GROUNDWATER QUALITY MONITORING PLAN AMÈN AGGREGATE RESOURCES DRMS PERMIT FILE M-2019-025

Prepared by: WEILAND INC. PO BOX 18087 BOULDER, CO 80308

Prepared for: COULSON EXCAVATING CO., INC 3609 N. COUNTY RD 13 LOVELAND, CO 80538

July 21, 2023

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1.0 INTRODUCTION

Pursuant to Rule 3.1.7 of the Mineral Rules and Regulations of The Colorado Mined Land Reclamation Board for The Extraction of Construction Materials, this Groundwater Monitoring Plan has been developed for the purpose of determining if sand and gravel mining and reclamation activities will degrade local groundwater quality to analyte concentrations above the State-wide groundwater quality standards established by the Water Quality Control Commission (WQCC). Since the area of the Amen Aggregate Resource (AAR) is identified by the state as "unclassified" the numeric standards as identified in 5 CCR 1002-41 shall be that quality which meets the most stringent criteria set forth in Tables 1 through 4 of "The Basic Standards for Groundwater." Which is given below in Section 1.2 Groundwater Standards.

2.0 HYDROGEOLOGIC SETTING

The Amen Aggregate Resource is located in the Big Thompson River Alluvial Valley (see Figure 1 Alluvial Aquifer). The valley width is approximately 2,000 ft – 3,000 ft wide and follows the trend of the river. The aquifer is composed of quaternary alluvial sand and gravel. Saturated sediment thickness ranges from 6ft-20ft and the average transmissivity is between 10,000 – 30,000 gpd/ft. Regional water table elevation contours are given in **Figure 1 Hydrogeologic Map** are based on the GIS layer published by the USGS Interactive Map of the Colorado Front Range Infrastructure Resources. The regional direction of groundwater flow in the valley is perpendicular to the flow of the river in the distal regions and becoming sub parallel and parallel to the flow of the river near the river. More detailed groundwater elevation contours for the AAR are given in Figure 2 Proposed Monitoring Well Locations. The water table elevations in Figure 2 are based on measurements from 2018 as follows:

- 32 test hole borings completed by Landmark Engineering (April 2018)
- 3 onsite existing wells EW-1, EW-2, EW-3 (April 2018) surveyed and measured by Weiland, Inc.
- 3 monitor wells LRM-MW-1, LRM-MW-2, LRM-MW-3, to the south collected by Loveland Ready Mix for Permit M-2001-022 (April 2018),
- 2 Terracon Test Borings B-2, B3 at the WCR 54 bridge (Jan 2020)
- Weiland, Inc. surveyed river water surface elevations (April 2018)
- Regional groundwater elevation contours published in 1998, USGS. Front Range Infrastructure Resources Project Fact Sheet 126-98, https://doi.org/10.3133/fs12698).

Landmark Test hole data, LRM water level measurements and Terracon water level measurements are given in Appendix I. The Weiland, Inc. data was transferred directly from the RTK GPS datalogger directly to the cad drawings.

The bedrock underneath the alluvial deposit is composed of weathered claystone and shale which is saturated to a thickness of 1-4ft. The soils above the alluvial aquifer in the vadose zone are composed primarily of sandy silt.

3.0 GROUNDWATER QUALITY MONITORING PLAN

3.1 GROUNDWATER STANDARDS

As described above, the numeric standards shall be the most restrictive of Tables 1-4. The most restrictive standards include Tables 1, 2 and 4 as well as Selected and are given below in Table 1.2.1.

TABLE 1 Domestic	Water Supply - Human Health	h Standards	
Parameter			
Biological		Standard	
Total Coliforms			
(30 day average)		2.2 ª	org/100 ml
Total Coliforms			
(max in 30 days)		23	org/100 ml
Inorganic			
Antimony	(Sb) ^{d, M}	0.006	mg/l
Asbestos	Μ	7,000,000	fibers/Liter
Arsenic	(As) ^{d, M}	0.01	mg/l
Barium	(Ba) ^{d, M}	2.0	mg/l
Beryllium	(Be) ^{d, M}	0.004	mg/l
Cadmium	(Cd) ^{d, M}	0.005	mg/l
Chromium	_(Cr) c, d, M	0.1	mg/l
Cyanide [Free]	(CN) ^M	0.2	mg/l
Fluoride	_(F) d, M	4.0	mg/l
Lead	(Pb) ^d	0.05	mg/l
Mercury	(Hg) ^{d,M}	0.002	mg/l
(inorganic)			
Molybdenum	(Mo) ^d	0.21	mg/l
Nickel	(Ni) ^d	0.1	mg/l
Nitrate	(NO ₃) ^{d, M}	10.0	mg/l as N
Nitrite	(NO ₂) ^{d, M}	1.0	mg/l as N
Total	(NO2+NO3)d, f	10.0	mg/l as N
Nitrate+Nitrite			
Selenium	(Se) ^{d, M}	0.05	mg/l
Silver	(Ag) ^d	0.05	mg/l
Thallium	(TI) ^{d, M}	0.002	mg/l

Table 1.2.1 Numeric Water Quality Standards

<u>Uranium</u> (<u>U)</u> d, 2		0.0168 to 0.03 ^M mg/l
Radiological ^{b,}		
<i>a</i>		
Gross Alpha Particle		
Activity ^{i, M}	15 pCi/l	
Beta and Photon Emitters ^e	4 mrem/year	

