Briargate Bridge at Sand Creek
Design Report
Sand Creek Drainageway

El Paso County, Colorado

Prepared for:
Sterling Ranch Metropolitan District
20 Boulder Crescent Suite 2nd Floor
Colorado Springs, Colorado 80903

Prepared by:

Kiowa Engineering Corporation
Celebrating 30 years
7175 West Jefferson Avenue, Suite 2200
Lakewood, Colorado 80235
Ph: (303)692-0369

Kiowa Project No. 19032

December 6, 2021

CDR-21-013

TABLE OF CONTENTS

List of Figures and Tables (Refer to the Appendix Table of Contents)

I. GENERAL LOCATION AND DESCRIPTION

This report summarizes the design of the Briargate Parkway bridge crossing of Sand Creek in the Sterling Ranch Development. A separate report by others will address design, drainage, and water quality design of the Briargate Parkway road.

The proposed crossing consists of a 42-foot wide Conspan precast bridge sized to convey 100-year frequency flows without resulting in increases to the effective base flood elevations (BFEs) for Sand Creek. Two grouted sloping boulder (GSB) drop structures are proposed upstream of the bridge crossing to provide necessary grade control. The current incised natural channel upstream and downstream of the bridge will be graded to provide stable 4:1 side embankment slopes and adequate capacity for major storm flows. The proposed channel revision, including the 228-foot long Conspan bridge crossing, will extend for approximately 625 feet along Sand Creek. The proposed channel and bridge improvements lie within El Paso County. The location of the site is shown on Figure 1.

Upon the completion of the crossing and acceptance by El Paso County and Sterling Ranch Metropolitan District, easements and or tracts will be dedicated for the purposes of maintenance access. The bridge and channel work will occur adjacent to Tracts A, B, and D of Sterling Ranch Filing No. 1. Operation and maintenance of the bridge and channel responsibility of the Sterling Ranch Metropolitan District. A "No-Rise" floodplain certification study will be conducted in lieu of a CLOMR submittal to FEMA. However, a LOMR submittal will be required after construction to account for the floodplain revision. No residential lots within future Sterling Ranch Filings that will lie within the 100-year floodplain.

The bridge over Sand Creek at Briargate Parkway is included within the design plans. The bridge consists of a Conspan precast structure that have the capacity to pass the 100-year discharge. The proposed road right-of-way is 130 feet for Briargate Parkway. The ultimate roadway section for Briargate Parkway as shown on the roadway design plans includes four 12-foot lanes and a 16-foot raised median, Type A curb and gutter, and 6-foot detached sidewalks. Protective guardrails as shown on the drawings have been designed in conformance with Colorado Department of Transportation M-standards. The roadway design plans have been included in the Appendix of this report.

Once the bridge and roadway facilities are completed and accepted by El Paso County, El Paso County will assume maintenance responsibility for the structures and roadways. A deed will be provided to transfer ownership to the County. The developer intends to request reimbursement for the cost to construct the bridges and drainageway facilities, or request credit against future drainage and bridge fees. Reimbursement will be processed in accordance with sections 1.7 and 3.3 of the Drainage Criteria Manual (DCM). The drainageway facilities will be operated and maintained by the Sterling Ranch Metropolitan District.

II. PROJECT BACKGROUND

Sand Creek within Sterling Ranch is a natural drainageway at his time that was shown to be stabilized in the Sterling Ranch Master Development Drainage Plan (MDDP). The MDDP showed Sand Creek to be reconfigured into a trapezoidal channel section capable of conveying the 100-year discharge as listed in the MDDP. The original channel design was a benched trapezoidal channel with numerous drop structures to provide grade control. However after subsequent consideration by El

Paso County and the Army Corps of Engineering, the decision was made to maintain the current natural configuration of the channel. Design plans for the bridge and channel are included in the Appendix. The present average slope of the drainageway within the design reach is 1.8 percent. As seen from the Briargate Bridge Plan and Profile, two drop structures upstream of the bridge were designed to reduce the channel slope through the bridge reach to 0.2 percent. Riprap channel and embankment lining through the bridge reach will provide erosion protection during major storm events.

III. PREVIOUS REPORTS AND JURISDICTIONAL REQUIREMENTS

The basis for the development of the design has been developed from referencing the following reports:

1. ***Sterling Ranch Master Development Drainage Plan (MDDP), prepared by M & S Civil Consultants, July 2018.***
2. ***Sand Creek Drainage Basin Planning Study (DBPS), prepared by Kiowa Engineering, 1996.***
3. ***City of Colorado Springs and El Paso County Drainage Criteria Manual, 1987.***
4. ***El Paso County Engineering Criteria Manual, most current version.***
5. ***City of Colorado Springs Drainage Criteria Manual, May 2014.***
6. ***The City of Colorado Springs and El Paso County Flood Insurance Study (FIS), prepared by the Federal Emergency Management Agency, effective 2018.***
7. ***Sterling Ranch Channel Improvements and Mitigation Plan, prepared by Core Consultants, October 2015.***

IV. SITE DESCRIPTION

The Sand Creek floodplain within the Briargate Bridge reach is well vegetated with native grasses that are in fair to good condition that exists on the floodplain overbanks and within the greater valley in general. There is little evidence of active invert degradation or bank sloughing except for the channel bends that occur at the location of future Sterling Ranch Road. Current longitudinal slope is approximately 1.4 percent. There is presently no base flow in this segment. There are presently no developed lots that lie within the 100-year floodplain. Lots in the Homestead at Sterling Ranch Filing No. 2 and Branding Iron at Sterling Ranch Filing No. 2 subdivisions do not encroach into the 100-year floodplain.

A 24-inch water line is proposed to cross the drainageway just upstream of future Briargate Boulevard. The water and wastewater facilities that may impact the drainageway are all owned and maintained by the Sterling Ranch Metropolitan District.

V. HYDROLOGY

Hydrology for use in determining the typical channel sections shown on the plans were obtained from Reference 6. The 100-year discharges shown in Reference 6 is 2,600 cubic feet per second. The 100-year peak discharges from references 1 and 2 were reviewed as well. A comparison if peak discharges is presented below.

Existing Development Condition Peak Discharges

Sand Creek at Sterling Ranch

Location: South Property Line (cfs)	5yr	10yr	100yr
City of Colorado Springs FIS	NR	1,200	2,600
Sand Creek DBPS	NR	770	2,620
Sterling Ranch MDDP	435	713	1,912

The above listed discharges all assume existing, or pre-development conditions. The hydrology used in the FIS was obtained from a Soil Conservation Service study conducted in 1975 for the Sand Creek watershed using the SCS method. The hydrology developed in the DBPS also used the SCS method and obtained similar results? The MDDP used the U. S. Army Corps of Engineers HEC-1 hydrograph model and the SCS curve numbers to develop the peak discharges shown above. The MDDP applied a Type II storm distribution as proposed to the Type IIA distribution applied in the FIS and DBPS. This will typically cause peak discharges to decrease 10 to 15 percent. As the difference in the peak discharges cause relatively small differences in the hydraulic design the channel and the bridges, the FIS 100-year discharge was used in the hydraulic design of the channel and bridge improvements. According to the criteria set forth in Reference 4, the low flow channel was sized using 10 percent of the 100-year discharge, or 260 cubic feet per second.

The assumption that FSD will be required for all future development is reflected in the use of the existing development discharges in this design. There is a good correlation between the FIS and 1996 DBPS 100-year discharges for the segment of Sand Creek subject to this design. The future FSD's within Sterling Ranch will be publicly operated and maintained facilities by the Sterling Ranch Metropolitan District.

VI. HYDRAULICS

The goal of the bridge crossing design was to provide adequate conveyance capacity for the effective 100-yr frequency flows per FEMA and avoid any increase in the effective BFEs for the Sand Creek Floodplain. In addition, the proposed crossing was designed to produce flow characteristics that meet El Paso County criteria. Two grouted sloping boulder drop structures are proposed upstream of the crossing to lower the channel invert and provide grade control through the crossing reach. In addition to the grouted boulders, the entire invert upstream, through the proposed bridge, and downstream outlet are to be riprap lined. The bridge, a Conspan C42T, will convey flows at a depth of 4 to 7 feet with freeboard to the crown in excess of 14 feet. The excess height of the bridge was required to match the roadway grade for Briargate Parkway and provide necessary invert elevation for the channel.

was

The hydraulic design of the bridge crossing of Sand Creek done with US Army Corps of Engineers HEC-RAS modeling system version 5.0.7. The model was used to determine the 100-year hydraulic grade line shown on the plan and profiles. The 100-year profile for the FIS hydrology has been determined. The location for the proposed 100-year floodplain using FIS hydrology has been presented on the plan view of the design plans and on the grading plan. Appendix A of this report has the floodplain maps that show the effective regulatory 100-year floodplain. The location for selected HEC-RAS cross-sections are shown on the design profile. The HEC-RAS model cross-sections are also contained within Appendix A. The summary output for the 10-, 50- 100-yar and 500-year recurrence intervals have been included in the Appendix A of this report.

year

only the 100-year summary is provided in the Appendix

A riprap apron is included on the downstream end of the bridge to prevent channel degradation and undercutting of the bridge and wingwalls. A sheet pile cutoff wall is included on the downstream end of the riprap apron extending on foot above the proposed 100-year water surface.

one

VII. HYDRAULIC DESIGN CRITERIA

A "No-Rise" floodplain certification study will be conducted in lieu of a CLOMR submittal to FEMA. However a LOMR submittal will be required after construction to account for the floodplain revision. No residential lots within future Sterling Ranch Filings that will lie within the 100-year floodplain.

Freeboard (between bridge low chord and 100-year design flow water surface) for the Briargate bridge is in excess of 15 feet and well below the 2-foot minimum per section 6.4.2 of the El Paso County Drainage Criteria Manual bridge.

above?

Analysis of bridge scour was performed at upstream and downstream cross sections. Since the Conspan crossing structure is entered as a culvert, the bridge scour analysis was not available in the HECRAS program. Therefor shear force variable, also referred to as tractive force, was used to determine the adequacy of riprap erosion protection shown on the design plans.

Presented on the design plans associated with this design memorandum are the proposed drainageway conditions. Design criteria for the project are summarized as follows:

Channel design slope:	0.2 percent
Maximum drop height:	4 feet
Manning's n-values:	.025-.035
Froude number-(excluding crests of drops):	.25-.-.75 0.75
Permissible shear stress: channel and embankment:	
Type M soil riprap	5.0 psf

Provide drop structure calculations for boulder sizes, drop structure dimensions, cutoff wall depth, etc.

Discuss if the simplified or detailed drop structure design procedure was used.

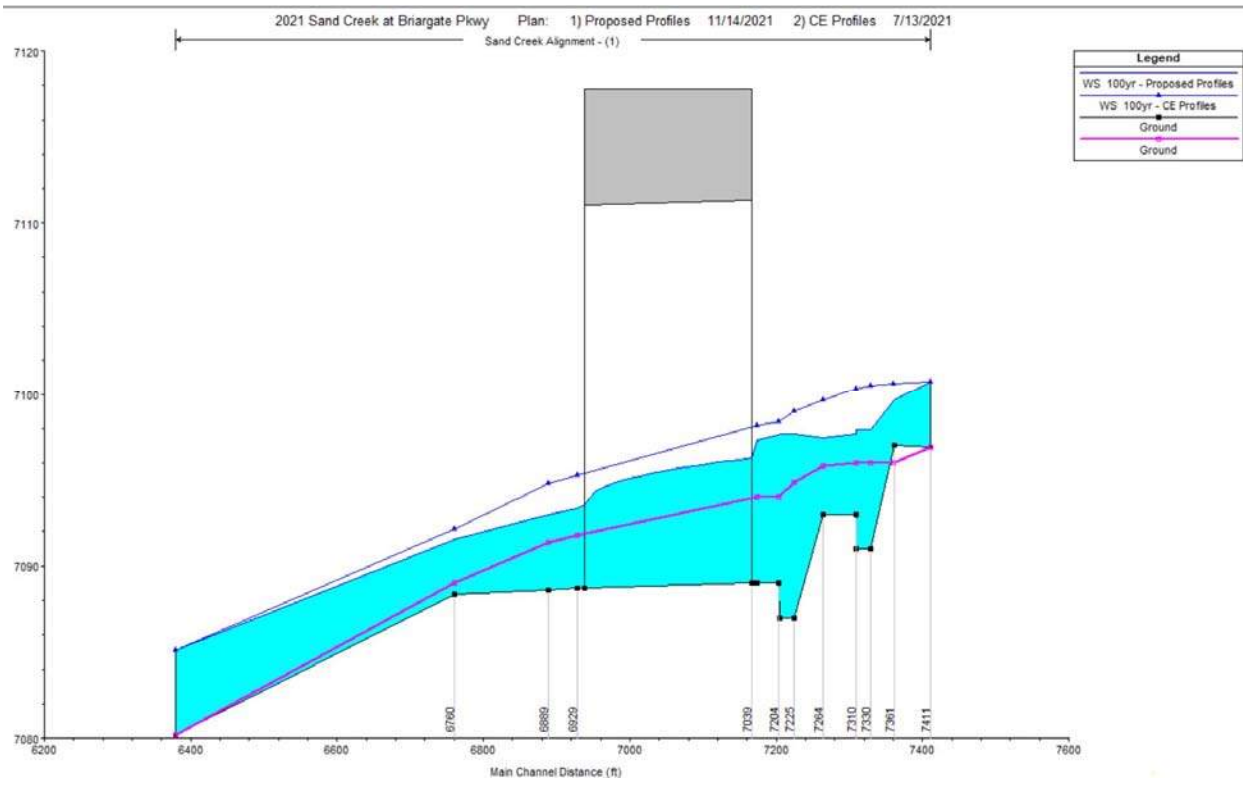
The drops will be constructed using grouted boulders. The selection of grouted boulders was chosen to address long-term durability of the drop. Each drop has an integral grouted boulder sill. Sheet pile cut-off walls are proposed at the crest of each drop that will extend across the entire width of the drop. The bottom depth of the sheet pile cut-off walls ranges from 6 to 7 feet. Wherever soil riprap linings are proposed, rock sizing and freeboard criteria followed is in accordance with Chapter 8 of the Urban Drainage and Flood Control Manual, equation 8-11.

A geotechnical investigation was conducted to support the design of the foundation for the bridge at Sterling Ranch Road and Briargate Parkway. The geotechnical report is included within the

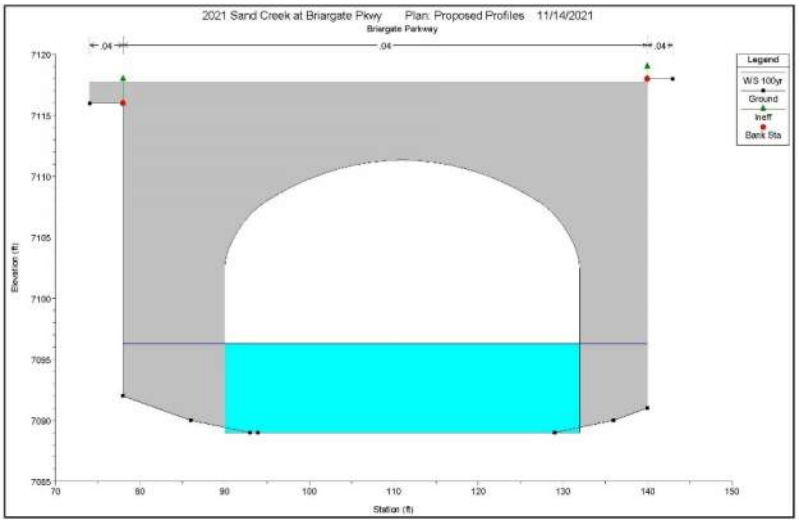
Appendix B. Two soil borings were drilled near the locations of the proposed footings for the bridges. Because of the depth to bedrock, deep foundations are proposed using driven H-piles at Briargate Boulevard. Bedrock is shallow at the Sterling Ranch Road and therefore it is assumed that spread footings will be used. A precast bridge section has been chosen that has a 42-foot clear span and a 22-foot rise. The 100-year discharge can be passed through the bridge at a depth of approximately 5 feet and headwater to depth of 0.22. Velocity during a 100-year event at the upstream and downstream reach of the bridge is 5.4 feet per second and 12.0 feet per second, respectively. A type M riprap invert will be provided at each bridge crossing. The construction of the improvements shown on the plans will prevent erosion due to changes in the channel hydraulic characteristics of the bridge and extend downstream to an extent where current conditions are matched.

VIII. HYDRAULIC MODELLING RESULTS

HECRAS simulation output including tables and sections are included in the Appendix. The results indicate that the proposed Briargate crossing has conveyance capacity is well in excess during 100-year storm events. As seen below, the 100-year water surface elevations are below those of existing conditions model throughout the revised channel reach. Freeboard from the crown of the Conspan crossing is well in excess of 2 feet per El Paso County criteria.



HECRAS profile comparison of proposed (blue filled) and existing 100-yr WSEL



Upstream face Conspan crossing 100-yr WSEL.

IX. SCOUR ANALYSIS

Scour analysis was performed to determine if bridge foundations and channel drop structures are susceptible to undermining during major storm events. Per CDOT Drainage Manual Section 10.4.3, the 500-year storm was used for scour analysis of the Conspan crossing abutment and foundation. Scour analysis in HECRAS is limited to bridges and therefor not available for the Conspan crossing modelled as a culvert. Therefor the shear stress variable calculated in HECRAS was used to determine the likelihood of scour. The crossing design includes riprap lining of the channel invert with added protection for the embankment on the downstream end of the crossing. This is shown on Figure 2 of Appendix A and the full design plans included in Appendix C.

As seen from Table 1 below, shear stress through the bridge reach is well below 5 lbs/ft^2 tolerance for the type M soil riprap lining of the channel bottom and embankments during 100-year and 500-year simulations. Velocities downstream of the bridge are comparable to existing conditions and will not result in an increase of erosive conditions.

Table 1 HECRAS Shear Stress and Velocity at Proposed Conspan Crossing

		100-Yr Profile		500-Yr Profile	
Location	Section	Maximum Velocity (ft/s)	Shear Stress Channel(lb/ft^2)	Maximum Velocity (ft/s)	Shear Stress Channel(lb/ft^2)
30' Upstream of Bridge	7205	4.3	0.4	4.1	0.4
Upstream Bridge Face	7175	6.0	0.7	6.1	0.9
Downstream Bridge Face	6929	12.3	1.8	13.6	2.1
40' Downstream of Bridge	6889	11.6	1.5	11.4	1.7
69' Downstream of Bridge	6760	9.3	1.1	10.2	1.0

Note: Permissible shear stress Type M soil riprap is 5 lb/ft^2

X. CONSTRUCTION PERMITTING

The following permits are anticipated to allow for the construction of the project as shown on the design plans. A copy of the Sterling Ranch 404 Permit is included within the Appendix.

USACE notification of project in conformance with 404 permit - USACE

No-Rise Floodway Certification, Floodplain Development Permit – Pikes Peak Regional Building Department

Grading and Erosion Control Permit (ESQCP) – El Paso County

Construction Stormwater Discharge Permit – CDPHE

Construction Dewatering Permit - CDPHE

Letter of Map Revision (post construction) - FEMA

XI. DRAINAGE AND BRIDGE FEES

The Sterling Ranch Development and specifically Sterling Ranch East lies wholly within the Sand Creek drainage basin. Drainage and bridge fees have been established by the County for the Sand Creek drainage basin for assessment against platted land within the watershed. The drainageway structures will be public and will be owned and maintained by the El Paso County upon acceptance. The costs for the public drainageway improvements are reimbursable or creditable against drainage and bridge fees owed when land within Sterling Ranch is platted. Reimbursement of drainage and bridge improvements require approval through the DCM reimbursement process. Construction of the bridge at Sterling Ranch Road and at Briargate Parkway will be creditable against bridge fees owed pending approval through the DCM reimbursement process.

The 2021 DBPS identifies the project section as unimproved SC1R11 channel with potential maintenance of future problems at $700 per length foot. The total length of the proposed bridge and channel improvements is approximately 630 feet, resulting in an estimated cost of $441,000.

The current 2021 drainage and bridge fees for the Sand Creek drainage basin are as follows:

Drainage Fee:	$18, 841 per impervious acre
Bridge Fee:	$ 0 per acre

XII. PHASING

Construction of the drainage and bridge facilities shown on the plans is to be completed all at once and no phasing of the construction is proposed. The construction will commence prior to or concurrent with the subdivisions east of Sand Creek including Branding Iron Filing No. 2 and Homestead Filing No. 2.

XIII. CONCLUSIONS

The development of the future Branding Iron at Sterling Ranch and Homestead at Sterling Ranch subdivisions requires the Briargate Bridge crossing of Sand Creek. Per direction of El Paso County and the Army Corps of Engineers, improvements to Sand Creek through the Sterling Ranch Development were limited to stabilize the channel upstream and downstream reach of the

proposed Briargate Boulevard Bridge. Results of hydraulic analysis demonstrate that the channel and Conspan crossing have adequate capacity to carry effective 100-year flows without causing an increase to existing water surface elevations. Scour analysis indicates that the riprap channel protection is sufficient to prevent undermining of the structure during major storm events and will not result in adverse impacts to the downstream natural channel compared to existing conditions.

References?

APPENDIX TABLE OF CONTENTS

Delete duplicate Appendix cover sheet

Appendix A: Hydrology and Hydraulic Calculations

Figure 1 Vicinity Map

Figure 2 Floodplain

Hydrology

Riprap Sizing

HECRAS Proposed Bridge Output

Delete duplicate Appendix cover sheet

APPENDIX B: Geotechnical Report

Delete duplicate Appendix cover sheet

APPENDIX C:

