GEOTECHNICAL ENGINEERING REPORT
HIGH PLAINS BANK
LOT 2, MARKET STREET BUSINESS PARK
KEENESBURG, COLORADO
EEC PROJECT NO. 3212008

Prepared for:

DBSI, Inc.
6950 West Morelos Place
Chandler, Arizona 85226

Prepared by:

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EARTH ENGINEERING
CONSULTANTS, LLC

June 3, 2021

DBSI, Inc.
6950 West Morelos Place
Chandler, Arizona 85226

Attn: Ms. Jennifer Dumphy (JDumphy@dbsi-inc.com)

Re: Geotechnical Engineering Report
High Plains Bank
Lot 2, Market Street Business Park
Keenesburg, Colorado
EEC Project No. 3212008

Ms. Dumphy:

Enclosed, herewith, are the results of the subsurface exploration completed by Earth Engineering Consultants, LLC (EEC) for the referenced project. For this exploration, six (6) test borings were advanced to depths of approximately 10 to 35 feet below existing site grades. This subsurface exploration was carried out in general accordance with our proposal dated May 6, 2021.

In summary, the subsurface conditions encountered in the test borings generally consisted of clay with various amounts of sand, underlain by highly weathered claystone bedrock, generally at depths of about 9 feet below ground surface. At current moisture and density conditions, the subgrades/bedrock exhibited moderate to high swell potential. Groundwater was encountered in only one of the test borings at a depth of approximately 24 feet below ground surface.

The expansive soils encountered present a risk of post-construction heaving of site improvements should those subgrades become wet subsequent to construction. Therefore, to reduce the risk of post-construction movement of site improvements, it is our opinion that planned lightly loaded building should be supported on drilled pier foundations. The building floor slab should consist of a structural slab also supported on drilled piers independent of the underlying subsoils. We anticipate that site roadways and associated flatwork could be supported on a shallow zone of over excavated and backfilled material with the acceptance of higher risk of movement. Geotechnical recommendations concerning design and construction of foundations and support of floor slabs and pavements are presented in the text of the attached report.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning the enclosed report, or if we can be of further service to you in any other way, please do not hesitate to contact us.

Very truly yours,
Earth Engineering Consultants, LLC

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INTRODUCTION

The geotechnical subsurface exploration for the proposed High Plains Bank planned for construction on Lot 2 in the Market Street Business Park in Keenesburg, Colorado has been completed. To develop subsurface information in the proposed development area, six (6) test borings were drilled to depths of approximately 10 to 35 feet below existing site grades. Individual boring logs and a diagram indicating the approximate boring locations are included with this report.

We understand the planned development would include an approximate 3,000 square-foot commercial building and drive thru, with associated site pavements and concrete flatwork. The building would likely be a one- or two-story, steel-frame structure constructed at-grade (no basement). We estimate foundation loads for the planned building would be relatively light with continuous wall loads less than 3 kips-per-foot and individual column loads less than 25 kips. Floor loads are expected to be relatively light, consistent with commercial use. We anticipate roadways would be utilized by low volumes of light passenger vehicles with areas designated for low volumes of light truck traffic. Based on areal imagery of the site, we anticipate cuts and fill to develop site grades would be less than 2 feet.

The purpose of this report is to describe the subsurface conditions encountered in the test borings, analyze, and evaluate the test data, and provide geotechnical recommendations concerning design and construction building foundations and floor slabs, and support of site flatwork and pavements. Recommended pavement sections, which are based on assumed traffic conditions, are also included.

EXPLORATION AND TESTING PROCEDURES

The test boring locations were selected by DBSI, Inc. and established in the field by EEC personnel by pacing and estimating angles from identifiable site features. The approximate locations of the borings are shown on the attached boring location diagram. The boring locations should be considered accurate only to the degree implied by the methods used to make the field measurements.

The test borings were advanced using a truck mounted, CME-55 drill rig equipped with a hydraulic head employed in drilling and sampling operations. The boreholes were advanced using 4-inch nominal diameter continuous flight augers. Samples of the subsurface materials encountered were obtained using split-barrel and California barrel sampling procedures in general accordance with ASTM Specifications D1586 and D3550, respectively.

In the split-barrel and California barrel sampling procedures, standard sampling spoons are advanced into the ground by means of a 140-pound hammer falling a distance of 30 inches. The number of blows required to advance the split-barrel and California barrel samplers is recorded and is used to estimate the in-situ relative density of cohesionless soils and, to a lesser degree of accuracy, the consistency of cohesive soils. In the California barrel sampling procedure, relatively intact samples are obtained in removable brass liners. All samples obtained in the field were sealed and returned to our laboratory for further examination, classification, and testing.

Laboratory testing on the recovered samples included moisture content with unconfined compressive strength of appropriate samples estimated using a calibrated hand penetrometer. Atterberg limits and washed sieve analysis tests were completed on select samples to evaluate the quantity and plasticity of fines in the subgrades. Swell/consolidation tests were performed on select samples to evaluate the potential for the subgrade materials to change volume with variation in moisture content and load. The quantity of water-soluble sulfates was determined on numerous samples to evaluate the potential for sulfate attack on site concrete and for selection of appropriate soil stabilization materials if needed. Results of the outlined tests are indicated on the attached boring logs and summary sheets.

As part of the testing program, all samples were examined in the laboratory and classified in general accordance with the attached General Notes and the Unified Soil Classification System, based on the soil's texture and plasticity. The estimated group symbol for the Unified Soil Classification System is indicated on the boring logs and a brief description of that classification system is included with this report. Classification of the bedrock was based on visual and tactual observations of disturbed samples; coring or petrograph analysis may reveal other rock types.

SITE AND SUBSURFACE CONDITIONS

The development property is located on Lot 2 in the Market Street Business Park, southwest of County Road 18 and Market Street in Keenesburg. Lot 2 is in the northeast corner of the subdivision. At the time of our site visit, the development property was vacant. Preliminary grading of the site appeared accomplished along with numerous dirt stockpiles across the site. Aside from the stockpiles, the ground surface was relatively flat and covered with sparse vegetation. Evidence of prior building construction was not observed in the development area. Site photos taken at the time of our drilling operations are included with this report.

EEC field personnel were on site during drilling to evaluate the subsurface conditions encountered and direct the drilling activities. Field logs prepared by EEC site personnel were based on visual and tactual observation of disturbed samples and auger cuttings. The final boring logs included with this report may contain modifications to the field logs based on results of laboratory testing and evaluation. Based on results of the field borings and laboratory testing, subsurface conditions can be generalized as follows.

From the ground surface, brown to light brown lean clay with various amounts of sand was encountered and extended to the bottom of test boring B-3, or to depths of approximately 9 to 10 feet below ground surface in the remaining test borings. The clay soils were relatively dry, dense, stiff to very stiff and exhibited high potential to swell with increases in moisture content at current moisture and density conditions. The lean clay soils were underlain by bedrock which extended to the bottom of the completed test borings. The bedrock generally consist of highly weathered claystone with interbedded sandstone. The bedrock was relatively soft to moderately hard with depth and exhibited a moderate swell potential.

The stratification boundaries indicated on the boring logs represent the approximate location of changes in soil types; in-situ, the transition of materials may be gradual and indistinct.

GROUNDWATER CONDITIONS

Observations were made while drilling and after completion of the borings to detect the presence and depth to hydrostatic groundwater. At the time of drilling, free water was observed in only one of the test borings while drilling at a depth of about 24 feet below ground surface. The borings were backfilled upon completion of the drilling operations; therefore, subsequent groundwater measurements were not obtained. The groundwater level observations are included on the attached boring logs.

Fluctuations in groundwater levels can occur over time depending on variations in hydrologic conditions, and other conditions not apparent at the time of this report. Long-term monitoring of water levels in cased wells, which are sealed from the influence of surface water, would be required to more evaluate fluctuations in groundwater levels at the site. We have typically noted deepest groundwater levels in late winter and shallowest groundwater levels in mid to late summer.

ANALYSIS AND RECOMMENDATIONS

General

The subgrades encountered in the test borings generally consisted of moderately plastic clay soils overlying claystone bedrock. The clay soils were relatively dry, dense, stiff to very stiff, and at current moisture and density conditions, exhibited a high potential to swell with increase in moisture content. Movement of foundations, pavements and other at-grade improvements placed on the expansive soils would be expected if the moisture content of those materials increases subsequent to construction.

Therefore, care will be needed to see that site preparation and design of site improvements include measures to mitigate the potential of heaving of the site improvements to an acceptable level. Outlined herein are recommendations for development of this site; however, the client should recognize that building on expansive soils is risky, even when mitigation plans are followed. Mitigation plans outlined herein would reduce the risk of heaving of site improvements, but that risk cannot be eliminated.

Site Preparation

Prior to placement of any fill and/or improvements, we recommend any topsoil, vegetation, and the existing dirt stockpiles be removed from the planned improvement areas. After stripping the site and after making all cuts and prior to placing any fill, we recommend over excavating the subgrades beneath pavements and exterior flatwork (sidewalks, curb-and-gutter, etc.). The over excavations should extend to a depth of at least 3 feet below ground surface and extend laterally 8 inches for every 12 inches of over excavation depth. Over excavation in the building area is not necessary; additional recommendations for preparation in the building area is included in the section titled *Building Foundations* and *Building Floors Slabs*. The over excavation depths recommended should reduce the amount of heaving of site pavements and exterior flatwork; however, that risk would not be eliminated. If those subgrades become substantially wet subsequent to construction, heaving of about 5 inches could be possible. If that is not acceptable, greater over excavation depths should be considered. EEC should be contacted to provide alternative recommendations if that is desirable.

After completing the over excavations, the exposed soils should be scarified to a depth of 9 inches, adjusted in moisture content and compacted to at least 95% of the material's maximum dry density as determined by ASTM Specification D698, the standard Proctor procedure. The moisture content should be adjusted to within -1 to +3% of optimum moisture content.

