dir		Map ID	Page
FOXCHASE VETERINARY CLINIC LIM	79 GARRETT STREET	1 - 2	NNW	123	152
VDACS - ACADEMY HILL RD	272 ACADEMY HILL RD	1 - 2	NNE	126	153
7-ELEVEN #19048	***US RTE 29 & RTS 211 & 1***	***1 - 2***	***NNW***	***Z131***	***156***

STATE AND LOCAL RECORDS

LUST: The Leaking Underground Storage Tank Database.

A review of the LUST list, as provided by EDR, and dated 05/18/2004 has revealed that there are 16 LUST sites within approximately 2 miles of the target property.

Equal/Higher Elevation	Address	Dist / Dir		Map ID	Page
VIRGINIA WIRE & FABRIC	***PARKING LOT***	***1/2 - 1***	***NNE***	***C12***	***29***
TAYLOR JUNIOR HIGH SCHOOL	350 EAST SHIRLEY AVENUE	1/2 - 1	NNE	D14	32
HITACHI	615 FALMOUTH STREET	1/2 - 1	NNE	27	46
SHIRLEY SITE (PREP)	***200-300 CLEVELAND / S***	***1/2 - 1***	***N***	***F30***	***68***
TOWN OF WARRENTON	***SHIRLEY / CLEVELAND S***	***1/2 - 1***	***N***	***F31***	***68***
AMOCO (XREF 94-1361)	241 EAST SHIRLEY AVENUE	1 - 2	N	G41	77
JEFFRIES, CHARLIE L. RESIDENCE	9335 LEES RIDGE ROAD	1 - 2	SW	H44	78
E.E. WINE OIL FACILITY	416 FALMOUTH STREET	1 - 2	NNE	I50	85
VIRGINIA POWER - WARRENTON OFF	8266 MEETZE ROAD	1 - 2	ENE	K55	88
MILLER CARPETS	133 WEST SHIRLEY AVENUE	1 - 2	NNW	Q79	114
WARRENTON PRESBYTERIAN CHURCH	103 MAIN STREET	1 - 2	N	P86	117
QUARLES/OLD TOWNE TEXACO	22 WATERLOO STREET	1 - 2	N	U106	126
FAUQUIER COUNTY FLEET MAINTENA	225 WEST SHIRLEY AVENUE	1 - 2	NNW	W113	145
RUSSELL PROPERTY	8045 FRYTOWN ROAD	1 - 2	NE	Y124	153

Lower Elevation	Address	Dist / Dir		Map ID	Page
VDOT - WARRENTON AREA HEADQUAR	ROUTE 643	1 - 2	NE	65	99
VDOT (SFL)	BUSINESS ROUTE 29	1 - 2	NNW	Z130	156

EXECUTIVE SUMMARY

LTANKS: The Leaking Tanks Database contains current Leaking petroleum tanks. The data comes from the Department of Environmental Quality.

A review of the LTANKS list, as provided by EDR, and dated 03/01/2007 has revealed that there are 30 LTANKS sites within approximately 2 miles of the target property.

Equal/Higher Elevation	Address	Dist / Dir		Map ID	Page
THOMPSON KELLY RESIDENCE Facility Status: Closed	7197 LEETON RIDGE RD	1/2 - 1	WSW	6	24
VDOT - WARRENTON RESIDENCY SHO Facility Status: Closed	***457 E SHIRLEY AVE***	***1/2 - 1***	***NNE***	***B10***	***27***
TAYLOR JUNIOR HIGH SCHOOL Facility Status: Closed	***350 E SHIRLEY AVE***	***1/2 - 1***	***NNE***	***D16***	***33***
SHIRLEY SITE (PREP) Facility Status: Closed	***200-300 CLEVELAND / S***	***1/2 - 1***	***N***	***F30***	***68***
LINDSEY HUESTON RESIDENCE Facility Status: Closed	9159 LEES RIDGE RD	1/2 - 1	SW	35	71
AMOCO - WARRENTON Facility Status: Closed Facility Status: Closed	241 E SHIRLEY AVE	1 - 2	N	G42	77
JEFFRIES CHARLIE L RESIDENCE Facility Status: Closed	9335 LEES RIDGE RD	1 - 2	SW	H43	78
WOODARD WILLIAM RESIDENCE Facility Status: Closed	9341 LEES RIDGE RD	1 - 2	SW	H45	78
E E WINE BULK FACILITY Facility Status: Open Facility Status: Closed	416 FALMOUTH ST	1 - 2	NNE	I46	78
E E WINE INCORPORATED - FALMOU Facility Status: Closed	***416 FALMOUTH STREET***	***1 - 2***	***NNE***	***I47***	***79***
E E WINE OIL FACILITY Facility Status: Closed	416 FALMOUTH ST	1 - 2	NNE	I48	79
HANBACK CONSTRUCTION (FORMER) Facility Status: Open	8182 SCENIC DR	1 - 2	ENE	J52	86
VIRGINIA POWER - WARRENTON OFF Facility Status: Closed	8266 MEETZE RD	1 - 2	ENE	K56	88
R L RIDER Facility Status: Closed	82 OLD MILL LN	1 - 2	NNE	M59	91
VALLESPIR OSWALD RESIDENCE Facility Status: Closed	186 GARDEN ST	1 - 2	N	61	94
LITTRELL MARY PROPERTY Facility Status: Closed	210 MOCKINGBIRD LN	1 - 2	N	71	108
MILLER CARPETS Facility Status: Open	133 W SHIRLEY AVE	1 - 2	NNW	Q80	114
WARRENTON PRESBYTERIAN CHURCH Facility Status: Closed	***103 MAIN ST***	***1 - 2***	***N***	***P85***	***116***
JONES PROPERTY Facility Status: Closed	6290 FOX HAVEN LN	1 - 2	NE	92	121
FAUQUIER SHERIFF'S OFFICE Facility Status: Closed	50 W LEE ST	1 - 2	N	S93	121
C AND P TELEPHONE Facility Status: Closed	87 W LEE ST	1 - 2	N	V100	124

EXECUTIVE SUMMARY

Equal/Higher Elevation	Address	Dist / Dir		Map ID	Page
R L RIDER CONSTRUCTION COMPANY Facility Status: Closed	30 JOHN MARSHALL ST	1 - 2	N	103	125
JOHN BARTON PAYNE BUILDING Facility Status: Closed	2 COURTHOUSE SQ	1 - 2	N	U104	126
QUARLES - OLD TOWNE TEXACO Facility Status: Closed	22 WATERLOO ST	1 - 2	N	U105	126
FAUQUIER COUNTY PUBLIC SCHOOLS Facility Status: Closed Facility Status: Closed	***225 WEST SHIRLEY AVENUE***	***1 - 2***	***NNW***	***W111***	***133***
FAUQUIER HOSPITAL INC THE Facility Status: Closed Facility Status: Closed	***500 HOSPITAL DR***	***1 - 2***	***NNW***	***116***	***147***
RUSSELL PROPERTY Facility Status: Open	8045 FRYTOWN RD	1 - 2	NE	Y125	153

Lower Elevation	Address	Dist / Dir		Map ID	Page
COMISAROW PAUL RESIDENCE Facility Status: Closed	7372 LEIGH RD	1 - 2	WNW	51	85
TRIBLE EQUIPMENT INC Facility Status: Closed	***8326 MEETZE RD***	***1 - 2***	***E***	***63***	***95***
VDOT - WARRENTON AREA HEADQUAR Facility Status: Closed	***8159 MEETZE RD***	***1 - 2***	***NE***	***64***	***96***

UST: The Underground Storage Tank database contains registered USTs. USTs are regulated under Subtitle I of the Resource Conservation and Recovery Act (RCRA). The data come from the Department of Environmental Quality's Underground Storage Tank Data Notification Information.

A review of the UST list, as provided by EDR, and dated 03/01/2007 has revealed that there are 32 UST sites within approximately 2 miles of the target property.

Equal/Higher Elevation	Address	Dist / Dir		Map ID	Page
VDOT - WARRENTON RESIDENCY SHO	***457 E SHIRLEY AVE***	***1/2 - 1***	***NNE***	***B10***	***27***
MID COUNTY FEED	606 FALMOUTH ST	1/2 - 1	NNE	C13	32
TAYLOR JUNIOR HIGH SCHOOL	***350 E SHIRLEY AVE***	***1/2 - 1***	***NNE***	***D16***	***33***
TAYLOR JUNIOR HIGH LIFT STATIO	350 E SHIRLEY AVE	1/2 - 1	NNE	D17	34
FORMER WARRENTON DISTRICT OFFI	249 E SHIRLEY AVE	1/2 - 1	N	G38	74
WARRENTON AMOCO	241 E SHIRLEY AVE	1 - 2	N	G39	74
WARRENTON BULK PLANT	***416 FALMOUTH ST***	***1 - 2***	***NNE***	***I49***	***80***
HANBACK CONSTRUCTION	8182 SCENIC DR	1 - 2	ENE	J53	86
VEPCO - WARRENTON DISTRICT OFF	8266 MEETZE RD	1 - 2	ENE	K54	87
TOWN OF WARRENTON - TOWN GARAG	360 FALMOUTH ST	1 - 2	NNE	L57	88
R.L. RIDER INC	***82 OLD MILL LN***	***1 - 2***	***NNE***	***M60***	***91***
WARRENTON FARMERS CO-OP	143 WASHINGTON ST	1 - 2	N	62	94
WARRENTON TRAINING STATION A	***744 SHIPMADILLY LN***	***1 - 2***	***NW***	***66***	***99***
UTILITIES SERVICE	56 LEE ST W	1 - 2	N	O73	111
FAUQUIER COUNTY SHERIFFS OFFIC	50 W LEE ST	1 - 2	N	O74	111
FAUQUIER COMMUNITY ACTION	73 E LEE ST	1 - 2	N	O75	112
FAUQUIER LAUNDRY & DRY CLEANIN	9 S 5TH ST	1 - 2	N	P77	112
ABANDONED LOT / ROW	140 W SHIRLEY AVE	1 - 2	NNW	Q81	114

EXECUTIVE SUMMARY

Equal/Higher Elevation	Address	Dist / Dir		Map ID	Page
WARRENTON PRESBYTERIAN CHURCH	***103 MAIN ST***	***1 - 2***	***N***	***P85***	***116***
#6 WARRENTON CO RESCUE UNIT	50 HOSPITAL DR	1 - 2	N	S88	118
OLDE TOWN TEXACO	22 WATERLOO ST	1 - 2	N	U107	126
VSP - AREA 12 OFFICE	224 W SHIRLEY AVE	1 - 2	NNW	W109	131
SCHOOL BUS GARAGE	***225 W SHIRLEY AVE***	***1 - 2***	***NNW***	***W112***	***141***
FAUQUIER HOSPITAL INC (THE)	500 HOSPITAL DR	1 - 2	NNW	X114	145
TOM FROST FIRESTONE, INC	239 W SHIRLEY AVE	1 - 2	NNW	W117	149
JIM HARRIS OLDSMOBILE	250 W SHIRLEY AVE	1 - 2	NNW	W118	149
WARRENTON WHOLESALE INC	60 ALEXANDRIA PIKE	1 - 2	N	120	151
ARRINGTON MOTORS	156 ALEXANDRIA PIKE	1 - 2	N	127	154

Lower Elevation	Address	Dist / Dir		Map ID	Page
WILSON BROTHERS INC	763 JAMES MADISON HWY	1/4 - 1/2	NE	4	9
TRIBLE EQUIPMENT INC	***8326 MEETZE RD***	***1 - 2***	***E***	***63***	***95***
VDOT - WARRENTON AREA HEADQUAR	***8159 MEETZE RD***	***1 - 2***	***NE***	***64***	***96***
GILL IMPLEMENT CO	365 W SHIRLEY AVE	1 - 2	NNW	129	155

AST: The Aboveground Storage Tank database contains registered ASTs. The data come from the Department of Environmental Quality's Aboveground Storage Tank Data Notification Information.

A review of the AST list, as provided by EDR, and dated 03/01/2007 has revealed that there are 7 AST sites within approximately 2 miles of the target property.

Equal/Higher Elevation	Address	Dist / Dir		Map ID	Page
WALMART STORE 2437	8278 JAMES MADISON HWY	1/4 - 1/2	ESE	A1	6
WARRENTON BULK PLANT	***416 FALMOUTH ST***	***1 - 2***	***NNE***	***I49***	***80***
R.L. RIDER INC	***82 OLD MILL LN***	***1 - 2***	***NNE***	***M60***	***91***
WARRENTON TRAINING STATION A	***744 SHIPMADILLY LN***	***1 - 2***	***NW***	***66***	***99***
WARRENTON ESS	87 W LEE ST	1 - 2	N	V99	124
SCHOOL BUS GARAGE	***225 W SHIRLEY AVE***	***1 - 2***	***NNW***	***W112***	***141***

Lower Elevation	Address	Dist / Dir		Map ID	Page
VDOT - WARRENTON AREA HEADQUAR	***8159 MEETZE RD***	***1 - 2***	***NE***	***64***	***96***

SPILLS: Pollution Complaint Database from The Department of Environmental Quality.

A review of the VA Spills list, as provided by EDR, and dated 06/01/1996 has revealed that there are 16 VA Spills sites within approximately 2 miles of the target property.

Equal/Higher Elevation	Address	Dist / Dir		Map ID	Page
WALMART	8278 JAMES MADISON HWY	1/4 - 1/2	ESE	A2	6
CORRAL FARM PUMPSTATION	8623 LORD FAIRFAX DRIVE	1/2 - 1	SE	9	25
VIRGINIA WIRE & FABRIC Date Closed: 9/20/2002	***PARKING LOT***	***1/2 - 1***	***NNE***	***C12***	***29***
HOBIC TRUCKING INC. Facility Status: CLOSED	8716 LEES RIDGE ROAD	1/2 - 1	SW	19	34
WARRENTON AUTO SERVICE Facility Status: CLOSED	281 EAST SHIRLEY AVE	1/2 - 1	N	F28	46
TOWN OF WARRENTON	***SHIRLEY / CLEVELAND S***	***1/2 - 1***	***N***	***F31***	***68***

EXECUTIVE SUMMARY

Equal/Higher Elevation	Address	Dist / Dir		Map ID	Page
WARRENTON TRAINING CENTER		1/2 - 1	N	F32	69
HEATHER LYNSKEY		1/2 - 1	N	F33	70
ALLIED STRIPING		1/2 - 1	N	F34	70
RENTALS SERVICE CORP.	249 EAST SHIRLEY AVE	1/2 - 1	N	G37	72
HG CUSTOMS	85 SOUTH 5TH STREET	1 - 2	N	N67	101
HG CUSTOMS AUTOBODY SPRAY SHOP	85 S. FIFTH STREET	1 - 2	N	N68	103
H.G. CUSTOMS AUTOBODY	85 S. FIFTH STREET	1 - 2	N	N69	105
GILLIAN LUMBER	105 W. SHIRLEY AVENUE	1 - 2	NNW	72	109
FAUQUIER BANK	10 COURTHOUSE SQUARE	1 - 2	N	U108	129
FAUQUIER HOSPITAL		1 - 2	NNW	122	152

DRYCLEANERS: A listing of registered drycleaners.

A review of the DRYCLEANERS list, as provided by EDR, and dated 01/17/2007 has revealed that there is 1 DRYCLEANERS site within approximately 2 miles of the target property.

Equal/Higher Elevation	Address	Dist / Dir		Map ID	Page
WARRENTON LAUNDRY COMPANY	***9 S 5TH ST***	***1 - 2***	***N***	***P82***	***115***

ENF: A listing of enforcement actions.

A review of the ENF list, as provided by EDR, and dated 03/31/2007 has revealed that there are 3 ENF sites within approximately 2 miles of the target property.

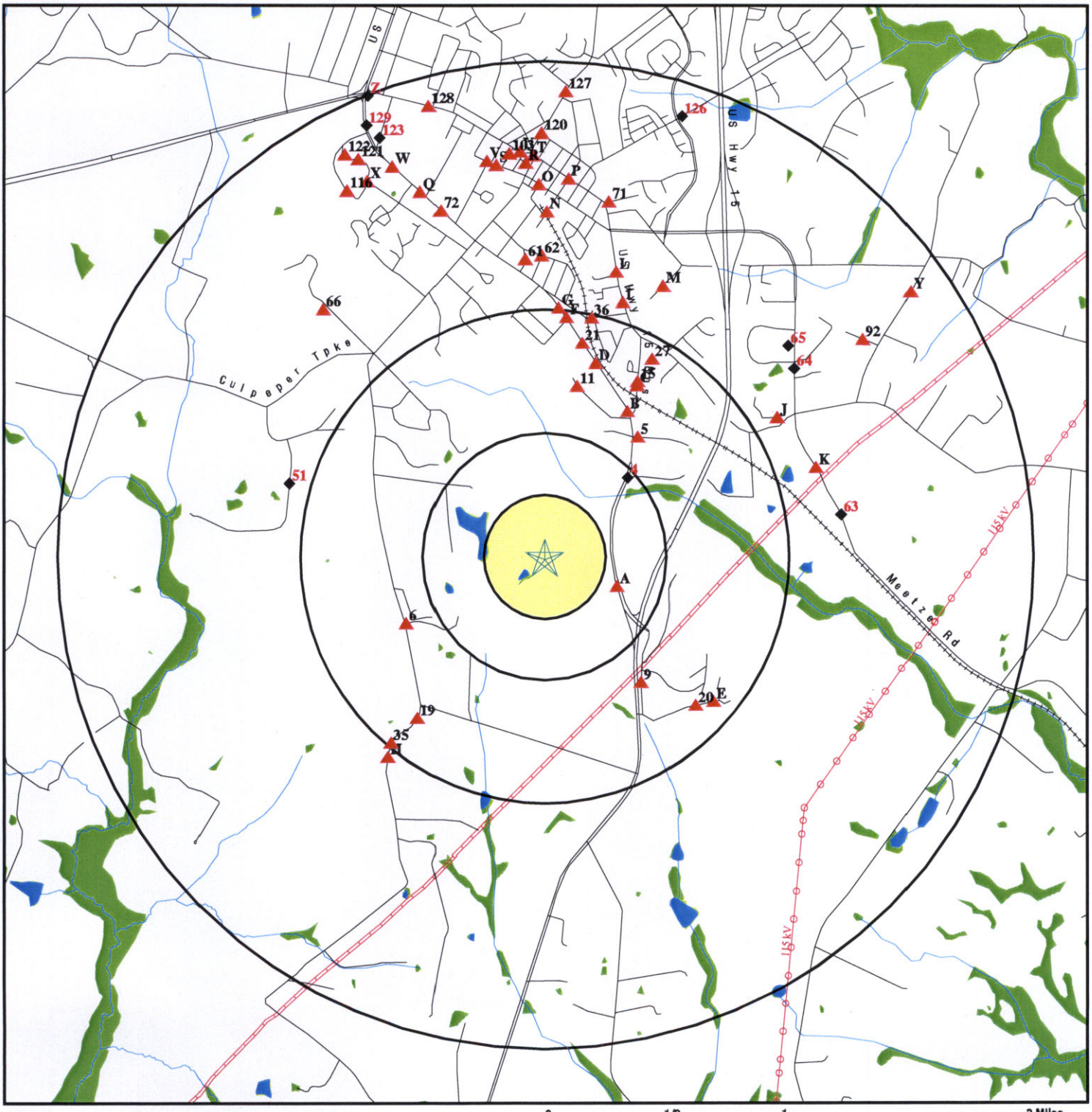
Equal/Higher Elevation	Address	Dist / Dir		Map ID	Page
FAUQUIER COUNTY SOLID WASTE MA	ROUTE 29 TO COLLEGE ST	1/2 - 1	SE	20	36
FAUQUIER COUNTY SOLID WASTE MA	6438 COLLEGE ST	1/2 - 1	SE	E23	41
FAUQUIER COUNTY SOLID WASTE MA	6438 COLLEGE ST	1/2 - 1	SE	E26	44

