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SUPPLEMENTAL PRELIMINARY GEOTECHNICAL INVESTIGATION

RIDGEGATE – MESA TOPS
SOUTHWEST OF RIDGEGATE PARKWAY AND INTERSTATE 25
LONE TREE, COLORADO

Prepared for:

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Project No. DN52,036.000-115-R2R

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SCOPE

This report presents the results of our Supplemental Preliminary Geotechnical Investigation for the Ridgegate – Mesa Tops development located southwest of Ridgegate Parkway and Interstate 25 in Lone Tree, Colorado (Fig. 1). The site is being considered for residential development served by paved roadways, access drives, and buried utilities. The purpose of our investigation was to evaluate subsurface conditions to assist in due diligence assessment and preliminary planning of site development and construction. The report includes descriptions of the subsurface conditions encountered in our exploratory borings, identification of geologic hazards and geotechnical concerns, and discussions of site development and construction as influenced by geotechnical considerations. The scope was described in a Proposal (No. DN 23-0210R-CM2R) revised date August 22, 2025.

The report is based on our understanding of the planned construction, site reconnaissance, subsurface conditions encountered during exploratory drilling and sampling, results of field and laboratory tests, previous investigation, engineering analysis of field and laboratory data, and our experience. The preliminary discussions of foundation and floor system alternatives presented in this report are intended for evaluation and planning purposes only. Lot specific investigations will be necessary to design residences. A summary of our conclusions and recommendations follows, with more detailed discussion in the report.

SUMMARY OF CONCLUSIONS

1. The site is judged suitable for development from a geotechnical perspective. The primary geotechnical concerns are the presence of potentially unstable slopes, expansive soil and bedrock, and potentially difficult excavation. We believe these concerns can be mitigated with proper planning, engineering, design, and construction. We believe there are no geotechnical concerns that would preclude development.

2. Strata encountered in our borings consisted of about nil to 13 feet of sandy clay and clayey sand underlain by claystone and sandstone bedrock. Drill rig refusal was encountered in twenty borings at depths of about 3 to 33 feet (Fig. 3). Soils encountered during our previous investigation are similar to the soils encountered during this investigation. We judge the clay and claystone are variably expansive.

3. Groundwater was not encountered during drilling nor when checked several days later. Groundwater is not expected to influence construction. Groundwater levels may fluctuate seasonally, and develop and rise in response to development, precipitation, landscape irrigation, changes in land-use and flow in nearby drainages.

4. We performed a preliminary slope stability analysis as part of this investigation. Our initial analyses indicate proposed grading configurations will not increase instability of existing slopes, however; we were very limited on where we could explore subsurface conditions due to steep slopes and private property. We recommend further borings and/or test pits along slopes to better define our subsurface profiles.

5. Sub-excavation is an alternative to enhance performance of slab-on-grade basement floors and increase the number of lots where footings will be suitable. We encountered expansive clay and bedrock at depths likely to influence the performance of shallow foundation systems and slab-on-grade basement floors in several of our borings. Sub-excavation may be considered to mitigate expansive soil and bedrock and likely allow the use of shallow foundations and slab-on-grade basement floors. Our Estimated Extent of Sub-Excavation is presented on Fig. 4.

6. Pavement subgrade soils will likely consist of sandy clay, clayey sand, or fill of similar composition. Douglas County requires minimum pavement thicknesses of 4 inches of hot mix asphalt over 6 inches of aggregate base course for local residential streets. Based on our experience at this site, we estimate the pavement section may be 5 inches of asphalt over 8 inches of base course. Mitigation of expansive pavement subgrade may be required, either with chemical amendment or replacement with CDOT Class 6 Aggregate Base Course. A design-level subgrade investigation should be done prior to paving.

7. Control of surface and subsurface drainage will be critical to the performance of foundations, slabs-on-grade, pavements and other improvements. Overall surface drainage should be designed to provide rapid run-off of surface water away from structures and flatwork. Water should not be allowed to pond near structures or on pavements and flatwork, or on the crests of slopes. Conservative irrigation practices should be employed to reduce the risk of subsurface wetting.

SITE CONDITIONS AND SITE GEOLOGY

The Ridgegate – Mesa Tops development is located southwest of Ridgegate Parkway and Interstate 25 in Lone Tree, Colorado (Photo 1). The site is bordered by North Heather Drive to the south, North Surrey Drive and Interstate 25 to the east, and residential developments to the north, west, and southwest. The site is vegetated moderately with grasses throughout with dense shrubs and trees along slope faces and drainages. There is a power line easement through the southeastern portion of the site. Historical aerial photos were reviewed to evaluate the history of the site and associated impacts on design and construction. Photos dating back to

1937 show that the site has remained relatively unchanged. The parcel continues to be used for grazing. During our most recent site visit, we encountered debris from previous residential homes located along the southern portion of the parcel. The site generally slopes to the north-east. Slopes are moderate to steep below the mesa and gentle on top.

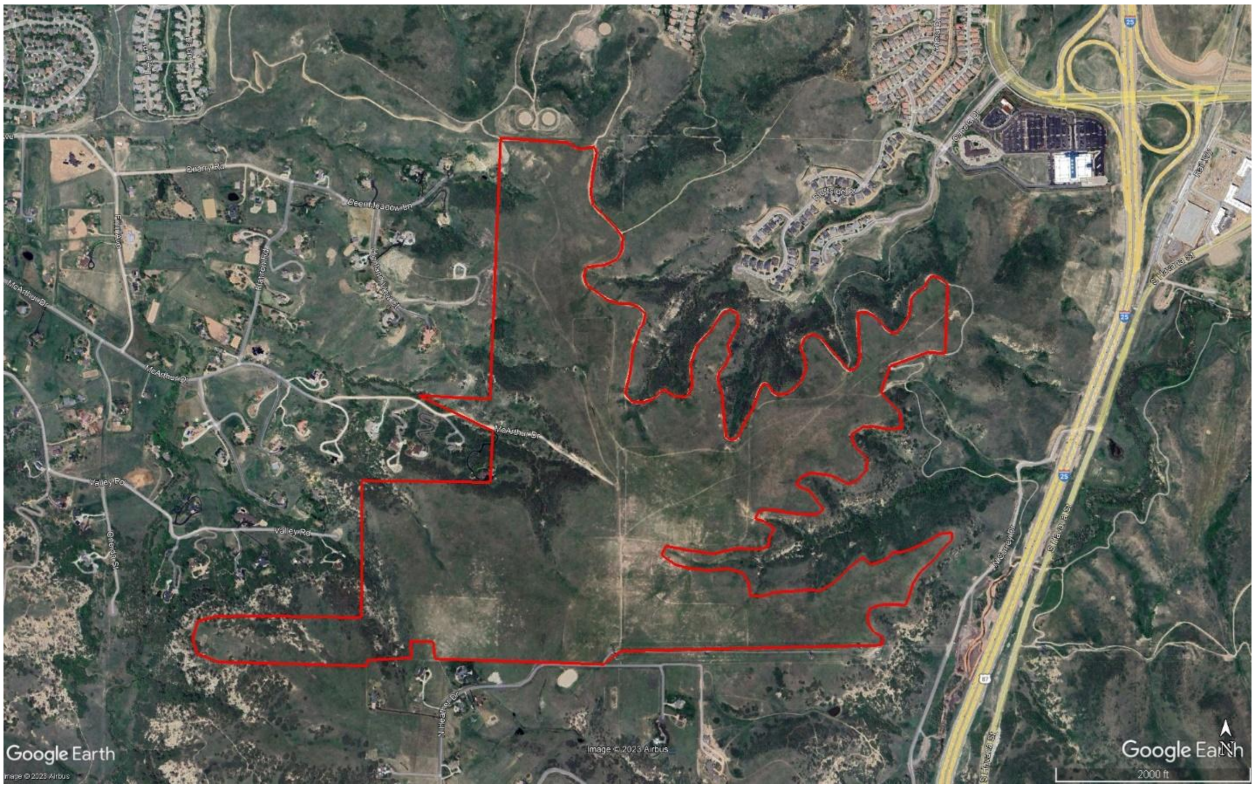


Photo 1: Google Earth© Aerial Site Photo, May 2023, approximate site boundary outlined in red.

To evaluate the geology of the parcel, we reviewed the 1977 Geologic map of the Highlands Ranch quadrangle and the 1972 Geologic map of the Parker Quadrangle, Arapahoe and Douglas Counties, Colorado by Maberry, J.O., and Lindvall, R.M. (Geologic Quadrangle Map GQ-1413 and Miscellaneous Geologic Investigations Map I-770-A, respectively), supplemented by borings drilled for this investigation and our previous investigation. Excerpts from the geologic maps are presented below in Photo 2.

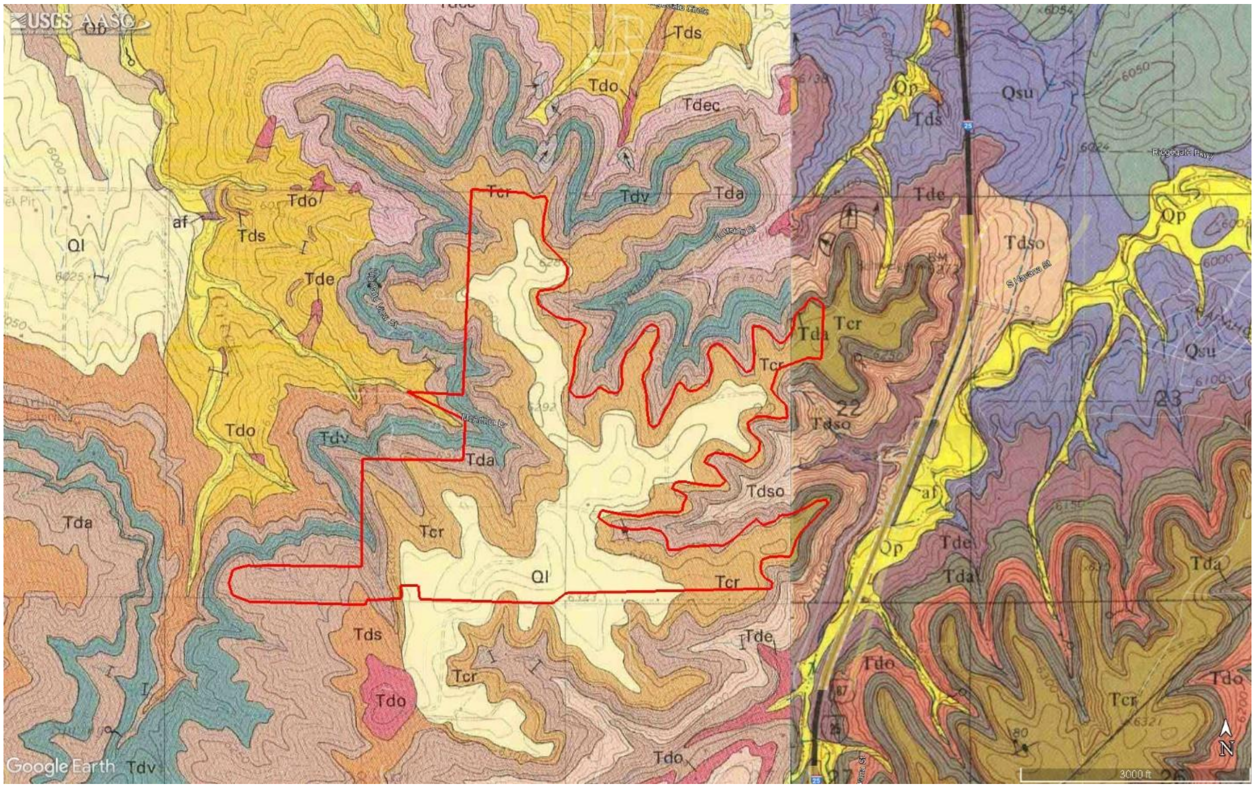


Photo 2: Excerpt from the Geologic Map of the Highlands Ranch (west portion of the site) and Parker (east portion of the site) quadrangles, Arapahoe and
Douglas Counties, Colorado.

As shown on the geologic maps, and supported by material encountered in our exploratory borings, the subject area is primarily underlain by the Castle Rock Conglomerate (map symbol Tcr) of the Oligocene age with outcroppings of the Upper Part of the Dawson Arkose (map symbol Tda) of the Paleocene age. Overburden soils consist of Loess (map symbol Ql) of the Holocene and Pleistocene ages. The Castle Rock Conglomerate is a pebble, cobble, and boulder arkosic conglomerate and can be difficult to excavate. Drill rig refusal was encountered in twenty of our borings during this investigation. During our previous investigation drill rig refusal was encountered in nine borings. The mapping is consistent with conditions found in our borings.

Loess consists of a light brown to tan sandy silt deposited by wind. Upper portions may contain small amounts of clay and silty clay. We have found that silty surficial soils on the hillslopes and drainages can be expansive or compressible.

PROPOSED DEVELOPMENT

Plans indicates the site will be developed for single-family residential, open space/park areas, and detention ponds. We anticipate the residences will be one to two-story, wood-framed structures with basements and multi-car garages. The residences will have partial brick or stone veneer exterior wall treatments. Paved streets will provide access throughout the development. Grading plans prepared by JR Engineering dated December 9, 2025, indicate cuts/fills up to about 15 feet will be necessary to achieve proposed grade.

GEOLOGIC HAZARDS

Geologic hazards were evaluated through review of geologic maps, exploratory borings, site reconnaissance, and local experience. Geologic hazards include steep and potentially unstable slopes, landslide and debris flow, expansive soils and bedrock, existing undocumented fill, erosion potential and the regional issues of seismicity and naturally occurring radioactive materials. We believe potential impacts of these hazards can be reduced with proper engineering, design, and construction practices. We identified no geologic hazard that would preclude development. These hazards and conceptual mitigation methods are discussed in the following sections.

Steep and Potentially Unstable Slopes

Steep (greater than 20%) and potentially unstable slopes were observed. Slumps are common where over-steeped slopes are present. These slopes are hazard to humans and livestock should failure occur when they are present. Mitigation may consist of erosion control or laying the unstable slopes back to safe inclination. Retaining walls may also be an option. Where development encroaches on steep slopes, sensitive site design will be necessary.

Preliminary Slope Stability Analysis

We performed a preliminary slope stability analysis along 12 cross sections where proposed lot locations abut steep slopes and mapped landslide deposits. We analyzed the stability of these slopes to evaluate risk of slope failure related to proposed grading. In order to perform the slope stability analysis, we used provided grading plans, interpolated subsurface conditions and soil profile based on borings from the current and previous investigations as well as published geological mapping[1,2], and selected strength properties of the soil and bedrock types based on laboratory test results and previous experience. Site slopes are very steep, precluding rig access in many locations. Our boring locations were selected in areas we could safely access. Mapped landslide deposits are present along the slopes where sections E through H are located. Based on our site reconnaissance, we also believe there are slopewash and/or landslide deposits, to some extent, on the slopes crossed by section A. As indicated earlier, we could not access these slopes with a drill rig. We estimated deposit thicknesses using boring data and visual observation of the slopes. <u>We recommend additional borings and/or test pits along the slopes to confirm and further define our subsurface profiles</u>. The scope for the additional work is currently being prepared.

The following paragraphs summarize our analyses. Results are shown in Appendix C. The locations of the 12 slope cross sections are shown on Fig. 1. Our analysis and recommendations are based on construction as currently planned. Slope stability should be reevaluated if revisions are made to the planned construction.

In discussions that follow, the term "factor of safety" (FOS) is used. This term describes the ratio of strength available to resist sliding compared to the forces that cause sliding. A FOS of 2.0 means the forces resisting sliding exceed the driving force by 2.0 times. For long-term stability, a typical minimum industry accepted FOS is 1.3, while a FOS of 1.5 is preferred. A FOS of less than 1.0 implies failure conditions.

We used our laboratory test results, in addition to our experience in the area, to select soil strength parameters for the soils. Strength values and slope geometry were input into a slope stability evaluation program, Slide2, by Rocscience. Mohr-Coulomb failure criterion was used to define the strength of each material type; input data are summarized in the table below. Strength values assigned to fill materials assume the fill has been moisture-conditioned and compacted to specifications discussed in **SITE DEVELOPMENT** and derived from on-site soil and bedrock. Conditions that differ from those used in our analysis may be encountered during

[1] Maberry, J.O., and Lindvall, R.M. "Geologic map of the Highlands Ranch quadrangle, Arapahoe and Douglas Counties, Colorado," Geologic Quadrangle Map GQ-1413, 1977

[2] Maberry, J.O., and Lindvall, R.M., "Geologic Map of the Parker quadrangle, Arapahoe and Douglas Counties, Colorado," Miscellaneous Geologic Investigations map I-770-A, 1972

construction. If different conditions are encountered, we should be notified to reevaluate our results.

TABLE I: SLIDE2 MATERIAL PROPERTY VALUES

Material	Unit Weight (pcf)	Cohesion (psf)	Angle of Internal Friction (degrees)
Residuum/Clayey Sand	115	25	28
Fill	120	1	28
Claystone	125	500	20
Sandstone	130	50	34

The complex geologic environment makes it difficult to model subsurface conditions and duplicate in-situ conditions. A considerable amount of extrapolation was needed to define subsurface profiles due to practical drill rig refusal and access restrictions. Extrapolations were done conservatively by preferentially modelling weaker material types where data was limited. The equilibrium states and FOS were calculated using the Janbu Corrected, GLE/Morgenstern-Price, and Spencer methods. Critical failure surfaces were computed using Slide2's non-circular Particle Swarm Search method with Surface Altering optimization. Multiple surfaces were allowed to be generated to identify all critical zones along the slopes. No limitations were placed on the location of entry and exit points of critical surfaces. Groundwater was not encountered during this investigation, and seeps were not observed along the slopes; therefore it was not included in our analysis. Increases in subsurface moisture, the presence of seepages, and erosion of slope faces via surface water will likely reduce stability. Care should be taken to direct surface water away from the slopes.

We modeled each cross section under both existing and proposed conditions to evaluate the impact of proposed grading on slope stability. Results of our analyses for proposed configurations are summarized in the table below and presented in Appendix C. Slope stability analyses imply proposed slope configurations for the studied sections are generally stable. The calculated FOS of 1.0 for Cross Section B is likely the result of using weaker strength properties for the sandstone than actual values. We believe this section is more stable than the analysis implies. More data is needed to better evaluate the stability of this section, which will be obtained as part of our additional slope stability investigation. Addition of water to the subsurface from precipitation or irrigation reduces relative stability and may initiate slope failures. Surface drainage should be designed, constructed, and maintained to provide rapid removal of surface runoff.

Landscaping should be designed for minimal irrigation. Changes to proposed grading and surface and subsurface drainage will impact slope stability along these sections.

TABLE II: RESULTS OF SLOPE STABILTY ANALYSIS – PROPOSED GRADING

Cross Section	Factor of Safety (Method)
A	1.3 (G/MP)
B	1.0 (G/MP)
C	1.7 (G/MP)
D	1.5 (G/MP)
E	1.6 (G/MP)
F	1.3 (Sp)
G	1.6 (G/MP)
H	1.6 (G/MP)
I	1.7 (JC)
J	1.5 (Sp)
K	1.5 (JC)
L	1.5 (JC)

Lowest calculated FOS is presented in the table above. The method resulting in the lowest FOS is indicated by JC=Janbu Corrected, G/MP=GLE/Morgenstern-Price, and Sp=Spencer.

Landslides and Debris Flow

As part of our evaluation, we reviewed the 2018 Landslide Inventory and Susceptibility Map of Douglas County, Colorado[3] and the 2018 Debris Flow Susceptibility Map of Douglas County, Colorado[4]. Excerpts of these maps are shown below in Photos 2 and 3, respectively. There are limitations associated with map scaling and scope of the investigation; however, the potential for landslides and debris flows indicated on these maps generally agree with site observations from this investigation.

The landslide map indicates there are potential landslide deposits and landslide hazard areas present around the proposed development to the north and west of the site. We are aware of post-construction slope failures on nearby sites. Addition of water to the subsurface from precipitation or irrigation reduces relative stability and may initiate slope failures. Surface

[3]Lindsey, Kassandra, "Landslide Inventory and Susceptibility for Douglas County, Colorado," Colorado Geological Survey, (Open File Report, OF-18-07), 2018.
[4]McCoy, Kevin M., F. Scot Fitzgerald, Matthew L. Morgan, and Karen A. Berry. "Debris Flow Susceptibility Map of Douglas County, Colorado," Colorado Geological Survey (Open File Report, OF-18-08), 2018.

drainage should be designed, constructed, and maintained to provide rapid removal of surface runoff.

Additionally, the debris flow map indicates debris flow hazard areas are present within the drainages on-site. The topography of the site encourages water to flow from higher elevations, through these drainage pathways, towards lower lying areas. In large precipitation events, erosion and mud or debris flows can occur through these pathways. The Civil Engineer should evaluate drainage basins present on the site slopes and design surface drainage structures that will reduce the risk of debris flows.

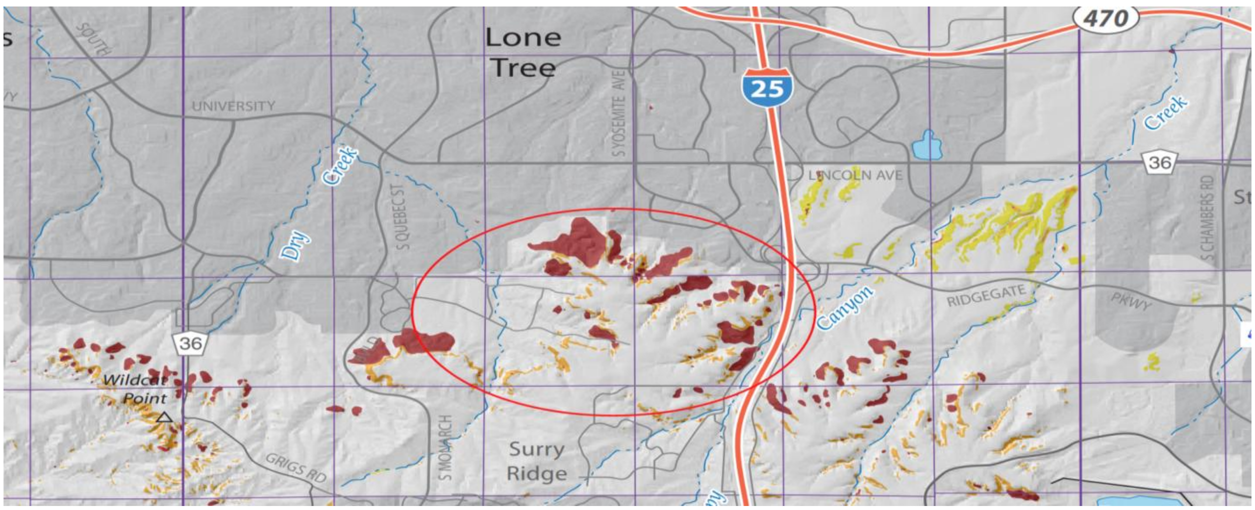


Photo 2: Excerpt from the Landslide Inventory and Susceptibility Map of Douglas County. Approximate site boundary outlined in red.

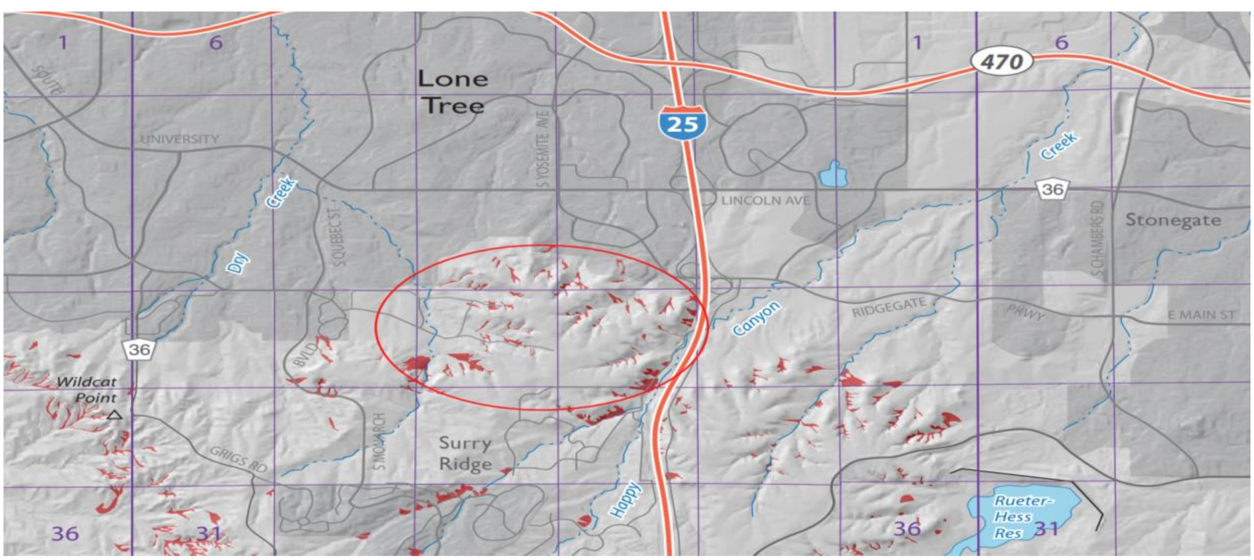


Photo 3: Excerpt from the Debris Flow Susceptibility Map of Douglas County. Approximate site boundary outlined in red.

Expansive Clay and Claystone

Colorado is a challenging location to practice geotechnical engineering. The climate is relatively dry and the near-surface soils are typically dry and comparatively stiff. These soils and related sedimentary bedrock formations react to changes in moisture conditions. Some of the soils swell as they increase in moisture and are referred to as expansive soils. Other soils can compress significantly upon wetting and are identified as compressible or collapsible soils. Much of the land available for development east of the Front Range is underlain by expansive clay and or claystone bedrock near the surface. The soils that exhibit collapsible behavior are more likely west of the Continental Divide; however, both types of soils occur throughout the state.

Estimated Potential Heave

Based on the subsurface profiles, previous investigations, swell-consolidation test results and our experience, we calculated the potential heave referencing proposed grades for each boring, as shown in the table below. The analysis involves dividing the soil and bedrock profile into layers and modeling the heave of each layer from representative swell tests. The heave estimates do not consider the planned grading; grading will affect the estimates. We estimated potential ground heave may range from less than ½-inch to about 6 inches. A depth of wetting of 24 feet below existing grades was considered for the analysis. It is not certain whether the estimated heave will occur. It is likely that potential heave can be reduced to tolerable levels with sub-excavation, as discussed in the next section.

TABLE III: ESTIMATED TOTAL POTENTIAL GROUND HEAVE
BASED ON 24 FEET DEPTH OF WETTING

Boring	Estimated Potential Heave at Existing Ground Surface (inches)
TH-14	<½
TH-15	<½
TH-101	<½
TH-102	4½
TH-103	3½
TH-104	1
TH-105	<½
TH-106	2
TH-107	<½
TH-108	1½

Boring	Estimated Potential Heave at Existing Ground Surface (inches)
TH-109	2½
TH-110	5
TH-111	2½
TH-112	1½
TH-113	3
TH-114	<½
TH-115	3½
TH-116	3½
TH-117	1½
TH-118	5½
TH-119	1
TH-120	6
TH-121	½
TH-122	1½
TH-123	1½
TH-124	<½
TH-125	2
TH-126	½
TH-127	1½
TH-128	½
TH-129	5
TH-130	<½
TH-131	<½

The clay and claystone are expansive. There is risk that ground heave will damage pavements, slabs-on-grade, and foundations. Engineering design of grading, pavements, foundations, slabs-on-grade, and surface drainage can mitigate, but not eliminate, the effects of expansive soil.

Undocumented Fill

Although not encountered in our borings, it is probable that existing fill is present along the southern portion of the site where debris from previous residential homes were encountered and may be present in other areas of the site. Existing fill (where present) is considered unsuitable to support improvements and should be removed and replaced as moisture conditioned, compacted fill. Utilities, structural elements, slabs and debris below the new improvements should be removed and replaced with moisture-conditioned, compacted fill.

Seismicity

According to the USGS, Colorado's Front Range and eastern plains are considered low seismic hazard zones. The earthquake hazard exhibits higher risk in western Colorado compared to other parts of the state. The Denver Metropolitan area has experienced earthquakes within the past 100 years, shown to be related to deep drilling, liquid injection, and oil/gas extraction. Naturally occurring earthquakes along faults due to tectonic shifts are rare in this area.

The soil and bedrock at this site are not expected to respond unusually to seismic activity. The current IBC and IRC defer the estimation of Seismic Site Classification to ASCE7-22, a structural engineering publication. Updates from the previous versions of ASCE7 include (1) incorporation of additional Site Classifications BC, CD, and DE, (2) removal of tabulated blow-count and shear-strength correlations to shear wave velocity, and (3) requires the engineer to reduce shear wave velocity values by a factor of 1.3 when empirically estimated or not directly measured. The table below summarizes ASCE7-22 Site Classification Criteria.

TABLE IV: ASCE7-22 SITE CLASSIFICATION CRITERIA

Seismic Site Class	$\bar{v}_s$, Calculated Using Measured or Estimated Shear Wave Velocity Profile (ft/s)
A. Hard Rock	>5,000
B. Medium Hard Rock	>3,000 to 5,000
BC. Soft Rock	>2,100 to 3,000
C. Very Dense Sand or Hard Clay	>1,450 to 2,100
CD. Dense Sand or Very Stiff Clay	>1,000 to 1,450
D. Medium Dense Sand or Stiff Clay	>700 to 1,000
DE. Loose Sand or Medium Stiff Clay	>500 to 700
E. Very Loose Sand or Soft Clay	≥500
F. Soils requiring Site Response Analysis	See Section 20.2.1

We judge the subsurface likely ranges between Seismic Site Classification CD and C. The field penetration test results along with the empirical estimates imply that shear-wave velocity seismic tests to directly measure $\bar{v}_s$ could likely result in a better Seismic Site Classification.

Radioactivity

It is normal in the Front Range of Colorado and nearby eastern plains area to measure radon gas in poorly ventilated spaces (e.g., crawl spaces, if any) in contact with soil or bedrock.

Radon 222 gas is considered a health hazard and is just one of several radioactive products in the chain of the natural decay of uranium into lead. Radioactive nuclides are common in the soil and bedrock underlying the subject site. Because these sources exist or will exist on most sites in the area, there is a potential for radon gas accumulation in poorly ventilated spaces. The concentration of radon that can develop is a function of many factors, including the radionuclide activity of the soil and bedrock, construction methods and materials, soil gas pathways, and accumulation areas. The only reliable method to determine if a hazard exists is to perform radon testing of completed residential structures. Typical mitigation methods consist of sealing soil gas entry areas, ventilation of below-grade spaces, and venting from foundation drain systems. Radon rarely accumulates to significant levels in above-grade living spaces. We recommend provision for ventilation of foundation drain systems to allow venting if a radon problem is discovered.

Other Considerations

Erosion potential on this site is moderate to high due to site slopes and materials present on-site. The soils on the hillslopes are granular and prone to erosion. Erosion can be expected to increase during construction but should return to preconstruction rates or less if proper grading practices, surface drainage design, and revegetation efforts are implemented. Construction sites within the Denver Metropolitan area are subject to the U.S. Environmental Protection Agency (EPA) regulations regarding the control of storm water discharge and soil erosion. We did not identify significant, emotionally recoverable, high-quality aggregate in our borings.

PREVIOUS INVESTIGATION

CTL|Thompson performed a Preliminary Geotechnical Investigation within the Ridgegate Mesa Tops development under our Project No. DN52,036-115-R1 and presented our results in a report dated November 20, 2023. We drilled and sampled 19 widely-spaced exploratory borings. We encountered sandy clay and clayey sand over claystone and sandstone bedrock. Bedrock was very hard and practical drill rig refusal was encountered in nine borings at depths of 12 to 21 feet below existing grades. The primary geotechnical concerns identified were expansive clay and claystone and potentially unstable slopes.

We subsequently performed a Preliminary Geotechnical Investigation for the proposed Mesa Tops Road Alignment under our Project No. DN52,378-115-R1 and presented results in a report dated March 12, 2025. The purpose of the investigation was to determine the type of subgrade soils present at the site, evaluate pavement support characteristics, and provide preliminary pavement design alternatives. We drilled and sampled six exploratory borings along the road alignment. We encountered sandy clay and clean to clayey sand underlain by weathered and comparatively unweathered claystone bedrock.

We performed a Slope Stability Evaluation for the proposed Mesa Tops Road Alignment under Project No. DN52,378-115-L1 and presented results in a letter dated April 18, 2025. The purpose of the investigation was to assess slope stability for the existing slopes relative to planned cuts and fills for the Mesa Tops Road Alignment. We drilled and sampled eleven widely-spaced exploratory borings along the slope areas in conjunction with the previously investigated pavement borings under our March 12, 2025, report. We encountered about 1 to 20 feet of sandy clay and/or clean to clayey sand underlain by weathered and comparatively unweathered claystone and sandstone bedrock to the maximum depth explored of 40 feet. Data from our previous investigations was considered in preparation of this report.

INVESTIGATION

We investigated subsurface conditions between August 27 and September 4, 2025, by drilling 33 exploratory borings at the approximate locations shown on Fig. 1. The boring locations were staked and surveyed by others. Prior to drilling, we contacted the Utility Notification Center of Colorado and local sewer and water districts to identify locations of buried utilities. The borings were advanced to depths of 3 to 45 feet below existing grades using 4-inch diameter, continuous-flight, solid-stem auger and truck-mounted drill rigs. Samples were obtained at approximate 5-feet intervals using a 2.5-inch diameter (O.D.) modified California barrel sampler driven by blows of a 140-pound hammer falling 30 inches. Our field representatives were present to observe drilling operations, log the strata encountered, and obtain samples. Summary logs of the exploratory borings are presented in Appendix A.

Samples were returned to our laboratory where they were examined by our engineers. Laboratory tests included dry density, moisture content, percent silt- and clay-size particles (passing the No. 200 sieve), Atterberg limits, swell-consolidation, swell load-back, total suction, and water-soluble sulfate concentrations. Swell-consolidation tests were performed by wetting the samples under existing overburden pressure (i.e., the pressure exerted by the overlying soil). Results of laboratory tests are presented in Appendix B and summarized in Table B-I.

SUBSURFACE CONDITIONS

Strata encountered in our borings consisted of about nil to 13 feet of sandy clay and clayey sand underlain by claystone and sandstone bedrock. Drill rig refusal was encountered in twenty borings at depths of about 3 to 33 feet. Some pertinent engineering characteristics of the soil and bedrock are described in the following paragraphs.

Clay and Sand

Sandy clay and clayey sand were encountered from the ground surface to depths of up to about 13 feet. The clay was very stiff based on the results of field penetration resistance tests. The soils encountered during this investigation are similar to the soils encountered during the previous investigation. One clay sample compressed 9.5 percent, and twelve samples swelled 1.6 to 7.9 percent when wetted. The clay sample that exhibited compression was likely disturbed during sampling and laboratory preparation and is not representative of the soil mass. One sample had a soil suction value of 4.79 pF and developed a load-back swell pressure of 19,500 psf. One clay sample contained 86 percent silt and clay-sized particles (passing the No. 200 sieve) and exhibited moderate plasticity. We judge the clay to be variably expansive and we judge the sand to be non-expansive.

Bedrock

Claystone and sandstone bedrock were encountered at the ground surface or at depths up to 13 feet in all borings (Fig. 2). The bedrock was medium hard to very hard. Practical drill rig refusal was encountered in twenty borings at depths of about 3 to 33 feet (Fig. 3). Two claystone samples compressed 0.1 and 0.3 percent and twelve samples swelled 0.1 to 10.1 percent when wetted. Bedrock samples exhibiting compression were likely disturbed during sampling and laboratory preparation and are not indicative of compressible bedrock. Five claystone samples had total suction values of 4.16 to 4.36 pF and five developed load-back swell pressures of approximately 3,100 to 12,400 psf. Six claystone samples contained 53 to 99 percent fines and five exhibited high plasticity. Fourteen sandstone samples contained 10 to 49 percent fines and three contained 2 to 24 percent gravels (retained on the No. 4 sieve). We judge the sandstone to be non-expansive or low-swelling and the claystone to be variably expansive.

Groundwater

Groundwater was not encountered during this investigation. Groundwater is not expected to influence construction. Groundwater levels may fluctuate seasonally, and develop and rise in response to development, precipitation, landscape irrigation, changes in land-use and flow in nearby drainages.

SITE DEVELOPMENT

The primary geotechnical concerns that we believe will influence development on this site is the presence of expansive clay and claystone and very hard, cemented bedrock. These concerns can be mitigated with proper planning, engineering, design, and construction. We believe there are no geologic or geotechnical constraints that would preclude development. The following sections provide a discussion of site development recommendations.

Excavation

Lenses of very hard, cemented sandstone were found in our borings, and rig refusal was encountered in twenty borings at depths of about 3 to 33 feet, as shown on Fig. 2. Harder lenses may require use of rock excavation techniques such as heavy ripping, rock saws or possibly blasting. We recommend the owner and the contractor become familiar with applicable local, state, and federal safety regulations, including the current OSHA Excavation and Trench Safety Standards. Based on our investigation and OSHA standards, we anticipate the clay and claystone will classify as Type B soils and sand and sandstone will classify as Type C soils, which require a maximum slope inclinations of 1H:1V and 1.5H:1V (horizontal:vertical), respectively, for temporary excavations in dry conditions. Flatter slopes will be required if seepage is present. The contractor's "competent person" is required to review excavation conditions and refer to OSHA Standards when worker exposure is anticipated. Stockpiles and equipment should not be placed within horizontal distance equal to one-half the excavation depth, from the edge of the excavation. A professional engineer should design excavations deeper than 20 feet.

Fill and Backfill

Prior to fill placement, the ground surface in areas to be filled should be stripped of debris, vegetation/organics and other deleterious materials, scarified to a depth of at least 8 inches, moisture-conditioned to between 1 and 4 percent above optimum moisture content for clay and within 2 percent of optimum for sand, and compacted to at least 95 percent of standard Proctor maximum density (ASTM D 698).

