November 13, 2018

EARTH ENGINEERING CONSULTANTS, LLC

Eckas Water
1514 Ambrosia Court
Fort Collins, Colorado 80526

Attn: Mr. Wayne Eckas (wayne@eckaswater.com)

Re: Geotechnical Subsurface Exploration
Walker Recharge Pipeline Project
Morgan County, Colorado
EEC Project No. 3182009

Mr. Eckas:

Earth Engineering Consultants, LLC (EEC) personnel have completed the geotechnical subsurface exploration as requested for the proposed Walker Recharge Pipeline project planned for construction in Morgan County, Colorado. This geotechnical subsurface exploration was carried out in general accordance with our proposal dated September 17, 2018. Results of the subsurface exploration completed by EEC personnel are provided with this report.

We understand this project involves the installation of approximately 8,000 feet of 36-inch diameter water line (pipeline). The pipeline would generally extend from the west side of the intersection of County Road (CR) V and State Highway (SH) 144, southeast to the east side of the intersection of CR U and SH 144. A recharge pond is planned near the southeast terminus of the pipeline near CR U and SH 144. We understand the pipeline would be installed at depths of approximately 5 to 10 feet below existing surface grades.

EXPLORATION AND TESTING PROCEDURES

As requested, to develop information on existing subsurface conditions in the vicinity of the new pipeline alignment and recharge pond, EEC personnel advanced five (5) soil borings. Those borings extended to depths of approximately 15 or 40 feet below ground surface in the planned pipeline alignment and recharge pond areas, respectively. The boring locations were selected by

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Eckas Water personnel and established in the field by Earth Engineering Consultants, LLC (EEC) personnel by pacing and estimating angles from identifiable site features. The approximate boring locations are indicated on the attached boring location diagram. The locations of the borings should be considerate accurate only to the degree implied by the methods used to make the field measurements.

The borings were completed using a CME-55 drill rig equipped with a hydraulic head employed in drilling and sampling operations. The boreholes were advanced using 4¼-inch inside diameter hollow stem augers to maintain open boreholes for sampling. Field slotted piezometers were installed in two (2) of the completed test borings prior to backfilling the holes. Those piezometers were registered (under well owner names CCWD c/o Wayne Eckas) with Division of Water Resources and will require removal within 18 months with the appropriate filing abandonment reports submitted. 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 split-barrel and California barrel sampling procedures, standard sampling spoons are driven 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 accuracy, the consistency of cohesive soils. All samples obtained in the field were sealed and returned to our laboratory for further examination, classification and testing.

Laboratory testing on the samples obtained from the field included moisture content tests with dry density on relatively intact samples. The unconfined compressive strength of appropriate samples was estimated using a calibrated hand penetrometer. Washed sieve analysis and Atterberg limits tests were performed on selected samples to evaluate the quantity and plasticity of the fines in the subgrade materials. Swell/consolidation tests were completed on select samples to evaluate the tendency of the subgrade soils to change volume with variation in moisture content and load. Select samples were tested for pH, redox potential, resistivity and sulfites to evaluate the corrosion potential of the site subgrade materials. Results of the outlined tests are indicated on the attached boring logs and summary sheets.

As a part of the testing program, all samples were examined in the laboratory by an engineer and classified in 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.

SITE AND SUBSURFACE CONDITIONS

The pipeline would generally extend from the west side of the intersection of CR V and SH 144, just south of the South Platte River, and extend approximately 8,000 feet south and east to near the intersection of CR U and SH 144. At the northern terminus, the pipeline would lie within the river terrace of the South Platte River and, within a relatively short distance, extend into the dunes terrace to the south. The land along the alignment appears to consist of either irrigated farmland or open range that generally slopes to the river at about 1%. Evidence of prior building construction was not observed in the proposed alignment by EEC site personnel. Photographs of the site are included with this report.

An EEC field engineer was on site during drilling to direct the drilling activities and evaluate the subsurface materials encountered. 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 engineering evaluation. Based on results of the field borings and laboratory testing, subsurface conditions can be generalized as follows.

Approximately 0 to 12 inches of topsoil and/or vegetation was encountered at the surface of the boring locations. The topsoil/vegetation was underlain by sand with various amounts of silt which extended to the bottom of the completed test borings. At various depths within the borings, relatively thin lenses of clay and trace amounts of gravel were encountered. The sand soils were generally brown in color, and loose to medium dense.

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

Observations made while drilling and after completion of the borings to detect the presence and depth to free water. Free water was only encountered while drilling in test borings B-3, B-4 and B-5 at depths of approximately 8 to 15 feet below ground surface.