Roadway Design
Bridge and Channel Design

Delete duplicate Appendix cover sheet

APPENDIX D: Sterling Ranch 404 Permit

Appendix A: Hydrology and Hydraulic Calculations

Figure 1 Vicinity Map

Figure 2 Floodplain Add FEMA FIRM panel

Hydrology

Riprap Sizing

HECRAS Proposed Bridge Output

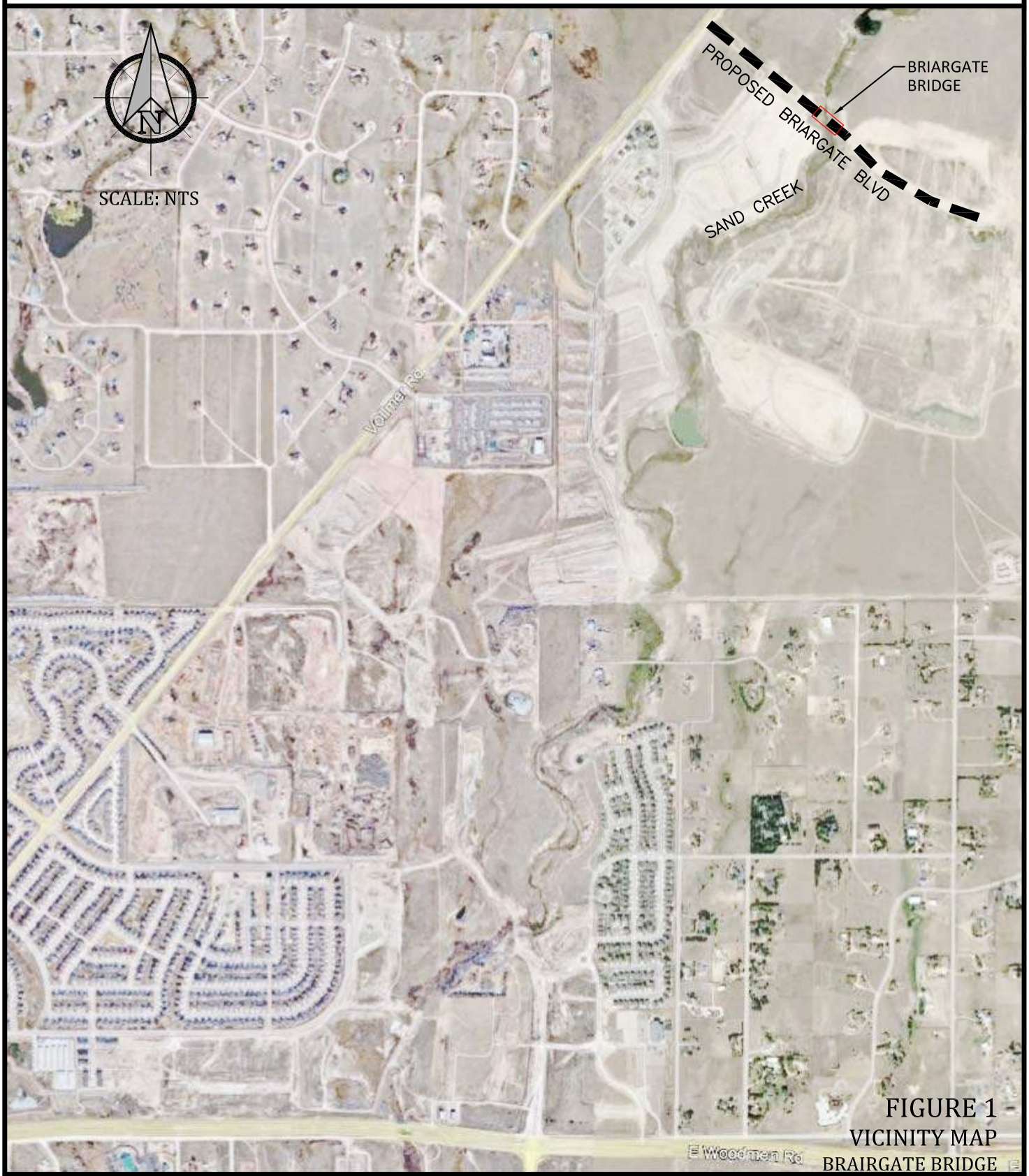


FIGURE 1
VICINITY MAP
BRAIRGATE BRIDGE

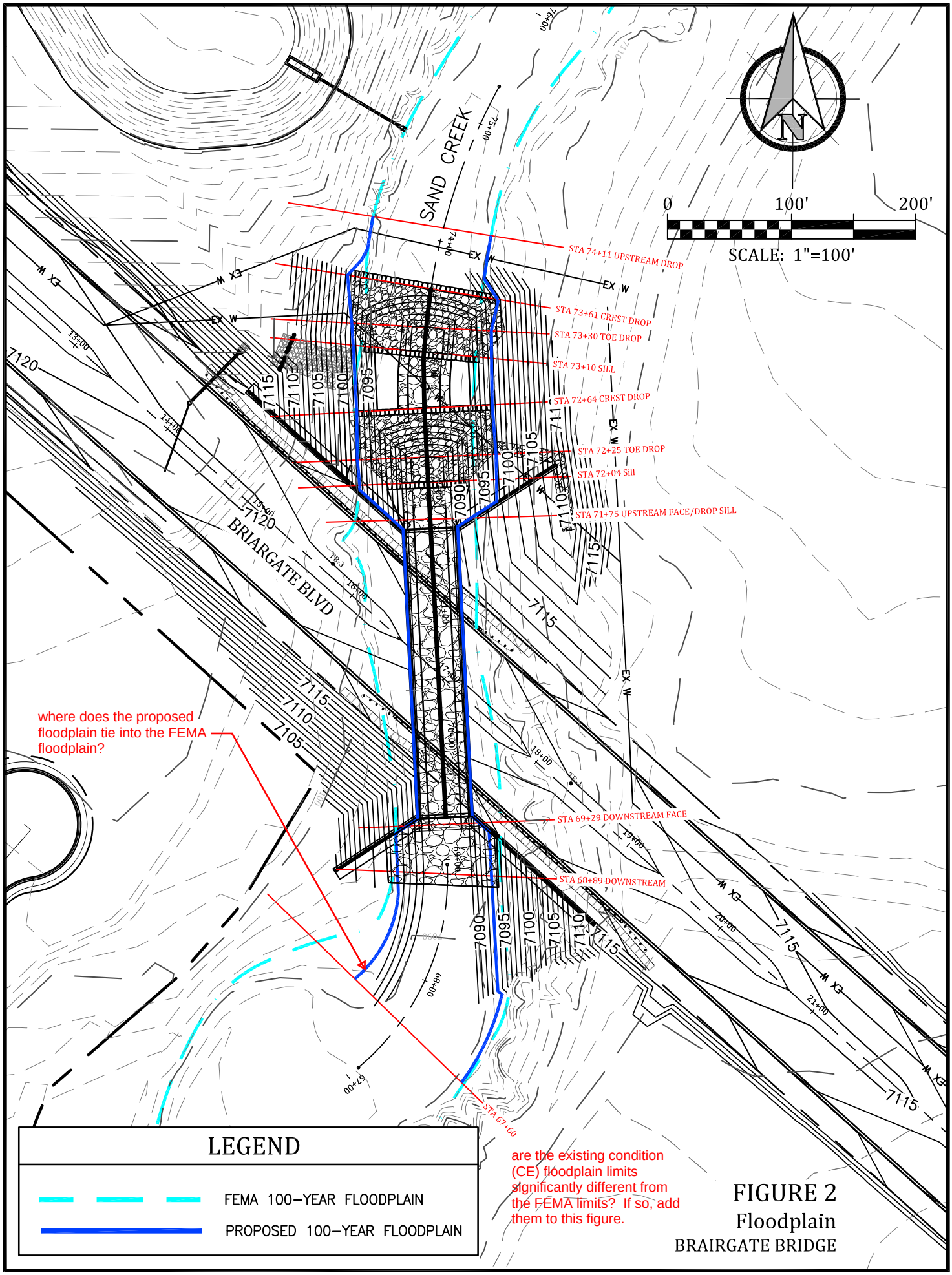
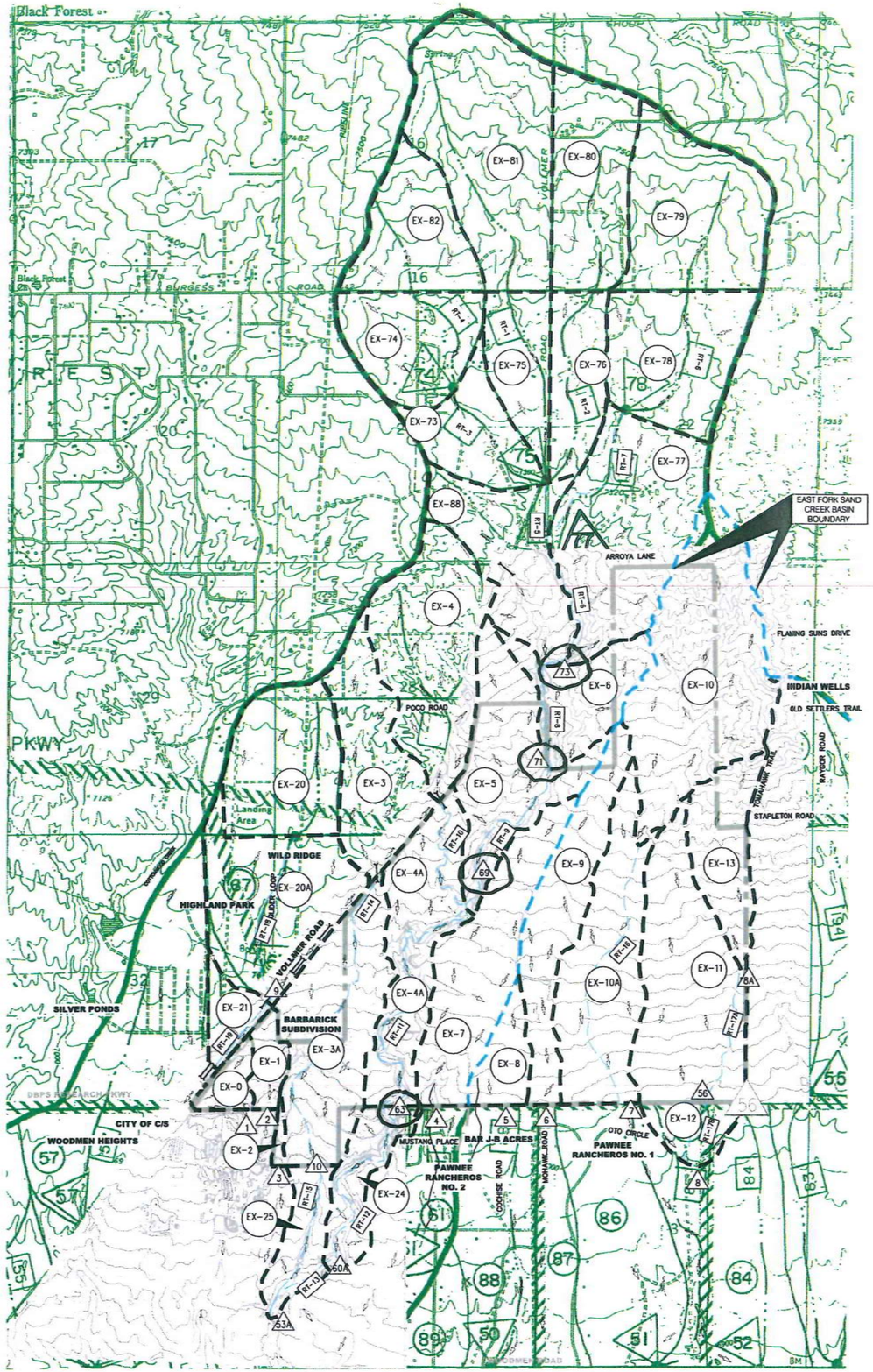


FIGURE 2
Floodplain
BRAIRGATE BRIDGE



5 600 1200 2400

Scale in Feet

LEGEND

BASIN ID – SC3-77

DESIGN POINT – 87

REACH IDENTIFIER – RT-17A

BASIN BOUNDARY

EAST FORK SAND CREEK BASIN BOUNDARY

FLOW DIRECTION –

FOR LOCATING & MARKING GAS, ELECTRIC, WATER & TELEPHONE LINES

FOR BURIED UTILITY INFORMATION 48 HRS BEFORE YOU DIG CALL 1-800-922-1987

File: O:\09002A\Sterling Ranch District\dwg\Eng Exhibits\2018 MDDP\2018-MDDP-ExistCondWSHkMap.dwg Plotstamp: 11/13/2018 1:52 PM

BASIN SUMMARY

BASIN	CN	AREA (acres)	AREA (sq mi)	Q_2 (cfs)	Q_5 (cfs)	Q_{10} (cfs)	Q_{25} (cfs)	Q_{50} (cfs)	Q_{100} (cfs)
EX-0	62	23.8	0.037	5.0	8.2	13.0	19.6	25.7	32.2
EX-1	62	25.7	0.040	4.8	7.9	12.4	18.7	24.5	30.9
EX-2	62	5.5	0.009	1.1	1.8	2.8	4.3	5.6	7.1
EX-3	62	136.8	0.214	22.0	36.4	57.6	86.9	114.0	143.1
EX-3A	61	188.1	0.294	28.3	47.4	75.7	115.1	152.2	192.6
EX-4	62	192.0	0.300	30.1	49.9	79.1	119.5	157.0	197.3
EX-4A	62	151.5	0.237	24.7	40.8	64.4	97.0	127.2	160.1
EX-5	62	153.9	0.240	24.2	40.0	63.4	95.9	125.9	158.2
EX-6	62	90.2	0.141	15.3	25.5	40.1	60.7	79.9	100.5
EX-7	56	165.0	0.258	11.6	21.5	37.5	60.9	83.1	107.4
EX-8	45	42.0	0.066	0.5	1.7	4.5	9.4	14.5	20.5
EX-9	54	131.9	0.206	12.2	23.9	43.1	70.9	97.0	125.2
EX-10	60	270.7	0.423	32.7	56.0	91.1	140.1	185.9	236.1
EX-10A	41	179.3	0.280	0.6	2.2	7.3	17.4	29.1	43.1
EX-11	43	209.3	0.327	18.0	29.8	47.7	73.4	98.3	126.1
EX-12	51	39.5	0.062	2.2	5.1	10.1	17.7	25.1	33.3
EX-13	55	89.3	0.139	7.7	15.2	27.1	44.2	60.5	78.4
EX-20	62	143.4	0.224	25.4	42.1	66.7	100.7	132.3	166.2
EX-20A	64	179.7	0.281	32.2	51.9	80.5	119.8	155.9	194.6
EX-21	65	33.3	0.052	8.6	13.5	20.7	30.5	39.4	49.0
EX-24	59	63.1	0.099	9.5	16.6	27.5	42.9	57.4	73.0
EX-25	43	54.4	0.085	0.3	1.5	4.8	10.7	17.2	25.1
EX-73	63	90.0	0.141	16.4	26.4	41.3	62.1	81.3	102.0
EX-74	63	119.7	0.187	22.3	36.5	57.3	85.9	112.3	140.7
EX-75	63	79.3	0.124	13.1	21.5	33.7	50.5	66.1	82.8
EX-76	63	86.4	0.135	14.2	23.1	36.4	54.6	71.4	89.6
EX-77	62	230.6	0.360	34.7	56.9	90.6	137.5	180.9	227.7
EX-78	63	155.6	0.243	28.1	45.3	70.6	106.2	139.1	174.5
EX-79	63	189.0	0.295	34.9	57.0	89.5	134.3	175.6	220.1
EX-80	63	147.7	0.231	27.3	44.3	69.6	104.5	136.8	171.4
EX-81	62	262.9	0.411	42.6	70.2	111.0	167.4	219.6	275.7
EX-82	62	117.8	0.184	20.0	33.2	52.8	80.0	105.1	132.3
EX-88	62	139.2	0.217	22.2	36.7	58.0	87.6	115.0	144.4

DESIGN POINT SUMMARY (PEAK FLOW)

DESIGN POINT	AREA (sq mi)	Q_2 (cfs)	Q_5 (cfs)	Q_{10} (cfs)	Q_{25} (cfs)	Q_{50} (cfs)	Q_{100} (cfs)	LOCATION
DP-74	0.371	39.3	65.3	104.8	158.9	209.1	262.8	
DP-75	1.413	141.2	235.1	376.6	566.6	750.9	950.5	
DP-78	0.538	59.7	98.4	154.0	232.6	306.2	385.3	
DP-73	2.528	225.9	380.7	618.0	957.0	1260.4	1582.3	
DP-71	2.669	229.3	388.9	629.7	978.8	1277.3	1637.9	STERLING RANCH NORTHERN BNDRY
DP-69	3.209	253.0	434.8	707.7	1100.0	1453.3	1870.4	
DP-63	3.446	251.4	430.7	713.1	1113.2	1496.2	1911.5	STERLING RANCH SOUTHERN BNDRY
DP-10	0.508	36.5	56.0	106.4	162.9	220.6	287.2	COLORADO SPRINGS/EL PASO BNDRY
DP-9A	0.557	55.3	94.3	150.3	227.7	299.5	380.5	VOLLMER/TAHITI DRIVE
DP-9	0.505	52.8	88.8	142.1	214.2	281.0	351.4	VOLLMER/LOCHWINNOCH LN
DP-8A	0.139	7.7	15.2	27.1	44.2	60.5	78.4	D/S STERLING RANCH EASTERN BNDRY
DP-8	0.528	24.2	45.1	77.8	124.4	169.5	220.9	D/S STERLING RANCH SOUTHERN BNDRY
DP-7	0.703	32.4	57.1	97.3	156.1	213.8	277.9	STERLING RANCH SOUTHERN BNDRY
DP-6	0.206	12.2	23.9	43.1	70.9	97.0	125.2	STERLING RANCH SOUTHERN BNDRY
DP-5	0.066	0.5	1.7	4.5	9.4	14.5	20.5	STERLING RANCH SOUTHERN BNDRY
DP-4	0.258	11.6	21.5	37.5	60.9	83.1	107.4	STERLING RANCH SOUTHERN BNDRY
DP-3	0.009	1.1	1.8	2.8	4.3	5.6	7.1	STERLING RANCH SOUTHERN BNDRY
DP-2	0.040	4.8	7.9	12.4	18.7	24.5	30.9	STERLING RANCH SOUTHERN BNDRY
DP-1	0.037	5.0	8.2	13.0	19.6	25.7	32.2	STERLING RANCH SOUTHERN BNDRY
DP-60A	3.545	247.7	430.2	707.1	1113.0	1496.6	1913.5	FUTURE MARKSHEFFEL X-ING
DP-56	0.466	23.2	42.5	71.9	115.6	157.4	202.9	STERLING RANCH SOUTHERN BNDRY
DP-53A	4.138	262.1	454.0	763.2	1196.5	1609.8	2061.5	SAND CREEK AND POND 3

DESIGN POINT SUMMARY (VOLUME)

DESIGN POINT	AREA (sq mi)	V_2 (ac-ft)	V_5 (ac-ft)	V_{10} (ac-ft)	V_{25} (ac-ft)	V_{50} (ac-ft)	V_{100} (ac-ft)	LOCATION
DP-74	0.371	5.9	9.0	13.6	19.8	25.5	31.6	
DP-75	1.413	22.7	34.5	51.7	75.4	97.1	120.5	
DP-78	0.538	8.9	13.5	20.1	29.3	37.7	46.7	
DP-73	2.528	40.4	61.5	92.1	134.3	173.1	214.9	
DP-71	2.669	42.5	64.9	97.1	141.6	182.5	226.6	STERLING RANCH NORTHERN BNDRY
DP-69	3.209	50.7	77.4	116.1	169.4	218.6	271.4	
DP-63	3.446	54.1	82.5	123.8	180.8	233.3	289.9	STERLING RANCH SOUTHERN BNDRY
DP-10	0.508	7.6	11.7	17.6	25.8	33.4	41.6	COLORADO SPRINGS/EL PASO BNDRY
DP-9A	0.557	9.3	14.1	21.1	30.7	39.4	48.8	VOLLMER/TAHITI DRIVE
DP-9	0.505	8.4	12.7	19.0	27.6	35.5	44.0	VOLLMER/LOCHWINNOCH LN
DP-8A	0.139	1.3	2.1	3.4	5.2	7.0	8.9	D/S STERLING RANCH EASTERN BNDRY
DP-8	0.528	4.4	7.0	11.1	16.8	22.3	28.4	D/S STERLING RANCH SOUTHERN BNDRY
DP-7	0.703	6.1	10.0	15.9	24.3	32.4	41.3	STERLING RANCH SOUTHERN BNDRY
DP-6	0.206	2.4	4.0	6.3	9.6	12.7	16.0	STERLING RANCH SOUTHERN BNDRY
DP-5	0.066	0.2	0.4	0.8	1.4	1.9	2.6	STERLING RANCH SOUTHERN BNDRY
DP-4	0.258	2.6	4.2	6.7	10.2	13.5	17.2	STERLING RANCH SOUTHERN BNDRY
DP-3	0.009	0.1	0.2	0.3	0.5	0.6	0.8	STERLING RANCH SOUTHERN BNDRY
DP-2	0.040	0.6	0.9	1.4	2.1	2.7	3.4	STERLING RANCH SOUTHERN BNDRY
DP-1	0.037	0.6	0.9	1.3	1.9	2.5	3.1	STERLING RANCH SOUTHERN BNDRY
DP-60A	3.545	55.3	84.4	126.4	184.8	238.5	296.6	FUTURE MARKSHEFFEL X-ING
DP-56	0.466	4.0	6.3	9.9	14.9	19.8	25.1	SAND CREEK AND POND 3
DP-53A	4.138	63.0	96.4	144.7	211.8	273.9	340.9	SAND CREEK AND POND 3

EFSC DBPS DESIGN POINT SUMMARY (PEAK FLOW)

DBPS DESIGN POINT	AREA (sq mi)	Q_{50} (cfs)	Q_{100} (cfs)
DP-50	0.32	47.0	195.7
DP-51 (BASIN 86)	0.33	17.7	74.1
DP-52	1.67	80.5	455.5
DP-56	0.79	63.6	265.0

Values reported from SCDBPS
(DP 50, 51, 52 Not analyzed as a part of this study)
DBPS Reach 85(Basin91)=Q10=28.8cfs Q100=115.2cfs

Discharge Summary
Sand Creek

DP-63 So PL 1912

DP 69 @ Briargate +/- 1870

DP 71 No PL 1637

Q_{100} FIS = 2600 cfs

M&S CIVIL CONSULTANTS, INC
20 BOULDER CRESCENT, SUITE 110
COLORADO SPRINGS, CO 80903
PHONE: 719.955.5485

2018 STERLING RANCH MDDP

EXISTING HYDROLOGIC CONDITIONS MAP

PROJECT NO. 09-002
FILE: \dwg\Eng Exhibits\2018-MDDP-ExistCondWSHkMap.dwg
DESIGNED BY: DLM
DRAWN BY: DLM
CHECKED BY: VAS
SCALE
HORIZ: NTS
VERT: NTS
DATE: 08-22-18

DM1

8.1 Riprap Sizing

Procedures for sizing rock to be used in soil riprap, void-filled riprap, and riprap over bedding are the same.

8.1.1 Mild Slope Conditions

When subcritical flow conditions occur and/or slopes are mild (less than 2 percent), UDFCD recommends the following equation (Hughes, et al, 1983):

$$d_{50} \geq \left[\frac{VS^{0.17}}{4.5(G_s - 1)^{0.66}} \right]^2 \qquad \text{Equation 8-11}$$

Where:

V = mean channel velocity (ft/sec)

S = longitudinal channel slope (ft/ft)

d_{50} = mean rock size (ft)

Gs = specific gravity of stone (minimum = 2.50, typically 2.5 to 2.7), Note: In this equation (Gs -1) considers the buoyancy of the water, in that the specific gravity of water is subtracted from the specific gravity of the rock.

Note that Equation 8-11 is applicable for sizing riprap for channel lining with a longitudinal slope of no more than 2%. This equation is not intended for use in sizing riprap for steep slopes (typically in excess of 2 percent), rundowns, or protection downstream of culverts. Information on rundowns is provided in Section 7.0 of the *Hydraulic Structures* chapter of the USDCM, and protection downstream of culverts is discussed in the *Culverts and Bridges* chapter. For channel slopes greater than 2% use one of the methods presented in 8.1.2.

Rock size does not need to be increased for steeper channel side slopes, provided the side slopes are no steeper than 2.5H:1V (UDFCD 1982). Channel side slopes steeper than 2.5H:1V are not recommended because of stability, safety, and maintenance considerations. See Figure 8-34 for riprap placement specifications. At the upstream and downstream termination of a riprap lining, the thickness should be increased 50% for at least 3 feet to prevent undercutting.

8.1.2 Steep Slope Conditions

Steep slope rock sizing equations are used for applications where the slope is greater than 2 percent and/or flows are in the supercritical flow regime. The following rock sizing equations may be referred to for riprap design analysis on steep slopes:

- CSU Equation, *Development of Riprap Design Criteria by Riprap Testing in Flumes: Phase II* (prepared by S.R. Abt, et al, Colorado State University, 1988). This method was developed for steep slopes from 2 to 20 percent.

- USDA- Agricultural Research Service Equations, *Design of Rock Chutes* (by K.M. Robinson, et al, USDA- ARS, 1998 Transactions of ASAE) and *An Excel Program to Design Rock Chutes for Grade*

Kiowa Engineering Corporation

Project Name: Sand Creek - Sterling Ranch Project No: 19032

Description: Riprap Sizing

By: SAB Date: 8/30/21

Riprap Sizing at Briargate Bridge per UDFCD Eq 8-11

From HECRAS: 100yr velocities

S = 0.2%

Velocities:

5.36 ft/s	upstream approach
12.0 ft/s	outlet
10.4 ft/s	departure

$$d_{50} \geq \left[\frac{V S^{.17}}{4.5 (G_s - 1)^{0.66}} \right]^2$$

V = mean channel velocity

S = longitudinal slope (ft/ft)

d_{50} = mean rock size (ft)

G_s = specific gravity of stone (2.5 to 2.7)

$$\frac{12.0 (.002)^{.17}}{4.5 (2.5-1)^{0.66}} = 1.0 \quad (12'' \; D_{50})$$

I don't think this will affect the final riprap size, but double check that this step was squared per the equation above.

DESIGN OF ROADSIDE CHANNELS WITH FLEXIBLE LININGS

Hydraulic Engineering Circular No. 15

Prepared By

Simons, Li & Associates, Inc.
3555 Stanford Road
P.O. Box 1816
Fort Collins, Colorado 80522

For

U.S. Department of Transportation
Federal Highway Administration

October 25, 1985

Table 4.1. Permissible Shear Stresses for Lining Materials.