The properties of fill will affect the performance of foundations, slabs-on-grade, utilities, pavement, flatwork and other improvements. The on-site soils are suitable for reuse as new fill provided they are substantially free of debris, vegetation/organics, and other deleterious materials. Rock particles and boulders larger than 6 inches and soil clods larger than about 3 inches in diameter should not be used for fill unless broken down. Fill should be placed in thin (8 inches or less) loose lifts, moisture-conditioned and compacted prior to placement of the next lift. The placement and compaction of fill and backfill should be tested by our representative during construction. Guideline Site Grading Specifications are presented in Appendix D. If imported fill is necessary, it should ideally consist of soil having a maximum particle size of 3 inches, between 25 and 50 percent passing the No. 200 sieve, a liquid limit less than 30, and a plasticity index less than 15. It may also be suitable to import soils which are similar to on-site soils. Potential fill materials should be submitted to our office for approval at least 2 weeks prior to importing to the site.

Our experience indicates fill and backfill can settle, even if properly compacted to criteria provide above. Factors that influence the amount of settlement are depth of fill, material type, degree of compaction, amount of wetting, and time. The degree of compression of properly compacted fill under its own weight will likely range from low for granular soils (½ percent or less) to moderate for clay/sand mixtures (1 to 2 percent). Most of this settlement occurs during and soon after construction; for clayey fill, it may continue longer. Additional heave and settlement may occur after development in response to wetting.

Where fill will be placed on slopes of 20 percent or greater, the slopes should be benched prior to placing fill. A typical benched fill detail is presented on Fig. 5.

Sub-Excavation

Deep foundations and structurally supported floor systems are commonly used on sites where moderate to high swelling clay or claystone bedrock are found at depths likely to influence performance. Many local builder-developers choose to perform sub-excavation to reduce potential heave and provide a relatively uniform fill layer that is likely suitable for footings and slab-on-grade basement floors. The variability of soil and bedrock materials implies that depth of sub-excavation could be variable, and that sub-excavation may not be merited for some of the site. Our Estimated Extent of Sub-Excavation plan is presented on Fig. 4. There are some areas where shallow sub-excavation is recommended (to basement level). An alternative in those areas would be to construct all upper-level footings to basement level.

Sub-excavation has been used in the Denver area with satisfactory performance for the large majority of sites where this ground modification method has been completed. We have seen isolated instances where settlement of sub-excavation fill has led to damage to houses supported on footings. In most cases, the settlement was caused by wetting associated with poor surface drainage or seepage, and/or poorly compacted fill placed at the horizontal limits of excavation. Wetting of the fill may cause softening and settlement.

The bottom of the sub-excavated area should extend laterally at least 5 feet outside the largest possible foundation footprints to ensure foundations are constructed over moisture-conditioned fill. The sub-excavation areas should be checked by a surveyor. An “as-built” sub-excavation plan should be prepared and provided to construction and sales staff to ensure foundations and decks are located within the sub-excavated area. Conceptual sub-excavation profiles are shown on Figs. 6 and 7.

The excavation contractor should be chosen carefully to assure they have experience with fill placement at over-optimum moisture and have the necessary compaction equipment. The contractor should provide discs to break down fill materials and anticipate use of push-pull scraper operations and dozer assistance The operation will be relatively slow. In order for the procedure to be performed properly, close contractor control of fill placement to specifications is required. Sub-excavation fill should be moisture-conditioned between 1 and 4 percent above optimum moisture content for clay or within 2 percent of optimum for sand. Fill should be compacted to at least 95 percent of standard Proctor (ASTM D 698) maximum dry density.

Special precautions should be taken for compaction of fill at corners, access ramps, and along the perimeters of the excavations as large compaction equipment cannot easily reach these areas. Our representative should observe placement procedures and test compaction of the fill. The swell of moisture-conditioned fill should be tested during and after the fill placement. Guideline Sub-Excavation Specifications are presented in Appendix E.

Sub-excavation will likely reduce potential heave to tolerable levels for shallow foundations for lightly loaded structures and enhance performance of slab-on-grade floors. Sub-excavation will also enhance performance of concrete flatwork (driveways and sidewalks) and pavements, potentially reducing maintenance costs. We suggest you consider some sub-excavation below all hardscapes (driveways, sidewalks, etc).

If fill dries excessively prior to construction, it may be necessary to rework the upper driers materials prior to constructing foundations. We judge the fill should retain adequate moisture for about two years. Moisture conditions can be assessed in excavation as construction progresses.

Utilities

Water and sewer lines are usually constructed beneath paved roads. Compaction of trench backfill can have a significant effect on the life and serviceability of pavements. Trench backfill should be placed in thin (8 inches or less) loose lifts and moisture-conditioned and compacted to the jurisdictional specifications. Our experience indicates fill and backfill can compress, even if properly compacted to the criteria provided. Settlement of the backfill on the order of 1 percent of the depth of fill due to self-weight of the fill should be anticipated.

For utility installation, our experience indicates use of a self-propelled compactor results in more reliable performance compared to backfill “compacted” by an attachment on a backhoe or trackhoe. The upper portion of the trenches should be widened to allow the use of a self-propelled compactor. Special attention should be paid to backfill placed adjacent to manholes as we have seen instances where settlement in excess to 2 percent has occurred. Any improvements placed over backfill should be designed to accommodate movement. The placement and compaction of utility trench backfill should be observed and tested by a qualified representative during construction.

Detention Pond Construction

Based on strata encountered in our borings, the pond will likely be underlain by sandstone or claystone bedrock, however; sandstone bedrock was predominantly encountered throughout the site. Plans dated August 6, 2025, indicate cuts up to about 4 feet. Groundwater was not encountered during our investigation. The detention pond is planned in the northeastern, southwestern, and southeastern portions of the site. Addition of water to the subsurface from precipitation, landscape irrigation, or leaking utilities/detention pond reduces relative stability and may initiate slope failures. We recommend detention ponds be lined to help prevent potential seepage. If a clay liner is selected, the clay should contain at least 70 percent fines (passing the No. 200 sieve), have a liquid limit greater than 40, and a plasticity index greater than 25. The material should be substantially free of roots and other deleterious material. The clay should be moisture-conditioned between optimum moisture content to 3 percent above optimum moisture content, and compacted to at least 95 percent of standard Proctor maximum dry density (ASTM D 698). The clay liner should have a thickness of at least 2 feet.

Moisture-conditioned clay at over-optimum moisture content may be difficult to compact on slopes. We recommend the placement of the clay liner on slopes no steeper than 3:1 (H:V). If this geometry cannot be achieved, the fill surface should be benched.

We recommend inlet/outlet pipes be bedded in a relatively impervious material such as clay or flow fill to reduce piping and erosion along the sides. Cutoff walls can be installed or a collar may be constructed of concrete or flow fill that can support the pipe. Hand compaction of embankment fill soils may be required around the pipes to reduce potential seepage between the outside of the pipes and fill.

Subsurface Drainage

With long term development and subsequent irrigation, groundwater may develop and rise. Our firm typically advocates an underdrain system below sanitary sewer mains and services to control groundwater that may accumulate in response to development and provide a gravity outlet for foundation drains. We understand the City of Lone Tree does not allow underdrains installed near sewer mains.

If an underdrain system is not installed, individual house foundation drains would discharge into sump pits with pumps. Sump discharge can result in ponding and recycling if slopes between lots are not adequately graded and well-drained. Problems with chronic ice or algae formation and sidewalks have also developed from sump discharge. If groundwater is encountered during grading and sub-excavation, interceptor drains may be necessary.

Slopes

We recommend permanent cut and fill slopes be designed with a maximum slope of 3H:1V (horizontal to vertical) with a preferred inclination of 4H:1V. If site constraints (property boundaries and streets) do not permit construction with recommended slopes, we should be contacted. Surface drainage should not be allowed to sheet flow across slopes or pond near the crest of slopes. All cut and fill slopes should be re-vegetated soon after grading to reduce erosion. Excavation contractors should evaluate ground conditions and control slopes in accordance with OSHA criteria.

Pavements

Pavement subgrade will likely consist of sandy clay, clayey sand, or fill derived of similar composition. The City of Lone Tree follows the Douglas County Roadway Design and Technical Criteria Manual. The clayey soils possess poor pavement support qualities. Our experience is that most fill made from clayey soils and moisture conditioned to above optimum may swell more than 2 percent under these criteria. For this reason, Douglas County requires mitigation of potential heave damage beyond moisture conditioning of the clayey soils. This can consist of replacement with non-expansive materials or chemical stabilization. Replacement of the upper foot of subgrade with CDOT Class 6 Aggregate Road Base is a common alternative. Non-expansive sand can be used as a replacement and is available on most of the site, either from soil or processed poorly-cemented sandstone bedrock. Subgrade mitigation may be necessary where expansive soil is present within about 3.5 feet below pavements. Subgrade mitigation can be accomplished during or after wet utility installation, prior to drilling and sampling for pavement design. For areas that contain samples that swell more than 2 percent, an additional foot of road base is likely to be required.

Douglas County requires edge drains and cleanouts on both sides of the street for all collectors that have curb and gutter. The edge or trench drain consists of a filter fabric wrapped gravel section with a pipe at least 30 inches below grade. The edge drains typically outfall in storm structures. Edge drains work well with pavements that have at least some aggregate road base.

We believe the roads providing access to the development will classify as Local-Residential, Residential Collector, Arterial. The pavement sections presented in the table below are presented in the Douglas County Roadway Design and Technical Criteria Manual for preliminary planning design. The sections below do not include potential swelling soil mitigation that may consist of chemical amendment or additional road base. These estimates are for preliminary planning purposes. A design-level subgrade investigation and pavement design should be performed prior to paving.

TABLE V: PRELIMINARY PAVEMENT DESIGN THICKNESS ALTERNATIVES

Traffic Classification	Full-Depth Hot-Mix Asphalt (HMA)	Composite Hot-Mix Asphalt + Aggregate Base Course (HMA + ABC)	Portland Cement Concrete (CC)
Local Residential	N/A	5” HMA + 8” ABC	6” PCC
Residential Collector	N/A	6” HMA + 8” ABC	8” PCC
Arterial	9” HMA	7” HMA + 12” ABC	10” PCC

BUILDING CONSTRUCTION CONSIDERATIONS

The following discussions are preliminary and are not intended for design or construction. The discussions are based on widely spaced borings. After grading is completed, design-level investigations should be performed on a lot-specific basis.

Foundations

Our investigation indicates variably expansive clay and claystone are present at depths likely to influence performance of shallow foundations. Footing foundations will likely be suitable provided sub-excavation is performed. Alternatively, a deep foundation system such as drilled piers can be considered. Detailed soils and foundation investigations should be performed after site grading to determine appropriate foundation types to provide design criteria.

Floor Systems

Slab-on-grade basement floors may be considered on low and some moderate sites where potential heave is acceptable to builders and home buyers. Structurally supported basement floors should be used on all sites with high or very high risk of poor basement slab performance. Sub-excavation should reduce potential heave in areas where moderate to high swelling soils are found and should allow use of slab-on-grade basement floors.

The performance of garage floors, driveways, sidewalks, and other surface flatwork will likely be poor where high swell materials are shallow, unless sub-excavation is performed. The following precautions will be required to reduce the potential for damage due to movement of slabs-on-grade placed at this site:

1. Isolation of the slabs from foundation walls, columns and other slab penetrations;
2. Voiding of interior partition walls to allow slab movement without transferring the movement to the structure;
3. Flexible water and gas connections to allow for slab movement. A flexible plenum above furnaces will be required; and
4. Proper surface grading and foundation drain installation to reduce water availability to sub-slab and foundation soils.

Below-Grade Areas

Surface water can penetrate relatively permeable loose backfill soils located adjacent to residences and collect at the bottom of relatively impermeable basement excavations causing wet or moist conditions. Basement foundation walls should be designed for lateral earth pressures. Foundation drains should be constructed around the lowest excavation levels and ideally should be connected to an underdrain system (if constructed) to provide a gravity outlet. The drains can be connected to a sump pit where water can be removed by pumping if an underdrain is not provided.

Surface Drainage

The performance of improvements will be influenced by surface drainage. When developing an overall drainage scheme, consideration should be given to drainage around each residence. The ground surface around the residences should be sloped to provide positive drainage away from the foundations. We recommend a slope of at least 10 percent for the first 10 feet surrounding residences with basements, where practical. If the distance between houses is less than 20 feet, the slope in this area should be 10 percent to swale between houses. Where possible, drainage swales should slope at least 2 percent. Variation from these criteria is acceptable in some areas. For example, for lots graded to direct drainage from the rear yard to the front, it is difficult to achieve the recommended slope at the high point behind a house. We believe it is acceptable to use a slope of about 6 inches in the first 10 feet (5 percent) in this instance and others when achieving 10 percent is not practical. Roof downspouts and other water collection systems should discharge beyond the limits of backfill around structures.

Proper control of surface runoff is also important to control the erosion of surface soils. Sheet flow should not be directed over unprotected slopes. Water should not be allowed to pond at the crest of slopes. Permanent slopes should be prepared in such a way to reduce erosion.

Concrete

Concrete in contact with soil can be subject to sulfate attack. We measured water-soluble sulfate concentrations of less than 0.01 to 0.78 percent in six samples, with an average of 0.20. As indicated in our tests and ACI 332-20, the sulfate exposure class ranged at *Not Applicable* or *S0* to *Severe or S2.*

TABLE VI: SULFATE EXPOSURE CLASSES PER ACI 332-20

Exposure Classes		Water-Soluble Sulfate (SO_4) in Soil [A](%)
Not Applicable	RS0	< 0.10
Moderate	RS1	0.10 to 0.20
Severe	RS2	0.20 to 2.00
Very Severe	RS3	> 2.00

A) Percent sulfate by mass in soil determined by ASTM C1580

For this level of sulfate concentration, ACI 332-20 *Code Requirements* indicates there are cement type restrictions for sulfate resistance as indicated in the table below. Additional sulfate testing is recommended during the design-level phase.

TABLE VII: CONCRETE DESIGN
REQUIREMENTS FOR SULFATE EXPOSURE PER ACI 332-20

Exposure Class	Maximum Water/ Cement Ratio	Minimum Compressive Strength A (psi)	Cementitious Material Types B			Calcium Chloride Admixtures
			ASTM C150/C150M	ASTM C595/C595M	ASTM C1157/C1157M	
RS0	N/A	2500	No Type Restrictions	No Type Restrictions	No Type Restrictions	No Restrictions
RS1	0.50	2500	II	Type with (MS) Designation	MS	No Restrictions
RS2	0.45	3000	V C	Type with (HS) Designation	HS	Not Permitted
RS3	0.45	3000	V + Pozzolan or Slag Cement D	Type with (HS) Designation plus Pozzolan or Slag Cement E	HS + Pozzolan or Slag Cement E	Not Permitted

A) Concrete compressive strength specified shall be based on 28-day tests per ASTM C39/C39M
B) Alternate combinations of cementitious materials of those listed in ACI 332-20 Table 5.4.2 shall be permitted when tested for sulfate resistance meeting the criteria in section 5.5.
C) Other available types of cement such as Type III or Type I are permitted in Exposure Classes RS1 or RS2 if the C3A contents are less than 8 or 5 percent, respectively.
D) The amount of the specific source of pozzolan or slag to be used shall not be less than the amount that has been determined by service record to improve sulfate resistance when used in concrete containing Type V cement. Alternatively, the amount of the specific source of the pozzolan or slab to be used shall not be less than the amount tested in accordance with ASTM C1012/C1012M and meeting the criteria in section 5.5.1 of ACI 332-20.
E) Water-soluble chloride ion content that is contributed from the ingredients including water aggregates, cementitious materials, and admixtures shall be determined on the concrete mixture ASTM C1218/C1218M between 29 and 42 days.

Superficial damage may occur to the exposed surfaces of highly permeable concrete, even though sulfate levels are relatively low. To control this risk and to resist freeze-thaw deterioration, the water-to-cementitious materials ratio should not exceed 0.50 for concrete in contact with soils that are likely to stay moist due to surface drainage or high-water tables. Concrete should have a total air content of 6 percent ± 1.5 percent. We advocate damp-proofing of all foundation walls and grade beams in contact with the subsoils.

RECOMMENDED FUTURE INVESTIGATIONS

We recommend the following investigations and services:

1. Additional subsurface exploration to further evaluate slope stability;
2. Construction testing and observation during site development and grading;
3. Subgrade Investigation and Pavement Design after utility installation;

4. Design-level Soils and Foundation Investigation(s) after grading; and

5. Foundation installation observations.

CONSTRUCTION OBSERVATIONS

This report has been prepared for the exclusive use of BCUS Acquisitions LLC and your team to assist in your due diligence assessment of potential site development and residential construction. The information, conclusions, and recommendations presented herein are based upon consideration of many factors including, but not limited to, the type of structures proposed, the geologic setting, and the subsurface conditions encountered. The conclusions and recommendations contained in the report are not valid for use by others. Standards of practice evolve in geotechnical engineering. The recommendations provided are preliminary. Further investigation is recommended prior to site development.

We recommend that CTL|Thompson, Inc. provide construction observation services to allow us the opportunity to verify whether soil conditions are consistent with those found during this investigation. If others perform these observations, they must accept responsibility for to judge whether the recommendations in this report remain appropriate.

GEOTECHNICAL RISK

The concept of risk is an important aspect with any geotechnical evaluation, primarily because the methods used to develop geotechnical recommendations do not comprise an exact science. We never have complete knowledge of subsurface conditions. Our analysis must be tempered with engineering judgment and experience. Therefore, the recommendations presented in any geotechnical evaluation should not be considered risk-free. Our recommendations represent our judgment of those measures that are necessary to increase the chances that the structure and improvements will perform satisfactorily. It is critical that all recommendations in this report are followed during construction.

LIMITATIONS

Our borings were widely spaced to obtain a reasonably accurate picture of subsurface conditions for due diligence assessment and preliminary planning of development. The borings are representative of conditions encountered only at the location drilled. Variations in the subsoil conditions not indicated by our borings are likely.

We believe this investigation was conducted in a manner consistent with the level of care and skill ordinarily used by geotechnical engineers practicing under similar conditions. No warranty, express or implied, is made.

If we can be of further service in discussing the contents of this report, or in the analysis of the influence of the subsurface conditions on the design of the building or any other aspect of the proposed construction, please call.

CTL | THOMPSON, INC.

Sharone Richards
Staff Engineer

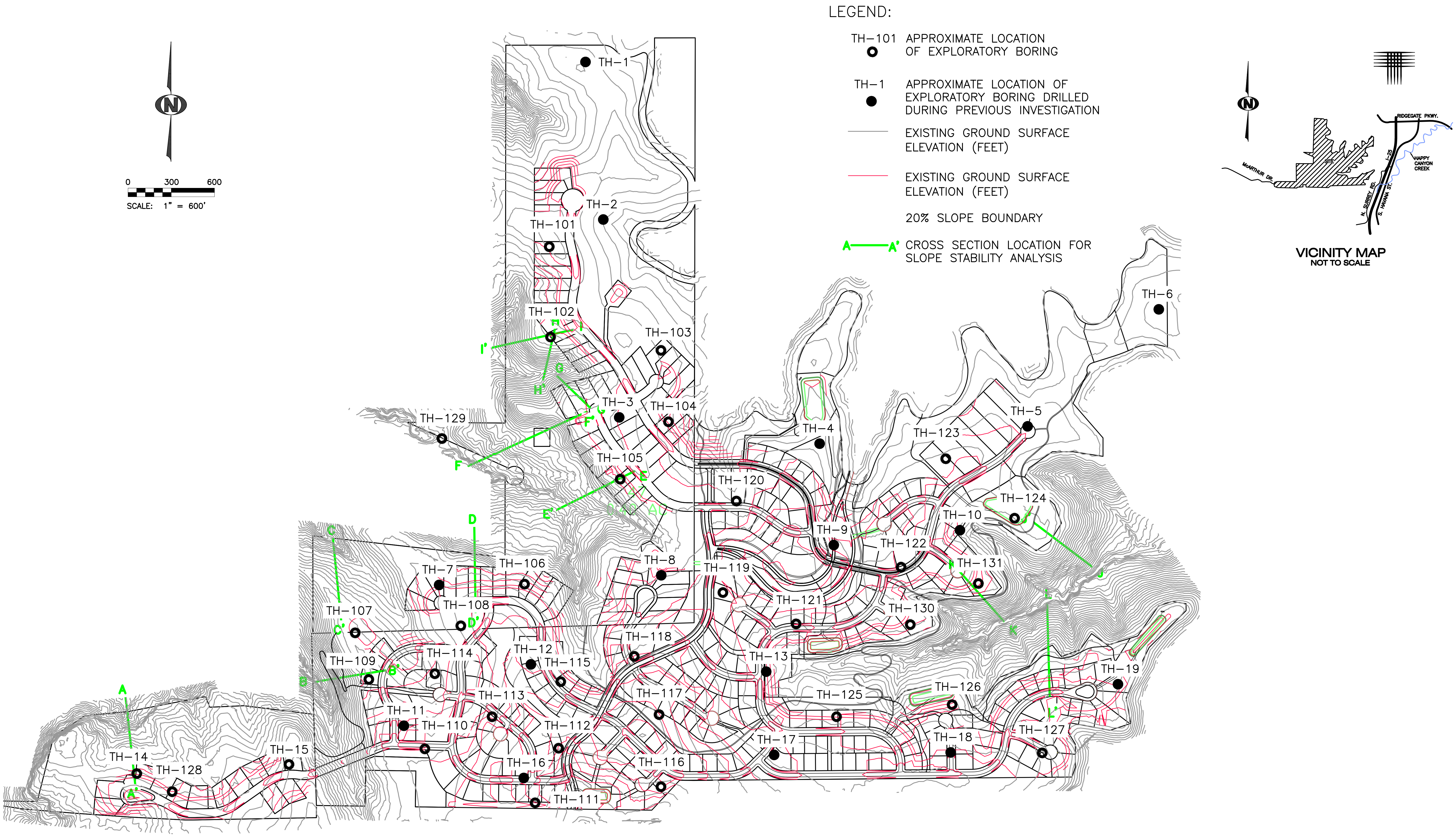
Robert Brown
Staff Engineer

Reviewed by:

Erin C. Bouchet, P.E., P.G.
Associate | Denver Engineering Manager

12/12/2025

Via e-mail: brad.wilkin@brookfieldrp.com



Locations of Exploratory Borings

Fig. 1

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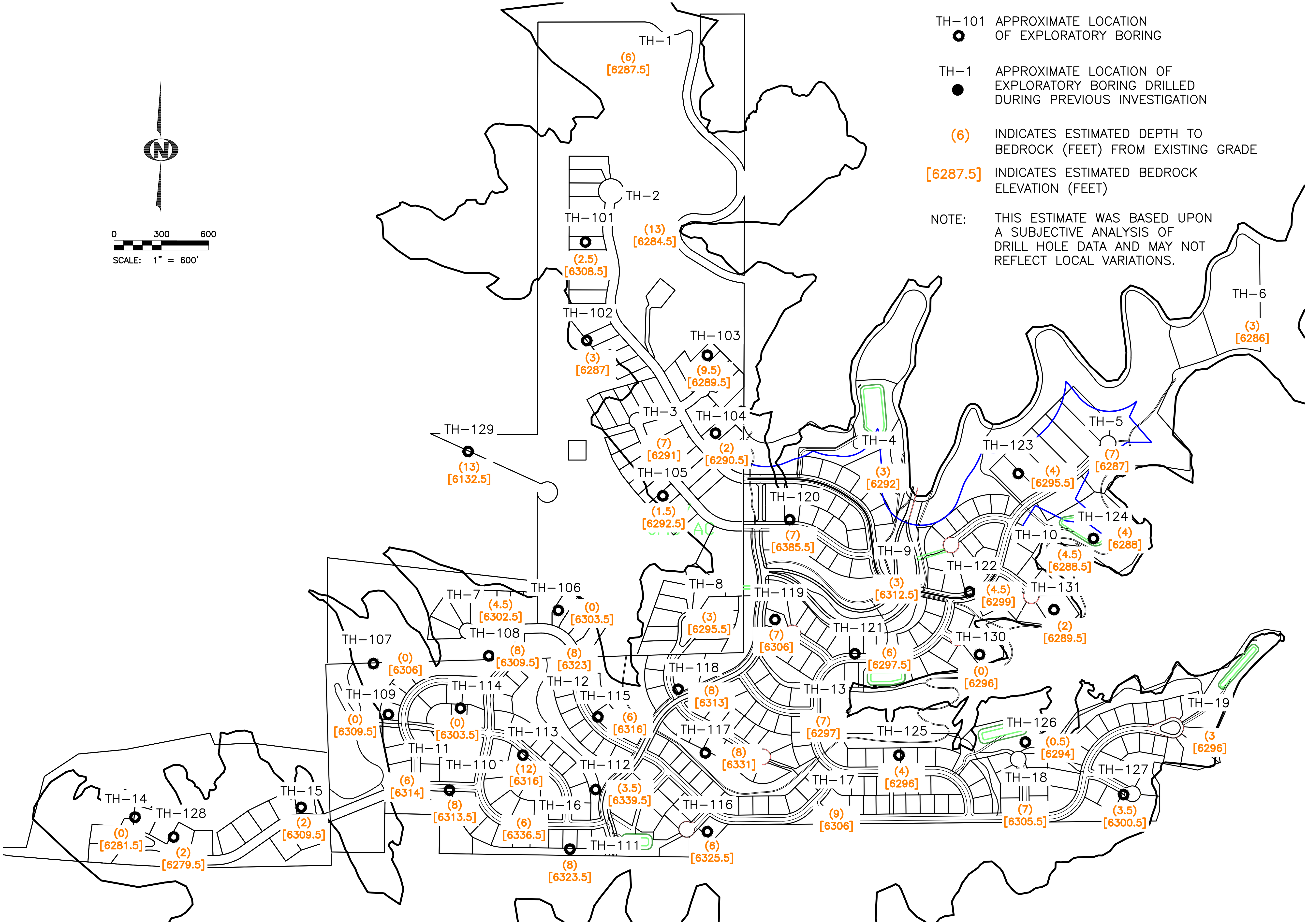

LEGEND:

TH-101 APPROXIMATE LOCATION OF EXPLORATORY BORING

TH-1 APPROXIMATE LOCATION OF EXPLORATORY BORING DRILLED DURING PREVIOUS INVESTIGATION

(6) INDICATES ESTIMATED DEPTH TO BEDROCK (FEET) FROM EXISTING GRADE

[6287.5] INDICATES ESTIMATED BEDROCK ELEVATION (FEET)

NOTE: THIS ESTIMATE WAS BASED UPON A SUBJECTIVE ANALYSIS OF DRILL HOLE DATA AND MAY NOT REFLECT LOCAL VARIATIONS.

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Depth and Elevations of Bedrock

Fig. 2

LEGEND:

TH-101 APPROXIMATE LOCATION OF EXPLORATORY BORING

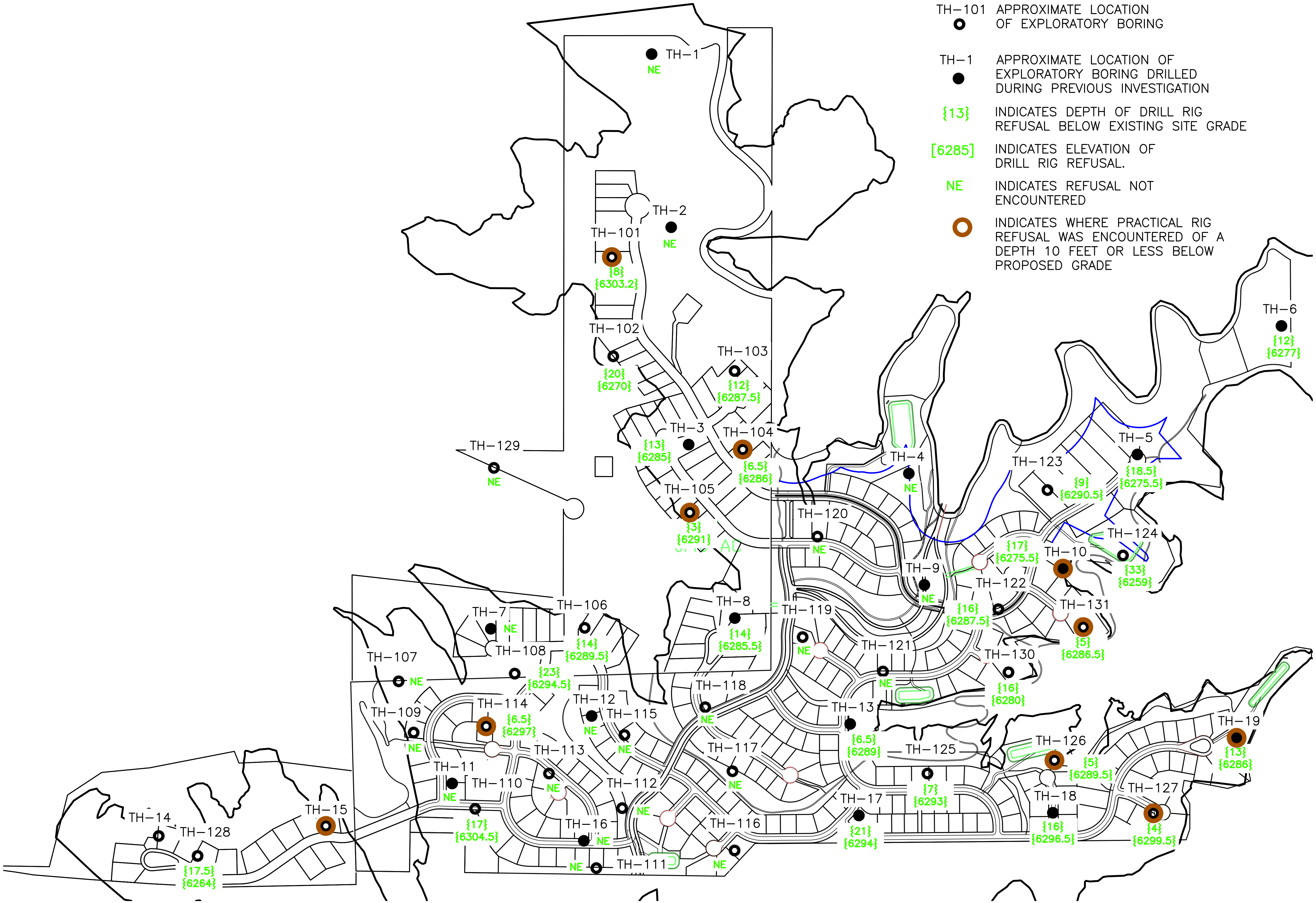
TH-1 APPROXIMATE LOCATION OF EXPLORATORY BORING DRILLED DURING PREVIOUS INVESTIGATION

{13} INDICATES DEPTH OF DRILL RIG REFUSAL BELOW EXISTING SITE GRADE

[6285] INDICATES ELEVATION OF DRILL RIG REFUSAL.

NE INDICATES REFUSAL NOT ENCOUNTERED

INDICATES WHERE PRACTICAL RIG REFUSAL WAS ENCOUNTERED OF A DEPTH 10 FEET OR LESS BELOW PROPOSED GRADE



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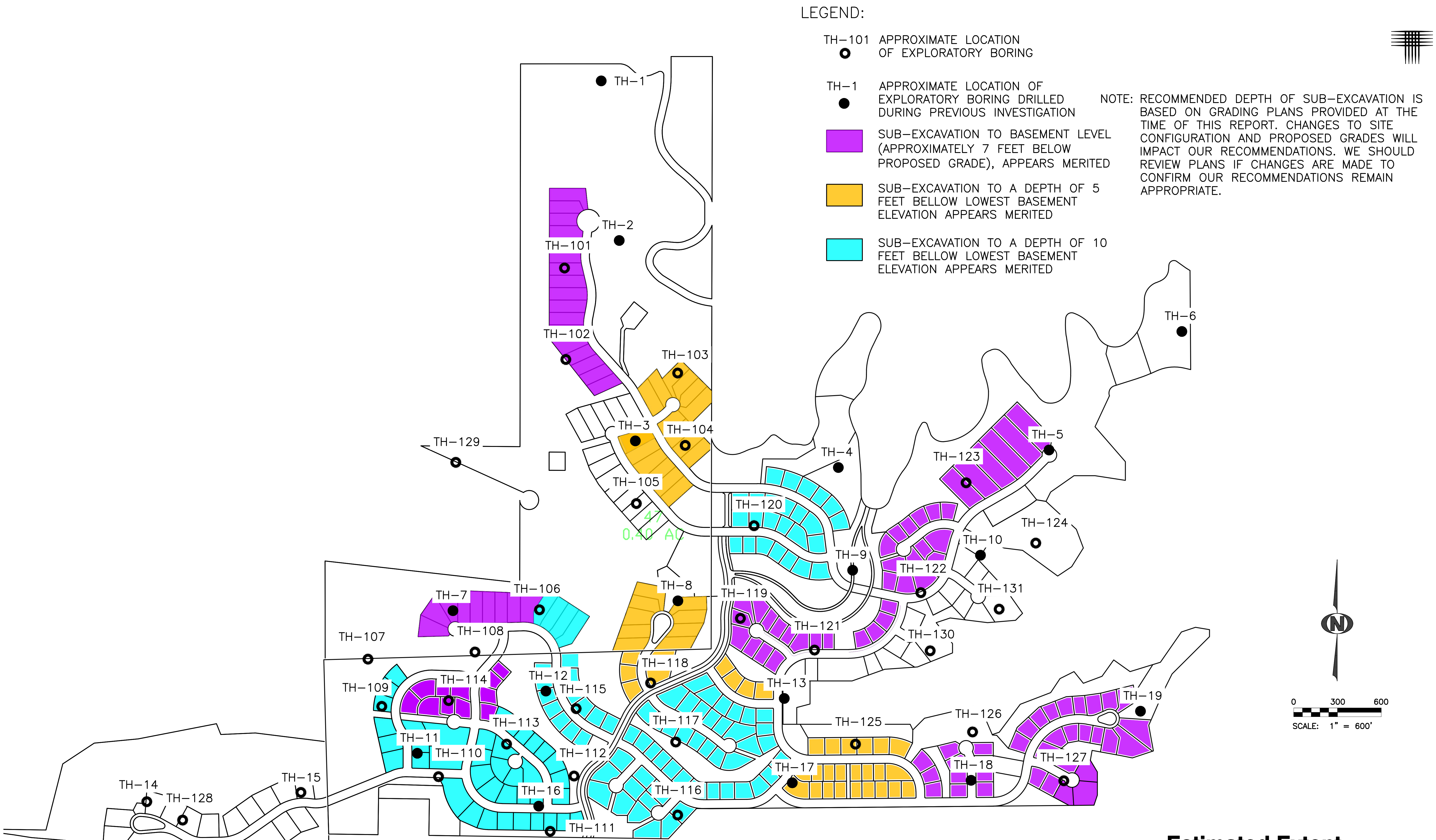
CTL|T Project No. DN52,036-115-R2

Refusal Depth and Elevation Fig. 3



Estimated Extent of Sub-Excavation Fig. 4

BCUS ACQUISITIONS, LLC
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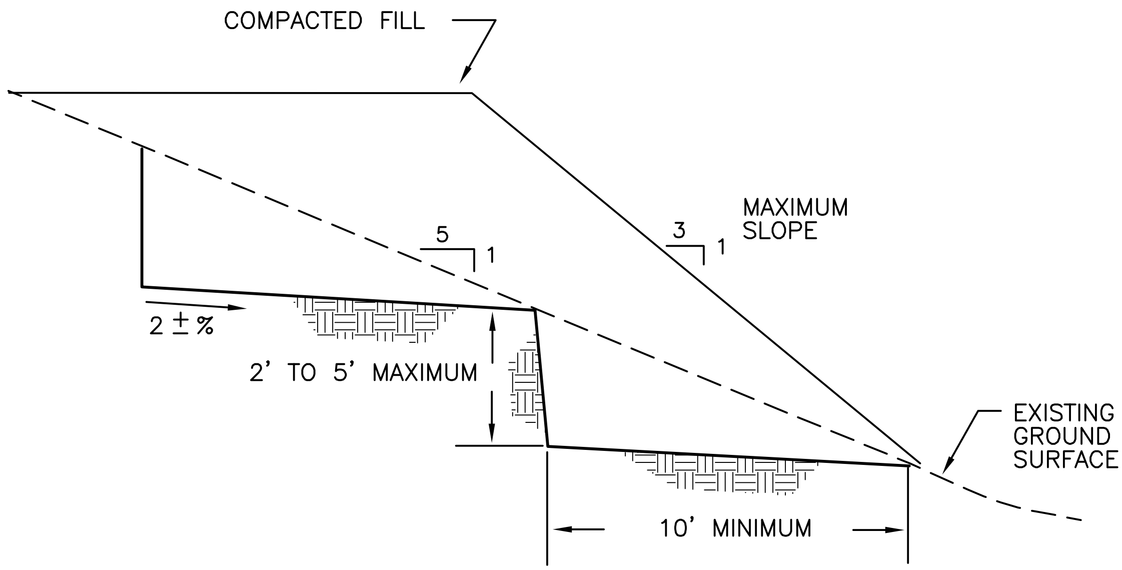
CTL|T Project No. DN52,036-115-R2

60-BENCHED-FILL_01



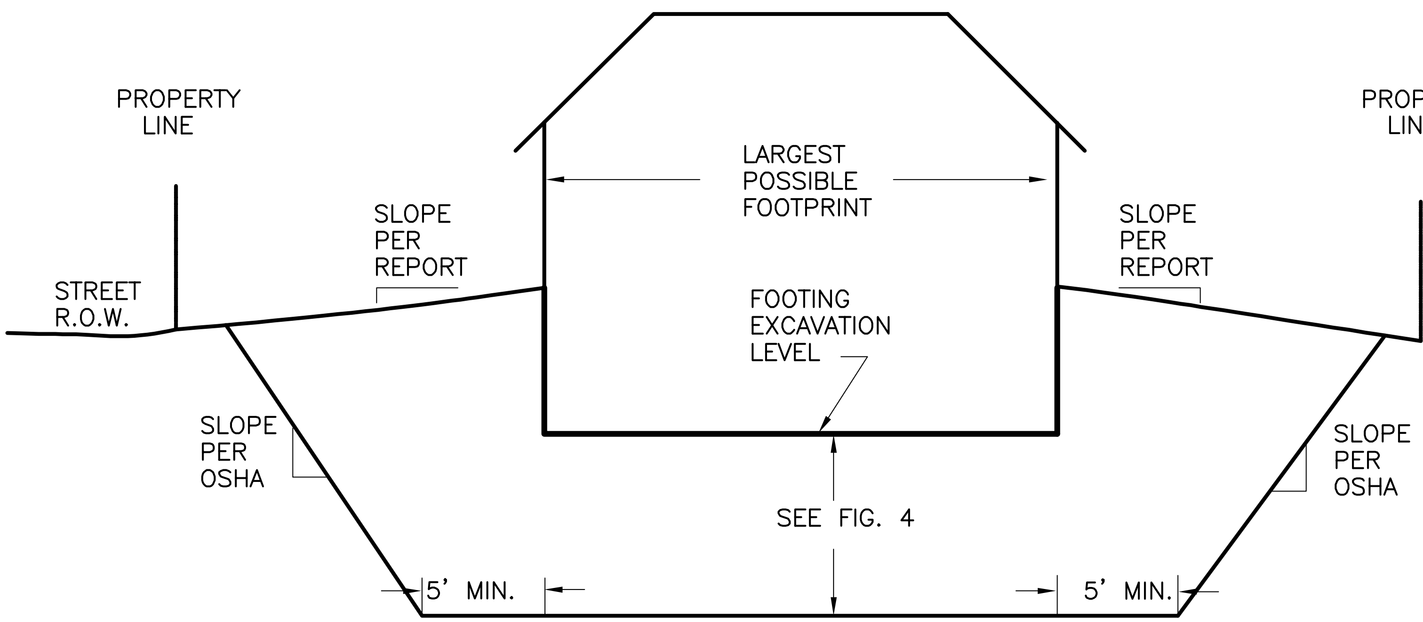
NOTES:

1) NATURAL SLOPES OF 20 PERCENT OR STEEPER ARE TO BE BENCHED PRIOR TO FILL PLACEMENT.