EXECUTIVE SUMMARY

Due to poor or inadequate address information, the following sites were not mapped:

Site Name	Database(s)
COUNTRY CLEANERS	DRYCLEANERS
DOMINION DRY CLEANERS	DRYCLEANERS
RYDER TRUCK ACCIDENT	LUST, VA Spills
C & P TELEPHONE MOTOR VEHICLE DEPT	LUST
JONES PROPERTY	LUST
LYNSKEY, HEATHER WELL	LUST
WARRENTON CO. RESCUE UNIT #6	LUST
TRINITY BAPTIST CHURCH	LUST
THOMPSON OIL (AST) (SLS)	LUST
QUARLES/COUNTRY STORE #3	LUST
QUARLES/OPAL TRUCK STOP	LUST
HIGHS DAIRY - COSNER - O'CONNELL (	LTANKS
EVERGREEN HOLLOW FARMS	VA Spills, LTANKS
LUCY GRANT ESTATE	LTANKS
HABRAT E E AND LEONA RESIDENCE	LTANKS
CARTER MACHINERY - WARRENTON FACIL	LTANKS
ALEXANDRIA PIKE PROPERTY	LTANKS
WARRENTON RESCUE UNIT 6	LTANKS
TRINITY BAPTIST CHURCH	LTANKS
WARRENTON TRAINING CENTER TANK A26	LTANKS
WARRENTON TOWN	LTANKS
HIGHLANDS OF WARRENTON	LTANKS
HIGHS DAIRY STORE	UST
WARRENTON FACILITY	UST
RENT A CAR CO INC	UST
WARRENTON REALTY PROPERTY	UST
DOMINION VIRGINIA POWER WARRENTON	RCRA-SQG, FINDS
US WARRENTON TRAINING CTR ST A	RCRA-SQG
BRANDON WOODWORKS	RCRA-SQG, FINDS
DRYSDALE SUBDIVISION	ICIS

OVERVIEW MAP - 1931300.1s



- Target Property
- Sites at elevations higher than or equal to the target property
- Sites at elevations lower than the target property
- Manufactured Gas Plants
- National Priority List Sites
- Dept. Defense Sites
- Indian Reservations BIA
- Power transmission lines
- Oil & Gas pipelines
- National Wetland Inventory

SITE NAME: Arrington Knolls ADDRESS: Route 17 Warrenton VA 20186 LAT/LONG: 38.6902 / 77.7944	CLIENT: Emery & Garrett Groundwater CONTACT: Mark Wingsted INQUIRY #: 1931300.1s DATE: May 18, 2007 12:39 pm

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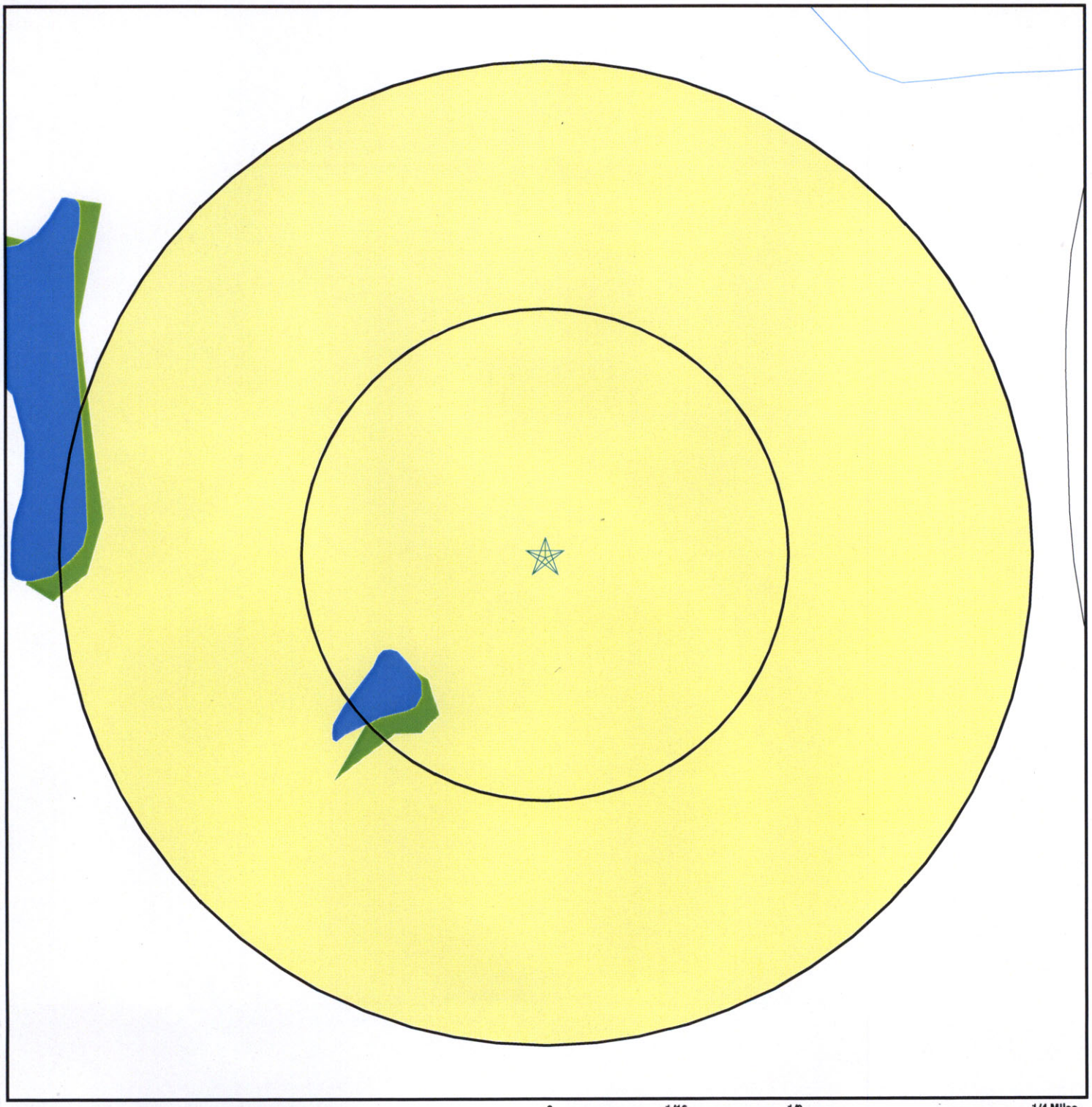
DETAIL MAP - 1931300.1s



- Target Property
- Sites at elevations higher than or equal to the target property
- Sites at elevations lower than the target property
- Manufactured Gas Plants
- Sensitive Receptors
- National Priority List Sites
- Dept. Defense Sites

0 1/16 1/8 1/4 Miles

- Indian Reservations BIA
- Oil & Gas pipelines
- National Wetland Inventory

SITE NAME: Arrington Knolls ADDRESS: Route 17 Warrenton VA 20186 LAT/LONG: 38.6902 / 77.7944	CLIENT: Emery & Garrett Groundwater CONTACT: Mark Wingsted INQUIRY #: 1931300.1s DATE: May 18, 2007 12:39 pm

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APPENDIX B

GEOPHYSICAL DATA

- VLF Surveys
- Resistivity Surveys

VLF Surveys

TABLE I

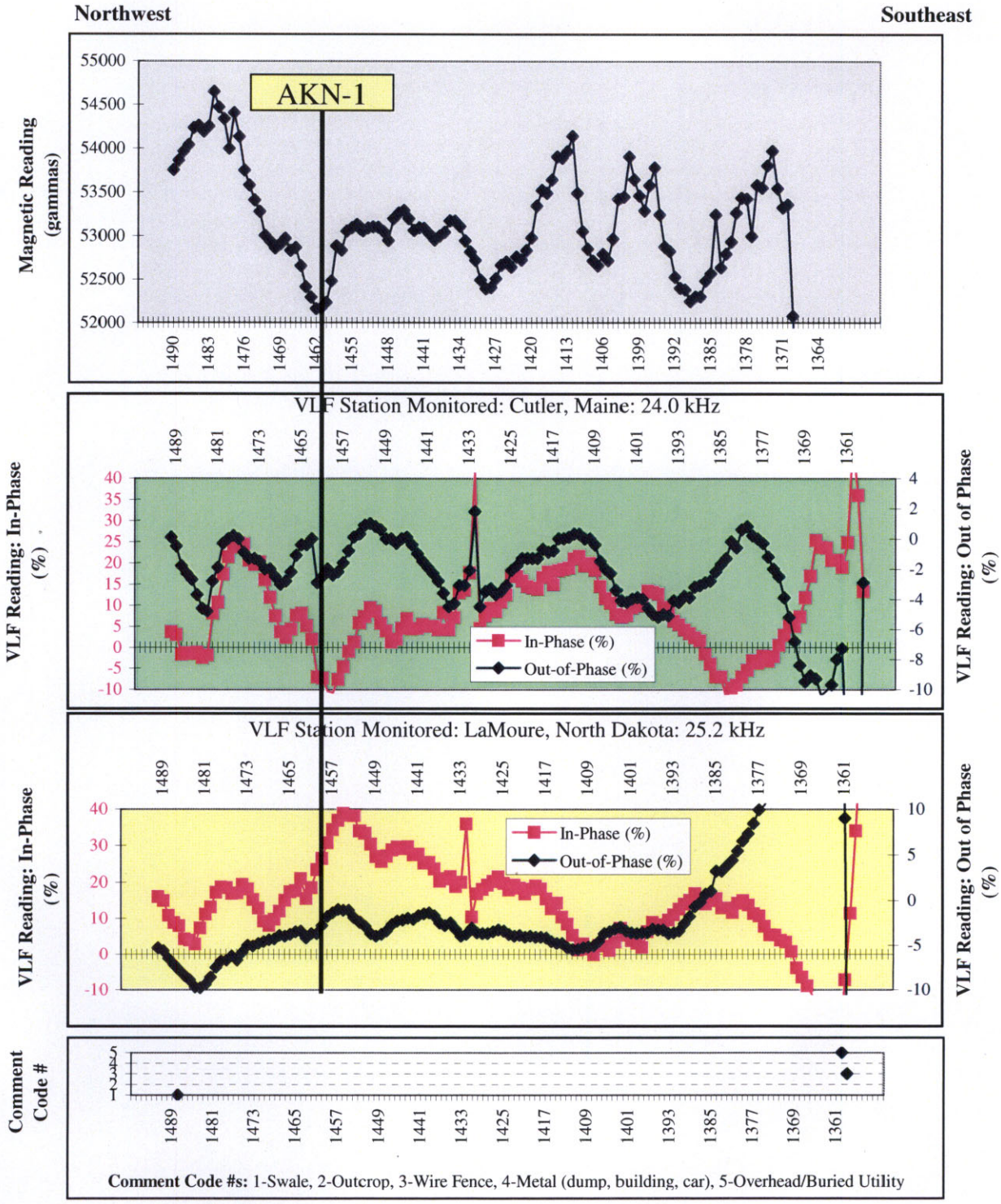
Information for Magnetometer and VLF Surveys
Arrington Knolls

Project Name: Arrington Knolls
Location: Fauquier County, Virginia
Instrument: Scintrex ENVI Mag/VLF

Total survey line length (feet): 26656
Total survey line length (miles): 5.048485
Total number of Survey Stations: 952

Date	Line Number	Line Orientation			Station Number		Mag	VLF Frequency			Initialization Direction	Paces Between Stations
		Azimuth (Degrees)		Compass Quadrant				1	2	3		
		(Magnetic)	(Geographic)		Start	End	(Y/N)	(kHz)	(kHz)	(kHz)	(Deg.)	
4/19/2006	10	340	331	NW	1358	1490	y	24.0	25.2	NM	340	10
4/19/2006	20	160	151	SE	1491	1605	y	24.0	25.2	NM		10
4/19/2006	30	280	271	WSW	1607	1697	y	24.0	25.2	NM		10
4/19/2006	40	100	91	ENE	1698	1764	y	24.0	25.2	NM		10
4/20/2006	50	19	10	NNE	1766	1910	y	24.0	25.2	NM		10
4/20/2006	60	199	190	SSW	1911	2043	y	24.0	25.2	NM		10
4/20/2006	70	287	278	WNW	2045	2139	y	24.0	25.2	NM		10
4/20/2006	80	87	78	ENE	2140	2231	y	24.0	25.2	NM		10
4/20/2006	90	105	96	ESE	2233	2281	y	24.0	25.2	NM		10
4/20/2006	100	285	276	WNW	2282	2323	y	24.0	25.2	NM		10

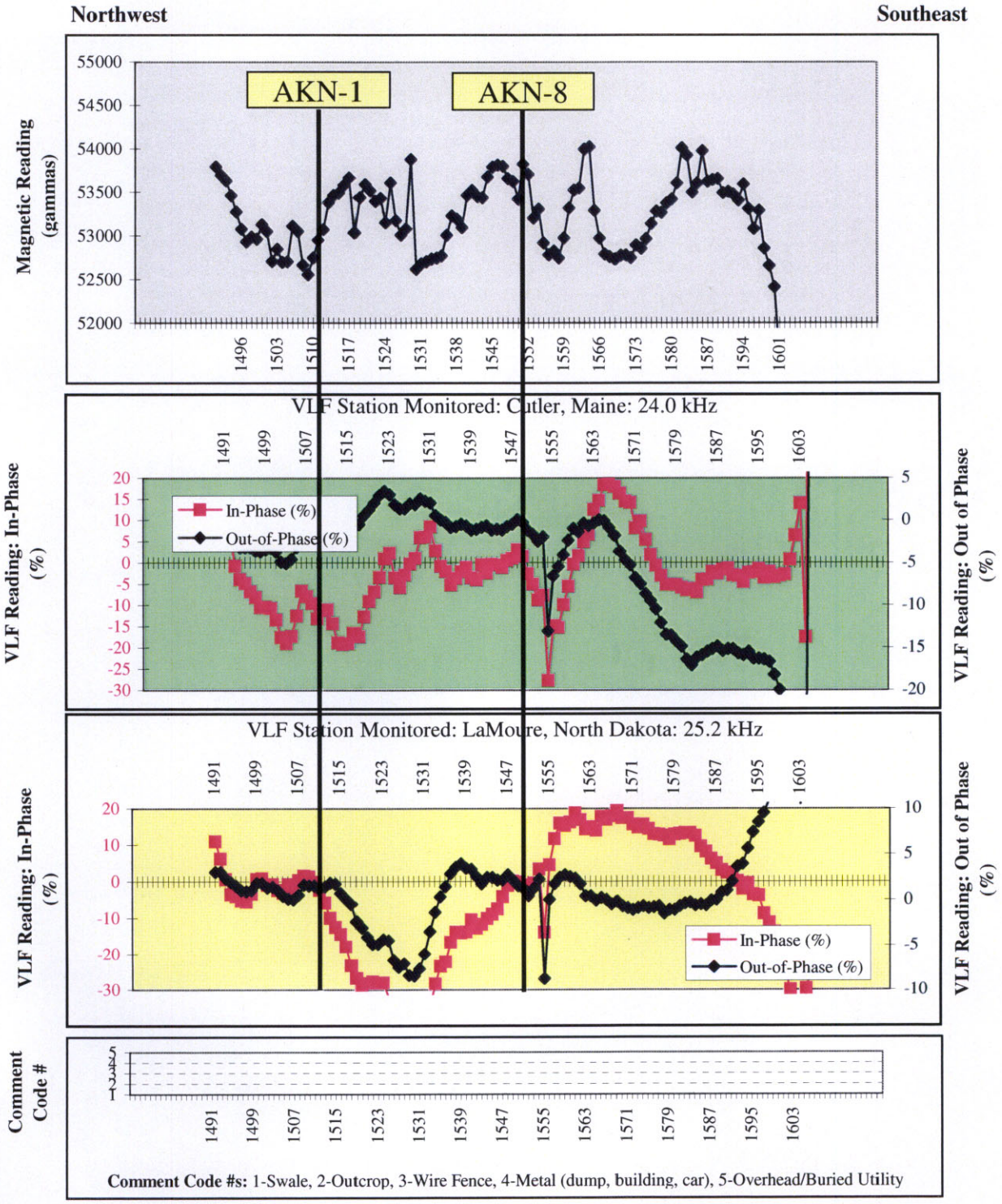
Data for Geophysical Survey Line
L10



Station number along geophysical survey line
(Approximately 28 feet between stations)

Geophysical Signature of the Bedrock Underlying
Arrington Knolls
Fauquier County, Virginia

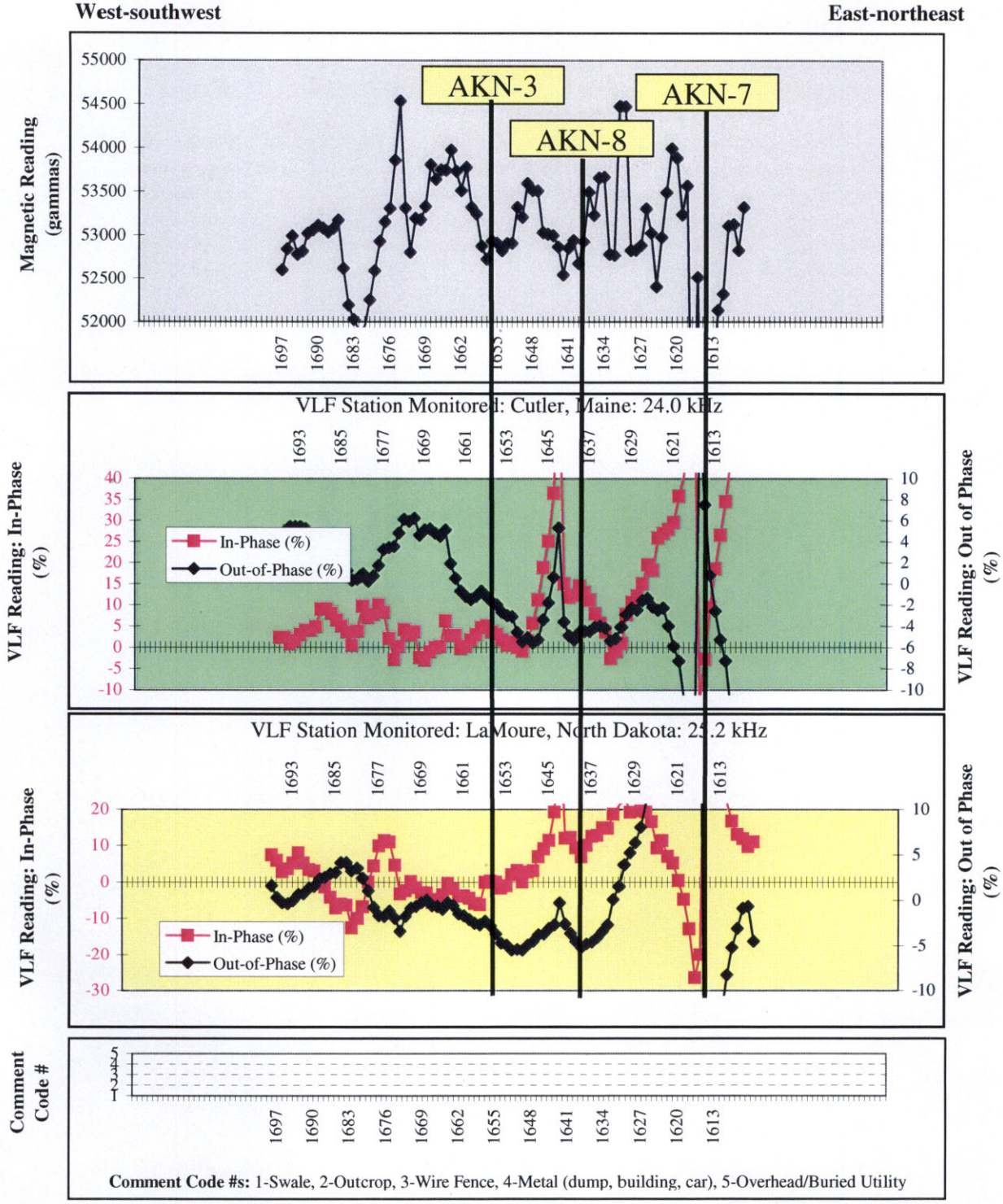
Data for Geophysical Survey Line
L20



Station number along geophysical survey line
(Approximately 28 feet between stations)