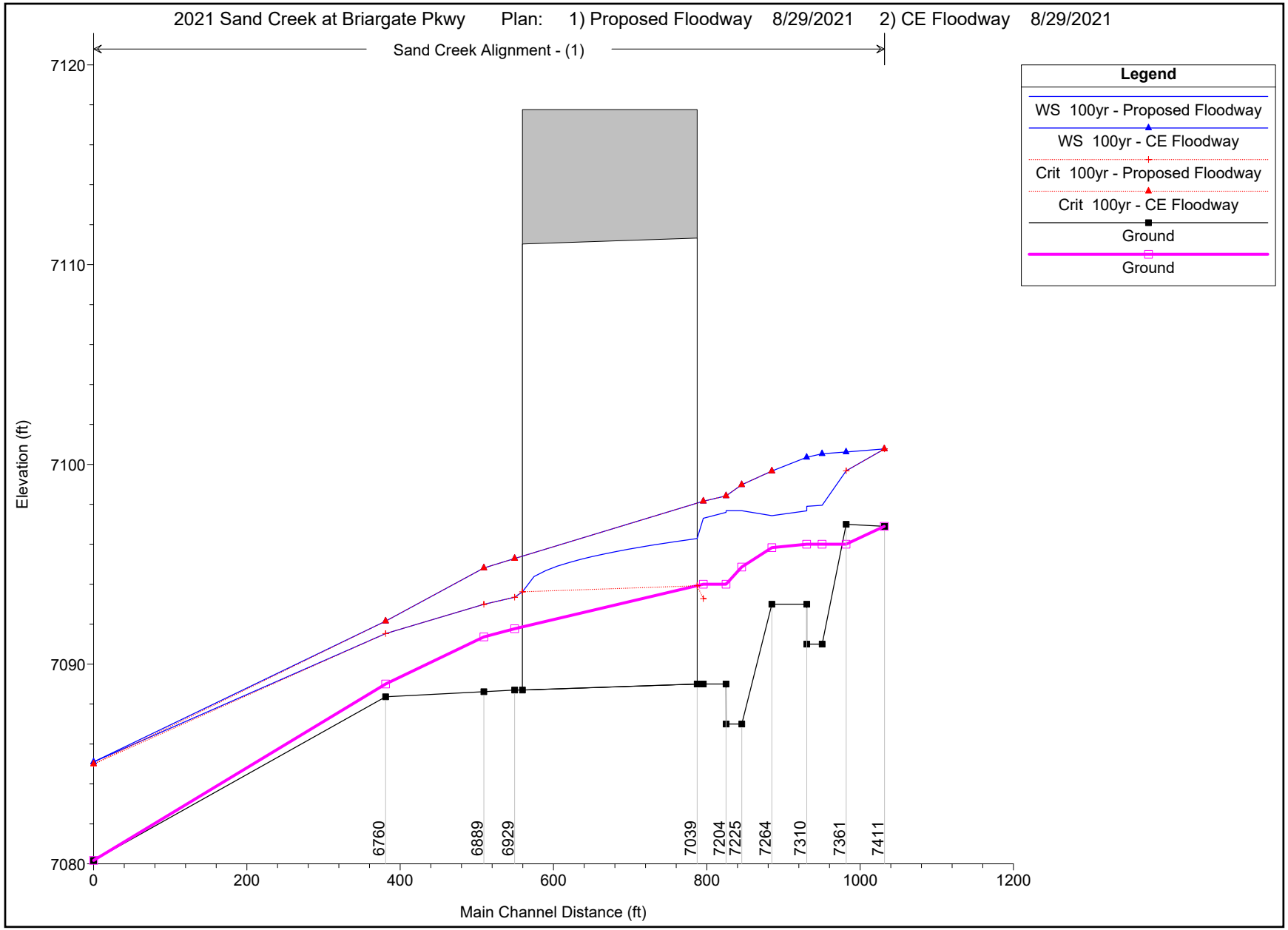
Lining Category	Lining Type	Permissible Unit Shear Stress (lb/ft2)
Temporary	Woven Paper Net	0.15
	Jute Net	0.45
	Fiberglass Roving*	0.75
	Straw and Erosion Net	1.45 ← OB slope
	Curled Wood Mat (TRM)	1.55 ← bench
	Nylon Mat	2.00
Vegetative	Class A	3.70
	Class B	2.10 ← OB slope
	Class C	1.00
	Class D	0.60
	Class E	0.35
Gravel Riprap	1-inch	0.40
	2-inch	0.80
Rock Riprap	6-inch	2.50
	12-inch	5.00

* single and double applications

TABLE 3.1.--Classification of vegetal covers as to degree of retardance (6)

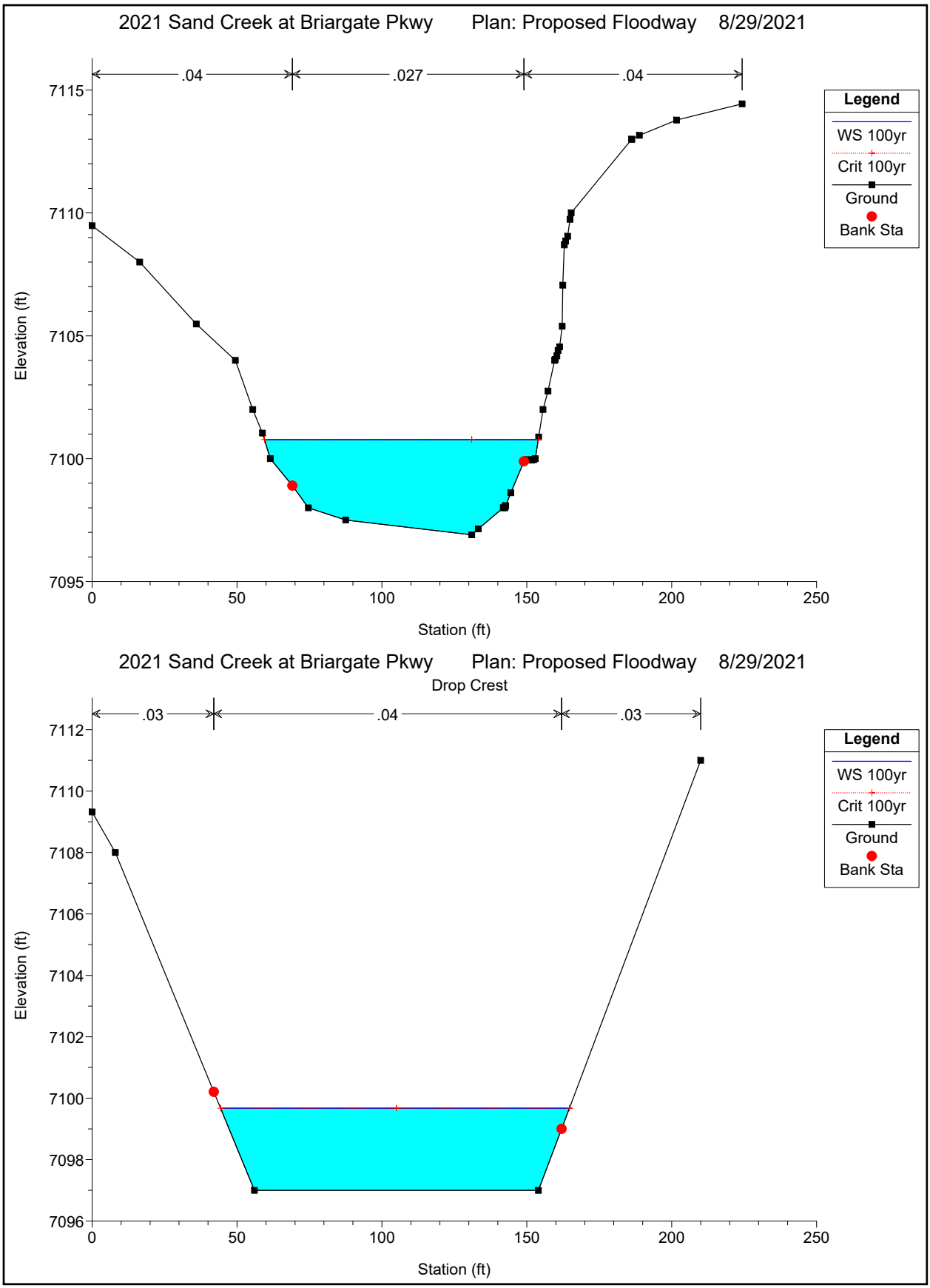
Note: Covers classified have been tested in experimental channels. Covers were green and generally uniform.

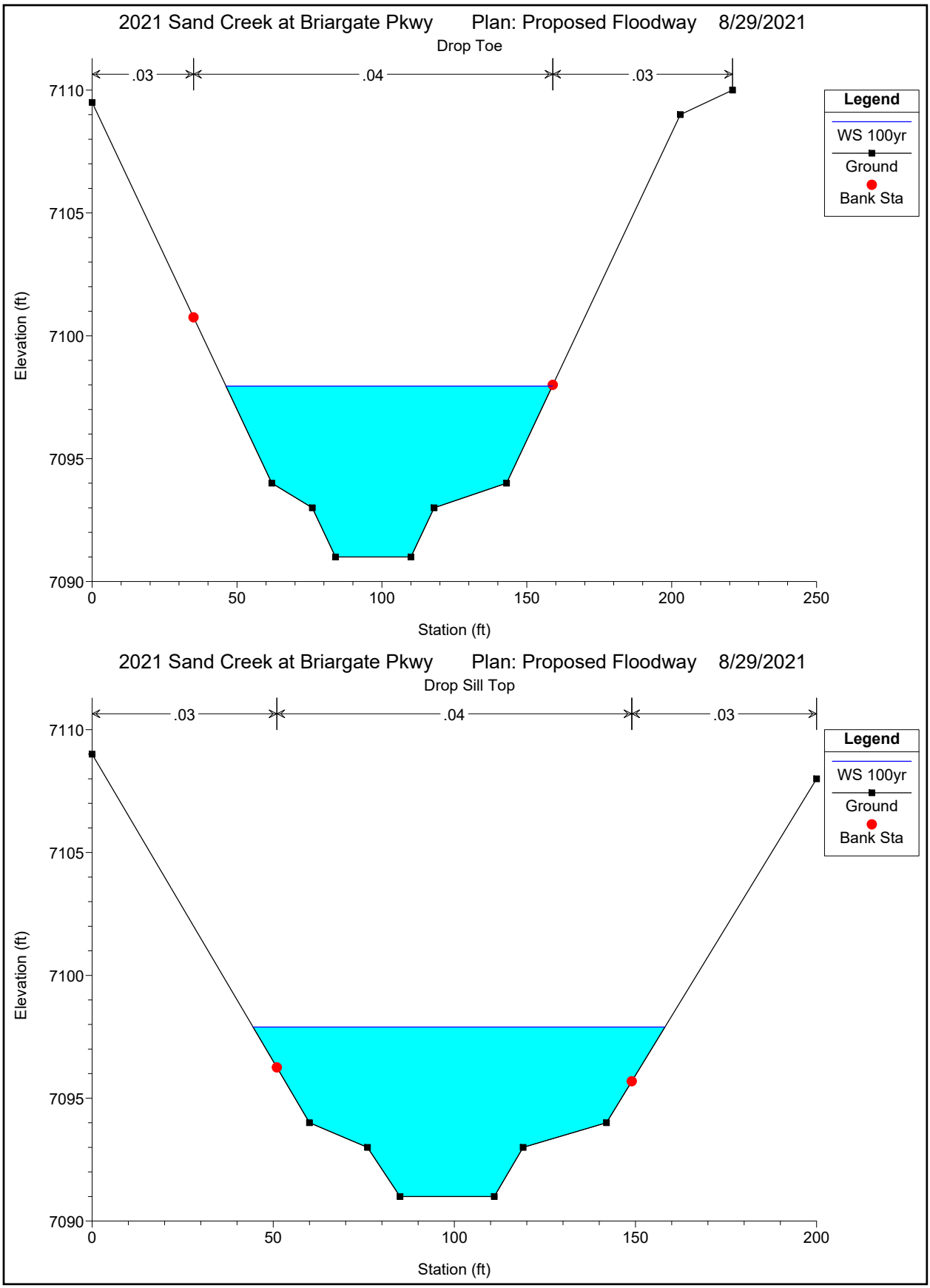
Retardance	Cover	Condition
A	Weeping lovegrass	Excellent stand, tall, (average 30")
	Yellow bluestem Ischaemum ..	Excellent stand, tall, (average 36")
B	Kudzu	Very dense growth, uncut
	Bermudagrass	Good stand, tall (average 12")
	Native grass mixture (little bluestem, blue grama, and other long and short midwest grasses)	Good stand, unmowed
	Weeping lovegrass	Good stand, tall, (average 24")
	Lespedeza sericea	Good stand, not woody, tall (average 19")
	Alfalfa	Good stand, uncut, (average 11")
	Weeping lovegrass	Good stand, mowed, (average 13")
	Kudzu	Dense growth, uncut
	Blue grama	Good stand, uncut, (average 13")
C	Crabgrass	Fair stand, uncut (10 to 48")
	Bermudagrass	Good stand, mowed (average 6")
	Common lespedeza	Good stand, uncut (average 11")
	Grass-legume mixture--summer (orchard grass, redtop, Italian ryegrass, and common lespedeza)	Good stand, uncut (6 to 8 inches)
	Centipedegrass	Very dense cover (average 6 inches)
	Kentucky bluegrass	Good stand, headed (6 to 12 inches)
D	Bermudagrass	Good stand, cut to 2.5-inch height
	Common lespedeza	Excellent stand, uncut (average 4.5")
	Buffalograss	Good stand, uncut (3 to 6 inches)
	Grass-legume mixture--fall, spring (Orchardgrass, redtop, Italian ryegrass, and common lespedeza)	Good stand, uncut (4 to 5 inches)
	Lespedeza sericea	After cutting to 2-inch height. Very good stand before cutting.
E	Bermudagrass	Good stand, cut to 1.5 inches height
	Bermudagrass	Burned stubble.

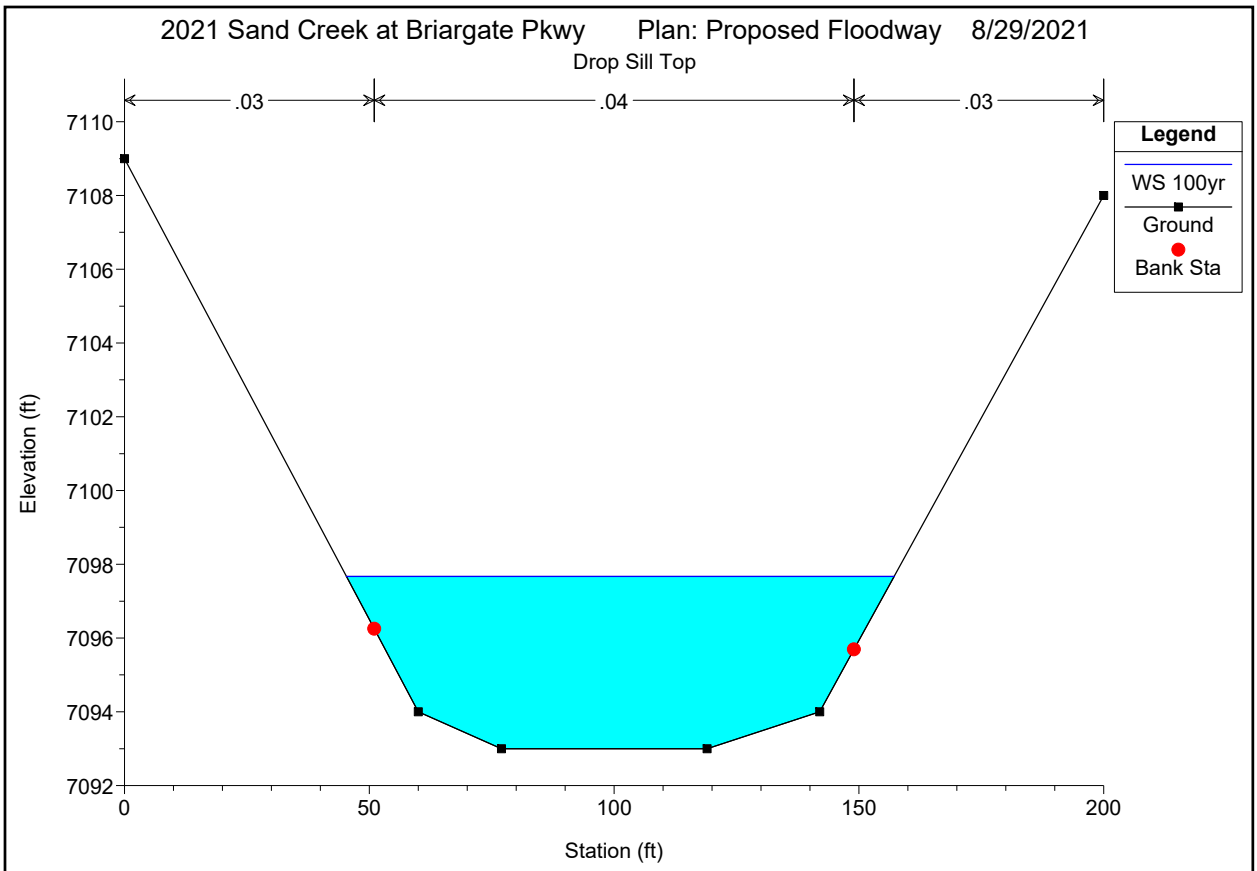

2021 Sand Creek at Briargate Pkwy Plan: 1) Proposed Floodway 8/29/2021 2) CE Floodway 8/29/2021
Sand Creek Alignment - (1)
Legend
WS 100yr - Proposed Floodway
WS 100yr - CE Floodway
Crit 100yr - Proposed Floodway
Crit 100yr - CE Floodway
Ground
Ground
Elevation (ft)
7120
7110
7100
7090
7080
0
200
400
600
800
1000
1200
Main Channel Distance (ft)
6760
6889
6929
7039
7204
7225
7264
7310
7361
7411

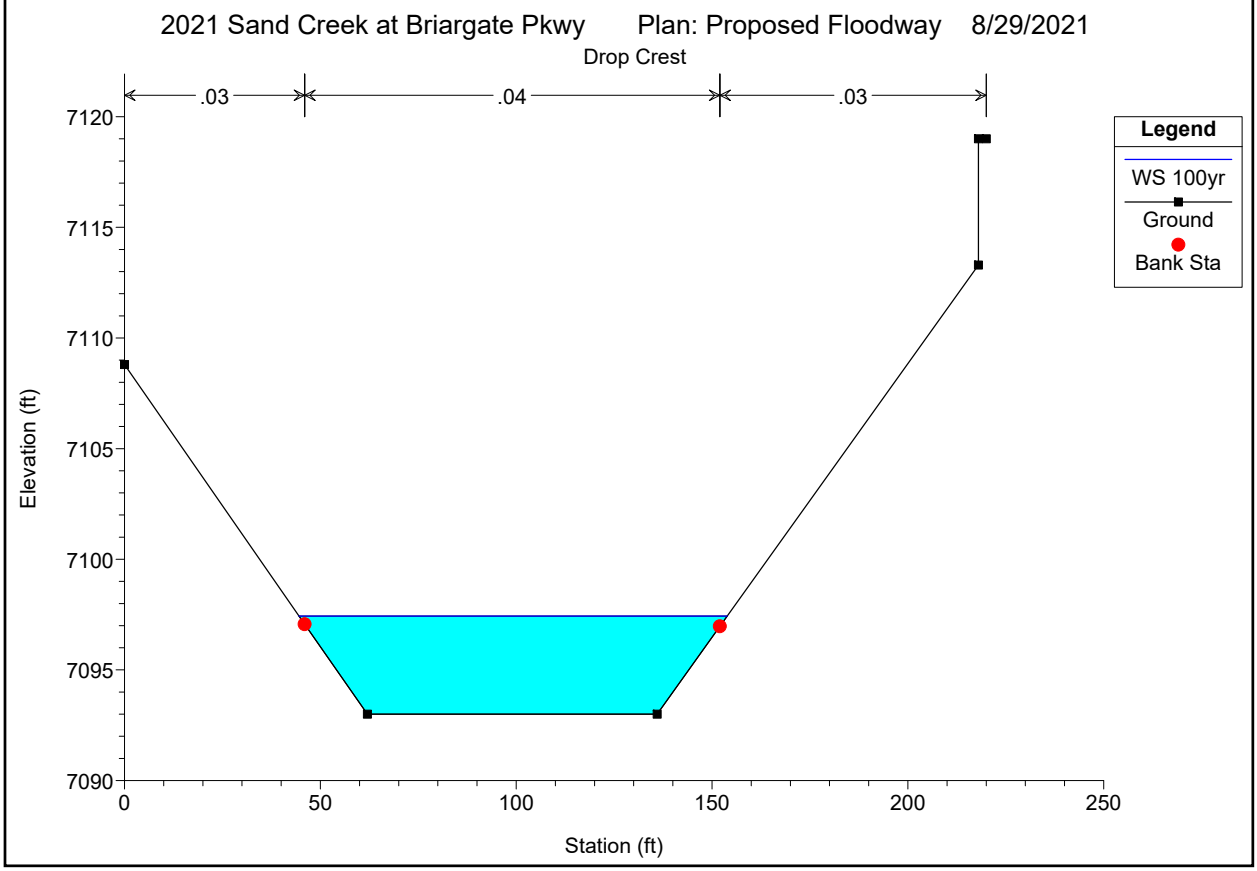
HEC-RAS Plan: Proposed Floodway River: Sand Creek Reach: Briargate Only Profile: 100yr

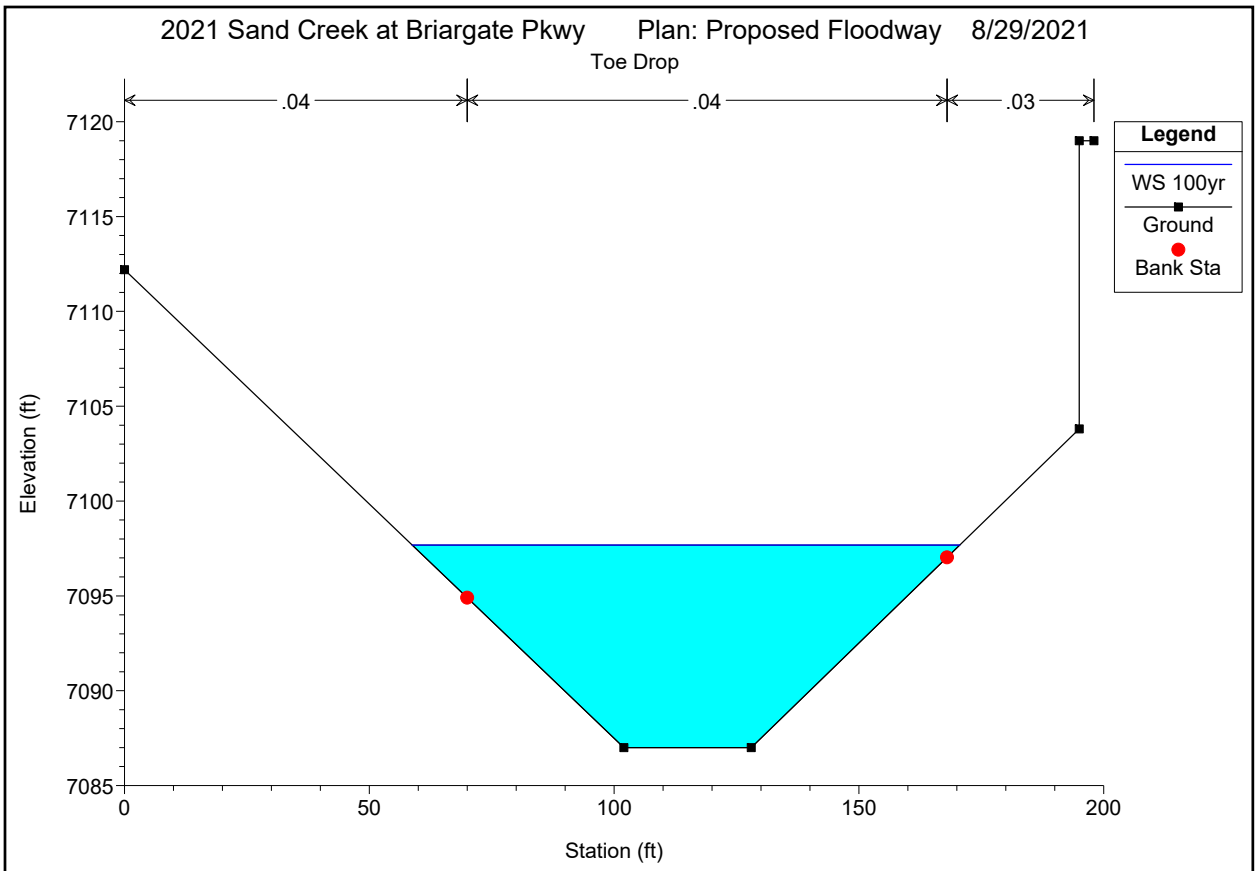
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Briargate Only	7411	100yr	2600.00	7096.90	7100.77	7100.77	7102.29	0.006934	9.95	271.39	94.46	0.98
Briargate Only	7361	100yr	2600.00	7097.00	7099.68	7099.68	7100.91	0.017318	8.92	292.17	120.38	1.00
Briargate Only	7330	100yr	2600.00	7091.00	7097.96		7098.36	0.002520	5.07	512.43	112.64	0.42
Briargate Only	7311	100yr	2600.00	7091.00	7097.90		7098.31	0.002238	5.16	512.93	113.74	0.40
Briargate Only	7310	100yr	2600.00	7093.00	7097.67		7098.29	0.004384	6.32	417.88	111.89	0.55
Briargate Only	7264	100yr	2600.00	7093.00	7097.43		7098.07	0.005030	6.41	406.42	109.33	0.58
Briargate Only	7225	100yr	2600.00	7087.00	7097.68		7097.88	0.000672	3.59	736.21	111.84	0.23
Briargate Only	7205	100yr	2600.00	7087.00	7097.68		7097.86	0.000709	3.45	754.43	111.05	0.23
Briargate Only	7204	100yr	2600.00	7089.00	7097.60		7097.84	0.001077	3.97	655.17	110.37	0.29
Briargate Only	7175	100yr	2600.00	7089.00	7097.30	7093.27	7097.75	0.001695	5.36	485.53	62.00	0.34
Briargate Only	7039		Culvert									
Briargate Only	6929	100yr	2600.00	7088.70	7093.35	7093.35	7095.58	0.006400	11.99	216.92	57.00	0.99
Briargate Only	6889	100yr	2600.00	7088.62	7092.99	7092.99	7094.66	0.007309	10.36	250.93	75.74	1.00
Briargate Only	6760	100yr	2600.00	7088.36	7091.53	7091.53	7092.88	0.007224	9.33	284.07	119.86	0.97
Briargate Only	6379	100yr	2600.00	7080.17	7085.10	7085.00	7085.90	0.007296	7.21	365.05	200.02	0.92

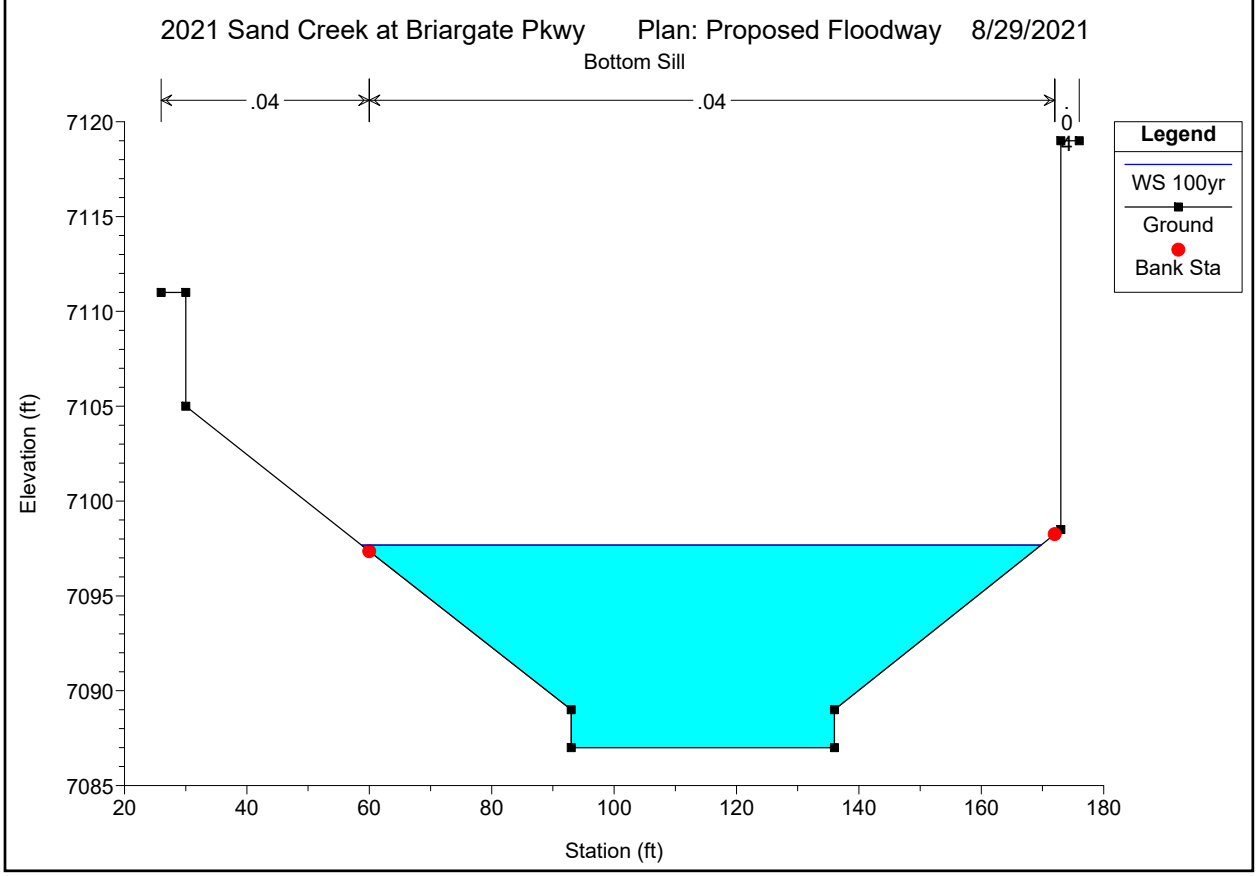

2021 Sand Creek at Briargate Pkwy Plan: Proposed Floodway 8/29/2021
.04
.027
.04
7115
7110
7105
7100
7095
Elevation (ft)
0
50
100
150
200
250
Station (ft)
Legend
WS 100yr
Crit 100yr
Ground
Bank Sta
2021 Sand Creek at Briargate Pkwy Plan: Proposed Floodway 8/29/2021
Drop Crest
.03
.04
.03
7112
7110
7108
7106
7104
7102
7100
7098
7096
Elevation (ft)
0
50
100
150
200
250
Station (ft)
Legend
WS 100yr
Crit 100yr
Ground
Bank Sta