2) SLOPE BENCHES TO OUTSLOPE AT 2± PERCENT.

Benched Fill Detail

Fig. 5

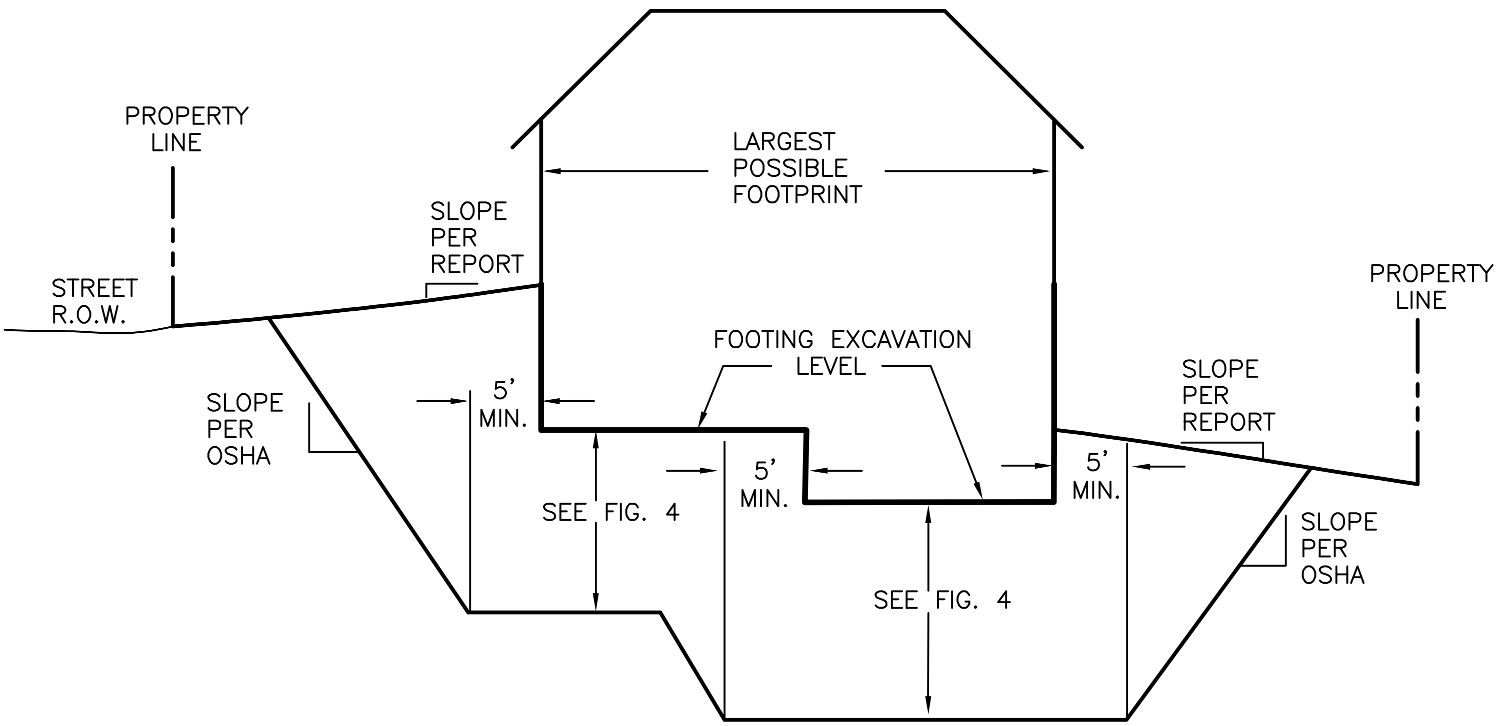


NOT TO SCALE

NOTE: RECOMMENDED DEPTH OF SUB-EXCAVATION IS BASED ON PROPOSED GRADING PLANS PROVIDED AT THE TIME OF THIS REPORT. CHANGES TO PROPOSED GRADE WILL IMPACT OUR RECOMMENDATIONS. WE SHOULD REVIEW CHANGES TO PROPOSED GRADES (IF ANY) TO CONFIRM RECOMMENDATIONS REMAIN APPROPRIATE.

Conceptual Sub-excavation Profile

Fig. 6



NOT TO SCALE

NOTE: RECOMMENDED DEPTH OF SUB-EXCAVATION IS BASED ON PROPOSED GRADING PLANS PROVIDED AT THE TIME OF THIS REPORT. CHANGES TO PROPOSED GRADE WILL IMPACT OUR RECOMMENDATIONS. WE SHOULD REVIEW CHANGES TO PROPOSED GRADES (IF ANY) TO CONFIRM RECOMMENDATIONS REMAIN APPROPRIATE.

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CTL|T Project No. DN52,036-115-R2

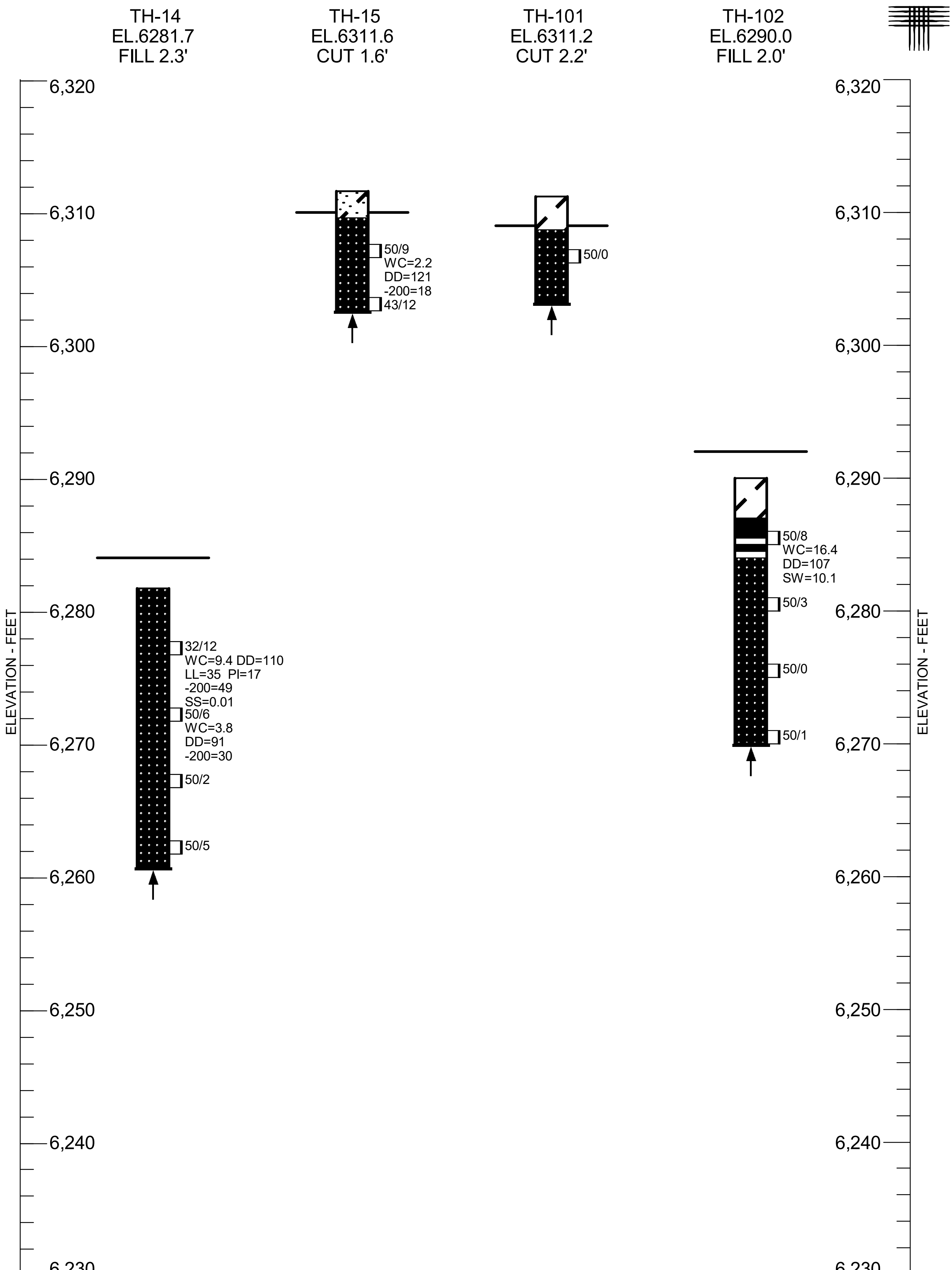
Conceptual Sub-excavation Profile

(Walk-out Basement)

Fig. 7

APPENDIX A

SUMMARY LOGS OF EXPLORATORY BORINGS



SUMMARY LOGS OF EXPLORATORY BORINGS

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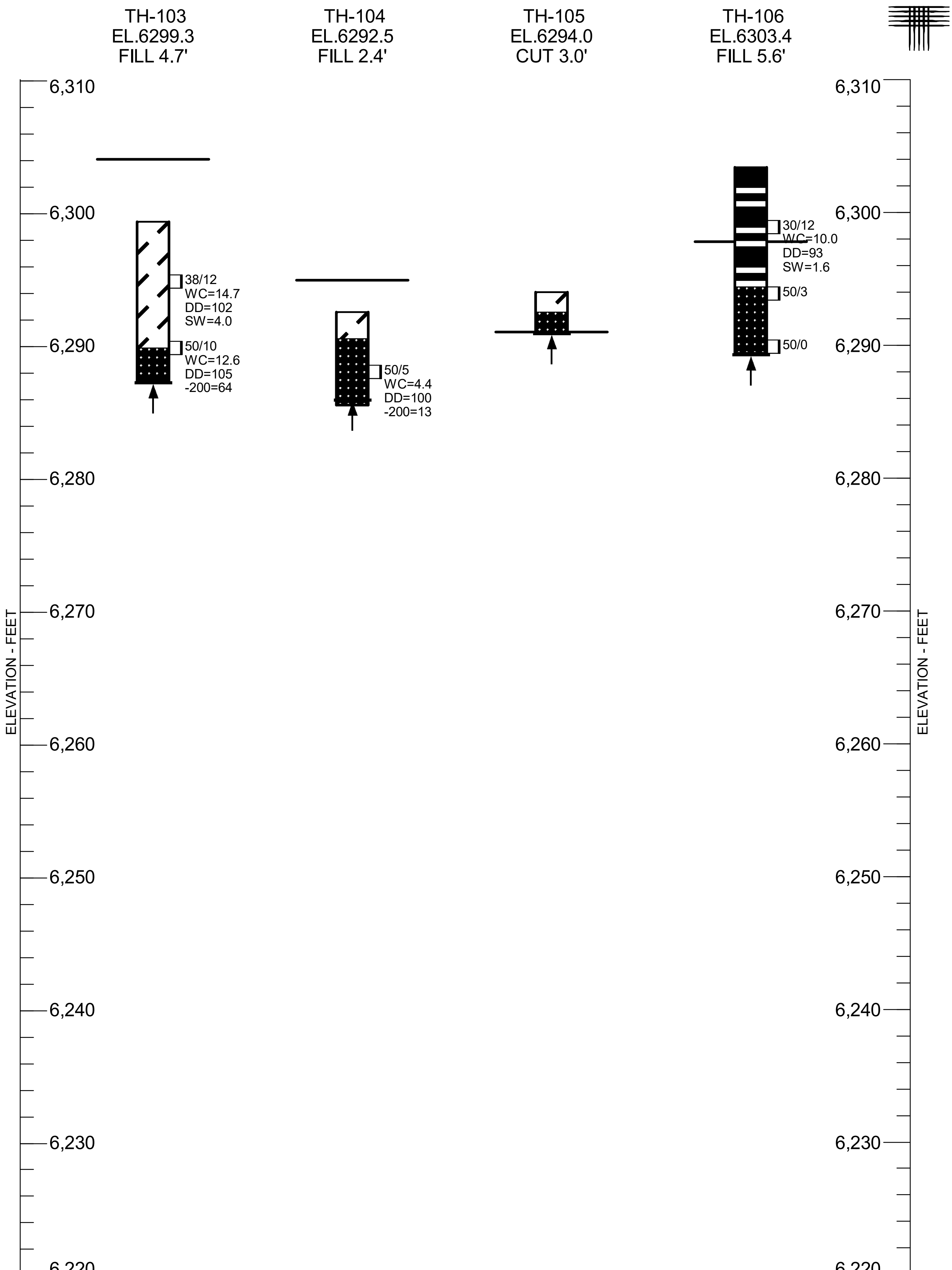
FIG. A-1



SUMMARY LOGS OF EXPLORATORY BORINGS

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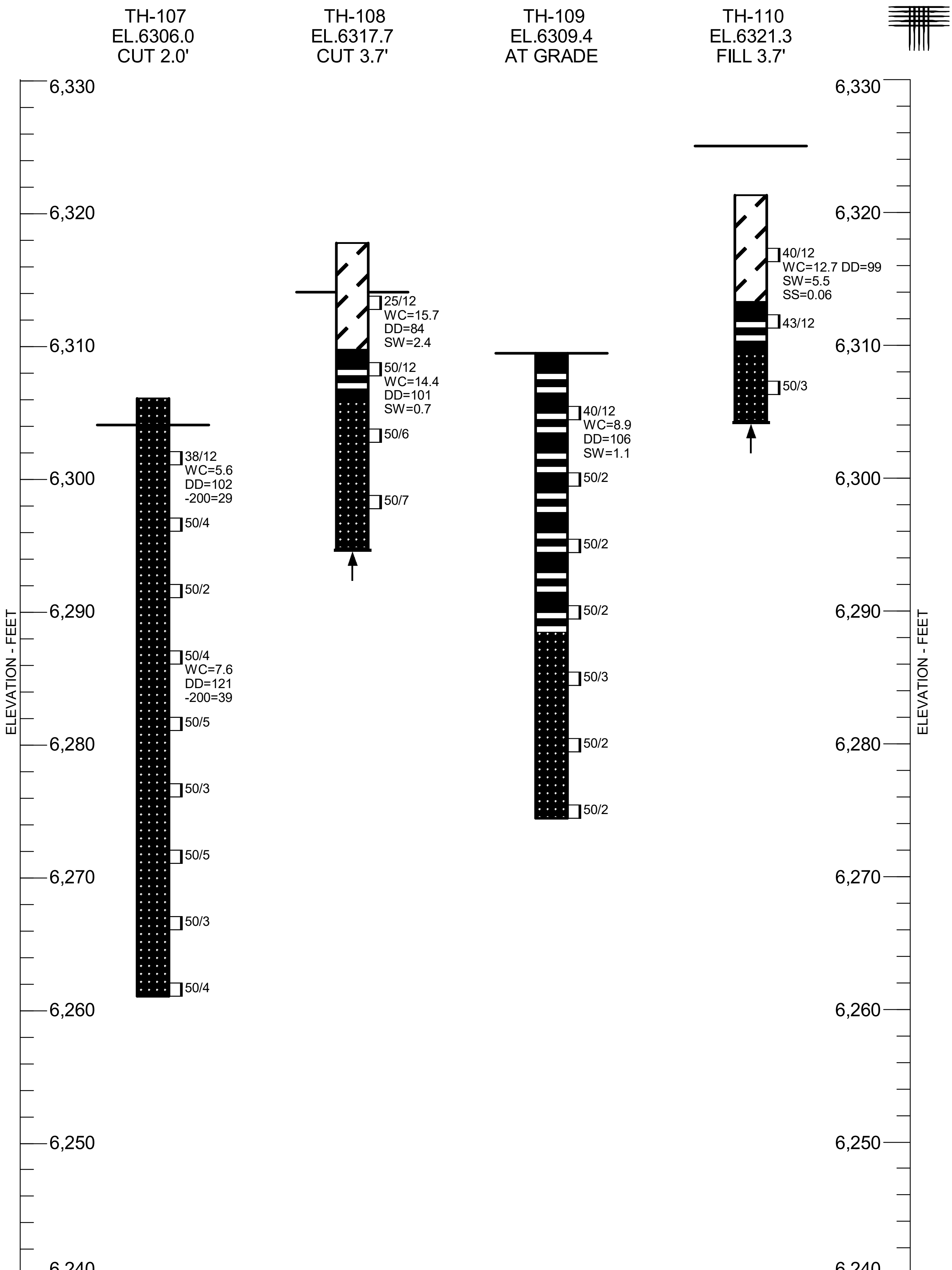
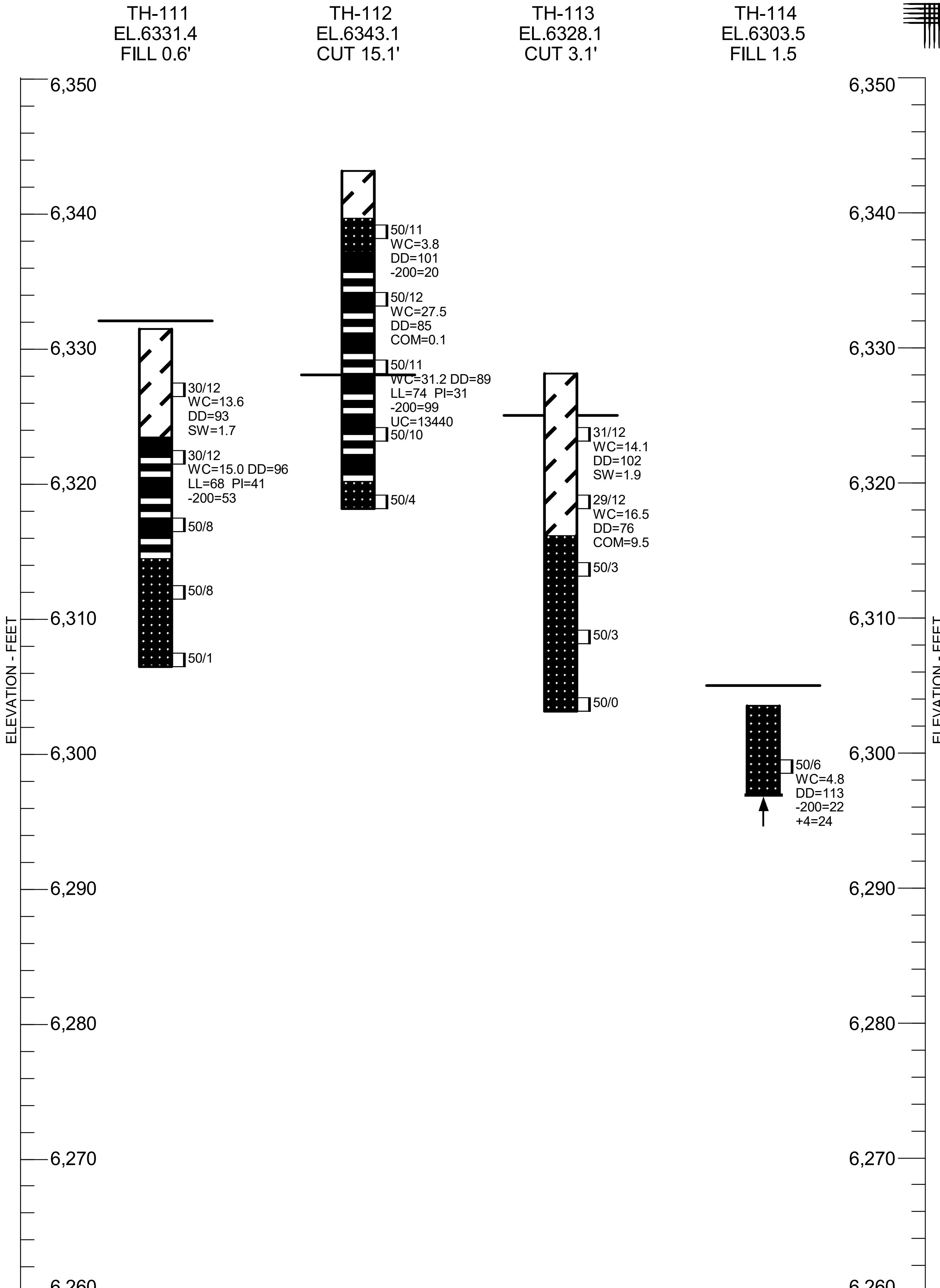
FIG. A-2