TABLE 2 - Domest	ic Water Supply - Drinkin	g Water Standards
Parameter	Standard	
Chlorophenol	0.0002	mg/l
Chloride (Cl) ^d	250.0	mg/l
Color	15.0	color units
Copper (Cu) ^d	1.0	mg/l
Corrosivity	Noncorrosive	
Foaming Agents	0.50	mg/l
Iron (Fe) ^d	0.30	mg/l
Manganese (Mn) ^d	0.05	mg/l
Odor	3.00	threshold odor
		numbers
рН	6.5 - 8.5	
Phenol	0.3	mg/l
Sulfate (SO 4) ^d	250.0	mg/l
Zinc (Zn) ^d	5.0	mg/l

TABLE 4 TDS Water Quality Standards	
Background TDS	Maximum Allowable
Value (mg/l)	TDS Concentrations
0 - 500	400 mg/l or 1.25
	times the background
	level, whichever is least
	restrictive
501 - 10,000	1.25 times the
	background value
10,001 or	No limit
greater	

TABLE 3 Select A	gricultur	al Standards*
Parameter	Standar	ď
Aluminum (Al) ^{d, f}	5 mg/l	mg/l
Boron (B) ^{d, g}	0.75 mg/l	mg/l
Cobalt (Co) ^d	0.05 mg/l	mg/l
Copper (Cu) ^d	0.2 mg/l	mg/l
Iron (Fe) ^d	5 mg/l	mg/l
Lithium (Li) ^{d, h}	2.5 mg/l	mg/l
Vanadium (V) ^d	0.1 mg/l	mg/l

*Omitted parameters that are included in Tables 1 &2 at higher concentration standards

It is requested that the following analytes be removed from the above tables for the baseline and site monitoring

- Gross Alpha Particle Activity
- Beta and Photon Emitters
- Chlorophenol
- Color
- Odor
- Asbestos
- Foaming Agents
- Phenol

The reasoning for this request is as follows; Concentrations of Gross Alpha Particle and Beta Photon Emitters are the result of decaying radionuclides, which occur naturally or are the result of man-made nuclear power plants and defense industry and some industrial waste. Not any of those activities have occurred in the area of the AAR. Additionally, it is known concentrations of radionuclides can occur in sedimentary rocks, the primary the local aquifer occurs in a sand and gravel deposit. Weathered claystone will be used for the compacted clay liner, however the permeability of that liner will be so low that it will not transmit water.

Chlorophenol, color, odor, asbestos, foaming agents, and Phenol are all parameters typically tested for in surface wastewater effluent. The groundwater in the area of the AAR is not directly subject to wastewater effluent and the site monitoring is for groundwater.

3.2 MONITOR WELL LOCATIONS AND CONSTRUCTION

The proposed monitor wells have been placed hydrologically upgradient and downgradient of the mining Cells (see Figure 1, Proposed Monitor Well Locations). Due to the fact that the site is hydrologically divided by the Big Thompson River, monitor wells have been placed upgradient and downgradient for the group of mining Cells as follows:

- For mining Cells 2,3, 4 and 6 upgradient wells include MW-1, MW-2, MW-4 and downgradient wells include MW-3 and MW-5.
- For Mining Cell 1 the upgradient well is MW-6 and the downgradient well is MW-7.
- For mining Cell 5 upgradient wells include MW-8 and MW-9 and the downgradient well is MW-10.

The monitor wells will be completed to fully penetrate the alluvial aquifer and will have screened intervals and depths as given in **Table 1.3.1 Monitor Well Construction Specifications.** The depths given in Table 1.3.1 are based on 3d surface model for top of bedrock developed from test hole data (see Appendix I). The screened interval will be 2" #10 slotted PVC tubing and the annulus will be backfilled with #10 Colorado silica sand. The 2" solid PVC sections will be backfilled with native sandy silt and capped with a bentonite seal. The wells will be fitted with a square tube riser set in concrete with a hinged lid. Wells will be developed by rapidly pumping and stopping until water runs clear.

Well	Depth (below ground surface)	Screen Interval
MW-1	22.0′	22.0'-12.0'
MW-2	24.7′	24.7'-17.7'
MW-3	9.1'	9.1'-4.1'
MW-4	24.4'	24.4'-14.4'

 Table 1.3.1 Monitor Well Construction Specifications

MW-5	12.2'	12.2'-4.2'
MW-6	20.0'	20.0'-10.0'
MW-7	25.0′	25.0'-15.0'
MW-8	11.0'	11.0'-5.0'
MW-9	12.0'	12.0'-4.0'
MW-10	9.3′	9.3'-4.3'

3.3 SAMPLING PLAN

3.3.1 Background Water Quality

For the purpose of establishing background water quality, 5 quarters of background sampling (quarterly) and 5 quarters of monthly water level measurements will be performed on *all* monitor wells following installation and annually thereafter.

For monitoring the potential effects of mining and reclamation on groundwater in the vicinity of Cells 2, 3, 4 and 6, monitor wells 1-5 were installed on 7/17/23 -7/18/23.