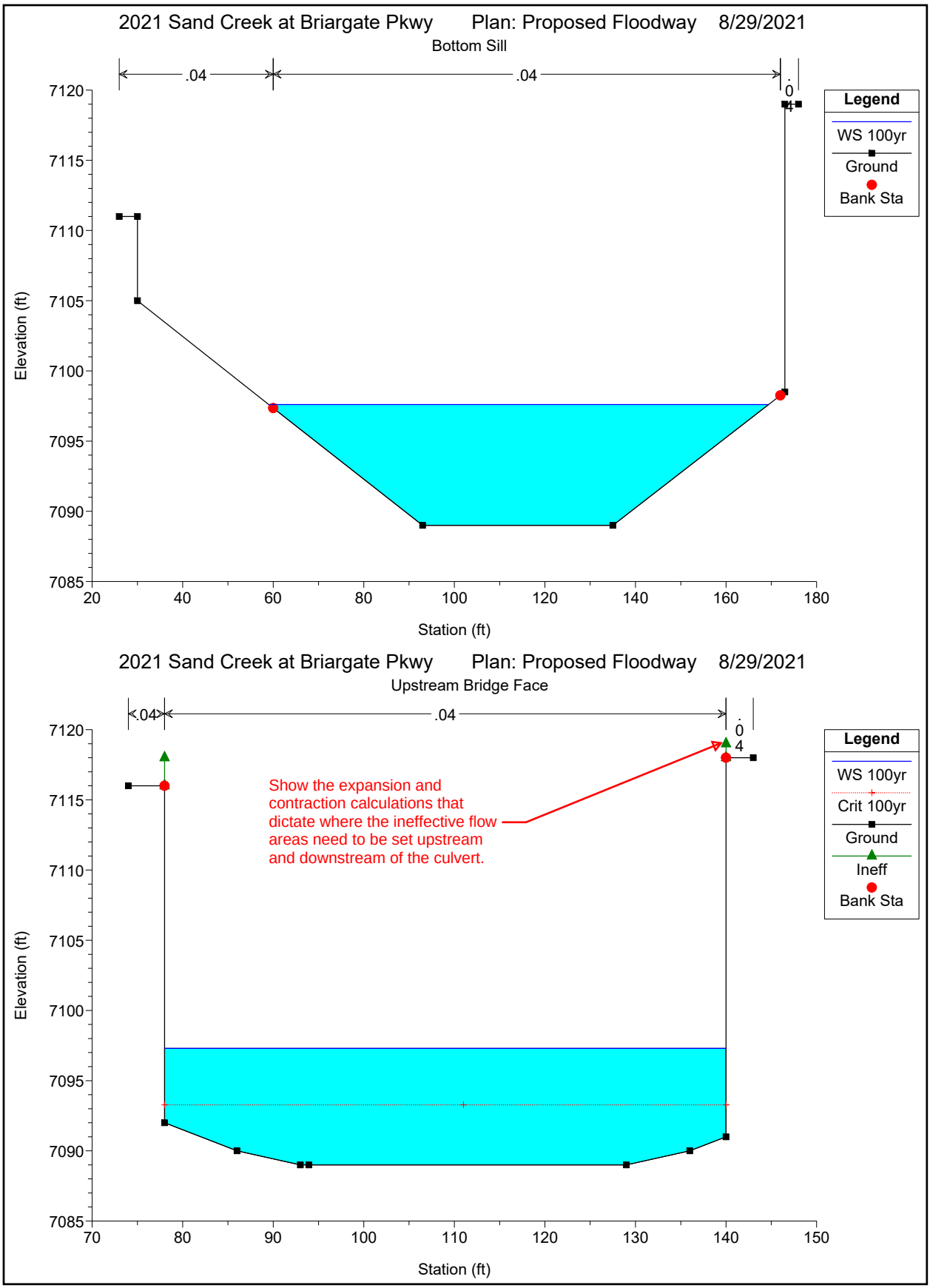

2021 Sand Creek at Briargate Pkwy Plan: Proposed Floodway 8/29/2021
Drop Toe
.03
.04
.03
Legend
WS 100yr
Ground
Bank Sta
Elevation (ft)
7110
7105
7100
7095
7090
0
50
100
150
200
250
Station (ft)
2021 Sand Creek at Briargate Pkwy Plan: Proposed Floodway 8/29/2021
Drop Sill Top
.03
.04
.03
Legend
WS 100yr
Ground
Bank Sta
Elevation (ft)
7110
7105
7100
7095
7090
0
50
100
150
200
Station (ft)

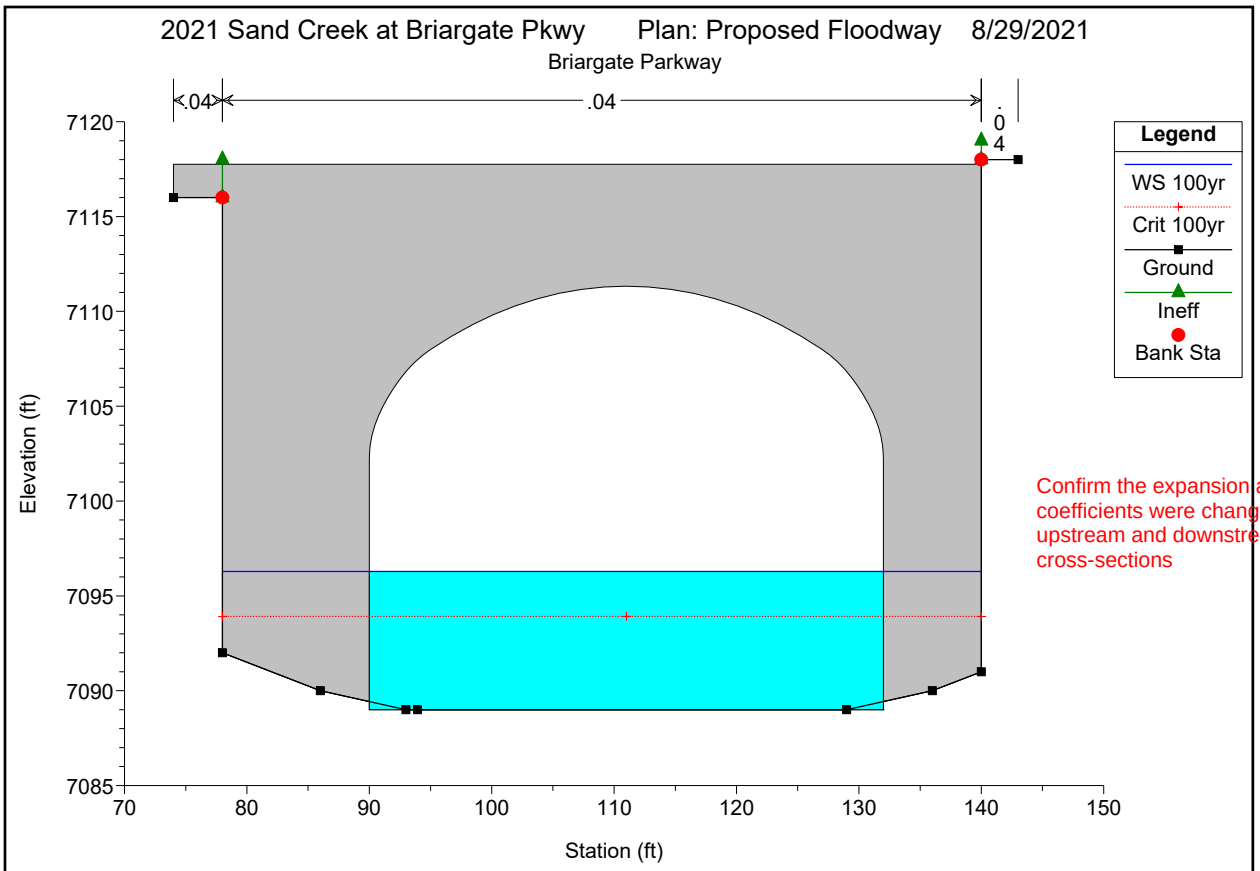

2021 Sand Creek at Briargate Pkwy Plan: Proposed Floodway 8/29/2021
Drop Sill Top
.03
.04
.03
Legend
WS 100yr
Ground
Bank Sta
Elevation (ft)
7110
7108
7106
7104
7102
7100
7098
7096
7094
7092
0
50
100
150
200
Station (ft)


2021 Sand Creek at Briargate Pkwy Plan: Proposed Floodway 8/29/2021
Drop Crest
.03
.04
.03
Legend
WS 100yr
Ground
Bank Sta
Elevation (ft)
7120
7115
7110
7105
7100
7095
7090
0
50
100
150
200
250
Station (ft)

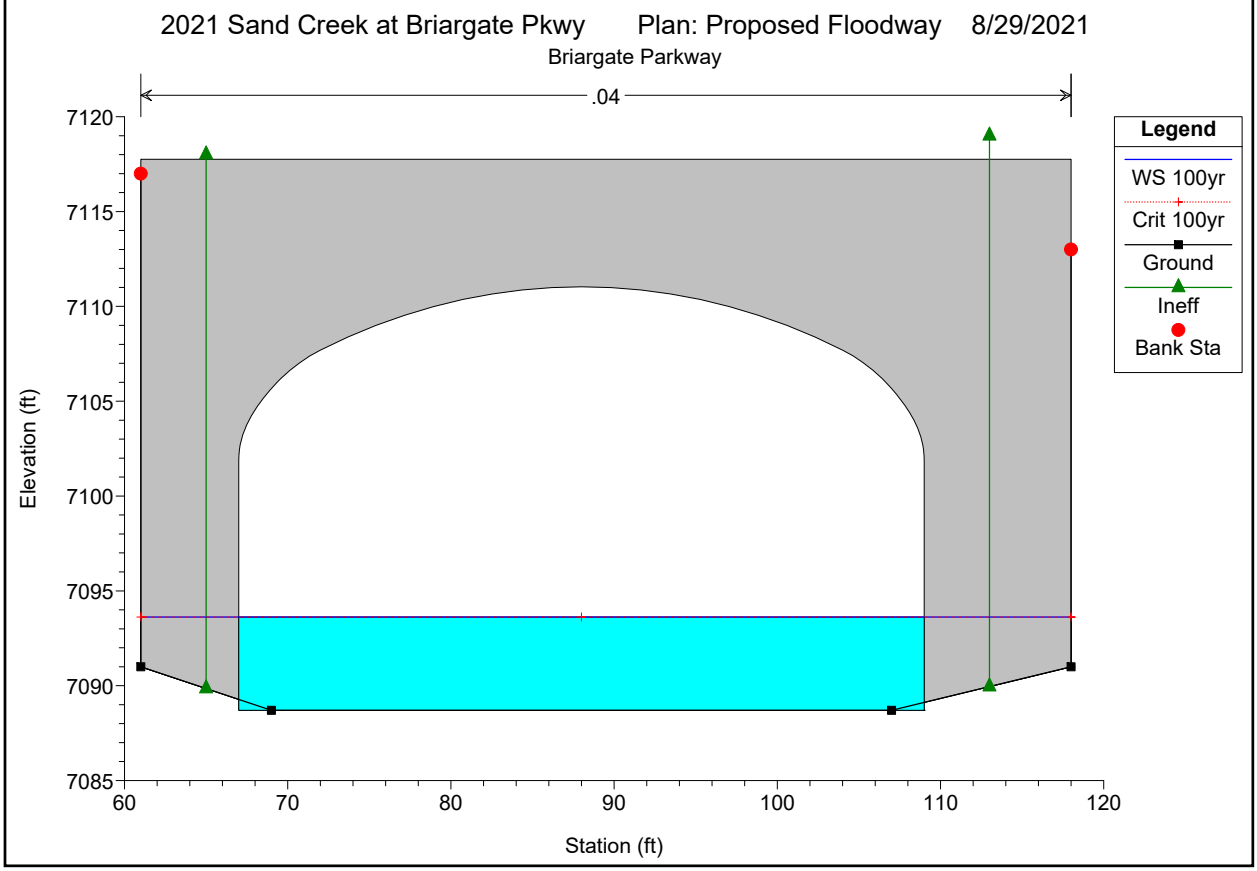

2021 Sand Creek at Briargate Pkwy Plan: Proposed Floodway 8/29/2021
Toe Drop
.04
.04
.03
Legend
WS 100yr
Ground
Bank Sta
Elevation (ft)
7120
7115
7110
7105
7100
7095
7090
7085
0
50
100
150
200
Station (ft)

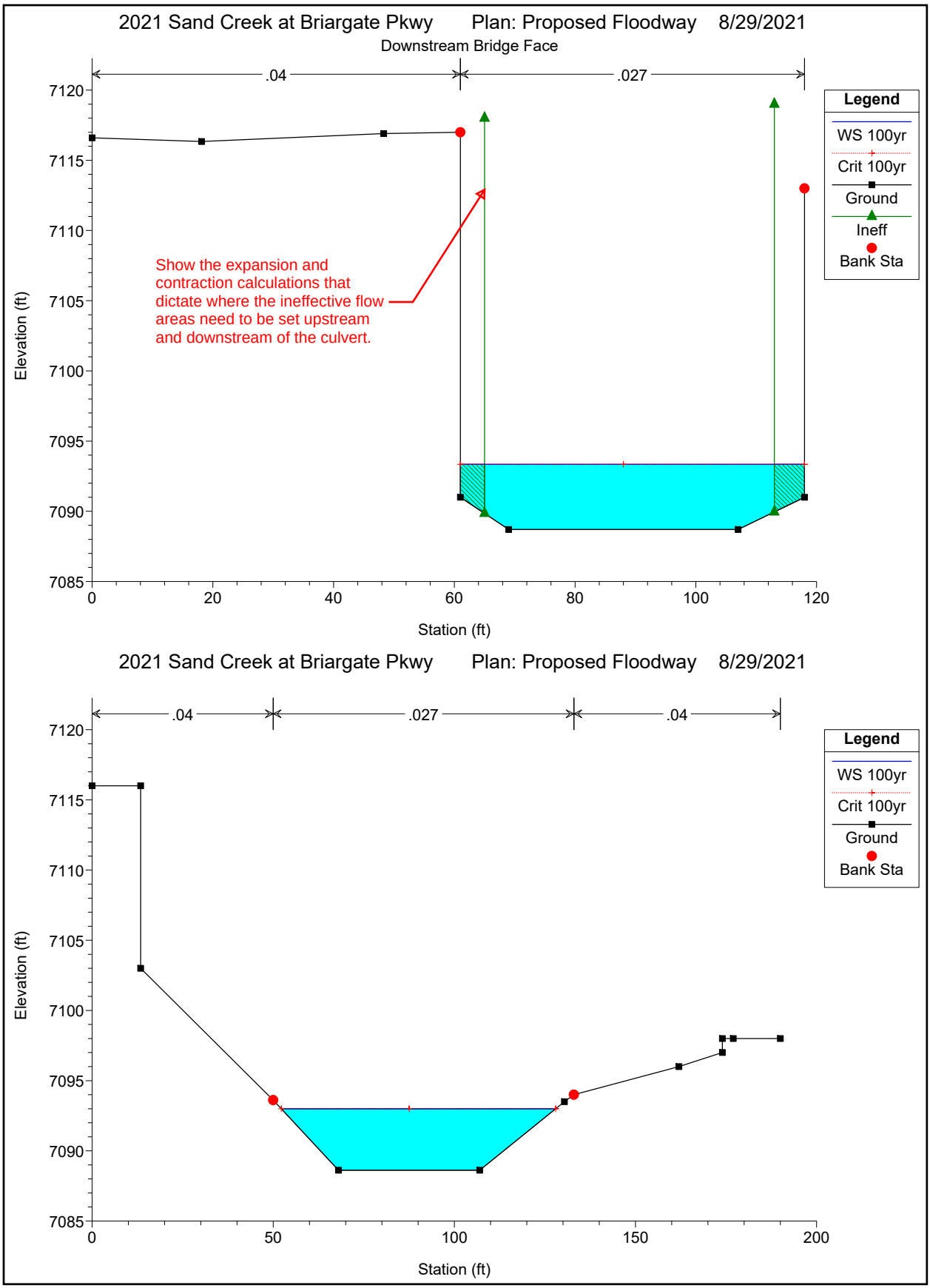

2021 Sand Creek at Briargate Pkwy Plan: Proposed Floodway 8/29/2021
Bottom Sill
.04
.04
.0
4
Legend
WS 100yr
Ground
Bank Sta
Elevation (ft)
7120
7115
7110
7105
7100
7095
7090
7085
20
40
60
80
100
120
140
160
180
Station (ft)

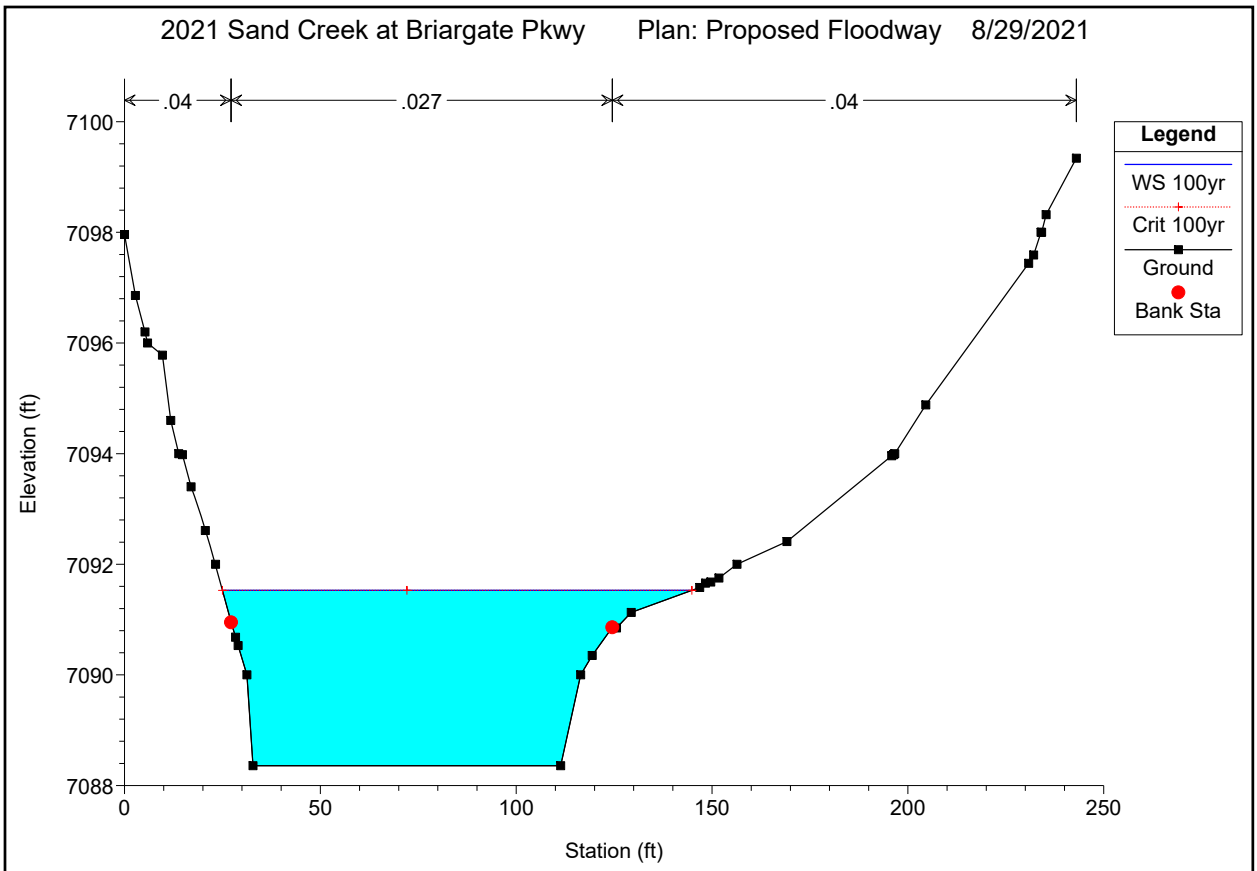

2021 Sand Creek at Briargate Pkwy Plan: Proposed Floodway 8/29/2021
Bottom Sill
.04
.04
.0
4
Legend
WS 100yr
Ground
Bank Sta
Elevation (ft)
7120
7115
7110
7105
7100
7095
7090
7085
20
40
60
80
100
120
140
160
180
Station (ft)
2021 Sand Creek at Briargate Pkwy Plan: Proposed Floodway 8/29/2021
Upstream Bridge Face
.04
.04
.0
4
Show the expansion and contraction calculations that dictate where the ineffective flow areas need to be set upstream and downstream of the culvert.
Legend
WS 100yr
Crit 100yr
Ground
Ineff
Bank Sta
Elevation (ft)
7120
7115
7110
7105
7100
7095
7090
7085
70
80
90
100
110
120
130
140
150
Station (ft)

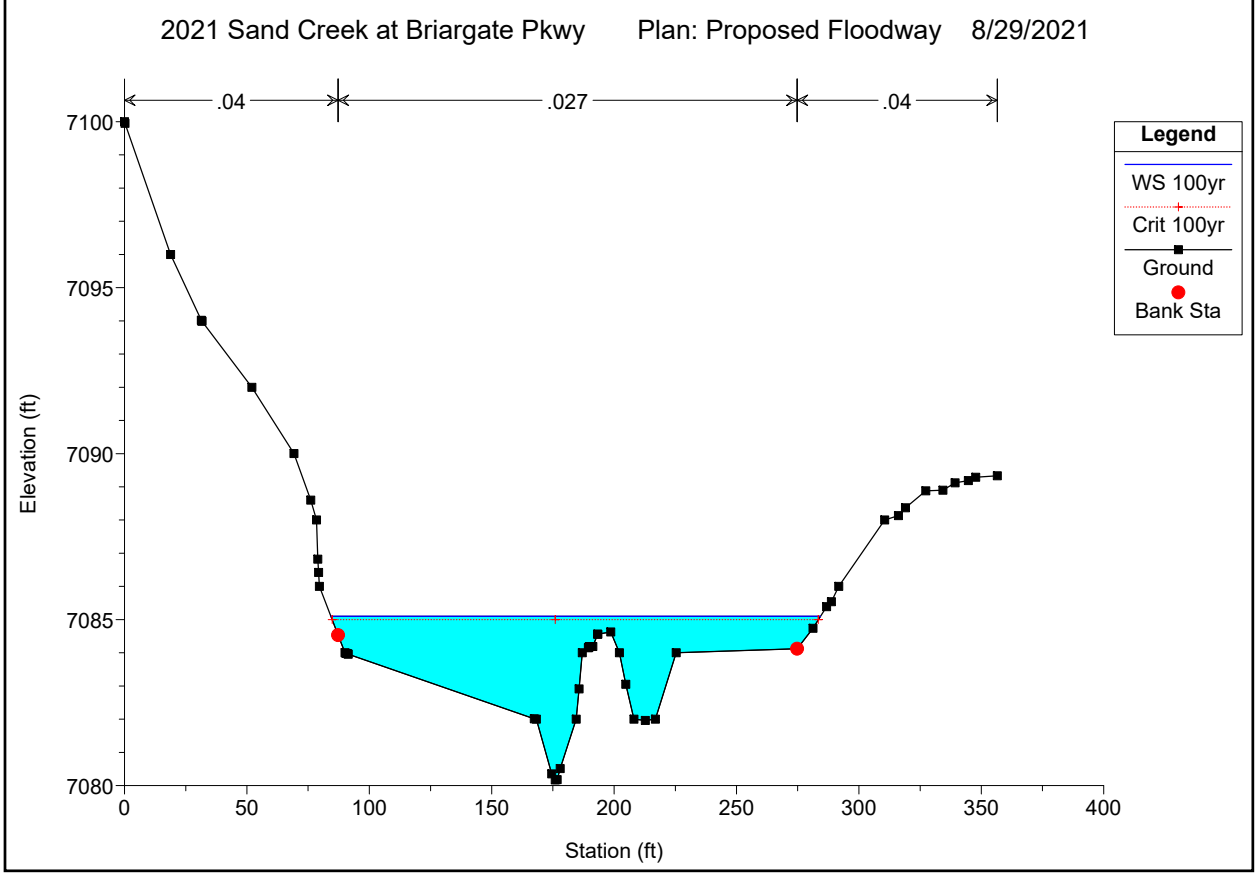


Confirm the expansion and contraction coefficients were changed at the upstream and downstream culvert cross-sections




2021 Sand Creek at Briargate Pkwy Plan: Proposed Floodway 8/29/2021
Downstream Bridge Face
.04
.027
Legend
WS 100yr
Crit 100yr
Ground
Ineff
Bank Sta
Show the expansion and contraction calculations that dictate where the ineffective flow areas need to be set upstream and downstream of the culvert.
Elevation (ft)
Station (ft)
7120
7115
7110
7105
7100
7095
7090
7085
0
20
40
60
80
100
120
2021 Sand Creek at Briargate Pkwy Plan: Proposed Floodway 8/29/2021
.04
.027
.04
Legend
WS 100yr
Crit 100yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
7120
7115
7110
7105
7100
7095
7090
7085
0
50
100
150
200


2021 Sand Creek at Briargate Pkwy Plan: Proposed Floodway 8/29/2021
.04
.027
.04
Legend
WS 100yr
Crit 100yr
Ground
Bank Sta
Elevation (ft)
7100
7098
7096
7094
7092
7090
7088
0
50
100
150
200
250
Station (ft)


2021 Sand Creek at Briargate Pkwy Plan: Proposed Floodway 8/29/2021
.04
.027
.04
Legend
WS 100yr
Crit 100yr
Ground
Bank Sta
Elevation (ft)
7100
7095
7090
7085
7080
0
50
100
150
200
250
300
350
400
Station (ft)

APPENDIX B: Geotechnical Report

Appendix B

Sterling Ranch Road and Briargate Parkway Bridges Geotechnical Report

ENTECH
ENGINEERING, INC.
505 ELKTON DRIVE
COLORADO SPRINGS, CO 80907
PHONE (719) 531-5599
FAX (719) 531-5238

SUBSURFACE SOIL INVESTIGATION
STERLING RANCH BRIDGES
STERLING RANCH ROAD OVER SAND CREEK
BRIARGATE BOULEVARD OVER SAND CREEK
COLORADO SPRINGS, COLORADO

Prepared for:

C&C Land
20 Boulder Crescent, 2nd Floor
Colorado Springs, Colorado 80903

Attn: Chaz Collins

March 4, 2020

Respectfully Submitted,

ENTECH ENGINEERING, INC.