SUMMARY LOGS OF EXPLORATORY BORINGS

BCUS ACQUISITIONS, LLC
RIDGEGATE- MESA TOPS
CTL|T PROJECT NO. DN52,036-115-R2

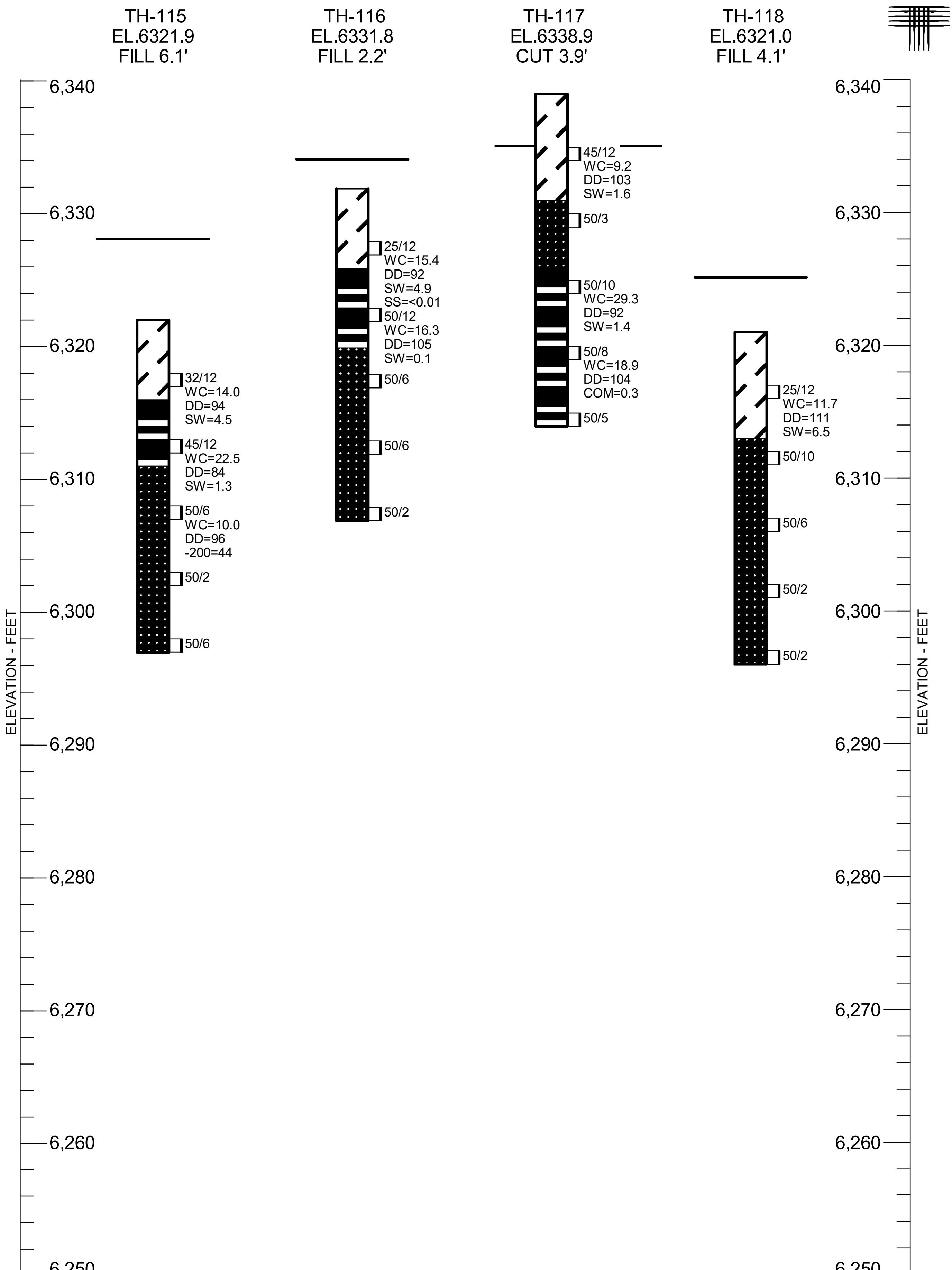
FIG. A-3



SUMMARY LOGS OF EXPLORATORY BORINGS

BCUS ACQUISITIONS, LLC
RIDGEGATE- MESA TOPS
CTL|T PROJECT NO. DN52,036-115-R2

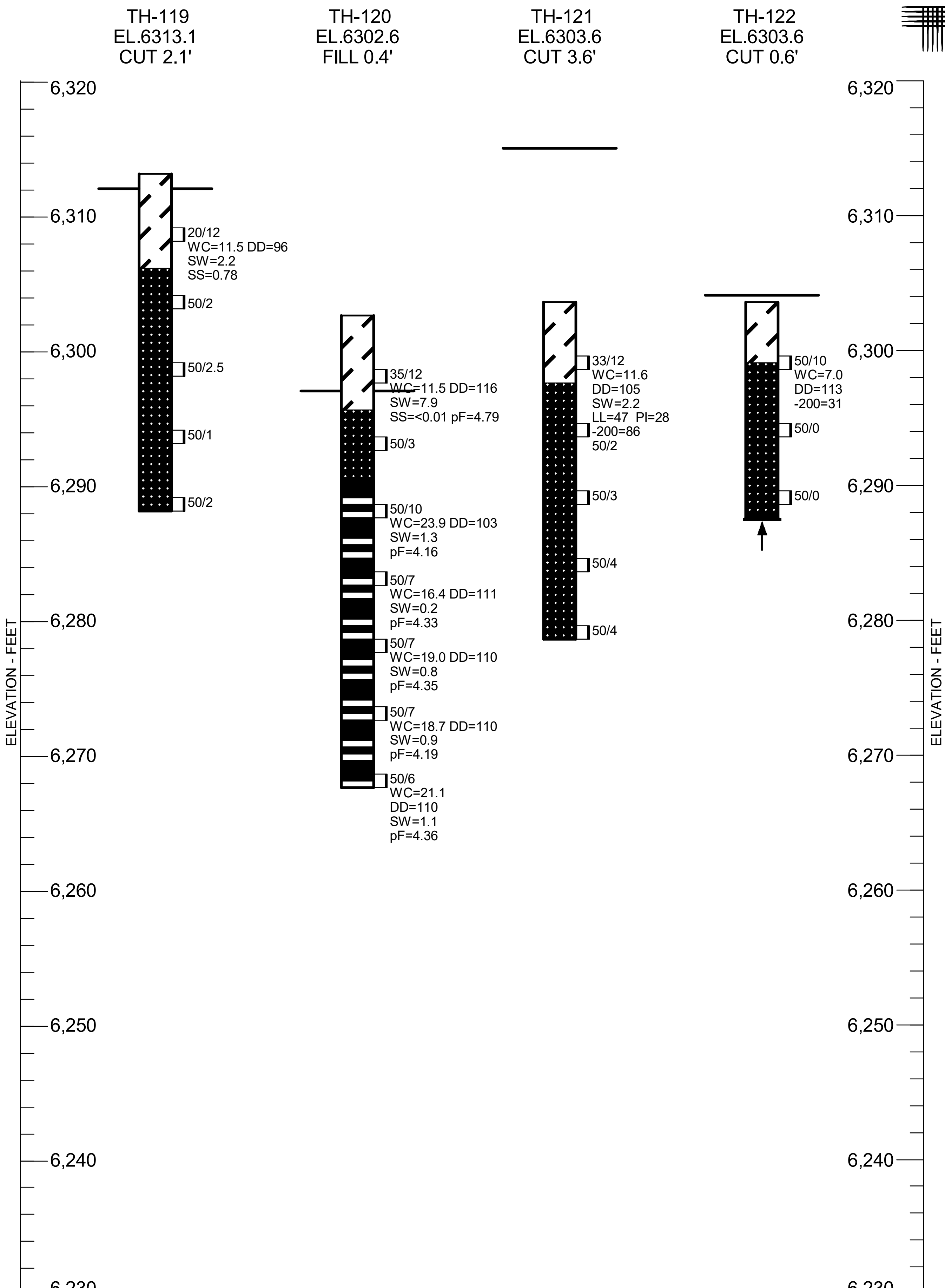
FIG. A-4



SUMMARY LOGS OF EXPLORATORY BORINGS

BCUS ACQUISITIONS, LLC
RIDGEGATE- MESA TOPS
CTL|T PROJECT NO. DN52,036-115-R2

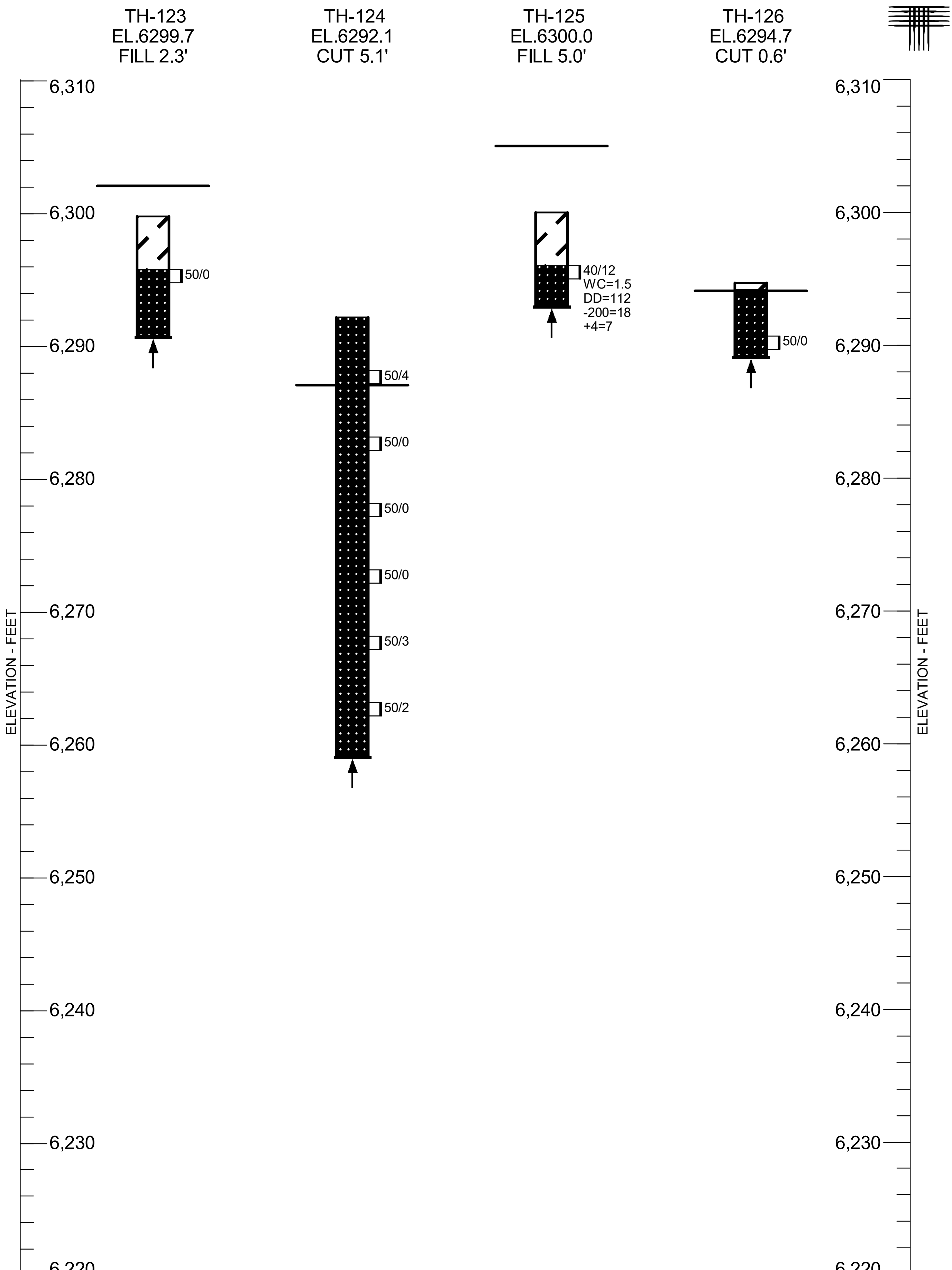
FIG. A-5



SUMMARY LOGS OF EXPLORATORY BORINGS

BCUS ACQUISITIONS, LLC
RIDGEGATE- MESA TOPS
CTL|T PROJECT NO. DN52,036-115-R2

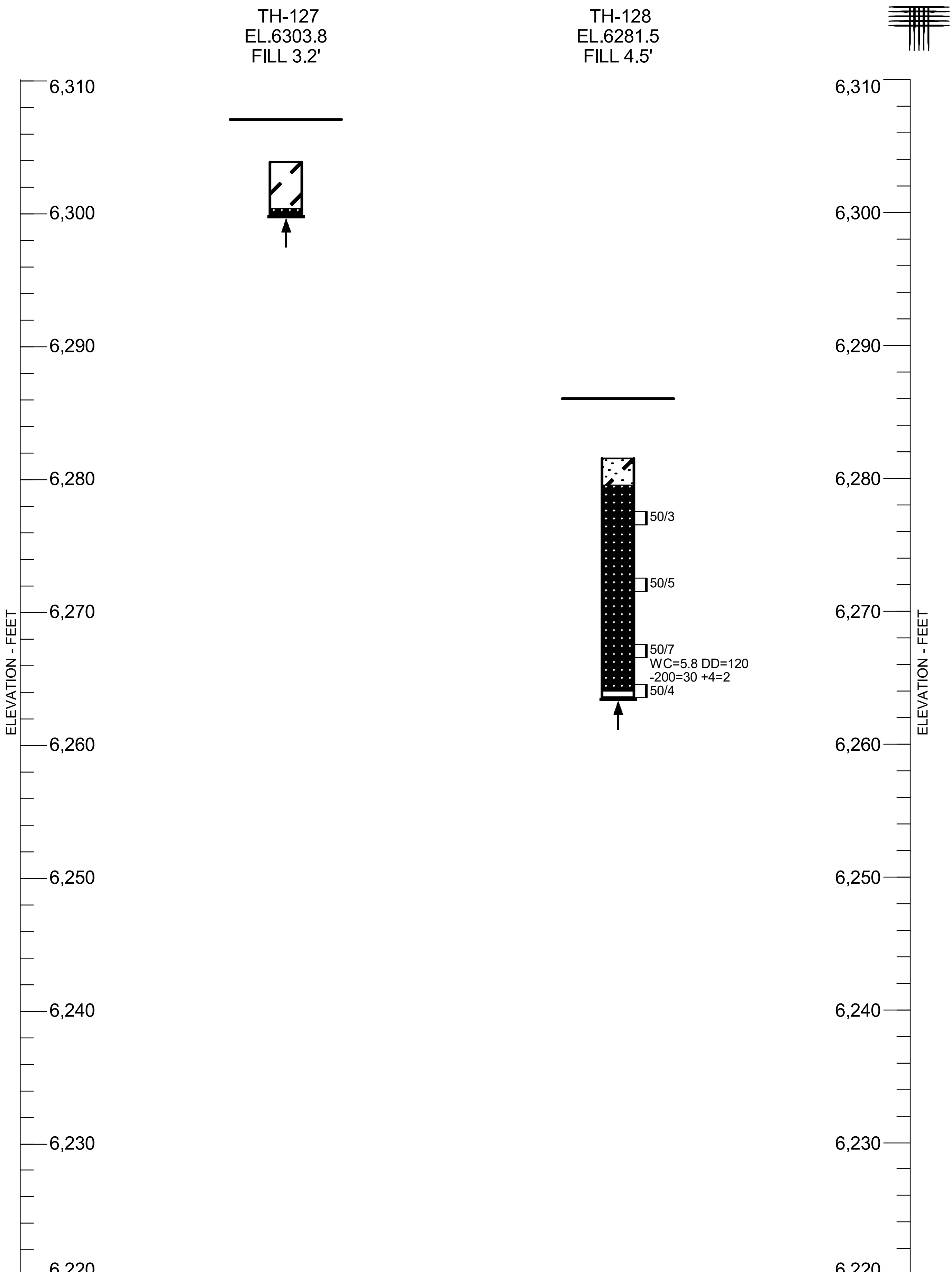
FIG. A-6



SUMMARY LOGS OF EXPLORATORY BORINGS

BCUS ACQUISITIONS, LLC
RIDGEGATE- MESA TOPS
CTL|T PROJECT NO. DN52,036-115-R2

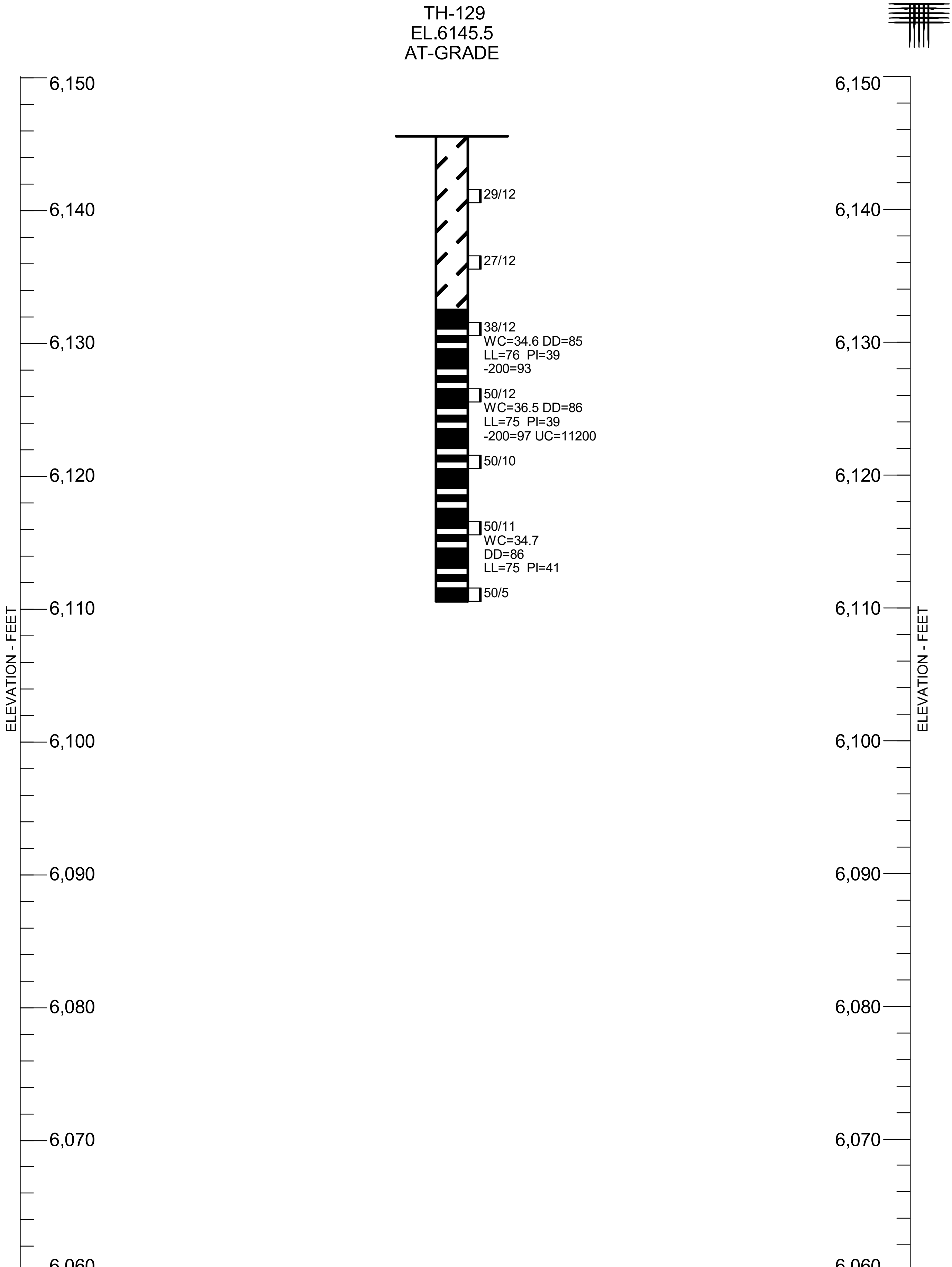
FIG. A-7



SUMMARY LOGS OF EXPLORATORY BORINGS

BCUS ACQUISITIONS, LLC
RIDGEGATE- MESA TOPS
CTL|T PROJECT NO. DN52,036-115-R2

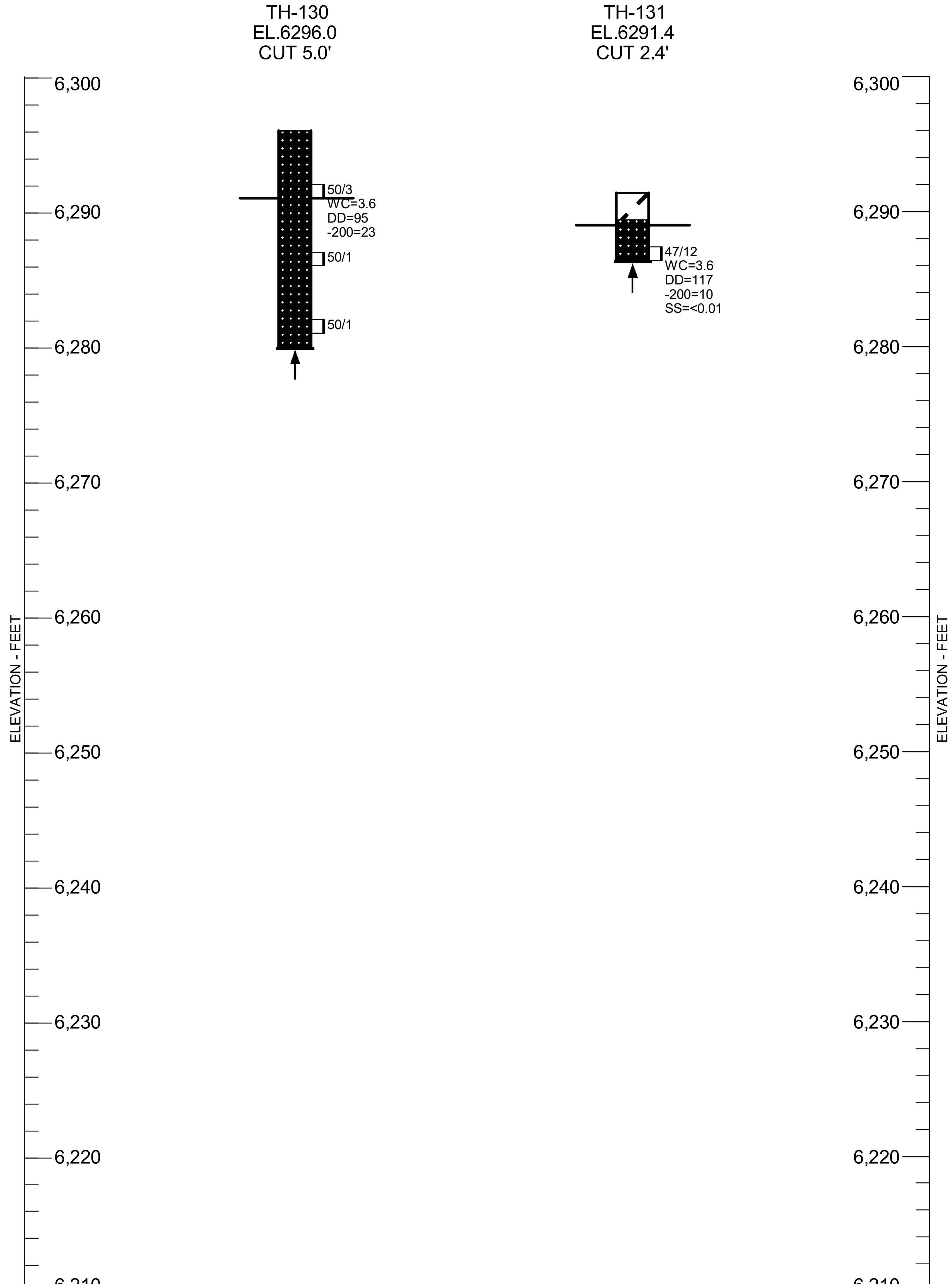
FIG. A-8



SUMMARY LOGS OF EXPLORATORY BORINGS

BCUS ACQUISITIONS, LLC
RIDGEGATE- MESA TOPS
CTL|T PROJECT NO. DN52,036-115-R2

FIG. A-9



SUMMARY LOGS OF EXPLORATORY BORINGS

LEGEND:

CLAY, SANDY, VERY STIFF, SLIGHTLY MOIST TO MOIST, BROWN, TAN, WHITE (CL).

SAND, CLAYEY, SLIGHTLY MOIST, LIGHT BROWN, TAN, WHITE (SC).

BEDROCK, SANDSTONE, MEDIUM HARD TO VERY HARD, SLIGHTLY MOIST TO MOIST, BRWON, TAN, GRAY, BLACK, OLIVE.

BEDROCK, CLAYSTONE, MEDIUM HARD TO VERY HARD, MOIST, BROWN, TAN, OLIVE, WHITE.

DRIVE SAMPLE. THE SYMBOL 32/12 INDICATES 32 BLOWS OF A 140-POUND HAMMER FALLING 30 INCHES WERE REQUIRED TO DRIVE A 2.5-INCH O.D. SAMPLER 12 INCHES.

INDICATES PRACTICAL DRILL RIG REFUSAL.

INDICATES PROPOSED GRADE.

NOTES:

1. THE BORINGS WERE DRILLED BETWEEN AUGUST 27 AND SEPTEMBER 4, 2025 USING A 4-INCH DIAMETER, CONTINUOUS-FLIGHT AUGER AND A TRUCK-MOUNTED CME-45 AND CME-55 DRILL RIG.

2. BORING LOCATIONS AND ELEVATIONS WERE STAKED AND SURVEYED BY OTHERS.

3. GROUNDWATER WAS NOT ENCOUNTERED IN THE EXPLORATORY BORINGS DURING THIS INVESTIGATION.

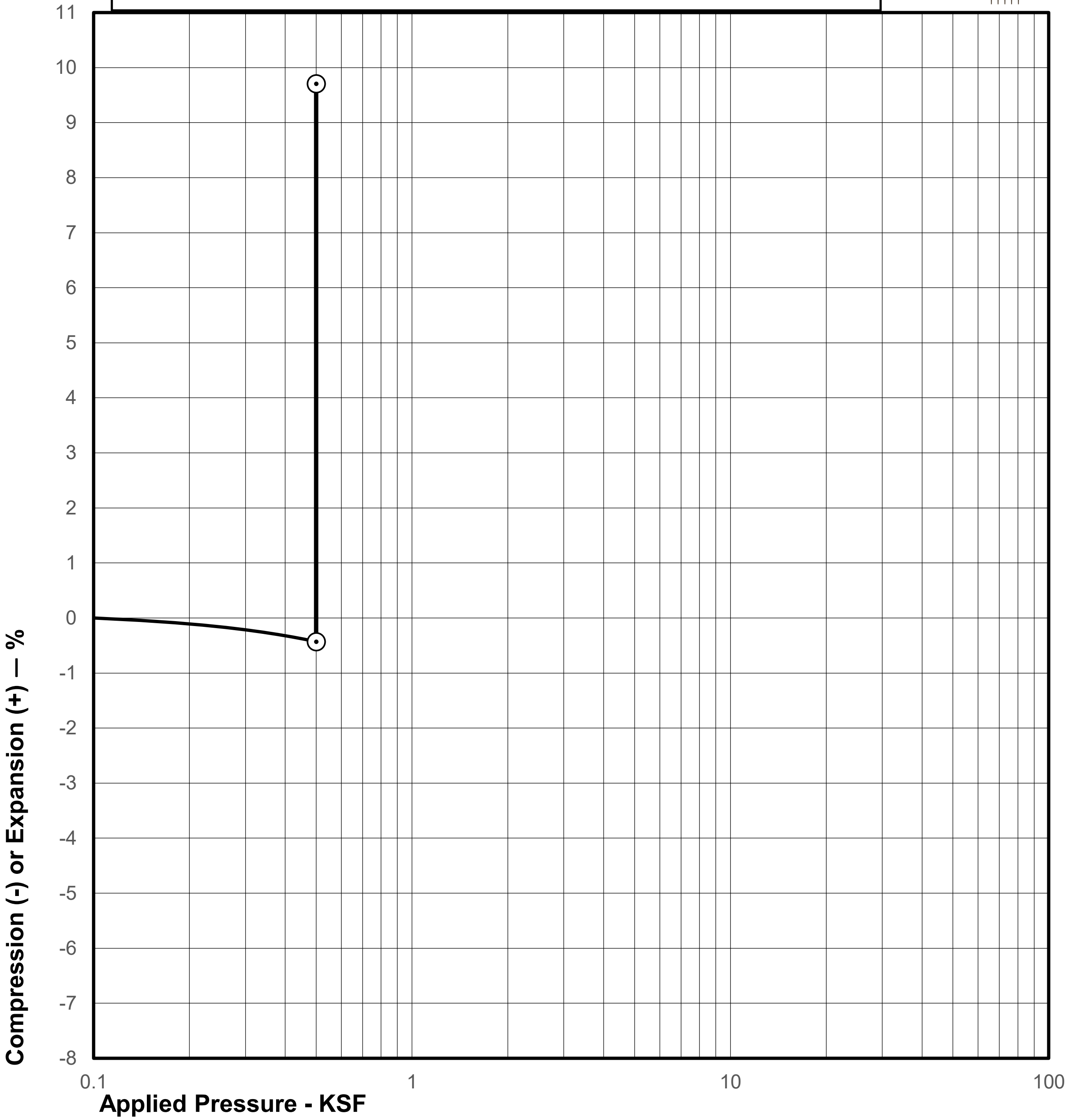
4. WC - INDICATES MOISTURE CONTENT (%).
   DD - INDICATES DRY DENSITY (PCF).
   SW - INDICATES SWELL WHEN WETTED UNDER APPROXIMATE OVERBURDEN PRESSURE (%).
   COM - INDICATES COMPRESSION WHEN WETTED UNDER APPROXIMATE OVERBURDEN PRESSURE (%).
   LL - INDICATES LIQUID LIMIT.
   PI - INDICATES PLASTICITY INDEX.
   -200 - INDICATES PASSING NO. 200 SIEVE (%).
   +4 - INDICATES RETAINED ON NO. 4 SIEVE (%).
   SS - INDICATES WATER-SOLUBLE SULFATE CONTENT (%).
   UC - INDICATES UNCONFINED COMPRESSIVE STRENGTH (PSF).

5. THESE LOGS ARE SUBJECT TO THE EXPLANATIONS, LIMITATIONS, AND CONCLUSIONS AS CONTAINED IN THIS REPORT.

APPENDIX B

LABORATORY TEST RESULTS AND TABLE B-I

Sample exhibited expansion of 10.1 percent when wetted under an applied pressure of 500 psf.



SAMPLE OF: CLAYSTONE

FROM: TH-102 AT 4 FEET

MOISTURE CONTENT: 16.4 % LIQUID LIMIT: ____ SILT AND CLAY: ____ %

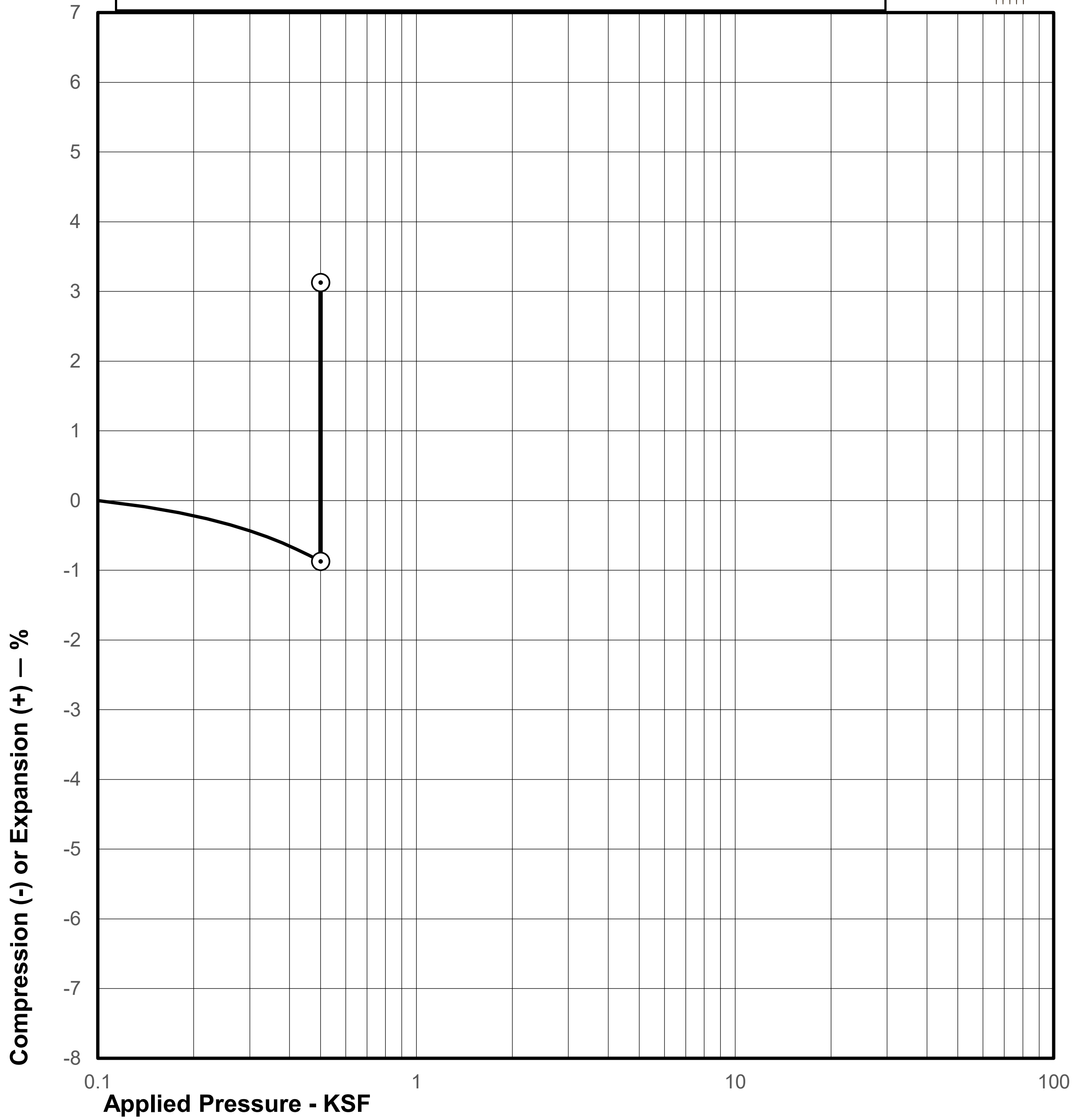
DRY UNIT WEIGHT: 107 pcf PLASTICITY INDEX: ____ SOIL SUCTION: ____ pF

Swell Consolidation Test Results

BCUS ACQUISITIONS, LLC
RIDGEGATE- MESA TOPS
CTL|T PROJECT NO. DN52,036-115-R2

FIG. B-1

Sample exhibited expansion of 4.0 percent when wetted under an applied pressure of 500 psf.



SAMPLE OF: CLAY, SANDY (CL)
FROM: TH-103 AT 4 FEET

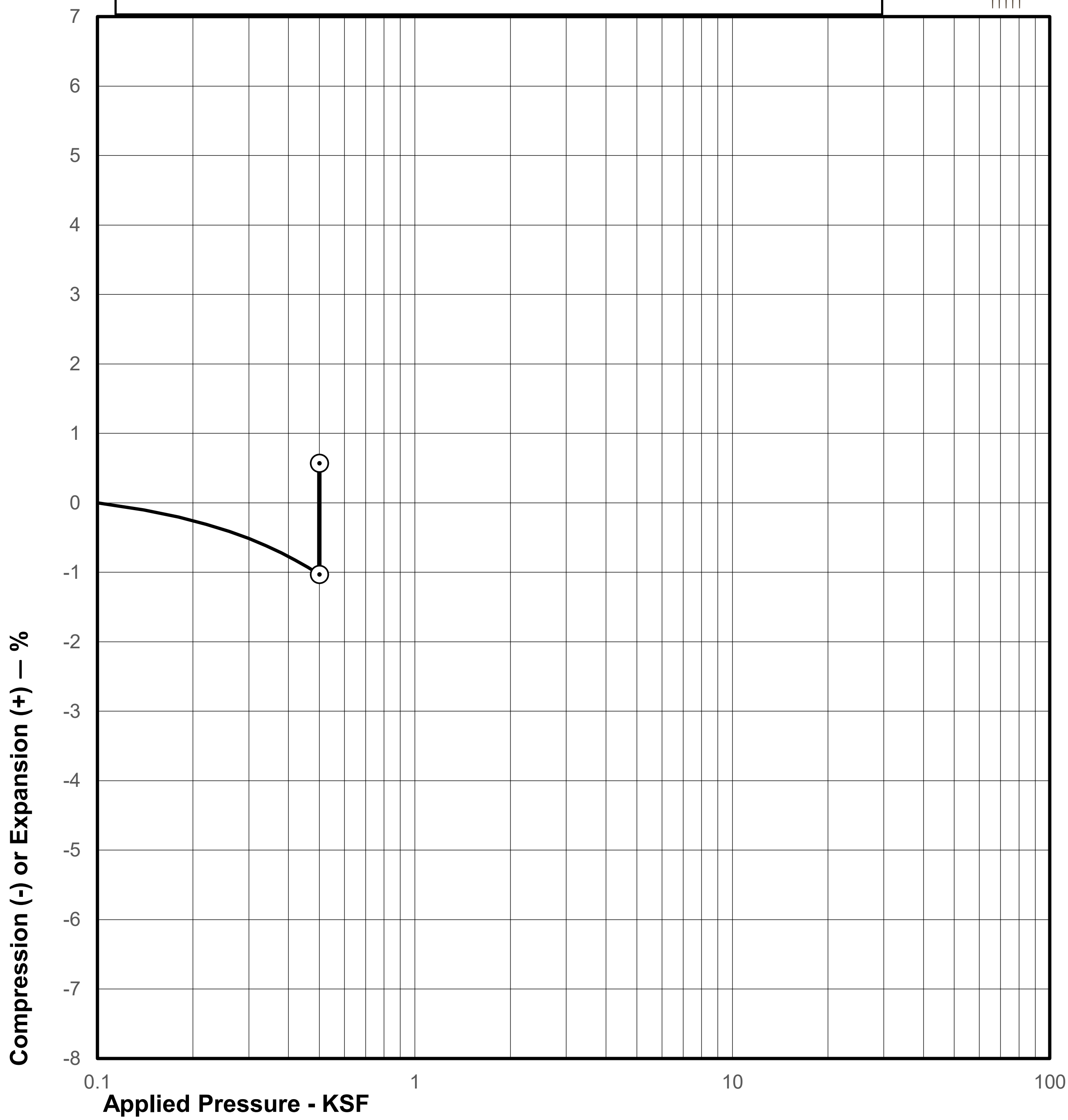
MOISTURE CONTENT: 14.7 % LIQUID LIMIT: ____ SILT AND CLAY: ____ %
DRY UNIT WEIGHT: 102 pcf PLASTICITY INDEX: ____ SOIL SUCTION: ____ pF

Swell Consolidation Test Results

BCUS ACQUISITIONS, LLC
RIDGEGATE- MESA TOPS
CTL|T PROJECT NO. DN52,036-115-R2

FIG. B-2

Sample exhibited expansion of 1.6 percent when wetted under an applied pressure of 500 psf.



SAMPLE OF: CLAYSTONE
FROM: TH-106 AT 4 FEET

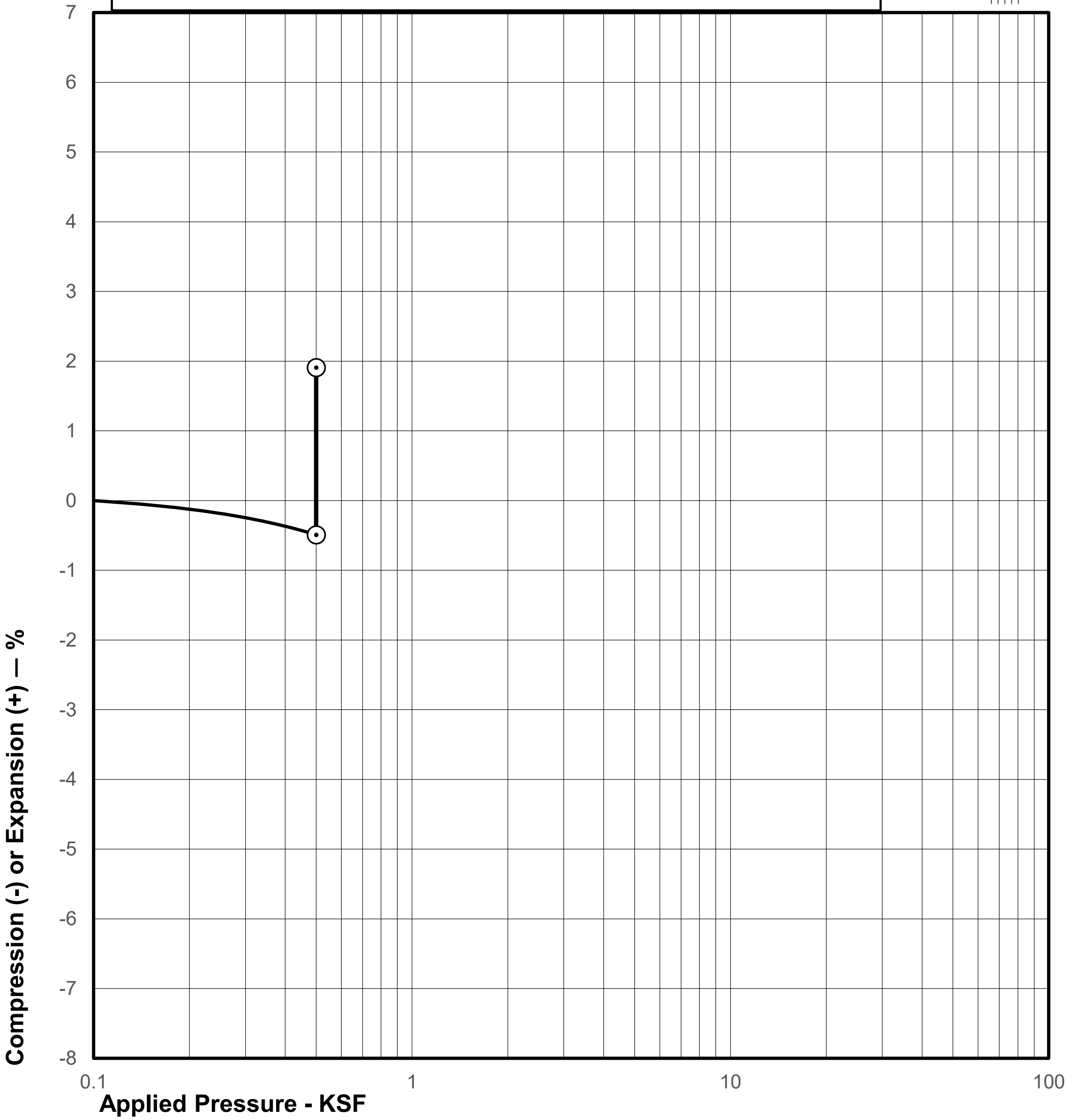
MOISTURE CONTENT: 10.0 % LIQUID LIMIT: ____ SILT AND CLAY: ____ %
DRY UNIT WEIGHT: 93 pcf PLASTICITY INDEX: ____ SOIL SUCTION: ____ pF

Swell Consolidation Test Results

BCUS ACQUISITIONS, LLC
RIDGEGATE- MESA TOPS
CTL|T PROJECT NO. DN52,036-115-R2

FIG. B-3

Sample exhibited expansion of 2.4 percent when wetted under an applied pressure of 500 psf.



SAMPLE OF: CLAY, SANDY (CL)
FROM: TH-108 AT 4 FEET

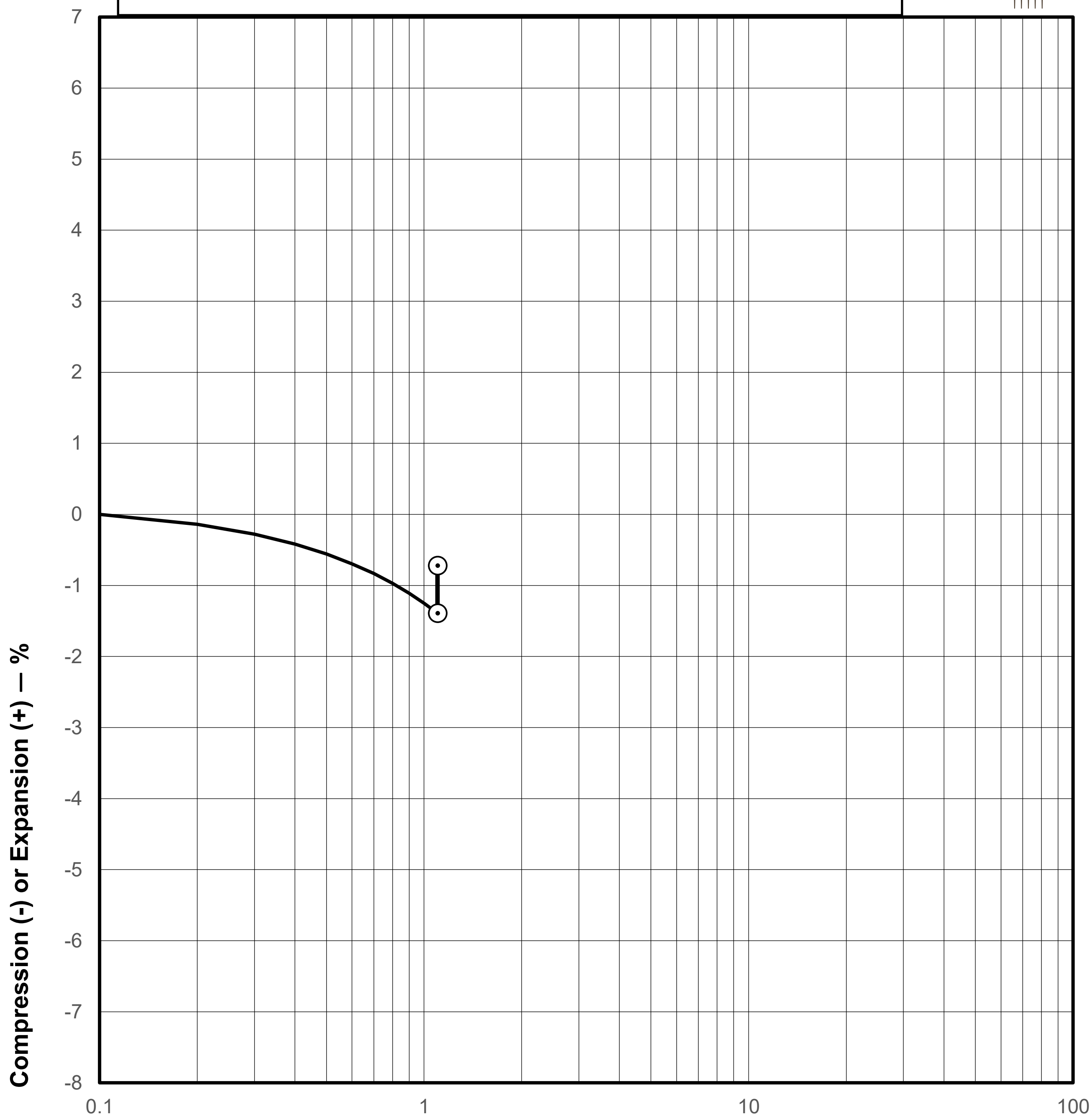
MOISTURE CONTENT:	15.7 %	LIQUID LIMIT:		SILT AND CLAY:	%
DRY UNIT WEIGHT:	84 pcf	PLASTICITY INDEX:		SOIL SUCTION:	pF

Swell Consolidation Test Results

BCUS ACQUISITIONS, LLC
RIDGEGATE- MESA TOPS
CTL|T PROJECT NO. DN52,036-115-R2

FIG. B-4

Sample exhibited expansion of 0.7 percent when wetted under an applied pressure of 1100 psf.

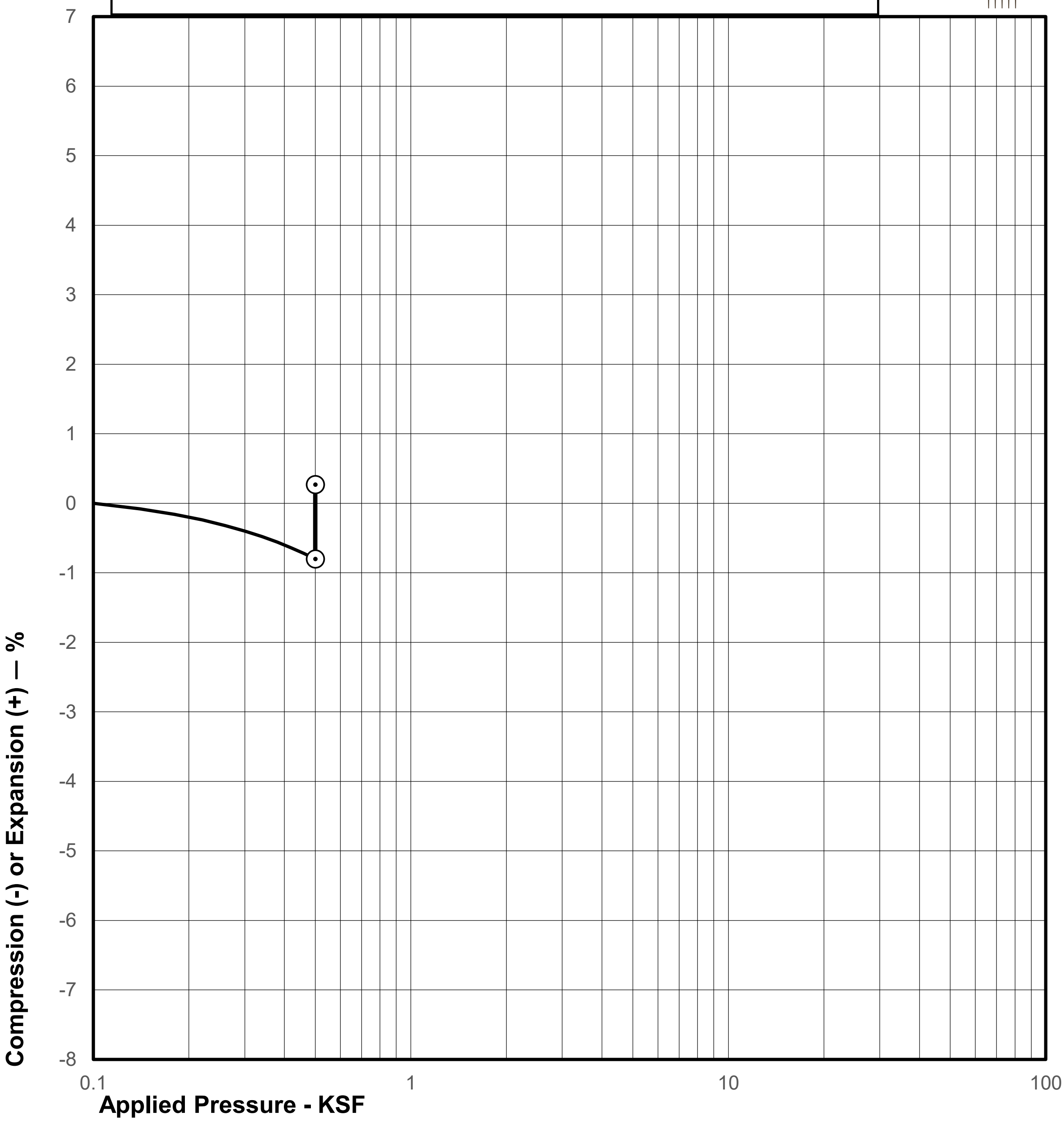


SAMPLE OF: CLAYSTONE
FROM: TH-108 AT 9 FEET

MOISTURE CONTENT: 14.4 % LIQUID LIMIT: ______ SILT AND CLAY: ______ %
DRY UNIT WEIGHT: 101 pcf PLASTICITY INDEX: ______ SOIL SUCTION: ______ pF

Swell Consolidation Test Results

Sample exhibited expansion of 1.1 percent when wetted under an applied pressure of 500 psf.