Geophysical Signature of the Bedrock Underlying Arrington Knolls Fauquier County, Virginia

Data for Geophysical Survey Line
L30

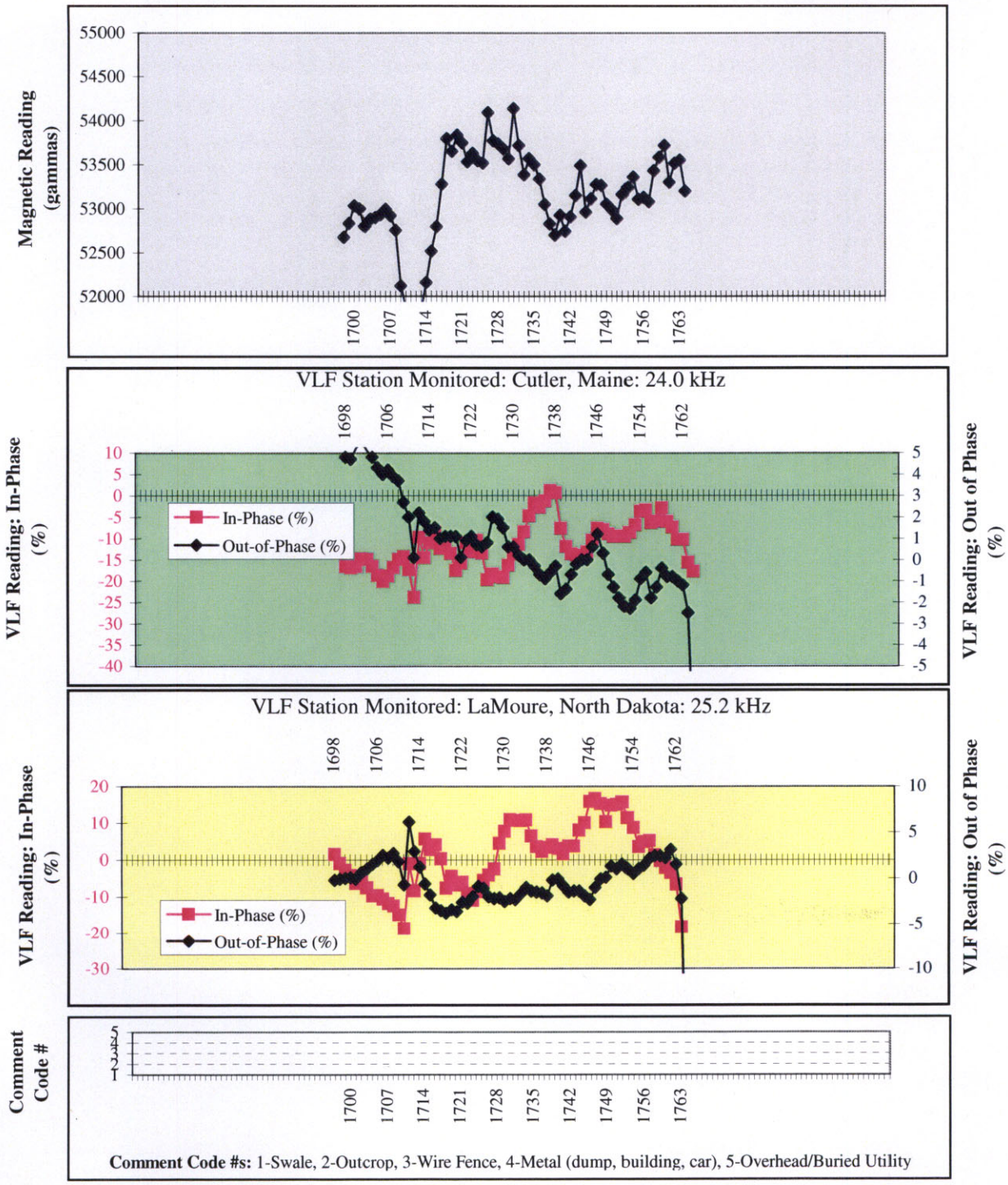


Station number along geophysical survey line
(Approximately 28 feet between stations)

Geophysical Signature of the Bedrock Underlying Arrington Knolls Fauquier County, Virginia

Data for Geophysical Survey Line
L40

West-southwest **East-northeast**



Comment Code #s: 1-Swale, 2-Outcrop, 3-Wire Fence, 4-Metal (dump, building, car), 5-Overhead/Buried Utility

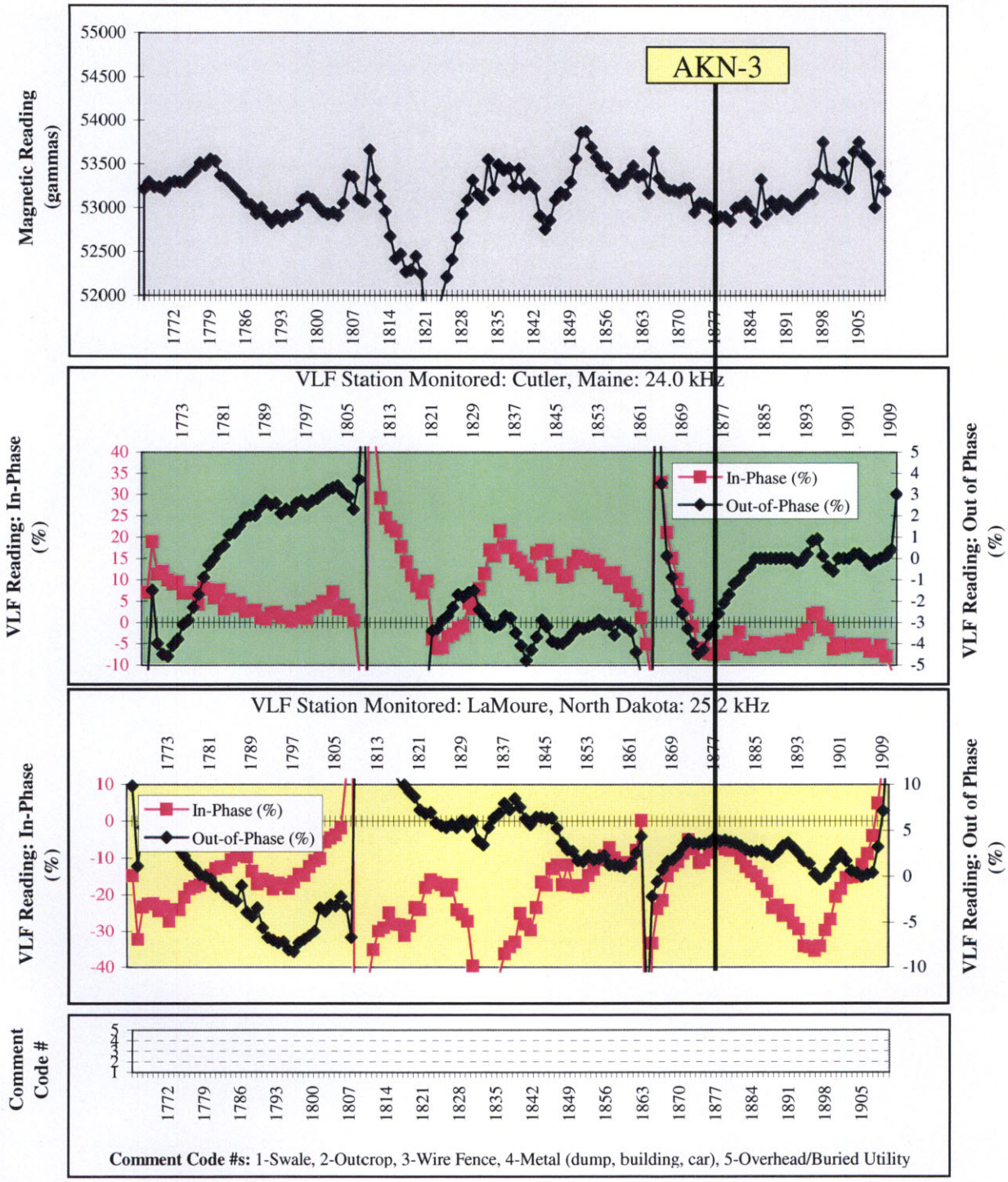
Station number along geophysical survey line

(Approximately 28 feet between stations)

Geophysical Signature of the Bedrock Underlying
Arrington Knolls
Fauquier County, Virginia

Data for Geophysical Survey Line
L50

South-southwest **North-northeast**

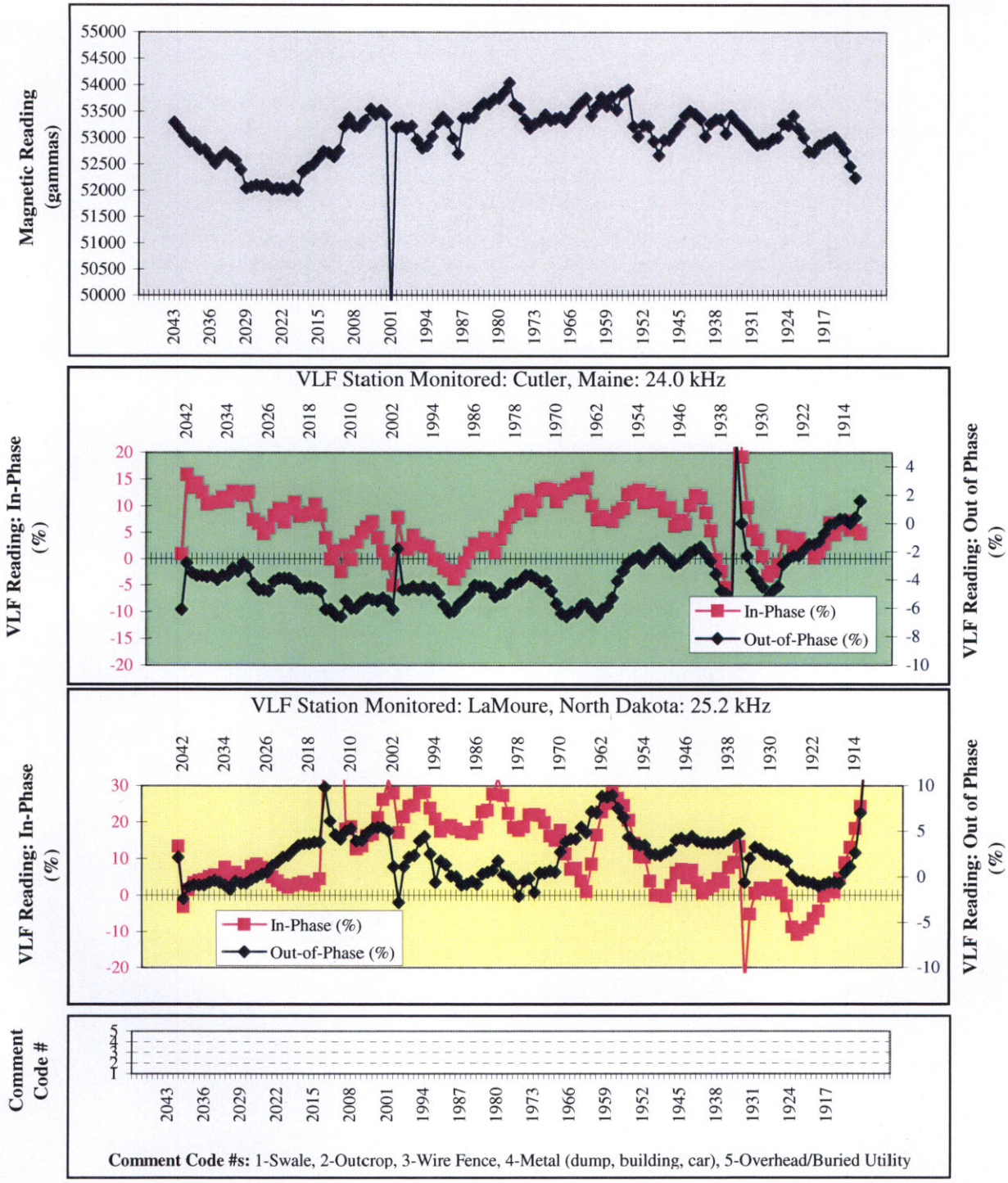


Station number along geophysical survey line
(Approximately 28 feet between stations)

Geophysical Signature of the Bedrock Underlying Arrington Knolls Fauquier County, Virginia

Data for Geophysical Survey Line
L60

South-southwest **North-northeast**

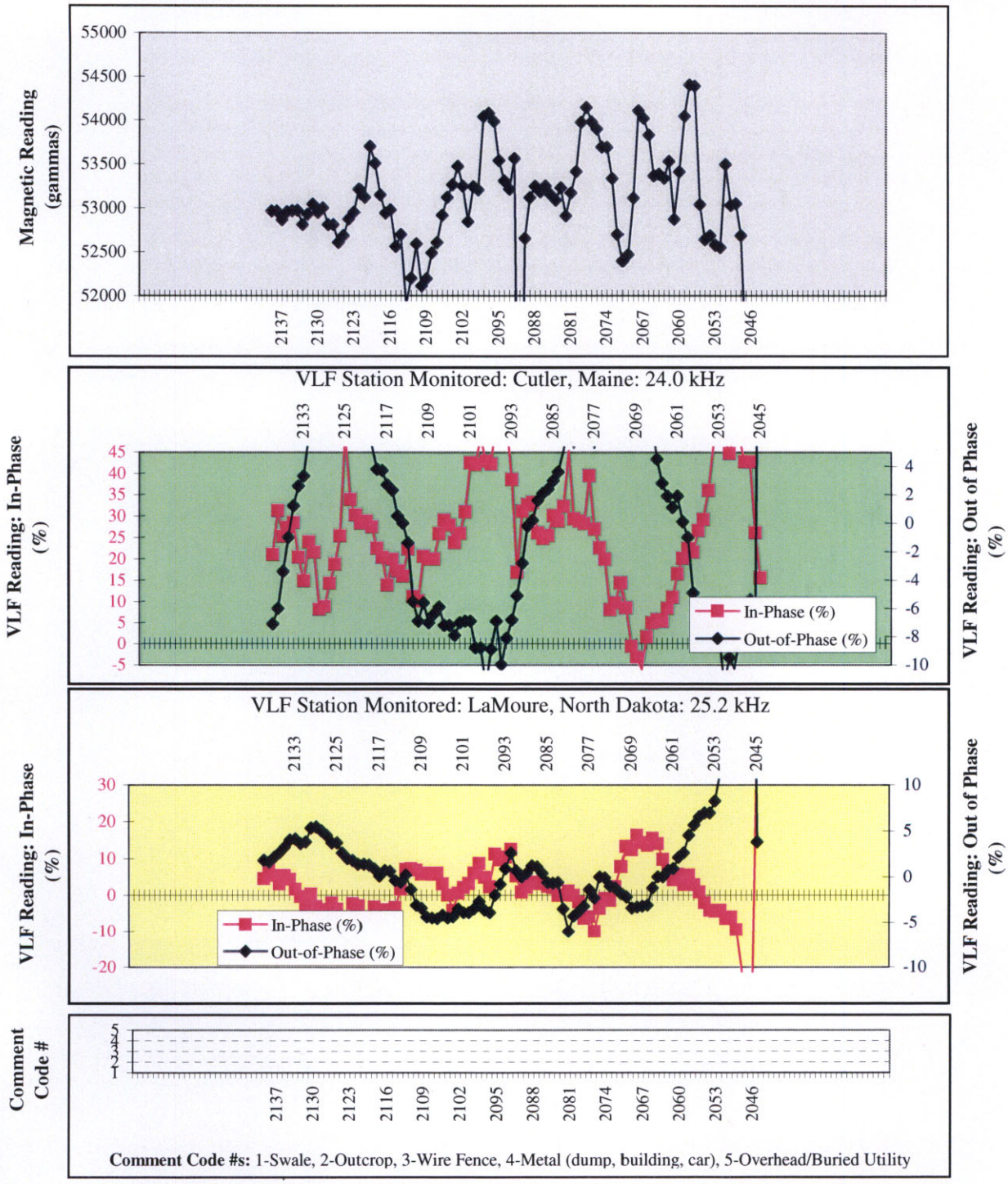


Station number along geophysical survey line
(Approximately 28 feet between stations)

Geophysical Signature of the Bedrock Underlying Arrington Knolls Fauquier County, Virginia