Fill soils should consist of approved materials which are free from organic matter and debris. In our opinion, the over excavated clay soils or similar soils could be used. The fill soils should be placed in loose lifts not to exceed 9 inches in thickness, adjusted in moisture content and compacted as recommended for the scarified soils. Care will be needed to maintain the recommended moisture content prior to and during construction of overlying improvements. Care should be taken after preparation of the subgrades to avoid disturbing the subgrade materials. Materials which are loosened or disturbed should be reworked prior to placement of site improvements.

Building Foundations

Based on the materials encountered in the completed test borings, it our opinion the proposed lightly loaded building could be supported on drilled pier foundations. We recommend drilled piers extend to bear at least 15 feet into firm competent bedrock and have a minimum length of at least 30 feet; both minimum length and minimum penetration into the underlying bedrock should be met.

For design of drilled piers, we recommend using a total end bearing pressure not to exceed 15 kips per square foot, along with a skin friction of 1.5 kips per square foot for the portion of the pier in the firm and/or harder bedrock formation. That skin friction could also be used for resistance to uplift forces. Piers should be designed with a minimum dead load of 5 kips per square foot. Lower design values may be appropriate for pier groups depending on pier diameter and spacing.

If the minimum dead load cannot be satisfied in the design, the drilled piers should be designed to balance the potential uplift forces with greater penetration into the bedrock. The skin friction for the portion of the pier extending beyond the recommended minimum length of bedrock penetration could be used to offset an inability to develop the minimum dead load on the piers. The uplift force on each pier can be determined on the basis of the following equation:

$$\boldsymbol{U_p = 50 \times D}$$

Where: $\boldsymbol{U_p}$ = the uplift force in kips
$\boldsymbol{D}$ = the pier diameter in feet

When the lateral capacity of drilled piers is evaluated by the LPILE program, we recommend that internally generated load-deformation (P-Y) curves be used. Table 1 below includes recommended soil parameters for design of drilled piers using LPILE.

Table 1. Soil parameters for design of drilled piers using LPILE program.

Parameters	Clay Soils	Bedrock
Unit Weight of Soil (pcf)	130(1)	130(1)
Undrained Shear Strength (psf)	2,000	4,000
Angle of Internal Friction, ϕ (degrees)	25	20
Strain Corresponding to ½ Max. Principal Stress Difference, ε_{50}	0.01	0.005

Unit weights in Table 1 should be adjusted for buoyant conditions as appropriate.

The drilled piers should be designed with full-length reinforcement to resist stress from the applied axial, lateral, and uplift loads imposed. Grade beams between the drilled piers should be designed with a minimum of 12 inches of void space between the grade beam and the underlying subgrades. Exterior foundation grade beams, or foundations in unheated areas should be located a minimum of 30 inches below adjacent exterior grade to provide frost protection.

Drilling caissons to design depth should be possible with conventional heavy-duty single flight power augers equipped with rock teeth; however, areas of well-cemented bedrock lenses may be encountered throughout the site at various depths where specialized drilling equipment and/or rock excavating equipment may be required. We do not believe temporary casing would be needed in the overlying cohesive soils; however, could be necessary where groundwater is encountered with depth.

Due to the presence of groundwater on the site, we expect some water may infiltrate the drilled shaft borehole. A maximum 3-inch depth of groundwater is acceptable in each pier prior to concrete placement. If pier concrete cannot be placed in relatively dry conditions, a tremie should be used for concrete placement. Due to potential sloughing and raveling, foundation concrete quantities may exceed calculated geometric volumes. Pier concrete with slumps in the range of 6 to 8 inches is recommended. If casing is used for the pier construction, it should be withdrawn in a slow and continuous manner maintaining a sufficient head of concrete to prevent influx of water and/or the creation of voids in the pier concrete.

The foundation pier excavations should be observed by the geotechnical engineer. A representative of the geotechnical engineer should inspect the bearing surface and pier configuration. If the soil conditions encountered differ significantly from those presented in this report, supplemental recommendations could be required.

We estimate the long-term settlement of drilled pier foundations designed and constructed as outlined above would be less than 1 inch.

Building Floor Slabs

Building floor slabs should consist of structural floor systems to reduce the risk for post-construction movement of caused by the swelling of the underlying expansive subgrades/bedrock. Structural floors should be supported on drilled pier foundations with minimum 12-inch void space between the bottom of the floor system and underlying expansive subgrade materials. Drilled piers should be designed and constructed as recommended in the section *Building Foundations*.

Foundation Wall and Utility Backfill

Backfill needed to develop site grades following installation of foundations and site utilities should consist of low volume change materials which are free of organic matter and debris. In our opinion the site clay soils could be used. Backfill soils should be placed in loose lifts not to exceed 9 inches in thickness, adjusted in moisture content, and compacted to at least 95% of the material's maximum dry density as determined by ASTM Specification D698, the standard Proctor procedure. The moisture content should be adjusted to with -1 to +3% of optimum moisture content.

Seismic

The site soil conditions consist of stiff to very stiff lean clay overlying moderately hard bedrock to the depths explored. For those site conditions, the International Building Code indicates a Seismic Site Classification of D. Evaluating borings to a greater depth could reveal an alternative site classification.

Corrosion Potential for Site Concrete

Results of water-soluble sulfate testing on three (3) select subgrade samples indicate sulfate (SO_4) contents ranging from 0.06 to 0.40%. ACI 318, Section 4.2 indicates the site soils have a severe risk of sulfate attack on Portland cement concrete and indicates site concrete should be designed using a sulfate exposure of S2. Note that concrete mixtures with a severe sulfate exposure may require sulfate resistant cements and/or pozzolans in the mixtures; refer to ACI 318 Section 4.3 for mixture design.

Pavements

Pavement subgrades should be prepared as outlined in the section *Site Preparation*. Once the subgrades are prepared as recommended and prior to surfacing with aggregate base, we recommend proof rolling the pavement subgrades to identify any soft, wet, and yielding areas. Yielding and/or soft areas in the subgrades should be reworked and/or replaced prior to placement of aggregate base materials. Note that laboratory testing indicated the subgrades contain appreciable amounts of water-soluble sulfates, as such, stabilizing the soil with calcium-based materials (i.e., Class C fly ash, lime, cement) is not recommended.

We anticipate the site pavements would include areas designated for low volumes of light weight passenger vehicles (Light Duty) and areas of low volumes of light trucks (Heavy Duty). Equivalent daily load application (EDLA) values of 15 and 5 were assumed for the Heavy Duty and Light Duty areas, respectively. Based on the subsurface conditions encountered at the site, an assumed R-value of 5 was used in design of the pavement sections.

Recommended minimum pavement sections are provided below in Table 2. Asphalt pavement sections may show rutting/distress in truck loading and drive areas; therefore, concrete pavements should be considered in those areas. The recommended pavement sections are considered minimum; thus, periodic maintenance should be expected.

Table 2. Recommended minimum pavement sections for estimated traffic loads.

Design Information	Heavy Duty	Light Duty
EDLA	15	5
Reliability (%)	80	80
Resilient Modulus (psi)	3025	3025
Serviceability Loss (psi)	2.2	2.2
Design Structure Number	3.05	2.57
Option 1: Composite Pavement		
Asphalt Pavement	5"	4"
Aggregate Base	8"	8"
Option 2: PCC (Non-reinforced)	6.5"	5.5"

We recommend aggregate base meet CDOT Class 5 or Class 6 aggregate base. Aggregate base should be adjusted in moisture content and compacted to achieve a minimum of 95% of standard Proctor maximum dry density.

Asphalt pavements should be graded as S or SX and prepared with 75 gyrations using a Superpave gyratory compactor in accordance with CDOT standards. Grading SX is recommended for surface course of the pavement. The asphalt mixture should consist of PG 58-28 or PG 64-22; however, if the mixture contains reclaimed asphalt pavement (RAP), we recommend using PG 58-28 binder. The hot mix asphalt in field should be compacted to achieve 92 to 96% of the mix's theoretical maximum specific gravity (Rice Value).

Portland cement concrete should be an approved exterior pavement mix with a minimum 28-day compressive strength of 4,500 psi and should be air entrained. Based on appreciable amounts of water-soluble sulfate contents in the subgrades, concrete pavement should be designed using a severe sulfate exposure of S2. Wire mesh or fiber could be considered to reduce shrinkage cracking.

Longitudinal and transverse joints should be provided as needed in concrete pavements for expansion/contraction and isolation. The location and extent of joints should be based upon the final pavement geometry. Sawed joints should be cut in general accordance with ACI recommendations. All joints should be sealed to prevent entry of foreign material and dowelled where necessary for load transfer.

Other Considerations

Positive drainage should be developed away from the structures and pavement areas with a minimum slope of 1 inch per foot for the first 10 feet away from the improvements in landscape areas. Care should be taken in planning of landscaping adjacent to the buildings to avoid features which would pond water adjacent to the foundations or stem walls. Placement of plants which require irrigation systems or could result in fluctuations of the moisture content of the subgrade material should be avoided adjacent to site improvements. Irrigation systems should not be placed within 5 feet of the perimeter of the buildings and parking areas. Spray heads should be designed not to spray water on or immediately adjacent to the structures or site pavements. Roof drains should be designed to discharge at least 5 feet away from the structures and away from the pavement areas.

The site contractors should be made responsible for designing and constructing stable, temporary excavations as required to maintain stability of both the excavation sides and bottom. All excavations should be sloped or shored in the interest of safety following local and federal regulations, including current OSHA excavation and trench safety standards.

GENERAL COMMENTS

The analysis and recommendations presented in this report are based upon the data obtained from the soil borings performed at the indicated locations and from any other information discussed in this report. This report does not reflect any variations, which may occur between borings or across the site. The nature and extent of such variations may not become evident until construction. If variations appear evident, it will be necessary to re-evaluate the recommendations of this report.

