Limited Hydrogeologic Assessment
Fairfield I-77 Development Site
Ridgeway, Fairfield County, South Carolina
S&ME Project No. 210730B

PREPARED FOR:

Luck Companies
Post Office Box 29682
Richmond, Virginia 23242

PREPARED BY:

S&ME, Inc.
134 Suber Road
Columbia, South Carolina 29210

March 22, 2021

March 22, 2021

Luck Companies
Post Office Box 29862
Richmond, Virginia 23242

Attention: Mr. Bruce Smith — Submitted via email: brucesmith@luckcompanies.com

Reference: **Limited Hydrogeologic Assessment**
Fairfield I-77 Development Site
Ridgeway, Fairfield County South Carolina
S&ME Project No. 210730B

Dear Mr. Smith:

S&ME, Inc. has completed a Limited Hydrogeologic Assessment for the referenced property (i.e. the subject property). The attached report presents the findings of the Limited Hydrogeologic Assessment, which was performed in general accordance with S&ME Proposal No. 42-2000424 Rev 1, dated January 21, 2021.

S&ME appreciates the opportunity to provide this Hydrogeologic Assessment for this project. Please contact us at your convenience if there are questions regarding the information contained in this report.

Sincerely,

S&ME, Inc.

SOUTH CAROLINA LICENSED PROFESSIONAL ENGINEER No. 27867 DAVID R. LOFTIS 3/22/21

David R. Loftis, P.E.
Senior Engineer
dloftis@smeinc.com

Edmund Q.B. Henriques
Principal Geologist
ehenriques@smeinc.com

Lyndal Butler
Project Professional
lbutler@smeinc.com

SOUTH CAROLINA S&ME, INC. NO. C00473 CERTIFICATE OF AUTHORIZATION

Table of Contents

1.0 INTRODUCTION 1
1.1 Purpose 1
1.2 Methodology 1
2.0 Site Setting 1
2.1 Planned Quarry Operations 2
2.2 Geology and Lineament Mapping 2
2.2.1 Geology 2
2.2.2 Lineament Study 3
2.3 Hydrogeology 3
2.4 Site Conceptual Model 3
3.0 Water Well Inventory 5
3.1 Freedom of Information Request 5
3.2 Regulatory Resources 6
3.3 Site Reconnaissance 6
3.4 Municipal Water Accounts 7
3.5 Data Summary 7
4.0 Field Methods 7
4.1 Geophysical Survey 7
5.0 Assumptions and Limitations 8
5.1 Significant Assumptions 8
5.2 Limitations and Exceptions of Assessment 8
6.0 Conclusions 9
7.0 References 9

Appendices

Appendix I – Figures
Appendix II – Receptor Survey
Appendix III – Geophysical Survey Report

1.0 INTRODUCTION

S&ME, Inc. (S&ME) conducted a Limited Hydrogeologic Assessment of the subject property located north of S.C. Highway 34 near Ridgeway in Fairfield County, South Carolina. A site vicinity map is shown on **Figure 1, Appendix I.** The Limited Hydrogeologic Assessment was conducted in general accordance with S&ME, Inc. Proposal No. 42-2000424 Rev 12, dated January 21, 2021.

1.1 Purpose

S&ME understands that Luck Companies (Luck) is considering the purchase of the subject properties for the purpose of developing a construction aggregate mine. The mining operations will use dry mining techniques; therefore, the proposed mining area will need to be dewatered via groundwater extraction points/sumps. The purpose of the limited hydrogeologic assessment requested by Luck was to provide information on certain recognized hydrogeology features of the site and vicinity, inferred locations of on-site water bearing fractures, and registered and inferred off-site water supply wells in the vicinity of the site.

1.2 Methodology

Luck provided S&ME with the rock coring and percussion data acquired by Luck for the subject site. The following information was gathered from a review of the provided data.

- Eleven coring holes were performed to depths ranging from 50 feet to 377 feet below grade (BG).
- Seventeen percussion holes were performed to depths ranging from 32 feet to 106 feet BG.
- The average depth to rock was approximately 50 feet BG.

Luck provided information to S&ME that the lowest elevation of the planned mined pit is -80 feet mean sea level (MSL) with the surface elevations around the pit ranging from 470 feet to 550 feet MSL. Therefore, the pit may extend to an average depth of 595 feet BG.

This limited hydrogeology assessment relied on a process that began with the development of a preliminary site conceptual model. The preliminary model was based on known or expected main features of geology, hydrogeology, mine pit location and development, and site-specific relationships between geologic structures and groundwater flow. The preliminary site conceptual model was utilized to develop field data collection needs for this assessment. The collected data included site specific geophysical information.

2.0 Site Setting

The subject site is located near the town of Ridgeway, Fairfield County, South Carolina. The approximate 404.11-acre site is located north of S.C. Highway 34, a two-lane highway bound to the north by railroad tracks, and west of Interstate Highway 77. The tax parcels comprising the site include 166-00-00-028-000 (107.96 acres), 166-00-00-018-000 (246.08 acres) and 166-00-00-030-000 (50.07 acres). The site consists of standing and harvested forestland with partially cleared areas. Properties surrounding the subject site consist primarily of forestland, and with areas of commercial and residential development generally south of the site and limited agricultural use west of the site.

The subject site is identified on the United States Geological Survey (USGS) 7.5-minute series Topographic Maps titled Winnsboro, South Carolina Quadrangle, dated 1969. The original map has a scale of one-inch equals 2,000 feet. A USGS Topographic Map of the site vicinity is included as **Figure 2, Appendix I**.

The subject site includes forestland and cleared land with two wood frame structures or shelters. The subject site topography is generally undulating and slopes towards the north and east. Based on a review of available topographic mapping, Dutchmans Creek and tributaries to Dutchmans Creek begin or flow thru the site ((https://gis.dhec.sc.gov/watersheds/) (**Figure 2, Appendix I)**. Surface elevations on the subject site range from approximately 420-620 feet above Mean Sea Level.

2.1 Planned Quarry Operations

The planned mining operations will take place in the north central portion of the subject property with the land east and southwest of the pit used for overburden storage. The initial plant area and the future final plant and facilities area for the facility will be located east and southwest of the proposed mine pit, respectively. Buffer areas will be located on each property boundary. The rail/road entrance to the mine facility will be from the southwest off Highway 34 E. and will extend northeastward to the final process plant area southwest of the proposed mine pit.

The planned mining operations will begin with the excavation and removal of overburden and rock from the Phase 1 extraction area located in the southwest portion of Parcel166-00-00-018-000. The pit will be mined to an approximate average depth of 595 feet below grade.

Please reference **Figure 3, Appendix I** regarding the planned operations.

2.2 Geology and Lineament Mapping

2.2.1 Geology

According to the Geology of the Carolinas, (Horton, Jr. J. Wright and Zulu A. Victor, University of Tennessee Press, 1991), the Property lies in the Piedmont Physiographic Province. The Piedmont is characterized by rolling relief drained by numerous creeks. Generally, soils in the Piedmont formed by the weathering of the underlying rock. Parent material is felsic/mafic residuum weathered from metamorphic and igneous rocks. In the vicinity of the subject site, the soils are classified as Cecil sandy clay loam (CnC2) and Chewacla loam (Cw) with slopes ranging from 0% to 2%, Winnsboro sandy loam (WnC) with slopes ranging from 2% to 6%, Cecil sandy loam (CeB) with slopes ranging from 2% to 10%, Appling loamy sand with slopes ranging from 6% to 10%, and Pacolet sandy loam with slopes ranging from 10% to 25% (https://websoilsurvey.nrs.usda.gov).

Figure 4, Appendix I represents the *Geologic Map of the Winnsboro Mills Quadrangle, Fairfield County, South Carolina* (2016) (https://www.dnr.sc.gov/geology/images/publications/winnm.gif) with mapped local geologic units in the vicinity of the subject site shown. According to this map and accompanying text, the subject site and vicinity are likely underlain by one or more of the following rock types.

- Mylonitic Felsic Gneiss and Amphibolite (Zmfa) - Proterozoic. Consists of amphibolite facies mylonitic felsic gneiss and amphibolite, with Chappells deformation fabric resulting from incorporation into the lower and northwestern part of the Chappells shear zone.

- Simpson Metagranite (Zsm) - Proterozoic. Part of a northeast-southwest belt of variably foliated metagranite plutons.
- Dutchmans Creek Gabbro (Cdgb) – Carboniferous. Consists primarily of plagioclase, olivine, clinopyroxene and orthoproxene. Field mapping and geophysical studies indicate the gabbro is a relatively thin sheet with a nearly horizontal upper surface exposed by erosion in the valley of Dutchmans Creek.
- Jurassic-age Diabase dikes (Jd) have been mapped in the area and on the Property. The dikes dip steeply and are up to 10 meters thick.

The thickness of the soil/saprolite overburden is highly variable throughout the subject site ranging from a depth of 22 feet to 98 feet BG to bedrock. The soil saprolite overburden thickness in the planned mine pit area ranges from 34 feet to 97 feet.

2.2.2 *Lineament Study*

Fractures are often the primary sources of permeability in crystalline bedrock aquifers. When these features cannot be observed directly, they can often be inferred by examining topographic maps, and aerial and satellite images. As an ancillary tool for predicting the location of possible geologic structures in the study area, a lineament (or facture trace) study was prepared. The lineament study entailed a qualitative and subjective visual analysis of the topographic map features in the study area and surrounding vicinity, searching of apparent linear features (i.e. lineaments) embedded in the map data. For example, straight stream segments or draws arranged in somewhat parallel patterns or aligned at roughly 90-degree angles to main streams may indicate that the drainage features would be controlled by high-angle fractures. Other non-man-made linear features may also provide indications of the structural fabric and compositional variations in the underlying bedrock.

As depicted in **Figure 5, Appendix I**, the recognized lineaments on the site are generally oriented north 20 east to 24 degrees west, north 49-81 east, and north 70-86 degrees west. The lineaments identified may be indicative of geologic structures or zones of contrasting strength due to differences in the composition of adjoining rock types. Lineaments and lineament intersections can represent possible targets for water well drilling, and/or identify areas warranting further examination during hydrogeologic studies. Considering the map scale used for this lineament study, fractures inferred by this method may or may not directly underlie the lines shown. Because a lineament study is a qualitative analysis, the actual presence and dip of features cannot be determined without additional investigations.

2.3 Hydrogeology

The hydrogeology of the Piedmont is typically characterized by surficial soils underlain by a weathered rock zone referred to as saprolite, which can range from a few feet to tens of feet thick. The saprolite transitions into bedrock with increased depth. In places the lowermost saprolite transition zone, just above bedrock, can be more permeable. Groundwater within the Piedmont generally moves from topographically high areas (recharge zones) to topographically low areas within and along stream valleys (discharge areas). Dutchmans Creek, and the other unnamed tributaries that bisect portions of the site, are the expected discharge zones for the shallow aquifer.

2.4 Site Conceptual Model

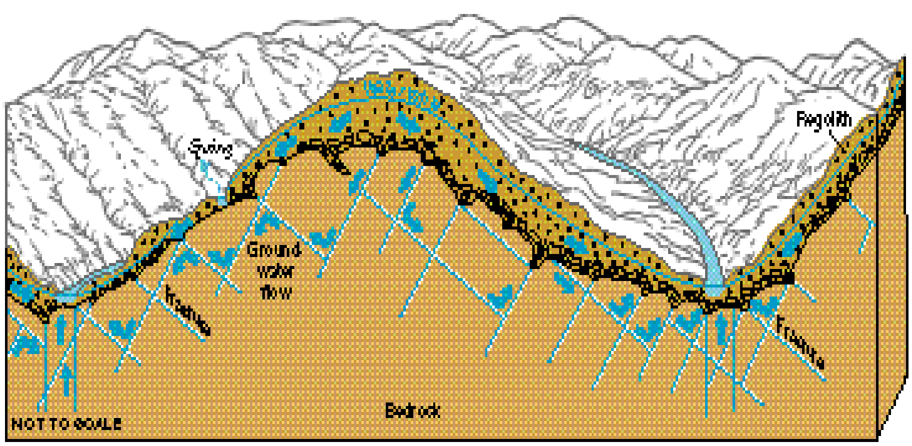
The generally accepted model for the Piedmont aquifers is a two layered system, built on the premise of an unconsolidated layer of soil and saprolite containing an unconfined aquifer that has a relatively high storage capacity supplying water to an underlying variably fractured crystalline bedrock aquifer that has low overall porosity and storage (Heath 1989). The low overall porosity and storage are due to the dense, somewhat impermeable bedrock that yields water primarily from secondary porosity and permeability provided by fractures, faults, joints and foliations. The saprolite aquifer and bedrock fractures zone are common targets for residential, industrial and irrigation water wells. It is important to emphasize that crystalline bedrock aquifers are irregular and heterogeneous in distribution, often highly localized, and exhibit discontinuous water bearing zones.

Although far more complex, the local aquifer system can be conceptually simplified and viewed as a two-layered system consisting of a shallow, unconsolidated, unconfined, porous regolith water aquifer that can supply water to surface water features and to the second layer, the underlying fractured bedrock aquifer.

Aquifer recharge in the Piedmont region is provided by precipitation which occurs in the form of rainfall and snow melt. Depending on factors such as ground saturation, ground cover, and slope, a portion of the precipitation forms runoff. This runoff flows to areas of lower elevation where some of the runoff water infiltrates in the unconsolidated material (i.e. soil) and some flows into local surface waters. The precipitation that does not form runoff infiltrates through the unsaturated zone where it can merge with underlying aquifers.

Most of the recharge in this region takes place in inter-stream areas. In general, recharge from precipitation enters the aquifer system through the saprolite zone. It is believed that much of the recharge water moves laterally through the saprolite zone and discharges to nearby streams. Under some conditions shallow groundwater can discharge at the ground surface down slope as seeps or permanent springs above these surface water bodies. Some of these seeps may occur on a seasonal basis or as short-term temporal responses to precipitation. This unconfined saprolite aquifer is generally expected to act as a storage reservoir for the underlying fractured bedrock aquifer.

Figure 2-1 Simplified Illustration of Groundwater Movement



Heath 1980

Some of the water moves vertically downward through the saprolite until it reaches bedrock where it enters fractures in the crystalline rock. Groundwater within the consolidated fractured bedrock aquifer flows in accordance with hydraulic (i.e. pressure) gradients in the fracture network. Because of this, the groundwater does not necessarily flow in the direction of topographic gradients. Based on the site geology and Very Low Frequency

(VLF) imaged fractures, flow likely occurs along rock fabric and fracture zones. Significant fracture zones have the potential to substantially influence groundwater flow and velocities.

3.0 Water Well Inventory

3.1 Freedom of Information Request

On February 17, 2021, S&ME requested to review available environmental regulatory files pertaining to water supply wells located within one mile of the site from the South Carolina Department of Health and Environmental Control (SCDHEC) through its Freedom of Information (FOI) office. The Freedom of Information Request Form is included in **Appendix II**.

On February 25, 2021, S&ME received two spreadsheets (FOI Response_842524), Fairfield1.xlsx (WellTrak), herein referred to as the Legacy database, and Fairfield2.xlsx (Regulated Entity), herein referred to as the active well database, containing information regarding registered water supply wells in Fairfield County, South Carolina. From past experience, we understand that the older Legacy database file (WellTrak), contains wells supposedly installed from 1985 to 2006. SCDHEC did not start permitting wells until 2000. Because of this, older non-permitted wells installed between 1985 and 1999 were given a log number only. Wells noted in the older database that were installed from 2000 to 2006 were permitted and given both a log number and a permit number.

The newer database, Regulated Entity, has been in use since 2006. When data was being migrated from the old database to the new, the wells with permit numbers (those installed from 2000 to 2006) were included in the new active well database. This makes for some duplication in the database of wells permitted between 2000 to 2006. From past experience we understand that wells included in the database are only the wells that were reported and should not be considered a complete inventory of all wells in Fairfield County.