Similarly, for monitoring the potential effects from Cell 5 and Cell 1, monitor wells 6, 7, 8, 9, and 10 will be installed a minimum of 1.25 years prior to any mining activity in those areas east north of the Big Thompson River. It is felt that the installation of these wells at that time is appropriate since the areas will not be mined for approximately 10+ years. Cell 5 occurs north of the river and Cell 1 occurs east of the river. The river serves as a hydrologic divide between these Cells and Cells 2, 3, 4 and 6. The groundwater upgradient of Cells 1 and 5 is also subject to different bedrock and land use. Additionally, timing background monitoring closer to the time of mining will provide a better picture of water chemistry and levels relative to the potential effects of mining at that future time.

Coulson Excavating Co., Inc. (CEC) will commit to not mining Cell 1 and Cell 5 until at least 5 quarters of background sampling and 5 quarters of monthly water levels have been completed.

Sampling will begin immediately following well construction and development. Sampling methodology will be to purge 3 times the water column volume followed by sampling with a dedicated bailer. Samples will be placed in analytical laboratory sampling vessels and sealed with a chain of custody. Field water quality parameters will include water level, pH, temp, and specific conductivity. All field meters shall be regularly calibrated.

At the time of sampling for inorganic analytes, appropriate filtering, preservation and or maintenance of temperature parameters will be followed as directed by the analytical laboratory. These procedures will be documented in the field logs.

Water quality samples will be delivered (not to exceed holding times or temperatures) to a reputable analytical laboratory certified for current EPA standards and methodologies.

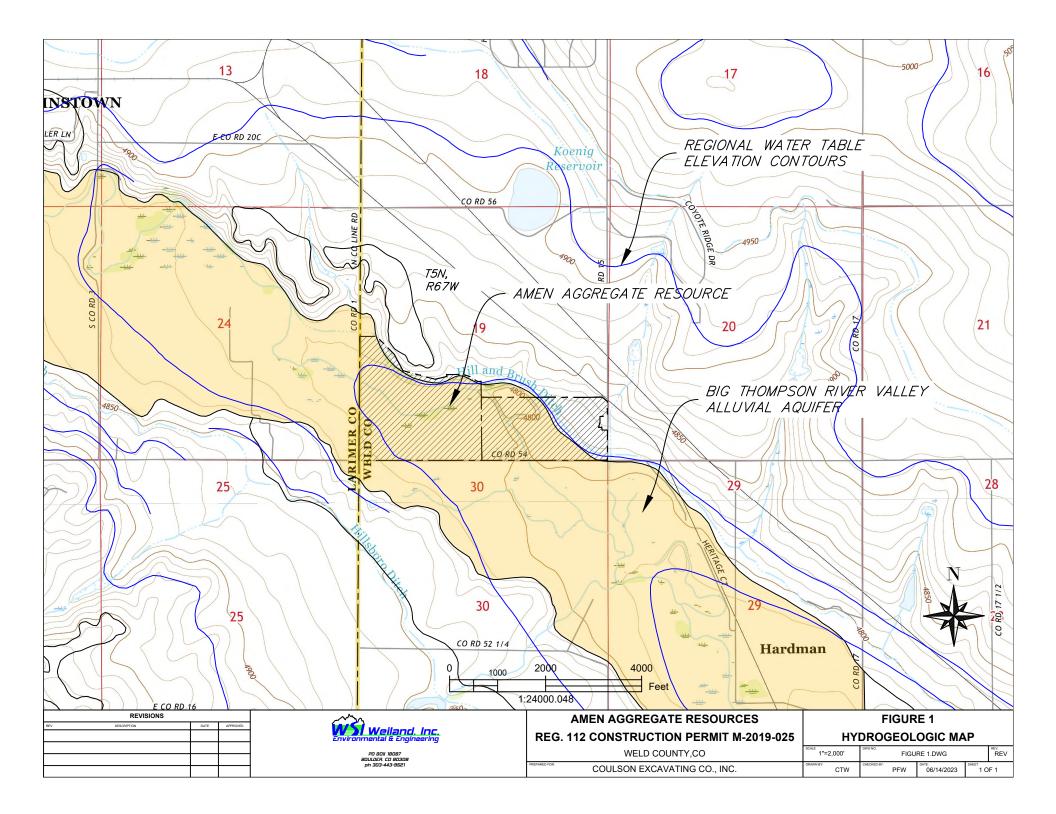
A field logbook will be developed and will include date, time, purge method and volume, temp. pH, specific conductivity, samples collected, filtering information, preservation, instrument calibration data and other pertinent data as needed for each sampling event. CEC or their agent will retain these records for submittal to DRMS as may be required.