It is recommended that the geotechnical engineer be retained to review the plans and specifications so comments can be made regarding the interpretation and implementation of our geotechnical recommendations in the design and specifications. It is further recommended that the geotechnical engineer be retained for testing and observations during earthwork phases to help determine that the design requirements are fulfilled.

This report has been prepared for the exclusive use of DBSI, Inc. for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices. No warranty, express or implied, is made. In the event that any changes in the nature, design, or location of the project as outlined in this report are planned, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed, and the conclusions of this report are modified or verified in writing by the geotechnical engineer.

DRILLING AND EXPLORATION

DRILLING & SAMPLING SYMBOLS:

SS: Split Spoon - 13/8" I.D., 2" O.D., unless otherwise noted
ST: Thin-Walled Tube - 2" O.D., unless otherwise noted
R: Ring Barrel Sampler - 2.42" I.D., 3" O.D. unless otherwise noted
PA: Power Auger
HA: Hand Auger
DB: Diamond Bit = 4", N, B
AS: Auger Sample
HS: Hollow Stem Auger

PS: Piston Sample
WS: Wash Sample
FT: Fish Tail Bit
RB: Rock Bit
BS: Bulk Sample
PM: Pressure Meter
WB: Wash Bore

Standard "N" Penetration: Blows per foot of a 140 pound hammer falling 30 inches on a 2-inch O.D. split spoon, except where noted.

WATER LEVEL MEASUREMENT SYMBOLS:

WL : Water Level
WCI: Wet Cave in
DCI: Dry Cave in
AB : After Boring

WS : While Sampling
WD : While Drilling
BCR: Before Casing Removal
ACR: After Casting Removal

Water levels indicated on the boring logs are the levels measured in the borings at the time indicated. In pervious soils, the indicated levels may reflect the location of ground water. In low permeability soils, the accurate determination of ground water levels is not possible with only short term observations.

DESCRIPTIVE SOIL CLASSIFICATION

Soil Classification is based on the Unified Soil Classification system and the ASTM Designations D-2488. Coarse Grained Soils have move than 50% of their dry weight retained on a #200 sieve; they are described as: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are described as : clays, if they are plastic, and silts if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse grained soils are defined on the basis of their relative in-place density and fine grained soils on the basis of their consistency. Example: Lean clay with sand, trace gravel, stiff (CL); silty sand, trace gravel, medium dense (SM).

CONSISTENCY OF FINE-GRAINED SOILS

Unconfined Compressive Strength, Qu, psf	Consistency
< 500	Very Soft
500 - 1,000	Soft
1,001 - 2,000	Medium
2,001 - 4,000	Stiff
4,001 - 8,000	Very Stiff
8,001 - 16,000	Very Hard

RELATIVE DENSITY OF COARSE-GRAINED SOILS:

N-Blows/ft	Relative Density
0-3	Very Loose
4-9	Loose
10-29	Medium Dense
30-49	Dense
50-80	Very Dense
80 +	Extremely Dense

PHYSICAL PROPERTIES OF BEDROCK

DEGREE OF WEATHERING:

Slight	Slight decomposition of parent material on joints. May be color change.
Moderate	Some decomposition and color change throughout.
High	Rock highly decomposed, may be extremely broken.

HARDNESS AND DEGREE OF CEMENTATION:

Limestone and Dolomite:

Hard	Difficult to scratch with knife.
Moderately Hard	Can be scratched easily with knife. Cannot be scratched with fingernail.
Soft	Can be scratched with fingernail.

Shale, Siltstone and Claystone:

Hard	Can be scratched easily with knife, cannot be scratched with fingernail.
Moderately Hard	Can be scratched with fingernail.
Soft	Can be easily dented but not molded with fingers.

Sandstone and Conglomerate:

Well Cemented	Capable of scratching a knife blade.
Cemented	Can be scratched with knife.
Poorly Cemented	Can be broken apart easily with fingers.

UNIFIED SOIL CLASSIFICATION SYSTEM

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests					Soil Classification: Group Symbol	Soil Classification: Group Name
Coarse - Grained Soils more than 50% retained on No. 200 sieve	Gravels more than 50% of coarse fraction retained on No. 4 sieve	Clean Gravels Less than 5% fines	$Cu \geq 4$ and $1 < Cc \leq 3$[E]		GW	Well-graded gravel [F]
			$Cu < 4$ and/or $1 > Cc > 3$[E]		GP	Poorly-graded gravel [F]
		Gravels with Fines more than 12% fines	Fines classify as ML or MH		GM	Silty gravel [G,H]
			Fines Classify as CL or CH		GC	Clayey Gravel [F,G,H]
	Sands 50% or more coarse fraction passes No. 4 sieve	Clean Sands Less than 5% fines	$Cu \geq 6$ and $1 < Cc \leq 3$[E]		SW	Well-graded sand [I]
			$Cu < 6$ and/or $1 > Cc > 3$[E]		SP	Poorly-graded sand [I]
		Sands with Fines more than 12% fines	Fines classify as ML or MH		SM	Silty sand [G,H,I]
			Fines classify as CL or CH		SC	Clayey sand [G,H,I]
Fine-Grained Soils 50% or more passes the No. 200 sieve	Silts and Clays Liquid Limit less than 50	inorganic	PI>7 and plots on or above "A" Line		CL	Lean clay [K,L,M]
			PI<4 or plots below "A" Line		ML	Silt [K,L,M]
		organic	Liquid Limit - oven dried / Liquid Limit - not dried	<0.75	OL	Organic clay [K,L,M,N]; Organic silt [K,L,M,O]
	Silts and Clays Liquid Limit 50 or more	inorganic	PI plots on or above "A" Line		CH	Fat clay [K,L,M]
			PI plots below "A" Line		MH	Elastic Silt [K,L,M]
		organic	Liquid Limit - oven dried / Liquid Limit - not dried	<0.75	OH	Organic clay [K,L,M,P]; Organic silt [K,L,M,O]
Highly organic soils		Primarily organic matter, dark in color, and organic odor			PT	Peat

[A]Based on the material passing the 3-in. (75-mm) sieve

[B]If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

[C]Gravels with 5 to 12% fines required dual symbols:
GW-GM well graded gravel with silt
GW-GC well-graded gravel with clay
GP-GM poorly-graded gravel with silt
GP-GC poorly-graded gravel with clay

[D]Sands with 5 to 12% fines require dual symbols:
SW-SM well-graded sand with silt
SW-SC well-graded sand with clay
SP-SM poorly graded sand with silt
SP-SC poorly graded sand with clay

[E]$Cu = D_{60}/D_{10}$ $Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$

[F]If soil contains ≥15% sand, add "with sand" to

[G]If fines classify as CL-ML, use dual symbol GC-CM, or SC-SM.

[H]If fines are organic, add "with organic fines" to group name

[I]If soil contains >15% gravel, add "with gravel" to group name

[J]If Atterberg limits plots shaded area, soil is a CL-ML, Silty clay

[K]if soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel", whichever is predominant.

[L]If soil contains ≥ 30% plus No. 200 predominantly sand, add "sandy" to group name.

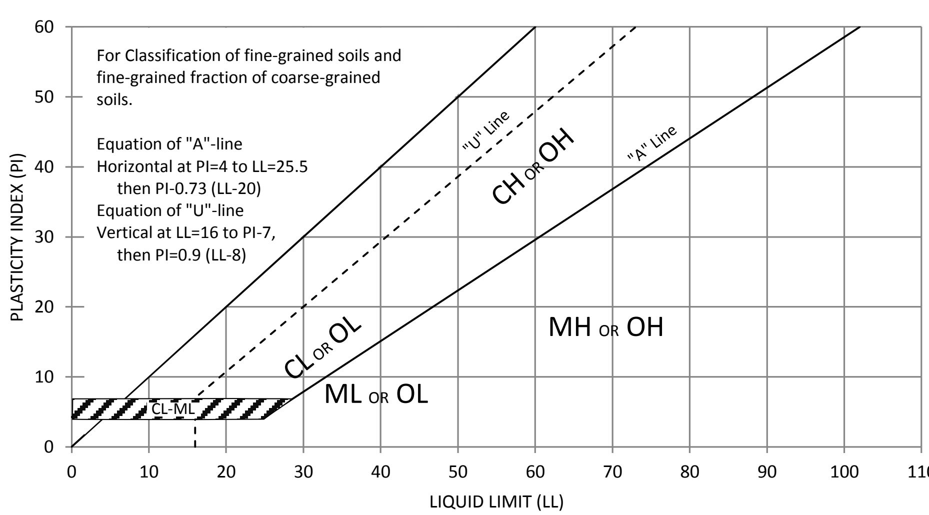
[M]If soil contains ≥30% plus No. 200 predominantly gravel, add "gravelly" to group name.