Data for Geophysical Survey Line
L70

West-northwest **East-southeast**



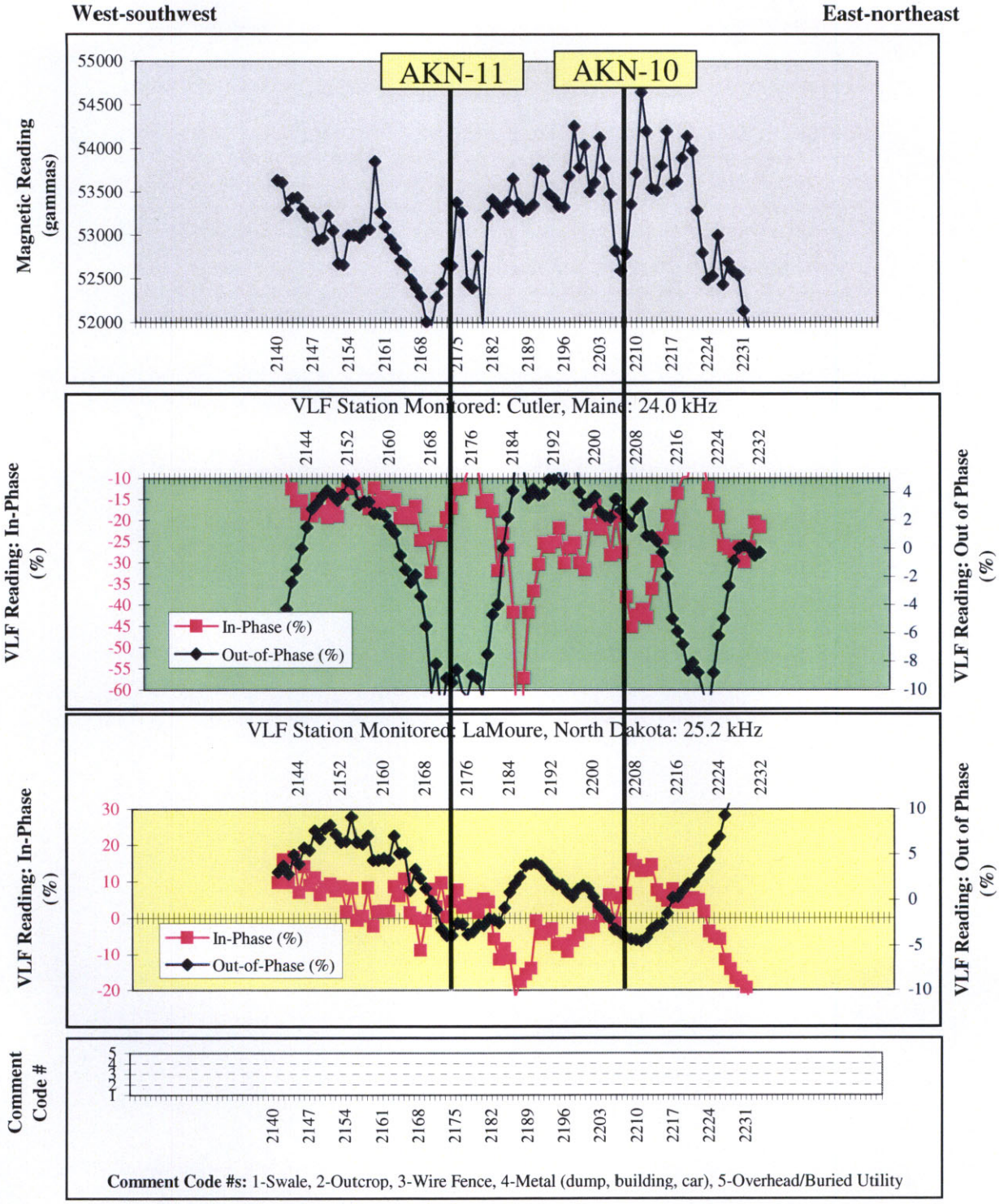
Comment Code #s: 1-Swale, 2-Outcrop, 3-Wire Fence, 4-Metal (dump, building, car), 5-Overhead/Buried Utility

Station number along geophysical survey line

(Approximately 28 feet between stations)

Geophysical Signature of the Bedrock Underlying
Arrington Knolls
Fauquier County, Virginia

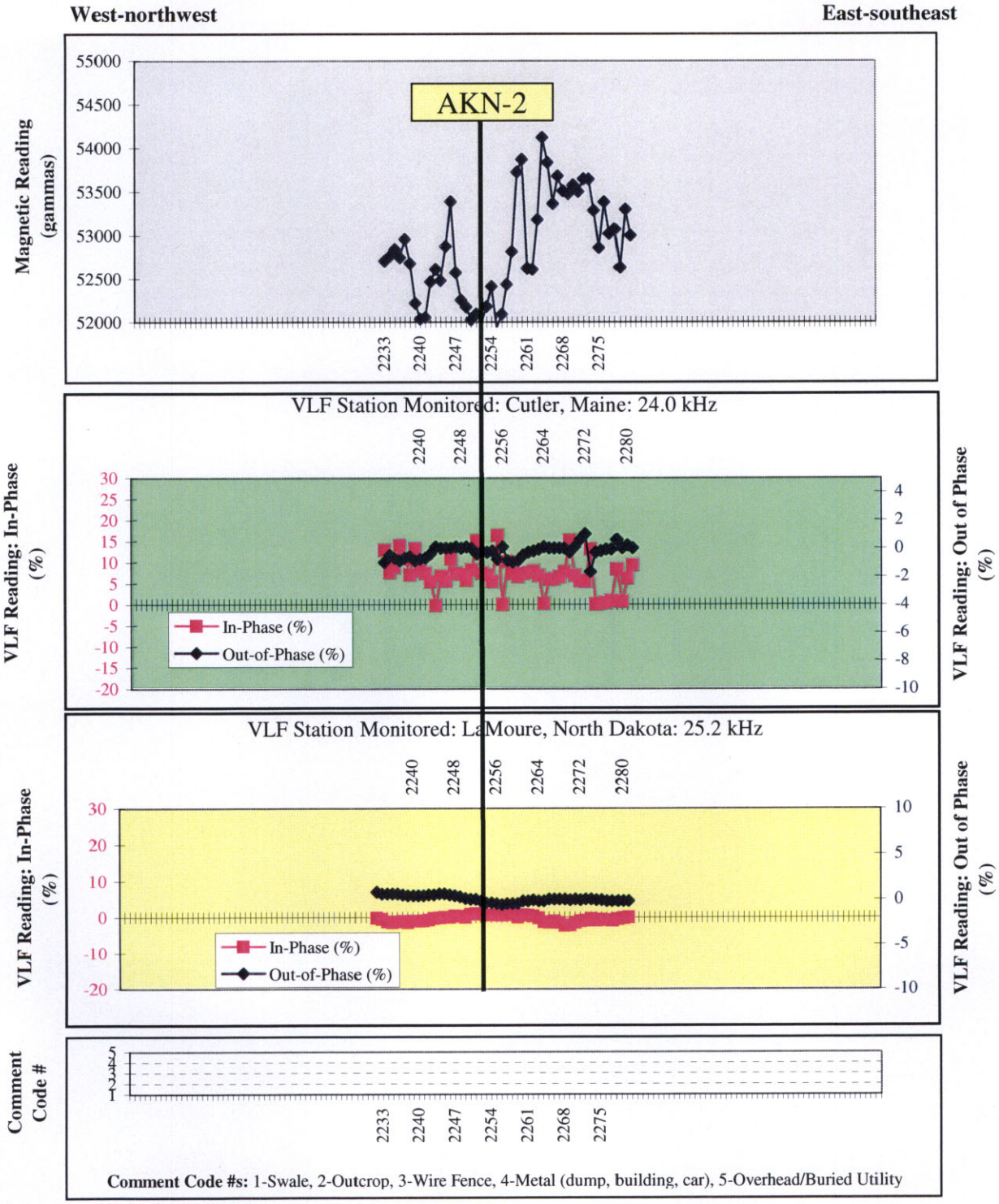
Data for Geophysical Survey Line
L80



Station number along geophysical survey line
(Approximately 28 feet between stations)

Geophysical Signature of the Bedrock Underlying
Arrington Knolls
Fauquier County, Virginia

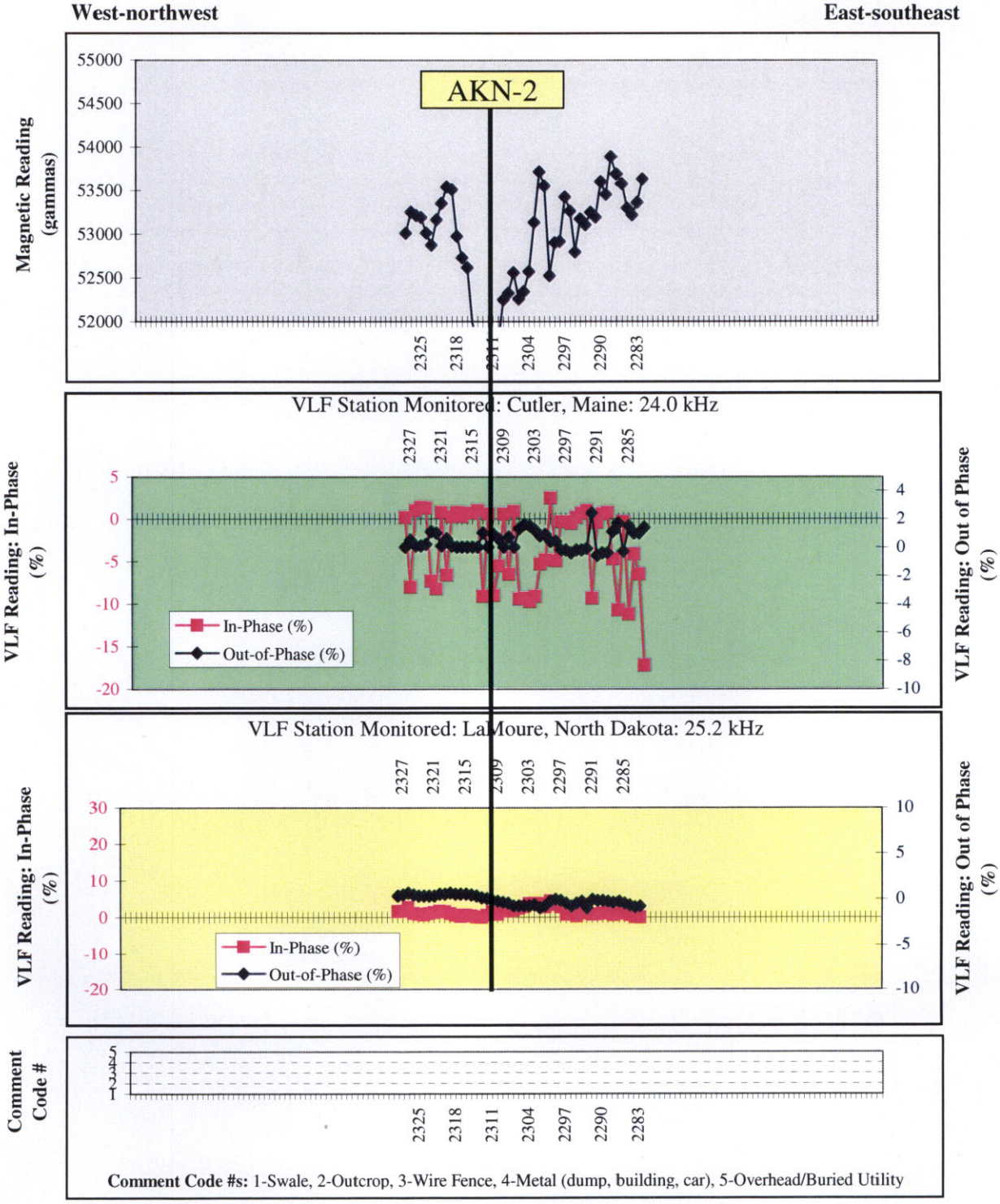
Data for Geophysical Survey Line
L90



Station number along geophysical survey line
(Approximately 28 feet between stations)

Geophysical Signature of the Bedrock Underlying
Arrington Knolls
Fauquier County, Virginia

Data for Geophysical Survey Line
L100



Station number along geophysical survey line
(Approximately 28 feet between stations)

Geophysical Signature of the Bedrock Underlying
Arrington Knolls
Fauquier County, Virginia

Resistivity Surveys

Emery & Garrett Groundwater, Inc.

Field Information for ABEM Surveys
Project: Arrington Knolls
Location: Warrenton, Virginia

Line number	File Name (S4K file)	Date of Survey	Time Survey Started	Survey Type (SCH, WEN, DIP)	Surveyor's Initials	Orientation(Degrees MN)	Orientation(Degrees GN)	Station Spacing (m)	Roll-along number	Output (mA)	Acq. Delay (msec)	Acq. Time (msec)	Min Stacks:	Max Stacks:	Error limit (%)	Accepted Power limit (mA):	Cables Used: Stations 1-10	Stations 11-21	Stations 21-30	Stations 31-41	Comments
AKN-R1	R1G	5/18/2006	8:00	grad	rpa	155	147	10	-	200	0.3	0.5	1	3	1	10	C	C	D	D	
AKN-R1	R1D	5/18/2006	8:40	dip	rpa	155	147	10	-	200	0.3	0.5	1	3	1	10	C	C	D	D	
AKN-R1	R1G	5/18/2006	9:00	grad	rpa	155	147	10	1	200	0.3	0.5	1	3	1	10	D	D	C	C	
AKN-R1	R1D	5/18/2006	9:30	dip	rpa	155	147	10	1	200	0.3	0.5	1	3	1	10	D	D	C	C	
AKN-R1	R1G	5/18/2006	10:00	grad	rpa	155	147	10	2	200	0.3	0.5	1	3	1	10	C	C	D	D	
AKN-R1	R1D	5/18/2006	10:30	dip	rpa	155	147	10	2	200	0.3	0.5	1	3	1	10	C	C	D	D	
AKN-R1	R1G	5/18/2006	11:00	grad	rpa	155	147	10	3	200	0.3	0.5	1	3	1	10	D	D	C	C	
AKN-R1	R1D	5/18/2006	11:30	dip	rpa	155	147	10	3	200	0.3	0.5	1	3	1	10	D	D	C	C	
AKN-R1	R1G	5/18/2006	12:00	grad	rpa	155	147	10	4	200	0.3	0.5	1	3	1	10	C	C	D	D	#115-121 off
AKN-R1	R1D	5/18/2006	12:30	dip	rpa	155	147	10	4	200	0.3	0.5	1	3	1	10	C	C	D	D	#115-121 off
AKN-R2	R2G	5/18/2006	1:30	grad	rpa	68	60	10	-	200	0.3	0.5	1	3	1	10	C	C	D	D	
AKN-R2	R2D	5/18/2006	2:00	dip	rpa	68	60	10	-	200	0.3	0.5	1	3	1	10	C	C	D	D	
AKN-R3	R3D	5/22/2006	2:40	Dip	mw	102	94	10	-	200	0.3	0.5	1	3	1	10	C1	C10	D1	D10	
AKN-R3	R3G	5/22/2006	3:10	Grad	mw	102	94	10	-	200	0.3	0.5	1	3	1	10	C1	C10	D1	D10	
AKN-R3	R3G	5/22/2006	4:00	Grad	mw	102	94	10	-1	200	0.3	0.5	1	3	1	10	D1	D10	C1	C10	roll down

Field Information for ABEM Surveys
Project: Arrington Knolls
Location: Fauquier County, Virginia

Line number	File Name (S4K file)	Date of Survey	Time Survey Started	Survey Type (SCH, WEN, DIP)	Surveyor's Initials	Orientation(Degrees MN)	Orientation(Degrees GN)	Station Spacing (m)	Roll-along number	Output (mA)	Acq. Delay (msec)	Acq. Time (msec)	Min Stacks:	Max Stacks:	Error limit (%)	Accepted Power limit (mA):	Cables Used: Stations 1-10	Stations 11-21	Stations 21-30	Stations 31-41	Comments
AKN-R3D2	RD2	5/22/2006	4:20	dip	mw	102	94	10	-1	200	0.3	0.5	1	3	1	10	D1	D10	C1	C10	separate diploe line than R3D
AKN-R4G	R4G	5/25/2006	8:45	grad	MW	107	99	10	-	200	0.3	0.5	1	3	1	10	C1	C10	D1	D10	
AKN-R4D	AKN	5/25/2006	9:30	dip	MW	107	99	10	-	200	0.3	0.5	1	3	1	10	C1	C10	D1	D10	
AKN-R4D	R4D	5/25/2006	10:45	dip	MW	107	99	10	1	200	0.3	0.5	1	3	1	10	D1	D10	C1	C10	
AKN-R4G	R4G	5/25/2006	11:30	grad	MW	107	99	10	1	200	0.3	0.5	1	3	1	10	D1	D10	C1	C10	
AKN-R5G	R5G	5/25/2006	1:45	grad	MW	102	94	10	-	200	0.3	0.5	1	3	1	10	C1	C10	D1	D10	
AKN-R5D	R5D	5/25/2006	2:30	dip	MW	102	94	10	-	200	0.3	0.5	1	3	1	10	C1	C10	D1	D10	
AKN-R5G	R5G	5/25/2006	3:10	grad	MW	102	94	10	1	200	0.3	0.5	1	3	1	10	D1	D10	C1	C10	
AKN-R5D	R5D	5/25/2006	3:40	dip	MW	102	94	10	1	200	0.3	0.5	1	3	1	10	D1	D10	C1	C10	
AKN-R6D	R6D	5/25/2006	5:15	dip	MW	107	99	10	-	200	0.3	0.5	1	3	1	10	C1	C10	D1	D10	
AKN-R6G	R6G	5/25/2006	5:15	grad	MW	107	99	10	-	200	0.3	0.5	1	3	1	10	C1	C10	D1	D10	
AKN-R7D	R7G	5/25/2006	8:25	dip	MW	119	111	10	-	200	0.3	0.5	1	3	1	10	C1	C10	D1	D10	
AKN-R7GC	R7GG	5/25/2006	9:00	grad	MW	119	111	10	-	200	0.3	0.5	1	3	1	10	C1	C10	D1	D10	

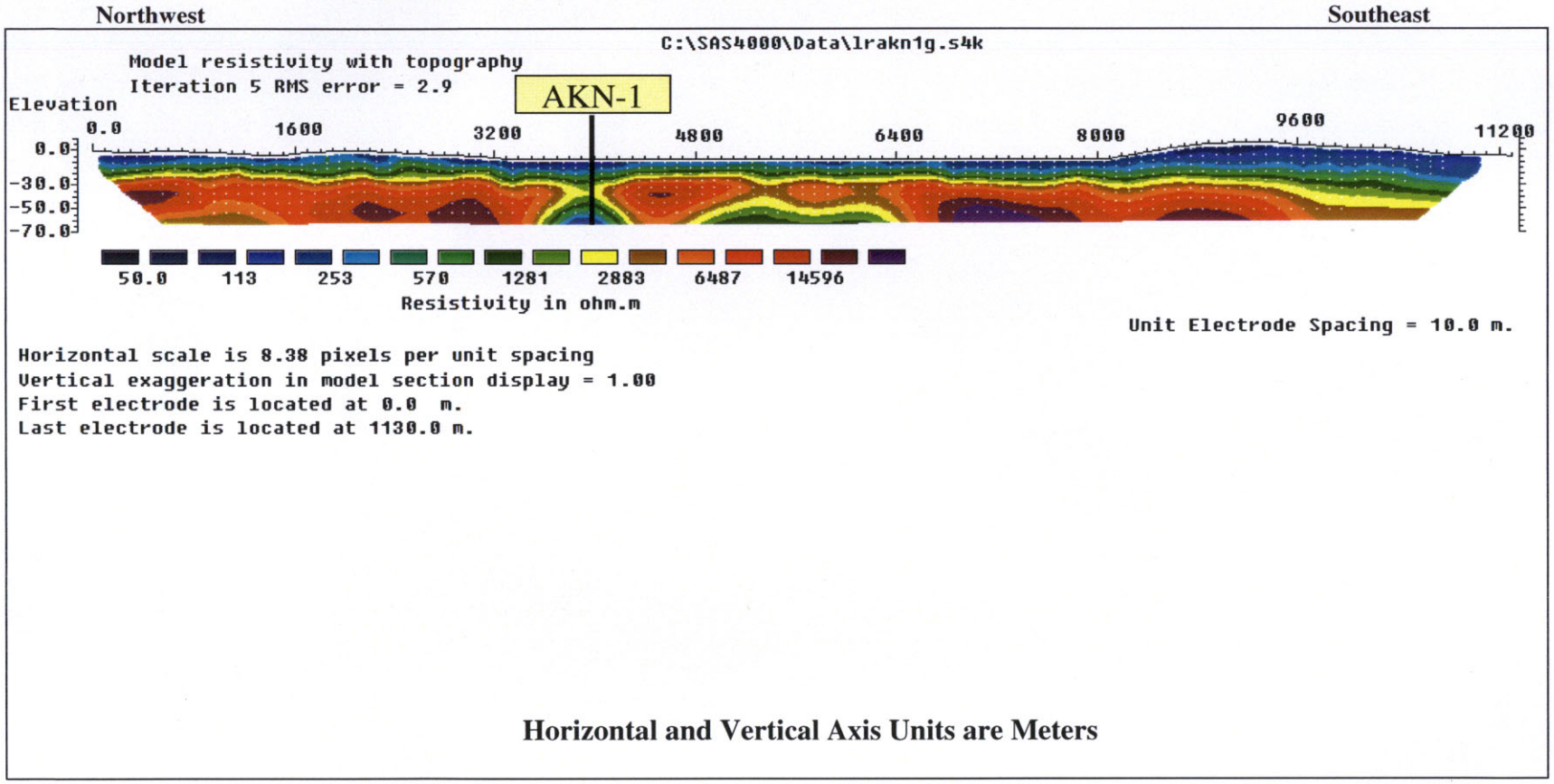
Field Information for ABEM Surveys
Project: Arrington Knolls
Location: Fauquier County, Virginia