As noted previously, after completing the borings, field slotted piezometers were installed in test borings B-1, B-3, and B-4, while the remaining borings were backfilled. Approximately 10 days after drilling, in test borings B-3 and B-4, free water was observed at depths of approximately 10 and 14 feet below ground surface, respectively. Again, no free water was observed in test boring B-1.

Note that 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 in boreholes with piezometers installed is recommended to estimate fluctuations of groundwater levels over time.

ANALYSIS AND RECOMMENDATIONS

Pipeline Installation

Based on the subsurface conditions encountered and the anticipated depths of the pipeline, we anticipate installation depths would extend within the site sand and silty sand soils, with portions of the pipeline extending near or below the groundwater table (particularly nearer to the South Platte River).

We expect the subgrades encountered could be excavated using conventional excavation methods. Free water was encountered at depths ranging from approximately 8 to 15 feet below ground surface; therefore, dewatering would likely be necessary in portions of the pipeline to keep water out of excavated areas during construction. Due to the water table and essentially granular soils at the proposed pipeline elevation, instability of the soils is likely to be observed during excavation. Efforts should be made to prevent excavated areas from caving. Instability of the trench bottom may also be observed with the high groundwater. Depending, in part, on the mode of dewatering, stabilization of the base of the excavation may be needed prior to pipe placement.

The excavated sand and silty sand soils could be used for backfill above the new pipeline. The backfill soil should be placed in loose lifts not to exceed 9 inches thick, adjusting moisture content and compacted to at least 95% of the material's maximum dry density as determined by ASTM D698, the standard Proctor procedure. In areas where overlying improvements will not be constructed, lowering the compaction requirement to at least 90% of standard Proctor maximum dry density could be considered. The moisture content of the backfill soils should be adjusted within the range of ±2% of standard Proctor optimum moisture; however, cohesionless soils could be adjusted to within ±3%.

Throughout the project, excavations may extend to groundwater. Although the essentially granular soils could be used as backfill, drying of those materials will likely be needed prior to placement as backfill. In areas above groundwater level the subgrade soils may require additional moisture for use of those materials as backfill.

Augmentation Pond

In the area of the augmentation pond, test boring B-1, the subgrades encountered include silty sand which extended to the bottom of the completed test boring at approximately 40 feet below ground surface. Intermittent clay lenses were encountered at various depths in the test boring. In general, the silty sand soils exhibited low to no plasticity and contained low fines content. According to the United State Department of Agriculture Natural Resources Conservation Service, those subgrades are described as Valent Sand and Valentine-Dwyer Sands, which exhibit high to very high capacity to transmit water. It should be noted that although the subgrades are described as exhibiting a high capacity to transmit water, the clay encountered in the subgrades could significantly reduce vertical flow through the subgrades. Care should be taken when designing the augmentation system to consider the clay lenses reduction in vertical flow.

Corrosion Potential

Laboratory analytical testing was carried out on four (4) samples obtained from the test borings to evaluate the potential for corrosivity of buried cast iron pipe. Analytical laboratory testing included resistivity, pH, oxidation-reduction, and sulfide contents. These values, along with an opinion of the quality of subgrade drainage, are included on the attached summary sheets. We recommend a

qualified corrosion engineer review the information to design an appropriate level of corrosion and cathodic protection needed.

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 that 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 construction phases to help determine that the design requirements are fulfilled.

This report has been prepared for the exclusive use of the Eckas Water 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 modified or verified in writing by the geotechnical engineer.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this 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

Ethan P. Wiechert, P.E.
Senior Project Engineer

Reviewed by: David A. Richer, P.E.
Senior 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.
Hard	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≥4 and 1<Cc≤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≥6 and 1<Cc≤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.

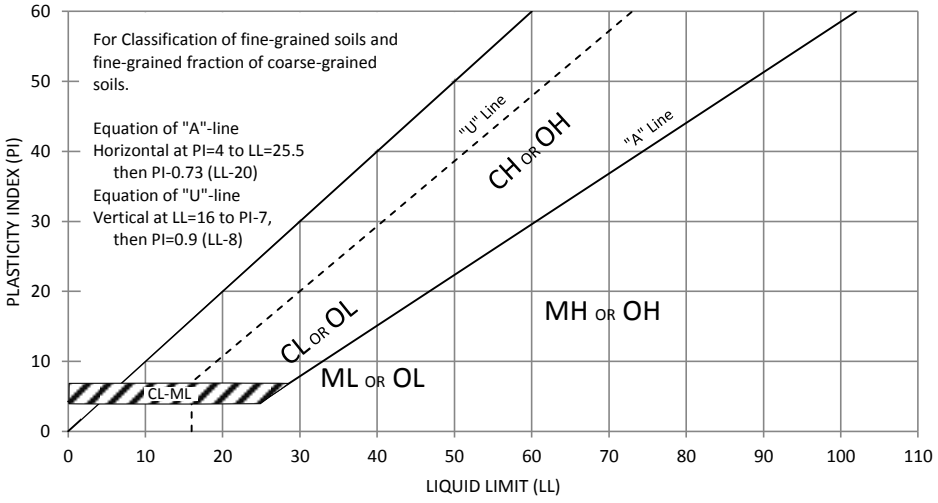
[M]If soil contains ≥30% plus No. 200 predominantly gravel, add "gravelly" to group name.