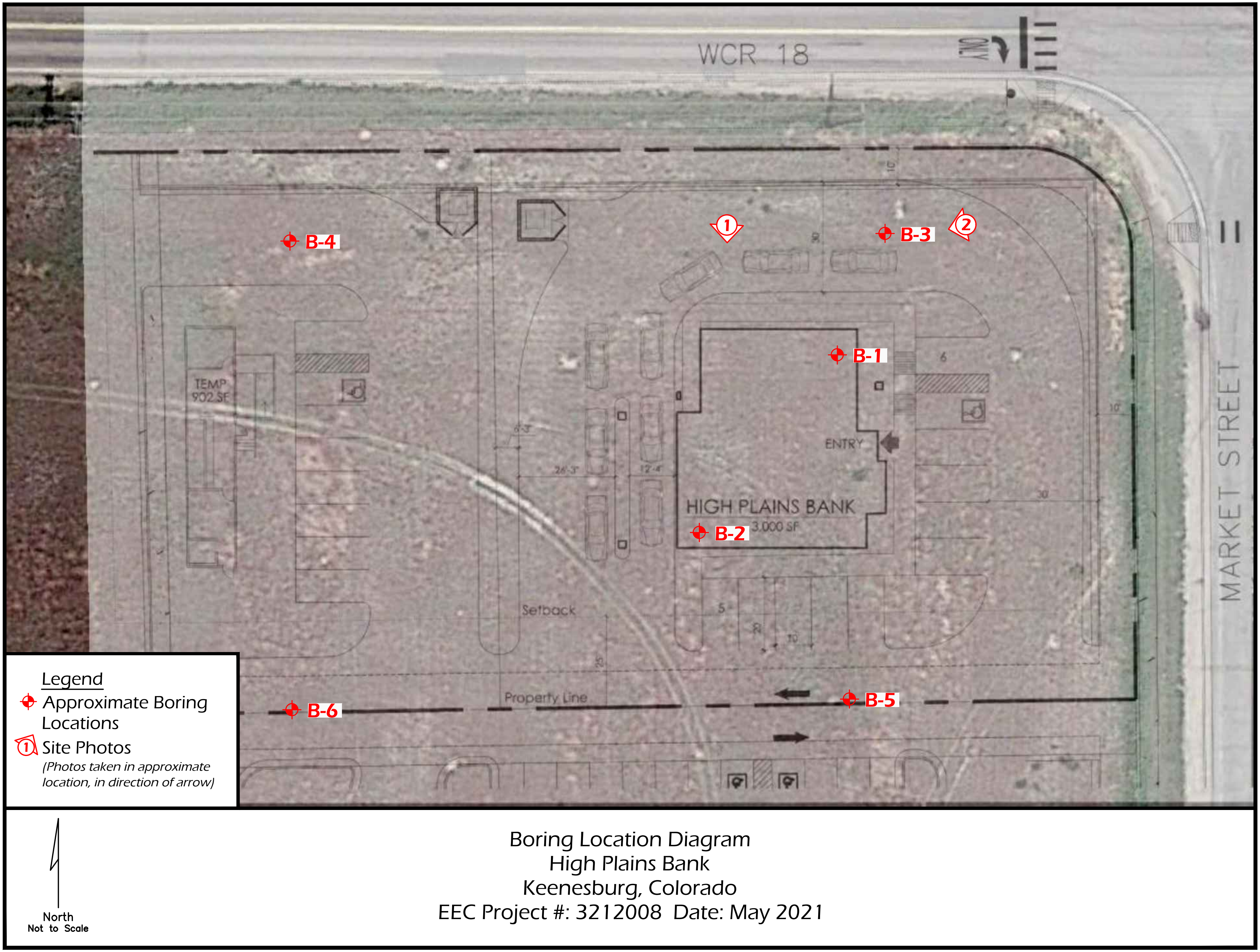
[N]PI≥4 and plots on or above "A" line.

[O]PI≤4 or plots below "A" line.

[P]PI plots on or above "A" line.

[Q]PI plots below "A" line.





Boring Location Diagram
High Plains Bank
Keenesburg, Colorado
EEC Project #: 3212008 Date: May 2021

EARTH ENGINEERING CONSULTANTS, LLC


PHOTO # 1


PHOTO # 2

HIGH PLAINS BANK

KEENESBURG, COLORADO

PROJECT NO: 3212008	LOG OF BORING B-1		DATE: MAY 2021	
RIG TYPE: CME55	*SHEET 1 OF 1*		WATER DEPTH	
FOREMAN: JK	START DATE	5/21/2021	WHILE DRILLING	None
AUGER TYPE: 4" CFA	FINISH DATE	5/21/2021		
SPT HAMMER: AUTOMATIC	SURFACE ELEV	N/A		

SOIL DESCRIPTION	TYPE	D (FEET)	N (BLOWS/FT)	QU (PSF)	MC (%)	DD (PCF)	A-LIMITS LL	A-LIMITS PI	-200 (%)	SWELL PRESSURE	SWELL % SWELL
SPARSE VEGETATION											
		1									
		2									
LEAN CLAY with SAND (CL)											
brown	CS	3	18	9000+	13.4	102.1					
very stiff											
		4									(% @ 500 psf)
	CS	5	14	7000	12.9	113.0	38	20	77.1	5000 psf	6.9%
		6									
		7									
		8									
		9									
CLAYSTONE											
brown/ gray/ rust	SS	10	42	9000+	10.8						
soft, highly weathered with interbedded sandstone											
BOTTOM OF BORING DEPTH 10.5'		11									
		12									
		13									
		14									
		15									
		16									
		17									
		18									
		19									
		20									
		21									
		22									
		23									
		24									
		25									

HIGH PLAINS BANK

KEENESBURG, COLORADO

PROJECT NO: 3212008	LOG OF BORING B-2		DATE: MAY 2021	
RIG TYPE: CME55	*SHEET 1 OF 1*		WATER DEPTH	
FOREMAN: JK	START DATE	5/21/2021	WHILE DRILLING	None
AUGER TYPE: 4" CFA	FINISH DATE	5/21/2021		
SPT HAMMER: AUTOMATIC	SURFACE ELEV	N/A		

SOIL DESCRIPTION	TYPE	D (FEET)	N (BLOWS/FT)	QU (PSF)	MC (%)	DD (PCF)	A-LIMITS LL	A-LIMITS PI	-200 (%)	SWELL PRESSURE	SWELL % SWELL
SPARSE VEGETATION											
		1									
		2									
LEAN CLAY with SAND (CL)			Water Soluble Sulfates =0.40%								(% @ 150 psf)
brown	CS	3	20	6500	9.8	115.6					10.5%
very stiff											
		4									
	SS	5	15	9000+	15.9	113.0					
		6									
		7									
		8									
		9									
CLAYSTONE											
brown/ gray/ rust	SS	10	33	9000+	16.2						
soft, highly weathered with interbedded sandstone											
BOTTOM OF BORING DEPTH 10.5'		11									
		12									
		13									
		14									
		15									
		16									
		17									
		18									
		19									
		20									
		21									
		22									
		23									
		24									
		25									

HIGH PLAINS BANK

KEENESBURG, COLORADO

PROJECT NO: 3212008	LOG OF BORING B-3		DATE: MAY 2021	
RIG TYPE: CME55	*SHEET 1 OF 1*		WATER DEPTH	
FOREMAN: JK	START DATE	5/21/2021	WHILE DRILLING	None
AUGER TYPE: 4" CFA	FINISH DATE	5/21/2021		
SPT HAMMER: AUTOMATIC	SURFACE ELEV	N/A		

SOIL DESCRIPTION	TYPE	D (FEET)	N (BLOWS/FT)	QU (PSF)	MC (%)	DD (PCF)	A-LIMITS LL	A-LIMITS PI	-200 (%)	SWELL PRESSURE	SWELL % SWELL
SPARSE VEGETATION											
		1									
		2									
LEAN CLAY (CL)											(% @ 150 psf)
light brown to brown	CS	3	32	9000+	10.8	117.6	34	18	90.9		10.4%
very stiff											
		4									
	CS	5	13	9000+	12.5	113.0					
		6									
		7									
		8									
		9									
	CS	10	11	6000	19.4	109.4					
BOTTOM OF BORING DEPTH 10'											
		11									
		12									
		13									
		14									
		15									
		16									
		17									
		18									
		19									
		20									
		21									
		22									
		23									
		24									
		25									

HIGH PLAINS BANK
KEENESBURG, COLORADO

PROJECT NO: 3212008	LOG OF BORING B-4		DATE: MAY 2021	
RIG TYPE: CME55	*SHEET 1 OF 1*		WATER DEPTH	
FOREMAN: JK	START DATE	5/21/2021	WHILE DRILLING	None
AUGER TYPE: 4" CFA	FINISH DATE	5/21/2021		
SPT HAMMER: AUTOMATIC	SURFACE ELEV	N/A		

SOIL DESCRIPTION	TYPE	D (FEET)	N (BLOWS/FT)	QU (PSF)	MC (%)	DD (PCF)	A-LIMITS LL	A-LIMITS PI	-200 (%)	SWELL PRESSURE	SWELL % SWELL
SPARSE VEGETATION											
		1									
		2									
LEAN CLAY (CL)											
light brown to brown	CS	3	20	5000	9.0	94.8					
very stiff to stiff											
		4									
	CS	5	13	2500	9.5	113.0					
		6									
		7									
		8									
		9									
CLAYSTONE											
brown/ gray/ rust	SS	10	34	9000+	13.4						
soft, highly weathered with interbedded sandstone											
BOTTOM OF BORING DEPTH 10.5'		11									
		12									
		13									
		14									
		15									
		16									
		17									
		18									
		19									
		20									
		21									
		22									
		23									
		24									
		25									

HIGH PLAINS BANK
KEENESBURG, COLORADO

PROJECT NO: 3212008	LOG OF BORING B-5		DATE: MAY 2021	
RIG TYPE: CME55	*SHEET 1 OF 2*		WATER DEPTH	
FOREMAN: JK	START DATE	5/21/2021	WHILE DRILLING	24'
AUGER TYPE: 4" CFA	FINISH DATE	5/21/2021		
SPT HAMMER: AUTOMATIC	SURFACE ELEV	N/A		

SOIL DESCRIPTION	TYPE	D (FEET)	N (BLOWS/FT)	QU (PSF)	MC (%)	DD (PCF)	A-LIMITS LL	A-LIMITS PI	-200 (%)	SWELL PRESSURE	SWELL % SWELL
SPARSE VEGETATION											
		1									
		2									
LEAN CLAY (CL)											(% @ 150 psf)
light brown to brown	CS	3	12	9000+	9.1	109.1				2800 psf	6.5%
very stiff											
		4									
	CS	5	16	8000	11.1	113.0					
		6									
		7									
		8									
		9									
	CS	10	34	8500	14.8	112.1					
CLAYSTONE											
brown/ gray/ rust		11									
soft, highly weathered											
with interbedded sandstone		12									
		13									
		14									
	SS	15	37	6000	19.6						
		16									
		17									
		18									
		19									(% @ 1000 psf)
	CS	20	40	9000+	16.4	113.7				6600 psf	3.6%
		21									
		22									
		23									
		24	Water Soluble Sulfates = 0.06%								
	SS	25	22	9000+	17.0						