Line number	File Name (S4K file)	Date of Survey	Time Survey Started	Survey Type (SCH, WEN, DIP)	Surveyor's Initials	Orientation(Degrees MN)	Orientation(Degrees GN)	Station Spacing (m)	Roll-along number	Output (mA)	Acq. Delay (msec)	Acq. Time (msec)	Min Stacks:	Max Stacks:	Error limit (%)	Accepted Power limit (mA):	Cables Used: Stations 1-10	Stations 11-21	Stations 21-30	Stations 31-41	Comments
AKN-R6G	R6G	5/25/2006	5:15	GRAD	MW	107	99	10	-	200	0.3	0.5	1	3	1	10	C1	C10	D1	D10	
AKN-R7D	R7G	5/25/2006	8:25	DIP	MW	119	111	10	-	200	0.3	0.5	1	3	1	10	C1	C10	D1	D10	
AKN-R7GG	R7GG	5/25/2006	9:00	GRAD	MW	119	111	10	-	200	0.3	0.5	1	3	1	10	C1	C10	D1	D10	
AKN-R8G	R8G	6/6/2006	11:13	GRAD	JM	188	180	10	-	200	0.3	0.5	1	3	1	10	C1	D10	D1	C10	
AKN-R8D	R8D	6/6/2006	11:47	DIP	JM	188	180	10	-	200	0.3	0.5	1	3	1	10	C1	D10	D1	C10	
AKN-R8D	R8D	6/6/2006	12:46	DIP	JM	188	180	10	1	200	0.3	0.5	1	3	1	10	D1	C10	C1	D10	
AKN-R8G	R8G	6/6/2006	13:00	GRAD	JM	188	180	10	1	200	0.3	0.5	1	3	1	10	D1	C10	C1	D10	
AKN-R8G	R8G	6/6/2006	13:57	GRAD	JM	188	180	10	1	200	0.3	0.5	1	3	1	10	C1	D10	D1	C10	
AKN-R8D	R8D	6/6/2006	14:01	DIP	JM	188	180	10	1	200	0.3	0.5	1	3	1	10	C1	D10	D1	C10	
AKN-R9G	R9G	6/6/2006	16:13	GRAD	JM	187	179	10	-	200	0.3	0.5	1	3	1	10	C1	C10	D1	D10	
AKN-R9G	R9D	6/6/2006	16:41	DIP	JM	187	179	10	-	200	0.3	0.5	1	3	1	10	C1	C10	D1	D10	
AKN-R9G	R9D	6/6/2006	17:36	DIP	JM	187	179	10	1	200	0.3	0.5	1	3	1	10	D1	D10	C1	C10	
AKN-R9G	R9G	6/6/2006	18:13	GRAD	JM	187	179	10	1	200	0.3	0.5	1	3	1	10	D1	D10	C1	C10	
AKN-R10D	R10D	6/7/2006	9:18	DIP	JM	25	17	10	-	200	0.3	0.5	1	3	1	10	D1	D10	C1	C10	
AKN-R10G	R10G	6/7/2006	9:42	GRAD	JM	25	17	10	1	200	0.3	0.5	1	3	1	10	D1	D10	C1	C10	

Field Information for ABEM Surveys
Project: Arrington Knolls
Location: Fauquier County, Virginia

Line number	File Name (S4K file)	Date of Survey	Time Survey Started	Survey Type (SCH, WEN, DIP)	Surveyor's Initials	Orientation(Degrees MN)	Orientation(Degrees GN)	Station Spacing (m)	Roll-along number	Output (mA)	Acq. Delay (msec)	Acq. Time (msec)	Min Stacks:	Max Stacks:	Error limit (%)	Accepted Power limit (mA):	Cables Used: Stations 1-10	Stations 11-21	Stations 21-30	Stations 31-41	Comments
R10D	AKNR10D	6/7/2006	11:09	DIP	JM	25	17	10	-	200	0.3	0.5	1	3	1	10	C1	C10	D1	D10	
R10G	AKN10G	6/7/2006	11:45	GRAD	JM	25	17	10	1	200	0.3	0.5	1	3	1	10	D1	D10	C1	C10	

Electrical Resistivity Survey Line R1G
Arrington Knolls
Warrenton, Virginia



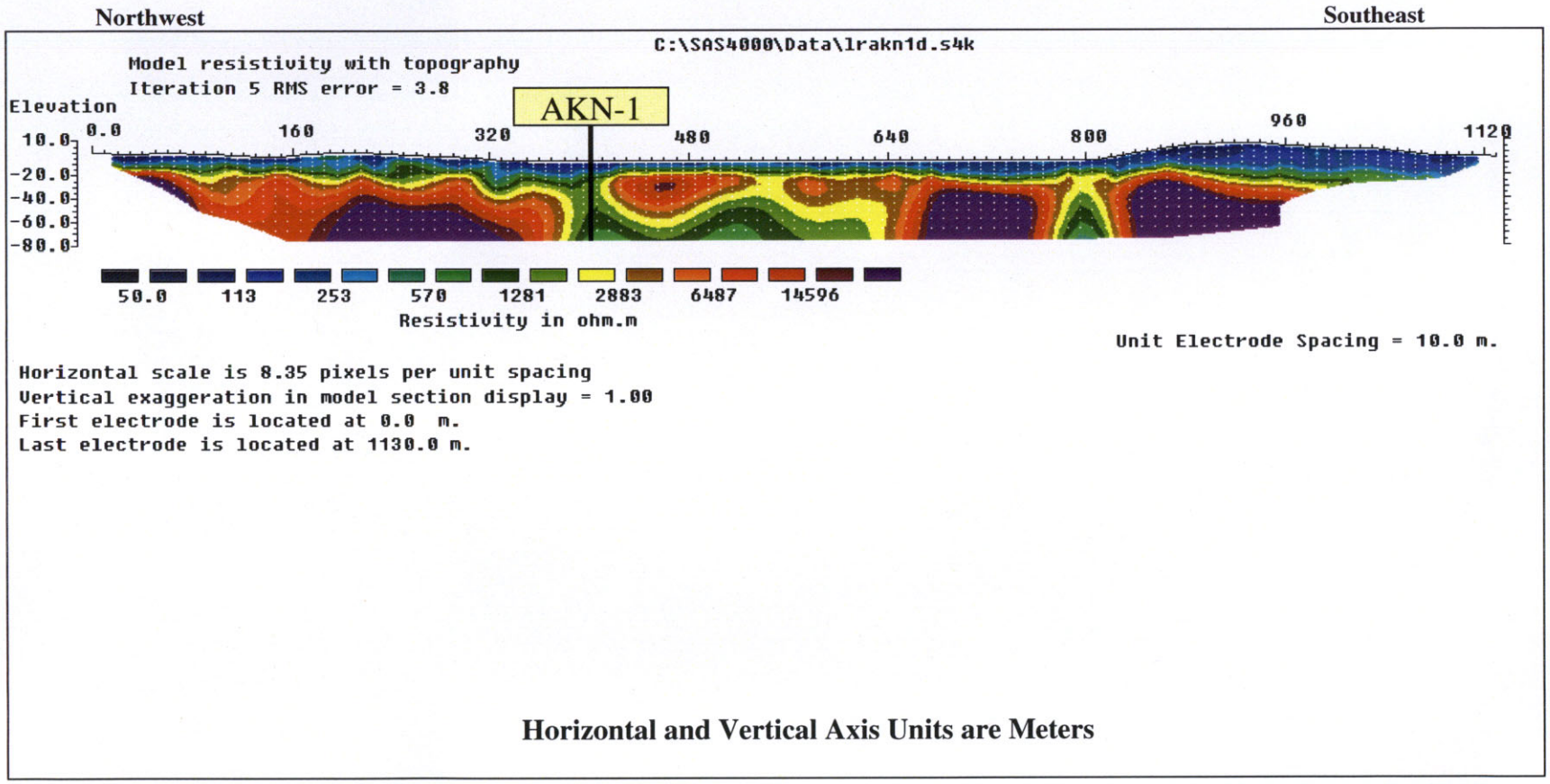
Horizontal and Vertical Axis Units are Meters

Survey Type: Gradient
Electrode Spacing (m.): 10
Vertical/Horizontal Scale Ratio: 1
Line orientation (geographic degrees): 147

Raw Data Quality Error Percent		
Minimum	Maximum	Average
0.000	1.79304	0.0497759

Number of Data Points		
Surveyed	After Modeling	Number Removed
1296	1296	0

Electrical Resistivity Survey Line R1D
Arrington Knolls
Warrenton, Virginia



Horizontal and Vertical Axis Units are Meters

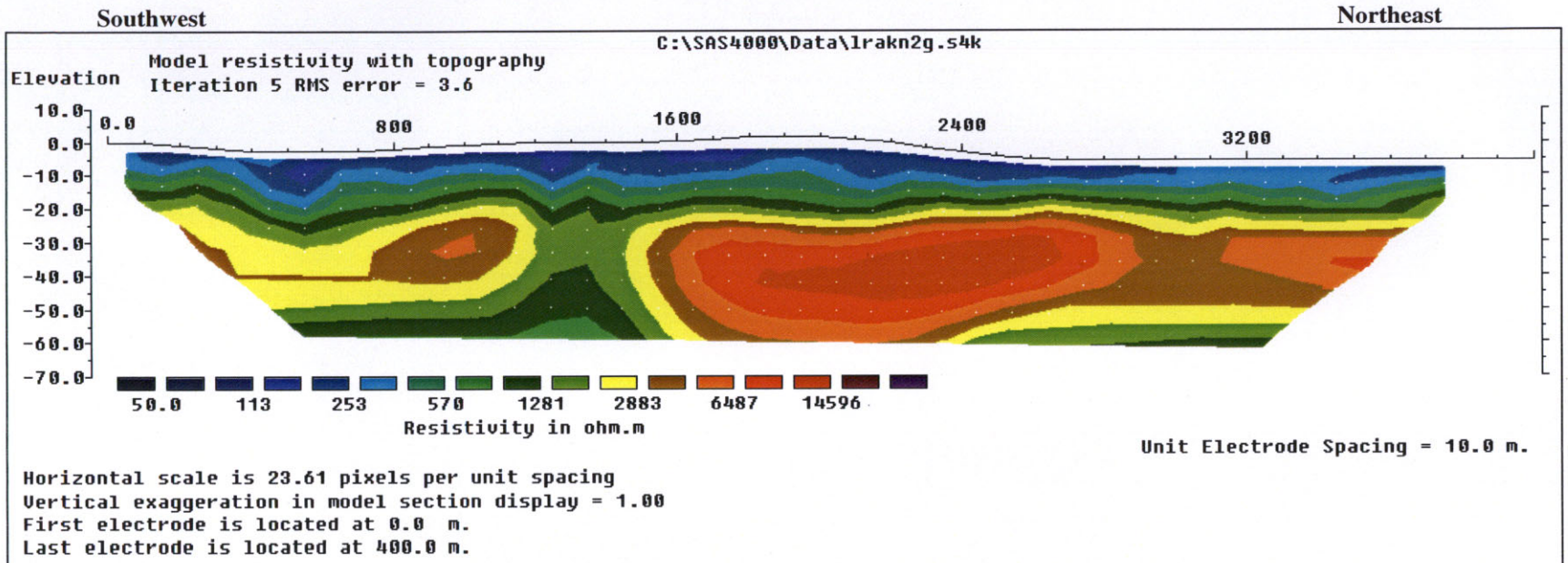
Survey Type: Dipole-dipole
Electrode Spacing (m.): 10
Vertical/Horizontal Scale Ratio: 1
Line orientation (geographic degrees): 147

Raw Data Quality Error Percent		
Minimum	Maximum	Average
0.000	4.231207	0.1242921

Number of Data Points		
Surveyed	After Modeling	Number Removed
1085	1085	0

Emery & Garrett Groundwater, Inc.

Electrical Resistivity Survey Line R2G
Arrington Knolls
Warrenton, Virginia



Horizontal and Vertical Axis Units are Meters

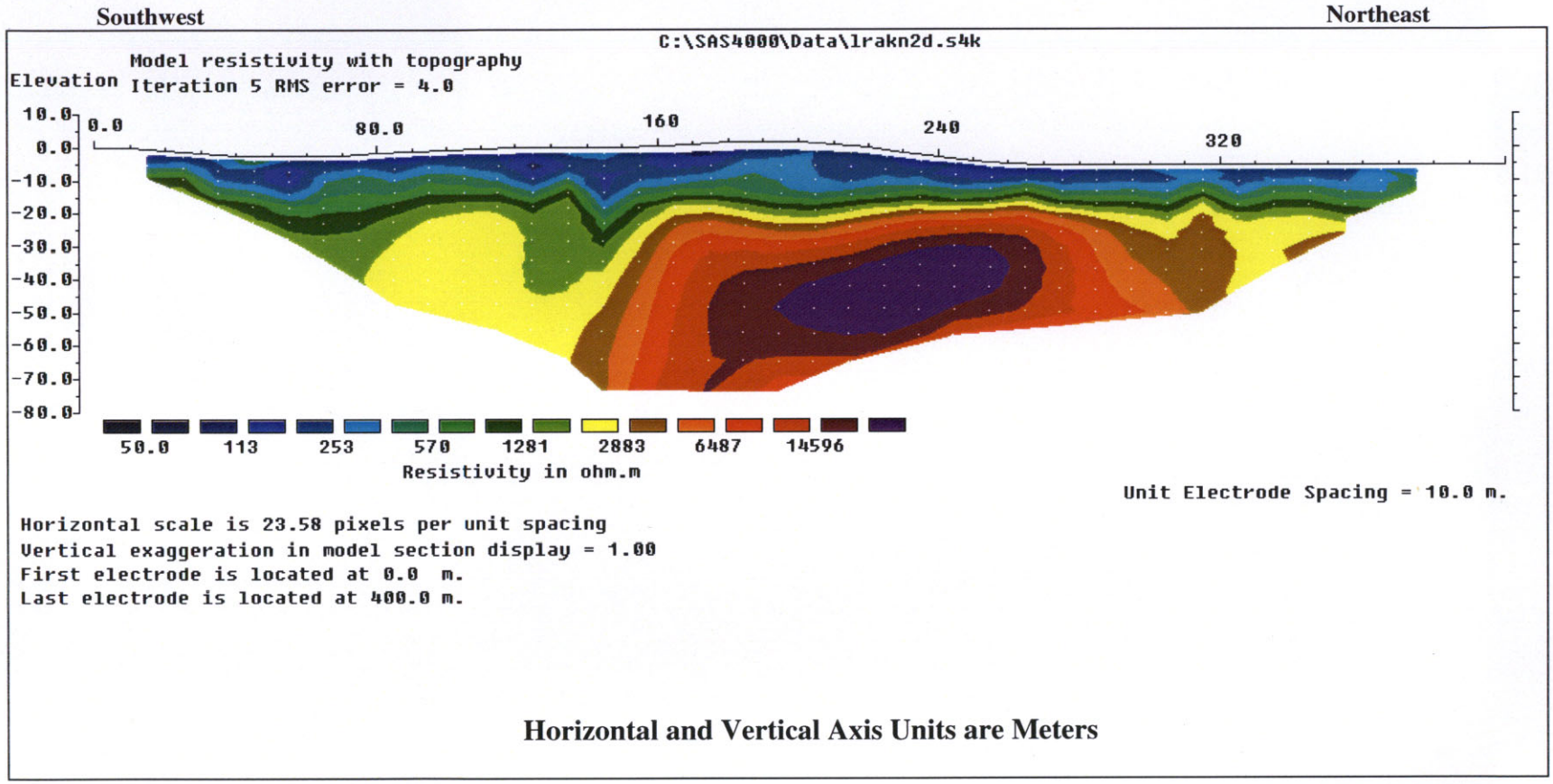
Survey Type: Gradient
Electrode Spacing (m.): 10
Vertical/Horizontal Scale Ratio: 1
Line orientation (geographic degrees): 60

Raw Data Quality Error Percent		
Minimum	Maximum	Average
0.000	0.969275	0.0447244

Number of Data Points		
Surveyed	After Modeling	Number Removed
504	504	0

Emery & Garrett Groundwater, Inc.

Electrical Resistivity Survey Line R2D
Arrington Knolls
Warrenton, Virginia



Horizontal and Vertical Axis Units are Meters

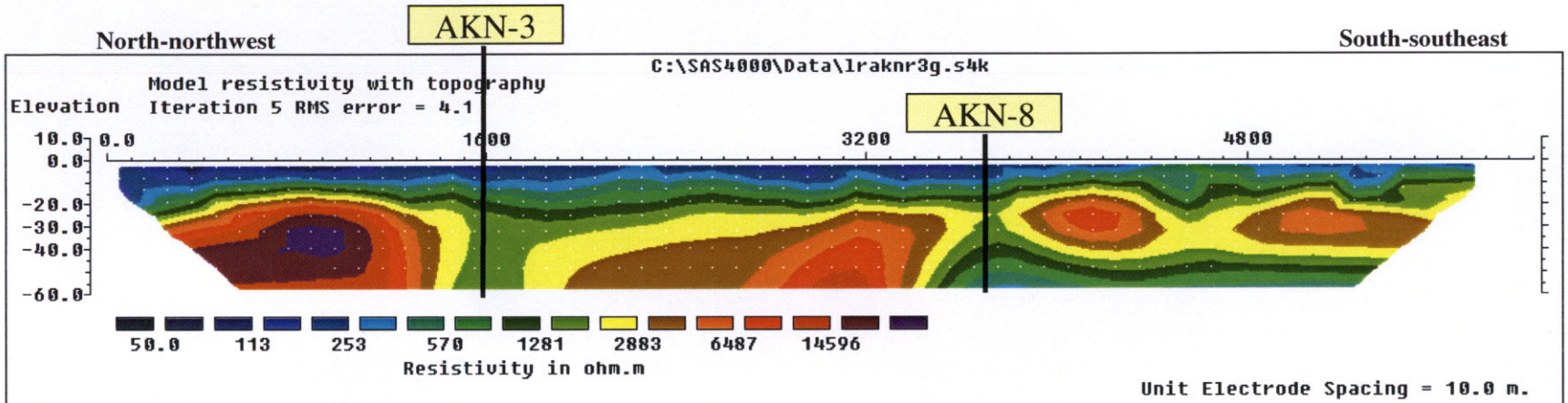
Survey Type: Dipole-dipole
Electrode Spacing (m.): 10
Vertical/Horzizontal Scale Ratio: 1
Line orientation (geographic degrees): 60

Raw Data Quality		
Error Percent		
Minimum	Maximum	Average
0.000	172.14145	0.6603557

Number of Data Points		
Surveyed	After Modeling	Number Removed
372	372	0

Emery & Garrett Groundwater, Inc.