Austin M. Nossokoff, P.E.

Reviewed by:

Joseph C. Goode, Jr., P.E.
President

AMN/amn

Encl.

Entech Job No. 200045
F:\AA projects\2020\200045-C&C LAnd-Sterling Ranch Bridges-220-SSI\200045 ssi.doc

Table of Contents

Tables

Figures

List of Appendices

SUBSURFACE SOIL INVESTIGATION
STERLING RANCH BRIDGES
STERLING RANCH ROAD OVER SAND CREEK &
BRIARGATE BOULEVARD OVER SAND CREEK
EL PASO COUNTY, COLORADO

1.0 INTRODUCTION

C&C Land is planning the construction of two vehicular bridges over sand creek for the proposed Sterling Ranch Road and Briargate Boulevard in El Paso County northeast of Colorado Springs, Colorado. The approximate location of the site is shown on the Vicinity Map, Figure 1. The planned layouts of the proposed bridges are shown on Figure 2, Site Plan/Test Boring Location Map.

This report describes the subsurface investigation conducted for the planned bridges and provides recommendations for foundation design and construction. The subsurface soil investigation included drilling test borings at four (4) locations within the footprints of the planned bridge foundations, collecting samples of soil, and conducting a geotechnical evaluation of the investigation findings. All drilling and subsurface investigation activities were performed by Entech Engineering, Inc. (Entech). The contents of this report, including the geotechnical evaluation and recommendations, are subject to the limitations and assumptions presented in Section 6.0.

2.0 PROJECT AND SITE DESCRIPTION

It is Entech's understanding that the project will consist of the construction of two (2) vehicular bridges spanning Sand Creek with driven H-pile foundations and associated site improvements. At the time of drilling, the sites for the proposed bridges were vacant. The crossing for the proposed Briargate Boulevard had been graded at the time of drilling. Sand Creek flows to the south. Current vegetation on the site consisted of grasses and small shrubs.

3.0 SUBSURFACE EXPLORATIONS AND LABORATORY TESTING

The subsurface conditions were investigated by drilling four (4) exploratory test borings, one at each bridge abutment. The borings were drilled to depths 20 feet below the existing ground surface using a truck-mounted continuous flight auger-drilling rig supplied and operated by Entech Engineering, Inc. Boring Logs descriptive of the subsurface conditions encountered during drilling and subsequent to drilling are presented in Appendix A. At the conclusion of drilling, observations of groundwater levels were made in each of the open borings. The approximate locations of the test borings are indicated on Figure 2.

Soil samples were obtained from the borings utilizing the Standard Penetration Test (ASTM D-1586) using a 2-inch O.D. split-barrel sampler and a California Sampler. Results of the Standard Penetration Test (SPT) are included on the Test Boring Logs in terms of N-values expressed in blows per foot (bpf). Soil samples recovered from the borings were visually classified and recorded on the Test Boring Logs. The soil classifications were later verified utilizing laboratory testing and grouped by soil type. The soil type numbers are included on the Test Boring Logs. It should be understood that the soil descriptions shown on the Test Boring Logs may vary between boring location and sample depth.

It should also be noted that the lines of stratigraphic separation shown on the Test Boring Logs represent approximate boundaries between soil types and the actual stratigraphic transitions may be more gradual and vary with location. The Test Boring Logs are presented in Appendix A.

Moisture Content, ASTM D-2216, was obtained in the laboratory for all recovered samples. Grain-Size, ASTM D-422, and Atterberg Limits, ASTM D-4318, were determined for various samples for the purpose of classification and to obtain pertinent engineering characteristics. Volume change testing was performed on selected samples using the Swell/Consolidation Test (ASTM D-4546) in order to evaluate potential expansion/consolidation characteristics of the soil and bedrock. Sulfate testing was performed on select samples to determine the corrosive characteristics of the soils. The Laboratory Test Results are included in Appendix B and summarized in Table 1.

4.0 SUBSURFACE CONDITIONS

Four (4) soil types were encountered in the borings drilled for the subsurface investigation: Type 1: silty sand fill (SM), Type 2: very silty sand (SM), Type 3: silty to very silty sandstone (SM), and Type 4: sandy to very sandy claystone (CL). The soils were classified in accordance with the Unified Soil Classification System (USCS) using the laboratory testing results and the observations made during drilling.

4.1 Soil and Rock

Soil Type 1 is a silty sand fill (SM). The sand fill was encountered in Test Boring 1 at the existing ground surface extending to a depth of 6 feet. Standard Penetration Testing conducted on the sand resulted in SPT N-values of 4 to 6 blows per foot (bpf), which indicates loose states. Moisture content and grain size testing resulted in a moisture contents of 7 to 8 percent with approximately 29 percent of the soil size particles passing the No. 200 sieve. Atterberg limit testing was performed on a sample of sand fill and resulted in a liquid limit of no value with a plastic index of non-plastic. Sulfate testing on the sand resulted in 0.00 percent soluble sulfate

by weight, indicating negligible potential for below grade concrete degradation due to sulfate attack.

Soil Type 2 is a very silty sand (SM). The sand was encountered in three (3) of the test borings at the existing ground surface extending to depths of 1 to 10 feet. Standard Penetration Testing conducted on the soil resulted in SPT N-values of 7 to 26 blows per foot (bpf), indicating the sand is loose to medium dense in terms of density. Moisture content and grain size testing resulted in moisture contents of 5 to 20 percent with approximately 40 percent of the soil size particles passing the No. 200 sieve. Atterberg limit testing was performed on a sample of sand fill and resulted in a liquid limit of 15 with a plastic index of 3. Sulfate testing on the sand resulted in less than 0.01 percent soluble sulfate by weight, indicating negligible potential for below grade concrete degradation due to sulfate attack.

Soil Type 3 is a silty to very silty sandstone (SM). The sandstone was encountered in all of the test borings at depths ranging from 1 to 10 feet bgs and extending to depths of 12 feet and the termination of the borings (20 feet). Standard Penetration Testing conducted on the soil resulted in SPT N-values of greater than 50 blows per foot (bpf), indicating the sandstone is very dense in terms of density. Moisture content and grain size testing resulted in moisture contents of 10 to 17 percent with approximately 14 to 42 percent of the soil size particles passing the No. 200 sieve. Atterberg limit testing resulted int liquid limits of no value to 32 and plastic indexes of non plastic to 6. Sulfate testing on the sandstone resulted in 0.00 to less than 0.01 percent soluble sulfate by weight, indicating negligible potential for below grade concrete degradation due to sulfate attack.

Soil Type 4 is sandy to very sandy claystone (CL). The claystone was encountered in Test Boring 1 at a depth of 12 feet bgs and extending to the termination of the boring (20 feet). Standard Penetration Testing conducted on the soil resulted in SPT N-values of greater than 50 blows per foot (bpf), indicating the soil is hard in terms of consistency. Moisture content and grain size testing resulted in moisture contents of 15 to 16 percent with approximately 59 percent of the soil size particles passing the No. 200 sieve. Atterberg limit testing resulted in a liquid limit of 35 and a plastic index of 14.

Additional descriptions and engineering properties of the soil encountered during drilling are included on the boring logs. Laboratory Testing Results are summarized on Table 1 and presented in Appendix B. It should be understood that the soil descriptions reported on the boring logs may vary between boring locations and sampling depths. Similarly, the lines of stratigraphic separation shown on the boring logs represent approximate boundaries between soil types and the actual transitions between types may be more gradual or variable.

4.2 Groundwater

Groundwater was encountered at depths ranging from 13 to 16.5 feet in Test Boring Nos. 3 and 4. Test Boring Nos. 1 and 2 were dry to 18 feet after drilling. Groundwater may affect development of significant foundation excavations or during installation of deep utilities depending on the final grading plans. Creek flow will vary due to rainfall, drainage, and other factors not readily apparent at this time. It should be noted that groundwater levels, observed at the time of the subsurface investigation, could change due to seasonal variations, changes in land runoff characteristics and future development including of nearby areas.

5.0 GEOTECHNICAL EVALUATION AND RECOMMENDATIONS

The following discussion is based on the subsurface conditions encountered in the borings drilled in the planned bridge footprints. If subsurface conditions different from those described herein are encountered during construction or if the project elements change from those described, Entech Engineering, Inc. should be notified so that the evaluation and recommendations presented can be reviewed and revised if necessary.

The site will be developed by constructing two (2) bridges over Sand Creek and associated site improvements at Sterling Ranch Road and Briargate Boulevard Crossings. The proposed bridges are expected to utilize driven H-pile foundations

Subsurface soil conditions encountered in the test borings drilled for the planned interchanges consisted of sand fill and silty to very silty sand overlying silty to very silty sandstone and sandy to very sandy claystone. Bedrock was encountered at depths of 1 to 10 feet in the test borings.

The surficial sands and sand fill were encountered in loose to medium dense states. The underlying sandstone was encountered in dense states, and the underlying claystone was encountered at hard consistencies.

5.1 Foundation Recommendations

The main purpose of the subsurface investigation was to gather soil and bedrock information for the proposed bridge abutments for use in providing foundation recommendations and design values. Recommendations for bridge supports using driven H-piles, shallow spread footings, and parameters for retaining walls are provided.

5.1.1 Deep Foundation Systems (Driven H-piles)

Based on evaluation of the site subsurface conditions, it is believed that the planned H-piles will achieve most of their compressive strength through end bearing and skin friction in the underlying sandstone and claystone bedrock (Soil Types 3 and 4). Some frictional resistance will also be developed in the overburden sand (Soil Type 1). Design parameters for use in the H-pile design, which include allowable end bearing, side resistance, and resisting factors are presented in Table 2. L Pile parameters for the sand, sandstone, and claystone are also included in Table 2. The recommendations and parameters apply to piles spaced by horizontal distances of at least 3 times the pile width. If the piles are spaced closer, reductions in the allowable pile capacity may be warranted. The following unit weights are recommended for the site soil and bedrock.

Unit weight of native overburden sand	120 pcf
Unit weight of sandstone bedrock	125 pcf
Unit weight of siltstone and claystone bedrock	125 pcf

It is recommended that full-time observation of the H-pile installation be performed to compile driving logs for each pile. At a minimum, the log should include: the driving resistance per foot of pile and per inch of pile over the last 3 inches; the pile driver make and model; rated energy; pile cushion/condition; observed damage; and final pile top location. The guidance set forth in the

State of Colorado Standard Specifications for Road and Bridge Construction, Section 502, Piling, is recommended. Piles should be driven 10 feet into bedrock or refusal.

5.1.2 Shallow Foundation Parameters

Structures associated with the bridges can be supported with shallow foundations resting on the native sands, recompacted loose sands, or sandstone. It should be noted that due to potential shallow groundwater on this site (due to the proximity to Sand Creek), extensive subgrade improvements are anticipated to support shallow foundations. The foundation members should bear on the native site sands, sandstone, or be recompacted according to the "Structural Fill" paragraph. Any topsoil must be removed and the existing subgrade cleared of any debris prior to excavation. Loose soils or uncontrolled fill material beneath foundation components will require removal and recompaction. Any expansive soils encountered beneath the foundation will require removal and replacement with non-expansive structural fill compacted according to the "Structural Fill" paragraph. Any new fill should be placed to the requirements of the "Structural Fill" paragraph. On-site granular sands may be used as structural fill as approved by Entech. Any import material should be approved by Entech prior to hauling to the site.

Provided the above recommendations are followed, an allowable bearing pressure of 2400 psf is recommended for the native sands. For recompacted sands or imported granular structural fill, an allowable bearing capacity of 3000 psf is recommended. An allowable bearing capacity of 4000 psf is recommended for undisturbed sandstone. Footings should extend a minimum of 30 inches below the adjacent exterior surface grade for frost protection. Following the above foundation subgrade preparation recommendations, and adhering to the recommended maximum allowable bearing pressure, it is expected to result in foundation designs which should limit total and differential vertical movements.

Foundation excavations are recommended to extend at least 3 feet horizontally beyond the foundation limits in order to provide adequate space for installation of drain materials (if necessary) and placement of controlled fill. All foundation excavation side slopes should be inclined at angles of 1 1/2 horizontal to 1 vertical or flatter, as necessary, to provide for excavation sidewall stability during construction or as required by OSHA regulations.

Entech should observe overexcavated subgrades as well as the overall foundation excavation subgrade and evaluate if the exposed conditions are consistent with those described in this report. Entech should also provide recommendations for overexcavation depth and other subgrade improvements, if necessary, and the need for drain systems based on the excavation conditions observed at that time.

5.1.3 Retaining Wall Parameters

The following values are recommended for use in designing retaining walls with unbalanced lateral loading that may be associated with this project. Roadway/Vehicle surcharge loading is required for wall design.

Recommended Design Values – Lateral Loading

Equivalent fluid density for lateral earth pressure (active), pcf (site granular soils)	45
Equivalent fluid density for lateral earth pressure (passive), pcf	300
Equivalent fluid density for lateral earth pressure (at rest), pcf	60
Soil density (compacted sand), pcf	125
Angle of Internal Friction (loose silty sand and sandy clay-silt)	26°
Angle of Internal Friction (compacted silty sand)	34°
Coefficient of sliding between concrete and silty gravelly sand	0.35
Bearing capacity of sand, psf	2400 psf
Bearing capacity of sandstone, psf	3500 psf

*Note: The above lateral loading design values are for level back slope angles and no surcharge loads. If wall backfill is submerged, water pressures must be taken into account as additional wall loading. If backfill slope angles are greater than zero degrees, or if the backfill is surcharged, the design values must be adjusted to account for additional lateral loading.

5.2 Site Seismic Classification

Based on the subsurface conditions encountered at the site and in accordance with Section 1613 of the 2015 International Building Code (IBC), the site meets the conditions of a Site Class C.

5.3 Surface and Subsurface Drainage

Positive surface drainage must be maintained around structures to minimize infiltration of surface water. A minimum gradient of 5 percent in the first 10 feet adjacent to foundation components is recommended. A minimum gradient of 2 percent is recommended for paved areas. All grades should be directed away from structures.

To help minimize infiltration of water into foundation zones, vegetative plantings placed close to foundation components should be limited to those species having low watering requirements and irrigated grass should not be located within 5 feet of foundation components. Similarly, sprinklers are not recommended to discharge water within 5 feet of foundation components. Irrigation near foundations should be limited to the minimum amount sufficient to maintain vegetation. Application of more irrigation water than necessary can increase the potential for foundation movement.

5.4 Concrete

Soluble sulfate testing was conducted on three samples of the site soils to evaluate the potential for sulfate attack on concrete placed below the surface grade. The test results indicated less than 0.01 percent soluble sulfate by weight for the site soils. The test results indicate the sulfate component of the in-place site soils present a negligible exposure threat to concrete placed below grade that comes into contact with the site soils.

Type II cement is recommended for concrete at this site. To further avoid concrete degradation during construction it is recommended that concrete not be placed on frozen or wet ground. Care should be taken to prevent the accumulation or ponding of water in foundation excavations prior to the placement of concrete. If standing water is present in the foundation excavations, it should be removed by ditching to sumps and pumping the water away from the foundation area

prior to concrete placement. If concrete is placed during periods of cold temperatures, the concrete must be kept from freezing. This may require covering the concrete with insulated blankets and adding heat to prohibit freezing.

5.5 Foundation Excavation Observations

Subgrade preparation for bridge foundations and associated improvements should be observed by Entech Engineering prior to construction of the foundation elements in order to verify that (1) no anomalies are present, (2) materials of the proper bearing capacity have been encountered or placed, and (3) no soft, loose, uncontrolled fill material, expansive soil or debris are present in the foundation area prior to concrete placement or backfilling. Pile driving should be observed to verify proper embedment or refusal. Piles should be driven 10 feet into bedrock or refusal. Entech should make final recommendations for over-excavation or stabilization, if required, at the time of excavation observation, if necessary.

5.6 Structural Fill

Areas to receive fill should have all topsoil, organic material or debris removed. Fill must be properly benched. The surface should be scarified and moisture conditioned to within ± 2 percent of its optimum moisture content and compacted to 95 percent of its maximum Modified Proctor Dry Density (ASTM D-1557) beneath footings or floor slabs prior to placing new fill. New fill beneath footings should be non-expansive and be placed in thin lifts not to exceed 6 inches after compaction while maintaining at least 95 percent of its maximum Modified Proctor Dry Density (ASTM D-1557). These materials should be placed at a moisture content conducive to compaction, usually ±2 percent of Proctor optimum moisture content. The placement and compaction of fill should be observed and tested by Entech Engineering, Inc. Imported soils should be approved by Entech Engineering, Inc. prior to being hauled to the site and on-site granular soils prior to placement.

Compacted, non-expansive granular soil, free of organics, debris and cobbles greater than 3-inches in diameter, is recommended for filling foundation components. All fill placed within the foundation areas should be non-expansive and be compacted to a minimum of 95 percent of the

soils maximum dry density as determined by the Modified Proctor Test (ASTM D-1557). Fill material placed beneath floor slabs should be compacted to a minimum of 95 percent of its maximum Modified Proctor Dry Density, ASTM D-1557. Fill material should be placed in horizontal lifts such that each finished lift has a compacted thickness of six inches or less. Fill should be placed at water contents conducive to achieving adequate compaction, usually within ±2 percent of the optimum water content as determined by ASTM D-1557. Mechanical methods can be used for placement and compaction of fill; however, heavy equipment should be kept at distance from foundation walls and below slab infrastructure to avoid overstressing. No water flooding techniques of any type should be used for compaction or placement of foundation or floor slab fill material.

5.7 Utility Trench Backfill

Fill placed in utility trenches should be compacted to a minimum of 95 percent of its maximum dry density as determined by the Standard Proctor Test (ASTM D-698) for cohesive soils and 95 percent as determined by the Modified Proctor Test (ASTM D-1557) for cohesionless soils. Fill should be placed in horizontal lifts having a compacted thickness of six inches or less and at a water content conducive to adequate compaction, within ±2 percent of the optimum water content. Mechanical methods should be used for fill placement; however, heavy equipment should be kept at a distance from foundation walls. No water flooding techniques of any type should be used for compaction or placement of utility trench fill.

Trench backfill placement should be performed in accordance with El Paso County specifications. All excavation and excavation shoring/bracing should be performed in accordance with OSHA guidelines.

5.8 General Backfill

Any areas to receive fill outside the foundation limits should have all topsoil, organic material, and debris removed. Fill must be properly benched into existing slopes in order to be adequately compacted. The fill receiving surface should be scarified to a depth of 12-inches and moisture conditioned to ± 2 percent of the optimum water content, and compacted to a minimum of 95 percent of the ASTM D-1557 maximum dry density before the addition of new fill. Fill should be placed in thin lifts not to exceed 6 inches in thickness after compaction while maintaining at least 95 percent of the ASTM D-1557 maximum dry density. Fill material should be free of vegetation and other unsuitable material and shall not contain rocks or fragments greater than 3-inches. Topsoil and strippings should be segregated from all other fill sources on the site. Fill placement and compaction beneath and around foundations, in utility trenches, beneath roadways or other structural features of the project should be observed and tested by Entech during construction.

5.9 Excavation Stability

Excavation sidewalls must be properly sloped, benched and/or otherwise supported in order to maintain stable conditions. All excavation openings and work completed therein shall conform to OSHA Standards as put forward in CFR 29, Part 1926.650-652, (Subpart P).

5.10 Winter Construction

In the event construction of the planned facility occurs during winter, foundations and subgrades should be protected from freezing conditions. Concrete should not be placed on frozen soil and once concrete has been placed, it should not be allowed to freeze. Similarly, once exposed, the foundation subgrade should not be allowed to freeze. During site grading and subgrade preparation, care should be taken to avoid burial of snow, ice or frozen material within the planned construction area.

5.11 Construction Observations

It is recommended that Entech observe and document the following activities during construction of the building foundations.

- Excavated subgrades and subgrade preparation.
- Drilled Pier Installation
- Placement of drains (if installed).
- Placement/compaction of fill material for the foundation components and retaining walls.
- Placement/compaction of utility bedding and trench backfill.

6.0 CLOSURE

The subsurface investigation, geotechnical evaluation and recommendations presented in this report are intended for use of C&C Land with application to the proposed bridges over Sand Creek at Sterling Ranch Road and Briargate Boulevard and their associated site improvements, in El Paso County northeast of Colorado Springs, Colorado. In conducting the subsurface investigation, laboratory testing, engineering evaluation and reporting, Entech Engineering, Inc. endeavored to work in accordance with generally accepted professional geotechnical and geologic practices and principles consistent with the level of care and skill ordinarily exercised by members of the geotechnical profession currently practicing in same locality and under similar conditions. No other warranty, expressed or implied is made. During final design and/or construction, if conditions are encountered which appear different from those described in this report, Entech Engineering, Inc. requests that it be notified so that the evaluation and recommendations presented herein can be reviewed and modified as appropriate.

If there are any questions regarding the information provided herein or if Entech Engineering, Inc. can be of further assistance, please do not hesitate to contact us.