Continued on Sheet 2 of 2

HIGH PLAINS BANK
KEENESBURG, COLORADO

PROJECT NO: 3212008	LOG OF BORING B-5			DATE: MAY 2021	
RIG TYPE: CME55	*SHEET 2 OF 2*			WATER DEPTH	
FOREMAN: JK	START DATE	5/21/2021		WHILE DRILLING	24'
AUGER TYPE: 4" CFA	FINISH DATE	5/21/2021			
SPT HAMMER: AUTOMATIC	SURFACE ELEV	N/A			

SOIL DESCRIPTION	TYPE	D (FEET)	N (BLOWS/FT)	QU (PSF)	MC (%)	DD (PCF)	A-LIMITS LL	A-LIMITS PI	-200 (%)	SWELL PRESSURE	SWELL % SWELL
Continued from Sheet 1 of 2		26									
CLAYSTONE		27									
brown/ gray/ rust											
soft, highly weathered		28									
with interbedded sandstone											
		29									
	CS	30	38	9000+	21.4	105.3					
		31									
		32									
		33									
		34									
	SS	35	50	9000+	18.1						
BOTTOM OF BORING DEPTH 35.5'		36									
		37									
		38									
		39									
		40									
		41									
		42									
		43									
		44									
		45									
		46									
		47									
		48									
		49									
		50									

HIGH PLAINS BANK
KEENESBURG, COLORADO

PROJECT NO: 3212008	LOG OF BORING B-6		DATE: MAY 2021	
RIG TYPE: CME55	*SHEET 1 OF 2*		WATER DEPTH	
FOREMAN: JK	START DATE	5/21/2021	WHILE DRILLING	None
AUGER TYPE: 4" CFA	FINISH DATE	5/21/2021		
SPT HAMMER: AUTOMATIC	SURFACE ELEV	N/A		

SOIL DESCRIPTION	TYPE	D (FEET)	N (BLOWS/FT)	QU (PSF)	MC (%)	DD (PCF)	A-LIMITS LL	A-LIMITS PI	-200 (%)	SWELL PRESSURE	SWELL % SWELL
SPARSE VEGETATION											
		1									
		2									
LEAN CLAY with SAND (CL)			Water Soluble Sulfates = 0.08%								
light brown to brown	CS	3	17	9000+	9.0	100.5					
very stiff											
		4									(% @ 500 psf)
	CS	5	13	8000	10.2	117.4	37	21	79.7	5000 psf	5.3%
		6									
		7									
		8									
		9									
	SS	10	34	9000+	15.0						
CLAYSTONE		11									
brown/ gray/ rust											
soft, highly weathered		12									
with interbedded sandstone											
		13									
		14									(% @ 1000 psf)
	CS	15	40	9000+	16.4	112.1				3500 psf	1.5%
		16									
		17									
		18									
		19									
	SS	20	32	9000+	19.1						
		21									
		22									
		23									
		24									(% @ 1000 psf)
	CS	25	30	9000+	20.6	109.2				8000 psf	5.7%

Continued on Sheet 2 of 2

HIGH PLAINS BANK

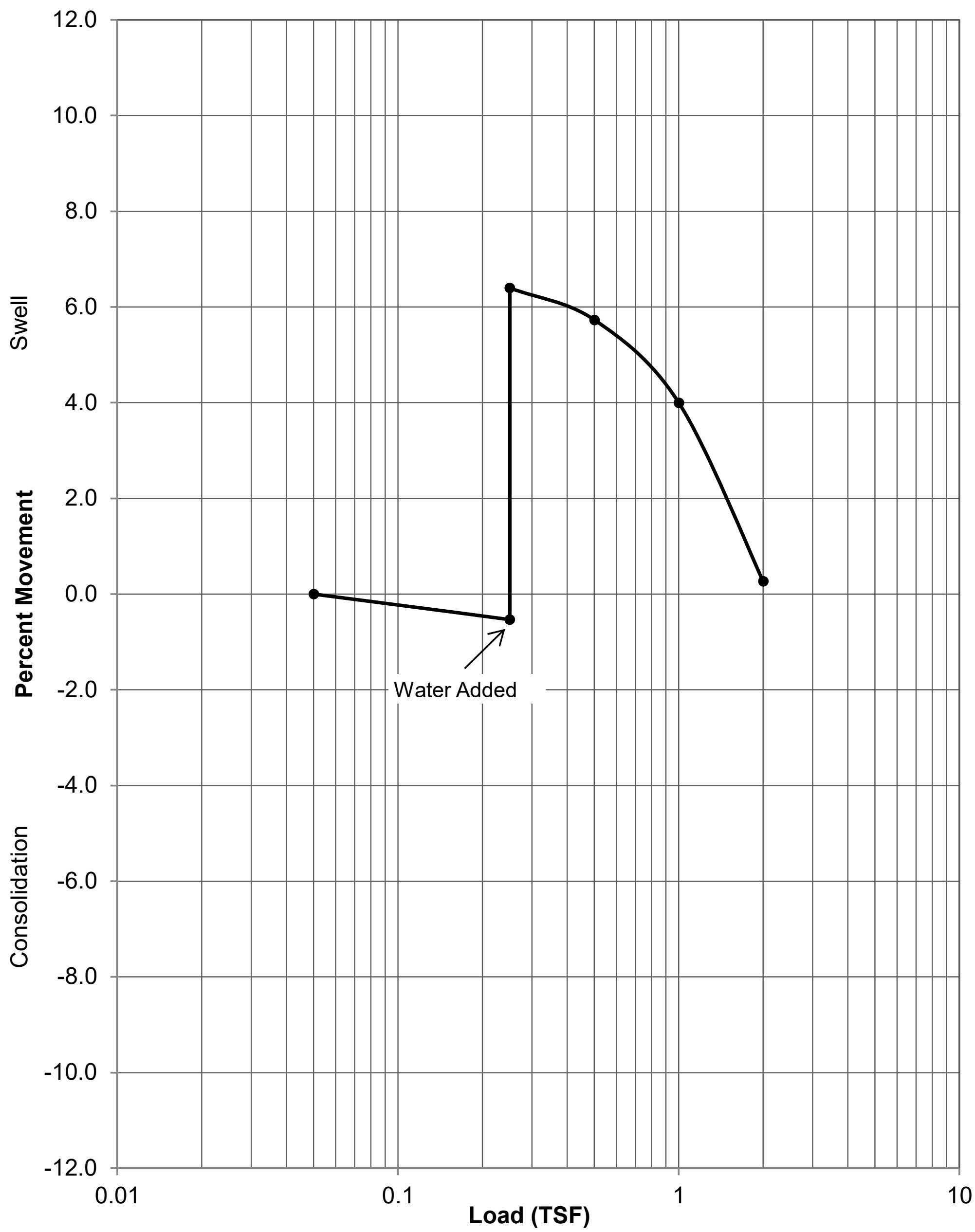
KEENESBURG, COLORADO

PROJECT NO: 3212008	LOG OF BORING B-6		DATE: MAY 2021	
RIG TYPE: CME55	*SHEET 2 OF 2*		WATER DEPTH	
FOREMAN: JK	START DATE	5/21/2021	WHILE DRILLING	None
AUGER TYPE: 4" CFA	FINISH DATE	5/21/2021		
SPT HAMMER: AUTOMATIC	SURFACE ELEV	N/A		

SOIL DESCRIPTION	TYPE	D (FEET)	N (BLOWS/FT)	QU (PSF)	MC (%)	DD (PCF)	A-LIMITS LL	A-LIMITS PI	-200 (%)	SWELL PRESSURE	SWELL % SWELL
Continued from Sheet 1 of 2		26									
CLAYSTONE brown/ gray/ rust		27									
soft, highly weathered with interbedded sandstone		28									
		29									
	SS	**30**	**39**	**9000+**	**18.6**						
		31									
		32									
		33									
		34									
	CS	**35**	**48**	**9000+**	**18.3**	**113.6**					
BOTTOM OF BORING DEPTH 35'		36									
		37									
		38									
		39									
		40									
		41									
		42									
		43									
		44									
		45									
		46									
		47									
		48									
		49									
		50									