Due the volume of information provided by SCDHEC via S&ME's FOI request, the data was not included in this report but can be submitted electronically upon request by S&ME.

A review of database information does not indicate the presence of a well located within a 0.5-mile radius of the planned final mining pit. The database presents 14 wells located within a one-mile radius of the planned final mining pit. The majority of these wells (up to 10) are residential water supply wells and are generally located southeast, southwest, west and north of the site. The WellTrak database provided the depth of five wells, located within 1 mile of the site, ranging from 170 to 605 feet BG (**Figure 6, Appendix I**).

Two private irrigation wells are present approximately 0.5 to 0.6 mile from the proposed mining pit, including one on a commercial property located southwest of the site, and one on an adjoining residential property southeast of the site. No information regarding the depth or date of installation of these wells was contained in the SCDHEC database.

Based on our telephone interview with Mr. Ethan McKinney, Administrative Assistant with the Town of Winnsboro Water on March 4, 2021, the elevated water tower observed on Highway 34 East (Parcel ID 166-00-00-026-000), and located approximately 0.6 mile southwest of the planned mine pit, is connected to another water tower in the Town of Winnsboro, and the tower is not connected to a well located on the tower site. Mr. McKinney stated that the tower provides water to the Ridgeway area, and the Town of Winnsboro owns and operates the water lines west of I-77.

3.2 Regulatory Resources

A review of the SC Watershed Atlas website (https://gis.dhec.sc.gov/watersheds/) identified the presence of one public water supply well (#SC2010002) at the Hwy 34/Elv Tank (G20127) facility – approximately 3,200 southwest of the proposed mine pit area. The SC Watershed Atlas website also indicated that a Public Water Supply Well (PWSW) Protection Zone is defined by 2,180-foot radius from the well that encompasses approximately 341-acres as depicted on **Figure 6**.

Mr. James Ferguson, Hydrogeologist with the SCDHEC, Drinking Water Protection Division, provided additional information regarding the identified public water supply well via electronic mail on March 15, 2021. According to Mr. Ferguson, the public water supply well is identified as Well 6 and is owned and operated by the Town of Ridgeway. Mr. Ferguson further indicated that, in 2013, the well yield for Well 6 was measured at 45 gallons per minute (gpm), and the well produced 32,000 gallon per day (gpd) on average.

On March 15, 2021, our David R. Loftis, P.E., spoke to Mr. Ferguson via telephone regarding the PWSW Protection Zone. According to Mr. Ferguson, PWSW Protection Zones were established at the direction of the United States Environmental Protection Agency (USEPA) in association with public water supply sources to identify potential contamination sources to the water supply within these zones. The zones were initially developed to allow municipalities to prepare land development ordinances/restrictions within these zones to reduce the potential for contaminants to be introduced to the water source. It was Mr. Ferguson's opinion that development of these land use ordinances/restrictions have not occurred. However, the PWSW Protection Zones are used by SCDHEC permitting agencies when reviewing permit applications, including, but not limited to water well permits, NPDES permits, mining permit and injection well permits.

On March 15 & 16, 2021, Mr. Loftis spoke with Mr. Robert Arndt, Town of Ridgeway Utilities Director. Mr. Arndt confirmed that the Town of Ridgeway owns and operates a public water supply well at the elevated water tank on Highway 34. Mr. Arndt indicated the well is in use about 18 hours per day and produces about 30,000 gpd. Mr. Arndt also stated that the Town of Ridgeway purchases some water from the Town of Winnsboro, but most of the Town of Ridgeway's water is sourced from this well.

3.3 Site Reconnaissance

During a site reconnaissance performed on February 2, 2021, by our Matthew Brundage, evidence of municipal water lines was observed, such as a fire hydrant observed near commercial property located on Highway 34 and near I-77. Areas located within 1-mile north, west and east, of the proposed mine pit were not accessible via public roads, with the exception of Barber Road west of the site.

During the site reconnaissance, three residential water supply wells located within 1 mile of the mine site, and identified in the FOI response, were observed. Ten residential wells and two irrigation wells identified within the search radius could not be observed from public roads. In addition, eight presumed water wells were observed from public roads within 1 mile of the mine site that were not identified in the FOI response. This information has been summarized on **Figure 6, Appendix I**.

Surface water bodies were not observed from public roads during the reconnaissance. Five ponds can be observed on Google Earth imagery (December 2019), and the ponds are located approximately 900 feet west, 2,900 feet north northwest, 2,700 feet east southeast, and approximately 4,000 feet and 4,600 feet southeast, from the proposed mine pit.

3.4 Municipal Water Accounts

As described in Section 3.1, S&ME was informed by a representative of the Town of Winnsboro that a water line installed on the Highway 34 corridor connects the Town of Winnsboro water system to the Town of Ridgeway system. On February 19, 2021, information was requested from Mr. Trip Peak, the Town of Winnsboro Director of Gas, Water, and Sewer, regarding active municipal water accounts and water line infrastructure associated with the Town of Winnsboro water system for areas located within a 1-mile radius of the proposed mine. As of the date the report herein was completed, Mr. Peak has not responded to this information request.

3.5 Data Summary

The findings of our receptor survey, including the parcels with water supply wells located within a 1-mile radius of the proposed mine pit are summarized on **Figure 6, Appendix I**. It should be noted that the well information discussed in Section 3.1 was mapped using addresses provided by the databases and their georeferenced locations provided by Google Earth®. As such, the well symbols are shown on the parcels of interest to indicate that a well is present on the parcel, but do not indicate the location of the wells.

Twenty-two properties with registered water wells, or observed properties with a presumed water supply well, are located at distances greater than 0.5-mile and less than 1-mile of the proposed mine pit. Multiple additional properties in apparent residential use, suspected to be without access to water service, are located within 1 mile of the subject property. The PWSW Protection Zone for the Town of Ridgeway public water supply well extends within approximately 1,040 feet southwest of the proposed final mine pit limits.

4.0 Field Methods

4.1 Geophysical Survey

The site conceptual model assumed that bedrock fractures would provide primary control over groundwater movement in the bedrock aquifer. Characterization of fractured bedrock aquifers can be aided by the utilization of certain non-invasive geophysical survey tools. For this project a VLF survey was employed for imaging steeply dipping fractures in the immediate vicinity of the proposed mine site. Electrical imaging was also performed at selected locations.

S&ME subcontracted THG Geophysics for the collection of VLF profile data across select portions of the site. The VLF survey utilizes very low frequency military radio signals to measure electrical properties of near surface soil and shallow bedrock. Electrically conductive features include fault zones and fractures, which tend to be more conductive than the surrounding bedrock. VLF is used to collect conductivity data, which is analyzed for contrasting electrical conductivities among underlying geologic units. The results of the analysis allow identification of more conductive zones (e.g. suspect fracture zones) in the underlying bedrock. The data is collected by walking a series of lines (e.g. profiles) with a backpack VLF receiver and stopping to collect data at points roughly every 10 meters along each line. The location of each data point along the profile is determined and recorded using a non-survey grade GPS. The VLF method is sensitive to cultural interference from items such as pipelines, utilities, fences, and other conductive objects. If observed, cultural features were noted at the time of data collection.

From February 1, 2021, to February 6, 2021, THG Geophysics collected data along 11 profiles covering approximately 34,200 linear feet, as depicted in **Figure 7, Appendix I**. The profile locations and orientations were selected based on regional and local geologic information.

THG Geophysics collected electrical imaging data along six profiles covering approximately 1,950 linear feet, as depicted in **Figure 7, Appendix I**. Electrical imaging profile locations were selected based on a review of preliminary VLF data and consideration of project objectives.

Following field data collection, the VLF data was post-processed. **Appendix III** contains the THG Geophysics report dated February 12, 2021, which includes figures illustrating the VLF profiles and the points along each profile where fractures were imaged. The post-processed VLF data was presented in both plan and cross-sectional view to illustrate the interpreted dip of the imaged fractures. The VLF data was examined and utilized to make interpretations of the subsurface fracture patterns and inferred diabase dikes within the study area. The green lines depicted on **Figure 7, Appendix I** illustrate the interpreted location and orientation of the imaged fractures, with arrows depicting the down-dip direction of these features. The orange lines depicted on **Figure 7, Appendix I** illustrate the interpreted location and orientation of imaged vertical diabase dikes. Although the lines shown are straight and continuous, actual fracture patterns and diabase dikes are not always linear and/or as laterally continuous as shown.

5.0 Assumptions and Limitations

5.1 Significant Assumptions

- The assessment assumes that the proposed mine pit and operations would be configured as provided by Luck and outlined in this report.

5.2 Limitations and Exceptions of Assessment

- Information obtained regarding off-site water supply wells was limited to that provided by SCDHEC through its FOI office and off-site features visible from public roadways.
- This evaluation is based on data available at this time. The estimates and opinions contained herein may need to be revised if significant additional information becomes available. Nevertheless, the opinions are well-founded and consistent with observed conditions at the site.
- S&ME used generally accepted industry practices to characterize site conditions.
- Geologic features imaged using geophysical methods have not be field verified using subsurface exploration and additional testing methods.
- This report does not warrant against future operations or conditions, nor does it warrant against operations or conditions of a type or at a specific location not evaluated.

- This evaluation was prepared by S&ME specifically for use by the Client and SCDHEC. Use of or reliance upon this information by any other party without express written permission granted by S&ME and the Client is not authorized and is completely at the risk of the user.

6.0 Conclusions

S&ME has completed a limited hydrogeologic assessment at the approximate 404-acre site near Ridgeway, in Fairfield County, South Carolina. The purpose of the limited hydrogeologic assessment requested by Luck was to provide information on certain recognized hydrogeology features of the site and vicinity, inferred locations of on-site water bearing fractures, and registered and inferred off-site water supply wells in the vicinity of the site.

This hydrogeologic assessment relied on a process of that began with the development of a preliminary site conceptual model. The preliminary model was based on known or expected main features of geology, hydrogeology, mine pit location and development, and site-specific relationships between geologic structures and groundwater flow. The preliminary site conceptual model was utilized to develop field data collections needs for this assessment. Site specific data was collected for the purpose of further characterizing the hydrogeologic system and refining the site conceptual model.

The areas east, north and west, and within approximately 1-mile of the proposed mine, are predominantly rural properties developed for agricultural use and sparse residential use. One public water well with a 2,180-foot radius PWSW Protection Zone is located approximately 3,200 feet southwest of the proposed mine pit. Multiple water supply wells included in the reviewed database, or presumed wells observed by reconnaissance, are located generally greater than 0.5-mile and less than 1-mile from the proposed mine area, and in areas not known to be served by the municipal water service, including State Highway 34, Barber Road, Lookout Tower Road, Cook Road, Gracie Land, Crossbow Road, Van Exum Road, and on the railway service road adjoining the Property. labelled

7.0 References

Geologic Map of Fairfield County, South Carolina (2016), South Carolina Geologic Survey Open-File Report 63

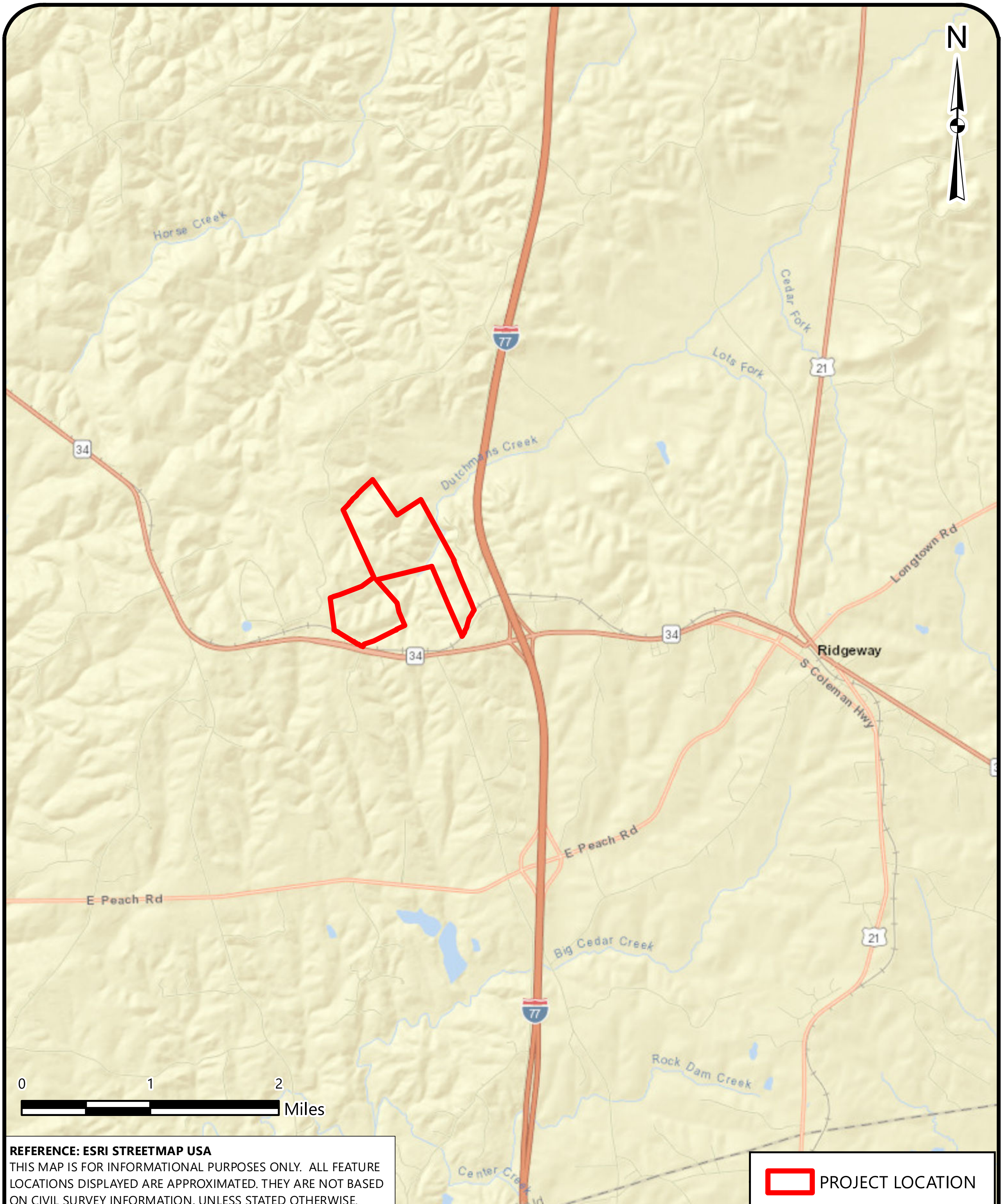
Geology of the Carolinas (1991), Horton, Jr. J. Wright, and Zulu A. Victor, University of Tennessee Press

Heath, R.C. (1989), Ground Water in the Piedmont: Proceedings of a conference on ground water in the Piedmont of the eastern United States: Clemson University, October 16-18, 1989: Clemson, South Carolina.

Heath, R.C. (1990), Basic Elements of Ground-Water Hydrology with reference to conditions in North Carolina: USGS Water-Resources Investigations Open File Report 80-44, page 86.