SAMPLE OF: CLAYSTONE

FROM: TH-109 AT 4 FEET

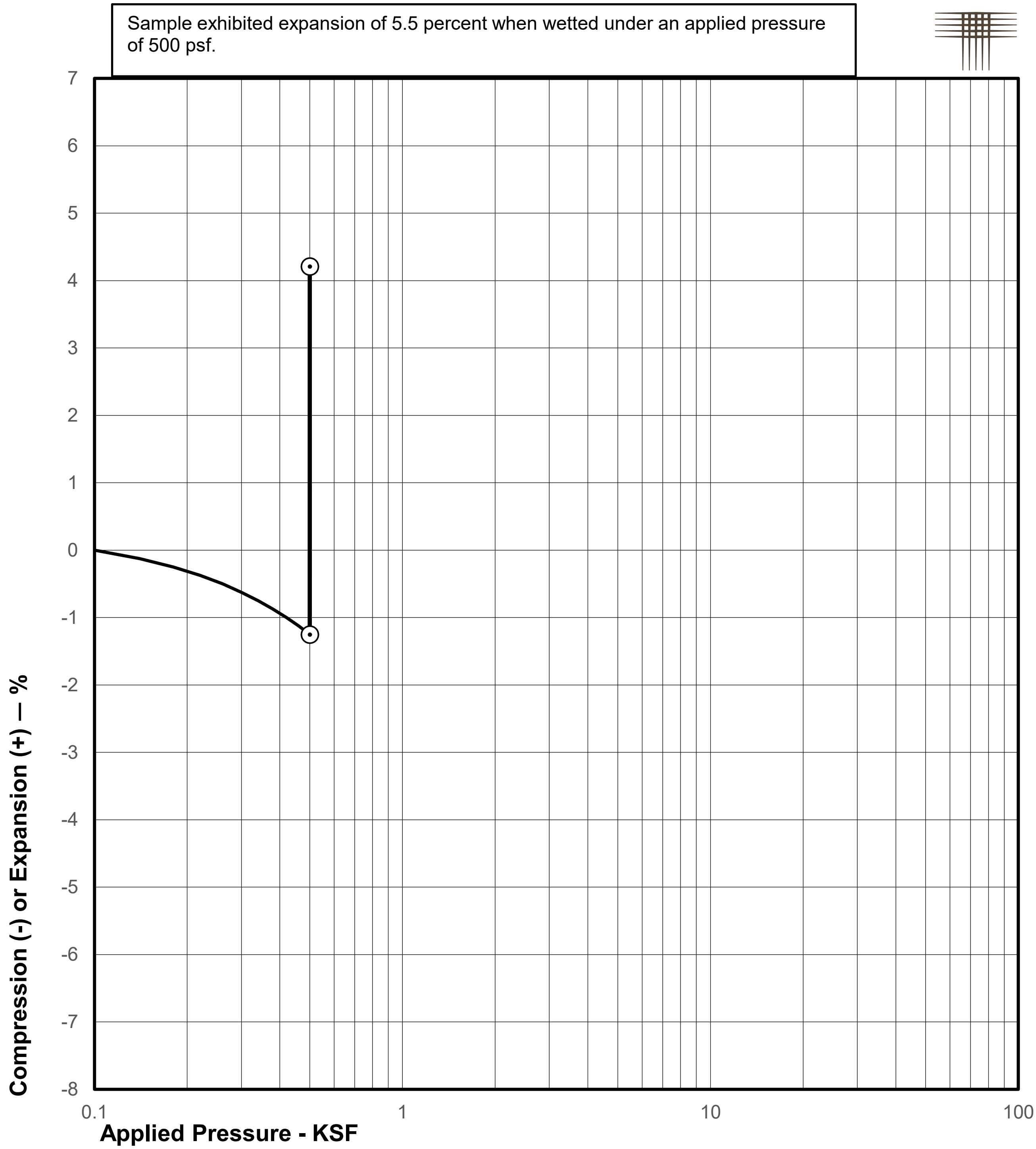
MOISTURE CONTENT: 8.9 % LIQUID LIMIT: ______ SILT AND CLAY: ______ %

DRY UNIT WEIGHT: 106 pcf PLASTICITY INDEX: ______ SOIL SUCTION: ______ pF

Swell Consolidation Test Results

BCUS ACQUISITIONS, LLC
RIDGEGATE- MESA TOPS
CTL|T PROJECT NO. DN52,036-115-R2

FIG. B-6



SAMPLE OF: CLAY, SANDY (CL)

FROM: TH-110 AT 4 FEET

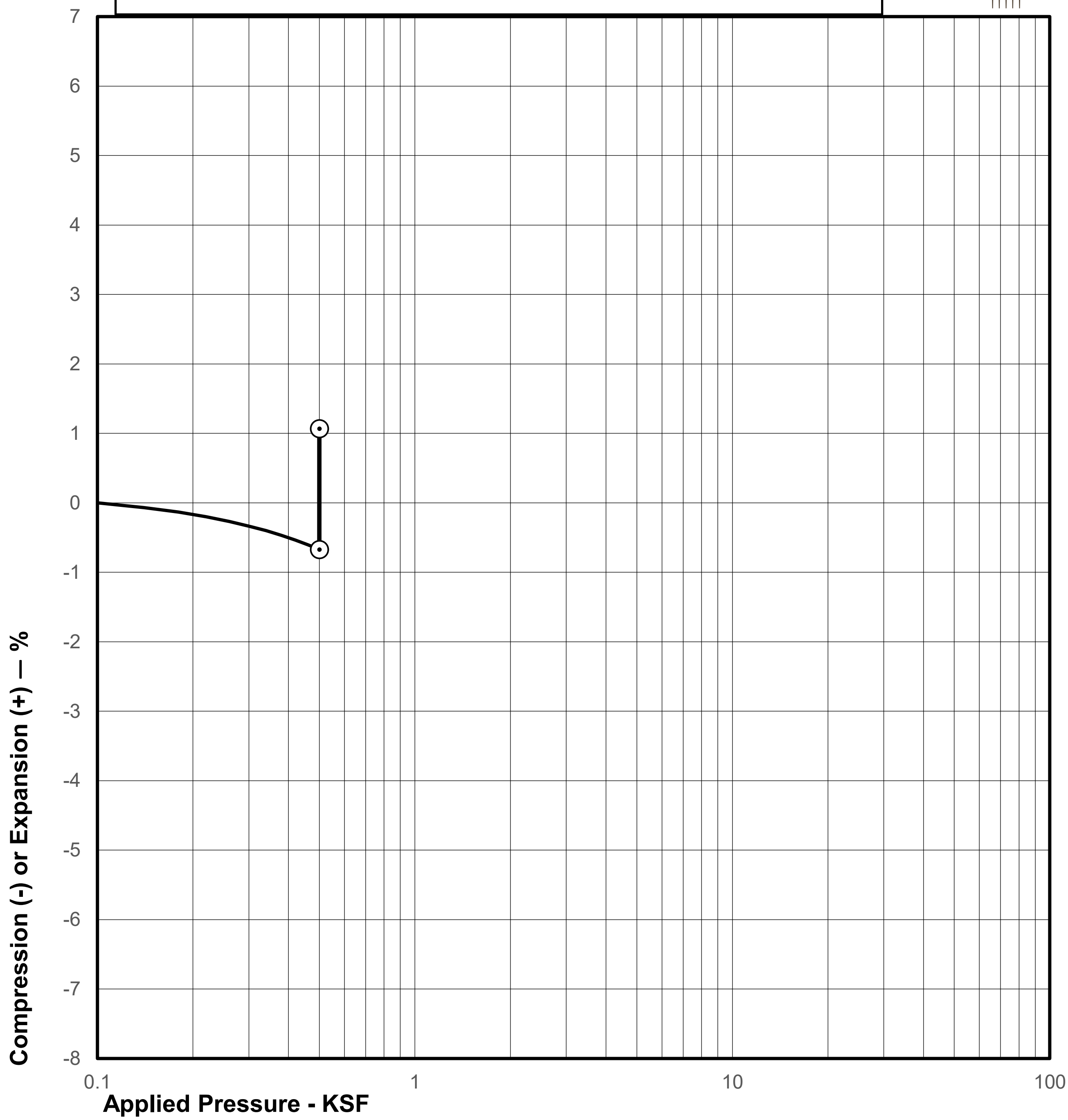
MOISTURE CONTENT:	12.7 %	LIQUID LIMIT:		SILT AND CLAY:	%
DRY UNIT WEIGHT:	99 pcf	PLASTICITY INDEX:		SOIL SUCTION:	pF

Swell Consolidation Test Results

BCUS ACQUISITIONS, LLC
RIDGEGATE- MESA TOPS
CTL|T PROJECT NO. DN52,036-115-R2

FIG. B-7

Sample exhibited expansion of 1.7 percent when wetted under an applied pressure of 500 psf.



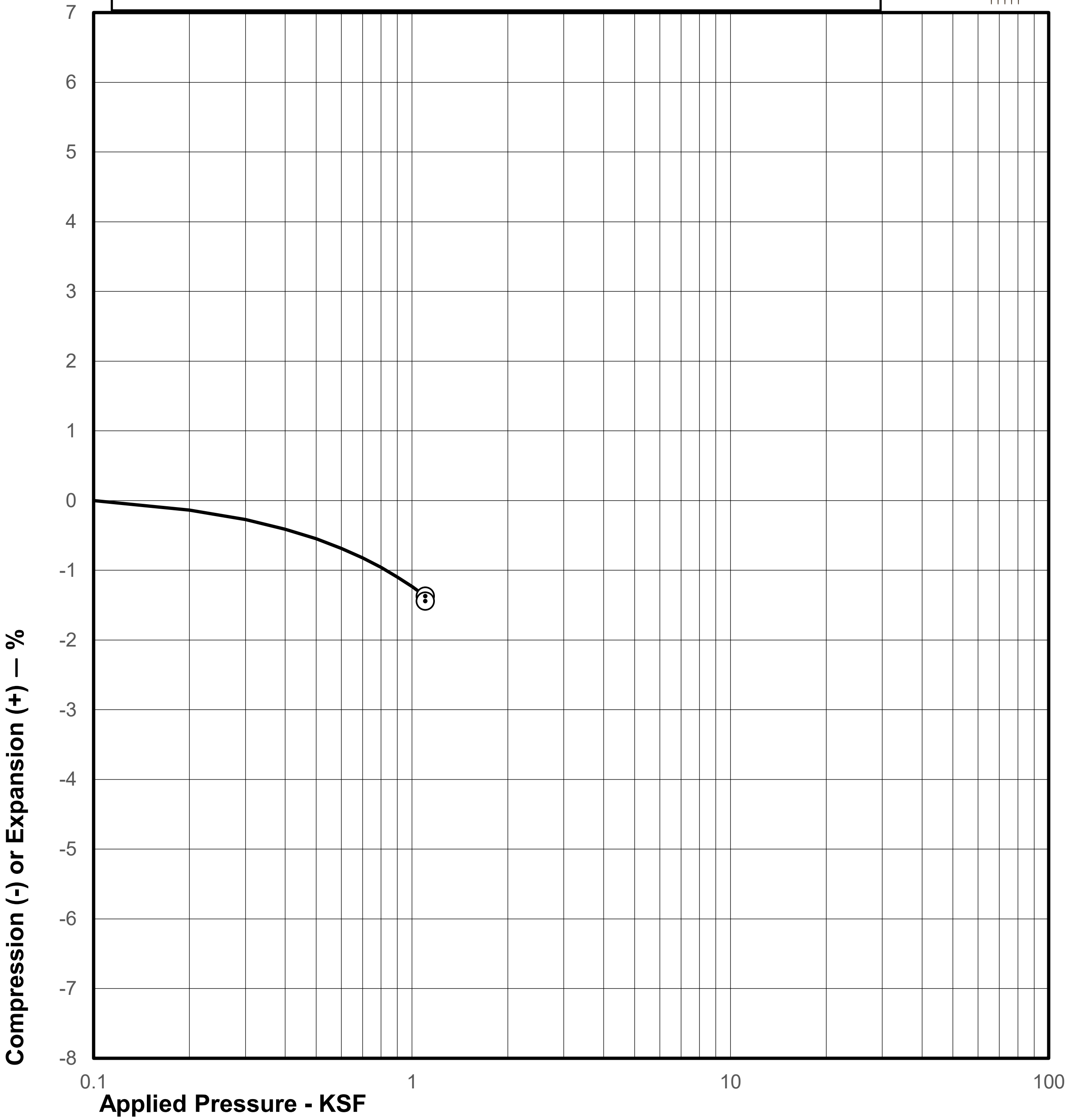
SAMPLE OF: CLAY, SANDY (CL)

FROM: TH-111 AT 4 FEET

MOISTURE CONTENT:	13.6	%	LIQUID LIMIT:		SILT AND CLAY:		%
DRY UNIT WEIGHT:	93	pcf	PLASTICITY INDEX:		SOIL SUCTION:		pF

Swell Consolidation Test Results

Sample exhibited compression of 0.1 percent when wetted under an applied pressure of 1100 psf.



SAMPLE OF: CLAYSTONE

FROM: TH-112 AT 9 FEET

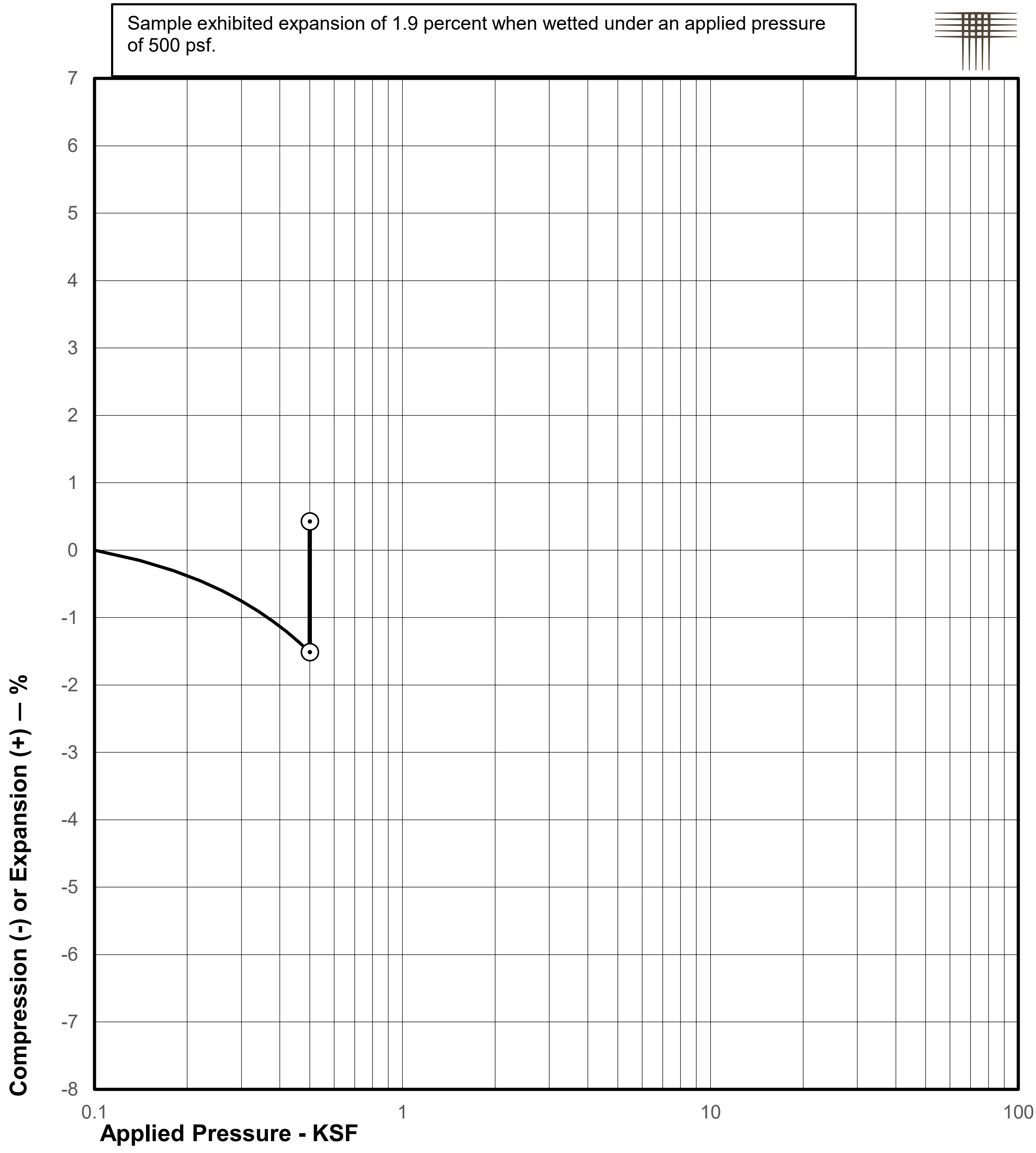
MOISTURE CONTENT: 27.5 % LIQUID LIMIT: ____ SILT AND CLAY: ____ %

DRY UNIT WEIGHT: 85 pcf PLASTICITY INDEX: ____ SOIL SUCTION: ____ pF

Swell Consolidation Test Results

BCUS ACQUISITIONS, LLC
RIDGEGATE- MESA TOPS
CTL|T PROJECT NO. DN52,036-115-R2

FIG. B-9

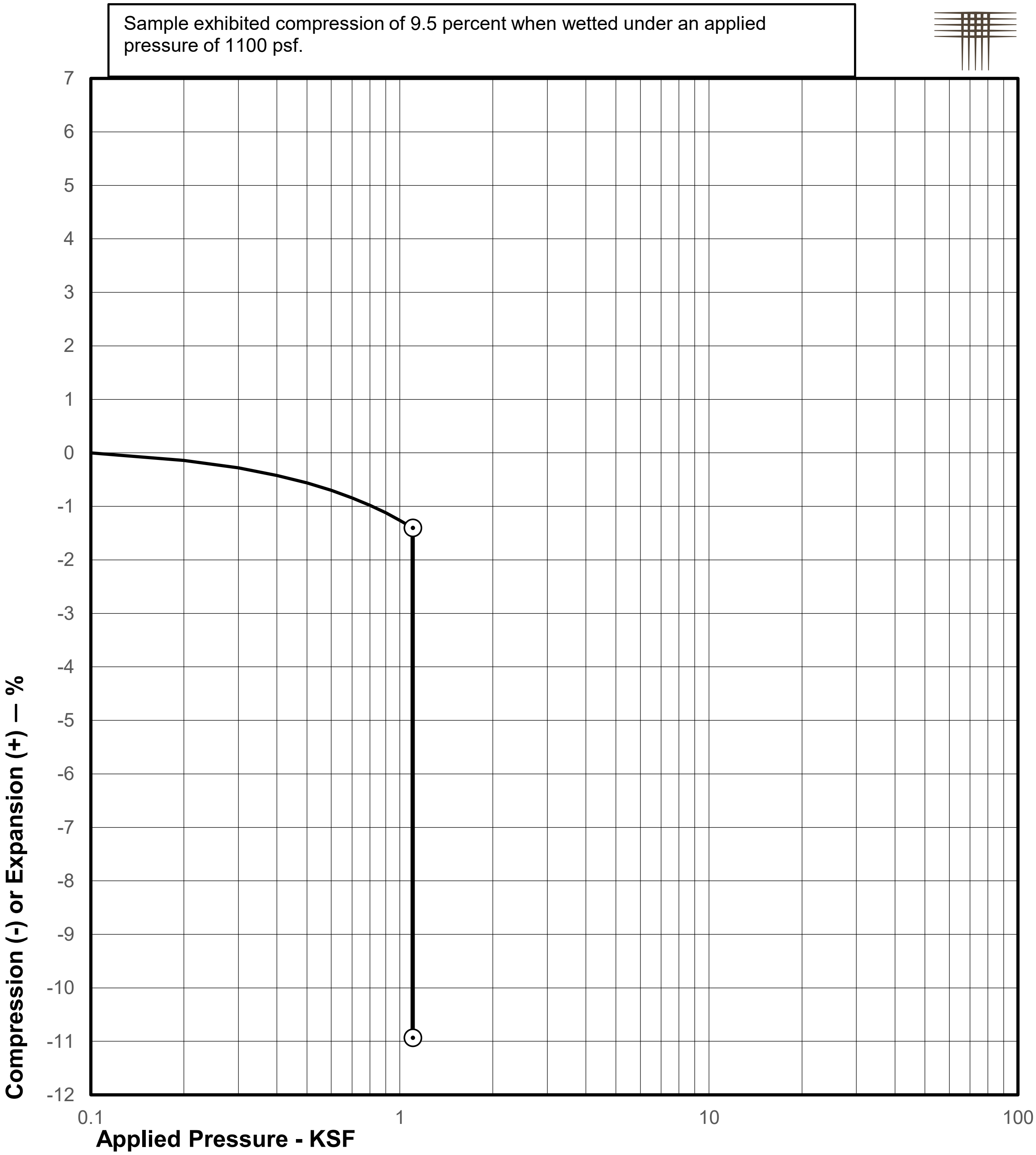


SAMPLE OF: CLAY, SANDY (CL)

FROM: TH-113 AT 4 FEET

MOISTURE CONTENT:	14.1 %	LIQUID LIMIT:		SILT AND CLAY:	%
DRY UNIT WEIGHT:	102 pcf	PLASTICITY INDEX:		SOIL SUCTION:	pF

Swell Consolidation Test Results



SAMPLE OF: CLAY, SANDY (CL)

FROM: TH-113 AT 9 FEET

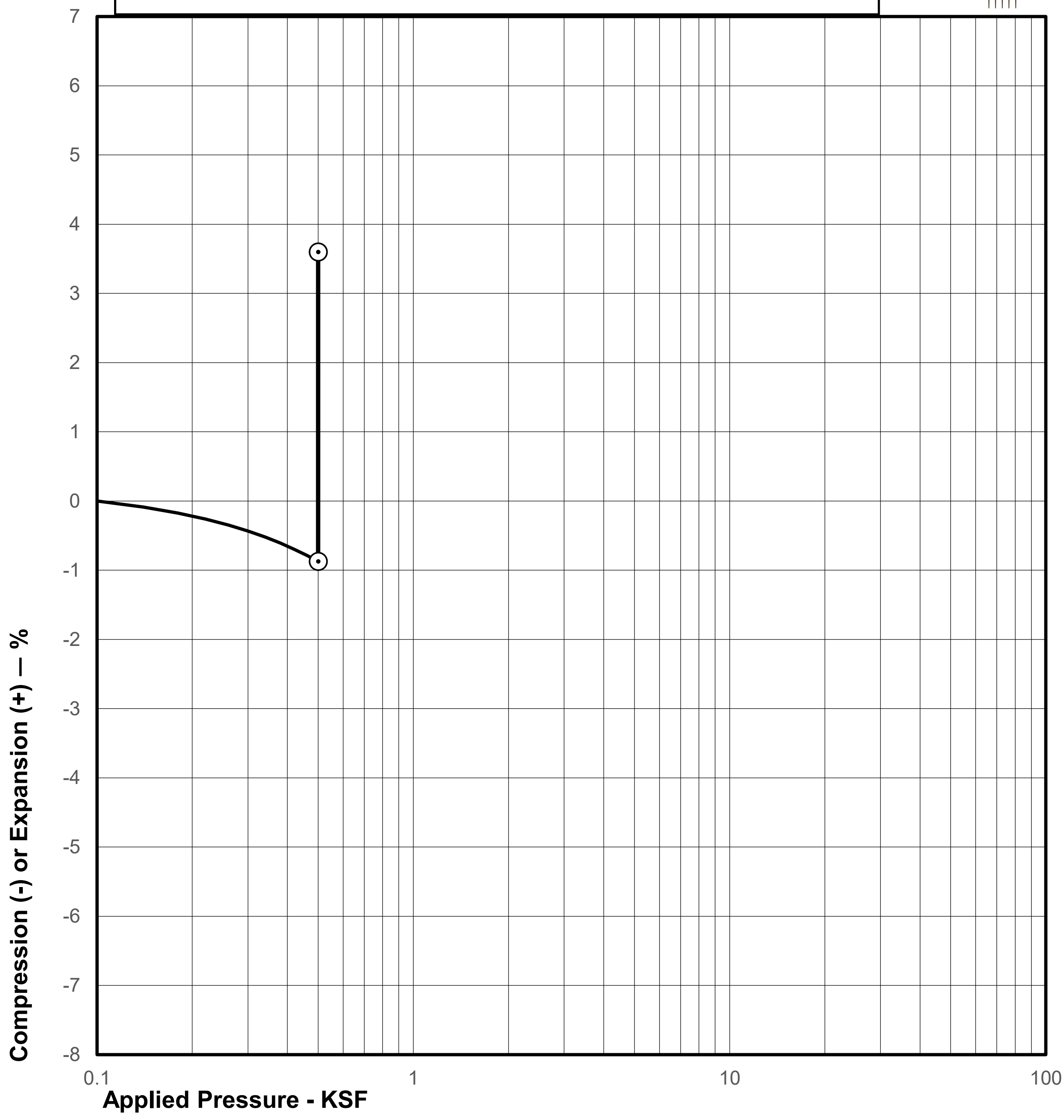
MOISTURE CONTENT:	16.5 %	LIQUID LIMIT:		SILT AND CLAY:	%
DRY UNIT WEIGHT:	76 pcf	PLASTICITY INDEX:		SOIL SUCTION:	pF

Swell Consolidation Test Results

BCUS ACQUISITIONS, LLC
RIDGEGATE- MESA TOPS
CTL|T PROJECT NO. DN52,036-115-R2

FIG. B-11

Sample exhibited expansion of 4.5 percent when wetted under an applied pressure of 500 psf.



SAMPLE OF: CLAY, SANDY (CL)

FROM: TH-115 AT 4 FEET

MOISTURE CONTENT: 14.0 % LIQUID LIMIT: ____ SILT AND CLAY: ____ %

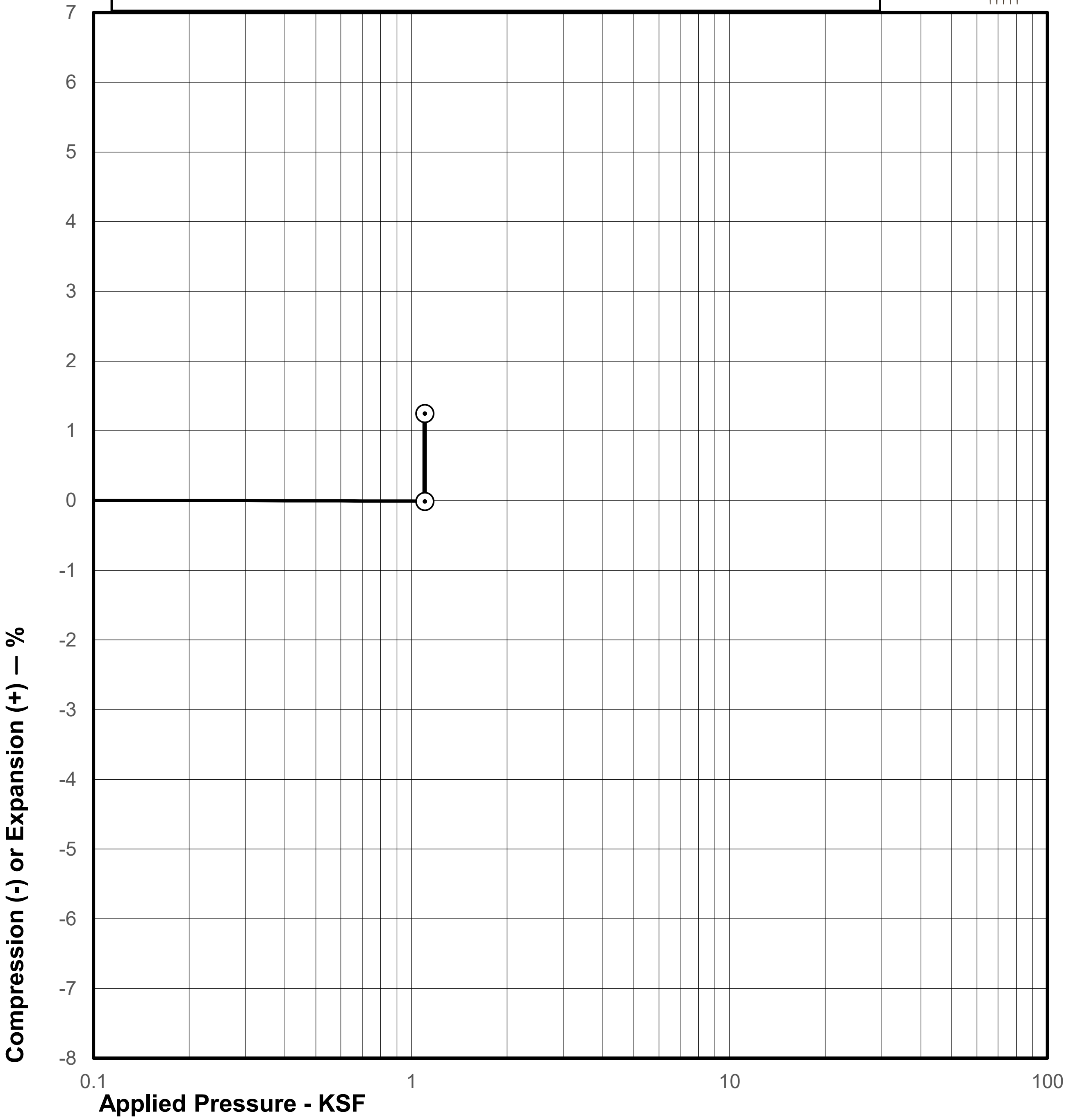
DRY UNIT WEIGHT: 94 pcf PLASTICITY INDEX: ____ SOIL SUCTION: ____ pF

Swell Consolidation Test Results

BCUS ACQUISITIONS, LLC
RIDGEGATE- MESA TOPS
CTL|T PROJECT NO. DN52,036-115-R2

FIG. B-12

Sample exhibited expansion of 1.3 percent when wetted under an applied pressure of 1100 psf.



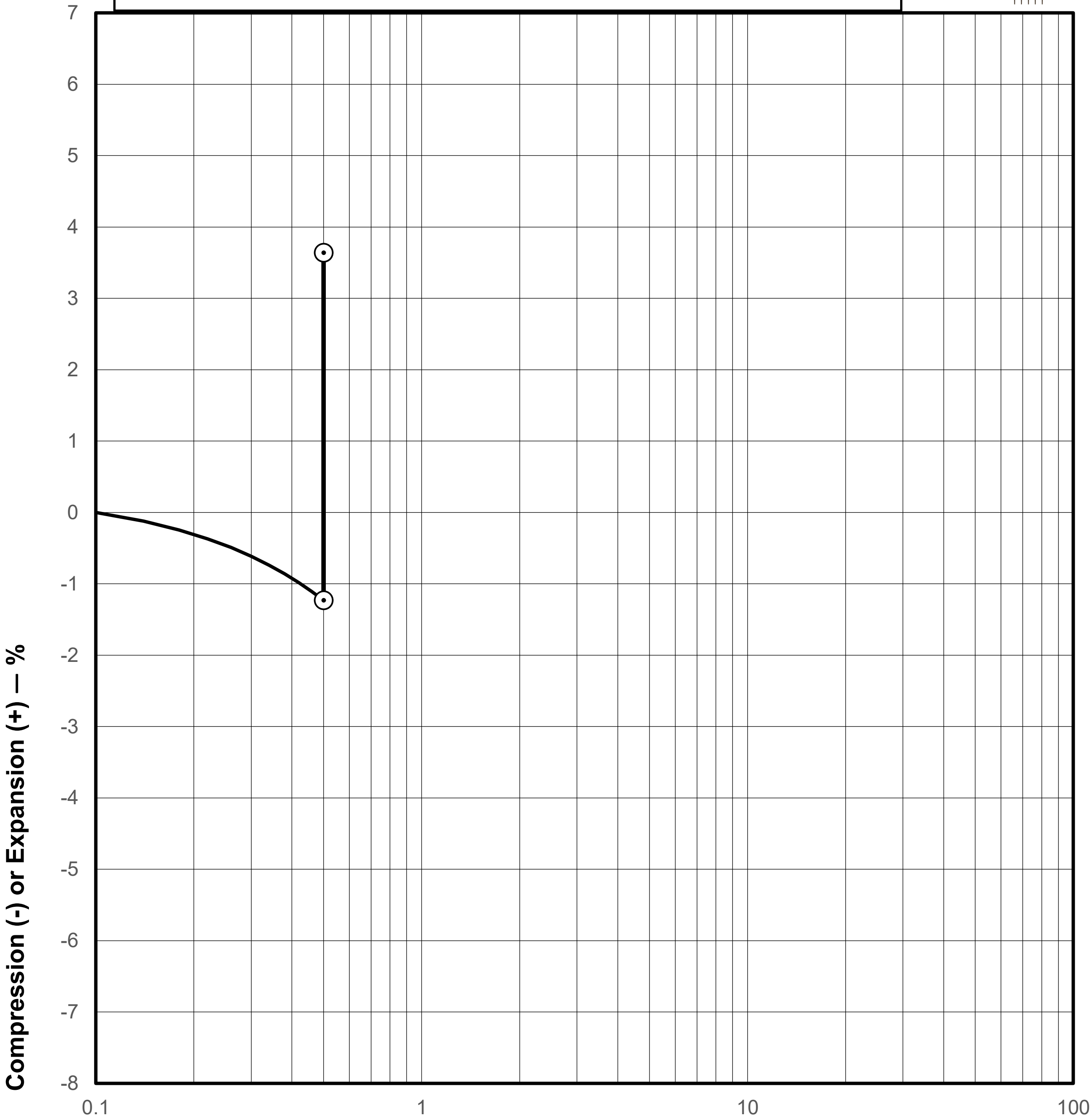
SAMPLE OF: CLAYSTONE

FROM: TH-115 AT 9 FEET

MOISTURE CONTENT:	22.5 %	LIQUID LIMIT:		SILT AND CLAY:	%
DRY UNIT WEIGHT:	84 pcf	PLASTICITY INDEX:		SOIL SUCTION:	pF

Swell Consolidation Test Results

Sample exhibited expansion of 4.9 percent when wetted under an applied pressure of 500 psf.



SAMPLE OF: CLAY, SANDY (CL)

FROM: TH-116 AT 4 FEET

MOISTURE CONTENT: 15.4 % LIQUID LIMIT: ____ SILT AND CLAY: ____ %

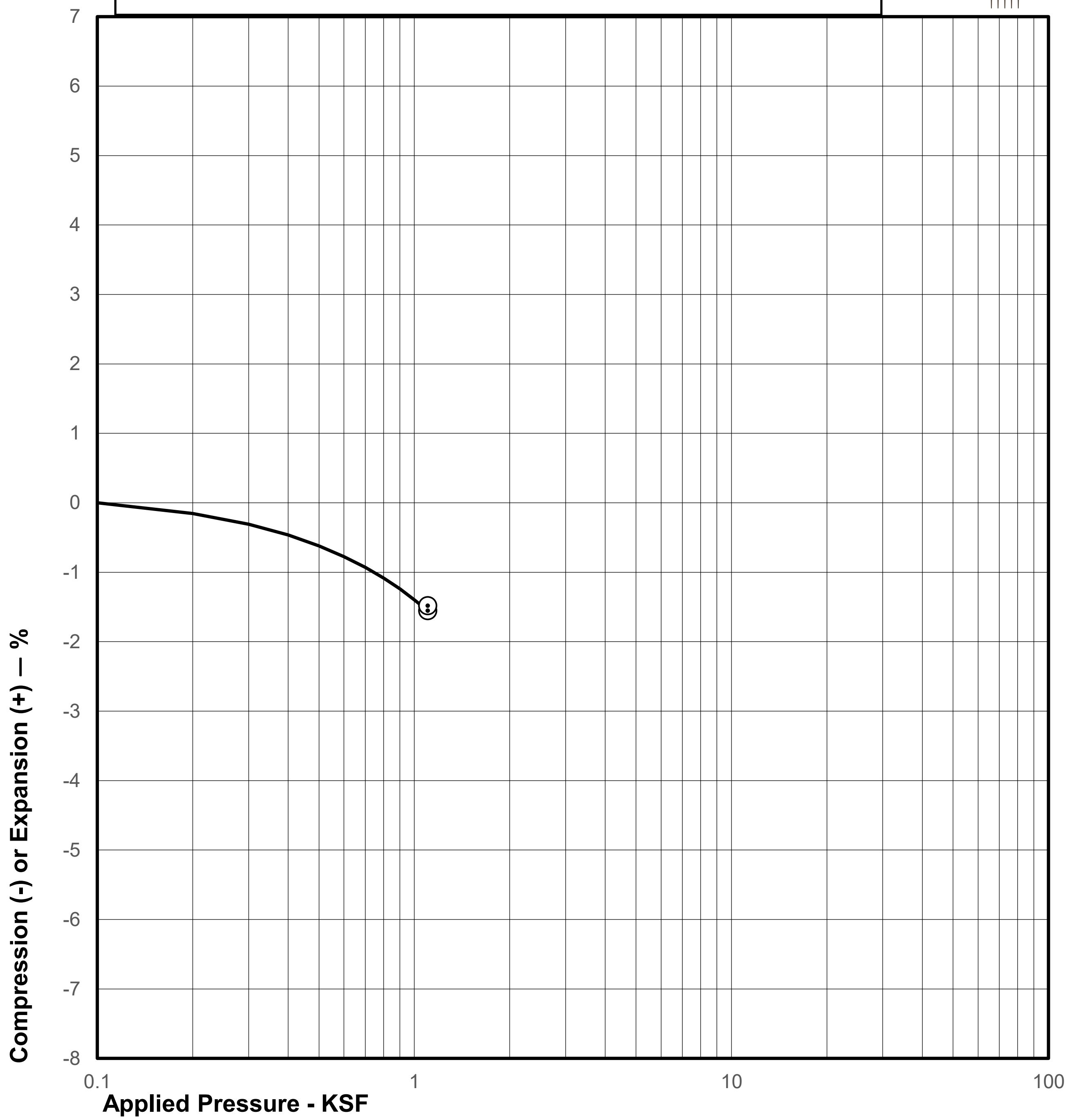
DRY UNIT WEIGHT: 92 pcf PLASTICITY INDEX: ____ SOIL SUCTION: ____ pF

Swell Consolidation Test Results

BCUS ACQUISITIONS, LLC
RIDGEGATE- MESA TOPS
CTL|T PROJECT NO. DN52,036-115-R2

FIG. B-14

Sample exhibited expansion of 0.1 percent when wetted under an applied pressure of 1100 psf.



SAMPLE OF: CLAYSTONE
FROM: TH-116 AT 9 FEET

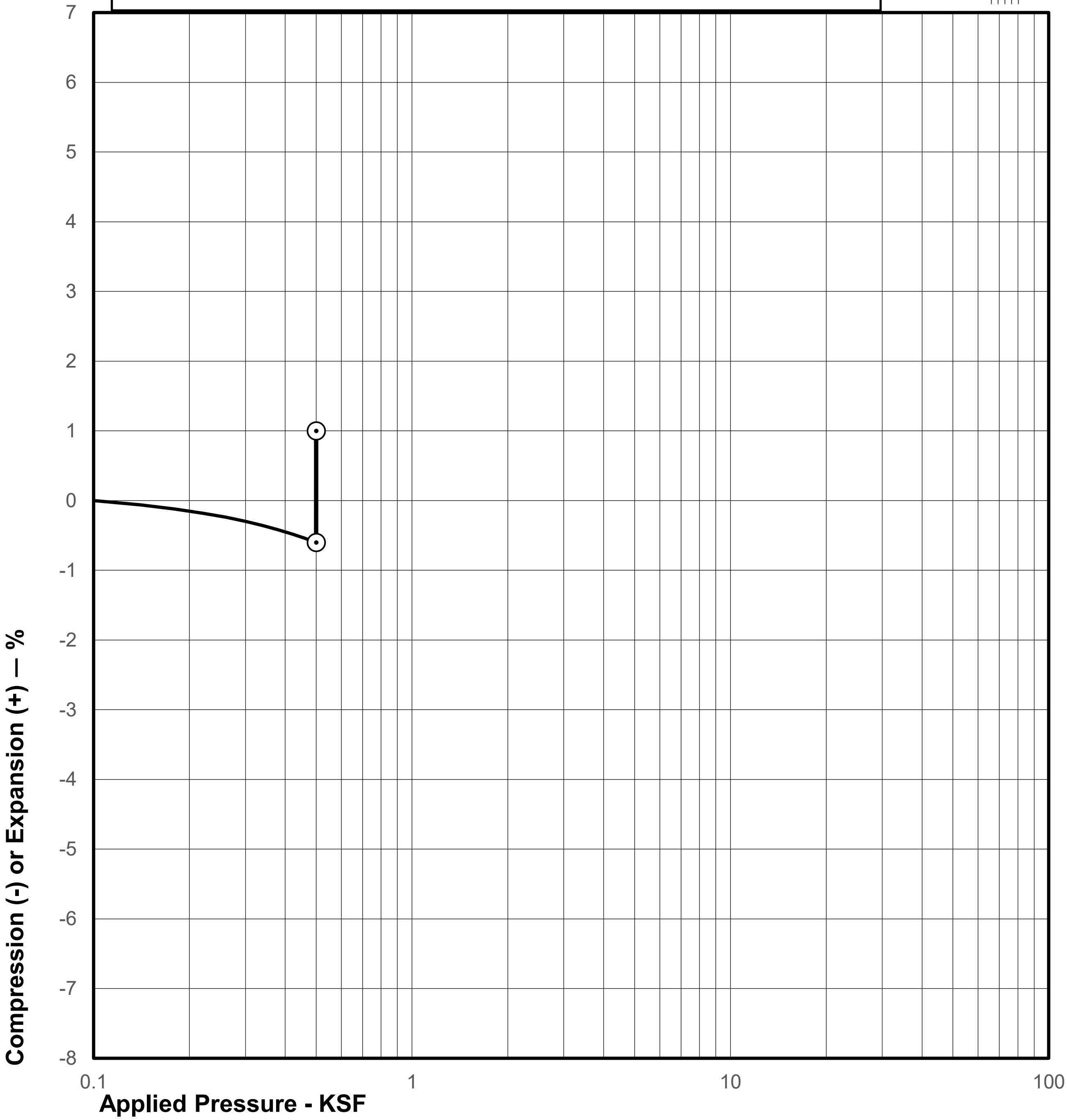
MOISTURE CONTENT: 16.3 % LIQUID LIMIT: ____ SILT AND CLAY: ____ %
DRY UNIT WEIGHT: 105 pcf PLASTICITY INDEX: ____ SOIL SUCTION: ____ pF

Swell Consolidation Test Results

BCUS ACQUISITIONS, LLC
RIDGEGATE- MESA TOPS
CTL|T PROJECT NO. DN52,036-115-R2

FIG. B-15

Sample exhibited expansion of 1.6 percent when wetted under an applied pressure of 500 psf.