SWELL / CONSOLIDATION TEST RESULTS

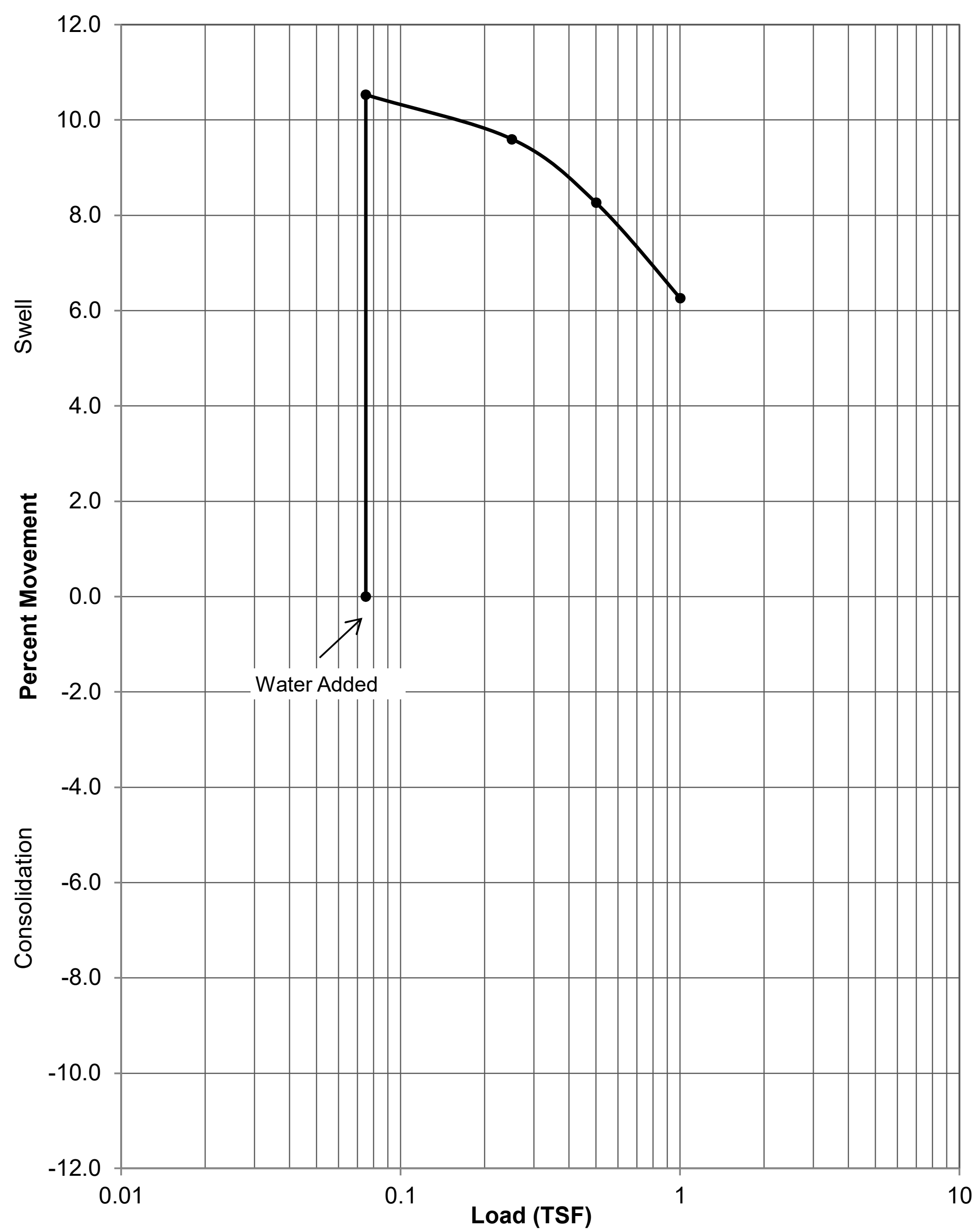
Material Description:	Brown Lean Clay with Sand		
Sample Location:	Boring 1, Sample 2, Depth 4'		
Liquid Limit: 38	Plasticity Index: 20	% Passing #200: 77.1%	
Beginning Moisture: 12.9%	Dry Density: 113 pcf	Ending Moisture: 18.2%	
Swell Pressure: 5000 psf	% Swell @ 500: 6.9%		



Project: High Plains Bank
Location: Keenesburg, Colorado
Project #: 3212008
Date: May 2021

SWELL / CONSOLIDATION TEST RESULTS

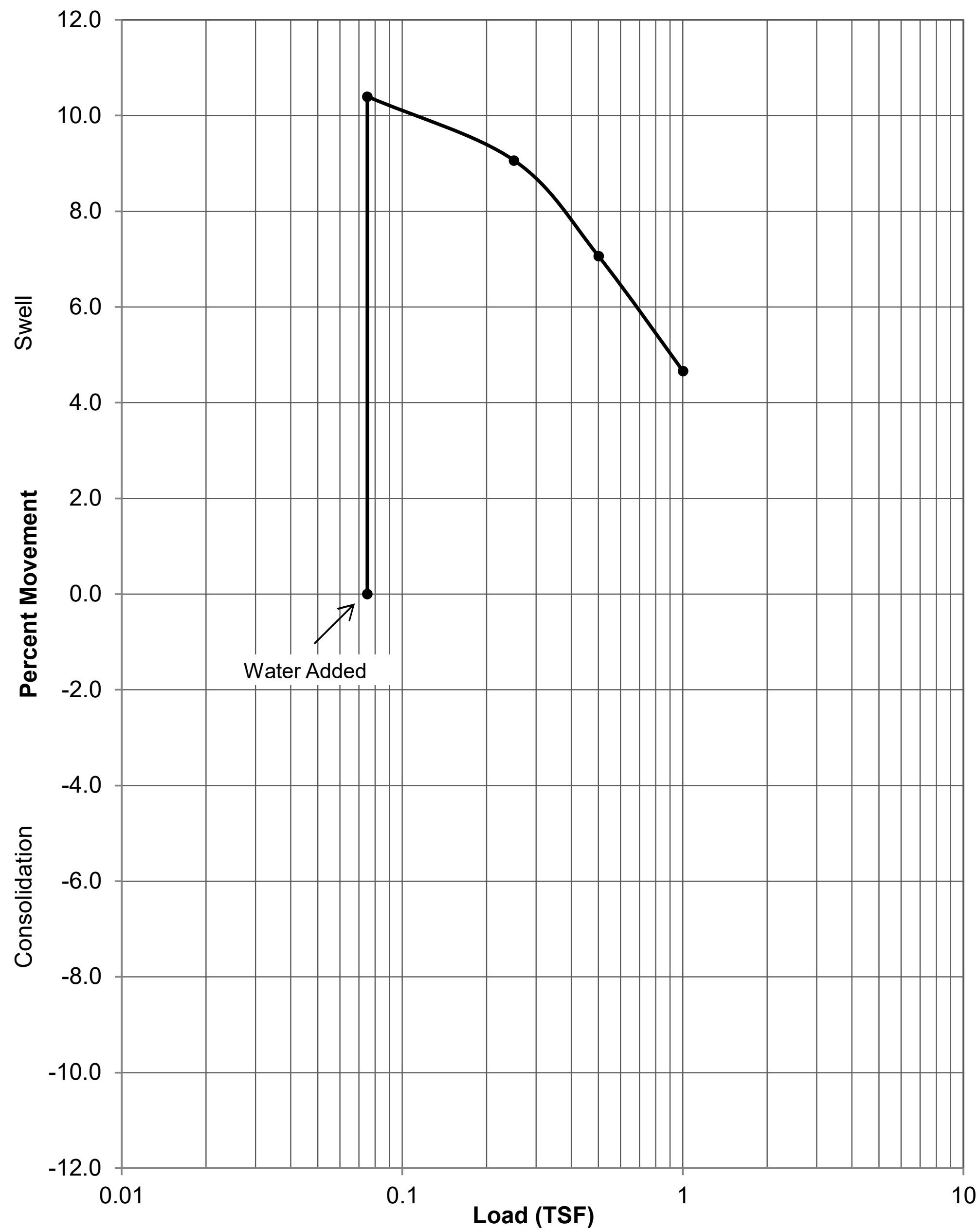
Material Description:	Brown Lean Clay with Sand		
Sample Location:	Boring 2, Sample 1, Depth 2'		
Liquid Limit:	Plasticity Index:	% Passing #200:	
Beginning Moisture: 9.8%	Dry Density: 119.1 pcf	Ending Moisture: 20.0%	
Swell Pressure:		% Swell @ 150:	10.5%



Project: High Plains Bank
Location: Keenesburg, Colorado
Project #: 3212008
Date: May 2021

SWELL / CONSOLIDATION TEST RESULTS

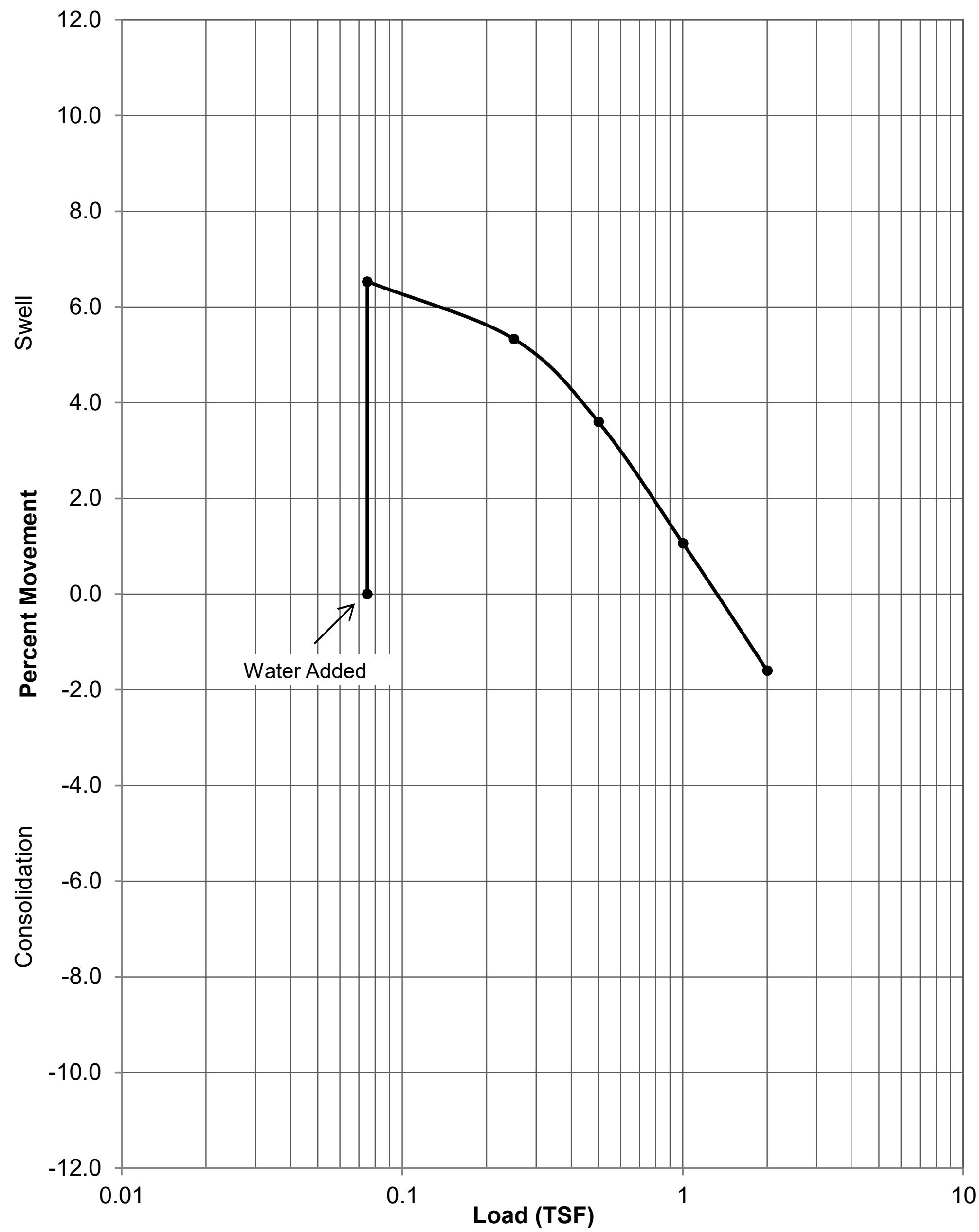
Material Description: Light Brown Lean Clay with Sand		
Sample Location: Boring 3, Sample 1, Depth 2'		
Liquid Limit: 34	Plasticity Index: 18	% Passing #200: 90.9%
Beginning Moisture: 10.8%	Dry Density: 121.1 pcf	Ending Moisture: 19.1%
Swell Pressure:	% Swell @ 150: 10.4%	