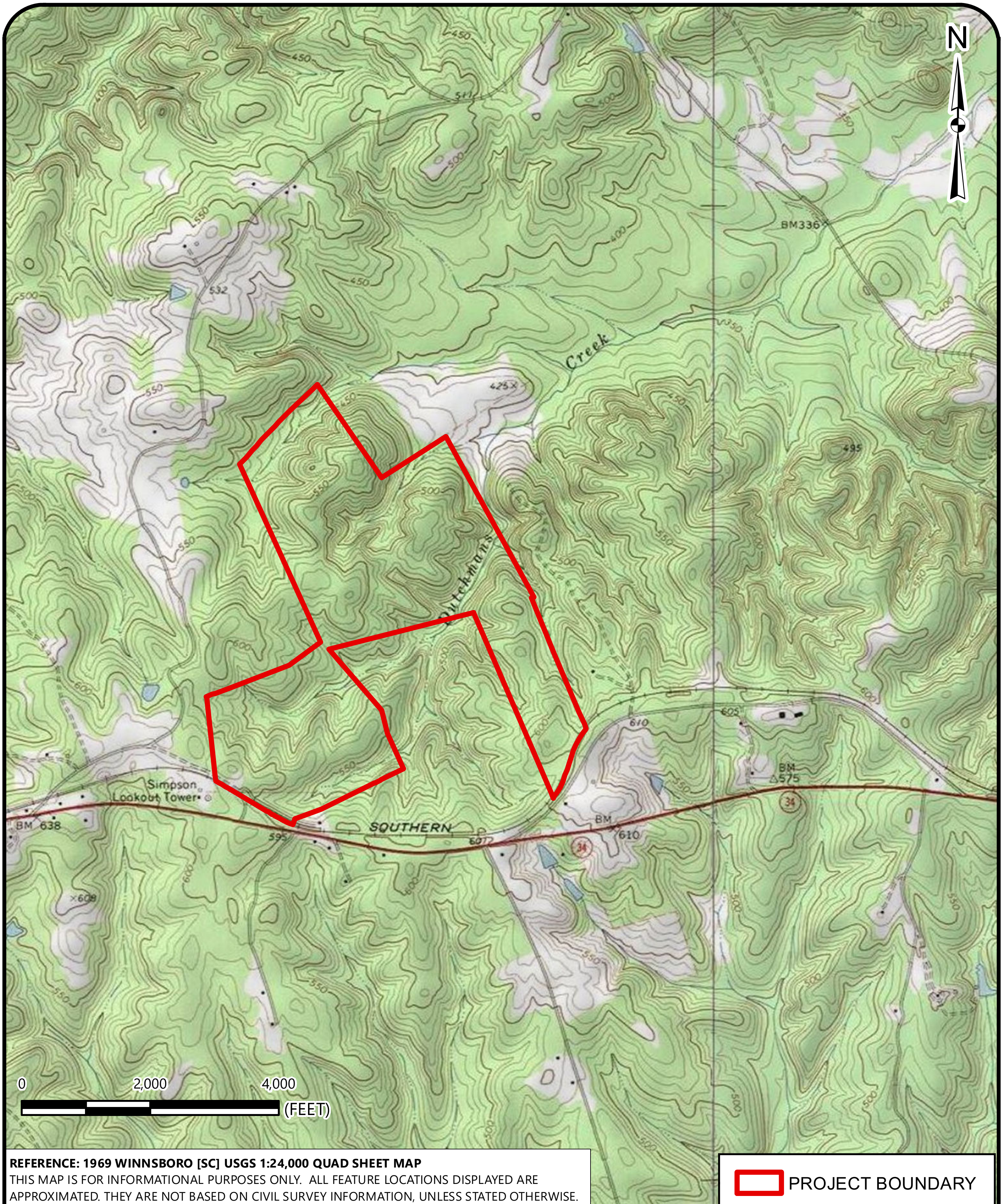
Appendices

Appendix I – Figures



REFERENCE: ESRI STREETMAP USA
THIS MAP IS FOR INFORMATIONAL PURPOSES ONLY. ALL FEATURE LOCATIONS DISPLAYED ARE APPROXIMATED. THEY ARE NOT BASED ON CIVIL SURVEY INFORMATION, UNLESS STATED OTHERWISE.

&	**SITE VICINITY**	SCALE: 1 inch = 1 mile	FIGURE NO.
	LIMITED HYDROGEOLOGIC ASSESSMENT FAIRFIELD I-77 DEVELOPMENT SITE RIDGEWAY, FAIRFIELD COUNTY, SOUTH CAROLINA	DATE: 3-4-21 PROJECT NUMBER 210730B	1



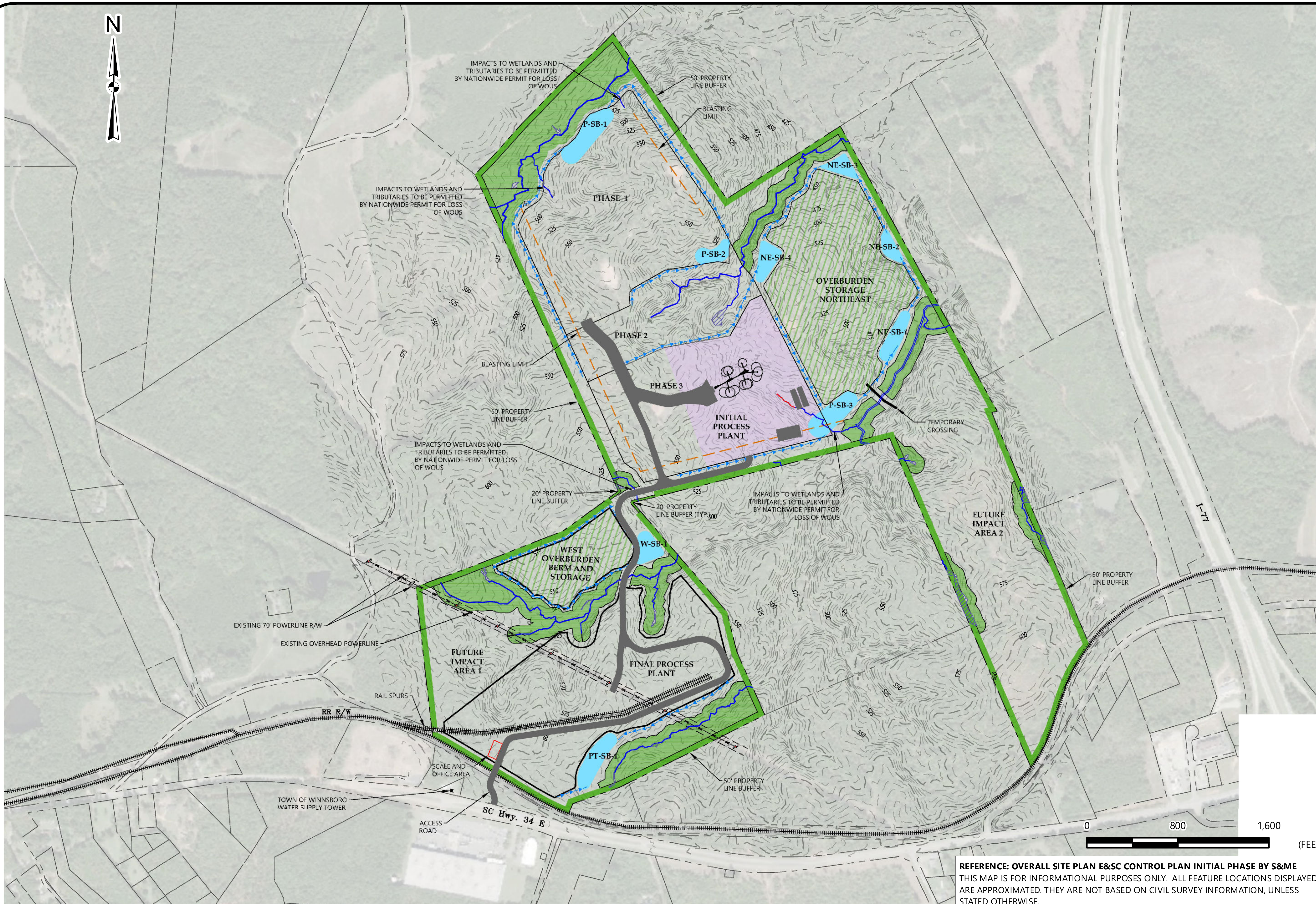
REFERENCE: 1969 WINNSBORO [SC] USGS 1:24,000 QUAD SHEET MAP
THIS MAP IS FOR INFORMATIONAL PURPOSES ONLY. ALL FEATURE LOCATIONS DISPLAYED ARE APPROXIMATED. THEY ARE NOT BASED ON CIVIL SURVEY INFORMATION, UNLESS STATED OTHERWISE.

PROJECT BOUNDARY

USGS TOPOGRAPHIC MAP

LIMITED HYDROGEOLOGIC ASSESSMENT
FAIRFIELD I-77 DEVELOPMENT SITE
RIDGEWAY, FAIRFIELD COUNTY, SOUTH CAROLINA

SCALE: 1 " = 2,000 '	FIGURE NO. 2
DATE: 3-4-21	
PROJECT NUMBER 210730B	



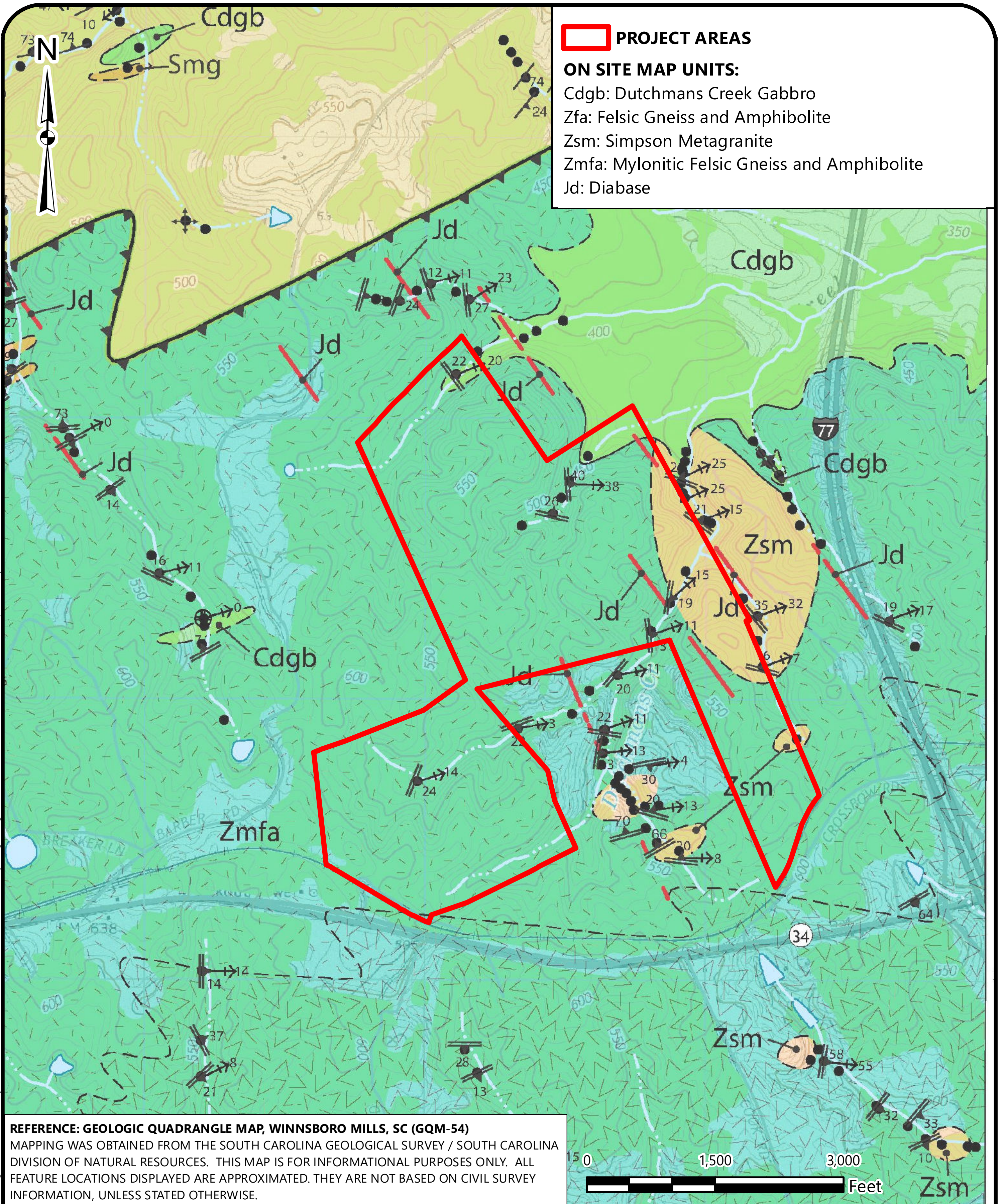
REFERENCE: OVERALL SITE PLAN E&SC CONTROL PLAN INITIAL PHASE BY S&ME
THIS MAP IS FOR INFORMATIONAL PURPOSES ONLY. ALL FEATURE LOCATIONS DISPLAYED ARE APPROXIMATED. THEY ARE NOT BASED ON CIVIL SURVEY INFORMATION, UNLESS STATED OTHERWISE.

S&ME

PROPOSED MINE OPERATION AREAS

LIMITED HYDROGEOLOGIC ASSESSMENT
FAIRFIELD I-77 DEVELOPMENT SITE
RIDGEWAY, FAIRFIELD COUNTY, SOUTH CAROLINA

SCALE:	1 " = 800 '
DATE:	3-11-21
PROJECT NUMBER	210730B
FIGURE NO.	3



PROJECT AREAS

ON SITE MAP UNITS:

Cdgb: Dutchmans Creek Gabbro
Zfa: Felsic Gneiss and Amphibolite
Zsm: Simpson Metagranite
Zmfa: Mylonitic Felsic Gneiss and Amphibolite
Jd: Diabase

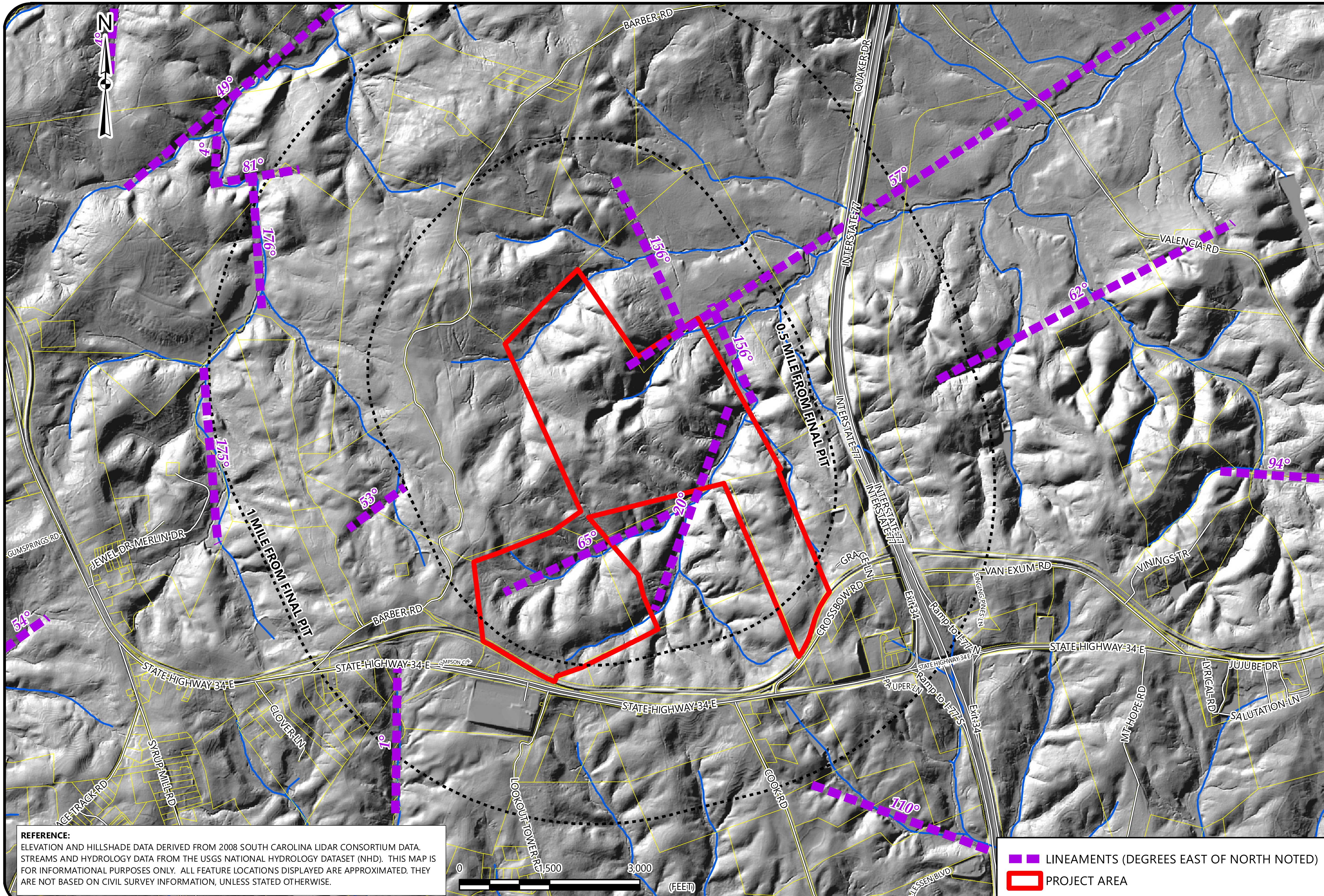
REFERENCE: GEOLOGIC QUADRANGLE MAP, WINNSBORO MILLS, SC (GQM-54)
MAPPING WAS OBTAINED FROM THE SOUTH CAROLINA GEOLOGICAL SURVEY / SOUTH CAROLINA DIVISION OF NATURAL RESOURCES. THIS MAP IS FOR INFORMATIONAL PURPOSES ONLY. ALL FEATURE LOCATIONS DISPLAYED ARE APPROXIMATED. THEY ARE NOT BASED ON CIVIL SURVEY INFORMATION, UNLESS STATED OTHERWISE.