Electrical Resistivity Survey Line R3G
Arrington Knolls
Warrenton, Virginia



Horizontal and Vertical Axis Units are Meters

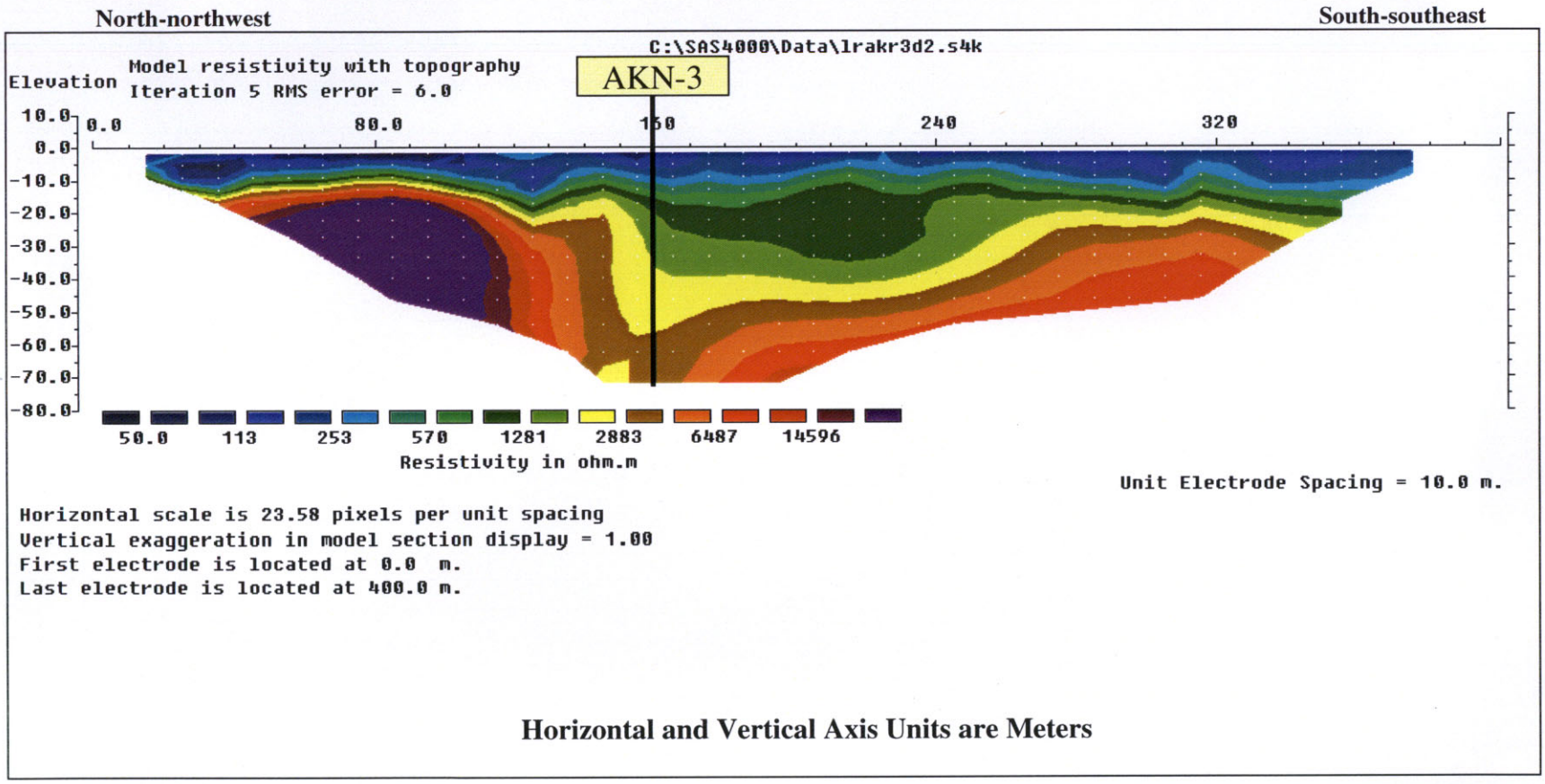
Survey Type: Gradient
Electrode Spacing (m.): 10
Vertical/Horzizontal Scale Ratio: 1
Line orientation (geographic degrees): 155

Raw Data Quality Error Percent		
Minimum	Maximum	Average
0.000	0.803274	0.0464921

Number of Data Points		
Surveyed	After Modeling	Number Removed
744	744	0

Emery & Garrett Groundwater, Inc.

Electrical Resistivity Survey Line R3D
Arrington Knolls
Warrenton, Virginia



Horizontal and Vertical Axis Units are Meters

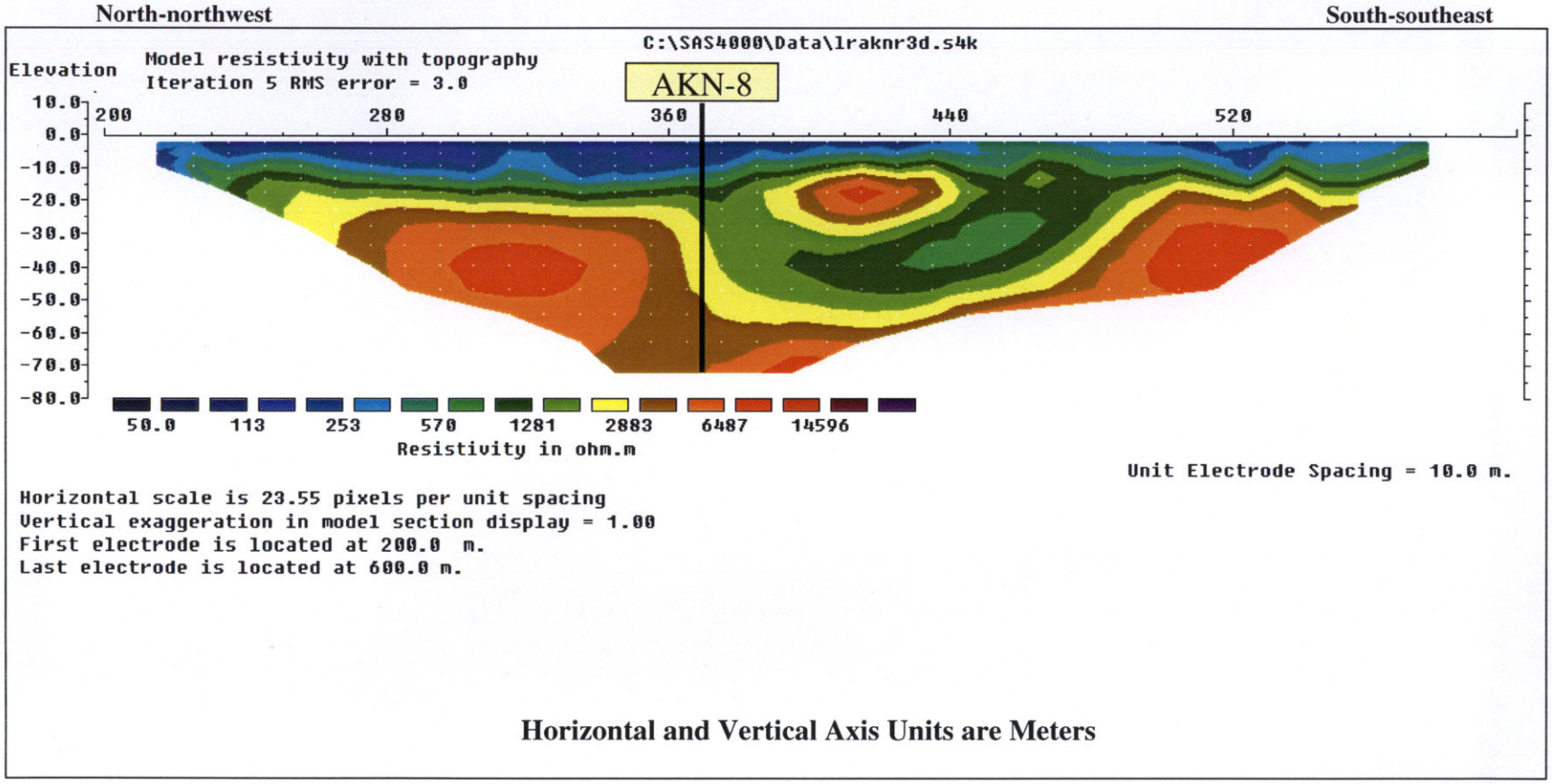
Survey Type: Dipole-dipole
Electrode Spacing (m.): 10
Vertical/Horizontal Scale Ratio: 1
Line orientation (geographic degrees): 155

Raw Data Quality Error Percent		
Minimum	Maximum	Average
0.000	0.965858	0.1545476

Number of Data Points		
Surveyed	After Modeling	Number Removed
372	301	71

Emery & Garrett Groundwater, Inc.

Electrical Resistivity Survey Line R3D
Arrington Knolls
Warrenton, Virginia



Horizontal and Vertical Axis Units are Meters

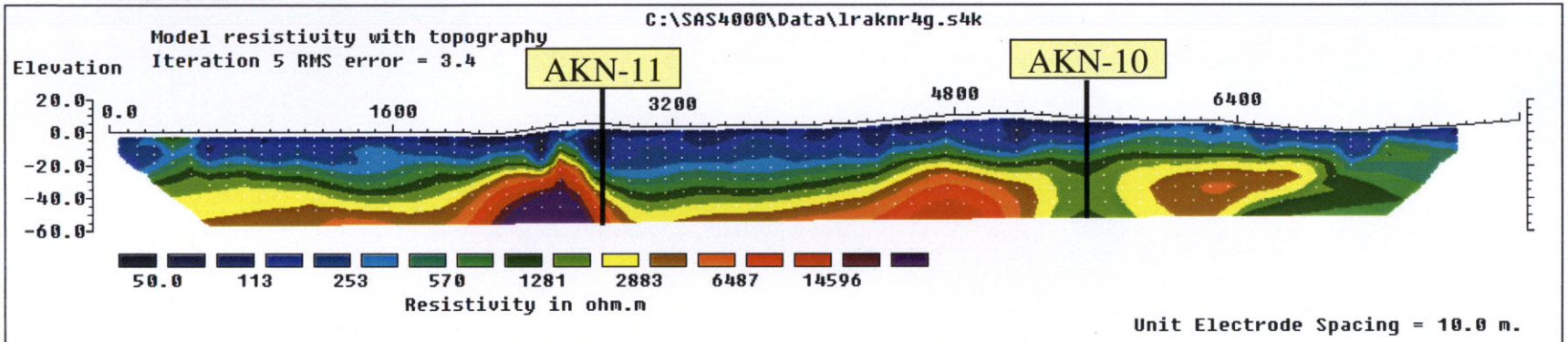
Survey Type: Dipole-dipole
Electrode Spacing (m.): 10
Vertical/Horzizontal Scale Ratio: 1
Line orientation (geographic degrees): 155

Raw Data Quality		
Error Percent		
Minimum	Maximum	Average
0.001	5.325594	0.1641736

Number of Data Points		
Surveyed	After Modeling	Number Removed
372	372	0

Electrical Resistivity Survey Line R4G
Arrington Knolls
Warrenton, Virginia

North-northwest | South-southeast



Horizontal and Vertical Axis Units are Meters

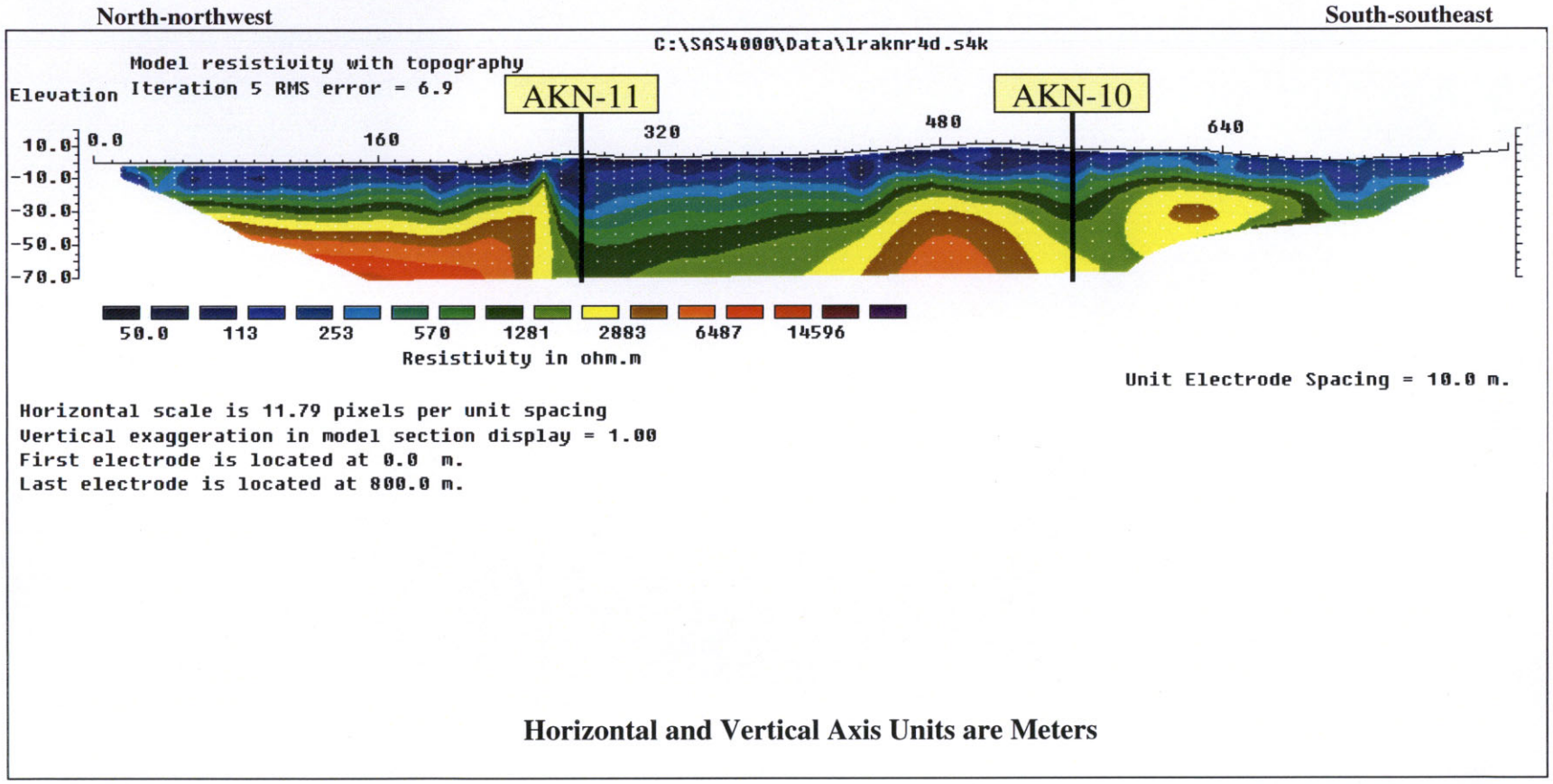
Survey Type: Gradient
Electrode Spacing (m.): 10
Vertical/Horizontal Scale Ratio: 1
Line orientation (geographic degrees): 155

Raw Data Quality Error Percent		
Minimum	Maximum	Average
0.000	5.070978	0.0712932

Number of Data Points		
Surveyed	After Modeling	Number Removed
983	972	11

Emery & Garrett Groundwater, Inc.

Electrical Resistivity Survey Line R4D
Arrington Knolls
Warrenton, Virginia



Horizontal and Vertical Axis Units are Meters

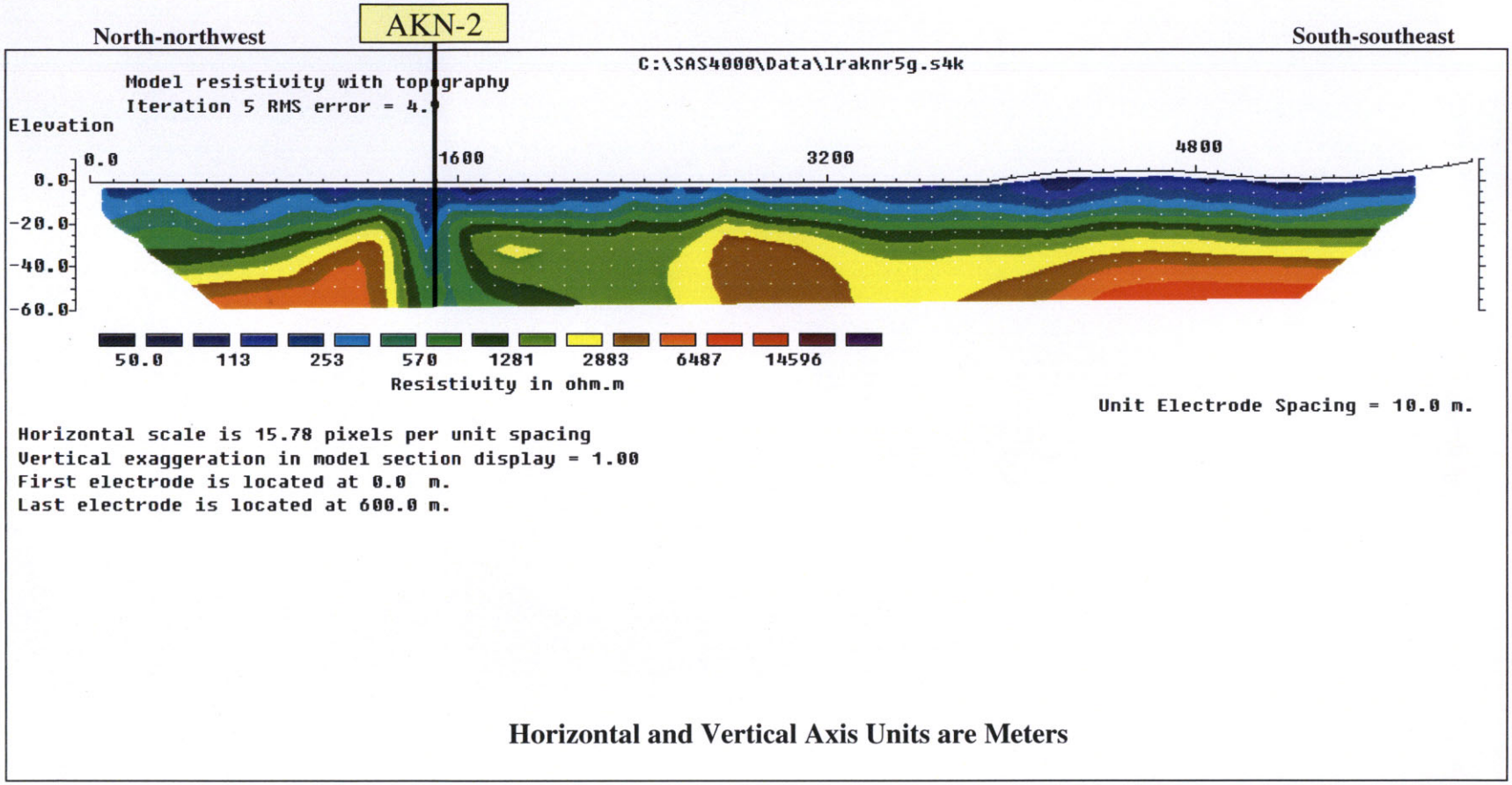
Survey Type: Dipole-dipole
Electrode Spacing (m.): 10
Vertical/Horzizontal Scale Ratio: 1
Line orientation (geographic degrees): 155

Raw Data Quality		
Error Percent		
Minimum	Maximum	Average
0.000	41.177662	0.5187468

Number of Data Points		
Surveyed	After Modeling	Number Removed
751	730	21

Emery & Garrett Groundwater, Inc.