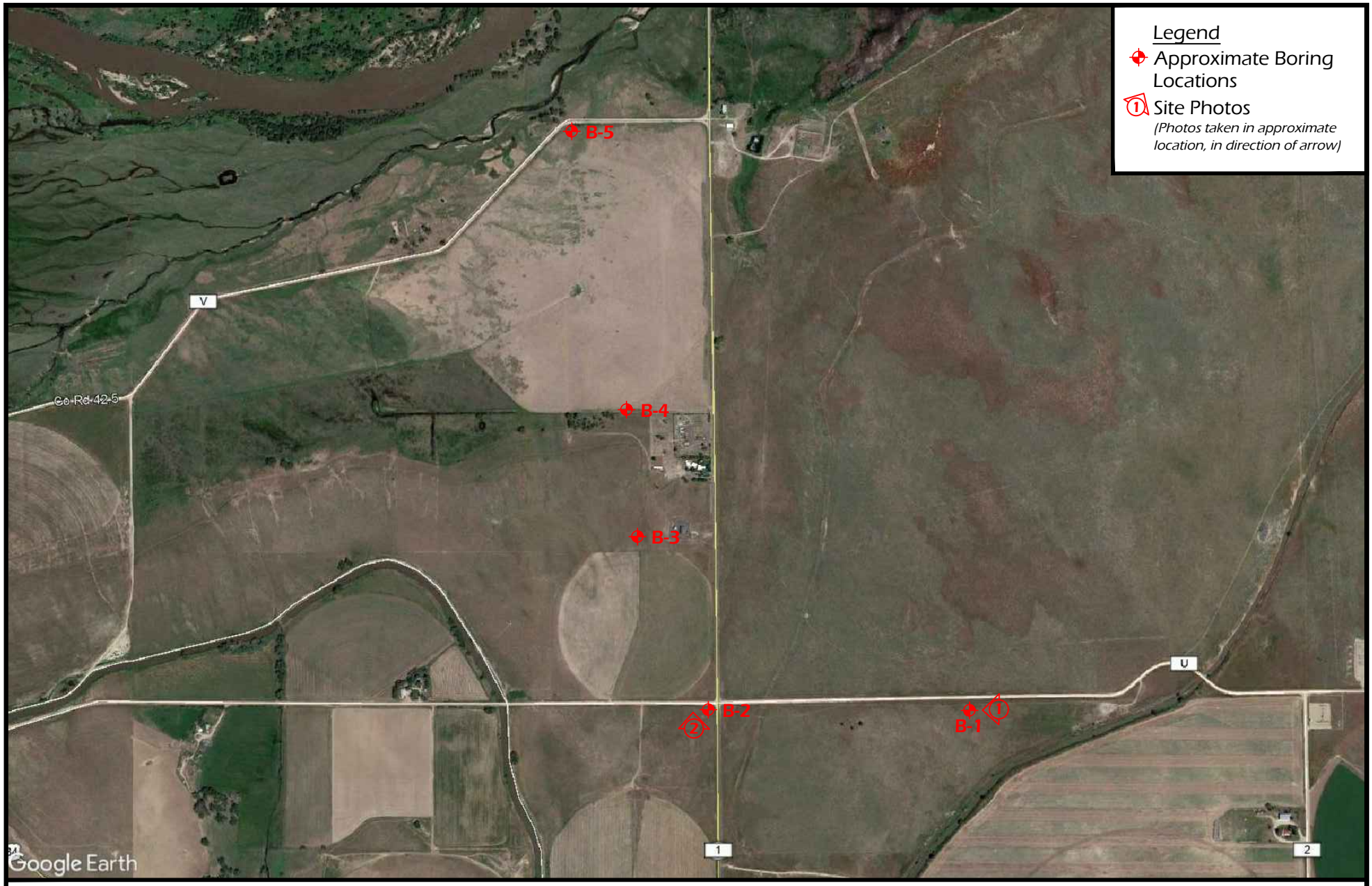
[N]PI≥4 and plots on or above "A" line.