Drawing Path: T:\ENV\Projects\2021\210730B Luck Stone_Fairfield I-77_Hydrogeologic Services\GIS_04-LOCAL GEOLOGY.mxd plotted by DHomans 03-04-2021

LOCAL GEOLOGY

LIMITED HYDROGEOLOGIC ASSESSMENT
FAIRFIELD I-77 DEVELOPMENT SITE
RIDGEWAY, FAIRFIELD COUNTY, SOUTH CAROLINA

SCALE: 1 " = 1,500 '
DATE: 3-4-21
PROJECT NUMBER 210730B
FIGURE NO. 4



REFERENCE:
ELEVATION AND HILLSHADE DATA DERIVED FROM 2008 SOUTH CAROLINA LIDAR CONSORTIUM DATA. STREAMS AND HYDROLOGY DATA FROM THE USGS NATIONAL HYDROLOGY DATASET (NHD). THIS MAP IS FOR INFORMATIONAL PURPOSES ONLY. ALL FEATURE LOCATIONS DISPLAYED ARE APPROXIMATED. THEY ARE NOT BASED ON CIVIL SURVEY INFORMATION, UNLESS STATED OTHERWISE.

LINEAMENTS (DEGREES EAST OF NORTH NOTED)
PROJECT AREA

LINEAMENT STUDY MAP

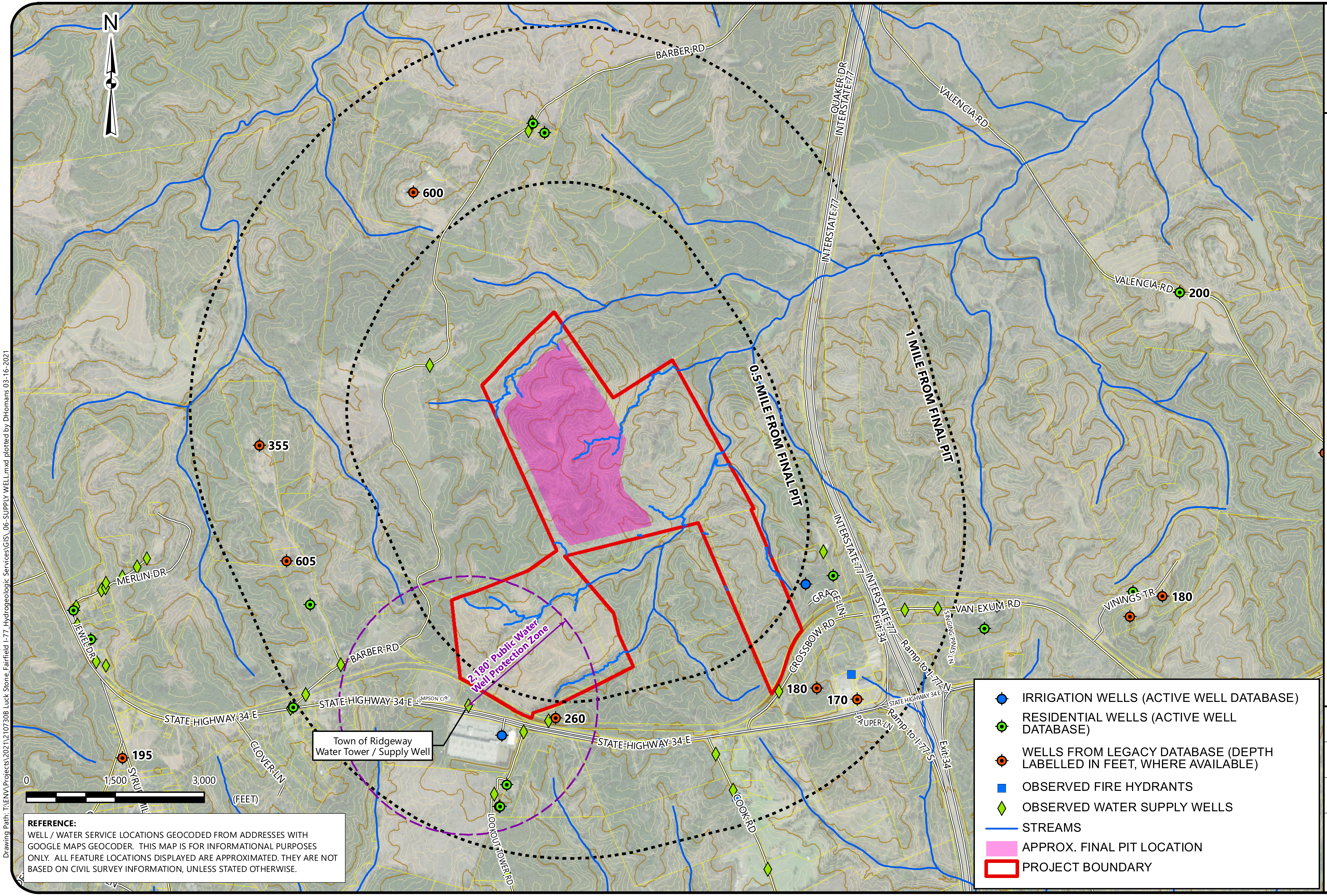
LIMITED HYDROGEOLOGIC ASSESSMENT
FAIRFIELD I-77 DEVELOPMENT SITE
RIDGEWAY, FAIRFIELD COUNTY, SOUTH CAROLINA

SCALE:
1 " = 1,500 '

DATE:
3-4-21

PROJECT NUMBER
210730B

FIGURE NO.
5



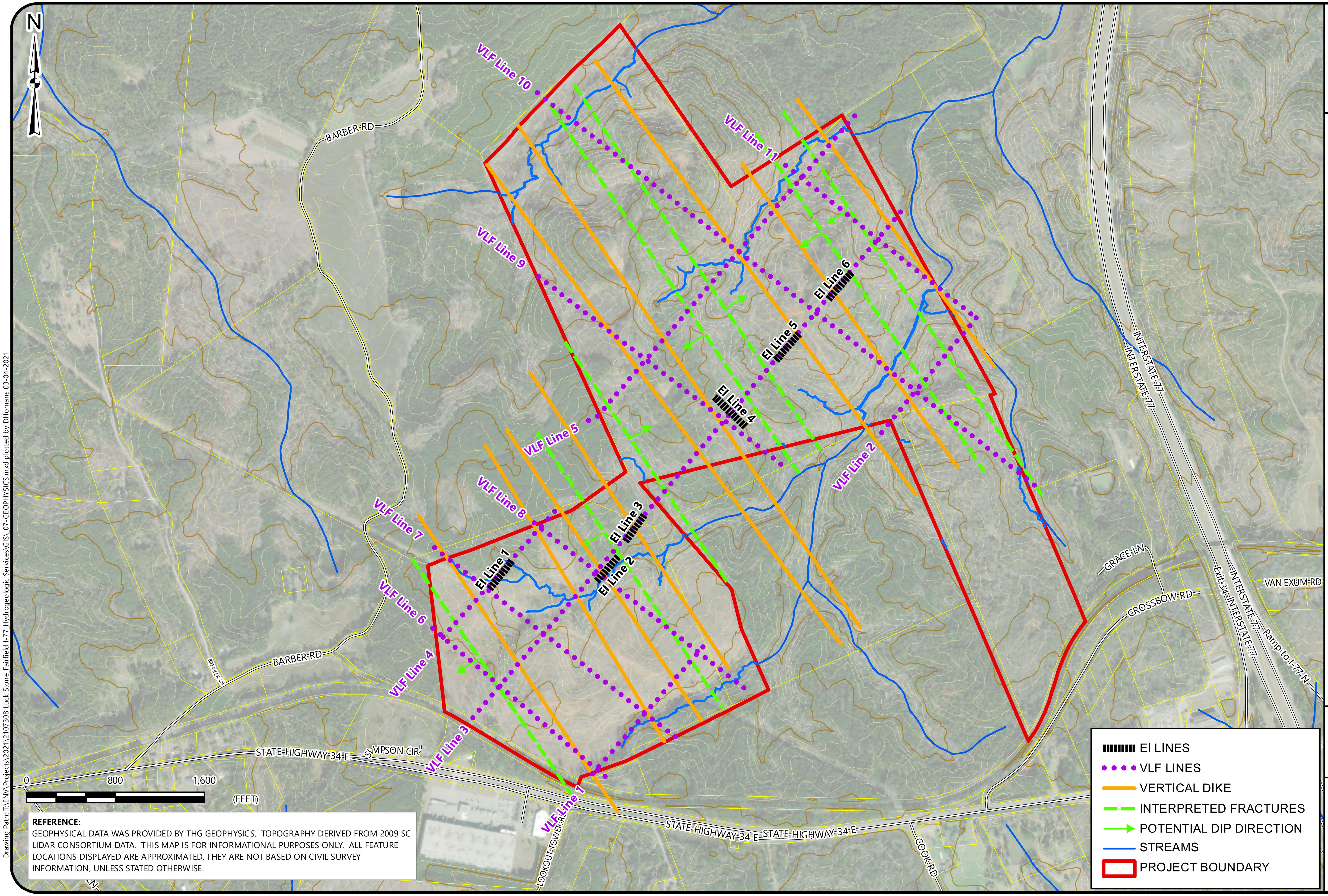
REFERENCE:
WELL / WATER SERVICE LOCATIONS GEOCODED FROM ADDRESSES WITH GOOGLE MAPS GEOCODER. THIS MAP IS FOR INFORMATIONAL PURPOSES ONLY. ALL FEATURE LOCATIONS DISPLAYED ARE APPROXIMATED. THEY ARE NOT BASED ON CIVIL SURVEY INFORMATION, UNLESS STATED OTHERWISE.

Drawing Path: T:\ENV\Projects\2021\210730B Luck Stone_Fairfield I-77_Hydrogeologic Services\GIS_06-SUPPLY WELL.mxd plotted by DHomans 03-16-2021

SUPPLY WELL LOCATION MAP

LIMITED HYDROGEOLOGIC ASSESSMENT
FAIRFIELD I-77 DEVELOPMENT SITE
RIDGEWAY, FAIRFIELD COUNTY, SOUTH CAROLINA

SCALE:	1 " = 1,500 '
DATE:	3-16-21
PROJECT NUMBER	210730B
FIGURE NO.	6



REFERENCE:
GEOPHYSICAL DATA WAS PROVIDED BY THG GEOPHYSICS. TOPOGRAPHY DERIVED FROM 2009 SC LIDAR CONSORTIUM DATA. THIS MAP IS FOR INFORMATIONAL PURPOSES ONLY. ALL FEATURE LOCATIONS DISPLAYED ARE APPROXIMATED. THEY ARE NOT BASED ON CIVIL SURVEY INFORMATION, UNLESS STATED OTHERWISE.

Drawing Path: T:\ENV\Projects\2021\210730B Luck Stone_Fairfield I-77_Hydrogeologic Services\GIS_07-GEOPHYSICS.mxd plotted by DHomans 03-04-2021

VLF SUREY – BEDROCK FRACTURE MAP

LIMITED HYDROGEOLOGIC ASSESSMENT
FAIRFIELD I-77 DEVELOPMENT SITE
RIDGEWAY, FAIRFIELD COUNTY, SOUTH CAROLINA

SCALE:
1 " = 800 '

DATE:
3-4-21

PROJECT NUMBER
210730B

FIGURE NO.
7

Appendix II – Receptor Survey

dhec

Freedom of Information Request Form
Customer Service: (803) 898-3882

Date: 2/17/21 Internal request number: ______

Contact information

Name: David R. Loftis, P.E. Company/Organization: S&ME, Inc.
Street address: 44 Buck Shoals Road, Suite C3 City: Arden State: NC Zip Code: 28704
Phone number: (828) 337-1923 (cell) Email address: dloftis@smeinc.com

Request information

I'm requesting: ☑ **Specific documents** ☐ **File review**
Facility or project name: Fairfield County Water Well Records
Facility address: ______
County: Fairfield
DHEC file custodian/staff contact if known: ______
Description of documents or files requested:

Please send me the Microsoft Excel database reports for water wells in Fairfield County, South Carolina

Family Privacy Protection Act statement

The Family Privacy Protection Act, SC Code Section 30-2-50, prohibits any person or private entity from knowingly obtaining or using any personal information obtained from our agency for commercial solicitation directed to any person in the State. Violation of this law is a crime.

I have read and understand this statement. I am not requesting personal information for the purposes of commercial solicitation or in violation of law.

Signed: David R. Loftis

Submit requests: Email: foi@dhec.sc.gov • **Fax:** (803) 898-3816 • **Mail:** FOI Office, 2600 Bull St., Columbia, S.C. 29201

Office Use Only: Date completed: ______
Billing info: Research: Time: ______ Cost: ______
Description: ______

______

Services: ☐ Scan #: ______ ☐ WebX documents #: ______ ☐ Hard copies #: ______ ☐ CD duplication #: ______
☐ Other: ______
Delivery options: ☐ Pick up ☐ Emailed ☐ Mailed ☐ Other: ______ **Total charge**: ______

Instructions for Completing DHEC Form 2295

Purpose: This form is used to obtain records under of the SC Freedom of Information Act

Who completes the form: Any person seeking review or copies of public records of the Department.

Instructions:
1. Fill out the top portion of the form by providing complete contact information. We may contact you to obtain additional information necessary to fulfill your request. Please provide a telephone number where you can be reached between 8:30 a.m. to 5 p.m., Monday through Friday.
2. Provide as much information about the desired documents as possible.
3. Read and sign the Family Privacy Protection Act statement.

Submit the form: E-mail (foi@dhec.sc.gov), fax (803-898-3816) or mail (FOI, 2600 Bull Street, Columbia, SC 29201) completed form to the FOI Office.