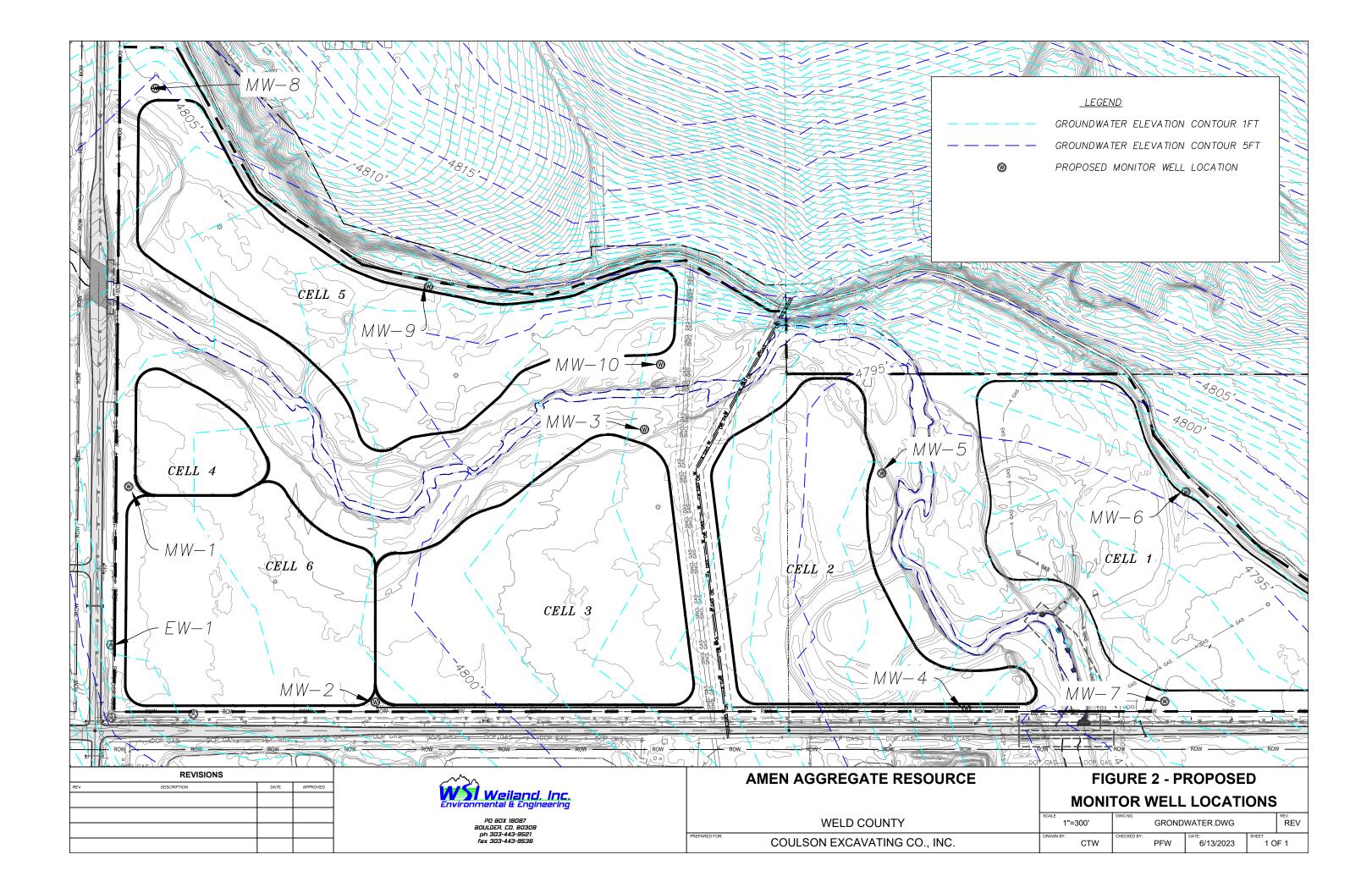
3.3.2 Continued Monitoring and Compliance

A Technical Revision (TR) will be submitted following the completion of the 5 quarters of monitoring and water level measurement for wells 1-4. Another TR will be submitted following the completion of 5 quarters of the same for wells 5-10. The TR's will contain a baseline data report, comparisons to the Table Value Standards, surveyed monitoring well locations and elevations, construction diagrams, and an updated groundwater contour map.

Following submittal of the TR's, DRMS will evaluate the 5 quarters of data and constituents identified as exceeding table value standards in baseline data. Permit-specific benchmarks will be set by DRMS for those constituents identified as exceeding table value standards in baseline data, as wells as sampling and reporting requirements for continued monitoring. Reporting requirements and follow-up actions for observed exceedances of either groundwater level or quality benchmarks will be specified and approved in these revisions.

The continued water quality monitoring will utilize the same standards, methodology and documentation as identified in Section 3.3.1 above.





APPENDIX I

April 19, 2018 Project No. CEXCAV-18D9A-14-709

Ken Coulson Coulson Excavation 3609 North County Road 13 Loveland, CO 80538 Landmark

Engineering

Loveland 970-667-6286 Toll Free 866-379-6252 Fax 970-667-6298 www.landmarkltd.com

3521 West Eisenhower Blvd. Loveland, Colorado 80537

Dear Ken,

At your request, Landmark Engineering Ltd performed subsurface exploration drilling on the Amen property located at the northeast corner of Weld County Roads 13 and 54. This property is bisected by the Big Thompson River. The purpose of this investigation was to evaluate the thickness of the overburden soil and alluvial sands, gravels and cobbles via 32 test boring locations on the site.

As the boring operation advanced, an index of soils relative density and consistency was obtained, in Test Boring No.'s 1, 8 & 11 at various depths, by use of the standard penetration test (SPT), ASTM Standard Test D-1586. The penetration test results, listed on the grain size distribution graphs, are the number of blows required to drive a 2-inch diameter split-spoon sampler 1 foot into undisturbed soil/gravel using a 140-pound hammer dropped 30 inches.