Project: High Plains Bank
Location: Keenesburg, Colorado
Project #: 3212008
Date: May 2021

SWELL / CONSOLIDATION TEST RESULTS

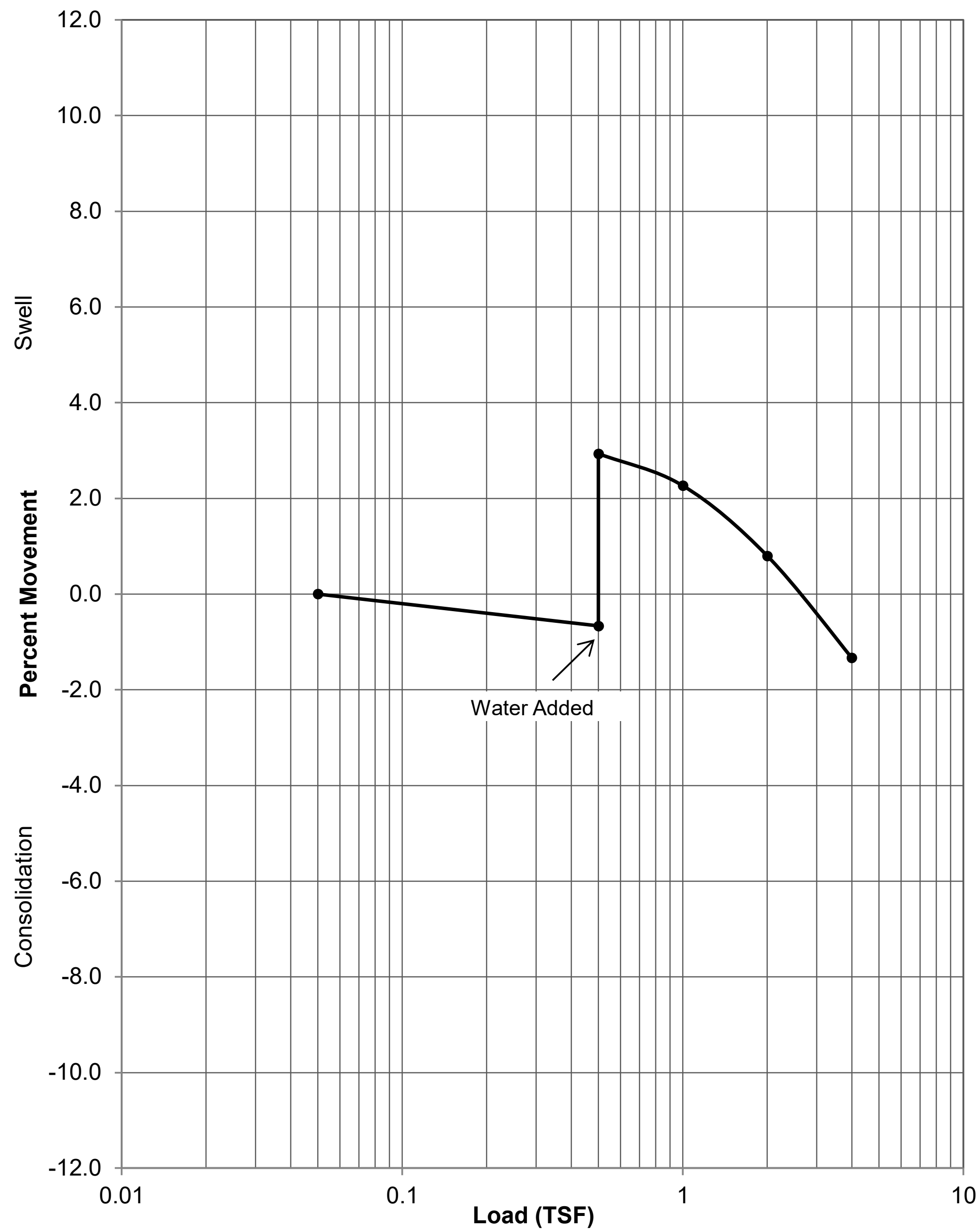
Material Description: Light Brown Lean Clay with Sand		
Sample Location: Boring 5, Sample 1, Depth 2'		
Liquid Limit:	Plasticity Index:	% Passing #200:
Beginning Moisture: 9.1%	Dry Density: 109.1 pcf	Ending Moisture: 22.3%
Swell Pressure: 2800 psf	% Swell @ 150: 6.5%	



Project: High Plains Bank
Location: Keenesburg, Colorado
Project #: 3212008
Date: May 2021

SWELL / CONSOLIDATION TEST RESULTS

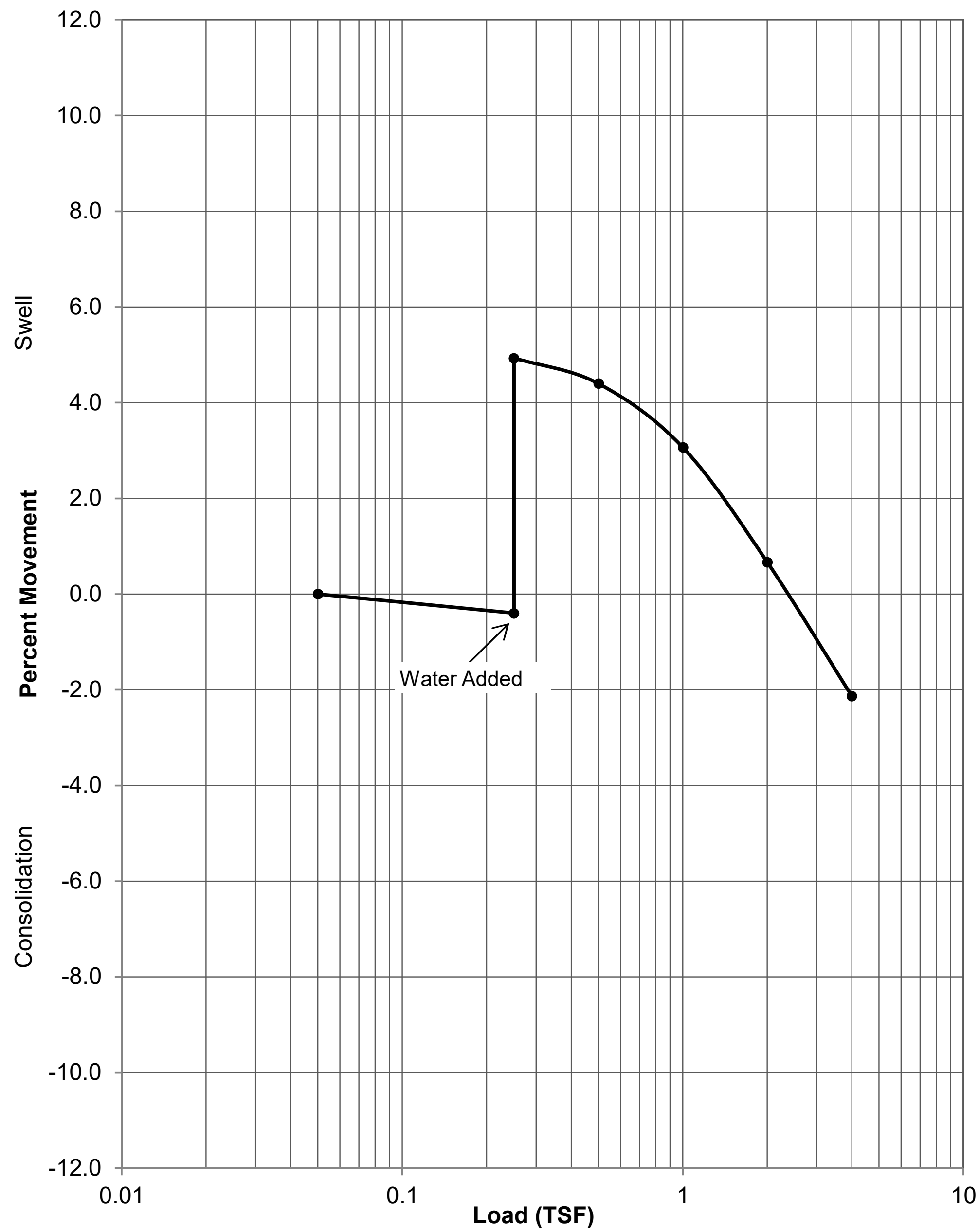
Material Description:	Claystone		
Sample Location:	Boring 5, Sample 5, Depth 19'		
Liquid Limit:	Plasticity Index:		% Passing #200:
Beginning Moisture: 16.4%	Dry Density: 115.7 pcf		Ending Moisture: 19.0%
Swell Pressure: 6600 psf		% Swell @ 1000: 3.6%	