Contact Information

For additional information, contact the:
Freedom of Information Center
South Carolina Department of Health and Environmental Control (DHEC)
2600 Bull Street
Columbia, SC 29201
(803) 898-3882

Appendix III – Geophysical Survey Report

GEOPHYSICAL INVESTIGATION
Luck Stone Corporation
Tombo Site
Winnsboro, South Carolina

Prepared for:
S&ME, Inc.
8646 W. Market Street, Suite 105
Greensboro, NC 27409

February 12, 2021

Prepared by:
THG Geophysics, Ltd.
4280 Old William Penn Highway
Murrysville, Pennsylvania 15668
724-325-3996
www.thggeophysics.com
THG Project No. 459-10551

TABLE OF CONTENTS

1.0 INTRODUCTION 2
1.1 Background 2
1.2 Work Scope 2

2.0 GEOPHYSICAL INVESTIGATION 3
2.1 Electrical Imaging Theory 4
2.2.1 Introduction 4
2.2.2 Methods 5
2.2.3 Processing 5
2.2 VLF Survey 6
2.3 Quality Assurance and Quality Control 7

3.0 GEOLOGY 8

4.0 ANALYSIS 9

5.0 CONCLUSION 10

6.0 REFERENCES 11

FIGURES

1. Site Location Map
2. Survey Footprint and Geologic Map
3. SW-NE VLF Profiles 1, 2, 4, and 5
4. SW-NE VLF Profile 3
5. NW-SE VLF Profiles 6, 7, 8, and 9
6. NW-SE VLF Profiles 10 and 11
7. Electrical Imaging Profiles

1.0 INTRODUCTION

1.1 BACKGROUND

S&ME contracted with THG Geophysics, Ltd (THG) to image bedrock fractures at the approximately 410-acre Tombo site located in Winnsboro, South Carolina (**Figures 1 and 2).** The scope of work is to identify bedrock fractures for the installation of pump and observation wells for future bedrock aquifer pump tests.

1.2 WORK SCOPE

The scope of work included the collection of Very Low Frequency (VLF) data to map regional fractures. The proposed scope of work includes the acquisition of 11 VLF lines totaling approximately 34,200 linear feet (~6.5 miles) **(Figures 3, 4, 5, and 6).** To further characterize interpreted fractures, THG collected electrical imaging profiles at six (6) locations (1,950 ft; **Figure 7**).

2.0 GEOPHYSICAL INVESTIGATION

2.1 VLF SURVEY

A VLF bedrock fracture survey was conducted using an ABEM WADI meter to collect 11 profiles (**Figures 3, 4, 5, and 6**). The VLF method can be used to find steeply dipping structures that differ from their surroundings with regard to electrical resistance. VLF transmitters, the strongest located in Cutler, Maine, send out low frequency military radio signals (15-30 kHz). When the field emitted by one of the transmitters strikes an anomaly, secondary currents are created that can be read and recorded by the WADI VLF meter.

Cables, metal pipes, and electrical fences can also cause very strong anomalies because they are grounded, which permits a large ground-return current loop to form, showing a similar signature to that of fractured bedrock (ABEM Geophysics, 1989).

When a field emitted by a transmitter strikes a body having low electrical resistance, secondary circuits are created in the body. Fraser filtering, a numeric algorithm is performed on the real part of the VLF data to enhance the anomaly. Fraser filtering is based upon the work of Karous and Hjelt (1983):

$$F_o = -0.102\,H_{-3} + 0.059\,H_{-2} - 0.561\,H_{-1} + H_0 + 0.561\,H_1 - 0.059\,H_2 + 0.102\,H_3$$

Where; F_0 is the filtered result and H_{-3} to H_3 are the original VLF data.

Approximately 34,200 feet of VLF data were collected in 11 profile lines; VLF Lines 1 through 5 are oriented southwest to northeast and VLF lines 6 through 11 are oriented northwest to southeast (**Figures 3, 4, 5, and 6**).

The VLF profile is a graphic depth profile, generated through a Fraser-filtering algorithm and is a rough estimate of the presence and dip of fractures, where the portion of the image in red is considered to be the profile of a fracture (however, power lines and fences can create noise within this image).

2.2 ELECTRICAL IMAGING

2.2.1 Introduction

Electrical resistance is based upon Ohm's Law:

$$R = \frac{V}{I} \quad [ohms]$$

Where, resistance, **R**, is equal to the ratio of potential, **V** (volts) to current flow, **I** (amperes). Resistivity is the measure of the resistance along a linear distance of a material with a known cross-sectional area. Consequently, resistivity is measured in Ohm-meters. This report presents the geophysical results as geo-electrical profiles of modeled resistivity versus depth, in units of feet.

Electrical currents propagate as a function of three material properties (1) ohmic conductivity, (2) electrolytic conductivity, and (3) dielectric conductivity. Ohmic conductivity is a property exhibited by metals. Electrolytic conductivity is a function of the concentration of total dissolved solids and chlorides in the groundwater that exists in the pore spaces of a material. Dielectric conductivity is a function of the permittivity of the matrix of the material. Therefore, the matrix of most soil and bedrock is highly resistive. Of these three properties, electrolytic conductivity is the dominant material characteristic that influences the apparent resistivity values collected by this method. In general, resistivity values decrease in water-bearing rocks and soil with increasing:

a. Fractional volume of the rock occupied by groundwater;
b. Total dissolved solid and chloride content of the groundwater;
c. Permeability of the pore spaces; and,
d. Temperature.

Materials with minimal primary pore space (i.e., basement rocks) or lack groundwater in the pore spaces will exhibit high resistivity values (Mooney, 1980). Highly porous, moist or saturated soil, such as fat clays, will exhibit very low resistivity values. Most soil and bedrock exhibit medium to low resistivity values.

In homogeneous ground, the apparent resistivity is the true ground resistivity; however, in heterogeneous ground, the apparent resistivity represents a weighted average of all formations through which the current passes. Many electrode placements (arrays) have been proposed (for examples see Reynolds, 1997); however, the Schlumberger array has proven to be an effective configuration for imaging voids in bedrock settings.

2.2.2 Method

The resistivity survey was performed using the ARES multi-electrode cable system (GF Instruments, s.r.o., Brno, Czech Republic). The survey was conducted using stainless steel electrodes and stainless-steel cylinder-bearing cables.

Approximately 1,950 linear feet of EI data were collected in 6 profiles. EI profiles 1, 2, 3, 5, and 6 are oriented southwest-northeast and EI profile 4 is oriented northwest-southeast (**Figure 7**). The EI profiles are located where fractures or diabase dike are located in the subsurface.

2.2.3 Processing

A forward modeling subroutine was used to calculate the apparent resistivity values using the EarthImager program (AGI, 2002). This program is based on the smoothness-constrained least-squares method (deGroot-Hedlin and Constable, 1990; Loke and Barker, 1996). The smoothness-constrained least-squares method is based upon the following equation:

$$J^T g = (J^T J + \mu F)d$$

Where, **F** is a function of the horizontal and vertical flatness filter, **J** is the matrix of partial derivatives, **μ** is the damping factor, **d** is the model perturbation vector and **g** is the discrepancy vector.

The EarthImager program divides the subsurface 2-D space into a number of rectangular blocks. Resistivities of each block are then calculated to produce an apparent resistivity pseudosection. The pseudosection is compared to the actual measurements for consistency. A measure of the difference is given by the root-mean-squared (rms) error.

2.3 QUALITY ASSURANCE AND QUALITY CONTROL

The interpretation of geophysically-generated data is not an exact science since the responses to induced disturbance is affected by many phenomena including buried metals, operator error, precipitation, and net changes in ground saturation conditions. Some sources of spurious data can be overcome through a QA/QC program and use of multiple geophysical methods. The quality control program employed with this study included frequent checks of the equipment and resurveys of lines and locations. The QA/QC program indicates that all geophysical equipment functioned as designed during the survey program.

3.0 GEOLOGY

Westward of the Atlantic Coastal Plain is a region of South Carolina referred to as the Central Piedmont. This area is northwest of the Fall Line, the line dividing the basinward younger sedimentary deposits from the exposed older igneous and metamorphic rocks (Offield and Sutphin, 2000; Secor et al., 1986; and Pray, 1997). The age of the rocks in this area is considered to be Neoproterozoic to Late Paleozoic (Dallmeyer et al, 1986).

The site consists primarily of felsic gneiss and amphibolite of Proterozoic age (Horton and Dicken, 2001). Exposed within the gneiss are several small exposures of the Simpson Metagranite (Barker and Secor, 2005). To the north of the site is an exposure of the Carboniferous-aged Dutchman's Creek Gabbro (Secor, Barker, and Howard, 2016). Intruded into these rocks are the Jurassic-aged intrusive diabase dikes.

Felsic Gneiss and Amphibolite – The protoliths for the felsic gneiss and amphibolite unit were predominantly intrusive igneous rocks in the Charlotte terrane varying from mafic to felsic (Secor, Barker, and Howard, 2016). During the Horse Creek deformation, these rocks were complexly deformed and metamorphosed into felsic gneiss and amphibolite. The southeastern portion of the felsic gneiss and amphibolite unit has been incorporated into the northwestern portion of the Chappells shear zone, resulting in the mylonitization of this part of the sequence.

Simpson Metagranite – The suite of metagranite plutons, termed Simpson Metagranite (Secor, Barker, and Howard, 2016), intrude mylonitic felsic gneiss and amphibolite contained in the Chappells shear zone that separates the Carolina terrane from the Charlotte terrane. The metagranite was emplaced either late synkinematically or post-kinematically relative to the mylonitic fabric in the surrounding rocks. Age dating is interpreted to indicate an episode of strong deformation (the Chappells deformation) in the Carolina terrane during the Late Proterozoic and/or Early Cambrian. The above suite of metagranite plutons in the Winnsboro Mills quadrangle are here collectively referred to as the "Simpson metagranite.

Dutchmans Creek Gabbro – The gabbro consists primarily of plagioclase, olivine, clinopyroxene, and orthopyroxene in varying proportions, with lesser amounts of biotite, hornblende, and opaque minerals (McSween and Nystrom, 1979). The gabbro is interpreted to have been emplaced post-metamorphically. The gabbro is a relatively thin sheet with a nearly horizontal upper surface. A Carboniferous age has been assigned to the gabbro (Mobely et al., 2014).

Diabase – The diabase dikes typically have subophitic texture containing plagioclase, augite, pigeonite, olivine, and Fe-Ti oxides. Dikes dip steeply, are up to 10 meters thick, and contain cooling joints oriented both perpendicular and parallel to the walls of the dikes. Saprolitic outcrops exhibit spheroidal weathering with residual corestones concentrated at the surface. These dikes have been assigned a Jurassic age. These dikes, due to their inherent intrusion into existing fractured rock, are excellent sources of water.

4.0 ANALYSIS

VLF mapping located at least nine (9) diabase dikes and several fractures as part of a dike swarm that invaded the host rock in this area during the Jurassic (**Figures 3, 4, 5, and 6**). Diabase dikes, emplaced by exploiting fractures in the host rock, are excellent sources of permeable and fractured rock. VLF mapping methods can easily detect these dikes because of the high concentration of ferrous and magnetic minerals within the dikes.

The predominant orientation of the dike swarm is N36^{o}W and the dikes are nearly vertical. The individual dikes have been mapped as up to ten (10) m wide (~33’) (Secor, Barker, and Howard, 2016); however, this study shows that they are approximately forty (40) feet wide possibly due to the non-normal orientation of data collection to the dikes. Further, several of the VLF profiles show that individual dikes can be composed of several intrusions. For example, the portion of VLF Line 3 from 1,750 to 2,200 feet shows at least 2 dikes, probably representing an *en echelon* set of dikes.

Six (6) EI profiles (1,940’) were collected to document the presence of the dikes and to determine the approximate width of a dike. EI Line 2 shows a forty (40) foot wide dike between 175’ and 215’ and likely shows the end of an *en echelon* dike between 225’ and 245’ (**Figure 7**). EI Line 3 shows a well-developed forty-five (45) foot wide dike between 160’ and 205’ along the profile. Finally, EI Line 6 shows a forty (40) foot wide dike between 100’ and 140’ along profile. The image of the dike in EI Line 6 is interesting as there may be several dikes shown on the profile and the base of the dike shows low apparent resistivity, an indication of saturation.

Seven (7) large fractures are present and sub-parallel the dikes. Five (5) of the fractures dip to the southwest at approximately 45^{o}, and two (2) dip with an approximate dip of 45^{o} to the northeast

Since the study area is within a dike swarm, the potential for productive groundwater wells is great. Drilling locations on either side of a dike can prove to be very productive depending upon the depth to and gradient of groundwater within the area of interest. Four (4) likely productive sites have been identified within the rocks on either side of the respective dikes (**Figure 2**). However, locations favorable to the operator of the site but adjacent to the dikes and along their predicted path, are also acceptable for groundwater production.

5.0 CONCLUSION

A geophysical survey of the approximately 410-acre Tombo site located southeast of Winnsboro, South Carolina shows that the site is within a Jurassic dike swarm. The rocks on either side of a vertical dike can produce excellent productive groundwater wells. The findings and conclusions in this report are stated with a reasonable degree of scientific certainty. THG's findings and conclusions are as follows:

1. Approximately 34,200 linear feet of VLF data were collected in eleven (11) profiles;
2. Five (5) VLF profiles were collected from the southwest to the northeast and six (6) VLF profiles were collected from the northwest to the southeast;
3. Six (6) EI profiles (1,950 feet) were collected in areas predicted to have dikes or fractures present;
4. The site consists of Proterozoic-aged felsic gneiss and amphibolite facies; and Simpson Metagranite;
5. The primary host rock within the study area is the dense, non-porous felsic gneiss and amphibolite facies;
6. The Carboniferous Dutchmans Creek Gabbro is located to the north;
7. The site is intruded by at least nine (9) Jurassic-aged diabase dikes as part of a dike swarm;
8. The intrusion of the dike swarm exploited an existing fractures and/or fractured the host rock during emplacement;
9. The dikes are oriented N36^{o}W, nearly vertical, and approximately forty (40) feet wide;
10. Seven (7) fractures were identified in the study area and are oriented N36^{o}W and dip either 45^{o}S or 45^{o}N, respectively;
11. The rocks on either side of the diabase dikes can be make excellent groundwater production wells based upon the fracturing of the rock;
12. Four locations have been identified as having the potential for groundwater production; however, the interpretation herein is that a boring in most any location in the rocks along a dike would make a productive groundwater well.

6.0 REFERENCES

AGI, 2002. EarthImager Program. American Geosciences Inc., Austin Texas.

Barker, C. A., Secor, D. T., Jr., Pray, J. R., and Wright, J. E., 1998, Age and deformation of the Longtown metagranite, South Carolina Piedmont: A possible constraint on the origin of the Carolina terrane: The Journal of Geology, v. 106, p. 713725.

Dallmeyer, D.R.; Wright, J.E.; Secor Jr., D.T. and Snoke, A.W. (1986). Character of the Alleghanian Orogeny in the Southern Appalachians: Part II. Geochronological Constraints on the Techtonothermal Evolution of the Eastern Piedmont in South Carolina. GSA Bulletin, V.97 (11): 1329-1344.

deGroot-Hedlin, C. and Constable, S., 1990, Occam's inversion to generate smooth, two-dimensional models from magnetotelluric data. Geophysics, V. 55, 1613-1624.

Horton, J. Wright., and Victor A. Zullo. The Geology of the Carolinas: Carolina Geological Society Fiftieth Anniversary Volume. Knoxville: University of Tennessee, 1991.

Loke, M. N., and Barker, R. D., 1996, Rapid least-squares inversion of apparent resistivity pseudosection by quasi-Newton method. Geophysical Prospecting, V. 44, 131-152.

McSween, H. Y., Jr., and Nystrom, P. G. Jr., 1979, Mineralogy and petrology of the Dutchmans Creek gabbroic intrusion, South Carolina: American Mineralogist, v. 64, p. 531545.

Mobley, R. M., Yogodzinski, G. M., Creaser, R. A., and Berry, J. M., 2014, Geologic history and timing of mineralization at the Haile gold mine, South Carolina: Economic Geology, v. 109, p. 18631881.

Mooney, H. M. (1980). Handbook of Engineering Geophysics: Volume 2: Electrical Resistivity, Bison Instruments, Inc.