In summary, the overburden soil classified as sandy lean clay/silty clayey sand/sandy silt soils that ranged in thicknesses from 0 to 9 feet while the underlying sand, gravel and cobble deposit thicknesses ranged from 2 to 20.5 feet thick. Even though a few SPT and auger samples were obtained and classified, the true quality of sand and gravel deposit was not evaluated at this time. If necessary, it is recommended that test pits be dug to collect sizeable bulk samples containing large gravel and cobble material that was omitted from our test boring samples.

Please find enclosed the Test Hole Site Plan, Boring Summary Sheet and soil classification/SPT test results. If you have any questions please call our office.

Best Regards,

Landmark Engineering Ltd.

Larry Miller, PO

Enclosures



BORING SUMMARY SHEET

BORING NO.	THICKNESS OF OVERBURDEN	DEPTH TO SHALE BEDROCK	SAND/GRAVEL THICKNESS	WATER LEVEL
B1	6'	20'	14'	5'
B2	5.5'	21'	15.5'	5'
B3	6'	22.5'	16.5'	4'
B4	5.5'	21'	15.5'	5.5'
B5	2'	22.5'	20.5'	4.5'
B6	5.5'	23'	17.5'	5'
B7	8'	22.5'	14.5'	6'
B8	6.5'	25'	18.5'	6'
B9	5'	20'	15'	6.5'
B10	7.5'	24'	16.5	6'
B11	4.5'	12.5	8'	5'
B12	5'	25'	20'	5'
B13	1.5'	12.5'	11'	5.5'
B14	4.5'	23'	18.5'	6'
B15	5.5'	15'	9.5'	6'
B16	3'	12'	9'	7'
B17	1'	9'	8'	7'
B18	6.5'	25'	18.5'	7'
B19	6.5'	23'	16.5'	6.5'
B20	8'	19.5'	11.5'	7'
B21	9'	18'	9'	8.5'
B22	5.5'	15'	9.5'	6.5'
B23	4'	16.5'	12.5'	5'
B24	6.5'	9'	2.5'	5.5'
B25	0'	13.5'	13.5'	3'
B26	8'	10'	2'	5'
B27	5'	15'	10'	6'
B28	3.5'	15'	11.5'	6'
B29	5'	14'	9'	7'
B30	3.5'	15'	11.5'	6'
B31	5.5'	9'	3.5'	8'
B32	2'	10.5'	8.5'	5'

Well Name	Date Measured	1/12/2018	18	4/5/2018	∞	018 4/5/2018 7/00/0019	0				
	Stick-up (ft)	Depth TOC (ft) DTW/ (ft)	-	Denth TOC 141	DTM 161	1/2/42/1		10/4/2018	81	1/11/2019	19
MW-01	2 07	202	-		DIW (TE)	Depth_IOC (tt)	DTW (ft)	Depth_TOC (ft) DTW (ft)	DTW (ft)	Depth TOC (ft)	DTW (ft)
NIN AT		16.1	5.05	8.05	5.13	8.55	5.63	8.81	5 89	8 60	
NTO-ANIAI	3.05	18.82	15.77	19.12	16.07	20.34	17 70	CF 0C	22.00	0.00	2.08
MW-02	3.04	cc 2	1 10	UL L		10.01	57.17	20.73	17.68	18.77	15.72
MW-02A	0 01		4.10	1.10	4.66	7.88	4.84	8.09	5.05	7.62	1 20
	10.7	CT.FT	15.84	19.10	15.79	18.90	15 50	10.72	100		Tiu
MM-03	2.95	11.31	8.36	11 25	UC Ø	1100		C7.CT	76.67	1/.81	14.50
MW-04	2.83	10.82	7 00	10.04	0.00	27.72	8.93	12.18	9.23	11.26	8.31
MW-04A	200	10.02	25.1	T.6'0T	8.08	9.36	6.53	9.55	6.72	10.08	7 75
111.0.	TC'C	20.27	16.96	20.81	17.50	18 66	1 7 2 7	40 10		-0.00	1.2.1
MW-05	2.75	9.62	6.87	9.62	F 87	000	C.1.7	TO'TO	14./9	18.22	14.91
MW-06	3.00	15.03	17 02	1 / 00	14.00	20.0	0.1/	9.23	6.48	9.18	6.43
MW-06A	217	244		14.00	11.00	14.50	11.50	15.00	12.00	15.17	12 17
NAIN OF	0.1/	24.81	21.64	24.37	21.20	24.95	21.78	24.81	21 64	27 62	17.77
IO-MAIAI	76.7	12.40	9.48	12.52	9 60	10.01	4 00			24.00	21.40
MW-07A	3.05	18.19	15.14	18 55	100	10.01	1.09	12.26	9.34	11.98	9.06
MW-08	3.27	11 72	7 0.5	HU.JU	10.00	75.81	15.47	18.26	15.21	18.54	15.49
A CONTRACTOR OF A CONT	1310	C7.TT	1.90	11.36	8.09	11.45	8.18	12 32	0 00	1 1 1	
MW-09	0.20	11.18	7.98	11.26	8.06	11.57	8 27	12 05	0.00	T4.7T	9.14