[O]PI≤4 or plots below "A" line.

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

[Q]PI plots below "A" line.





North
Not to Scale

Boring Location Diagram
Walker Recharge Pipeline Project
Morgan County, Colorado
EEC Project #: 3182009 Date: October 2018

EARTH ENGINEERING CONSULTANTS, LLC

WALKER RECHARGE PIPELINE PROJECT
MORGAN COUNTY, COLORADO
EEC PROJECT NO. 3182009
OCTOBER 2018

WALKER RECHARGE PIPELINE PROJECT

MORGAN COUNTY, COLORADO

PROJECT NO: 3182009	**LOG OF BORING B-1 (PIEZOMETER)**		**DATE: OCTOBER 2018**
RIG TYPE: CME55	*SHEET 1 OF 1*		**WATER DEPTH**
FOREMAN: DG	**START DATE**	**10/22/2018**	**WHILE DRILLING**	**None**
AUGER TYPE: 4 1/4" H.S.A.	**FINISH DATE**	**10/22/2018**	**10/31/2018**	**None**
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 % @ 500 PSF
		1									
SILTY SAND (SM)		2									
brown		3									
medium dense		4									
intermittent clay seams	CS	**5**	**16**		**3.3**	**105.3**					
		6									
		7									
		8									
		9									
	SS	**10**	**18**		**13.3**						
		11									
		12									
		13									
with gravel		14									
clay seam	CS	**15**	**15**		**3.6**	**103.2**	**37**	**21**	**13.2**	**< 500 psf**	**None**
		16									
		17									
		18									
		19									
	SS	**20**	**30**		**7.3**						
		21									
		22									
		23									
		24									
	CS	**25**	**28**		**3.5**	**112.7**	**25**	**NP**	**13.3**		

Continued on Sheet 2 of 2

WALKER RECHARGE PIPELINE PROJECT

MORGAN COUNTY, COLORADO

PROJECT NO: 3182009	**LOG OF BORING B-1 (PIEZOMETER)**		**DATE: OCTOBER 2018**
RIG TYPE: CME55	*SHEET 2 OF 2*		**WATER DEPTH**
FOREMAN: DG	**START DATE**	**10/22/2018**	**WHILE DRILLING** — **None**
AUGER TYPE: 4 1/4" H.S.A.	**FINISH DATE**	**10/22/2018**	**10/31/2018** — **None**
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 % @ 500 PSF
Continued from Sheet 1 of 2		26									
SILTY SAND (SM)		27									
brown											
medium dense		28									
		29									
	SS	**30**	**26**		**5.0**						
		31									
		32									
		33									
		34									
medium dense to dense	SS	**35**	**33**		**2.1**		**NL**	**NP**	**14.6**		
		36									
		37									
		38									
		39									
	SS	**40**	**50**		**1.2**						
BOTTOM OF BORING DEPTH 40.5'		41									
		42									
		43									
		44									
		45									
		46									
		47									
		48									
		49									
		50									

WALKER RECHARGE PIPELINE PROJECT

MORGAN COUNTY, COLORADO

PROJECT NO: 3182009	**LOG OF BORING B-2**		**DATE: OCTOBER 2018**
RIG TYPE: CME55	*SHEET 1 OF 1*		**WATER DEPTH**
FOREMAN: DG	**START DATE**	**10/22/2018**	**WHILE DRILLING** **None**
AUGER TYPE: 4 1/4" H.S.A.	**FINISH DATE**	**10/22/2018**	
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 % @ 500 PSF
SPARSE VEGETATION & TOPSOIL		1									
SAND (SP)		2									
brown		3									
loose to medium dense		4									
	CS	**5**	**7**		**3.4**	**96.0**	**NL**	**NP**	**3.7**		
		6									
		7									
		8									
		9									
	SS	**10**	**10**		**2.3**						
		11									
		12									
		13									
		14									
	CS	**15**	**27**		**4.0**	**109.5**					
BOTTOM OF BORING DEPTH 15.0'		16									
		17									
		18									
		19									
		20									
		21									
		22									
		23									
		24									
		25									