SAMPLE OF: CLAY, SANDY (CL)

FROM: TH-117 AT 4 FEET

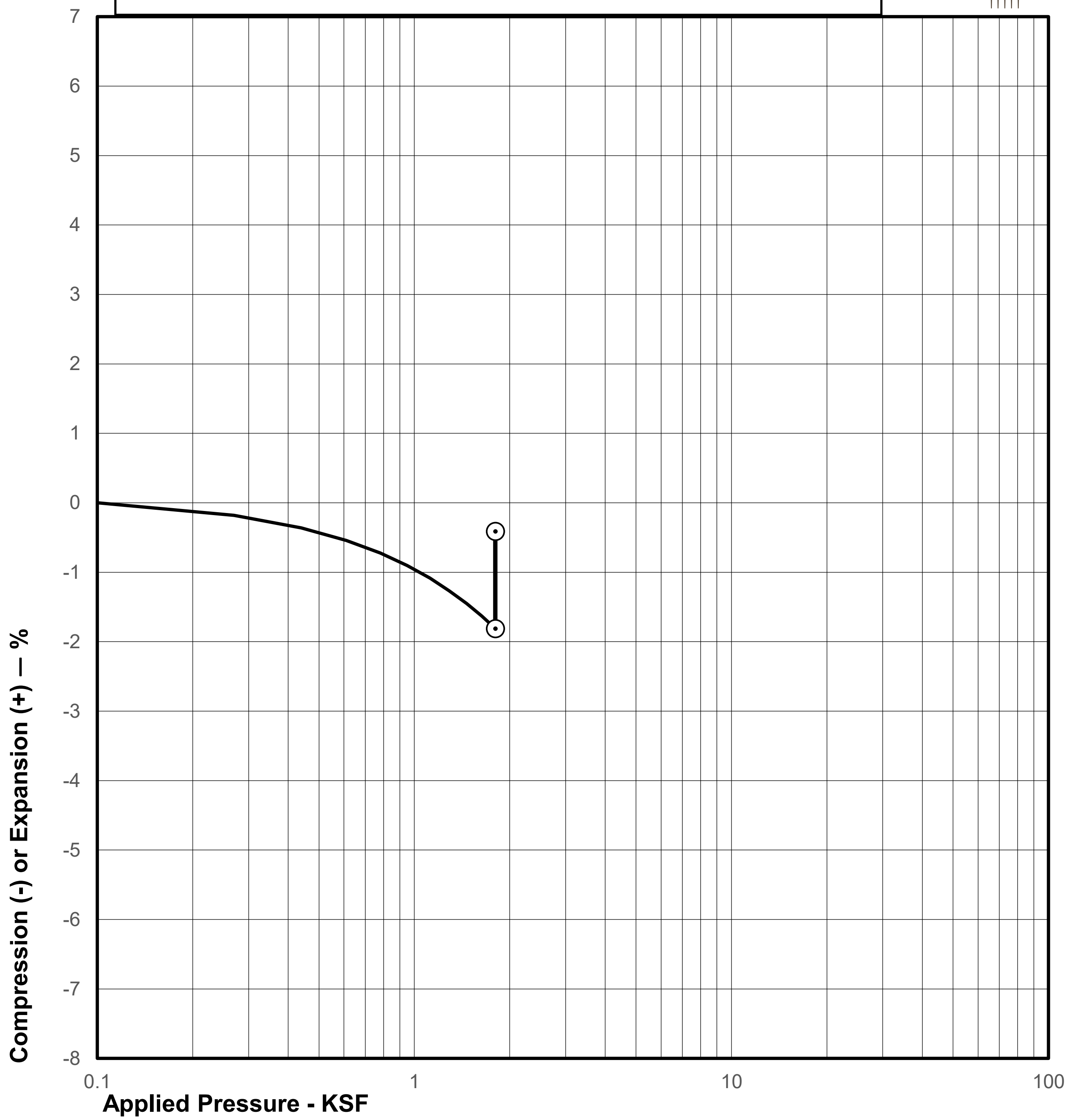
MOISTURE CONTENT:	9.2 %	LIQUID LIMIT:		SILT AND CLAY:	%
DRY UNIT WEIGHT:	103 pcf	PLASTICITY INDEX:		SOIL SUCTION:	pF

Swell Consolidation Test Results

BCUS ACQUISITIONS, LLC
RIDGEGATE- MESA TOPS
CTL|T PROJECT NO. DN52,036-115-R2

FIG. B-16

Sample exhibited expansion of 1.4 percent when wetted under an applied pressure of 1800 psf.



SAMPLE OF: CLAYSTONE

FROM: TH-117 AT 14 FEET

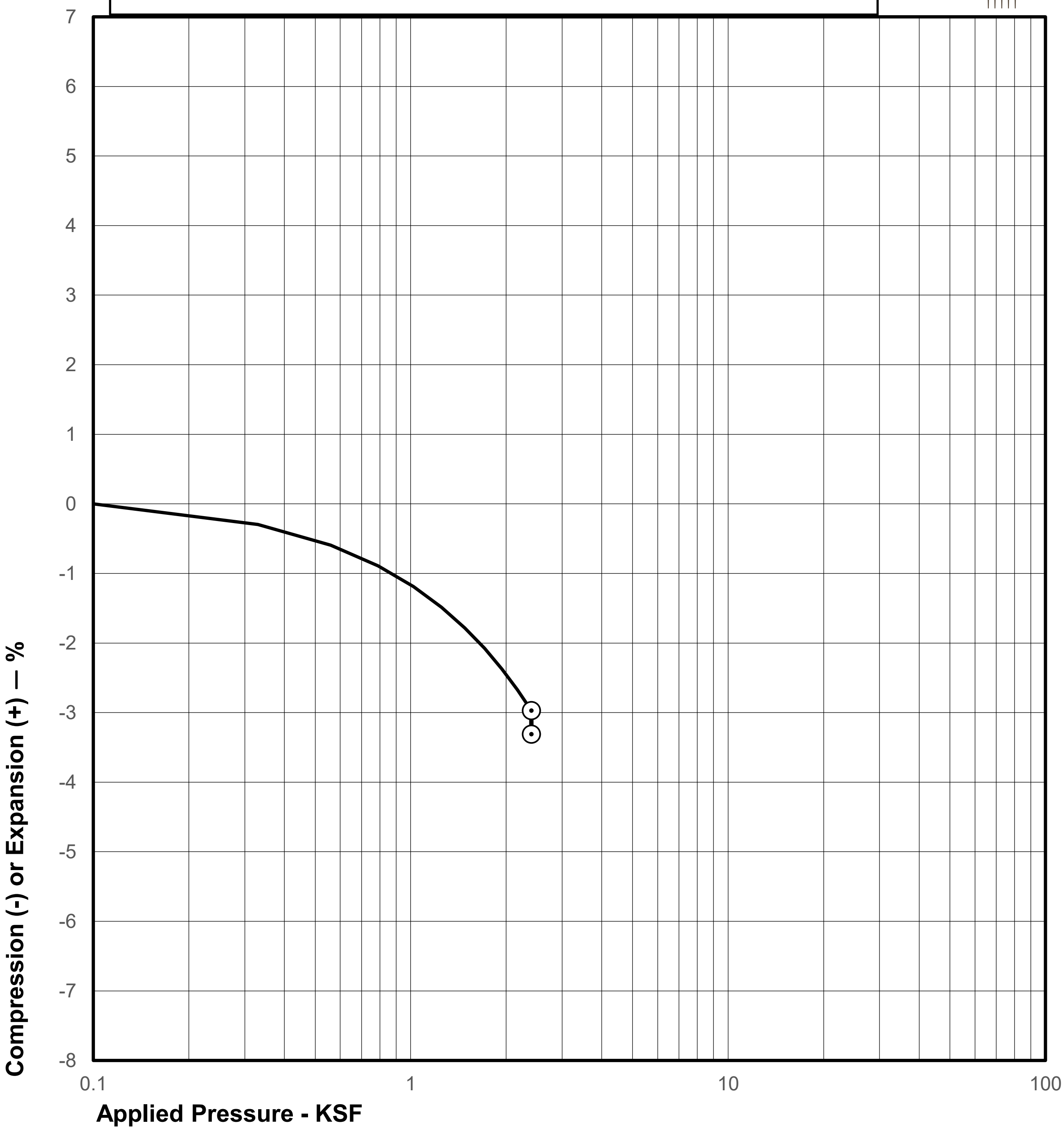
MOISTURE CONTENT:	29.3 %	LIQUID LIMIT:		SILT AND CLAY:	%
DRY UNIT WEIGHT:	92 pcf	PLASTICITY INDEX:		SOIL SUCTION:	pF

Swell Consolidation Test Results

BCUS ACQUISITIONS, LLC
RIDGEGATE- MESA TOPS
CTL|T PROJECT NO. DN52,036-115-R2

FIG. B-17

Sample exhibited compression of 0.3 percent when wetted under an applied pressure of 2400 psf.



SAMPLE OF: CLAYSTONE

FROM: TH-117 AT 19 FEET

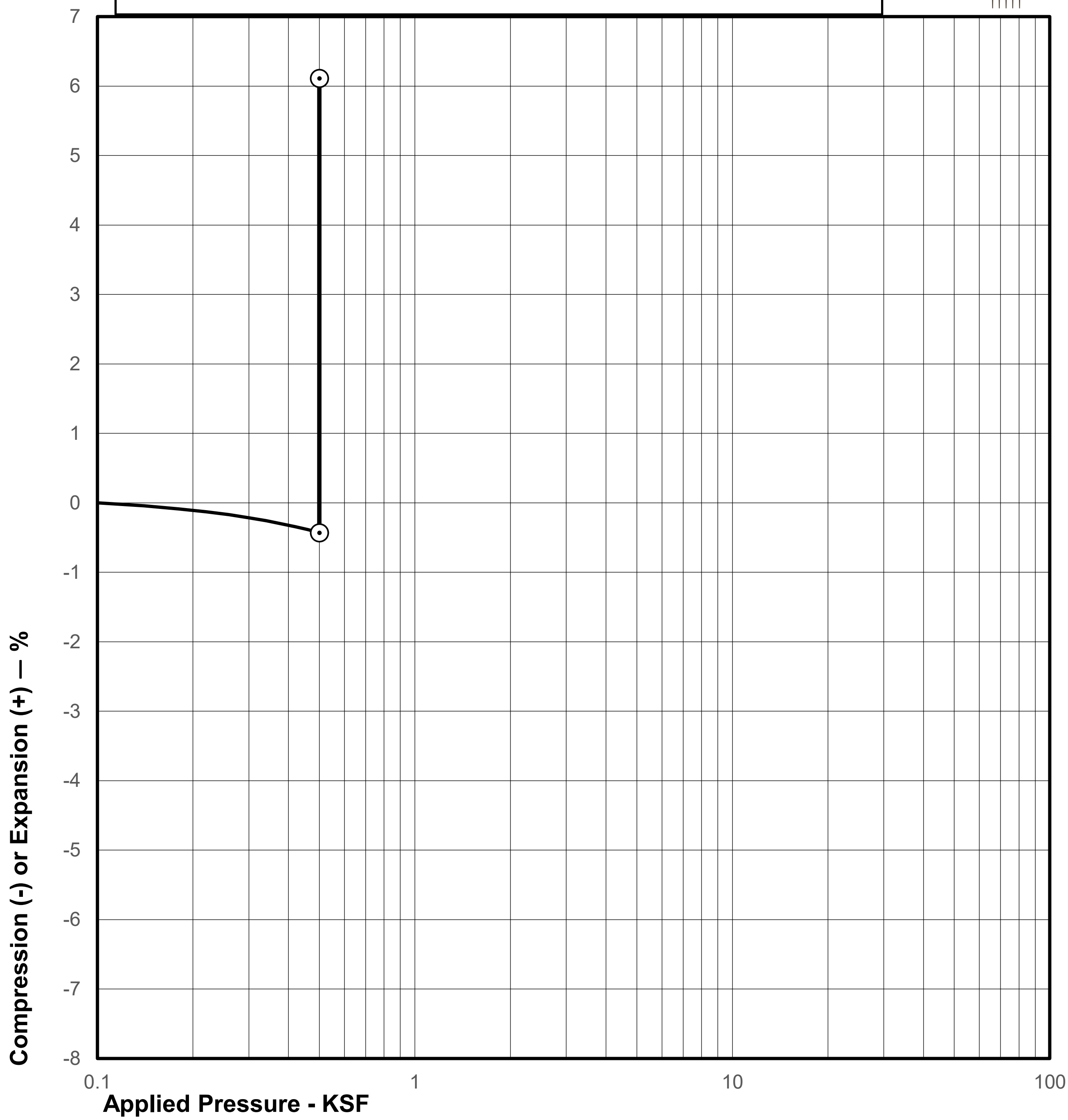
MOISTURE CONTENT:	18.9 %	LIQUID LIMIT:		SILT AND CLAY:	%
DRY UNIT WEIGHT:	104 pcf	PLASTICITY INDEX:		SOIL SUCTION:	pF

Swell Consolidation Test Results

BCUS ACQUISITIONS, LLC
RIDGEGATE- MESA TOPS
CTL|T PROJECT NO. DN52,036-115-R2

FIG. B-18

Sample exhibited expansion of 6.5 percent when wetted under an applied pressure of 500 psf.



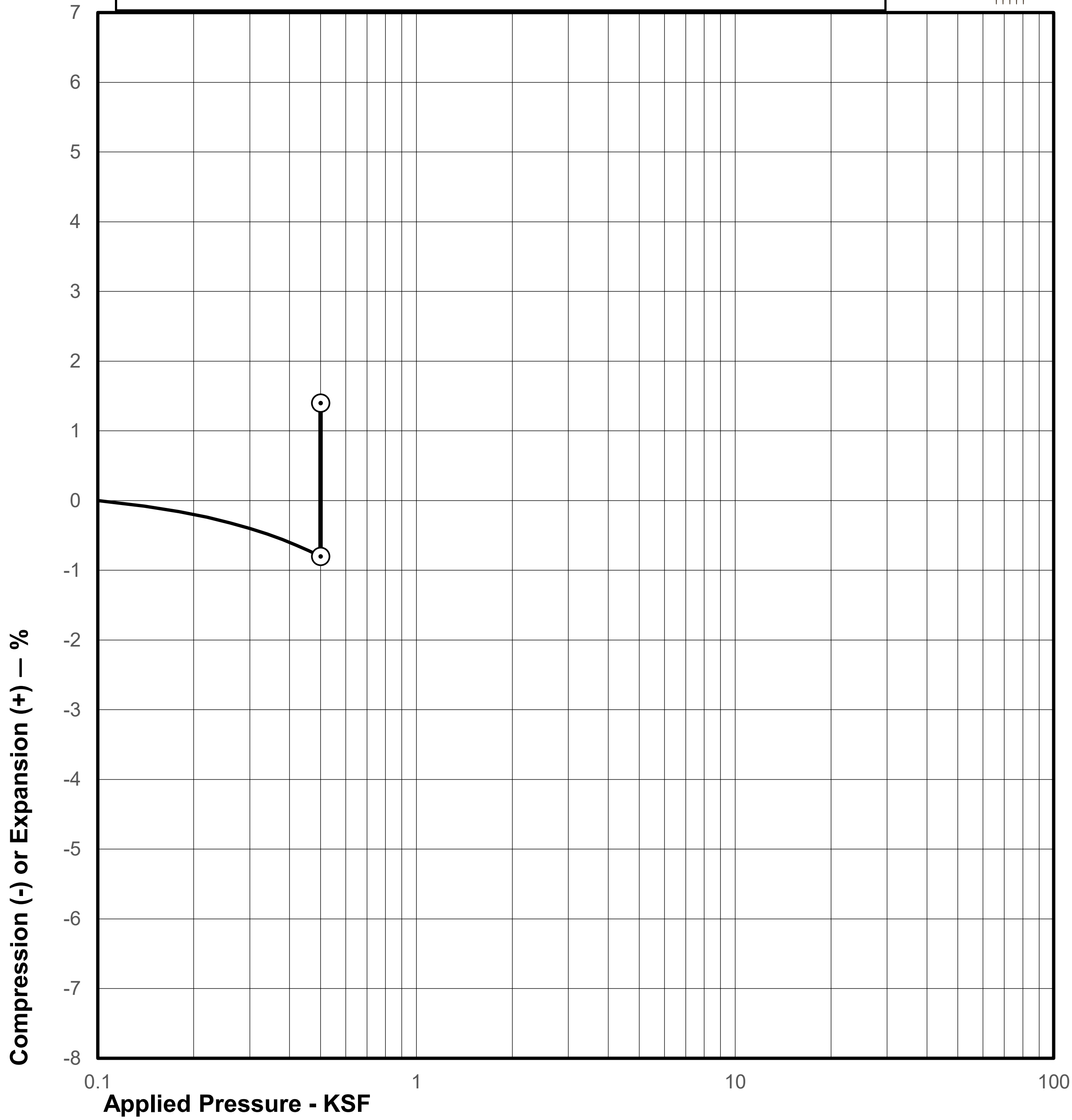
SAMPLE OF: CLAY, SANDY (CL)

FROM: TH-118 AT 4 FEET

MOISTURE CONTENT:	11.7 %	LIQUID LIMIT:		SILT AND CLAY:	%		
DRY UNIT WEIGHT:	111 pcf	PLASTICITY INDEX:		SOIL SUCTION:	pF		

Swell Consolidation Test Results

Sample exhibited expansion of 2.2 percent when wetted under an applied pressure of 500 psf.

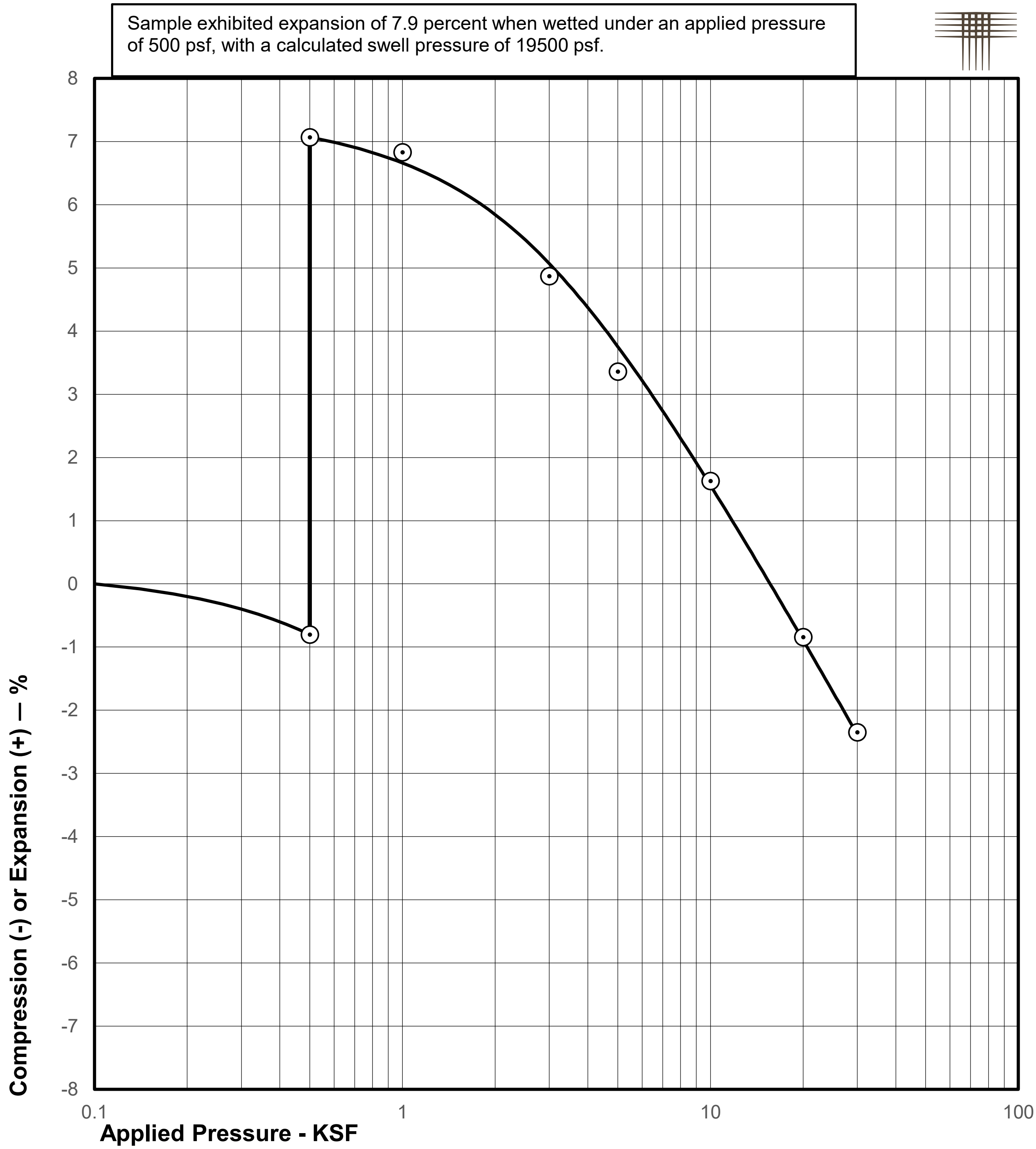


SAMPLE OF: CLAY, SANDY (CL)

FROM: TH-119 AT 4 FEET

MOISTURE CONTENT:	11.5	%	LIQUID LIMIT:			SILT AND CLAY:		%
DRY UNIT WEIGHT:	96	pcf	PLASTICITY INDEX:			SOIL SUCTION:		pF

Swell Consolidation Test Results



SAMPLE OF: CLAY, SANDY (CL)
FROM: TH-120 AT 4 FEET

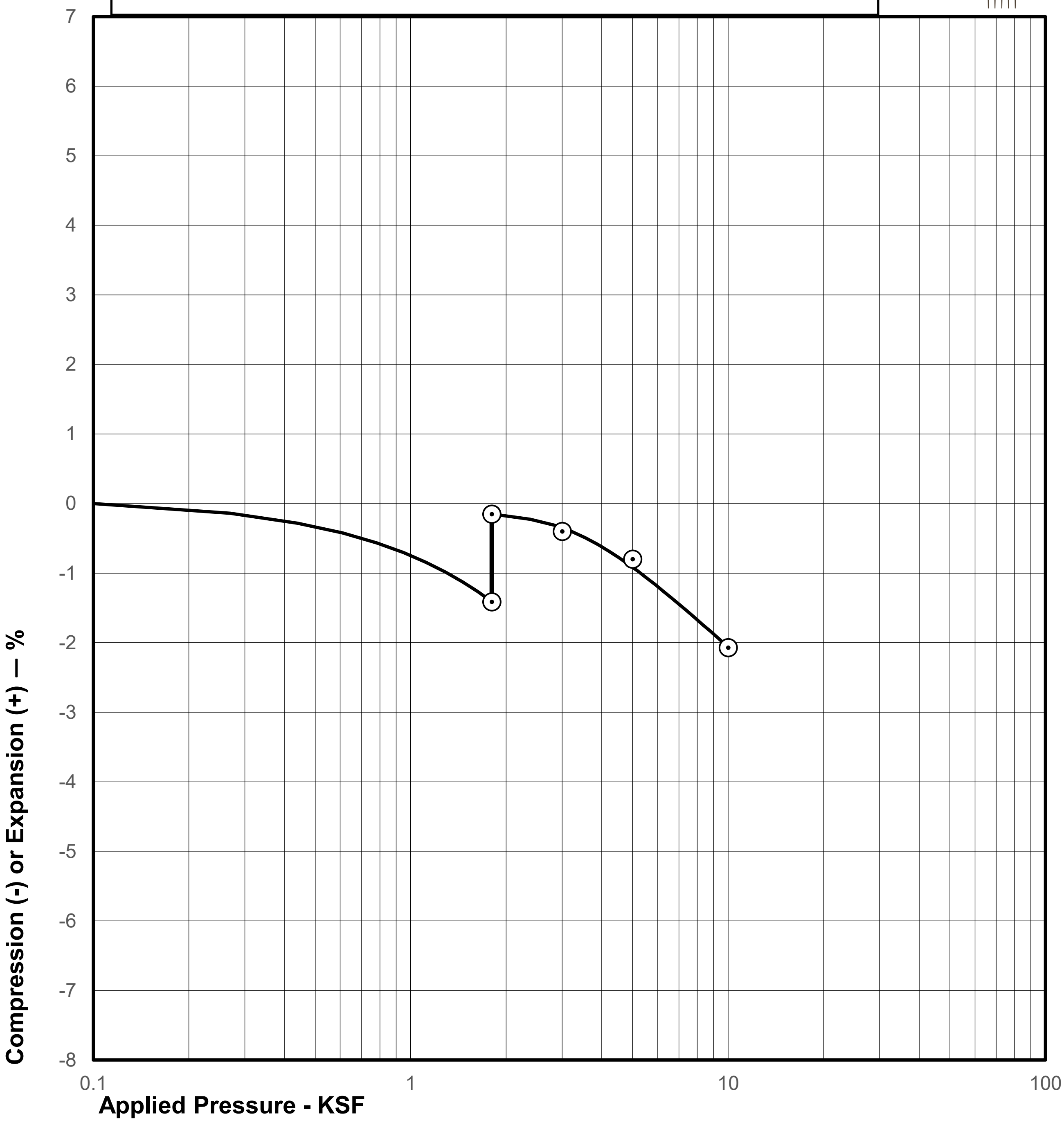
MOISTURE CONTENT: 11.5 % LIQUID LIMIT: ____ SILT AND CLAY: ____ %
DRY UNIT WEIGHT: 116 pcf PLASTICITY INDEX: ____ SOIL SUCTION: 4.79 pF

Swell Consolidation Test Results

BCUS ACQUISITIONS, LLC
RIDGEGATE- MESA TOPS
CTL|T PROJECT NO. DN52,036-115-R2

FIG. B-21

Sample exhibited expansion of 1.3 percent when wetted under an applied pressure of 1800 psf, with a calculated swell pressure of 6600 psf.



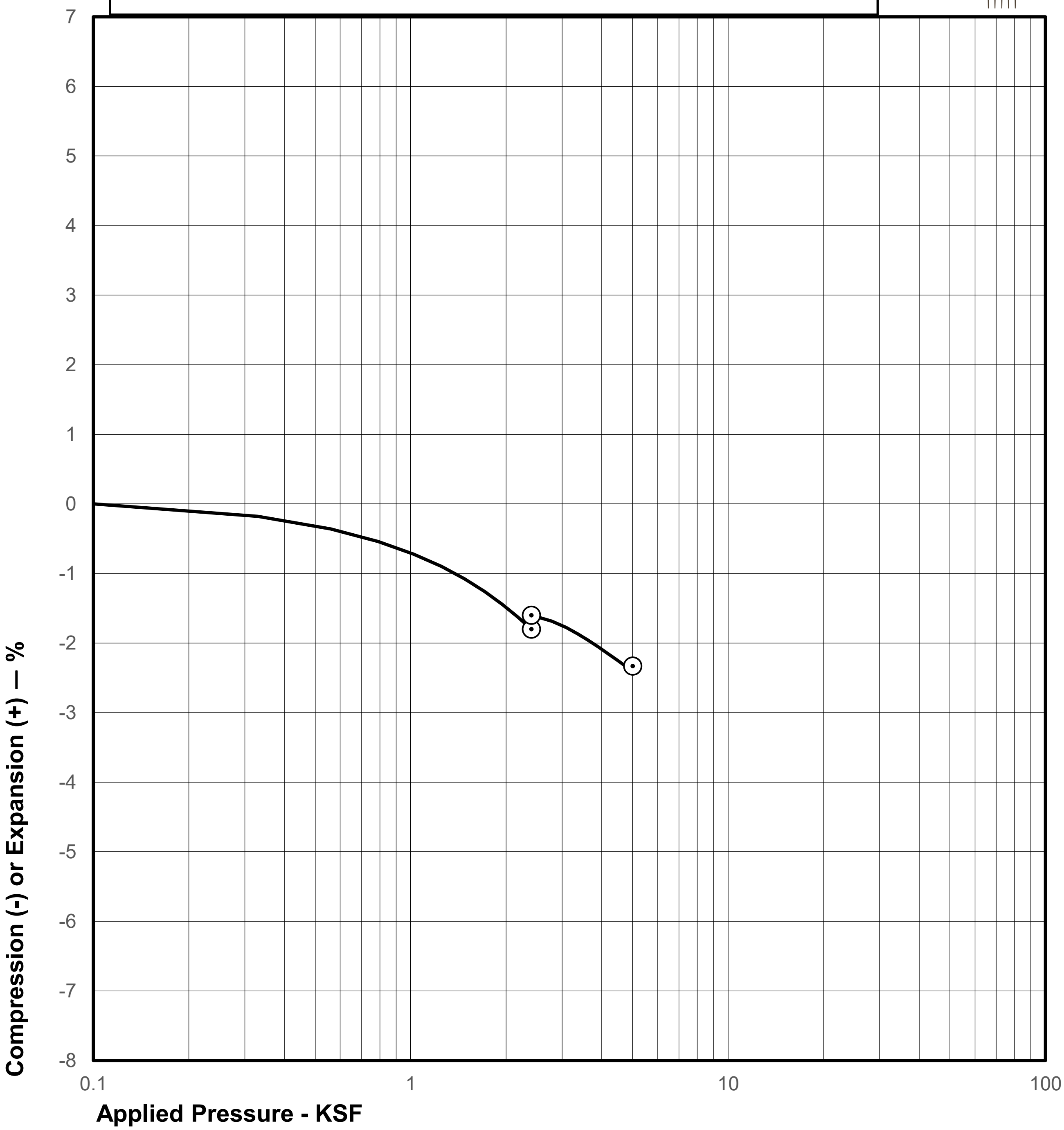
SAMPLE OF: CLAYSTONE

FROM: TH-120 AT 14 FEET

MOISTURE CONTENT:	23.9 %	LIQUID LIMIT:		SILT AND CLAY:	%
DRY UNIT WEIGHT:	103 pcf	PLASTICITY INDEX:		SOIL SUCTION:	4.16 pF

Swell Consolidation Test Results

Sample exhibited expansion of 0.2 percent when wetted under an applied pressure of 2400 psf, with a calculated swell pressure of 3100 psf.



SAMPLE OF: CLAYSTONE

FROM: TH-120 AT 19 FEET

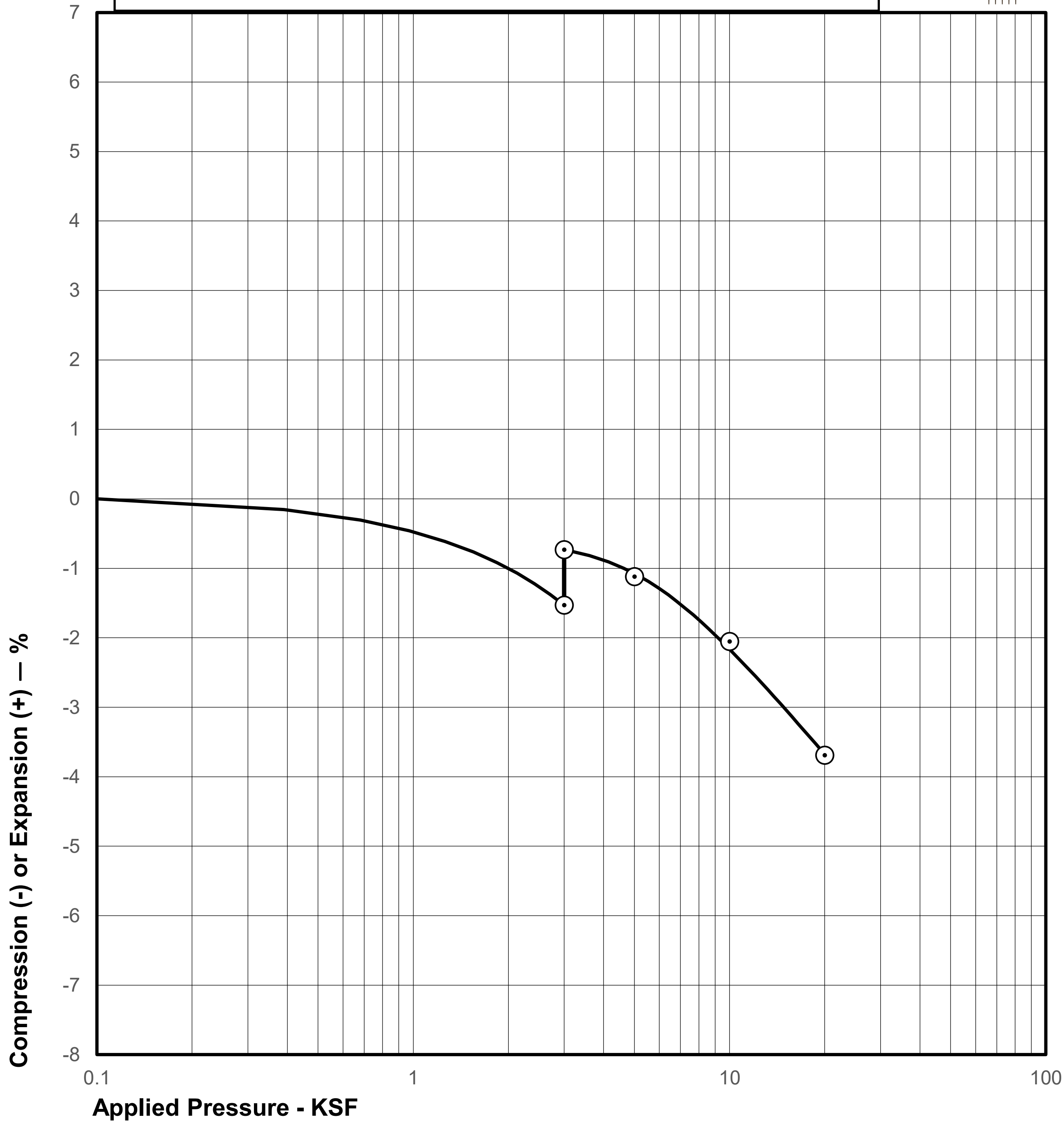
MOISTURE CONTENT:	16.4 %	LIQUID LIMIT:		SILT AND CLAY:	%
DRY UNIT WEIGHT:	111 pcf	PLASTICITY INDEX:		SOIL SUCTION:	4.33 pF

Swell Consolidation Test Results

BCUS ACQUISITIONS, LLC
RIDGEGATE- MESA TOPS
CTL|T PROJECT NO. DN52,036-115-R2

FIG. B-23

Sample exhibited expansion of 0.8 percent when wetted under an applied pressure of 3000.0 psf, with a calculated swell pressure of 6800 psf.



SAMPLE OF: CLAYSTONE

FROM: TH-120 AT 24 FEET

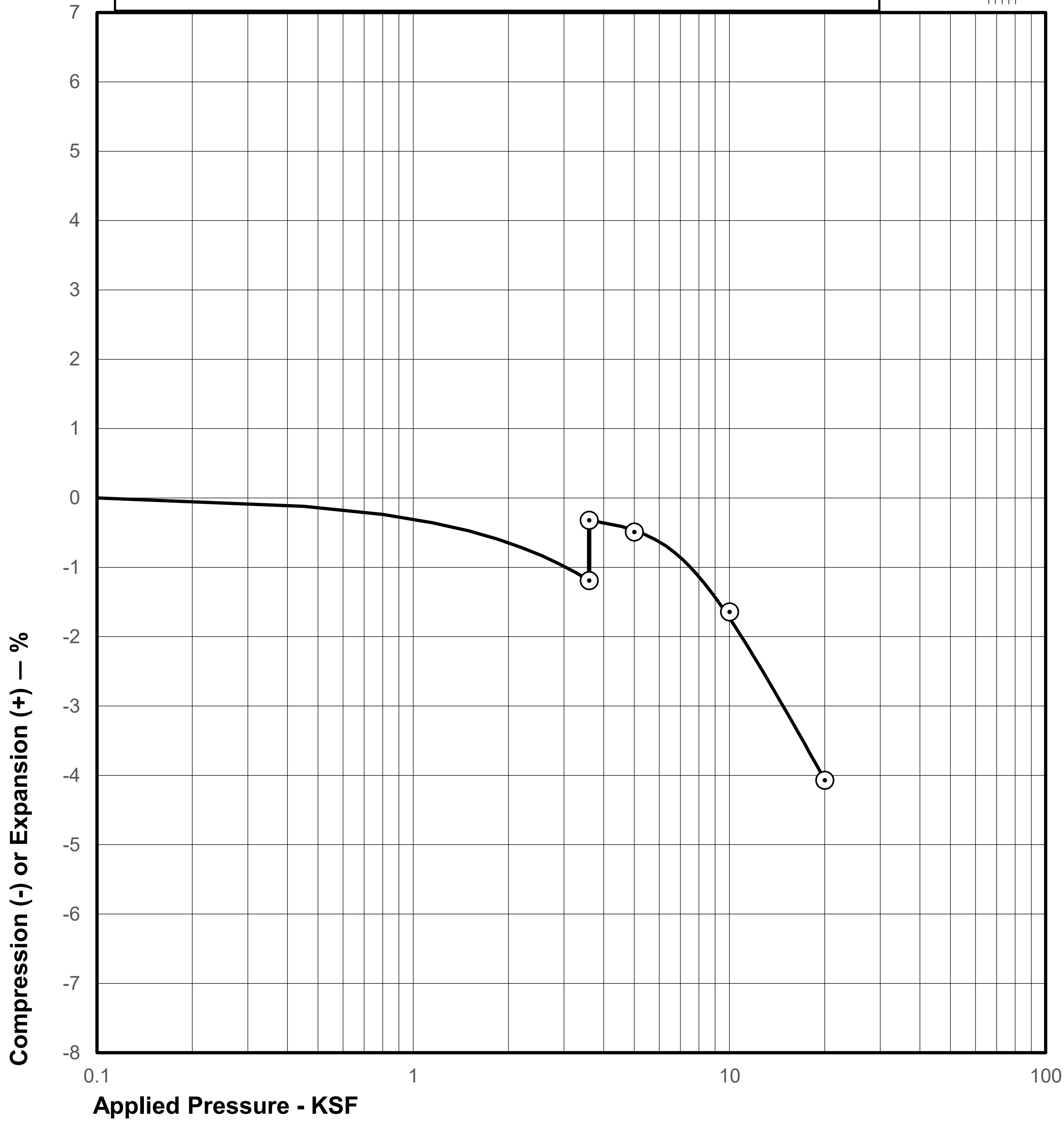
MOISTURE CONTENT:	19.0 %	LIQUID LIMIT:		SILT AND CLAY:	%
DRY UNIT WEIGHT:	110 pcf	PLASTICITY INDEX:		SOIL SUCTION:	4.35 pF

Swell Consolidation Test Results

BCUS ACQUISITIONS, LLC
RIDGEGATE- MESA TOPS
CTL|T PROJECT NO. DN52,036-115-R2

FIG. B-24

Sample exhibited expansion of 0.9 percent when wetted under an applied pressure of 3600 psf, with a calculated swell pressure of 8200 psf.