TOC = TOP OF CASING DTW = DEPTH TO WATER

1	ATER OBSERVATIO	N DATA	
Date	Depth Measured (PVC rim to water) (ft.)	Depth Below Original Ground (ft)	Notes
9/10/2010	9.1	6	
12/7/2010	10.27	7.17	
3/15/2011	10.39	7.29	
6/8/2011	9.75	6.65	
9/9/2011	10.2	7.1	
1/9/2012	10.27	7.17	
3/12/2012	10.38	7.28	
6/19/2012	9.6	6.5	
9/2/2012	9.34	6.24	
1/9/2013	10.32	7.22	
7/9/2013	9.9	6.8	
9/9/2013	9.75	6.65	
12/18/2013	10.15	7.05	
3/27/2014	10.3	7.2	
7/5/2014	9.7	6.6	
11/7/2014	10.45	7.35	
1/11/2015	10.2	7.1	
3/30/2015	10.12	7.02	
6/25/2015	9.47	6.37	
9/30/2015	9.8	6.7	
1/11/2016	10.05	6.95	
3/22/2016	10.17	7.07	
6/9/2016	10.5	7.4	
10/6/2016	9.9	6.8	
1/11/2017	10.12	7.02	
5/15/2017	9.7	6.6	
10/5/2017	9.38	6.28	
1/12/2018	10.22	7.12	
4/5/2018	10.35	7.25	Cell 4 Filled in February
7/24/2018	10.17	7.07	
10/4/2018	10.54	7.44	
1/8/2019	10.81	7.71	
4/23/2019	10.67	7.57	
7/10/2019	10.25	7.15	
10/15/2019	10.68	7.58	

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	ATER OBSERVATIO rty - Well Number 2	N DATA	
Green riope			
Date	Depth Measured	Depth Below	Notes
	(PVC rim to water)	Original Ground	
	(ft.)	(ft)	
9/10/2010	5.64	2.74	
12/7/2010	5.45	2.55	
3/15/2011	5.64	2.74	
6/8/2011	5.85	2.95	
9/9/2011	5.65	2.75	
1/9/2012	5.7	2.8	
3/12/2012	5.64	2.74	
6/19/2012	5.75	2.85	
9/2/2012	6.03	3.13	
1/9/2013	7.5	4.6	farm pond drained
7/9/2013	5.9	3	
9/9/2013	5.63	2.73	
12/18/2013	5.3	2.4	
3/27/2014	6.03	3.13	
7/5/2014	5.63	2.73	
11/7/2014	5.53	2.63	
1/11/2015	5.5	2.6	
3/30/2015	5.33	2.43	
6/25/2015	5.4	2.5	deer flys horrendous
9/30/2015	5.61	2.71	
1/11/2016	5.13	2.23	
3/22/2016	6.1	3.2	
6/9/2016	6.56	3.66	
10/6/2016	5.4	2.5	
1/11/2017	5.1	2.2	
5/15/2017	5.4	2.5	
10/5/2017	4.41	1.51	
1/12/2018	5.33	2.43	
4/5/2018	5.87	2.97	Cell 4 Filled in February
7/24/2018	5.61	2.71	
10/4/2018	6.4	3.5	
1/8/2019	6.13	3.23	
4/23/2019	6.32	3.42	
7/10/2019	6.26	3.36	
10/15/2019	6.01	3.11	

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	ATER OBSERVATIO rty - Well Number 3	N DATA						
Date	Depth Measured (PVC rim to water) (ft.)	Depth Below Original Ground (ft)	Notes					
9/10/2010	9.21	6.31						
12/7/2010	7.9	5						
3/15/2011	9.21	6.31						
6/8/2011	7.9	5						
9/9/2011	7.23	4.33						
1/9/2012	7.4	4.5						
3/12/2012	7.85	4.95						
6/19/2012	8.88	5.98						
9/2/2012	8.82	5.92						
1/9/2013	8.8	5.9						
7/9/2013	7.53	4.63						
9/9/2013	8.7	5.8						
12/18/2013	7.7	4.8						
3/27/2014	8.62	5.72						
7/5/2014	7.7	4.8						
11/7/2014	8.2	5.3						
1/11/2015	8.9	6						
3/30/2015	8.8	5.9						
6/25/2015	9.9	7						
9/30/2015	9	6.1						
1/11/2016	8.62	5.72						
3/22/2016	8.4	5.5						
6/9/2016	8.05	5.15						
10/6/2016	8.9	6						
1/11/2017	8.7	5.8						
5/15/2017	8.9	6						
10/5/2017	7.33	4.43						
1/12/2018	9.12	6.22						
4/5/2018	9.21	6.31	Cell 4 Filled in February					
7/24/2018	9.15	6.25						
10/4/2018	7.95	5.05						
1/8/2019	9.11	6.21						
4/23/2019	8.48	5.58						
7/10/2019	9.01	6.11						
10/15/2019	8.21	5.31						

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Geotechnical Engineering Report

Weld County Bridge 54-13A

Johnstown, Colorado

January 24 Revised August 24, 2020 Terracon Project No. 21195074A (revised)

Prepared for:

J-U-B Engineers, Inc. Fort Collins, Colorado

Prepared by:

Terracon Consultants, Inc. Greeley, Colorado

Facilities

😑 Geo

January 24, 2020 Revised August 24, 2020



J-U-B Engineers, Inc. 4745 Boardwalk Drive Fort Collins, Colorado 80525

Attn: Mr. Jeff Temple, P.E. P: (970) 377-3602 E: itemple@jub.com

Re: Geotechnical Engineering Report Weld County Bridge 54-13A 6724 County Road 54 Johnstown, Colorado Terracon Project No. 21195074A (revised)

Dear Mr. Temple:

Terracon Consultants, Inc. (Terracon) has completed the geotechnical engineering services for the project referenced above. This study was performed in general accordance with Terracon Proposal No. P21195074A (Revised) dated September 6, 2019 and revised November 1, 2019. This report presents the findings of the subsurface exploration and provides geotechnical recommendations concerning earthwork and the design and construction of foundations and pavements for the proposed project. This report has been revised to include additional pavement thickness recommendations.