TABLES

TABLE 1

SUMMARY OF LABORATORY TEST RESULTS

CLIENT C&C LAND
PROJECT STERLING RANCH BRIDGES
JOB NO. 200045

SOIL TYPE	TEST BORING NO.	DEPTH (FT)	WATER (%)	DRY DENSITY (PCF)	PASSING NO. 200 SIEVE (%)	LIQUID LIMIT (%)	PLASTIC INDEX (%)	SULFATE (WT %)	FHA SWELL (PSF)	SWELL/ CONSOL (%)	UNIFIED CLASSIFICATION	SOIL DESCRIPTION
1	1	2-3			29.1	NV	NP	0.00			SM	FILL, SAND, SILTY
2	3	5			39.8	15	3	<0.01			SM	SAND, VERY SILTY
3	2	10			13.9	NV	NP	<0.01			SM	SANDSTONE, SILTY
3	4	2-3			14.7						SM	SANDSTONE, SILTY
3	4	15	17.1	110.2	42.2	32	6	0.00		1.9	SM	SANDSTONE, VERY SILTY
4	1	15	14.3	116.1						1.6	CL	CLAYSTONE, SANDY
4	1	20			58.7	35	14				CL	CLAYSTONE, VERY SANDY

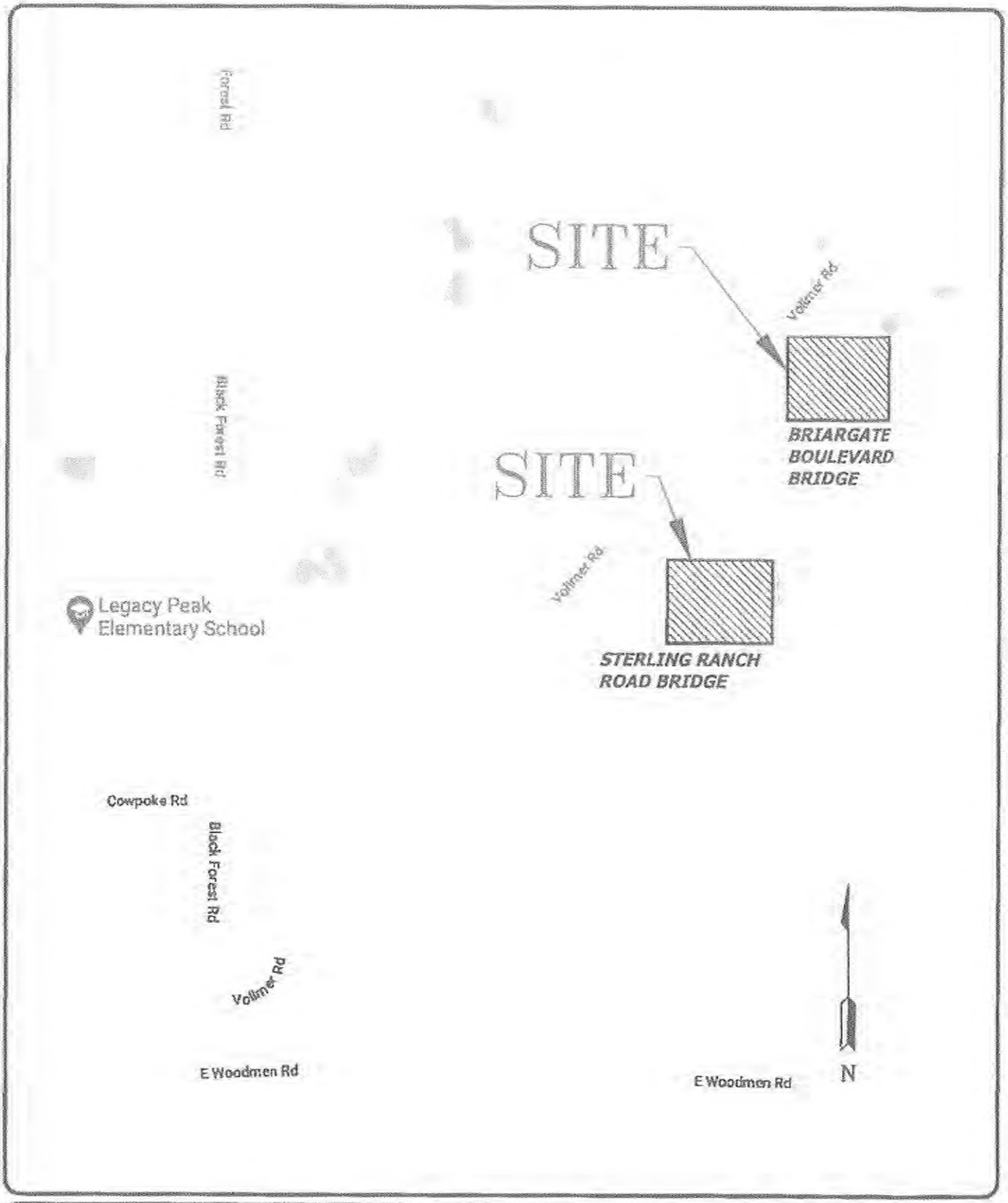
TABLE 2

Sterling Ranch Bridges - LPile Design Parameters

Depth Below Existing Ground Surface		Groundwater Elevation (ft) Below Existing Ground	Soil/Rock Description	Axial Pile Capacity Parameters		PRELIMINARY LPile Parameters						
Top	Bottom			Allowable Side Resistance (ksf)	Allowable End Bearing (ksf)	p-y Curve	Unit Weight γ[1] (pcf)	Peak Friction Angle ϕ (deg)	Initial Static Modulus of Subgrade Reaction, k (pci)	Undrained Cohesion s_u (psf)	Strain Factor ε_{50} (in/in)
0	0	12 to 16	Suitable Granular Structural Fill (Dense)	—	—	Sand	120 60[1]	32	225 90[1]	N/A	N/A
0	1 to 10		Native Silty Sand	—	—	Sand	120 60[1]	32	225 90[1]	N/A	N/A
1 to 10	12 to BOE		Silty Sandstone	3	30	Sand	125 67[1]	34	225 135[1]	N/A	N/A
12	BOE		Sandy to Very Sandy Claystone	0	30	Clay	115 57[1]	N/A	500	1500	0.005

[1] = Submerged

FIGURES



ENTECH ENGINEERING, INC.
305 ELKTON DRIVE
COLORADO SPRINGS, CO 80907 (719) 531-5599

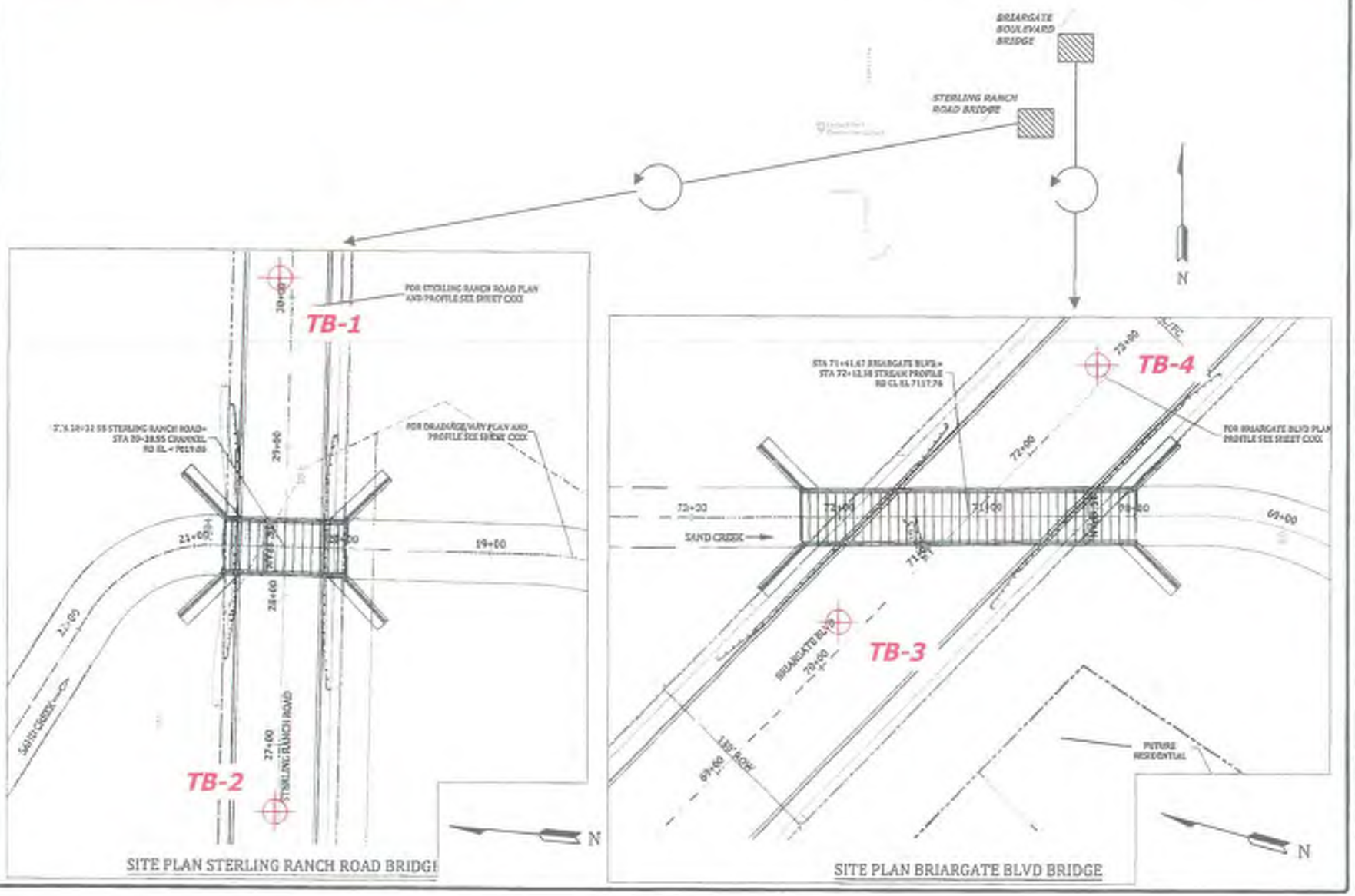
Vicinity Map
Sterling Ranch Bridges
Sterling Ranch Rd & Briargate Blvd Over
Sand Creek
El Paso County, CO
For: C & C Land

DRAWN:	DATE:	CHECKED:	DATE:
AMN	2/14/20		

JOB NO.: 200045

FIG NO.: 1

TB-2 - APPROXIMATE TEST BORING LOCATION AND NUMBER



REVISIONS	BY

ENTECH ENGINEERING, INC.

Site Plan/Test Boring Map
Sterling Ranch Bridges
Sterling Ranch Rd & Briargate Blvd
Over Sand Creek
El Paso County, CO
For: C & C Land

APPENDIX A: Test Boring Logs

TEST BORING NO. 1
DATE DRILLED 1/23/2020
Job # 200045

REMARKS

DRY TO 18', 1/28/20

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
FILL 0-6', SAND, SILTY, FINE TO COARSE GRAINED, BROWN, LOOSE, MOIST			6	7.7	1
5			4	6.9	1
SANDSTONE, SILTY, FINE GRAINED, TAN, VERY DENSE, MOIST					
10			50/7"	14.6	3
CLAYSTONE, SANDY TO VERY SANDY, GRAY BROWN, HARD, MOIST					
15			50/8"	15.3	4
20			50/7"	15.9	4

TEST BORING NO. 2
DATE DRILLED 1/23/2020
CLIENT C&C LAND
LOCATION STERLING RANCH BRIDGES

REMARKS

DRY TO 18', 1/28/20

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
SAND, SILTY, FINE TO COARSE GRAINED, TAN, MEDIUM DENSE, MOIST			26	5.2	2
5			50/11"	13.5	3
SANDSTONE, SILTY, FINE GRAINED, TAN, VERY DENSE, MOIST					
10			50/6"	10.0	3
SANDSTONE, SILTY, FINE TO COARSE GRAINED, TAN TO GRAY BROWN, VERY DENSE, MOIST					
15			50/10"	11.2	3
20			50/5"	12.2	3

ENTECH
ENGINEERING, INC.
505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

TEST BORING LOG

DRAWN	DATE	CHECKED	DATE
			12/10/20

JOB NO. 200045
FIG NO. A- 1

TEST BORING NO. 3
DATE DRILLED 1/23/2020
Job # 200045

REMARKS

WATER @ 16.5', 1/28/20

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	
						SAND, SILTY TO VERY SILTY, FINE TO COARSE GRAINED, TAN TO BROWN, MEDIUM DENSE TO LOOSE, MOIST
			16	5.0	2	
5			7	19.7	2	
10			24	15.1	2	SANDSTONE, SILTY, FINE TO COARSE GRAINED, GRAY BROWN, VERY DENSE, MOIST TO VERY MOIST
15			50/10"	12.7	3	
20			50/10"	17.3	3	

TEST BORING NO. 4
DATE DRILLED 1/23/2020
CLIENT C&C LAND
LOCATION STERLING RANCH BRIDGES

REMARKS

WATER @ 13', 1/28/20

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	
					2	SAND, SILTY, TAN
			50/10"	7.1	3	SANDSTONE, SILTY, FINE TO COARSE GRAINED, TAN, VERY DENSE, MOIST
5			50/11"	9.2	3	
10			50/9"	10.3	3	
15			10/10"	16.4	3	SANDSTONE, VERY SILTY, FINE GRAINED, GRAY BROWN, VERY DENSE, MOIST TO VERY MOIST
20			50/4"	14.9	3	COARSE GRAINED LENSES

ENTECH
ENGINEERING, INC.
505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

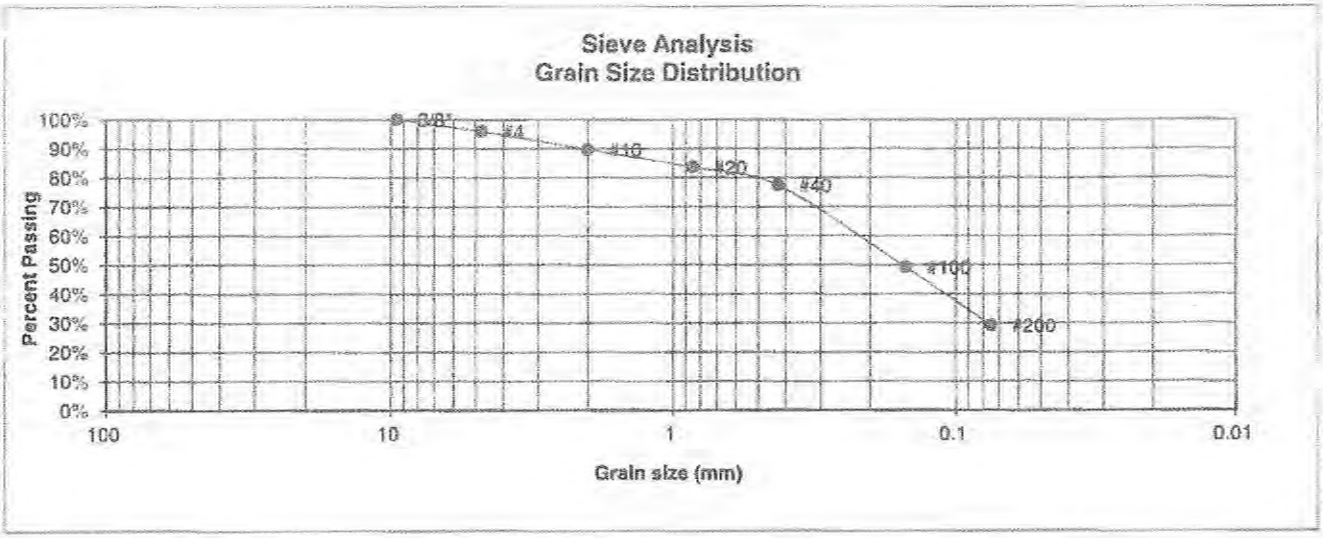
TEST BORING LOG

DRAWN	DATE	CHECKED:	DATE
			2/10/20

JOB NO. 200045
FIG NO A- 2

APPENDIX B: Laboratory Test Results

UNIFIED CLASSIFICATION	SM	CLIENT	C&C LAND
SOIL TYPE #	1	PROJECT	STERLING RANCH BRIDGES
TEST BORING #	1	JOB NO.	200045
DEPTH (FT)	2-3	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	95.9%
10	89.7%
20	83.6%
40	77.3%
100	49.2%
200	29.1%

Atterberg Limits

Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

Swell

Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	

ENTECH
ENGINEERING, INC.
505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

LABORATORY TEST RESULTS

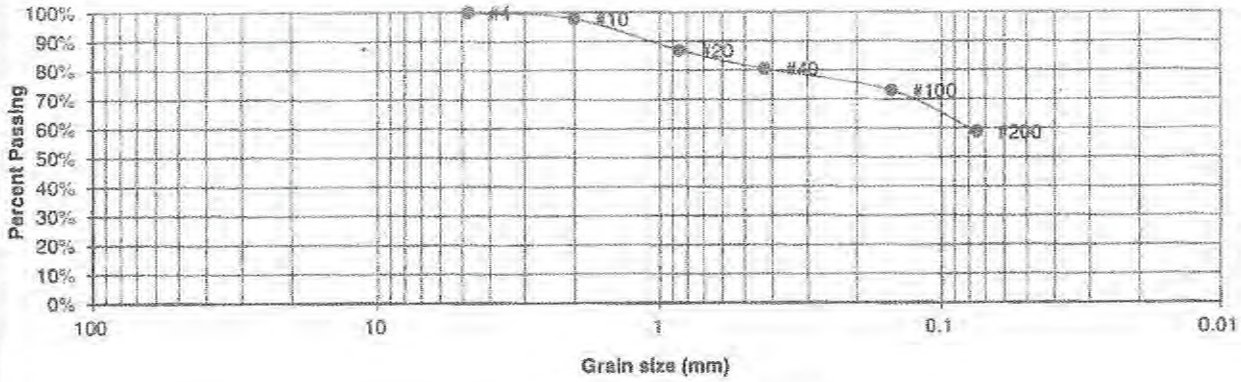
DRAWN:	DATE	CHECKED:	DATE:
			2/10/20

JOB NO. 200045

FIG NO. B-1

UNIFIED CLASSIFICATION	CL	CLIENT	C&C LAND
SOIL TYPE #	4	PROJECT	STERLING RANCH BRIDGES
TEST BORING #	1	JOB NO.	200045
DEPTH (FT)	20	TEST BY	BL

Sieve Analysis
Grain Size Distribution



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	97.8%
20	86.9%
40	80.5%
100	72.9%
200	58.7%

Atterberg Limits

Plastic Limit	21
Liquid Limit	35
Plastic Index	14

Swell

Moisture at start

Moisture at finish

Moisture increase

Initial dry density (pcf)

Swell (psf)

ENTECH
ENGINEERING, INC.
505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

LABORATORY TEST RESULTS

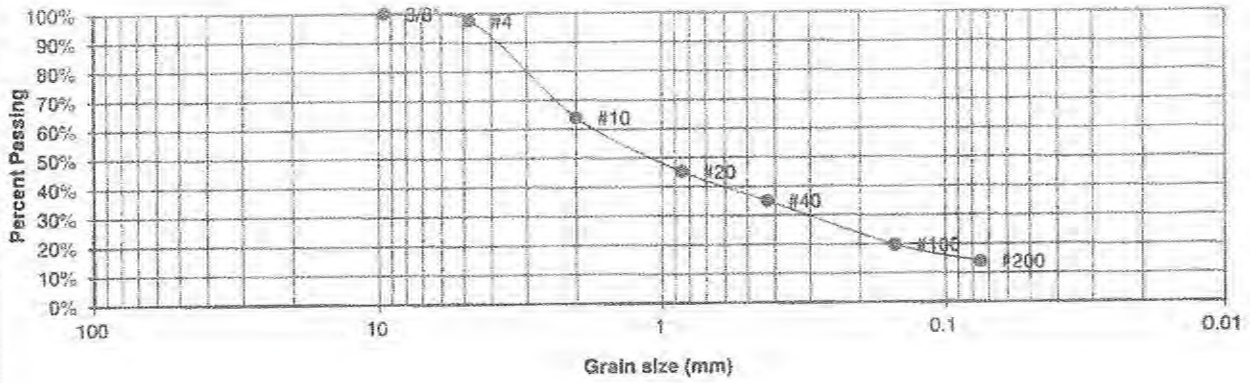
DRAWN	DATE	CHECKED	DATE
			4/16/20

JOB NO 200045

FIG NO B-2

UNIFIED CLASSIFICATION	SM	CLIENT	C&C LAND
SOIL TYPE #	3	PROJECT	STERLING RANCH BRIDGES
TEST BORING #	2	JOB NO.	200045
DEPTH (FT)	10	TEST BY	BL

Sieve Analysis
Grain Size Distribution



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	97.4%
10	63.9%
20	45.2%
40	35.0%
100	19.7%
200	13.9%

Atterberg Limits

Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

Swell

Moisture at start

Moisture at finish

Moisture increase

Initial dry density (pcf)

Swell (psf)

ENTECH ENGINEERING, INC.
505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

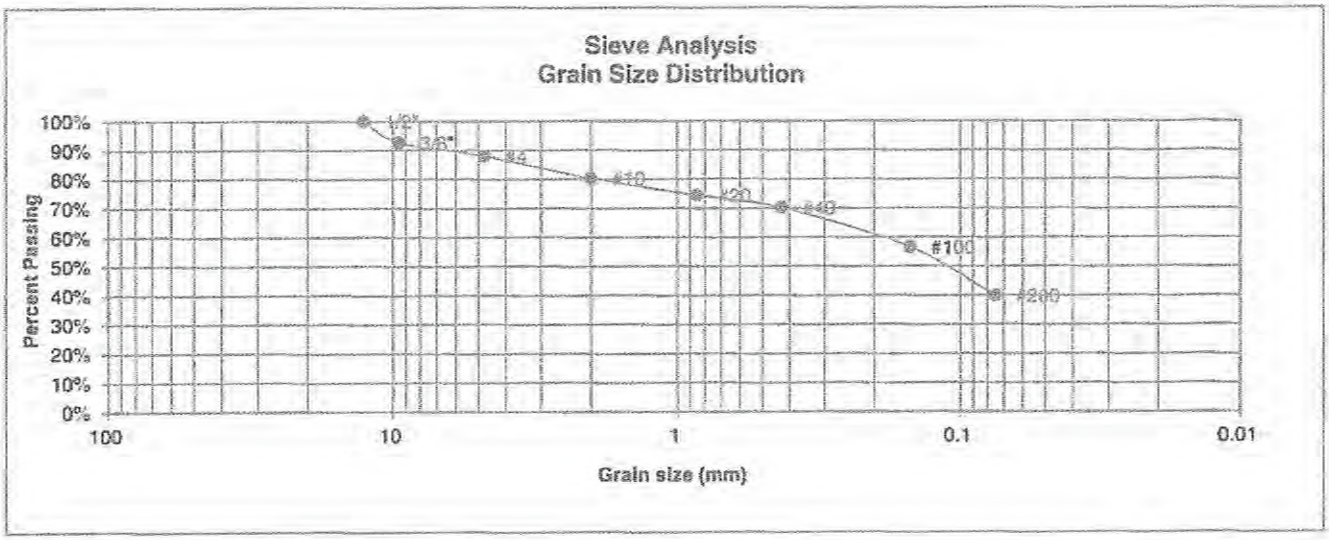
LABORATORY TEST RESULTS

DRAWN	DATE	CHECKED:	DATE: 2/11/20

JOB NO 200045

FIG NO B-3

UNIFIED CLASSIFICATION	SM	CLIENT	C&C LAND
SOIL TYPE #	2	PROJECT	STERLING RANCH BRIDGES
TEST BORING #	3	JOB NO.	200045
DEPTH (FT)	5	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	100.0%
3/8"	92.6%
4	88.0%
10	80.3%
20	74.4%
40	70.1%
100	56.5%
200	39.8%

Atterberg Limits	
Plastic Limit	12
Liquid Limit	15
Plastic Index	3

Swell	
Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	

ENTECH
ENGINEERING, INC.
505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

LABORATORY TEST RESULTS

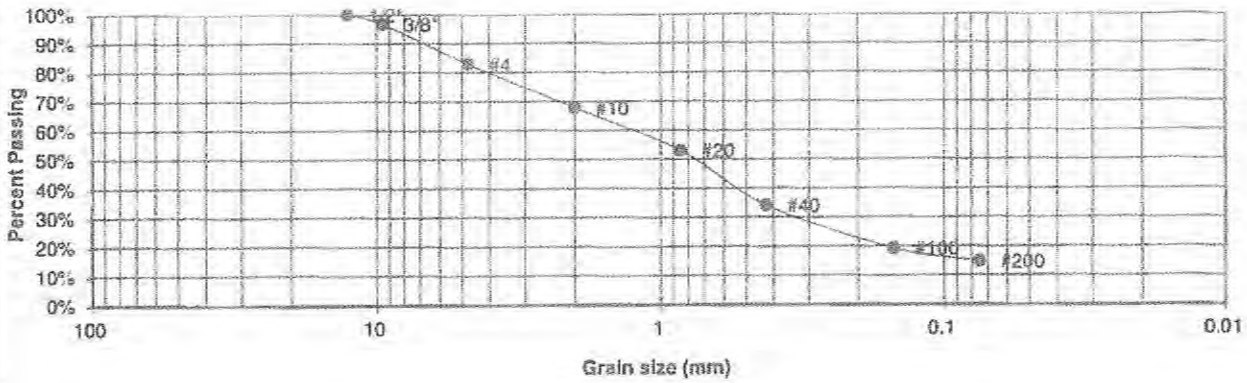
DRAWN:	DATE:	CHECKED	DATE:
		MV	5.2.20

JOB NO. 200045

FIG NO. B-4

UNIFIED CLASSIFICATION	SM	CLIENT	C&C LAND
SOIL TYPE #	3	PROJECT	STERLING RANCH BRIDGES
TEST BORING #	4	JOB NO.	200045
DEPTH (FT)	2-3	TEST BY	BL

Sieve Analysis
Grain Size Distribution



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	100.0%
3/8"	96.7%
4	82.8%
10	67.8%
20	53.0%
40	34.0%
100	19.2%
200	14.7%

Atterberg Limits
Plastic Limit
Liquid Limit
Plastic Index

Swell
Moisture at start
Moisture at finish
Moisture increase
Initial dry density (pcf)
Swell (psf)

ENTECH ENGINEERING, INC.
505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

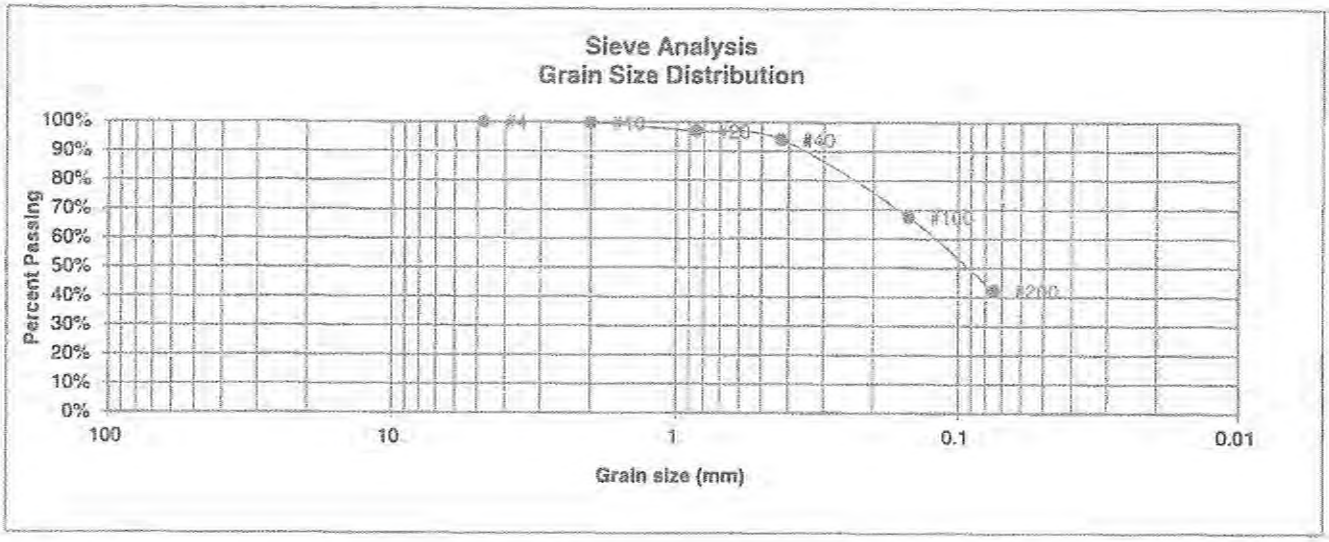
LABORATORY TEST RESULTS

DRAWN	DATE	CHECKED	DATE:
			2/10/20

JOB NO. 200045

FIG NO. B-5

UNIFIED CLASSIFICATION	SM	CLIENT	C&C LAND
SOIL TYPE #	3	PROJECT	STERLING RANCH BRIDGES
TEST BORING #	4	JOB NO.	200045
DEPTH (FT)	15	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	99.7%
20	96.9%
40	94.0%
100	67.4%
200	42.2%