SAMPLE OF: CLAYSTONE

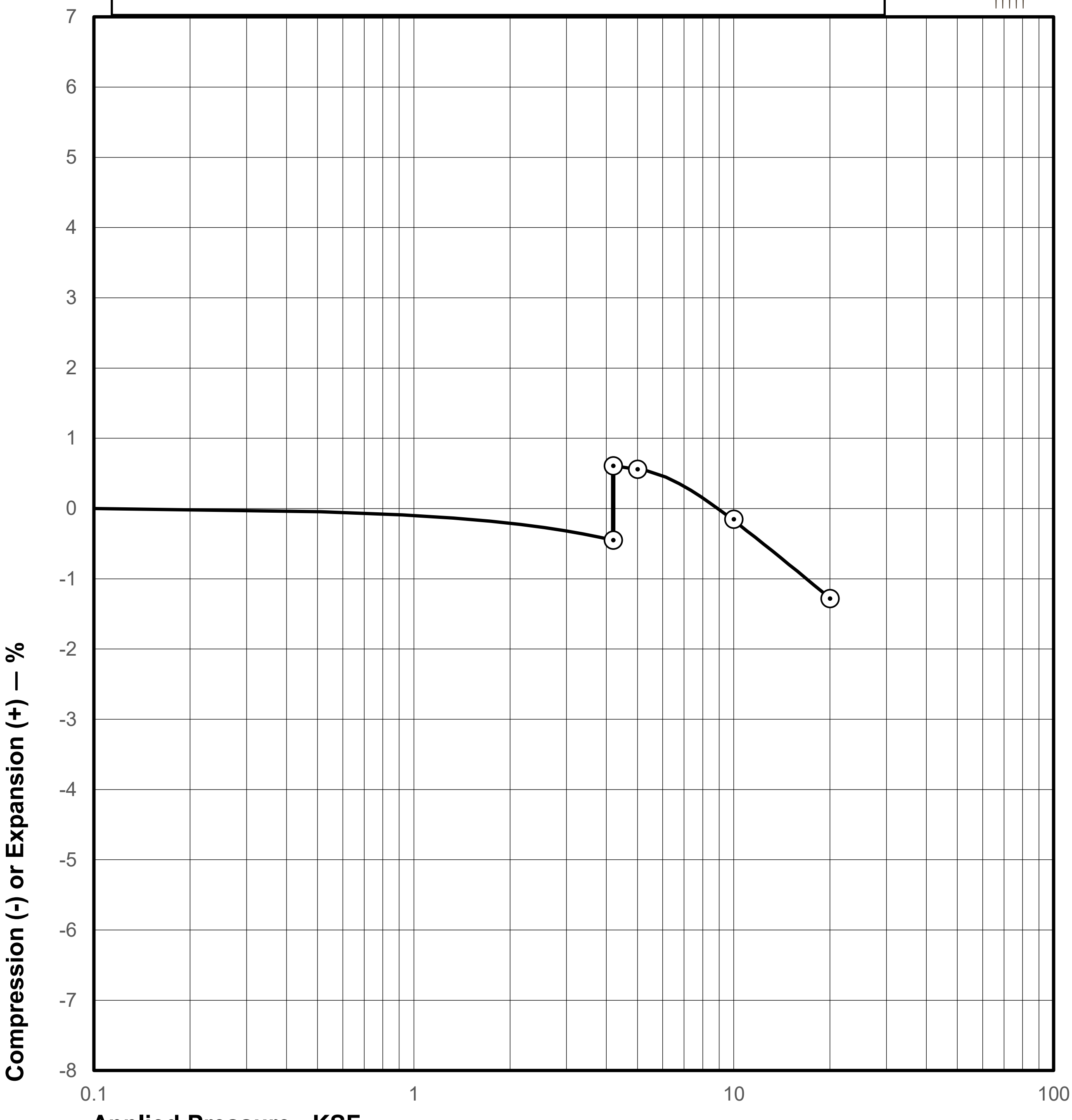
FROM: TH-120 AT 29 FEET

MOISTURE CONTENT:	18.7 %	LIQUID LIMIT:		SILT AND CLAY:	%
DRY UNIT WEIGHT:	110 pcf	PLASTICITY INDEX:		SOIL SUCTION:	4.19 pF

Swell Consolidation Test Results

BCUS ACQUISITIONS, LLC
RIDGEGATE- MESA TOPS
CTL|T PROJECT NO. DN52,036-115-R2

Sample exhibited expansion of 1.1 percent when wetted under an applied pressure of 4200 psf, with a calculated swell pressure of 12400 psf.



SAMPLE OF: CLAYSTONE

FROM: TH-120 AT 34 FEET

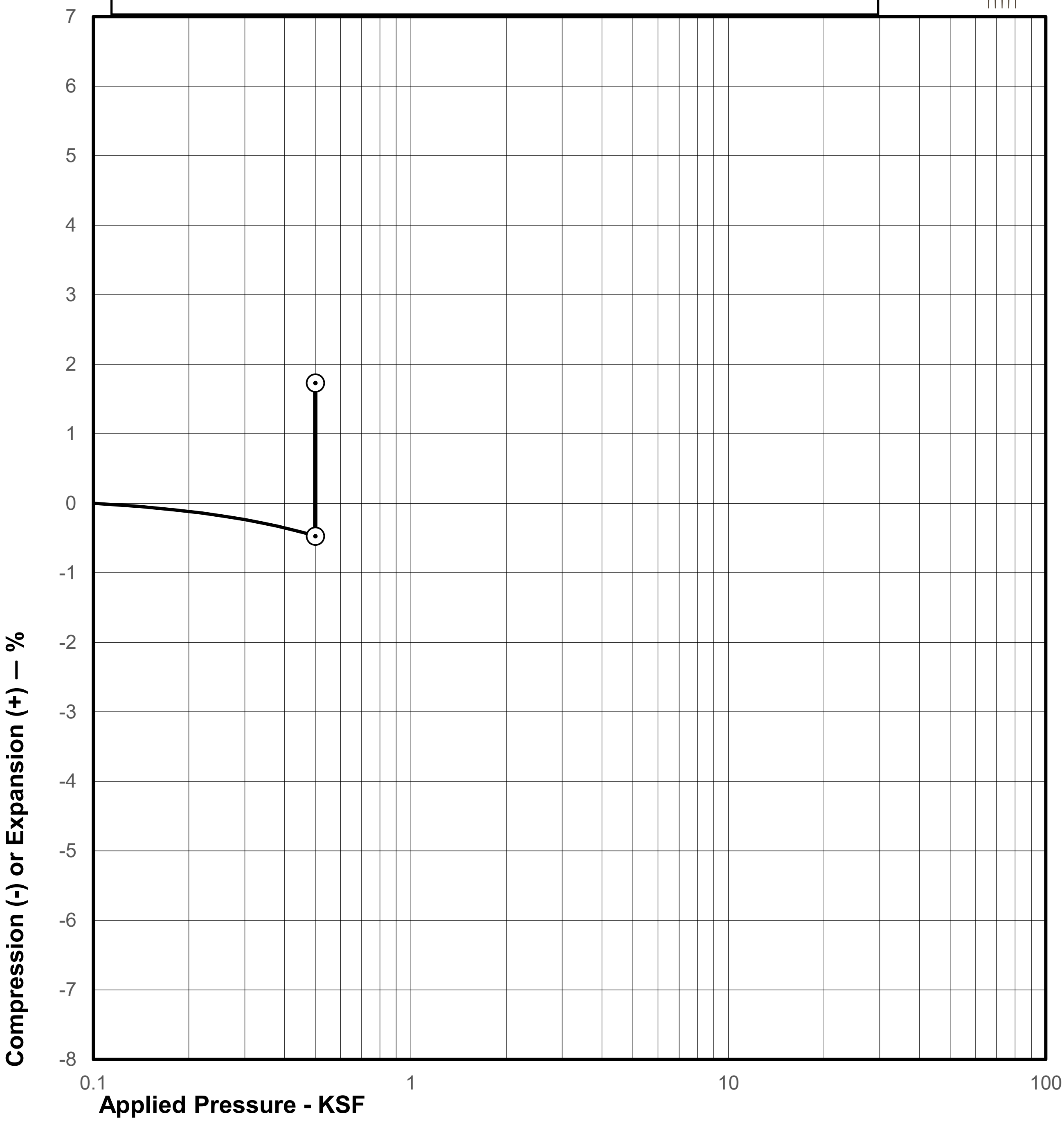
MOISTURE CONTENT:	21.1	%	LIQUID LIMIT:		SILT AND CLAY:		%
DRY UNIT WEIGHT:	110	pcf	PLASTICITY INDEX:		SOIL SUCTION:	4.36	pF

Swell Consolidation Test Results

BCUS ACQUISITIONS, LLC
RIDGEGATE- MESA TOPS
CTL|T PROJECT NO. DN52,036-115-R2

FIG. B-26

Sample exhibited expansion of 2.2 percent when wetted under an applied pressure of 500 psf.



SAMPLE OF: CLAY, SANDY (CL)

FROM: TH-121 AT 4 FEET

MOISTURE CONTENT:	11.6 %	LIQUID LIMIT:	47	SILT AND CLAY:	86 %
DRY UNIT WEIGHT:	105 pcf	PLASTICITY INDEX:	28	SOIL SUCTION:	pF

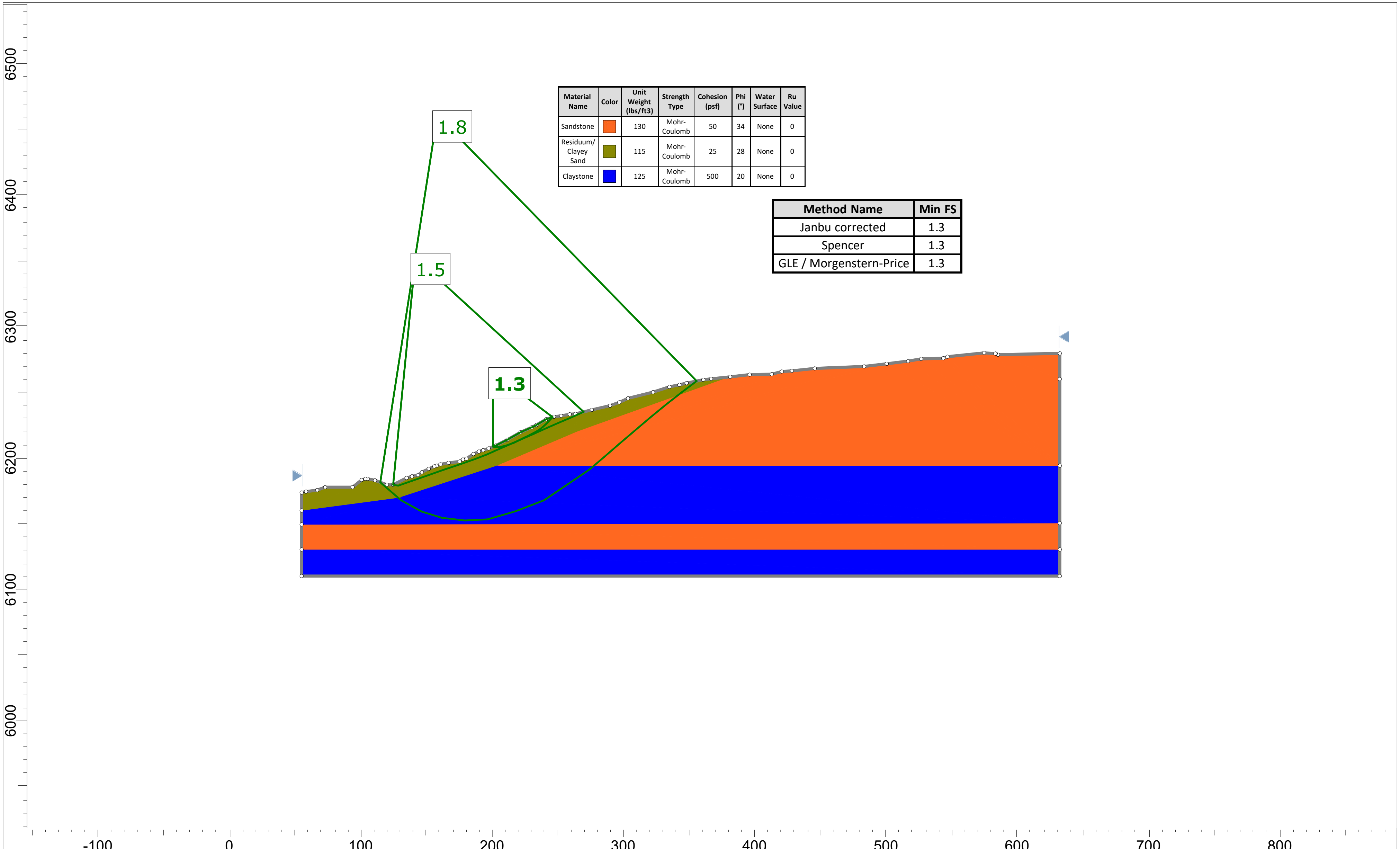
Swell Consolidation Test Results

BCUS ACQUISITIONS, LLC
RIDGEGATE- MESA TOPS
CTL|T PROJECT NO. DN52,036-115-R2

FIG. B-27

APPENDIX C

SLOPE STABILITY ANALYSIS RESULTS



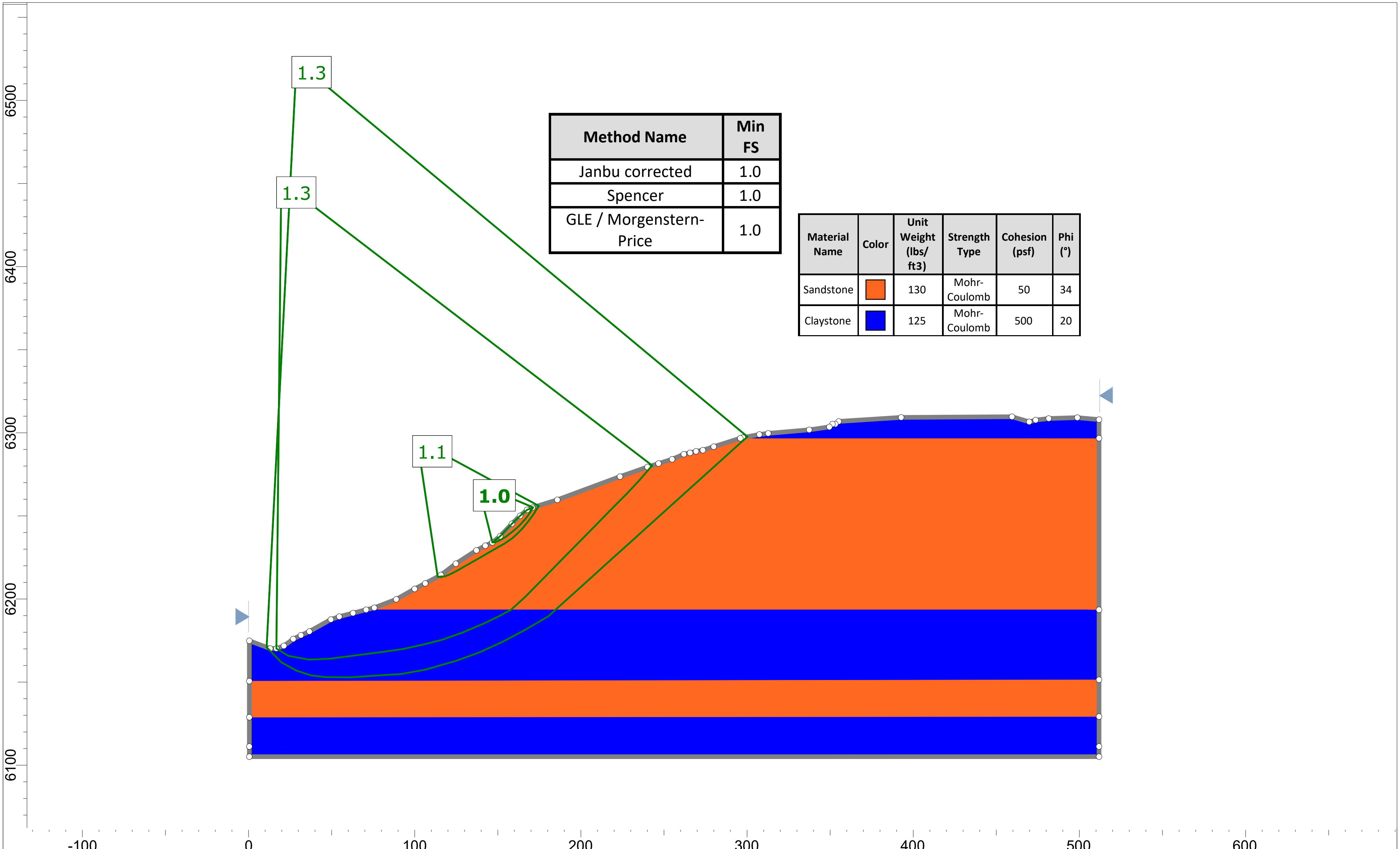
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (°)	Water Surface	Ru Value
Sandstone		130	Mohr-Coulomb	50	34	None	0
Residuum/ Clayey Sand		115	Mohr-Coulomb	25	28	None	0
Claystone		125	Mohr-Coulomb	500	20	None	0

Method Name	Min FS
Janbu corrected	1.3
Spencer	1.3
GLE / Morgenstern-Price	1.3

ROCSCIENCE

SLIDEINTERPRET 9.040

Project	Slide2 - An Interactive Slope Stability Program		
Group	Section A-A' Proposed	*Scenario*	Master Scenario
Drawn By		*Company*	
Date	9/16/2025, 9:22:31 AM	*File Name*	Mesa Tops DN52036-115 Sec A eb edits.slmd



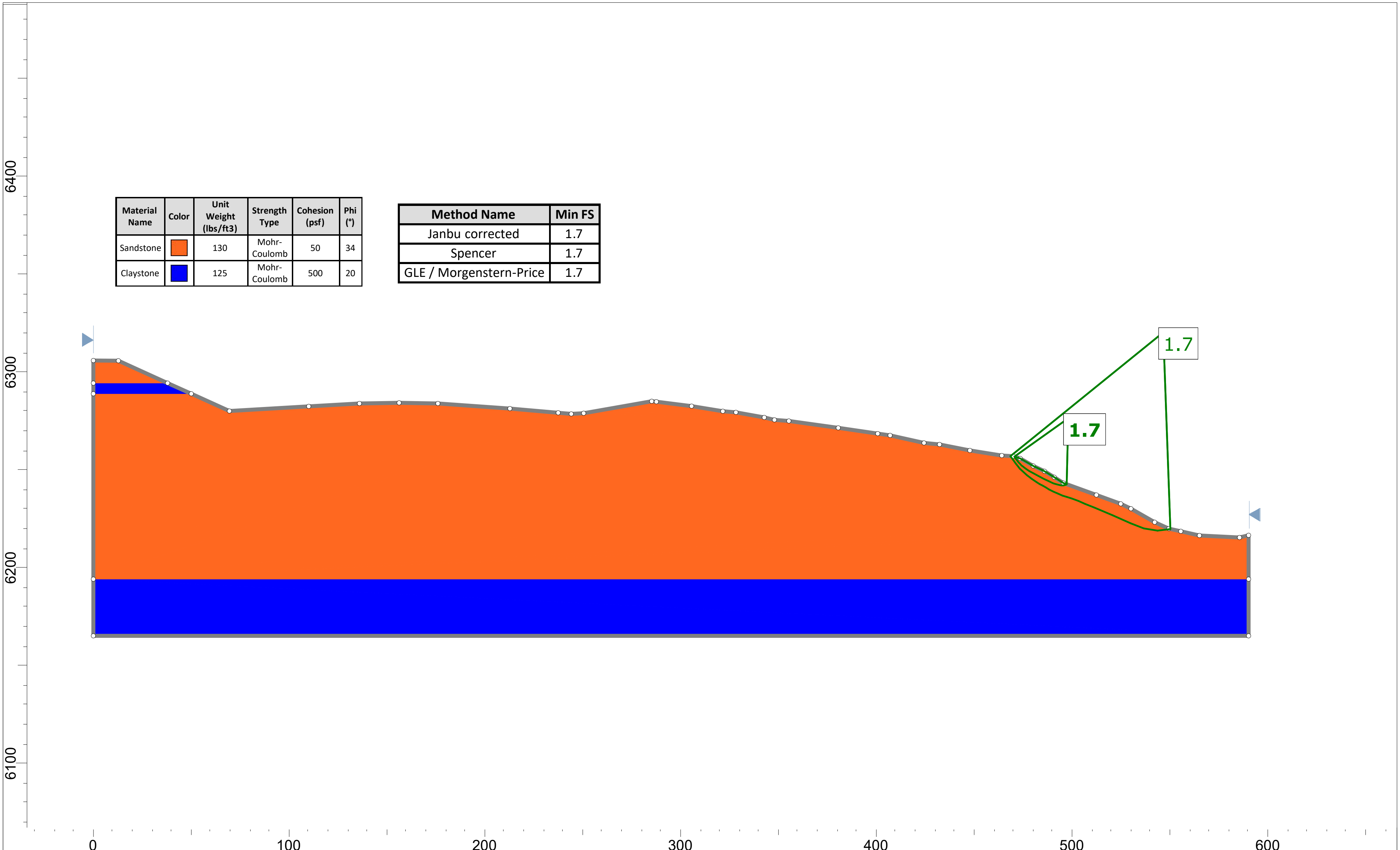
Method Name	Min FS
Janbu corrected	1.0
Spencer	1.0
GLE / Morgenstern-Price	1.0

Material Name	Color	Unit Weight (lbs/ ft3)	Strength Type	Cohesion (psf)	Phi (°)
Sandstone		130	Mohr-Coulomb	50	34
Claystone		125	Mohr-Coulomb	500	20

ROCSCIENCE

SLIDEINTERPRET 9.040

Project	Slide2 - An Interactive Slope Stability Program		
Group	Section B-B' Proposed	*Scenario*	Master Scenario
Drawn By		*Company*	
Date	9/16/2025, 9:57:25 AM	*File Name*	Mesa Tops DN52036-115 Sec B.slmd



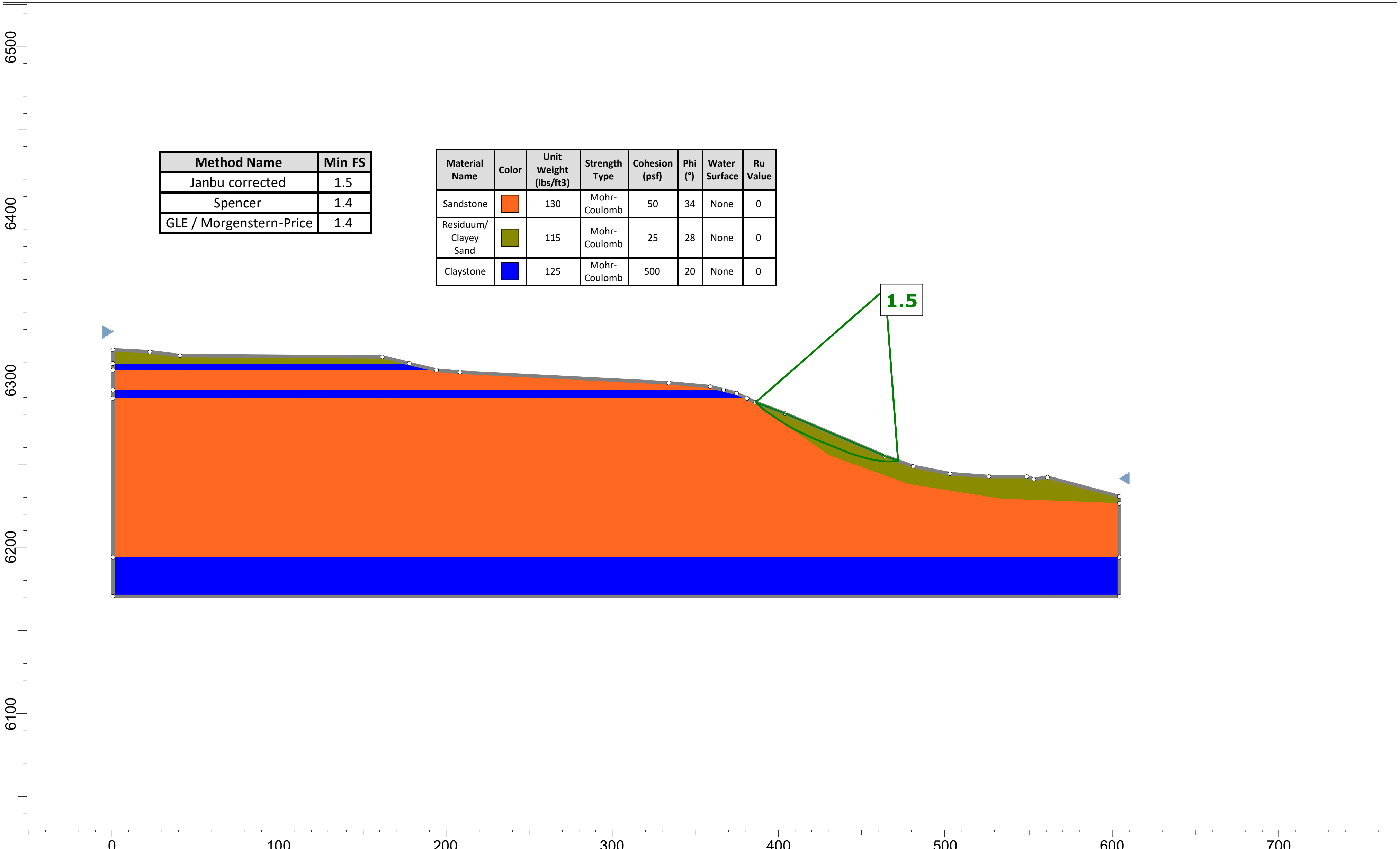
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (°)
Sandstone		130	Mohr-Coulomb	50	34
Claystone		125	Mohr-Coulomb	500	20

Method Name	Min FS
Janbu corrected	1.7
Spencer	1.7
GLE / Morgenstern-Price	1.7

ROCSCIENCE

SLIDEINTERPRET 9.040

Project	Slide2 - An Interactive Slope Stability Program		
Group	Section C-C' Proposed	*Scenario*	Master Scenario
Drawn By		*Company*	
Date	9/16/2025, 10:09:06 AM	*File Name*	Mesa Tops DN52036-115 Sec C.slmd



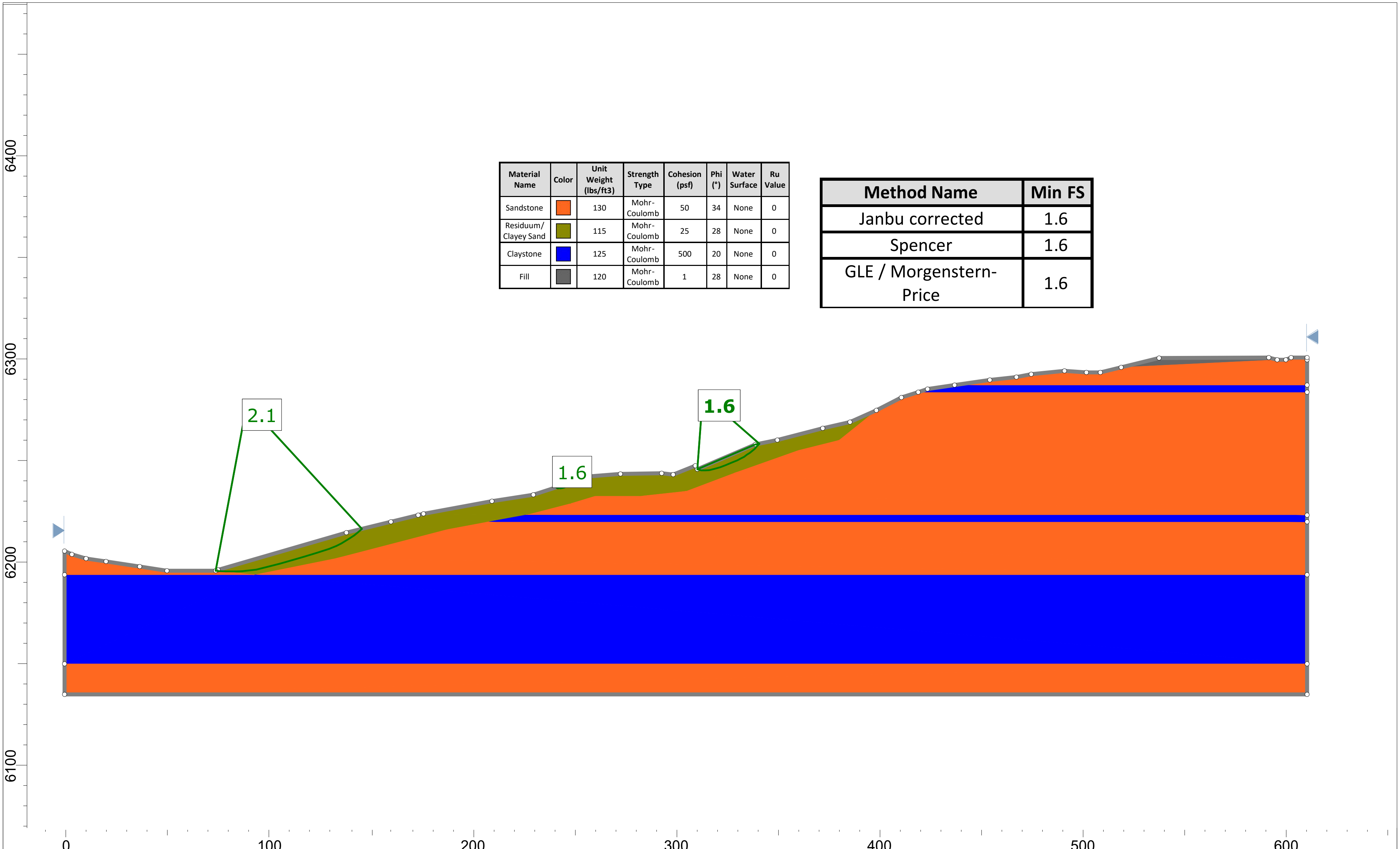
Method Name	Min FS
Janbu corrected	1.5
Spencer	1.4
GLE / Morgenstern-Price	1.4

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (°)	Water Surface	Ru Value
Sandstone		130	Mohr-Coulomb	50	34	None	0
Residuum/ Clayey Sand		115	Mohr-Coulomb	25	28	None	0
Claystone		125	Mohr-Coulomb	500	20	None	0

ROCSCIENCE

SLIDEINTERPRET 9.040

Project	Slide2 - An Interactive Slope Stability Program		
Group	Section D-D' Proposed	*Scenario*	Master Scenario
Drawn By		*Company*	
Date	9/16/2025, 10:21:07 AM	*File Name*	Mesa Tops DN52036-115 Sec D eb edits.slmd



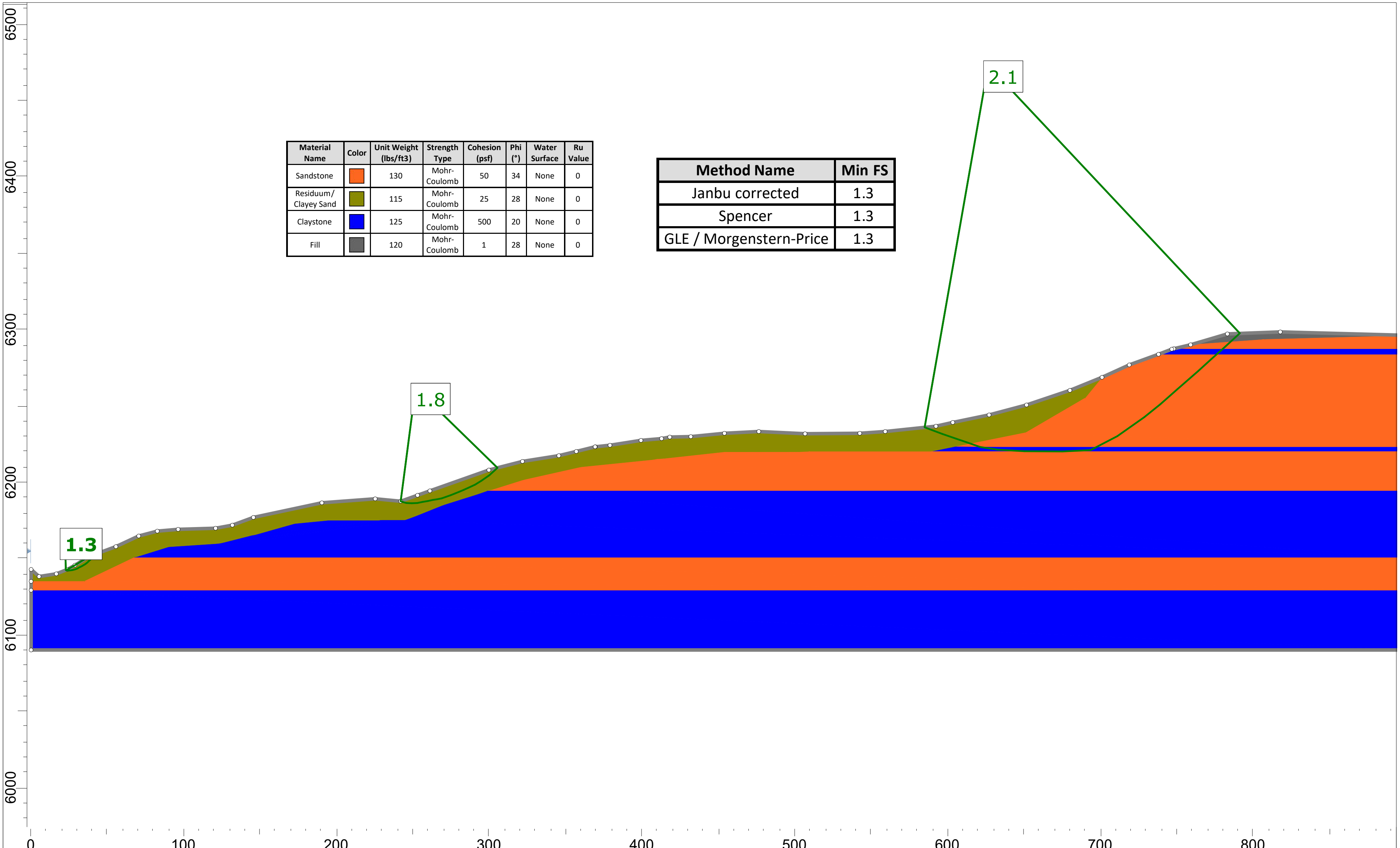
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (°)	Water Surface	Ru Value
Sandstone		130	Mohr-Coulomb	50	34	None	0
Residuum/ Clayey Sand		115	Mohr-Coulomb	25	28	None	0
Claystone		125	Mohr-Coulomb	500	20	None	0
Fill		120	Mohr-Coulomb	1	28	None	0

Method Name	Min FS
Janbu corrected	1.6
Spencer	1.6
GLE / Morgenstern-Price	1.6

ROCSCIENCE

Project	Slide2 - An Interactive Slope Stability Program		
Group	Section E-E' Proposed	*Scenario*	Master Scenario
Drawn By		*Company*	
Date	9/16/2025, 10:33:30 AM	*File Name*	Mesa Tops DN52036-115 Sec E eb edits.slmd