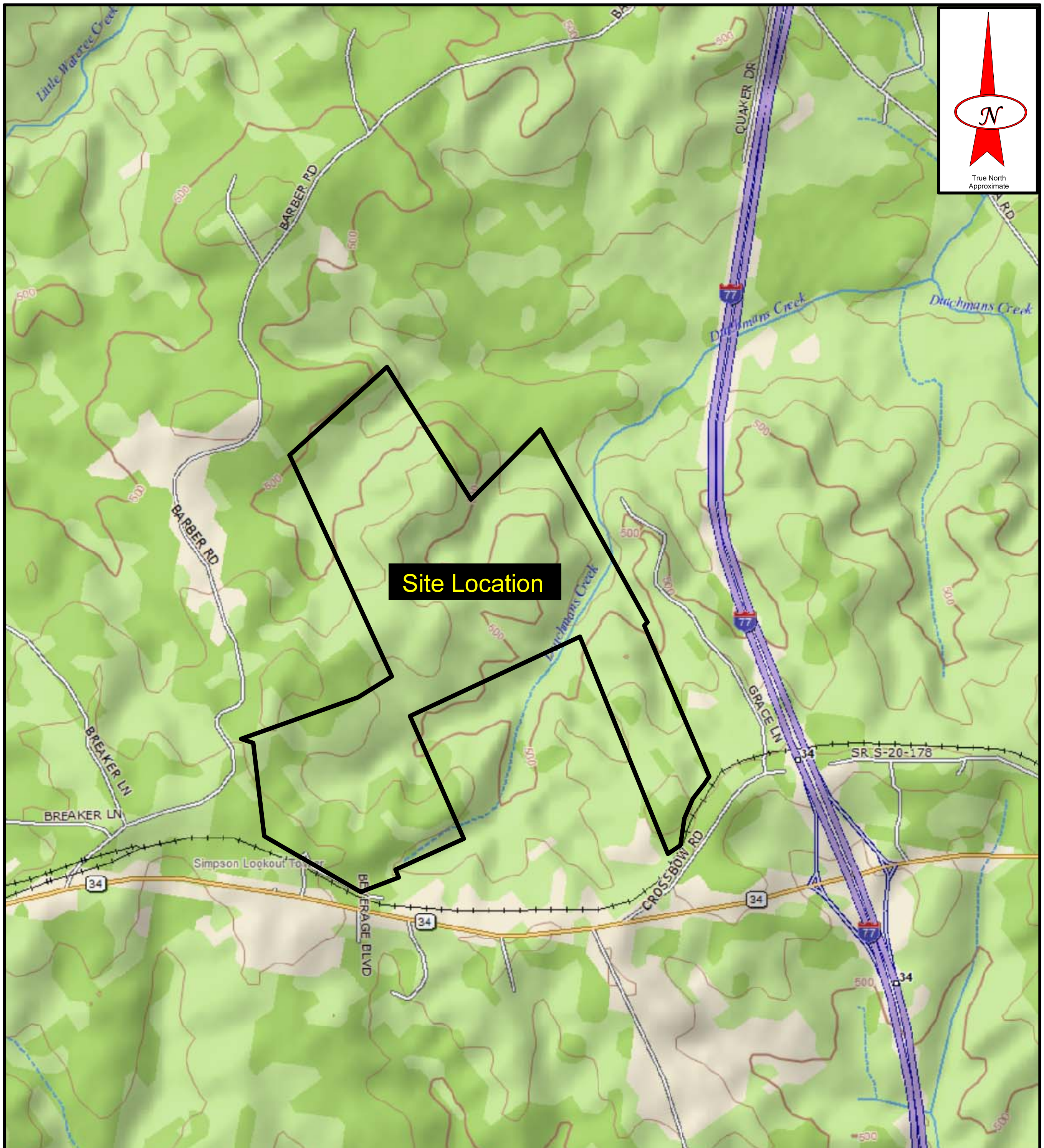
Offield, T.W. and Sutphin, D,E. (2000).Revised Stratigraphic and Tectonic Framework of the Carolina Slate Belt from Southern Virginia to the South Carolina –Georgia Border (with observations bearing on the origin of slate-belt gold deposits). U.S. Geological Survey, U.S. Geological open file report, Reston, VA. CD –ROM 99-2.

Secor Jr. D. T, C.A. Barker, and C. S. Howard (2016). Geologic Map of the Winnsboro Mills Quadrangle, Fairfield County, South Carolina. South Carolina Geologic Quadrangle Map GQM-54.

Secor Jr., D.T.; Snoke, A.W.; Bramlett K.W.; Costello, O.P. and Kimbrell, O.P. (1986). Character of the Alleghanian Orogeny in the Southern Appalachians: Part I. Alleghanian Deformation in the Eastern Piedmont of South Carolina. GSA Bulletin, V.97 (11): 1319-1328.

Secor Jr., D.T.; Snoke, A.W.; and Dallmeyer, R.D. (1986). Character of the Alleghanian Orogeny in the Southern Appalachians: Part III. Regional Tectonic Relations. GSA Bulletin, V.97 (11): 1345-1353.

Reynolds, J. M. (1997). An Introduction to Applied and Environmental Geophysics. New York, NY, Wiley.



4280 Old William Penn Hwy
Murrysville, Pennsylvania 15668
(724) 325-3996 Fax: (724) 733-7901

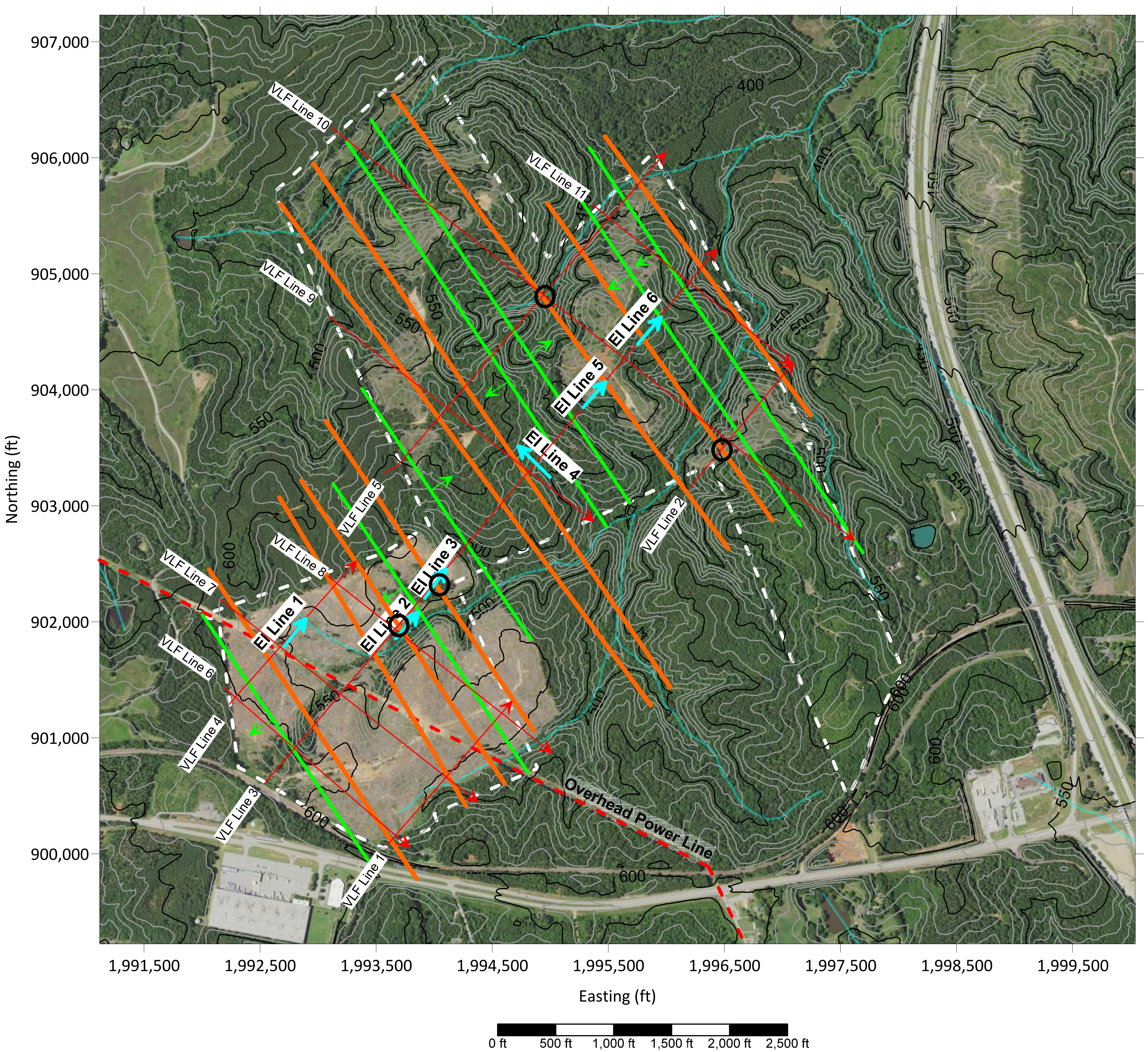
www.thggeophysics.com

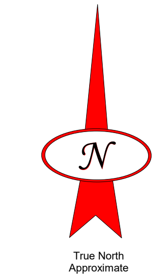
0 ft 1000 ft 2000 ft 3000 ft 4000 ft 5000 ft

Figure 1
Site Location Map

Geophysical Investigation
Luck Stone Corporation - Tombo Site
Winnsboro, South Carolina

SCALE: 1:24,000	PROJECT NO.: 459-10551	DRAWING NO.: DWG10551F1
DATE : 2/11/2021		
DRAWN BY: MNH	SOURCE: 1969 Winnsboro Mills (Sc) USGS 7.5 Minute Topographic Quadrangle	
CHECKED BY: PJH		





Legend

- VLF Profile (arrow indicates direction)
- Electrical Imaging Profile (arrow indicates direction)
- NHD Flowlines
- Vertical Dike
- Fracture (showing dip direction)
- Possible location for a production well

Notes

Geophysical survey conducted February 1-6, 2021 using ABEM Wadi Very Low Frequency Meter and GF Instruments ARES II electrical resistivity meter with active multi-electrode cable sections.

Real-time positioning of data using fully integrated Trimble Geo-7X global positioning system set to NAD 1983 US State Plane (South Carolina) coordinate system in US Survey feet.

Locations are approximate.

Topographic Contours = 10 ft (NAVD88, ft amsl)
Topographic data from 1/9 arc-second (~11-ft horizontal resolution) NED LIDAR survey dated 2008.

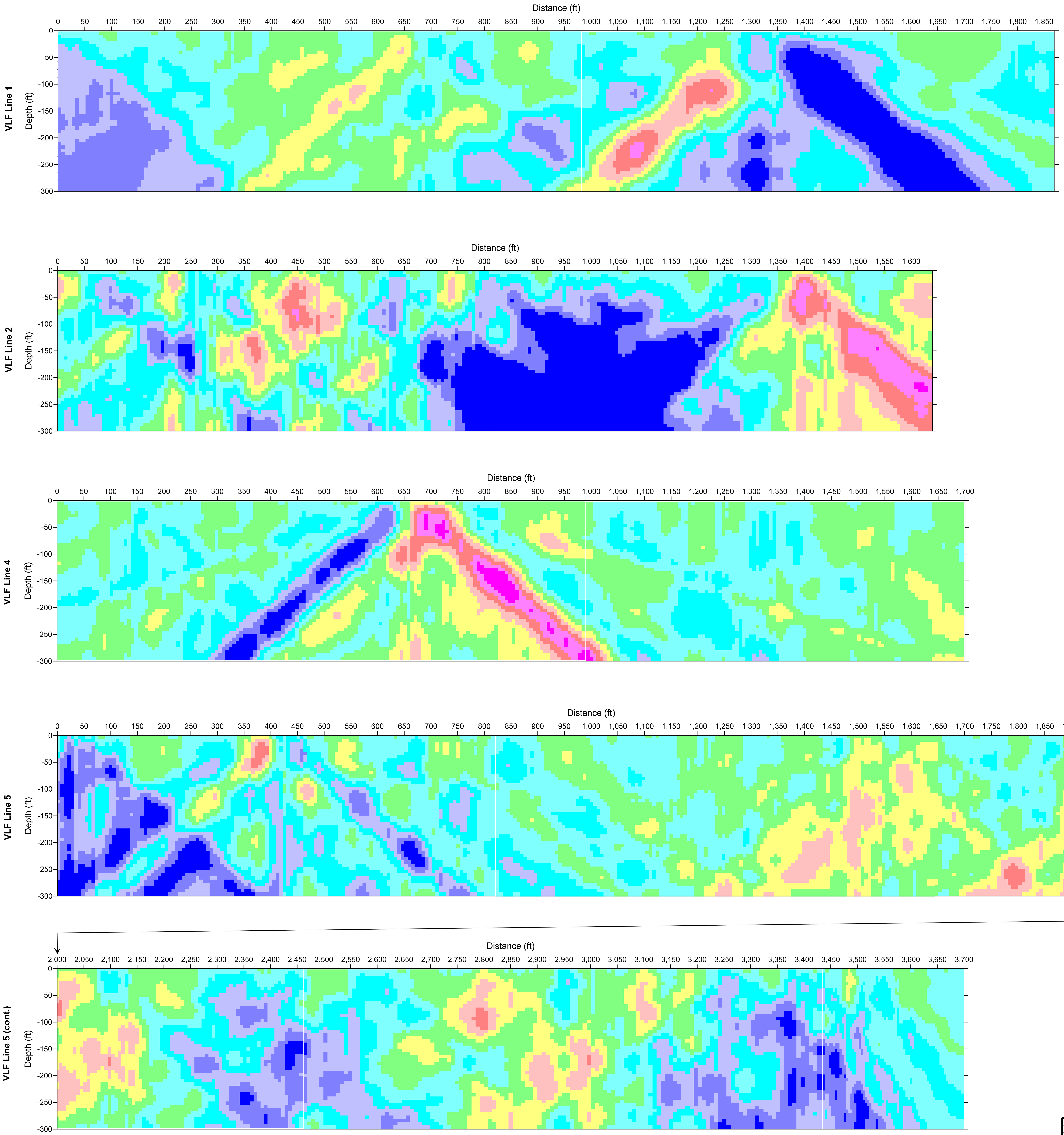
THG GEOPHYSICS
4280 Old William Penn Hwy
Murrysville, Pennsylvania 15668
(724) 325-3996 Fax: (724) 733-7901
www.thggeophysics.com

DRN	PJH	2/3/21
DES	PJH	2/3/21
CHK	MLT	2/12/21
REV		
PROJ. MGR.	ARB	2/12/21
SCALE:	1" = 1,000'	
SOURCE:		
PREPARED FOR:	S&ME	

PROJECT:
Geophysical Investigation
Luck Stone Corporation
Tombo Site
Winnsboro, South Carolina

DRAWING NO.:
Geophysical Location Map

PROJECT NO.: 459-10551
SHEET TITLE: DWG10551F2



Notes

Geophysical survey conducted February 1-6, 2021 using ABEM WADI VLF meter.