Atterberg Limits	
Plastic Limit	26
Liquid Limit	32
Plastic Index	6

Swell	
Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	

ENTECH
ENGINEERING, INC.
505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

LABORATORY TEST RESULTS

DRAWN	DATE	CHECKED	DATE
			2/10/20

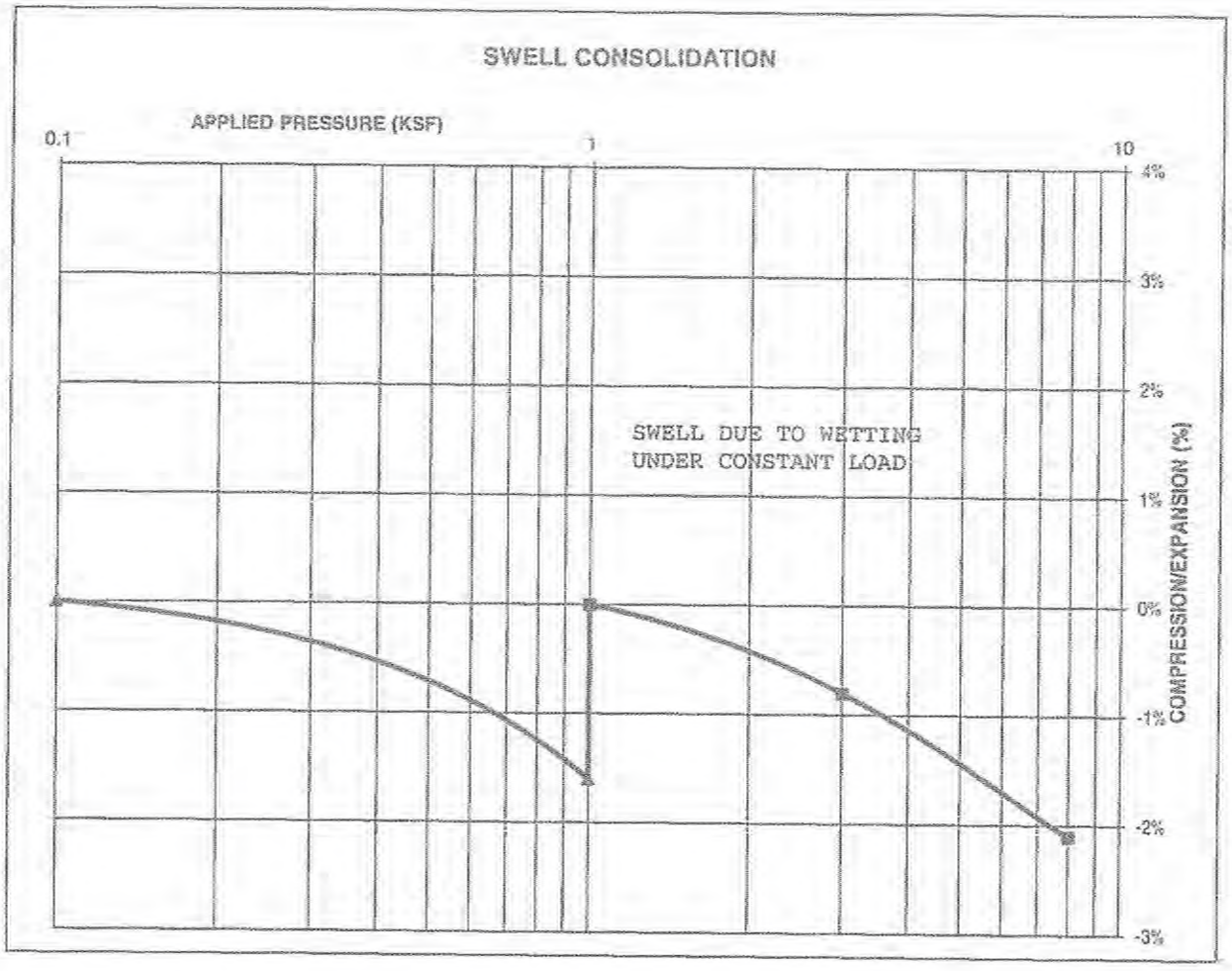
JOB NO. 200045

FIG NO. B-6

CONSOLIDATION TEST RESULTS

TEST BORING #	1	DEPTH(ft)	15
DESCRIPTION	CL	SOIL TYPE	4
NATURAL UNIT DRY WEIGHT (PCF)			116
NATURAL MOISTURE CONTENT			14.3%
SWELL/CONSOLIDATION (%)			1.6%

JOB NO. 200045
CLIENT C&C LAND
PROJECT STERLING RANCH BRIDGES



ENTECH
ENGINEERING, INC.
505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

SWELL CONSOLIDATION
TEST RESULTS

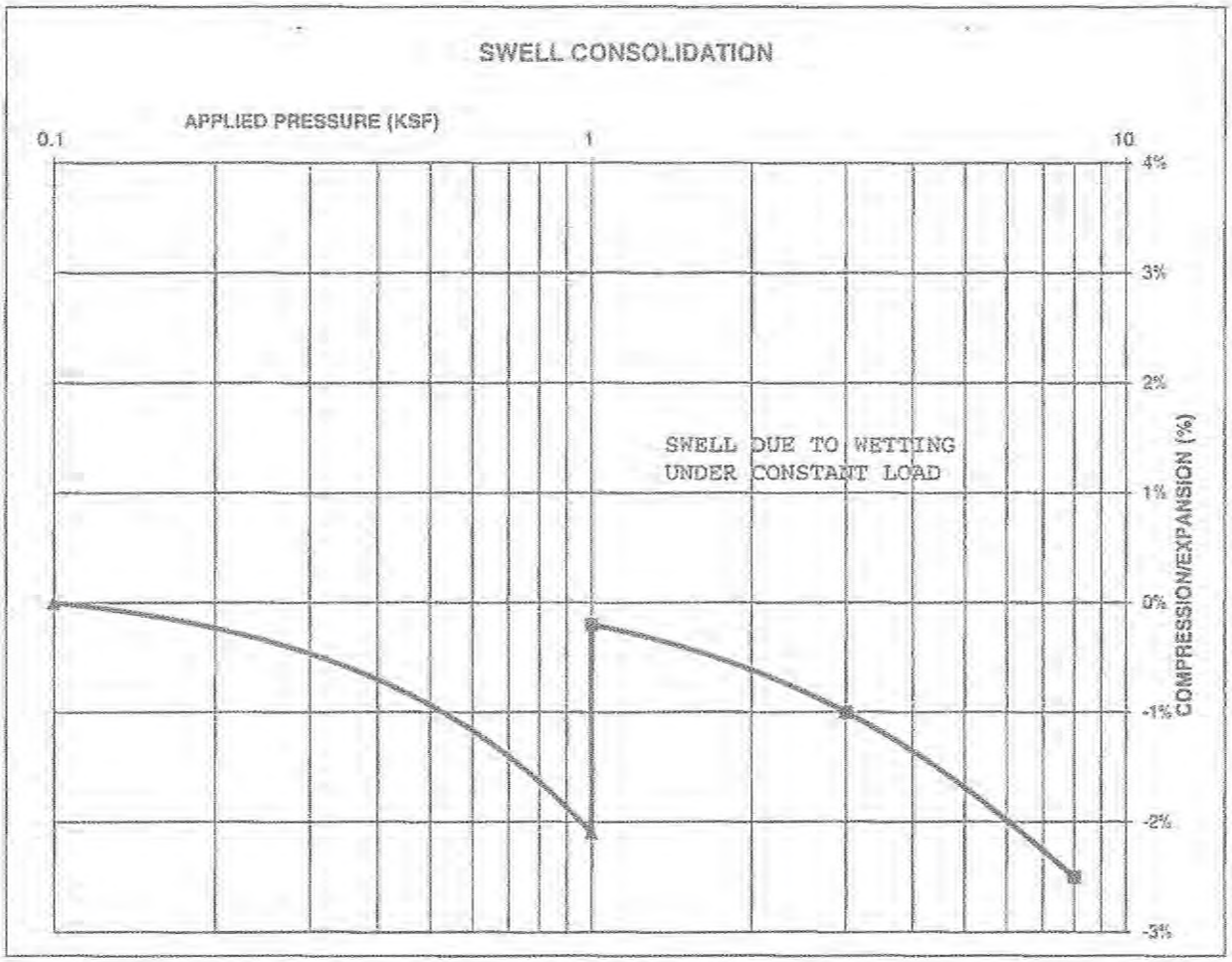
DRAWN	DATE	CHECKED	DATE
			2/10/20

JOB NO. 200045
FIG NO. B-7

CONSOLIDATION TEST RESULTS

TEST BORING #	4	DEPTH(ft)	15
DESCRIPTION	SM	SOIL TYPE	3
NATURAL UNIT DRY WEIGHT (PCF)			110
NATURAL MOISTURE CONTENT			17.1%
SWELL/CONSOLIDATION (%)			1.9%

JOB NO. 200045
CLIENT C&C LAND
PROJECT STERLING RANCH BRIDGES



ENTECH
ENGINEERING, INC.
505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

SWELL CONSOLIDATION
TEST RESULTS

DRAWN	DATE	CHECKED:	DATE:
			2/10/20

JOB NO. 200045
FIG NO. B-8

CLIENT	C&C LAND	JOB NO.	200045
PROJECT	STERLING RANCH BRIDGES	DATE	2/4/2020
LOCATION	STERLING RANCH BRIDGES	TEST BY	BL

BORING NUMBER	DEPTH, (ft)	SOIL TYPE NUMBER	UNIFIED CLASSIFICATION	WATER SOLUBLE SULFATE, (wt%)
TB-1	2-3	1	SM	0.00
TB-2	10	3	SM	<0.01
TB-4	15	3	SM	0.00
TB-3	5	2	SM	<0.01

QC BLANK PASS

ENTECH
ENGINEERING, INC.
509 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

LABORATORY TEST
SULFATE RESULTS

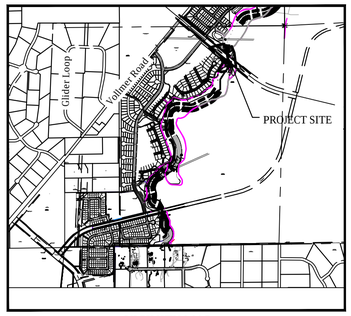
DRAWN	DATE	CHECKED: DN	DATE: 3-2-20

JOB NO. 200045
FIG NO. B-9

APPENDIX C: Briargate Bridge Design Plans

STERLING RANCH DEVELOPMENT
BRIARGATE BOULEVARD BRIDGE
CONSTRUCTION DRAWINGS
EL PASO COUNTY, COLORADO

Kiowa Project No. 19032
12/6/2021



VICINITY MAP
SCALE: N.T.S.

GENERAL NOTES

1. Profile design lines are based on centerline, as shown, unless otherwise noted.
2. All new construction to conform to the specifications of El Paso County Department of Public Works. Any asphalt removed is to be replaced to meet the specifications of the El Paso County Public Works Department.
3. For pavement design, curb and gutter, and sidewalks see individual plan and profile sheets. Pavement design to be based on Resistance Value 'R' derived from Hveem tests and are to be approved by the Engineering Division of the El Paso County Planning and Community Development prior to work above subgrade.
4. At intersections, all curb returns will have 20-foot radius unless otherwise noted.
5. All existing utilities have been shown according to the best available information. The contractor is responsible for field location and verification prior to beginning work. If it appears that there could be a conflict with any utilities, whether indicated on the plans or not, the contractor is to notify the engineer and owner immediately. The contractor is responsible for the protection and repair (if necessary) of all utilities..
6. A Pre-Construction meeting shall be held with the El Paso County Planning and Community Development prior to any construction.
7. Approved plans, Engineering Criteria Manual, etc. is required to be on-site at all times during construction..
8. All necessary permits, such as SWMP, ESQCP, Fugitive Dust, Access, C.O.E. 404, etc. shall be obtained prior to construction.
9. All handicap ramps to be per El Paso County Standard SD_2-40.
10. The contractor shall coordinate locations and layout with the El Paso County Planning and Community Development on the placement of any pedestrian ramps prior to construction of the curb.
11. Where appropriate, neatly saw cut all existing concrete and asphalt. Repair/replace all disturbed existing items with like materials and thicknesses.
12. All disturbed areas shall be revegetated with native grasses within 21 days of excavation per Erosion Control Plan.
13. The prepared Erosion/Sediment Control Plan is to be considered a part of these plans and its requirements adhered to during the construction of this project.
14. All storm and sanitary sewer pipe lengths and slopes are figured from center of manhole or bend. Pipe lengths are given as a horizontal length.
15. All storm sewer bedding to be per CDoT Standards.
16. All storm sewer pipe shall be Class III B Wall unless otherwise shown on the storm sewer plan and profile sheets.
17. All wyes and bends used in construction of storm sewer facilities shall be factory fabricated, unless approved by the El Paso County Planning and Community Development.
18. Construction and materials used in all storm and sanitary sewer manholes shall be per specifications. Storm sewer radial deflections to be grouted or installed per manufacturer's recommendations.
19. Storm sewer manholes sizes as follows unless otherwise shown:
    18" thru 36" use 48" I.D. manhole
    42" thru 48" use 60" I.D. manhole
    54" thru 60" use 72" I.D. manhole
    NOTE: Manhole sizes tabulated here shall be increased, if necessary, to accommodate incoming laterals.
20. All horizontal stationing is based on the 'Face of Curb', unless otherwise shown.
21. All vertical design and top of curb are based on the design point shown in the typical cross section.
22. The curb line design point is located at the intersection of the face and top of curb for the Type III Standard 6-inch vertical curb. See typical street section for design point locations. .
23. Vertical curb to be used between curb returns (CR) and at curb inlets. Transitions from ramp to vertical curb shall be 10-feet unless otherwise approved by the El Paso County Public Services Department. All other curb & gutter to be ramp curb & gutter.
24. Cross pans to be per El Paso County Standard Detail SD_2-26.
25. Curb returns shall be straight graded from CR to CR unless otherwise noted.
26. Inlets are Type 'R' inlets (CDOT STD M-604-12) unless otherwise noted.

BENCHMARK:
THE TOP OF AN ALUMINUM SURVEYORS CAP, STAMPED "8953"
NORTHING = 411416.273
EASTING = 235167.071
ELEVATION = 7023.42

THE TOP OF RED PLASTIC SURVEYORS CAP, ILLEGIBLE
NORTHING = 410095.404
EASTING = 235052.131
ELEVATION = 7000.40

THE TOP OF RED PLASTIC SURVEYORS CAP, STAMPED "38141"
NORTHING = 411399.962
EASTING = 233849.817
ELEVATION = 7030.82

BASIS OF BEARING
THE SOUTH LINE OF THE SOUTHWEST QUARTER ($SW\frac{1}{4}$) OF SECTION 34, TOWNSHIP 12 SOUTH, RANGE 65 WEST OF THE 6TH P.M. AS MONUMENTED AT THE SOUTHWEST CORNER OF SAID SOUTHWEST QUARTER ($SW\frac{1}{4}$) BY A 2-1/2" ALUMINUM CAP STAMPED "LS 11624" AND AT THE SOUTHEAST CORNER OF SAID SOUTHWEST QUARTER ($SW\frac{1}{4}$) BY A 2-1/2" ALUMINUM CAP STAMPED "LS11624", SAID LINE BEARS N 89°14'14" E, A DISTANCE OF 2,722.56 FEET.

811 Know what's **below.** **Call** before you dig.

STATEMENTS

Design Engineer's Statement:

These detailed plans and specifications were prepared under my direction and supervision. Said plans and specifications have been prepared according to the criteria established by the County for detailed roadway, drainage, grading and erosion control plans and specifications, and said plans and specifications are in conformity with applicable master drainage plans and master transportation plans. Said plans and specifications meet the purposes for which the particular roadway and drainage facilities are designed and are correct to the best of my knowledge and belief. I accept responsibility for any liability caused by any negligent acts, errors or omissions on my part in preparation of these detailed plans and specifications.

_____ _____
Todd Cartwright, P.E. #33365 Date
For and on behalf of Kiowa Engineering Corp.

Owner/Developer's Statement:

I, the owner/developer have read and will comply with of the requirements of the Grading and Erosion Control Plans and all of the requirements specified in these detailed plans and specifications.

_____ _____
James Morley Date
Sterling Ranch Metropolitan District

El Paso County:

County plan review is provided only for general conformance with County Design Criteria. The County is not responsible for the accuracy and adequacy of the design, dimensions, and/or elevations which shall be confirmed at the job site. The County through the approval of this document assumes no responsibility for completeness and/or accuracy of this document.

Filed in accordance with the requirements of the El Paso County Land Development Code, Drainage Criteria Manual Volumes 1 and 2, and Engineering Criteria Manual as amended.

In accordance with ECM Section 1.12, these construction documents will be valid for construction for a period of 2 years from the date signed by the El Paso County Engineer. If construction has not started within those 2 years the plans will need to be resubmitted for approval, including payment of review fees at the Planning and Community Development Directors discretion.

_____ _____
Jennifer Irvine, P.E., Date
County Engineer / ECM Administrator

EL PASO COUNTY STANDARD NOTES

1. All drainage and roadway construction shall meet the standards and specifications of the City of Colorado Springs/El Paso County Drainage Criteria Manual, Volumes 1 and 2, and the El Paso County Engineering Criteria Manual.

2. Contractor shall be responsible for the notification and field notification of all existing utilities, whether shown on the plans or not, before beginning construction. Location of existing utilities shall be verified by the contractor prior to construction. Call 811 to contact the Utility Notification Center of Colorado (UNCC).

3. Contractor shall keep a copy of these approved plans, the Grading and Erosion Control Plan, the Stormwater Management Plan (SWMP), the soils and geotechnical report, and the appropriate design and construction standards and specifications at the job site at all times, including the following:
   a. El Paso County Engineering Criteria Manual (ECM)
   b. City of Colorado Springs/El Paso County Drainage Criteria Manual, Volumes 1 and 2
   c. Colorado Department of Transportation (CDOT) Standard Specifications for Road and Bridge Construction
   d. CDOT M & S Standards

4. Notwithstanding anything depicted in these plans in words or graphic representation, all design and construction related to roads, storm drainage and erosion control shall conform to the standards and requirements of the most recent version of the relevant adopted El Paso County standards, including the Land Development Code, the Engineering Criteria Manual, the Drainage Criteria Manual, and the Drainage Criteria Manual Volume 2. Any deviations from regulations and standards must be requested, and approved, in writing. Any modifications necessary to meet criteria after-the-fact will be entirely the developer's responsibility to rectify.

5. It is the design engineer's responsibility to accurately show existing conditions, both onsite and offsite, on the construction plans. Any modifications necessary due to conflicts, omissions, or changed conditions will be entirely the developer's responsibility to rectify.

6. Contractor shall schedule a pre-construction meeting with El Paso County Planning and Community Development (PCD) - Inspections, prior to starting construction.

7. It is the contractor's responsibility to understand the requirements of all jurisdictional agencies and to obtain all required permits, including but not limited to El Paso County Erosion and Stormwater Quality Control Permit (ESQCP), Regional Building Floodplain Development Permit, U.S. Army Corps of Engineers-issued 401 and/or 404 permits, and county and state fugitive dust permits.

8. Contractor shall not deviate from the plans without first obtaining written approval from the design engineer and PCD. Contractor shall notify the design engineer immediately upon discovery of any errors or inconsistencies.

9. All storm drain pipe shall be Class III RCP unless otherwise noted and approved by PCD.

10. Contractor shall coordinate geotechnical testing per ECM standards. Pavement design shall be approved by El Paso County PCD prior to placement of curb and gutter and pavement.

11. All construction traffic must enter/exit the site at approved construction access points.

12. Sight visibility triangles as identified in the plans shall be provided at all intersections. Obstructions greater than 18 inches above flowline are not allowed within sight triangles.

13. Signing and striping shall comply with El Paso County Department of Public Works and MUTCD criteria. [If applicable, additional signing and striping notes will be provided.]

14. Contractor shall obtain any permits required by El Paso County Department of Public Works, including Work Within the Right-of-Way and Special Transport permits.

15. The limits of construction shall remain within the property line unless otherwise noted. The owner/developer shall obtain written permission and easements, where required, from adjoining property owner(s) prior to any off-site disturbance, grading, or construction.

INDEX OF SHEETS

ABBREVIATIONS

ASSY	= ASSEMBLY	MIN.	= MINIMUM
BNDY	= BOUNDARY	NTS	= NOT TO SCALE
BOA	= BOTTOM OF ARCH	OD	= OUTSIDE DIAMETER
BOF	= BOTTOM OF FOOTER	PC	= POINT OF HORIZONTAL CURVATURE
BOP	= BOTTOM OF PIPE	PP	= PROPOSED
CL	= CENTERLINE	PT	= POINT OF HORIZONTAL TANGENCY
CRA	= CONCRETE REVERSE ANCHOR	PVC	= POLY VINYL CHLORIDE PIPE
CTRB	= CONCRETE THRUST BLOCK	PVC	= POINT OF VERTICAL CURVATURE
CR	= POINT OF CURB RETURN	PVI	= POINT OF VERTICAL INTERSECTION
DIP	= DUCTILE IRON PIPE	PVT	= POINT OF VERTICAL TANGENCY
EL	= ELEVATION	RCB	= REINFORCED CONCRETE BOX
ESMT	= EASEMENT	RCP	= REINFORCED CONCRETE PIPE
EX.	= EXISTING	ROW	= RIGHT OF WAY
FC	= FACE OF CURB	RT	= RIGHT
FES	= FLARED END SECTION	SHT	= SHEET
FLG	= FLANGE	SS	= SANITARY SEWER
FL	= FLOWLINE	STA	= STATION
GB	= GRADE BREAK	STD	= STANDARD
HP	= HIGH POINT	TA	= TOP OF ASPHALT
HORIZ	= HORIZONTAL	TC	= TOP OF CURB
HYD	= HYDRANT	TOF	= TOP OF FOOTER
I.D.	= INSIDE DIAMETER	TOP	= TOP OF PIPE
LT	= LEFT	TOR	= TOP OF ROCK
LF	= LINEAR FEET	TYP	= TYPICAL
LP	= LOW POINT	VC	= VERTICAL CURVE
MAX	= MAXIMUM	VERT	= VERTICAL
MH	= MANHOLE		

Kiowa Engineering Corporation
Celebrating 30 years
1604 South 21st Street
Colorado Springs, Colorado 80904
(719) 630-7342

STERLING RANCH DEVELOPMENT
BRIARGATE BOULEVARD BRIDGE CONSTRUCTION DRAWINGS
COVER SHEET
EL PASO COUNTY, COLORADO

Project No.:	19032
Date:	12/6/2021
Design:	TAC
Drawn:	PAV
Check:	
Revisions:	

C001

19032 Sand Creek at Sterling Ranch/drawings/Const dwg/1-BB/19032 BB 01-02.dwg

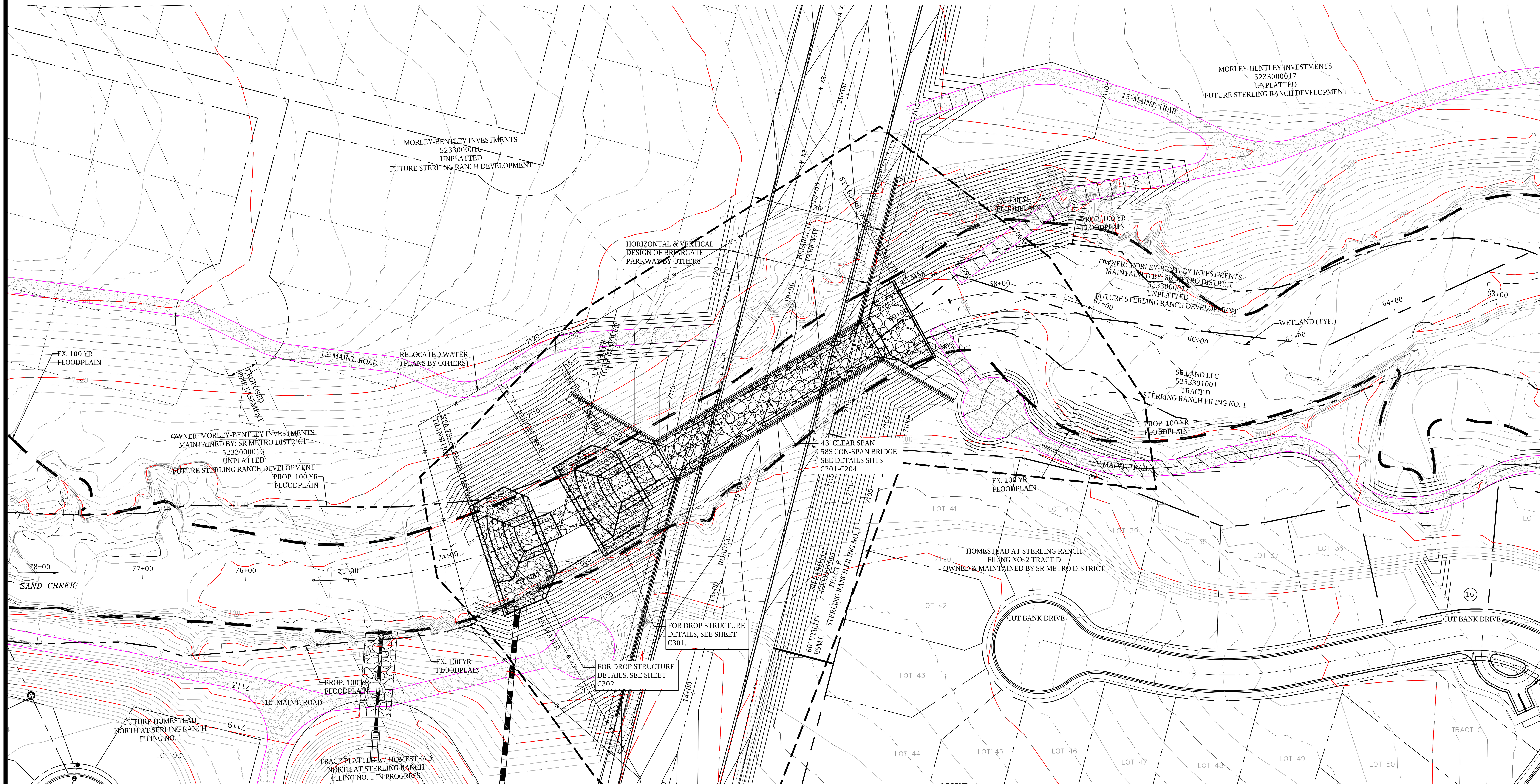
EPC FILE NO. CDR 204

WETLAND DISTURBANCE AREA: 0.74 AC. (0.74 AC. MAX.)