Electrical Resistivity Survey Line R5G
Arrington Knolls
Warrenton, Virginia



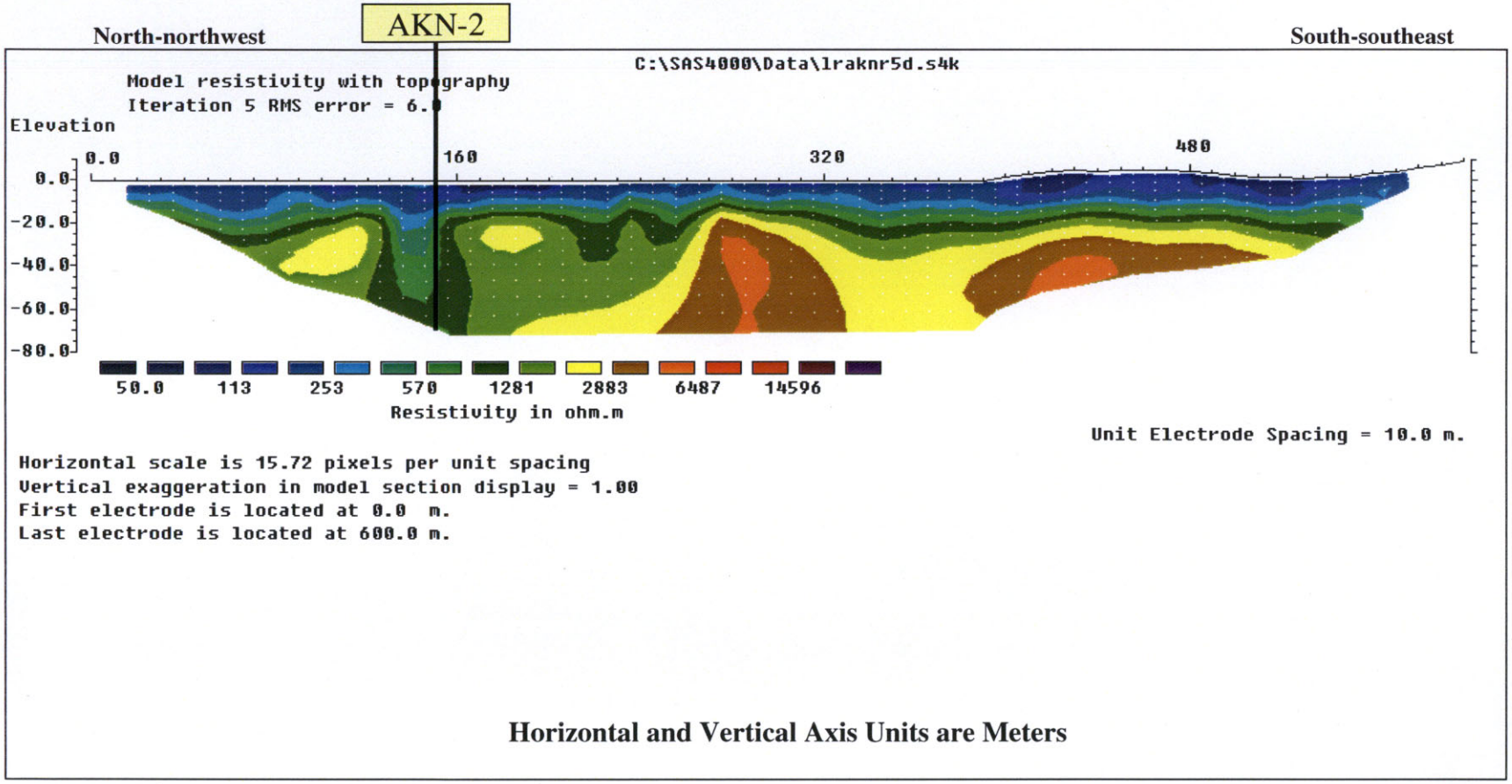
Survey Type: Dipole-dipole
Electrode Spacing (m.): 10
Vertical/Horzizontal Scale Ratio: 1
Line orientation (geographic degrees): 155

Raw Data Quality Error Percent		
Minimum	Maximum	Average
0.000	9.471956	0.0686223

Number of Data Points		
Surveyed	After Modeling	Number Removed
741	737	4

Emery & Garrett Groundwater, Inc.

Electrical Resistivity Survey Line R5D
Arrington Knolls
Warrenton, Virginia



Horizontal and Vertical Axis Units are Meters

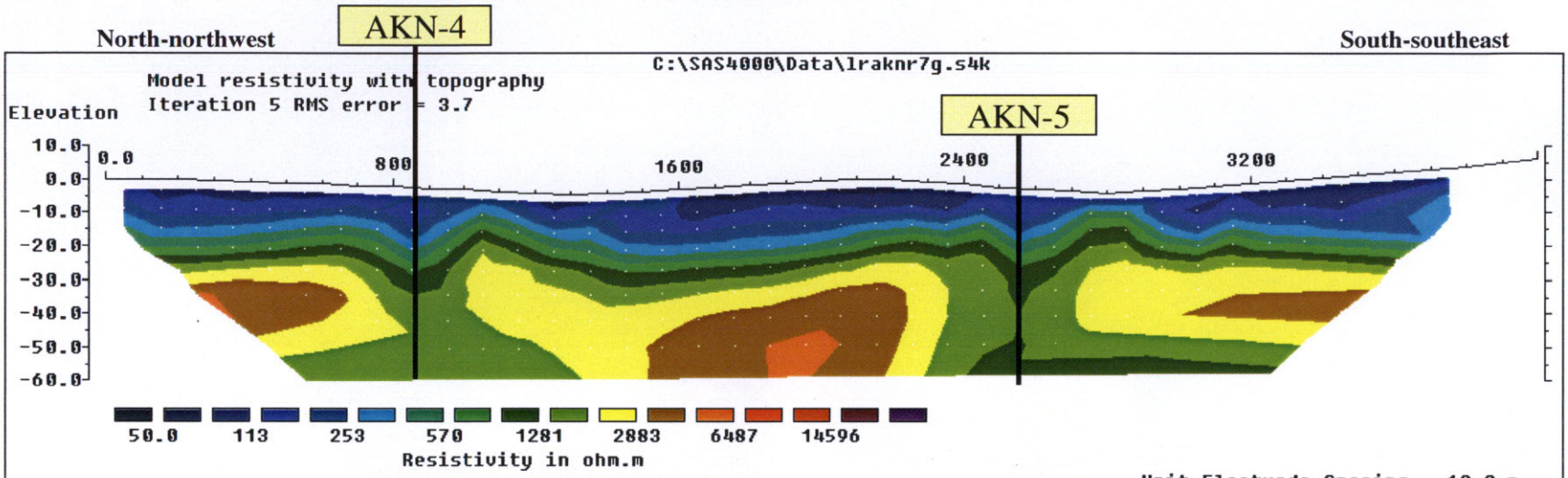
Survey Type: Dipole-dipole
Electrode Spacing (m.): 10
Vertical/Horzizontal Scale Ratio: 1
Line orientation (geographic degrees): 155

Raw Data Quality		
Error Percent		
Minimum	Maximum	Average
0.000	2.368589	0.1971404

Number of Data Points		
Surveyed	After Modeling	Number Removed
564	564	0

Emery & Garrett Groundwater, Inc.

Electrical Resistivity Survey Line R6G
Arrington Knolls
Warrenton, Virginia



Unit Electrode Spacing = 10.0 m.

Horizontal scale is 23.65 pixels per unit spacing
Vertical exaggeration in model section display = 1.00
First electrode is located at 0.0 m.
Last electrode is located at 400.0 m.

Horizontal and Vertical Axis Units are Meters

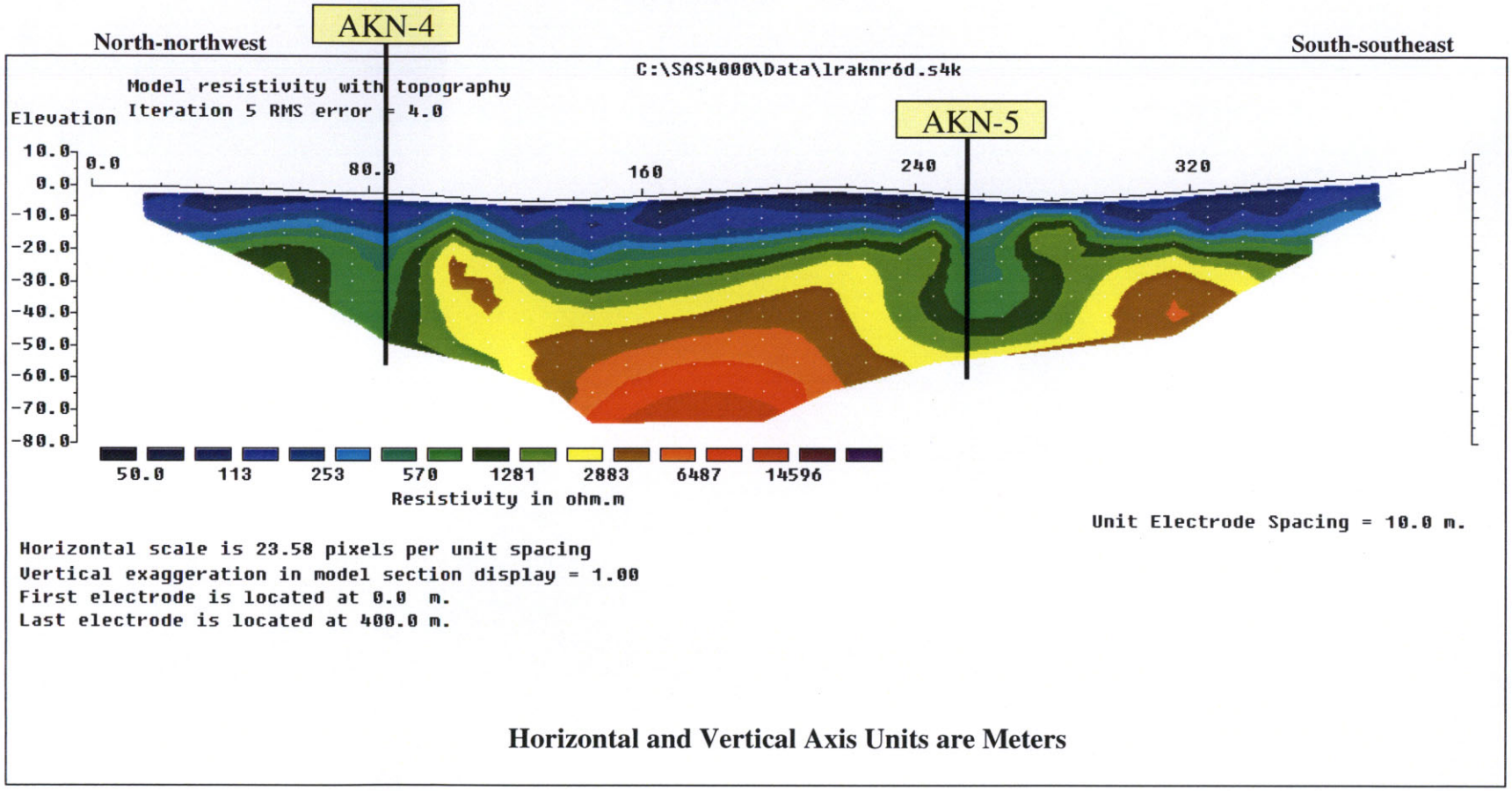
Survey Type: Gradient
Electrode Spacing (m.): 10
Vertical/Horzizontal Scale Ratio: 1
Line orientation (geographic degrees): 155

Raw Data Quality		
Error Percent		
Minimum	Maximum	Average
0.000	1.214469	0.0696151

Number of Data Points		
Surveyed	After Modeling	Number Removed
504	504	0

Emery & Garrett Groundwater, Inc.

Electrical Resistivity Survey Line R6D
Arrington Knolls
Warrenton, Virginia



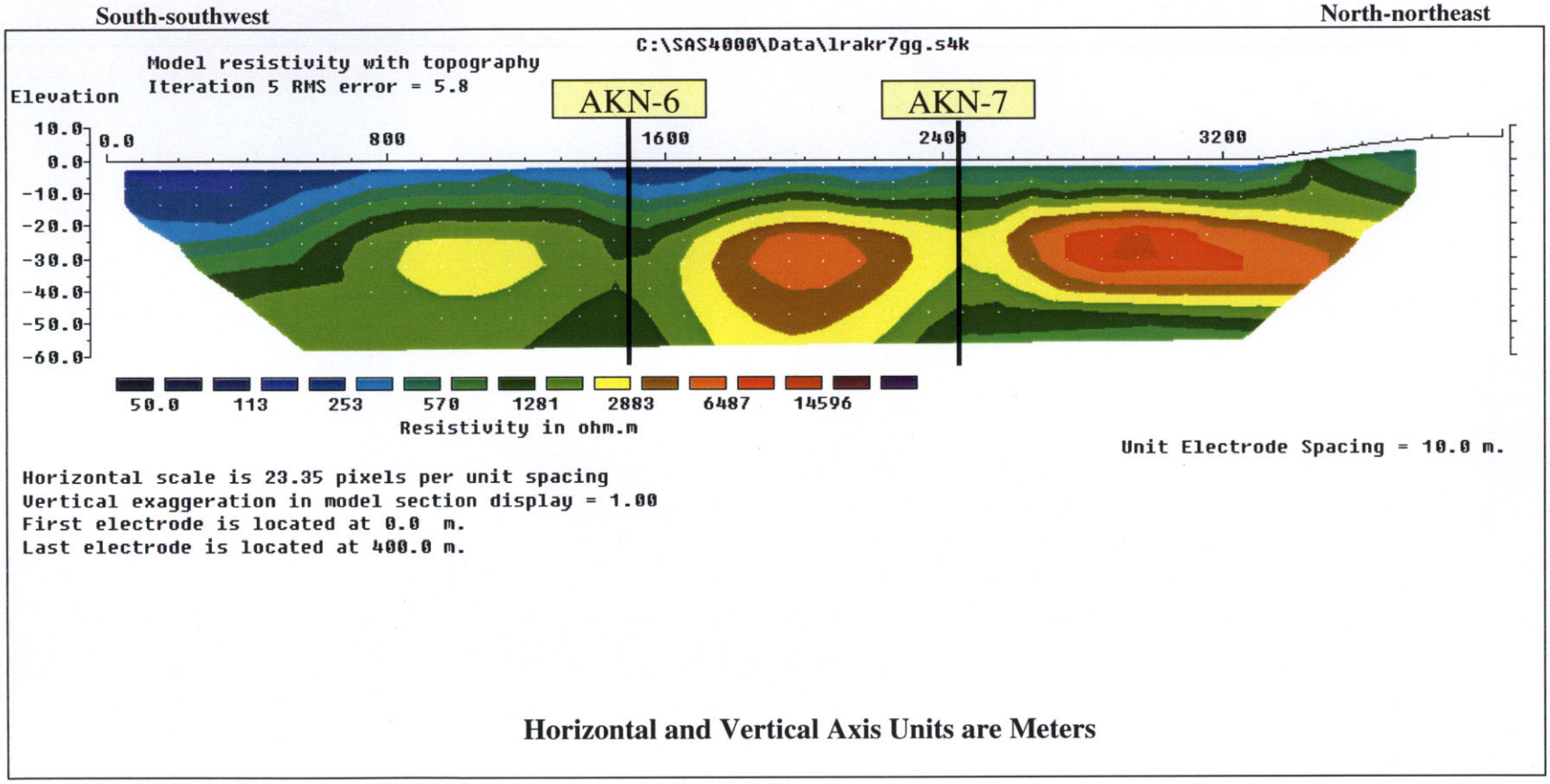
Horizontal and Vertical Axis Units are Meters

Survey Type: Dipole-dipole
Electrode Spacing (m.): 10
Vertical/Horzizontal Scale Ratio: 1
Line orientation (geographic degrees): 155

Raw Data Quality Error Percent		
Minimum	Maximum	Average
0.000	1.708945	0.2439904

Number of Data Points		
Surveyed	After Modeling	Number Removed
372	372	0

Electrical Resistivity Survey Line R7G
Arrington Knolls
Warrenton, Virginia



Horizontal and Vertical Axis Units are Meters

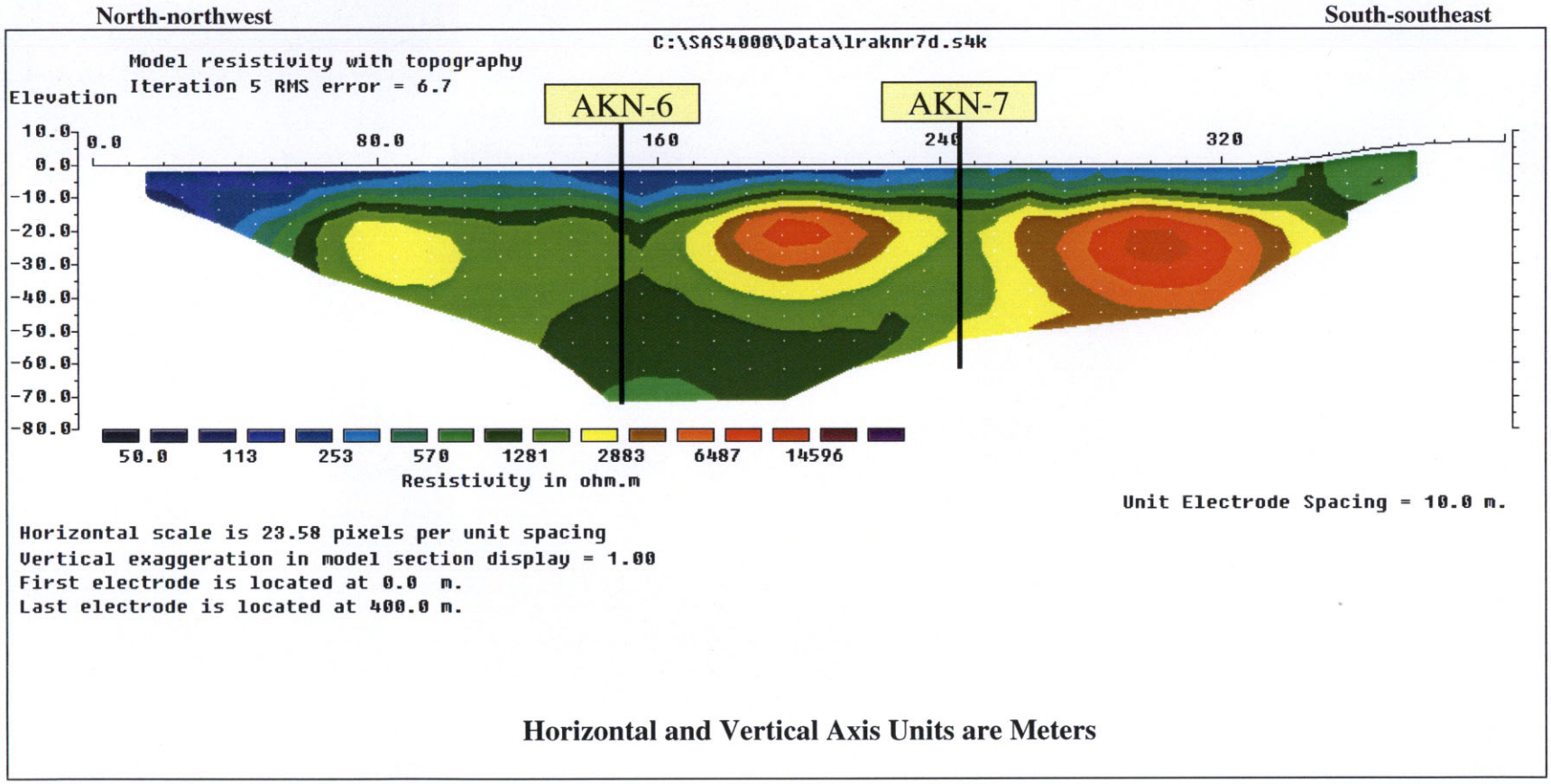
Survey Type: Gradient
Electrode Spacing (m.): 10
Vertical/Horizontal Scale Ratio: 1
Line orientation (geographic degrees): 335

Raw Data Quality Error Percent		
Minimum	Maximum	Average
0.000	1.022714	0.0662678

Number of Data Points		
Surveyed	After Modeling	Number Removed
504	495	9

Emery & Garrett Groundwater, Inc.