No vertical exaggeration
Horizontal scale 1" = 100'
Vertical Scale 1" =100'

THG GEOPHYSICS
4280 Old William Penn Hwy
Murrysville, Pennsylvania 15668
(724) 325-3996 Fax: (724) 733-7901
www.thggeophysics.com

DRN	PJH	2/3/21
DES	PJH	2/3/21
CHK	MLT	2/12/21
REV		
PROJ. MGR.	ARB	2/12/21

SCALE: 1" = 100'

SOURCE:

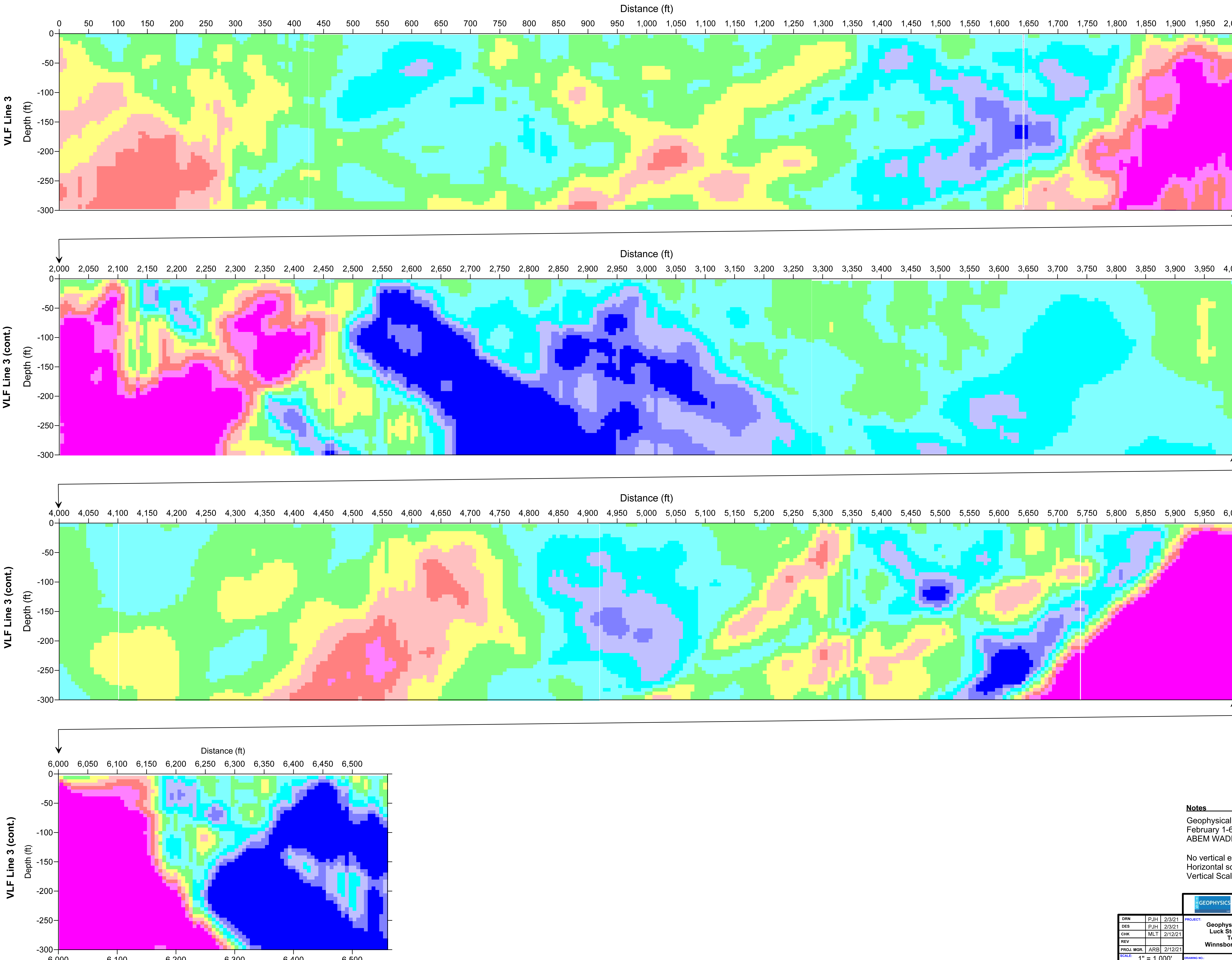
PROJECT: Geophysical Investigation
Luck Stone Corporation
Tombo Site
Winnsboro, South Carolina

DRAWING NO.: Figure 3
SW-NE VLF Profiles 1, 2, 4, and 5

PREPARED FOR: S&ME

PROJECT NO.: 459-10551

SHEET TITLE: DWG10551F3



Notes

Geophysical survey conducted February 1-6, 2021 using ABEM WADI VLF meter.

No vertical exaggeration
Horizontal scale 1" = 100'
Vertical Scale 1" =100'

THG GEOPHYSICS
4280 Old William Penn Hwy
Murrysville, Pennsylvania 15668
(724) 325-3996 Fax: (724) 733-7901
www.thggeophysics.com

DRN	PJH	2/3/21
DES	PJH	2/3/21
CHK	MLT	2/12/21
REV		
PROJ. MGR.	ARB	2/12/21

SCALE: 1" = 1,000'

SOURCE:

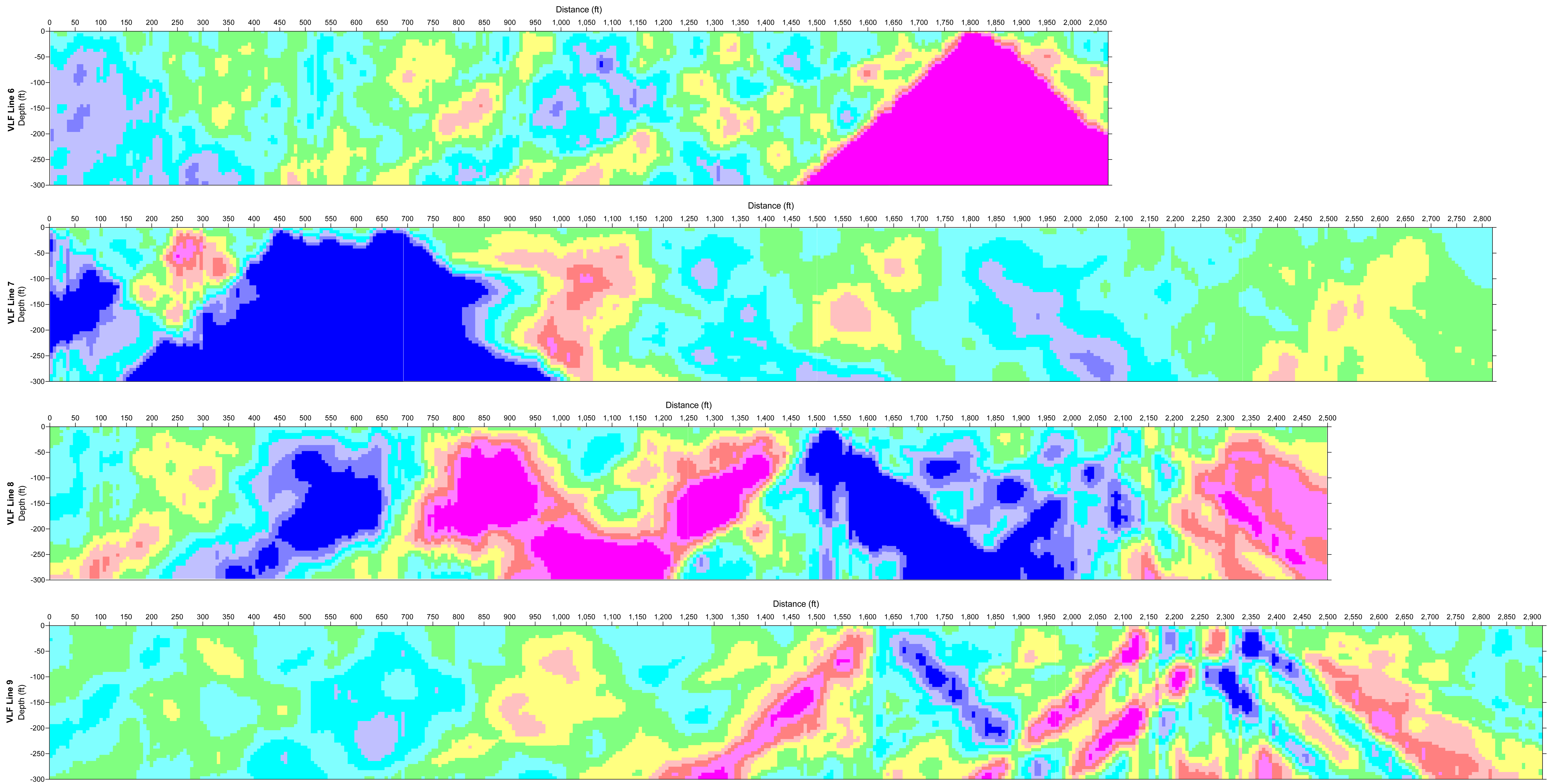
PROJECT:
Geophysical Investigation
Luck Stone Corporation
Tombo Site
Winnsboro, South Carolina

DRAWING NO.:
Figure 4
SW-NE VLF Line 3

PREPARED FOR: S&ME

PROJECT NO.: 459-10551

SHEET TITLE: DWG10551F4



Notes

Geophysical survey conducted February 1-6, 2021 using ABEM WADI VLF meter.

No vertical exaggeration
Horizontal scale 1" = 100'
Vertical Scale 1" =100'

THG GEOPHYSICS
4280 Old William Penn Hwy
Murrysville, Pennsylvania 15668
(724) 325-3996 Fax: (724) 733-7901
www.thggeophysics.com

DRN	PJH	2/3/21
DES	PJH	2/3/21
CHK	MLT	2/12/21
REV		
PROJ. MGR.	ARB	2/12/21
SCALE:	1" = 100'	
SOURCE:		

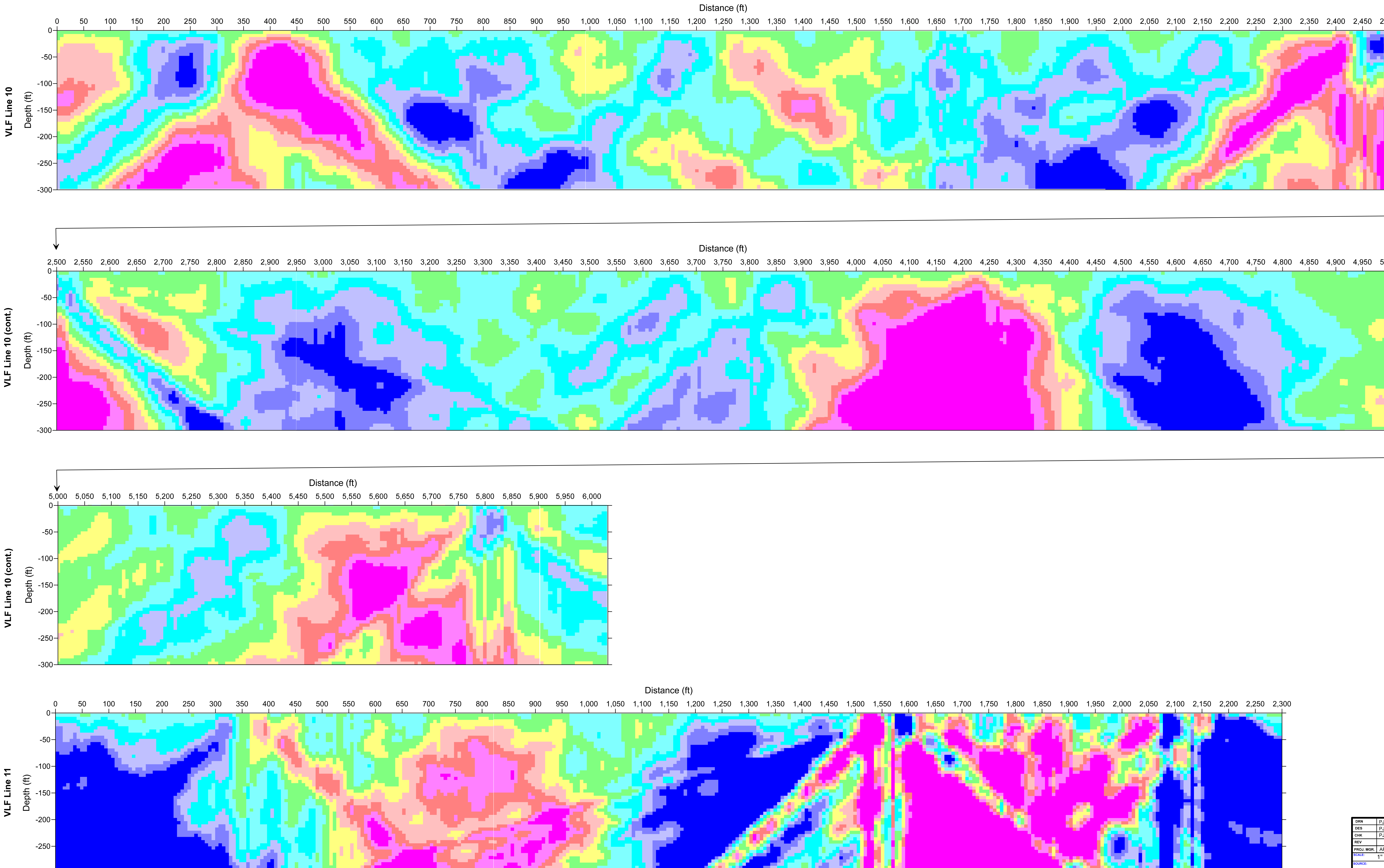
PROJECT: Geophysical Investigation
Luck Stone Corporation
Tombo Site
Winnsboro, South Carolina

DRAWING NO.: Figure 5
NW-SE VLF Profiles 6, 7, 8 and 9

PREPARED FOR: S&ME

PROJECT NO.: 459-10551

SHEET TITLE: DWG10551F5



Notes

Geophysical survey conducted February 1-6, 2021 using ABEM WADI VLF meter.

No vertical exaggeration
Horizontal scale 1" = 100'
Vertical Scale 1" =100'

THG GEOPHYSICS
4280 Old William Penn Hwy
Murrysville, Pennsylvania 15668
(724) 325-3996 Fax: (724) 733-7901
www.thggeophysics.com

DRN	PJH	2/4/21
DES	PJH	2/4/21
CHK	PJH	2/4/21
REV		
PROJ. MGR.	ARB	2/4/21
SCALE:	1" = 100'	
SOURCE:		

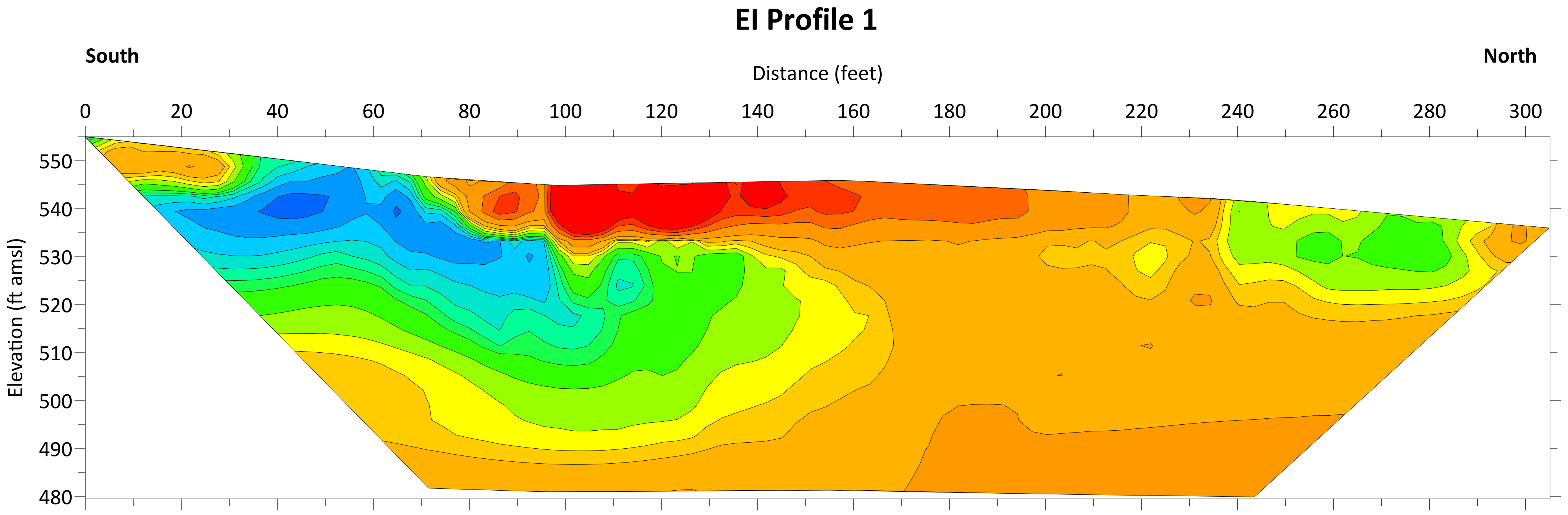
PROJECT: Geophysical Investigation
Luck Stone Corporation
Tombo Site
Winnsboro, South Carolina