WALKER RECHARGE PIPELINE PROJECT

MORGAN COUNTY, COLORADO

PROJECT NO: 3182009	**LOG OF BORING B-3 (PIEZOMETER)**		**DATE: OCTOBER 2018**
RIG TYPE: CME55	*SHEET 1 OF 1*		**WATER DEPTH**
FOREMAN: DG	**START DATE**	**10/22/2018**	**WHILE DRILLING** **9.0'**
AUGER TYPE: 4 1/4" H.S.A.	**FINISH DATE**	**10/22/2018**	**10/31/2018** **10.0'**
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 % @ 500 PSF
SILTY SAND (SM) brown loose		1 2 3 4									
SAND (SP) brown loose	SS	**5** 6 7 8 9	**6**		**4.6**						
SILTY SAND (SM) brown loose to medium dense	CS	**10** 11 12 13 14	**3**		**21.3**						
	SS	**15**	**11**		**22.3**						
BOTTOM OF BORING DEPTH 15.5'		16 17 18 19 **20** 21 22 23 24 **25**									

Earth Engineering Consultants, LLC

WALKER RECHARGE PIPELINE PROJECT

MORGAN COUNTY, COLORADO

PROJECT NO: 3182009	**LOG OF BORING B-4 (PIEZOMETER)**		**DATE: OCTOBER 2018**
RIG TYPE: CME55	*SHEET 1 OF 1*		**WATER DEPTH**
FOREMAN: DG	**START DATE**	**10/22/2018**	**WHILE DRILLING** **15.0'**
AUGER TYPE: 4 1/4" H.S.A.	**FINISH DATE**	**10/22/2018**	**10/31/2018** **14.0'**
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 % @ 500 PSF
SPARSE VEGETATION & TOPSOIL		1									
SILTY SAND (SM)		2									
brown		3									
loose		4									
	CS	**5**	**7**		**3.0**	**100.3**					
		6									
		7									
		8									
		9									
	SS	**10**	**8**		**11.9**		**19**	**NP**	**21.3**		
		11									
		12									
		13									
		14									
clay seam											
with gravel	CS	**15**	**8**	**1500**	**28.5**	**95.2**	**33**	**5**	**65.2**	**< 500 psf**	**None**
		16									
		17									
		18									
		19									
dense	SS	**20**	**38**		**14.3**						
BOTTOM OF BORING DEPTH 20.5'		21									
		22									
		23									
		24									
		25									

Earth Engineering Consultants, LLC

WALKER RECHARGE PIPELINE PROJECT

MORGAN COUNTY, COLORADO

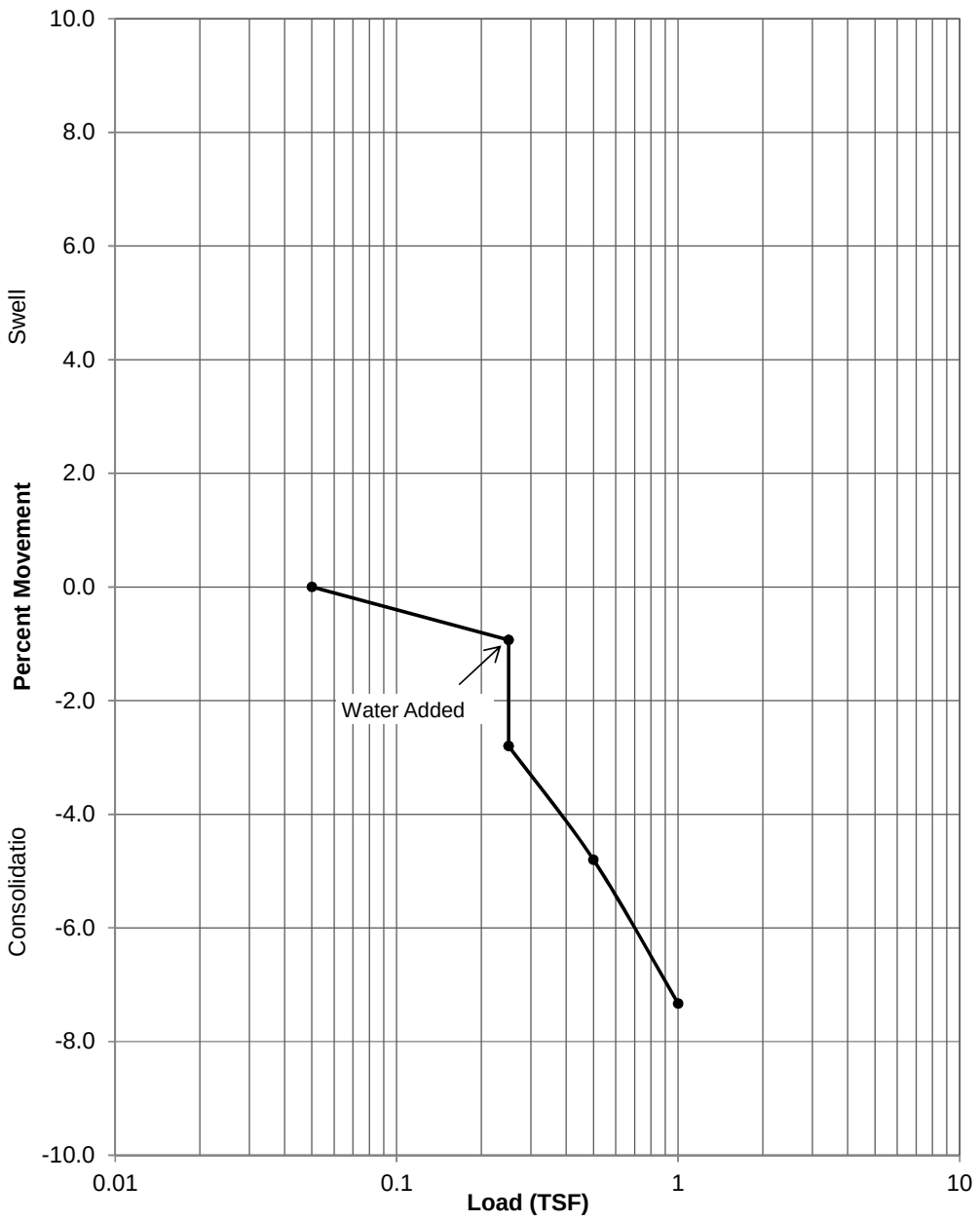
PROJECT NO: 3182009	**LOG OF BORING B-5**		**DATE: OCTOBER 2018**
RIG TYPE: CME55	*SHEET 1 OF 1*		**WATER DEPTH**
FOREMAN: DG	**START DATE**	**10/22/2018**	**WHILE DRILLING** **8.0'**
AUGER TYPE: 4 1/4" H.S.A.	**FINISH DATE**	**10/22/2018**	
SPT HAMMER: AUTOMATIC	**SURFACE ELEV**	**N/A**	