SLIDEINTERPRET 9.040



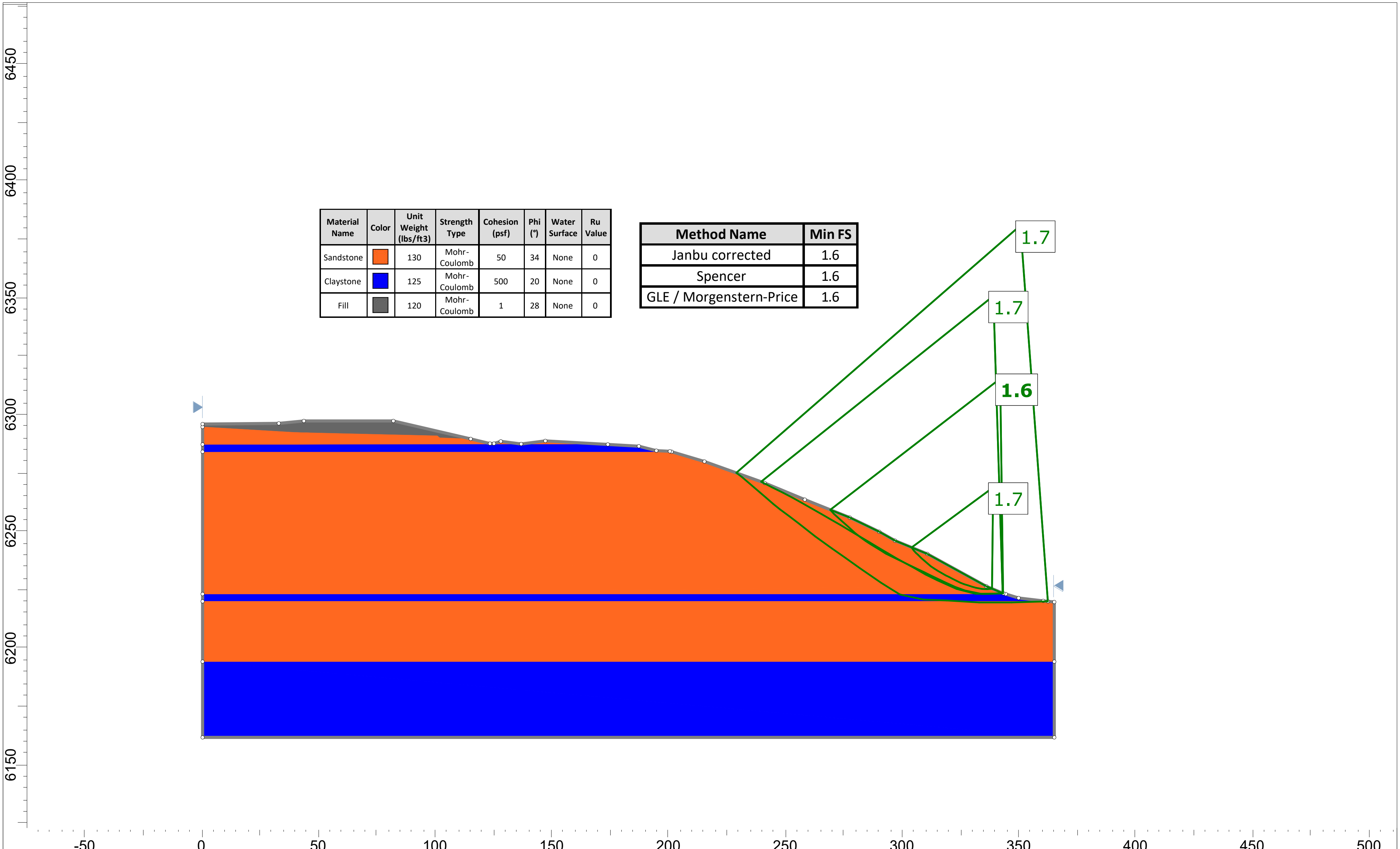
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (°)	Water Surface	Ru Value
Sandstone		130	Mohr-Coulomb	50	34	None	0
Residuum/ Clayey Sand		115	Mohr-Coulomb	25	28	None	0
Claystone		125	Mohr-Coulomb	500	20	None	0
Fill		120	Mohr-Coulomb	1	28	None	0

Method Name	Min FS
Janbu corrected	1.3
Spencer	1.3
GLE / Morgenstern-Price	1.3

ROCSCIENCE

SLIDEINTERPRET 9.040

Project	Slide2 - An Interactive Slope Stability Program		
Group	Section F-F' Proposed	*Scenario*	Master Scenario
Drawn By		*Company*	
Date	9/16/2025, 10:52:55 AM	*File Name*	Mesa Tops DN52036-115 Sec F eb edits.slmd



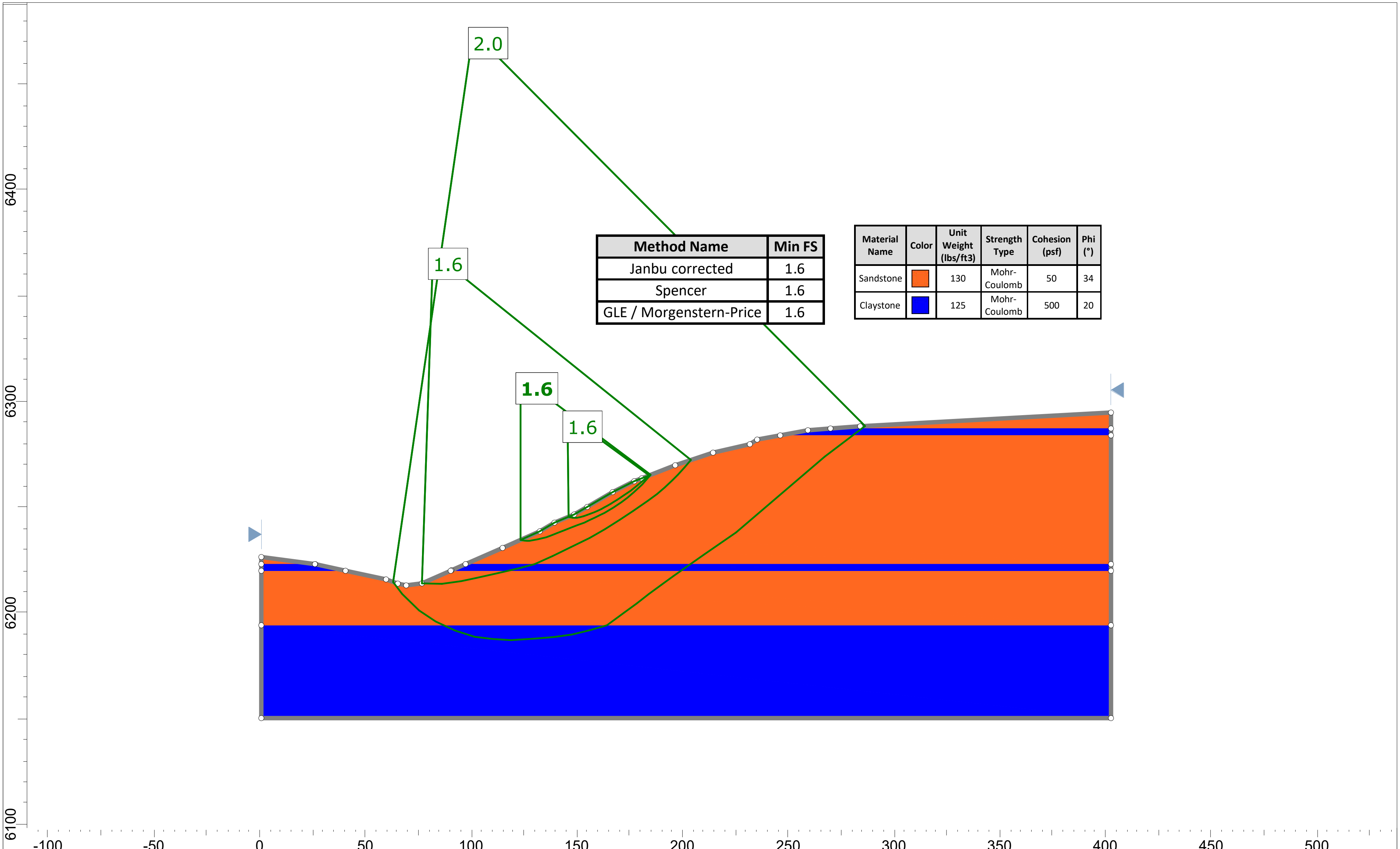
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (°)	Water Surface	Ru Value
Sandstone		130	Mohr-Coulomb	50	34	None	0
Claystone		125	Mohr-Coulomb	500	20	None	0
Fill		120	Mohr-Coulomb	1	28	None	0

Method Name	Min FS
Janbu corrected	1.6
Spencer	1.6
GLE / Morgenstern-Price	1.6

ROCSCIENCE

SLIDEINTERPRET 9.040

Project	Slide2 - An Interactive Slope Stability Program		
Group	Section G-G' Proposed	*Scenario*	Master Scenario
Drawn By		*Company*	
Date	9/18/2025, 8:45:14 AM	*File Name*	Mesa Tops DN52036-115 Sec G eb edits.slmd



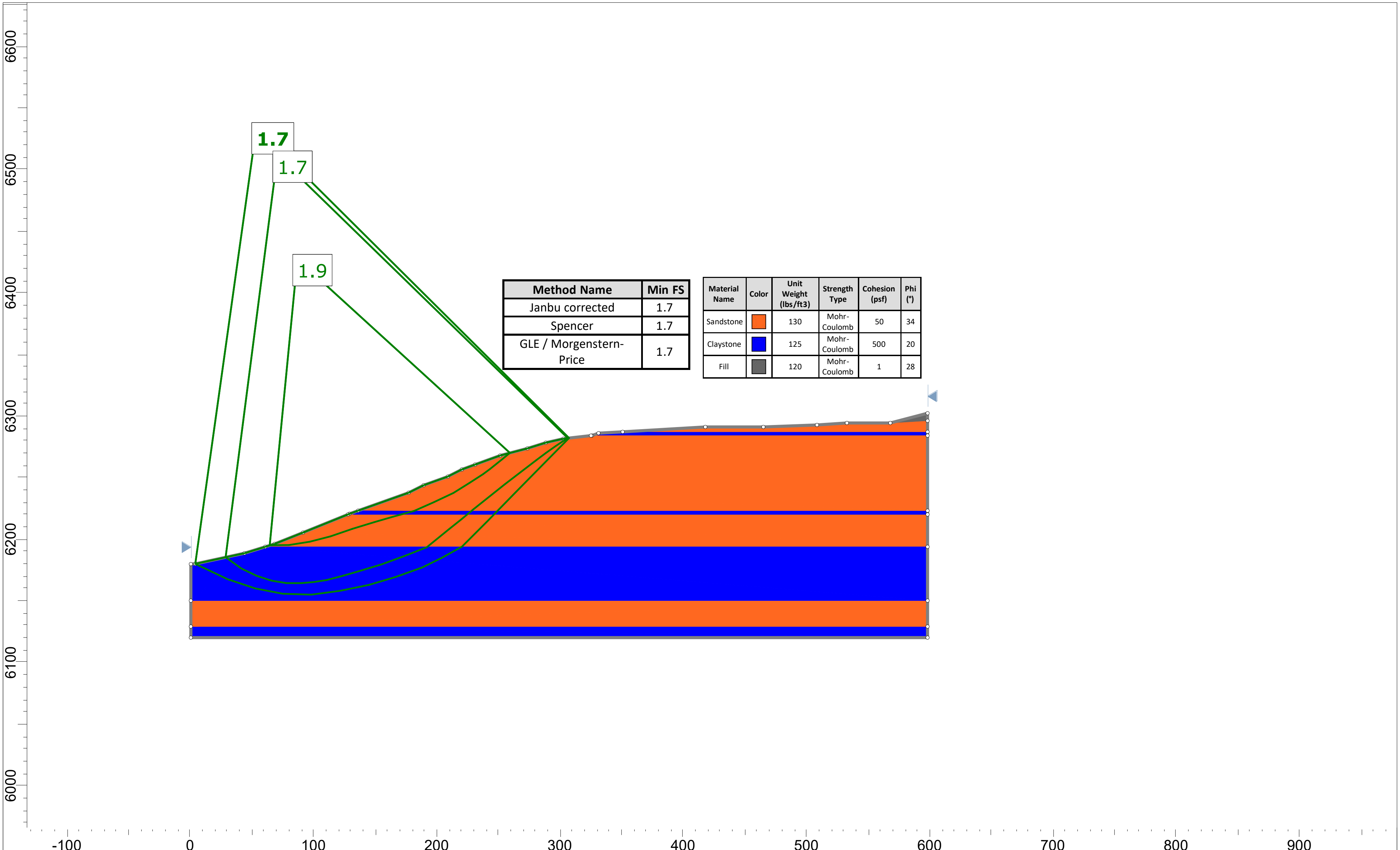
Method Name	Min FS
Janbu corrected	1.6
Spencer	1.6
GLE / Morgenstern-Price	1.6

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (°)
Sandstone		130	Mohr-Coulomb	50	34
Claystone		125	Mohr-Coulomb	500	20

ROCSCIENCE

SLIDEINTERPRET 9.040

Project	Slide2 - An Interactive Slope Stability Program
Group	Section H-H' Existing
Scenario	Master Scenario
Drawn By	
Company	
Date	9/16/2025, 11:02:03 AM
File Name	Mesa Tops DN52036-115 Sec H.slmd



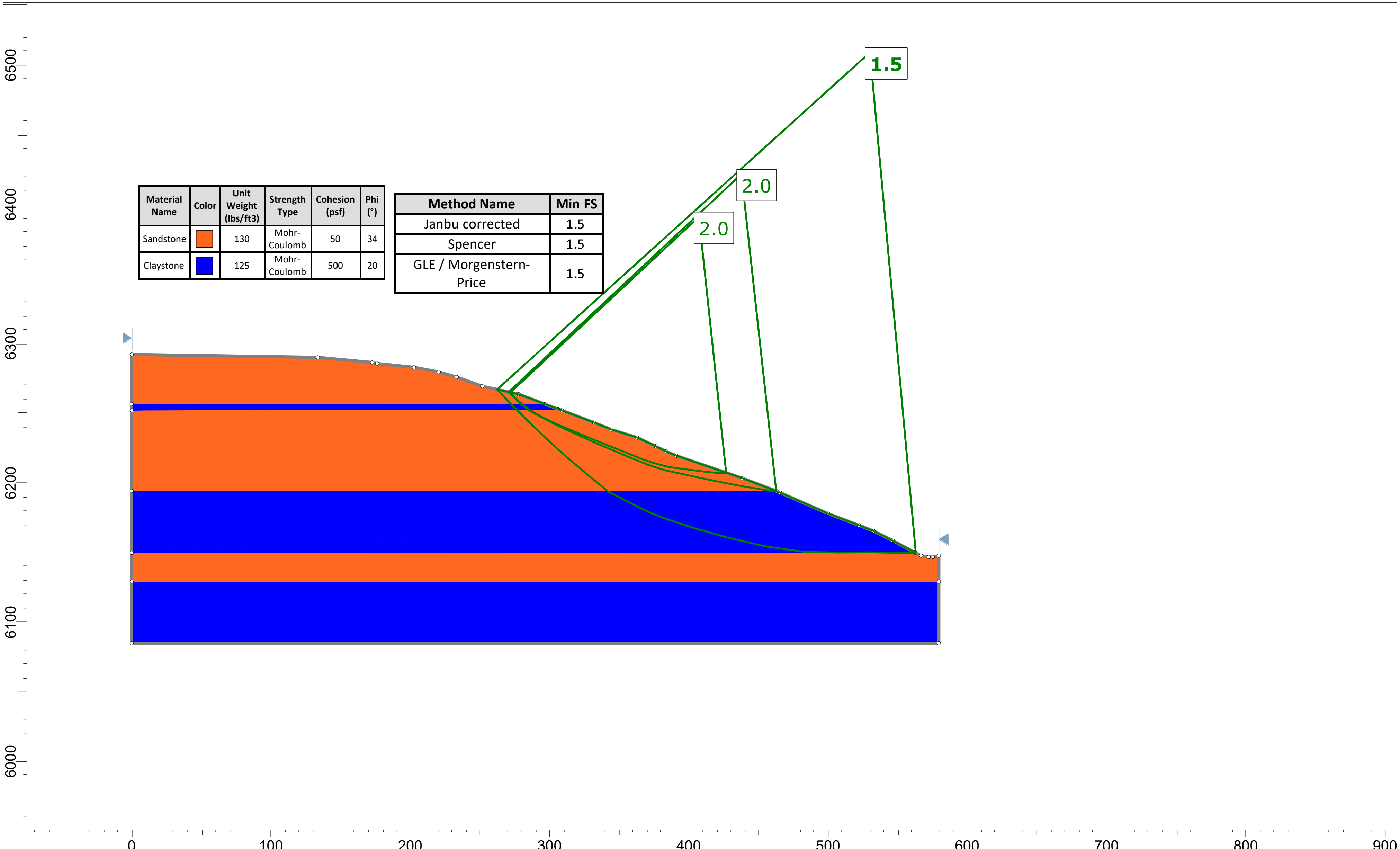
Method Name	Min FS
Janbu corrected	1.7
Spencer	1.7
GLE / Morgenstern-Price	1.7

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (°)
Sandstone		130	Mohr-Coulomb	50	34
Claystone		125	Mohr-Coulomb	500	20
Fill		120	Mohr-Coulomb	1	28

ROCSCIENCE

SLIDEINTERPRET 9.040

Project	Slide2 - An Interactive Slope Stability Program		
Group	Section I-I' Proposed	*Scenario*	Master Scenario
Drawn By		*Company*	
Date	9/18/2025, 8:56:02 AM	*File Name*	Mesa Tops DN52036-115 Sec I.slmd



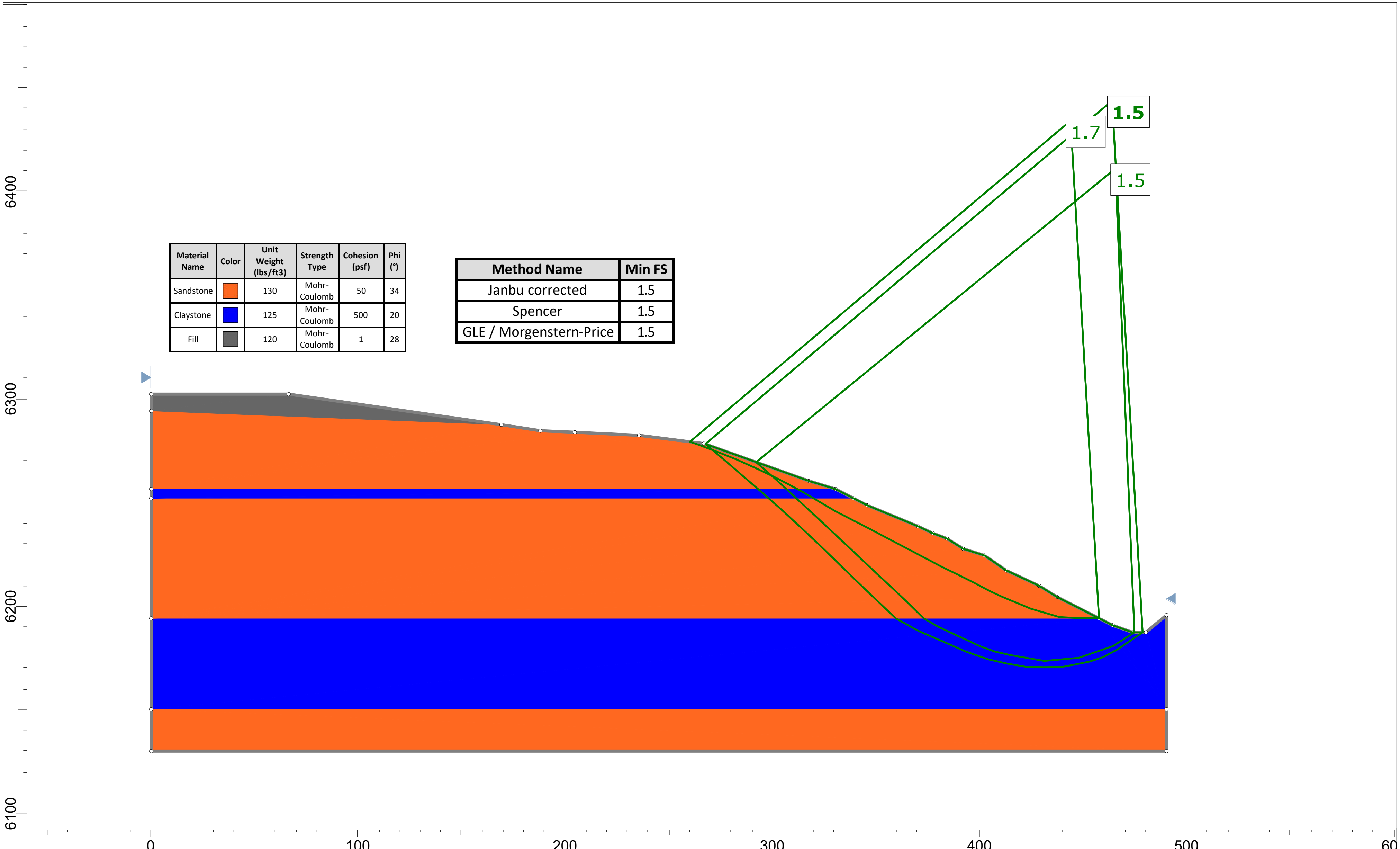
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (°)
Sandstone		130	Mohr-Coulomb	50	34
Claystone		125	Mohr-Coulomb	500	20

Method Name	Min FS
Janbu corrected	1.5
Spencer	1.5
GLE / Morgenstern-Price	1.5

ROCSCIENCE

SLIDEINTERPRET 9.040

Project	Slide2 - An Interactive Slope Stability Program		
Group	Section J-J' Proposed	*Scenario*	Master Scenario
Drawn By		*Company*	
Date	9/16/2025, 11:52:44 AM	*File Name*	Mesa Tops DN52036-115 Sec J.slmd



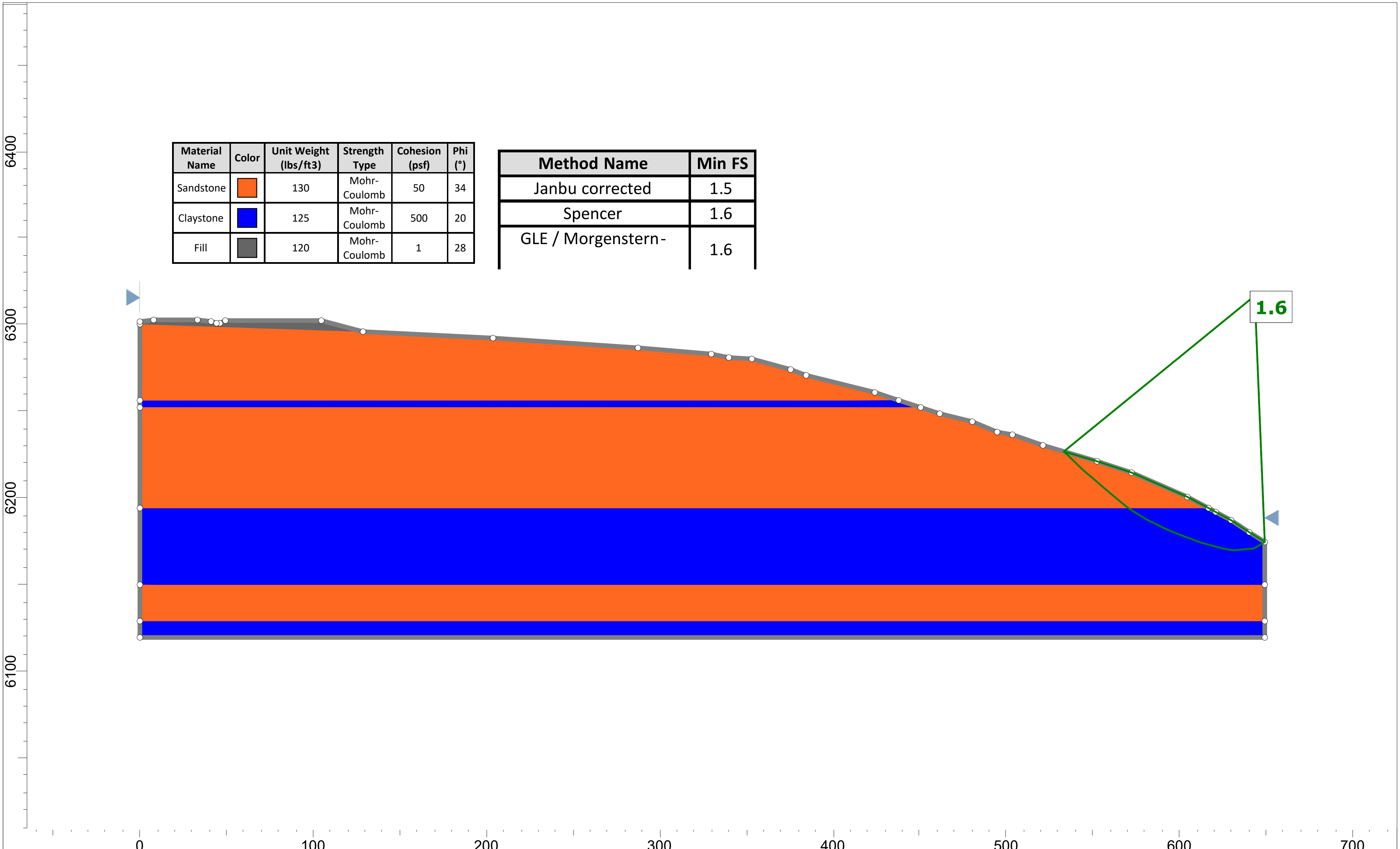
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (°)
Sandstone		130	Mohr-Coulomb	50	34
Claystone		125	Mohr-Coulomb	500	20
Fill		120	Mohr-Coulomb	1	28

Method Name	Min FS
Janbu corrected	1.5
Spencer	1.5
GLE / Morgenstern-Price	1.5

ROCSCIENCE

SLIDEINTERPRET 9.040

Project	Slide2 - An Interactive Slope Stability Program		
Group	Section K-K' Proposed	*Scenario*	Master Scenario
Drawn By		*Company*	
Date	9/16/2025, 12:07:38 PM	*File Name*	Mesa Tops DN52036-115 Sec K.slmd



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (°)
Sandstone		130	Mohr-Coulomb	50	34
Claystone		125	Mohr-Coulomb	500	20
Fill		120	Mohr-Coulomb	1	28

Method Name	Min FS
Janbu corrected	1.5
Spencer	1.6
GLE / Morgenstern-	1.6

ROCSCIENCE SLIDEINTERPRET 9.040	Project	Slide2 - An Interactive Slope Stability Program	
	Group: Section L-L' Proposed	Scenario: Master Scenario	
	Drawn By	Company	
	Date: 9/16/2025, 12:16:54 PM	File Name: Mesa Tops DN52036-115 Sec L.slmd	

APPENDIX D

GUIDELINE SITE GRADING SPECIFICATIONS

GUIDELINE SITE GRADING SPECIFICATIONS
Ridgegate – Mesa Tops
Lone Tree, Colorado

1. DESCRIPTION

This item shall consist of the excavation, transportation, placement and compaction of materials from locations indicated on the plans, or staked by the Engineer, as necessary to achieve preliminary street and overlot elevations. These specifications shall also apply to compaction of excess cut materials that may be placed outside of the development boundaries.

2. GENERAL

The Soils Engineer shall be the Owner's representative. The Soils Engineer shall approve fill materials, method of placement, moisture contents and percent compaction, and shall give written approval of the completed fill.

3. CLEARING JOB SITE

The Contractor shall remove all vegetation and debris before excavation or fill placement is begun. The Contractor shall dispose of the cleared material to provide the Owner with a clean, neat appearing job site. Cleared material shall not be placed in areas to receive fill or where the material will support structures of any kind.

4. SCARIFYING AREA TO BE FILLED

All topsoil and vegetable matter shall be removed from the ground surface upon which fill is to be placed. The surface shall then be plowed or scarified until the surface is free from ruts, hummocks or other uneven features, which would prevent uniform compaction.

5. COMPACTING AREA TO BE FILLED

After the foundation for the fill has been cleared and scarified, it shall be disked or bladed until it is free from large clods, brought to the proper moisture content (1 to 4 percent above optimum moisture content for clays and within 2 percent of optimum moisture content for sands) and compacted to not less than 95 percent of maximum dry density as determined in accordance with ASTM D698.

6. FILL MATERIALS

Fill soils shall be free from organics, debris or other deleterious substances, and shall not contain rocks or lumps having a diameter greater than three (3) inches. Fill materials shall be obtained from cut areas shown on the plans or staked in the field by the Engineer.

On-site materials classifying as CL, CH, SC, SM, SW, SP, GP, GC and GM are acceptable. Concrete, asphalt, organic matter and other deleterious materials or debris shall not be used as fill.

7. MOISTURE CONTENT

Fill material classifying as CH and CL shall be moisture conditioned to between 1 and 4 percent above optimum moisture content. Granular soils classifying as SC, SM, SW, SP, GP, GC and GM shall be moisture conditioned to within 2 percent of optimum moisture content as determined from Proctor compaction tests. Sufficient laboratory compaction tests shall be made to determine the optimum moisture content for the various soils encountered in borrow areas.

The Contractor may be required to add moisture to the excavation materials in the borrow area if, in the opinion of the Soils Engineer, it is not possible to obtain uniform moisture content by adding water on the fill surface. The Contractor may be required to rake or disc the fill soils to provide uniform moisture content through the soils.

The application of water to embankment materials shall be made with any type of watering equipment approved by the Soils Engineer, which will give the desired results. Water jets from the spreader shall not be directed at the embankment with such force that fill materials are washed out.

Should too much water be added to any part of the fill, such that the material is too wet to permit the desired compaction from being obtained, rolling and all work on that section of the fill shall be delayed until the material has been allowed to dry to the required moisture content. The Contractor will be permitted to rework wet material in an approved manner to hasten its drying.

8. COMPACTION OF FILL AREAS

Selected fill material shall be placed and mixed in evenly spread layers. After each fill layer has been placed, it shall be uniformly compacted to not less than the specified percentage of maximum density. Fill shall be compacted to at least 95 percent of the maximum density as determined in accordance with ASTM D 698. At the option of the Soils Engineer, soils classifying as SW, GP, GC, or GM may be compacted to 95 percent of maximum density as determined in accordance with ASTM D 1557 or 70 percent relative density for cohesionless sand soils. Fill materials shall be placed such that the thickness of loose materials does not exceed 10 inches and the compacted lift thickness does not exceed 6 inches.

Compaction as specified above, shall be obtained by the use of sheepsfoot rollers, multiple-wheel pneumatic-tired rollers, or other equipment approved by the Engineer for soils classifying as CL, CH, or SC. Granular fill shall be compacted using vibratory equipment or other equipment approved by the Soils Engineer. Compaction shall be accomplished while the fill material is at the specified moisture content. Compaction of each layer shall be continuous over the entire area. Compaction equipment shall make sufficient trips to ensure that the required density is obtained.

9. COMPACTION OF SLOPES

Fill slopes shall be compacted by means of sheepsfoot rollers or other suitable equipment. Compaction operations shall be continued until slopes are stable, but not too dense for planting, and there is not appreciable amount of loose soils on the slopes. Compaction of slopes may be done progressively in increments of three to five feet (3' to

5') in height or after the fill is brought to its total height. Permanent fill slopes shall not exceed 3:1 (horizontal to vertical).

10. PLACEMENT OF FILL ON NATURAL SLOPES

Where natural slopes are steeper than 20 percent in grade and the placement of fill is required, benches shall be cut at the rate of one bench for each 5 feet in height (minimum of two benches). Benches shall be at least 10 feet in width. Larger bench widths may be required by the Engineer. Fill shall be placed on completed benches as outlined within this specification.

11. DENSITY TESTS

Field density tests shall be made by the Soils Engineer at locations and depths of his choosing. Where sheepsfoot rollers are used, the soil may be disturbed to a depth of several inches. Density tests shall be taken in compacted material below the disturbed surface. When density tests indicate that the density or moisture content of any layer of fill or portion thereof is not within specification, the particular layer or portion shall be reworked until the required density or moisture content has been achieved.

12. SEASONAL LIMITS

No fill material shall be placed, spread or rolled while it is frozen, thawing, or during unfavorable weather conditions. When work is interrupted by heavy precipitation, fill operations shall not be resumed until the Soils Engineer indicates that the moisture content and density of previously placed materials are as specified.

13. NOTICE REGARDING START OF GRADING

The Contractor shall submit notification to the Soils Engineer and Owner advising them of the start of grading operations at least three (3) days in advance of the starting date. Notification shall also be submitted at least 3 days in advance of any resumption dates when grading operations have been stopped for any reason other than adverse weather conditions

14. REPORTING OF FIELD DENSITY TESTS

Density tests made by the Soils Engineer, as specified under "Density Tests" above, shall be submitted progressively to the Owner. Dry density, moisture content, and percentage compaction shall be reported for each test taken.

15. DECLARATION REGARDING COMPLETED FILL

The Soils Engineer shall provide a written declaration stating that the site was filled with acceptable materials and was placed in general accordance with the specifications.

APPENDIX E

GUIDELINE SUB-EXCAVATION SPECIFICATIONS

Note: This guideline is intended for use with sub-excavation, If sub-excavation is not selected, the guidelines in Appendix D should be followed.

GUIDELINE SUB-EXCAVATION SPECIFICATIONS
Ridgegate – Mesa Tops
Lone Tree, Colorado

1. DESCRIPTION

This item shall consist of the excavation, transportation, placement and compaction of materials from locations indicated on the plans, or staked by the Engineer, as necessary to achieve preliminary street and overlot elevations. These specifications shall also apply to compaction of materials that may be placed outside of the development boundaries.

2. GENERAL

The Soils Engineer shall be the Owners representative. The Soils Engineer shall approve fill materials, method of placement, moisture content and percent compaction, and shall give written approval of the completed fill.

3. CLEARING JOB SITE

The Contractor shall remove all vegetation and debris before excavation or fill placement is begun. The Contractor shall dispose of the cleared material to provide the Owner with a clean, neat appearing job site. Cleared material shall not be placed in areas to receive fill where the material will support structures of any kind.

4. SCARIFYING AREA TO BE FILLED

All topsoil and vegetable matter shall be removed from the ground surface upon which fill is to be placed. The surface shall then be plowed or scarified until the surface is free from ruts, hummocks or other uneven features which would prevent uniform compaction.

5. COMPACTING AREA TO BE FILLED

After the foundation for the fill has been cleared and scarified, it shall be disked or bladed until it is free from large clods, brought to the proper moisture content, (1 to 4 percent above optimum) and compacted to not less than 95 percent of maximum density as determined in accordance with ASTM D 698.

6. FILL MATERIALS

Fill soils shall be free from vegetable matter or other deleterious substances and shall not contain rocks having a diameter greater than three (3) inches. Fill materials shall be obtained from cut areas shown on the plans or staked in the field by the Engineer.

On-site materials classifying as CL, CH, SC, SM, SP, GP, GC and GM are acceptable. Concrete, asphalt, and other deleterious materials or debris shall not be used as fill.

7. MOISTURE CONTENT

Fill materials shall be moisture treated to within limits of optimum moisture content specified in “Moisture Content and Density Criteria”. Sufficient laboratory compaction tests shall be made to determine the optimum moisture content for the various soils encountered in borrow areas or imported to the site.

The Contractor may be required to add moisture to the excavation materials in the borrow area if, in the opinion of the Soils Engineer, it is not possible to obtain uniform moisture content by adding water on the fill surface. The Contractor will be required to rake or disc the fill to provide uniform moisture content throughout the fill.

The application of water to embankment materials shall be made with any type of watering equipment approved by the Soils Engineer, which will give the desire results. Water jets from the spreader shall not be directed at the embankment with such force that fill materials are washed out.

Should too much water be added to any part of the fill, such that the material is too wet to permit the desired compaction from being obtained, rolling and all work on that section of the fill shall be delayed until the material has been allowed to dry to the required moisture content. The Contractor will be permitted to rework wet material in an approved manner to hasten its drying.

8. COMPACTION OF FILL MATERIALS

Selected fill material shall be placed and mixed in evenly spread layers. After each fill layer has been placed, it shall be uniformly compacted to not less than the specified percentage of maximum density given in “Moisture Content and Density Criteria”. Fill materials shall be placed such that the thickness of loose material does not exceed 8 inches and the compacted lift thickness does not exceed 6 inches.

Compaction, as specified above, shall be obtained by the use of sheepsfoot rollers, multiple-wheel pneumatic-tired rollers, or other equipment approved by the Soils Engineer for soils classifying as CL, CH or SC. Granular fill shall be compacted using vibratory equipment or other equipment approved by the Soils Engineer. Compaction shall be accomplished while the fill material is at the specified moisture content. Compaction of each layer shall be continuous over the entire area. Compaction equipment shall make sufficient trips to ensure that the required density is obtained.

9. MOISTURE CONTENT AND DENSITY CRITERIA

Fill material shall be substantially compacted to at least 95 percent of maximum ASTM D 698 (AASHTO T 99) dry density at 1 to 4 percent above optimum moisture content for clay or within 2 percent of optimum for sand. Additional criteria for acceptance are presented in DENSITY TESTS.

10. DENSITY TESTS

Field density tests shall be made by the Soils Engineer at locations and depths of his choosing. Where sheepsfoot rollers are used, the soil may be disturbed to a depth of several inches. Density tests shall be taken in compacted material below the disturbed surface. When density tests indicate the density or moisture content of any layer of fill or portion thereof not within specifications, the particular layer or portion shall be reworked until the required density or moisture content has been achieved.

Allowable ranges of moisture content and density given in MOISTURE CONTENT AND DENSITY CRITERIA are based on design considerations. The moisture shall be controlled by the Contractor so that moisture content of the compacted earth fill, as determined by tests performed by the Soils Engineer, shall be within the limits given. The Soils Engineer will inform the Contractor when the placement moisture is less than or exceeds the limits specified and the Contractor shall immediately make adjustments in procedures as necessary to maintain placement moisture content within the specified limits, to satisfy the following requirements.

A. Moisture

1. The average moisture content of material tested each day shall not be less than 1 percent over optimum moisture content.

2. Material represented by samples tested having moisture lower than 0 percent over optimum will be rejected. Such rejected materials shall be reworked until moisture equal to or greater than 0 percent above optimum is achieved.

B. Density

1. The average dry density of material tested each day shall not be less than 95 percent of maximum ASTM D 698 dry density.

2. No more than 10 percent of the material represented by the samples tested shall be at dry densities less than 95 percent of maximum ASTM D 698 dry density.

3. Material represented by samples tested having dry density less than 93 percent of maximum ASTM D 698 dry density will be rejected. Such rejected materials shall be reworked until a dry density equal to or greater than 95 percent of maximum ASTM D 698 dry density is obtained.

11. INSPECTION AND TESTING OF FILL

Inspection by the Soils Engineer shall be sufficient during the placement of fill and compaction operations so that they can declare the fill was placed in general conformance with specifications. All inspections necessary to test the placement of fill and observe compaction operations will be at the expense of the Owner.

12. SEASONAL LIMITS

No fill material shall be placed, spread or rolled while it is frozen, thawing, or during unfavorable weather conditions. When work is interrupted by heavy precipitation, fill operations shall not be resumed until the Soils Engineer indicates the moisture content and density of previously placed materials are as specified.

13. REPORTING OF FIELD DENSITY TESTS

Density tests made by the Soils Engineer, as specified under "Density Tests" above, shall be submitted progressively to the Owner. Dry density, moisture content and percentage compaction shall be reported for each test taken.