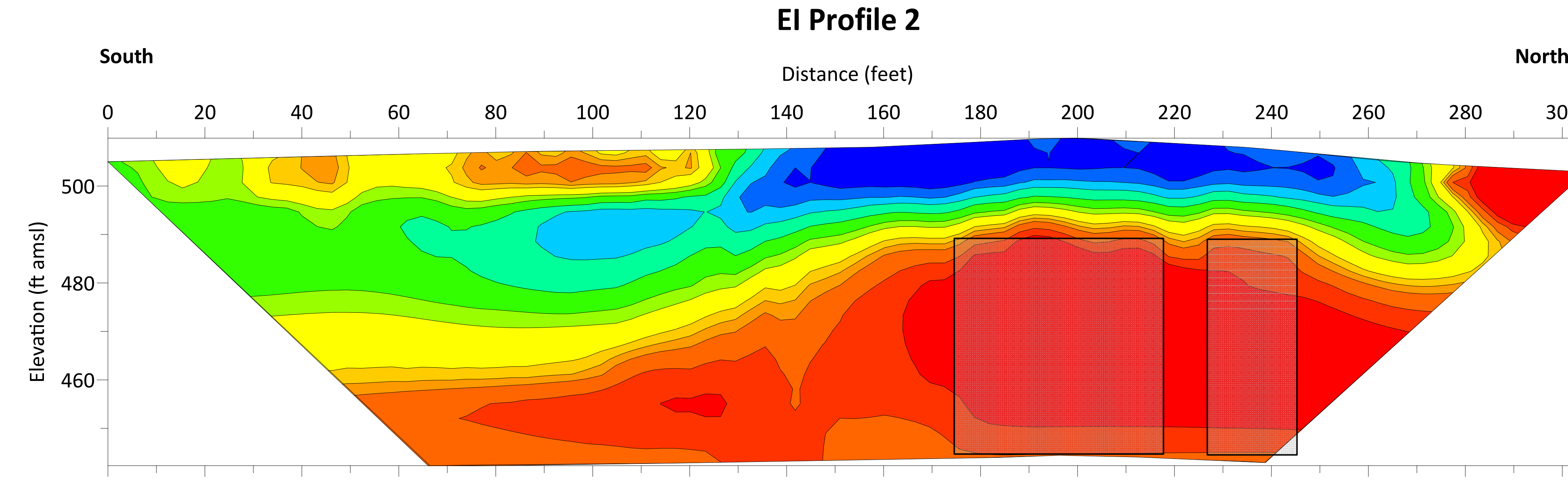
DRAWING NO.: Figure 6
NW-SE VLF Profiles 10 and 11

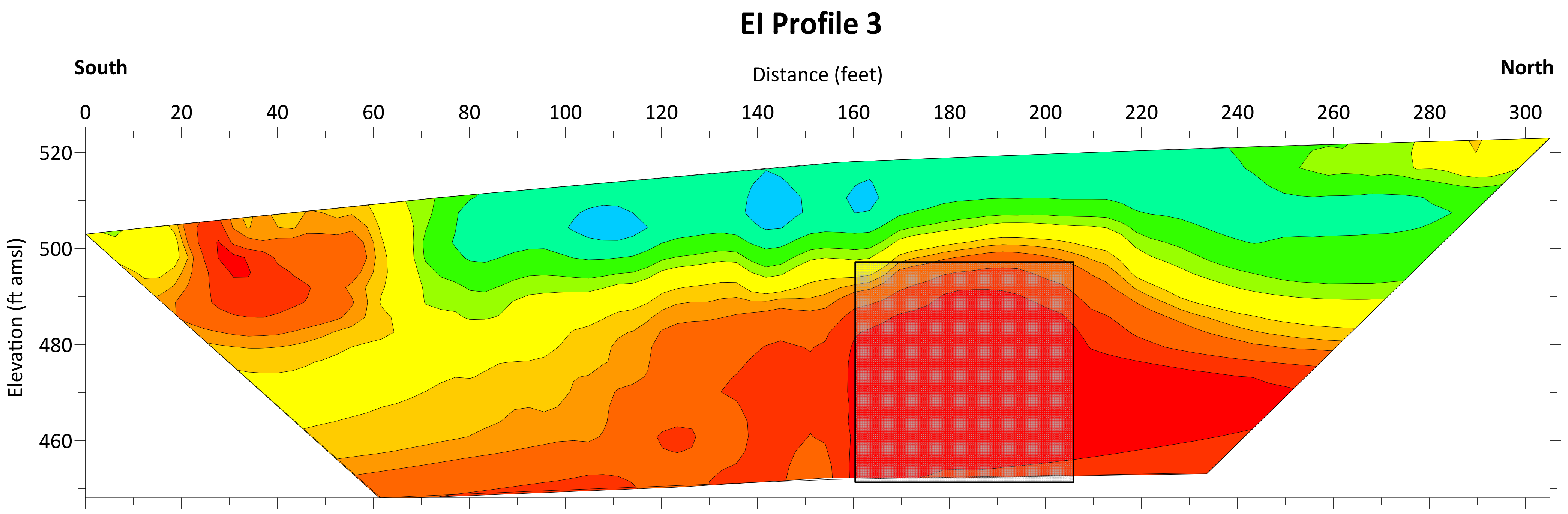
PREPARED FOR: S&ME

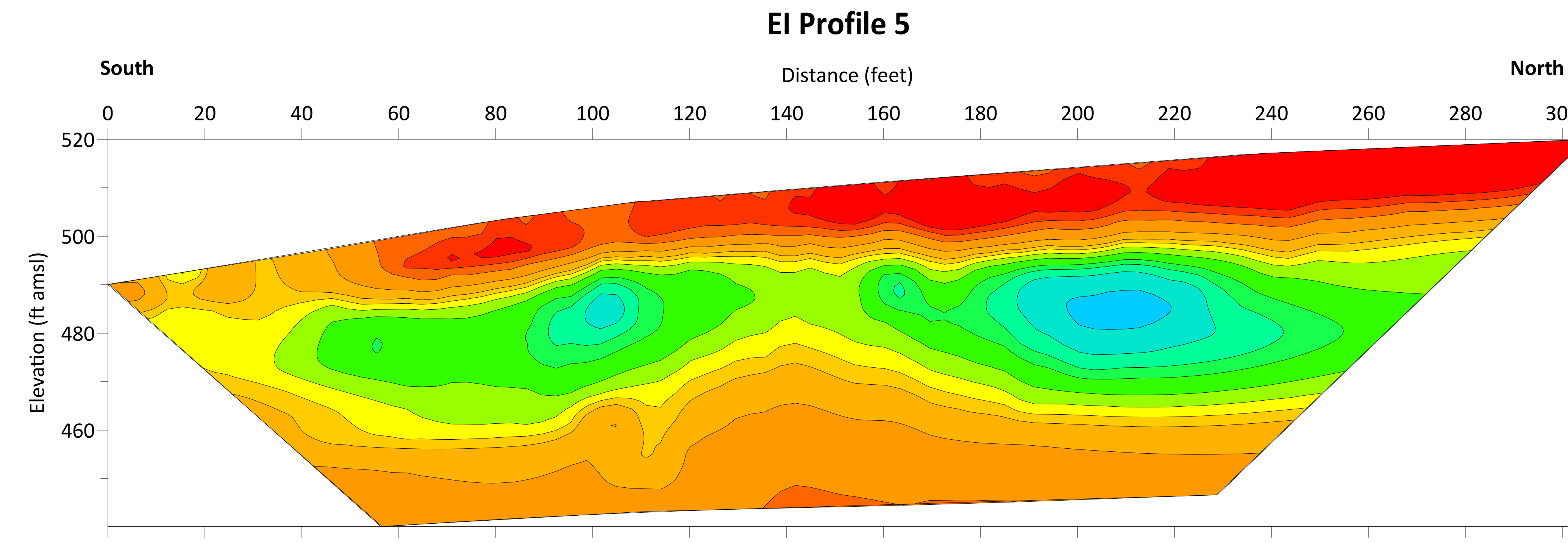
PROJECT NO.: 459-10551

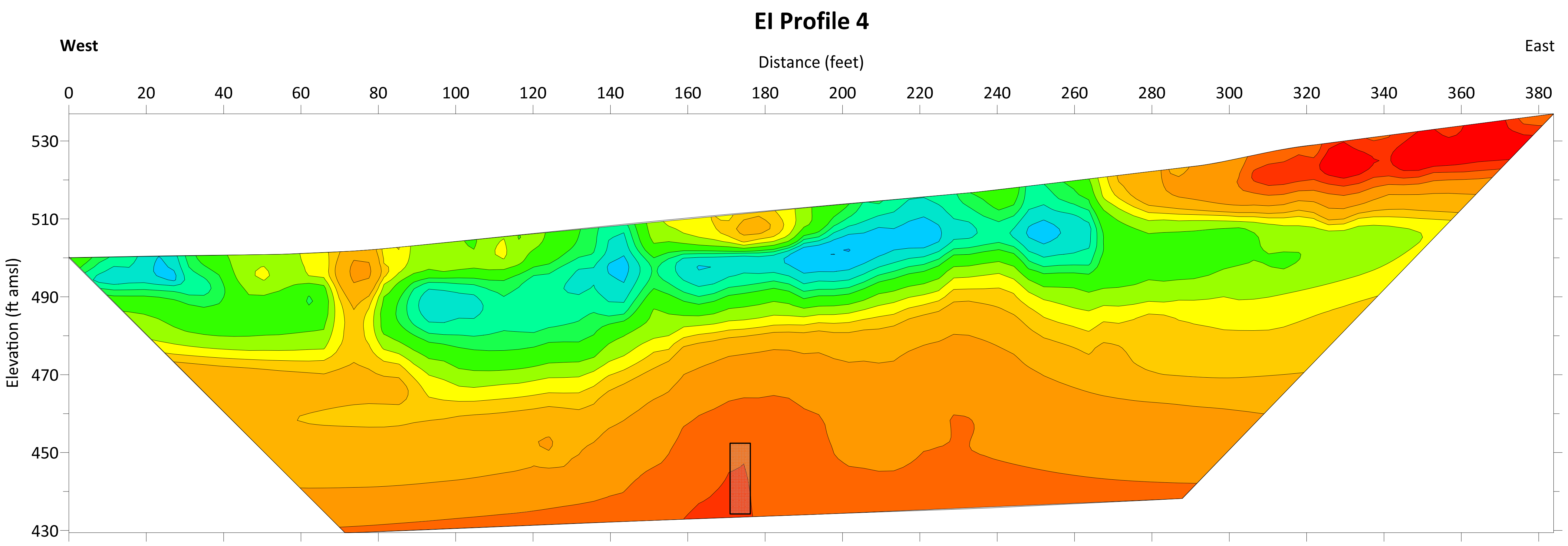
SHEET TITLE: DWG10551F6

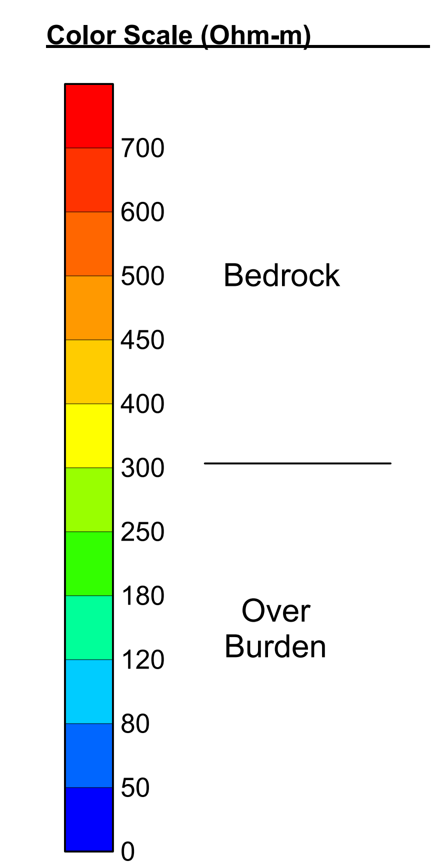


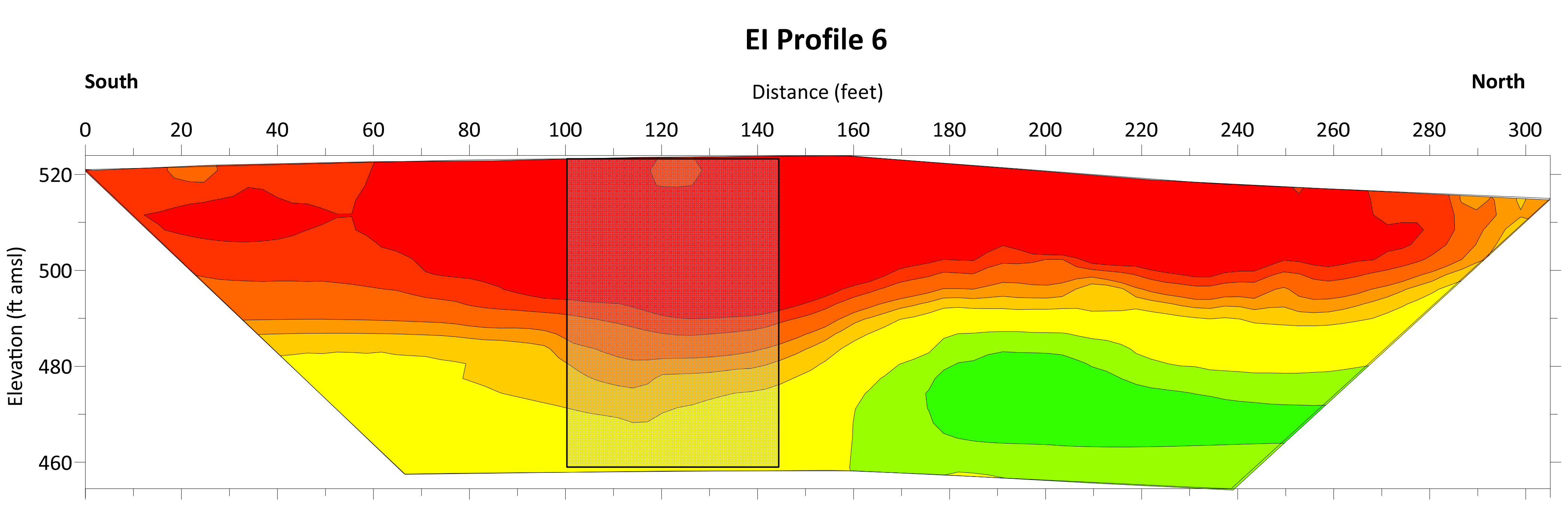












Legend

Approximate Location of a diabase dike

Notes

Geophysical survey conducted February 1-6, 2021 using GF Instruments ARES II electrical resistivity meter with active multi-electrode cable sections.

No vertical exaggeration
Horizontal scale 1" = 30'
Vertical Scale 1" =30'

THG GEOPHYSICS
4280 Old William Penn Hwy
Murrysville, Pennsylvania 15668
(724) 325-3996 Fax: (724) 733-7901
www.thggeophysics.com

DRN	PJH	2/4/21
DES	PJH	2/4/21
CHK	MLT	2/12/21
REV		
PROJ. MGR.	ARB	2/12/21

SCALE: 1" = 100'

SOURCE:

PROJECT:
Geophysical Investigation
Luck Stone Corporation
Tombo Site
Winnsboro, South Carolina

DRAWING NO.:
Figure 7
Electrical Imaging Profiles

PREPARED FOR: S&ME

PROJECT NO.: 459-10551

SHEET TITLE: DWG10551F7