We appreciate the opportunity to be of service to you on this project. Materials testing and construction observation services are provided by Terracon as well. We would be pleased to discuss these services with you. If you have any questions concerning this report, or if we may be of further service, please contact us.

Sincerely, Terracon Consultants, Inc.

Maia G. Hayes, E.I. Staff Geotechnical Engineer

Eric D. Bernhardt, PE/ONAL

Geotechnical Department Manager

 Terracon Consultants, Inc.
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 Greeley, Colorado 80631

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REPORT TOPICS

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Note: This report was originally delivered in a web-based format. **Orange Bold** text in the report indicates a referenced section heading. The PDF version also includes hyperlinks which direct the reader to that section and clicking on the *GeoReport* logo will bring you back to this page. For more interactive features, please view your project online at <u>client.terracon.com</u>.

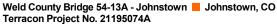
ATTACHMENTS

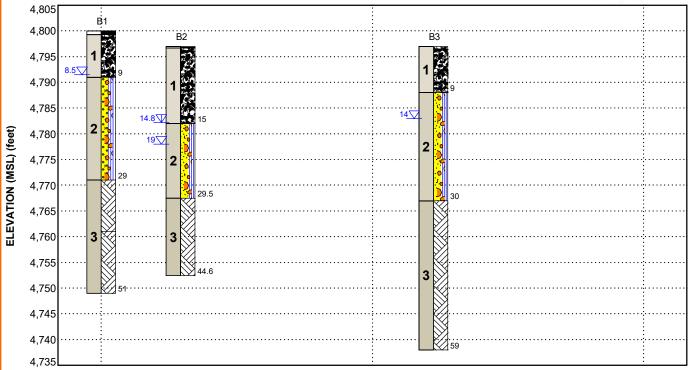
EXPLORATION AND TESTING PROCEDURES SITE LOCATION AND EXPLORATION PLANS EXPLORATION RESULTS

SUPPORTING INFORMATION

Note: Refer to each individual Attachment for a listing of contents.

GEOMODEL





This is not a cross section. This is intended to display the Geotechnical Model only. See individual logs for more detailed conditions.

Model Layer	Layer Name	General Description					
1	FILL	Fill consisting of clayey sand to poorly graded sand. Loose to medium dense.					
2	Poorly to well graded sand	Poorly to well graded sand with varying amounts of silt and gravel, brown to gray, medium dense to very dense.					
3	Bedrock	Sandstone to siltstone bedrock, gray to dark gray, hard to very hard.					

LEGEND



Bedrock

Fill Poorly-graded Sand with Silt and Gravel

✓ First Water Observation

✓ Second Water Observation

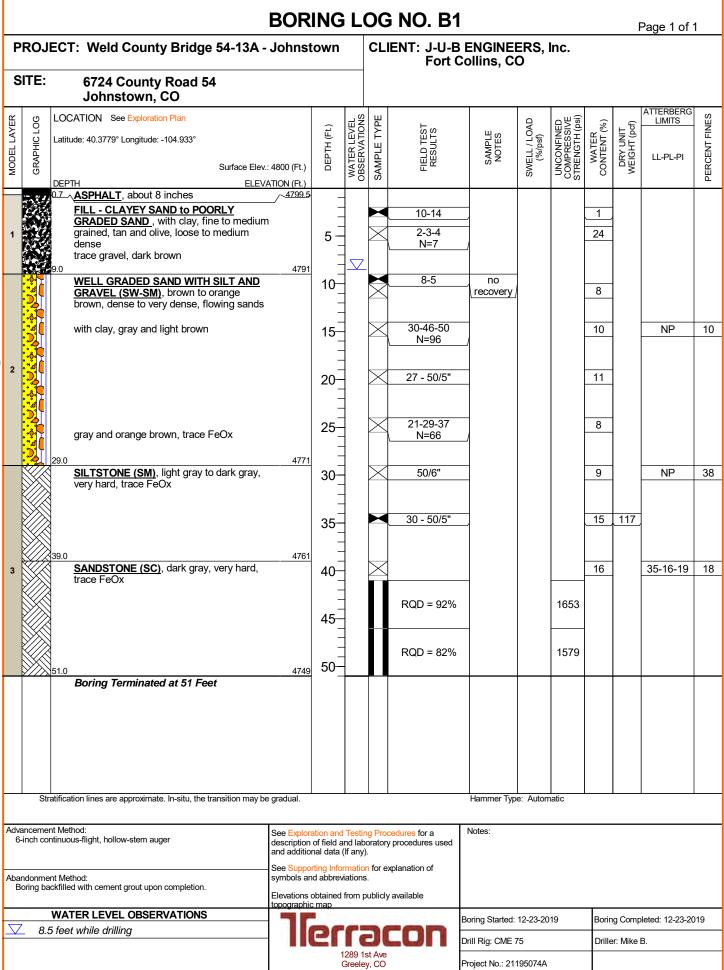
Groundwater levels are temporal. The levels shown are representative of the date and time of our exploration. Significant changes are possible over time. Water levels shown are as measured during and/or after drilling. In some cases, boring advancement methods mask the presence/absence of groundwater. See individual logs for details. NOTES:

Layering shown on this figure has been developed by the geotechnical engineer for purposes of modeling the subsurface conditions as required for the subsequent geotechnical engineering for this project.