SOIL DESCRIPTION	TYPE	D (FEET)	N (BLOWS/FT)	QU (PSF)	MC (%)	DD (PCF)	A-LIMITS LL	A-LIMITS PI	-200 (%)	SWELL PRESSURE	SWELL % @ 500 PSF
SAND (SP) brown medium dense to loose	SS	5	11		7.6		NL	NP	3.7		
SILTY SAND (SM) brown	CS	10	6	No Recovery							
intermittent clay lenses	SS	15	6	500	22.7						
BOTTOM OF BORING DEPTH 15.5'											

Earth Engineering Consultants, LLC

SWELL / CONSOLIDATION TEST RESULTS

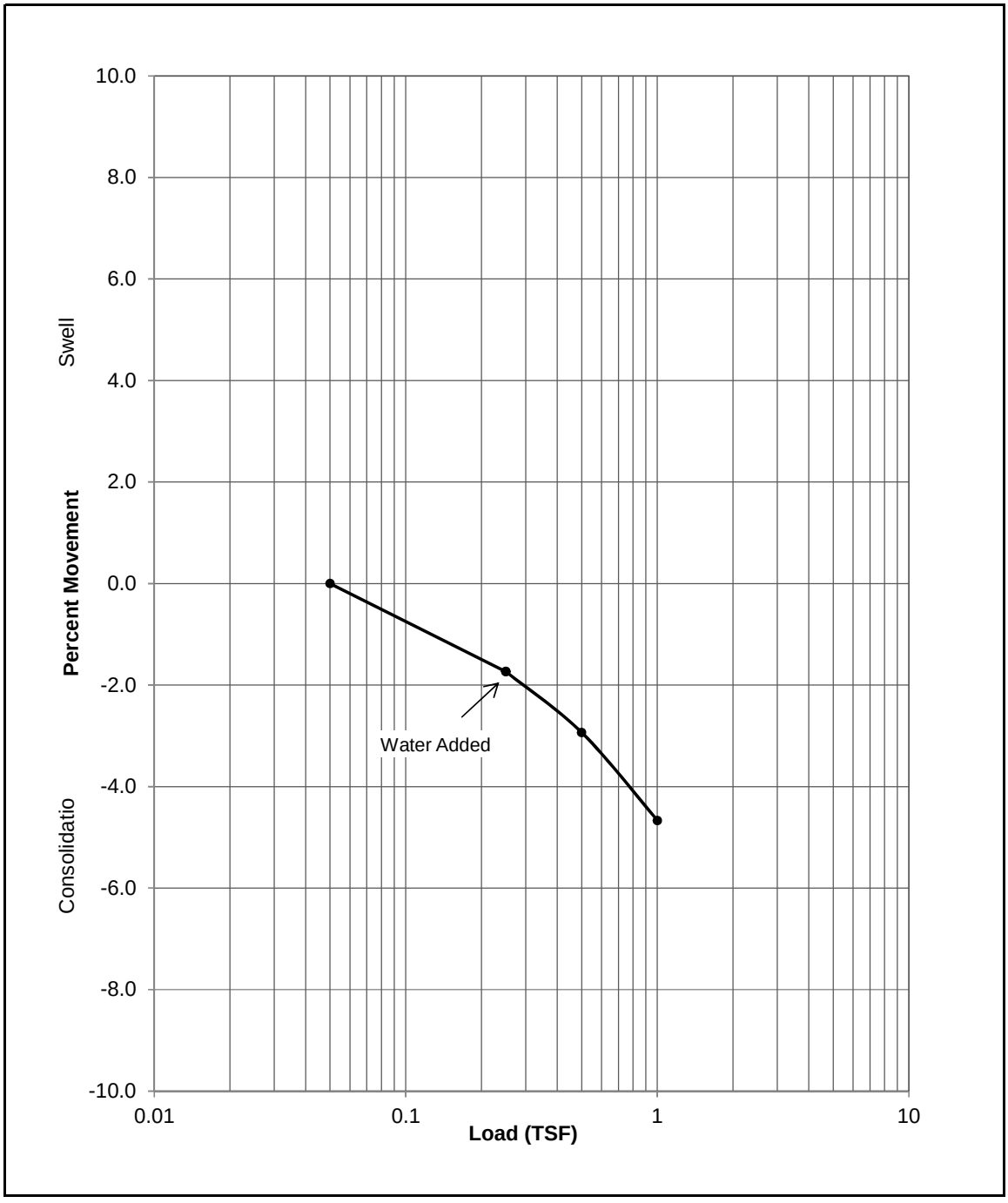
Material Description:	Brown Clayey Sand (SC)		
Sample Location:	Boring 1, Sample 3, Depth 14'		
Liquid Limit: 37	Plasticity Index: 21	% Passing #200: 13.2%	
Beginning Moisture: 3.6%	Dry Density: 113.6 pcf	Ending Moisture: 25.3%	
Swell Pressure: < 500 psf	% Swell @ 500: None		



Project: Walker Recharge Pipeline Project
Location: Morgan County, Colorado
Project #: 3182009
Date: October 2018

SWELL / CONSOLIDATION TEST RESULTS

Material Description:	Brown Sandy Silty Clay		
Sample Location:	Boring 4, Sample 3, Depth 14'		
Liquid Limit: 33	Plasticity Index: 5	% Passing #200: 65.2%	
Beginning Moisture: 28.5%	Dry Density: 92.9 pcf	Ending Moisture: 30.1%	
Swell Pressure: < 500 psf	% Swell @ 500: None		