Electrical Resistivity Survey Line R7D
Arrington Knolls
Warrenton, Virginia



Horizontal and Vertical Axis Units are Meters

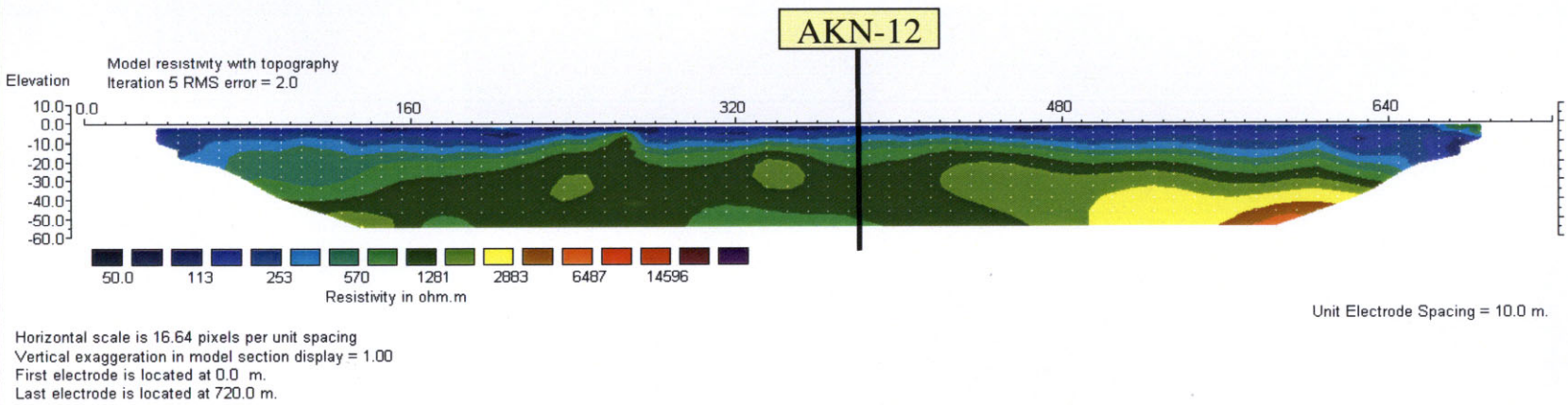
Survey Type: Dipole-dipole
Electrode Spacing (m.): 10
Vertical/Horizontal Scale Ratio: 1
Line orientation (geographic degrees): 155

Raw Data Quality Error Percent		
Minimum	Maximum	Average
0.000	6.11215	0.2962823

Number of Data Points		
Surveyed	After Modeling	Number Removed
371	368	3

Electrical Resistivity Survey Line R8G
Arrington Knolls
Warrenton, Virginia

North-northwest **South-southeast**



Horizontal and Vertical Axis Units are Meters

Survey Type: Gradient
Electrode Spacing (m.): 10
Vertical/Horizontal Scale Ratio: 1
Line orientation (geographic degrees): 359

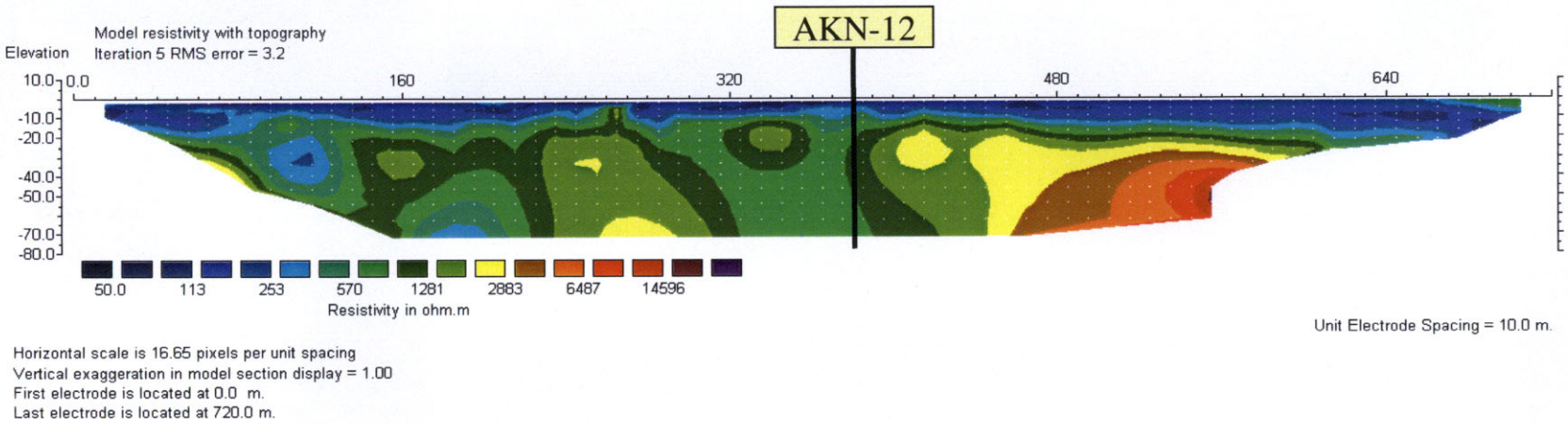
Raw Data Quality		
Error Percent		
Minimum	Maximum	Average
0.000	249.09955	0.3980918

Number of Data Points		
Surveyed	After Modeling	Number Removed
792	792	0

Emery & Garrett Groundwater, Inc.

Electrical Resistivity Survey Line R8D
Arrington Knolls
Warrenton, Virginia

North-northwest **South-southeast**



Horizontal and Vertical Axis Units are Meters

Survey Type: Dipole-dipole
Electrode Spacing (m.): 10
Vertical/Horizontal Scale Ratio: 1
Line orientation (geographic degrees): 359

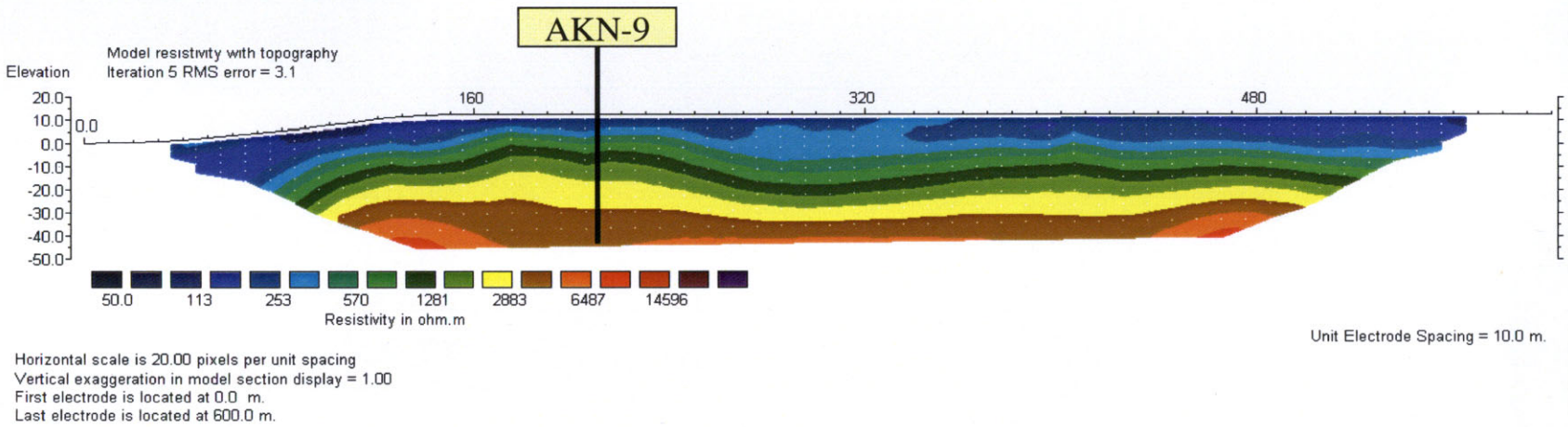
Raw Data Quality Error Percent		
Minimum	Maximum	Average
0.000	2.984041	0.256329

Number of Data Points		
Surveyed	After Modeling	Number Removed
691	691	0

Emery & Garrett Groundwater, Inc.

Electrical Resistivity Survey Line R9G
Arrington Knolls
Warrenton, Virginia

North-northwest **South-southeast**



Horizontal and Vertical Axis Units are Meters

Survey Type: Gradient
Electrode Spacing (m.): 10
Vertical/Horizontal Scale Ratio: 1
Line orientation (geographic degrees): 359

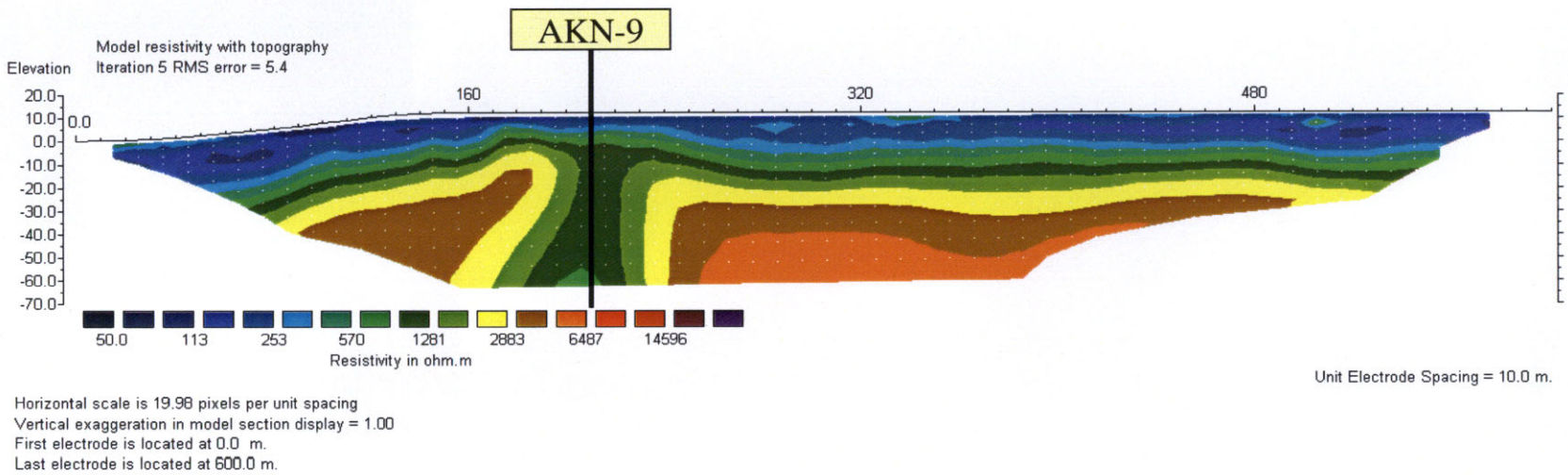
Raw Data Quality Error Percent		
Minimum	Maximum	Average
0.000	1.399544	0.063375

Number of Data Points		
Surveyed	After Modeling	Number Removed
744	744	0

Emery & Garrett Groundwater, Inc.

Electrical Resistivity Survey Line R9D
Arrington Knolls
Warrenton, Virginia

North-northwest **South-southeast**



Horizontal and Vertical Axis Units are Meters

Survey Type: Dipole-dipole
Electrode Spacing (m.): 10
Vertical/Horzizontal Scale Ratio: 1
Line orientation (geographic degrees): 359

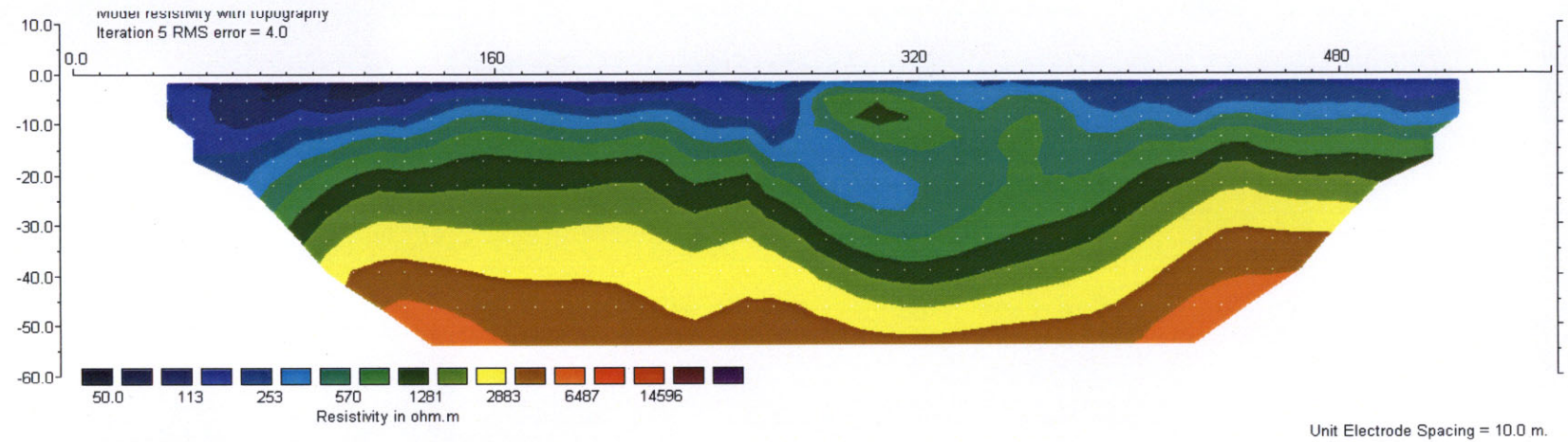
Raw Data Quality Error Percent		
Minimum	Maximum	Average
0.000	311.39014	1.04905

Number of Data Points		
Surveyed	After Modeling	Number Removed
558	546	12

Emery & Garrett Groundwater, Inc.

Electrical Resistivity Survey Line R10G
Arrington Knolls
Warrenton, Virginia

South-southwest **North-northeast**



Horizontal scale is 21.39 pixels per unit spacing
Vertical exaggeration in model section display = 2.03
First electrode is located at 0.0 m.
Last electrode is located at 560.0 m.

Horizontal and Vertical Axis Units are Meters

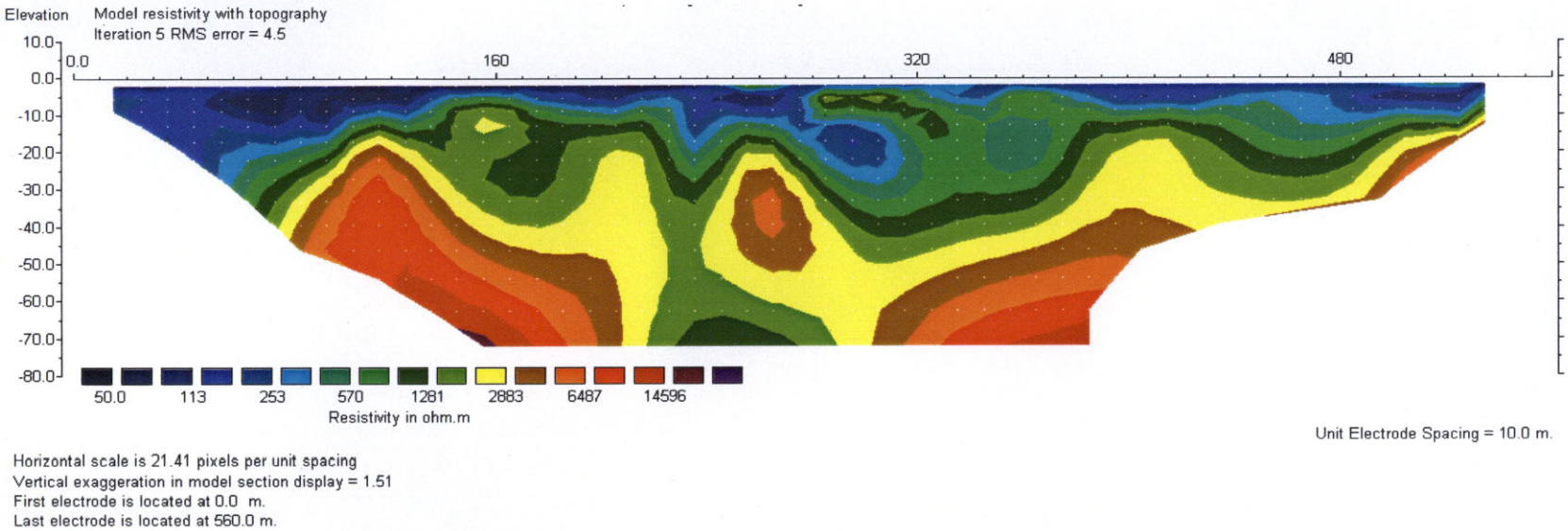
Survey Type: Gradient
Electrode Spacing (m.): 10
Vertical/Horzizontal Scale Ratio: 1
Line orientation (geographic degrees): 18

Raw Data Quality Error Percent		
Minimum	Maximum	Average
0.000	1.666481	0.0540737

Number of Data Points		
Surveyed	After Modeling	Number Removed
648	648	0

Electrical Resistivity Survey Line R10D
Arrington Knolls
Warrenton, Virginia

South-southwest **North-northeast**



Horizontal and Vertical Axis Units are Meters

Survey Type: Dipole-dipole
Electrode Spacing (m.): 10
Vertical/Horizontal Scale Ratio: 1
Line orientation (geographic degrees): 18

Raw Data Quality Error Percent		
Minimum	Maximum	Average
0.000	5.094074	0.2120102

Number of Data Points		
Surveyed	After Modeling	Number Removed
539	539	0

Emery & Garrett Groundwater, Inc.

PLATE