Project: High Plains Bank
Location: Keenesburg, Colorado
Project #: 3212008
Date: May 2021

SWELL / CONSOLIDATION TEST RESULTS

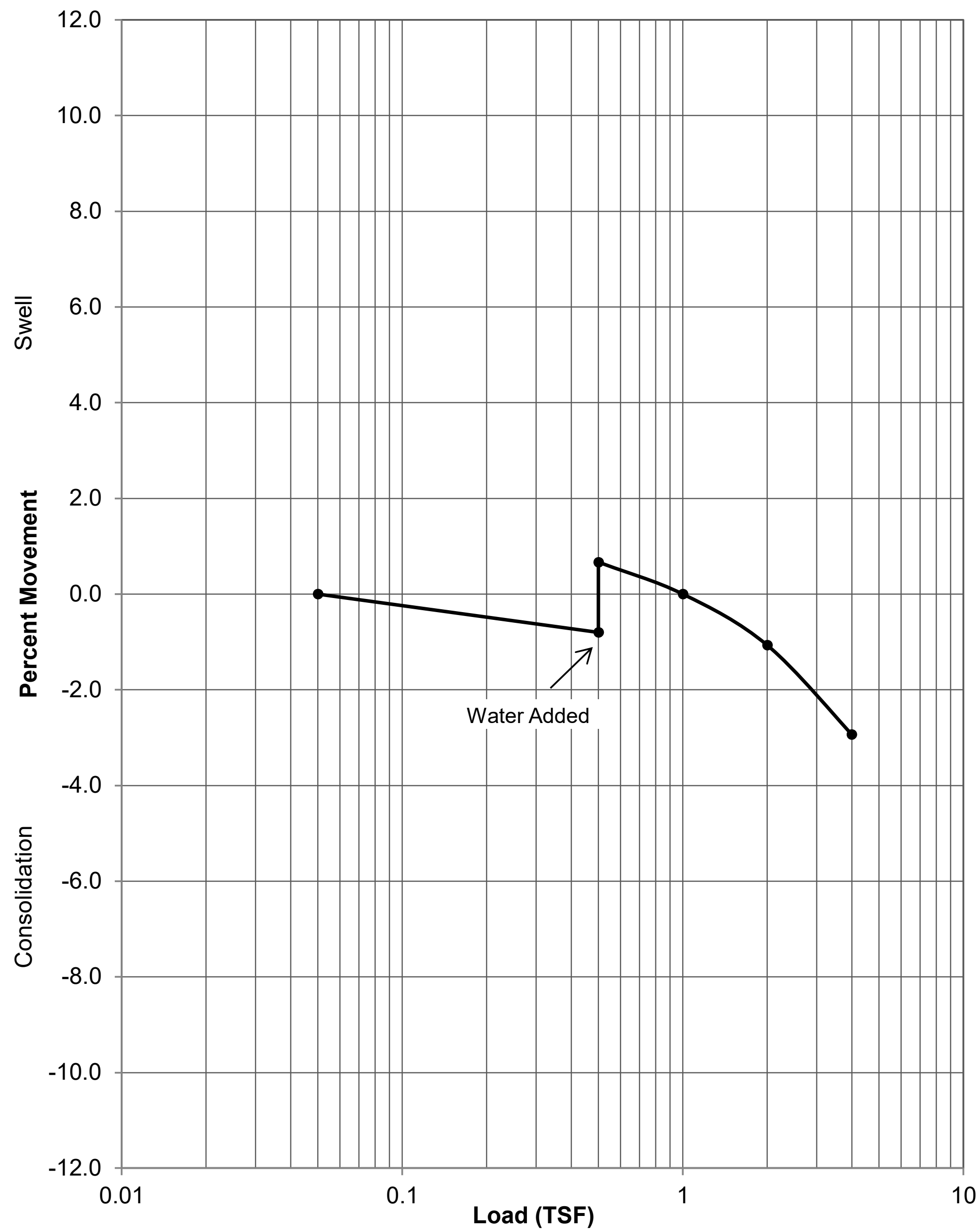
Material Description: Brown Lean Clay with Sand		
Sample Location: Boring 6, Sample 2, Depth 4'		
Liquid Limit: 37	Plasticity Index: 21	% Passing #200: 79.7%
Beginning Moisture: 10.2%	Dry Density: 117.4 pcf	Ending Moisture: 16.2%
Swell Pressure: 5000 psf	% Swell @ 500: 5.3%	



Project: High Plains Bank
Location: Keenesburg, Colorado
Project #: 3212008
Date: May 2021

SWELL / CONSOLIDATION TEST RESULTS

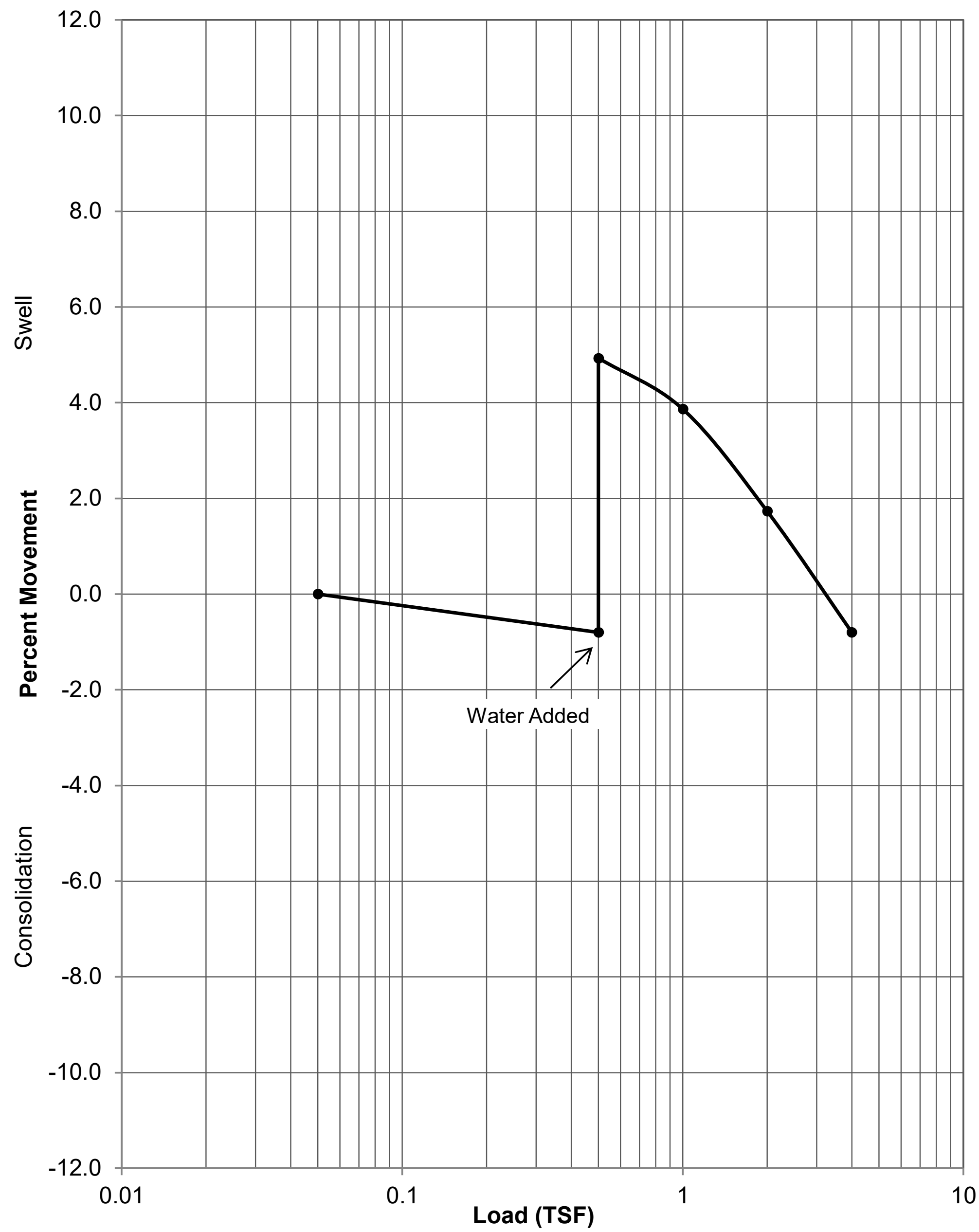
Material Description:	Claystone		
Sample Location:	Boring 6, Sample 4, Depth 14'		
Liquid Limit:	Plasticity Index:	% Passing #200:	
Beginning Moisture: 16.4%	Dry Density: 112.3 pcf	Ending Moisture: 18.8%	
Swell Pressure: 3500 psf		% Swell @ 1000: 1.5%	



Project:	High Plains Bank
Location:	Keenesburg, Colorado
Project #:	3212008
Date:	May 2021

SWELL / CONSOLIDATION TEST RESULTS

Material Description: Claystone			
Sample Location: Boring 6, Sample 6, Depth 24'			
Liquid Limit:	Plasticity Index:		% Passing #200:
Beginning Moisture: 20.6%	Dry Density: 106.3 pcf		Ending Moisture: 23.8%
Swell Pressure: 8000 psf		% Swell @ 1000: 5.7%	



Project: High Plains Bank
Location: Keenesburg, Colorado
Project #: 3212008
Date: May 2021