Project: Walker Recharge Pipeline Project
Location: Morgan County, Colorado
Project #: 3182009
Date: October 2018

Soil-Test Evaluation for Gray or Ductile Cast-Iron Pipe (10-Point System)

Soil Characteristics		Points	Sample Results	Corresponding Points
[(1)] **Resistivity (ohm-cm)**	< 1,500	10	5010	0
	≥ 1,500 - 1,800	8		
	> 1,800 - 2,100	5		
	> 2,100 - 2,500	2		
	> 2,500 - 3,000	1		
	> 3000	0		
pH	0 - 2	5	8.61	3
	2 - 4	3		
	4 - 6.5	0		
	6.5 - 7.5	0 [(2)]		
	7.5 - 8.5	0		
	> 8.5	3		
Redox Potential	> + 100 mV	0	35	4
(Oxidation-Reduction)	+ 50 to + 100 mV	3.5		
	0 to + 50 mV	4		
	Negative Reading	5		
Sulfides	Positive	3.5	Trace - <1 (mg/kg)	2
	Trace	2		
	Negative	0		
Moisture	Poor drainage, continuously wet	2	Good to Poor	0-2
	Fair drainage, generally moist	1		
	Good drainage, generally dry	0		
			Total	**9-11**

Project:	Walker Recharge
Boring No.	B-2
Sample Depth, ft.	S-2, at 9'
Material Description:	Sand (SP)
EEC Project No.	3182009

*Note: the total should be expected to vary based on groundwater depth

(1) Based on water-saturated soil box method

(2) If Sulfides are present, and low or negative redox potential results are obtained, 3 points are applied for this range