Terracon

GeoReport

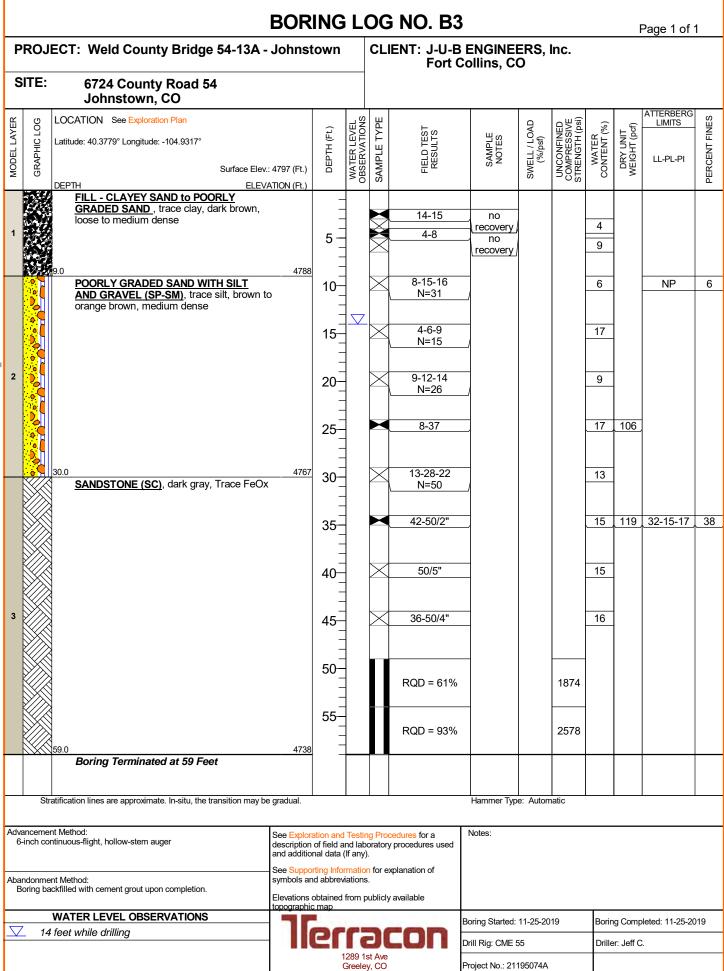
Numbers adjacent to soil column indicate depth below ground surface.



THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 21195074A WELD COUNTY BRIDG. GPJ TERRACON. DATATEMPILATE.GDT 1/23/20

	BORING LOG NO. B2 Page 1 of 1														
PROJECT: Weld County Bridge 54-13A - Johnstown					CLIENT: J-U-B ENGINEERS, Inc. Fort Collins, CO										
S	ITE:	6724 County Road 54 Johnstown, CO					Fort	Johns, Ci	0						
MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 40.378° Longitude: -104.9327° Surface Elev.: 4797 DEPTH ELEVATION		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	SAMPLE NOTES	SWELL / LOAD (%/psf)	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	Atterberg Limits LL-PL-PI	PERCENT FINES	
1		0.3.^ <u>ASPHALT</u> , about 4 inches // FILL - CLAYEY SAND to POORLY <u>GRADED SAND (SC)</u> , trace gravel, fine to medium grained, brown and gray, stiff	4796 <i>.8</i>	5 -		XXX	3-9 6-6-7 N=13 10-12		0/150		 	110	86-15-71	49	
2		15.0 POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), trace clay, brown, medium dense to dense	4782	15 12 20	∇		10-10-8 N=18 10-13				7	116			
		light gray, flowing sands 29.5 47 SANDSTONE, dark gray, hard to very hard, trace FeOx	<u>4767.5</u>	25 30		\times	25-33-40 N=73 17-36				11	121	NP	7	
3			1750 5	35 			38 - 50/1" RQD = 74% RQD = 93%			5780 432					
		Auger Refusal at 44.6 Feet	<u>4752.5</u>					Hammer Typ	e: Autom	atic					
	Stratification lines are approximate. In-situ, the transition may be gradual.						Hammer Typ	e: Autom	auc						
6 Aba	6-inch continuous-flight, hollow-stem auger det and Se Abandonment Method: syr Boring backfilled with cement grout upon completion.			See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any). See Supporting Information for explanation of symbols and abbreviations. Elevations obtained from publicly available topographic map					Notes:						
	WATER LEVEL OBSERVATIONS				-			Boring Started: 12-09-2019 Bo				Boring Completed: 12-09-2019			
19 feet while drilling 14.8 feet after drilling			lerracon				Drill Rig: CME 75				Driller: Jeff C.				
		1289 1st Ave Greeley, CO					Project No.: 21195074A								

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