Soil-Test Evaluation for Gray or Ductile Cast-Iron Pipe (10-Point System)

Soil Characteristics		Points	Sample Results	Corresponding Points
[(1)] **Resistivity (ohm-cm)**	< 1,500	10	7153	0
	≥ 1,500 - 1,800	8		
	> 1,800 - 2,100	5		
	> 2,100 - 2,500	2		
	> 2,500 - 3,000	1		
	> 3000	0		
pH	0 - 2	5	8.28	0
	2 - 4	3		
	4 - 6.5	0		
	6.5 - 7.5	0 [(2)]		
	7.5 - 8.5	0		
	> 8.5	3		
Redox Potential (Oxidation-Reduction)	> + 100 mV	0	28	4
	+ 50 to + 100 mV	3.5		
	0 to + 50 mV	4		
	Negative Reading	5		
Sulfides	Positive	3.5	Trace - <1 (mg/kg)	2
	Trace	2		
	Negative	0		
Moisture	Poor drainage, continuously wet	2	Good to Poor	0-2
	Fair drainage, generally moist	1		
	Good drainage, generally dry	0		
			Total	**6-8**

*Note: the total should be expected to vary based on groundwater depth

Project:	Walker Recharge
Boring No.	B-3
Sample Depth, ft.	S-3, at 14'
Material Description:	Silty Sand (SM)
EEC Project No.	3182009

(1) Based on water-saturated soil box method

(2) If Sulfides are present, and low or negative redox potential results are obtained, 3 points are applied for this range

Soil-Test Evaluation for Gray or Ductile Cast-Iron Pipe (10-Point System)

Soil Characteristics		Points	Sample Results	Corresponding Points
[1] **Resistivity (ohm-cm)**	< 1,500	10	5747	0
	≥ 1,500 - 1,800	8		
	> 1,800 - 2,100	5		
	> 2,100 - 2,500	2		
	> 2,500 - 3,000	1		
	> 3000	0		
pH	0 - 2	5	9.04	3
	2 - 4	3		
	4 - 6.5	0		
	6.5 - 7.5	0 [2]		
	7.5 - 8.5	0		
	> 8.5	3		
Redox Potential	> + 100 mV	0	22	4
(Oxidation-Reduction)	+ 50 to + 100 mV	3.5		
	0 to + 50 mV	4		
	Negative Reading	5		
Sulfides	Positive	3.5	Trace - <1 (mg/kg)	2
	Trace	2		
	Negative	0		
Moisture	Poor drainage, continuously wet	2	Good to Poor	0-2
	Fair drainage, generally moist	1		
	Good drainage, generally dry	0		
			Total	**9-11**

Project:	Walker Recharge
Boring No.	B-4
Sample Depth, ft.	S-2, at 9'
Material Description:	Silty Sand (SM)
EEC Project No.	3182009

*Note: the total should be expected to vary based on groundwater depth

(1) Based on water-saturated soil box method

(2) If Sulfides are present, and low or negative redox potential results are obtained, 3 points are applied for this range

Soil-Test Evaluation for Gray or Ductile Cast-Iron Pipe (10-Point System)

Soil Characteristics		Points	Sample Results	Corresponding Points
[(1)] **Resistivity (ohm-cm)**	< 1,500	10	6150	0
	≥ 1,500 - 1,800	8		
	> 1,800 - 2,100	5		
	> 2,100 - 2,500	2		
	> 2,500 - 3,000	1		
	> 3000	0		
pH	0 - 2	5	8.99	3
	2 - 4	3		
	4 - 6.5	0		
	6.5 - 7.5	0 [(2)]		
	7.5 - 8.5	0		
	> 8.5	3		
Redox Potential	> + 100 mV	0	29	4
(Oxidation-Reduction)	+ 50 to + 100 mV	3.5		
	0 to + 50 mV	4		
	Negative Reading	5		
Sulfides	Positive	3.5	Trace - <1 (mg/kg)	2
	Trace	2		
	Negative	0		
Moisture	Poor drainage, continuously wet	2	Good to Poor	0-2
	Fair drainage, generally moist	1		
	Good drainage, generally dry	0		
			Total	**9-11**

*Note: the total should be expected to vary based on groundwater depth

Project:	Walker Recharge
Boring No.	B-5
Sample Depth, ft.	S-3, at 14'
Material Description:	Silty Sand (SM)
EEC Project No.	3182009

(1) Based on water-saturated soil box method

(2) If Sulfides are present, and low or negative redox potential results are obtained, 3 points are applied for this range