LENGTH CHANNEL DISTURBANCE: 630 LF. (635 LF MAX.)

CAUTION!!!
EXISTING UTILITIES TO BE PROTECTED FROM DISTURBANCE WHEN INSTALLING ALL DRAINAGE INFRASTRUCTURE.

GRAPHIC SCALE
50 75 100
(IN FEET)
1 inch = 50 ft.



MORLEY-BENTLEY INVESTMENTS
5233000016
UNPLATTED
FUTURE STERLING RANCH DEVELOPMENT
MORLEY-BENTLEY INVESTMENTS
5233000017
UNPLATTED
FUTURE STERLING RANCH DEVELOPMENT
15' MAINT. TRAIL
EX. 100 YR FLOODPLAIN
PROP. 100 YR FLOODPLAIN
HORIZONTAL & VERTICAL DESIGN OF BRIARGATE PARKWAY BY OTHERS
BRIARGATE PARKWAY
OWNER: MORLEY-BENTLEY INVESTMENTS
MAINTAINED BY: SR METRO DISTRICT
5233000017
UNPLATTED
FUTURE STERLING RANCH DEVELOPMENT
WETLAND (TYP.)
SR LAND LLC
5233301001
TRACT D
STERLING RANCH FILING NO. 1
EX. 100 YR FLOODPLAIN
15' MAINT. ROAD
RELOCATED WATER (PLANS BY OTHERS)
PROPOSED OHE EASEMENT
OWNER: MORLEY-BENTLEY INVESTMENTS
MAINTAINED BY: SR METRO DISTRICT
5233000016
UNPLATTED
FUTURE STERLING RANCH DEVELOPMENT
PROP. 100 YR FLOODPLAIN
43' CLEAR SPAN
58S CON-SPAN BRIDGE
SEE DETAILS SHTS
C201-C204
15' MAINT. TRAIL
EX. 100 YR FLOODPLAIN
HOMESTEAD AT STERLING RANCH
FILING NO. 2 TRACT D
OWNED & MAINTAINED BY SR METRO DISTRICT
SAND CREEK
78+00
77+00
76+00
75+00
74+00
68+00
67+00
66+00
65+00
64+00
63+00
ROAD CL
SR LAND LLC
5233301001
TRACT B
STERLING RANCH FILING NO. 1
60' UTILITY ESMT
FOR DROP STRUCTURE DETAILS, SEE SHEET C301.
FOR DROP STRUCTURE DETAILS, SEE SHEET C302.
EX. 100 YR FLOODPLAIN
PROP. 100 YR FLOODPLAIN
15' MAINT. ROAD
FUTURE HOMESTEAD NORTH AT SERLING RANCH FILING NO. 1
TRACT PLATTED w/ HOMESTEAD NORTH AT STERLING RANCH FILING NO. 1 IN PROGRESS
CUT BANK DRIVE
CUT BANK DRIVE
LOT 35
LOT 36
LOT 37
LOT 38
LOT 39
LOT 40
LOT 41
LOT 42
LOT 43
LOT 44
LOT 45
LOT 46
LOT 47
LOT 48
LOT 49
LOT 50
LOT 93
TRACT C
16

LEGEND

	EXISTING FEMA 100 YEAR FLOODPLAIN
	PROPOSED FEMA 100 YEAR FLOODPLAIN
10+00	PROFILE CENTERLINE
	PROPERTY LINE
	PROPOSED CONTOUR
	EXISTING CONTOUR
	FENCE

HATCH LEGEND

GROUTED BOULDER 36"-48"	ACCESS ROAD/TRAIL
TYPE L SOIL RIPRAP D50=9"	TURF REINFORCED MAT
TYPE M SOIL RIPRAP D50=12"	WETLAND MITIGATION VEGITATION

Kiowa
Celebrating 30 years
Engineering Corporation
1604 South 21st Street
Colorado Springs, Colorado 80904
(719) 630-7342

STERLING RANCH DEVELOPMENT
BRIARGATE BOULEVARD BRIDGE CONSTRUCTION DRAWINGS
SITE PLAN
EL PASO COUNTY, COLORADO

Project No.:	19032
Date:	12/6/2021
Design:	TAC
Drawn:	PAV
Check:	
Revisions:	

C101

TEST BORING NO. 1
DATE DRILLED 7/13/2021
Job # 211647

REMARKS

WATER @ 1.5', 7/20/21

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
					SAND, SLIGHTLY SILTY, FINE TO COARSE GRAINED, GRAY BROWN, DENSE, VERY MOIST
5			47	16.5	1
					SANDSTONE, SLIGHTLY SILTY, FINE TO COARSE GRAINED, GRAY BROWN, VERY DENSE, MOIST
10			50 6"	11.5	2
					SILTSTONE, SANDY, GRAY BROWN, HARD, MOIST
15			50 5"	16.0	3
					SANDSTONE, SLIGHTLY SILTY, FINE TO COARSE GRAINED, GRAY BROWN, VERY DENSE, VERY MOIST
20			50 5"	15.5	2

TEST BORING NO. 2
DATE DRILLED 7/13/2021
CLIENT C&C LAND
LOCATION BRIARGATE BRIDGE

REMARKS

WATER @ 3.5', 7/20/21

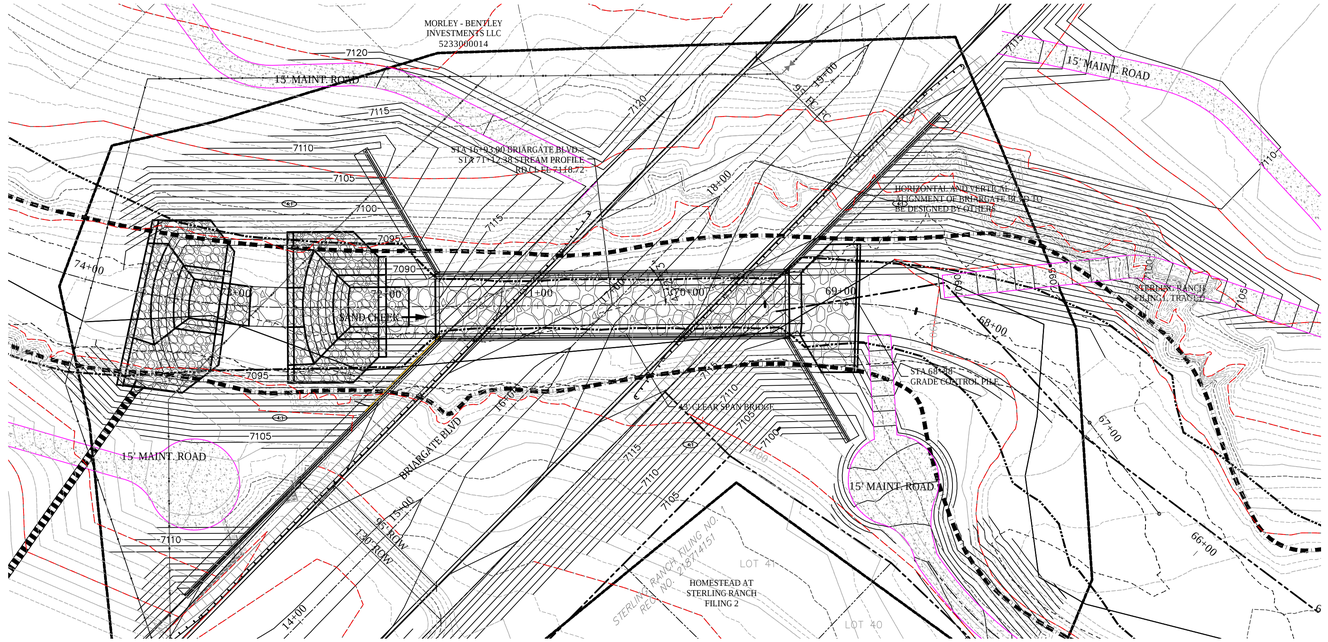
Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
					SAND, SILTY, BROWN
5			50	13.2	2
					SANDSTONE, SLIGHTLY SILTY, FINE TO COARSE GRAINED, GRAY BROWN, VERY DENSE, MOIST
10			50 11"	14.3	3
					SILTSTONE, SANDY, GRAY BROWN, HARD, MOIST
15			50 4"	16.6	3
					SANDSTONE, SLIGHTLY SILTY, FINE TO COARSE GRAINED, GRAY BROWN, VERY DENSE,
20			50 4"	10.8	2

ENTECH ENGINEERING, INC.
505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
		A	7/23/21

JOB NO. 211647
FIG NO. A- 1



SITE PLAN BRIARGATE BLVD BRIDGE

1"= 50'

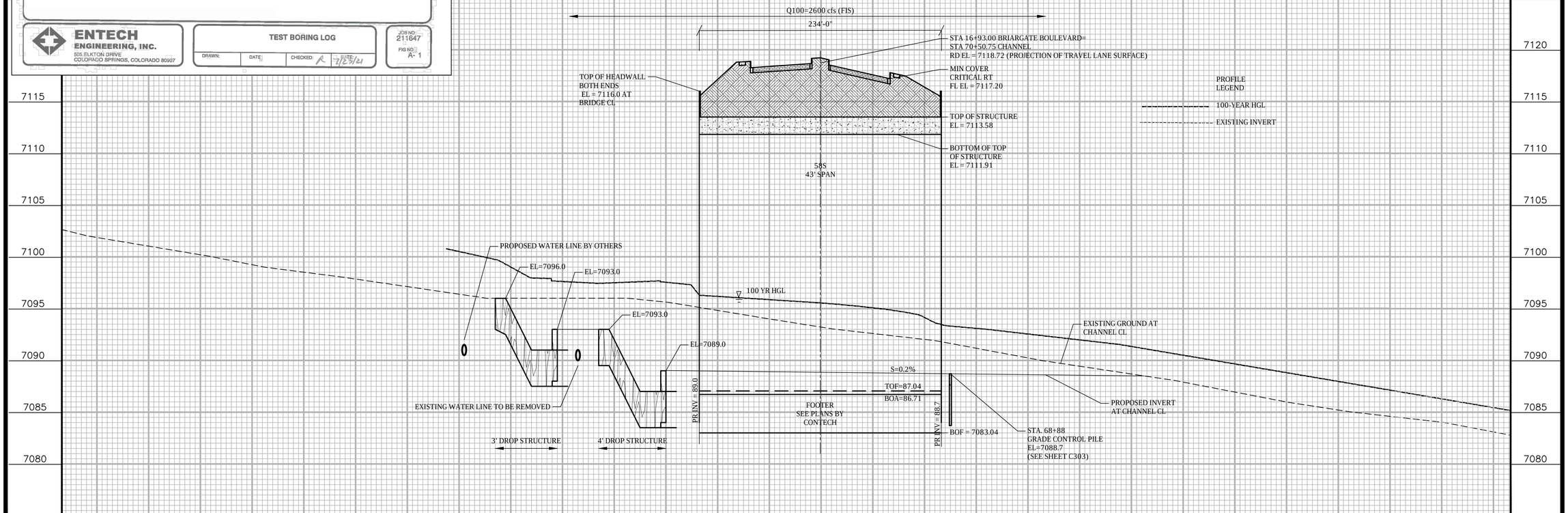
CAUTION!!!

EXISTING UTILITIES TO BE PROTECTED FROM DISTURBANCE WHEN INSTALLING BRIDGE AND INFRASTRUCTURE.

0 50' 100'

SCALE: 1"=50'

811 Know what's below. Call before you dig.



BRIARGATE BLVD BRIDGE PROFILE

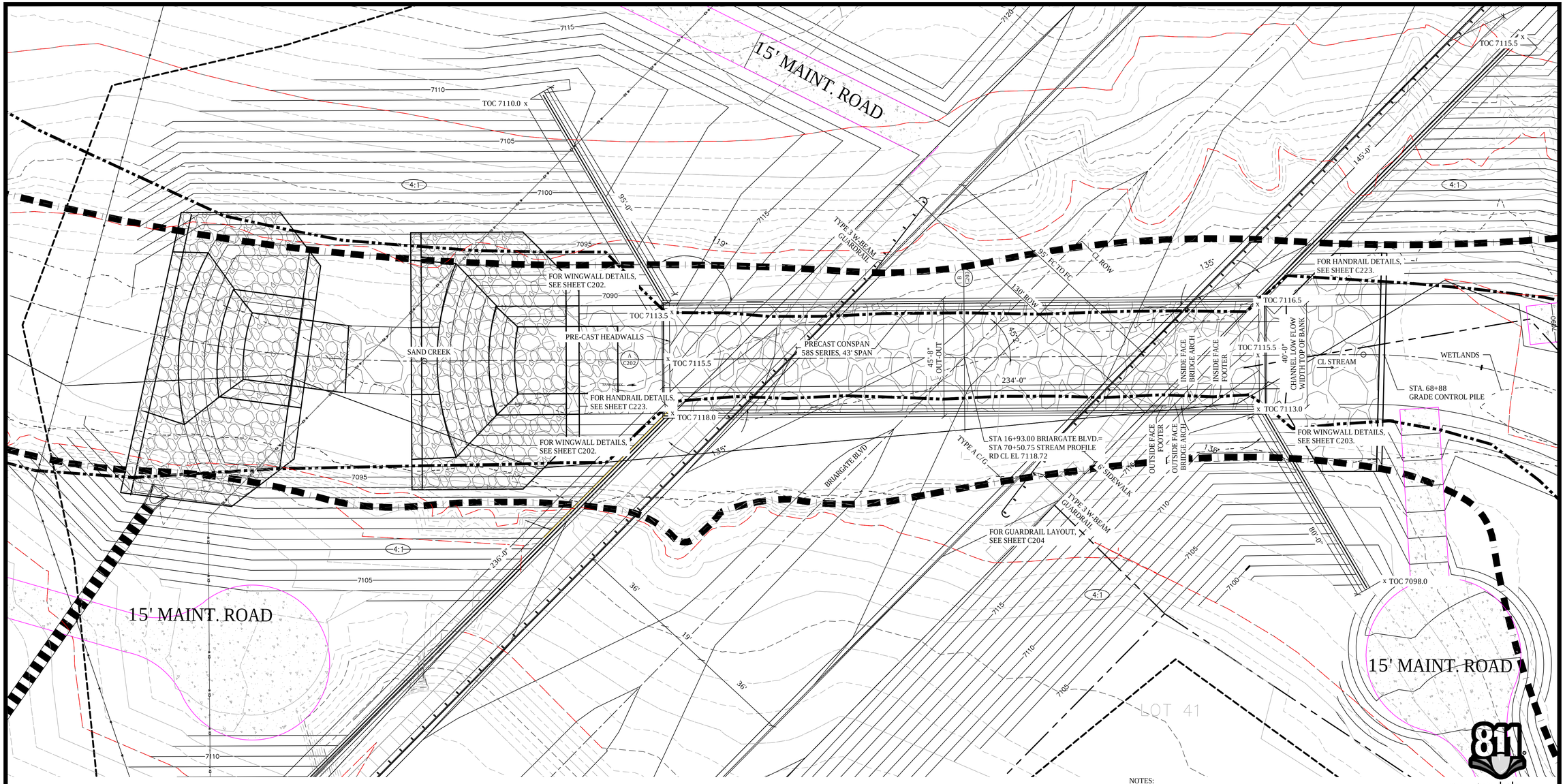
Kiowa Engineering Corporation
1604 South 21st Street
Colorado Springs, Colorado 80904
(719)630-7342

STERLING RANCH DEVELOPMENT
BRIARGATE BOULEVARD BRIDGE CONSTRUCTION DRAWINGS
PLAN AND PROFILE
EL PASO COUNTY, COLORADO

Project No.:	19032
Date:	12/6/21
Design:	TAC
Drawn:	PAV
Check:	
Revisions:	

C201

19032 Sand Creek at Sterling Ranch/drawings/Const dwg/1-BB/19032 BB 201-223.dwg



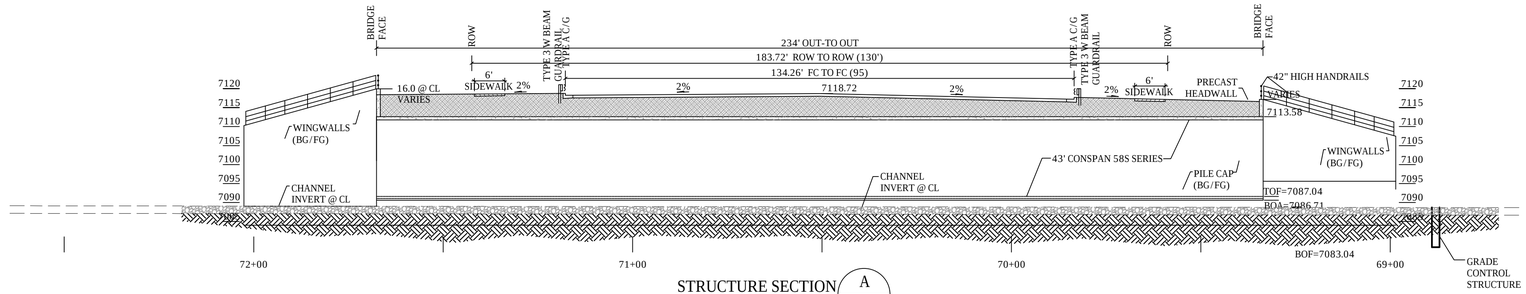
STRUCTURE LAYOUT

1"= 20'

SCALE: 1"=20'

NOTES:

1. PRECAST BRIDGE SECTIONS SHALL BE DESIGNED TO MEET HL-93 HIGHWAY LOADING AND MANUFACTURED IN CONFORMANCE WITH CDoT STANDARD SPECIFICATIONS.



STRUCTURE SECTION A

C202

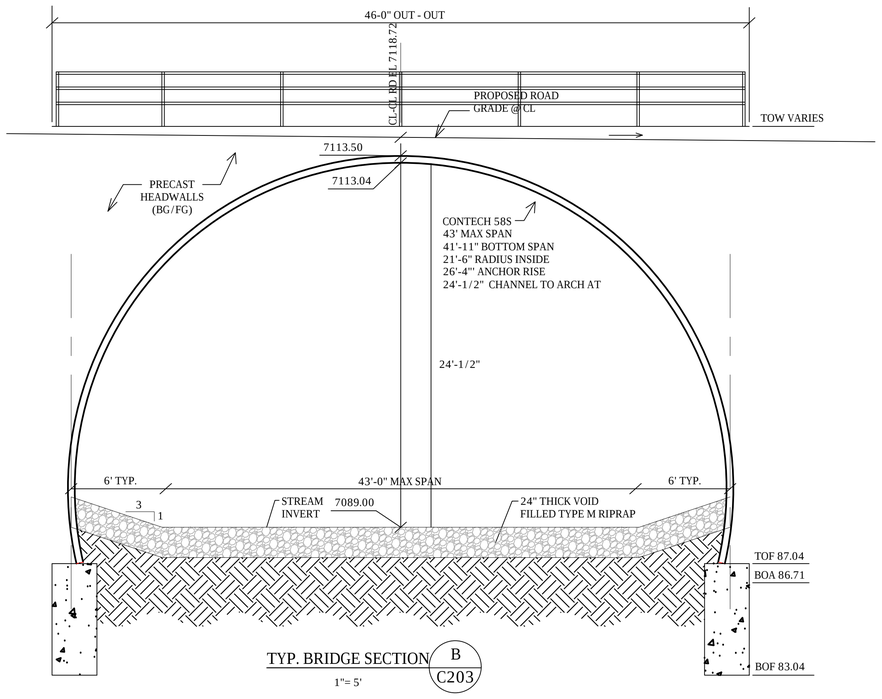
1"= 20'

Kiowa Engineering Corporation
1604 South 21st Street
Colorado Springs, Colorado 80904
(719)630-7342

STERLING RANCH DEVELOPMENT
BRIARGATE BOULEVARD BRIDGE CONSTRUCTION DRAWINGS
STRUCTURE LAYOUT
EL PASO COUNTY, COLORADO

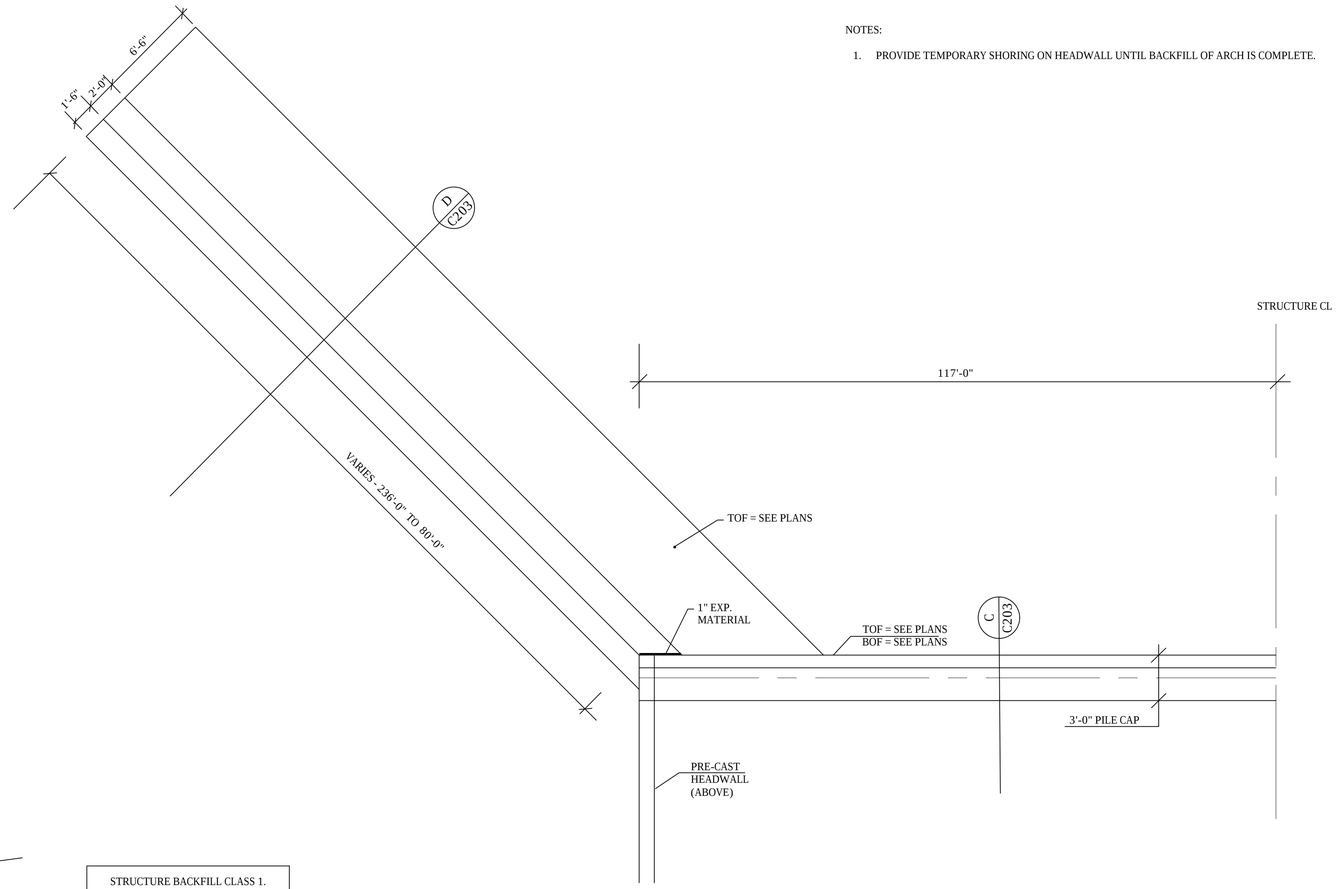
Project No.:	19032
Date:	12/6/21
Design:	TAC
Drawn:	PAV
Check:	
Revisions:	

C202



TYP. BRIDGE SECTION B C203

1"= 5'

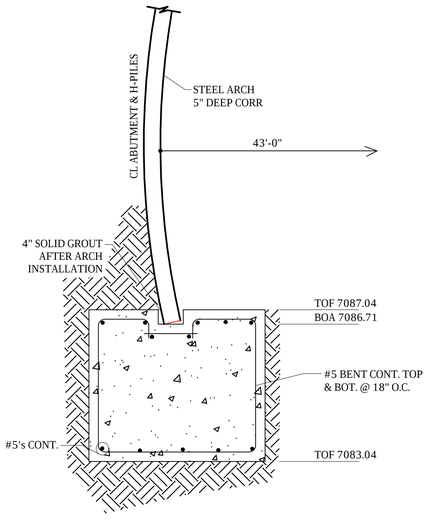


TYP. FOUNDATION PLAN

1"= 5'

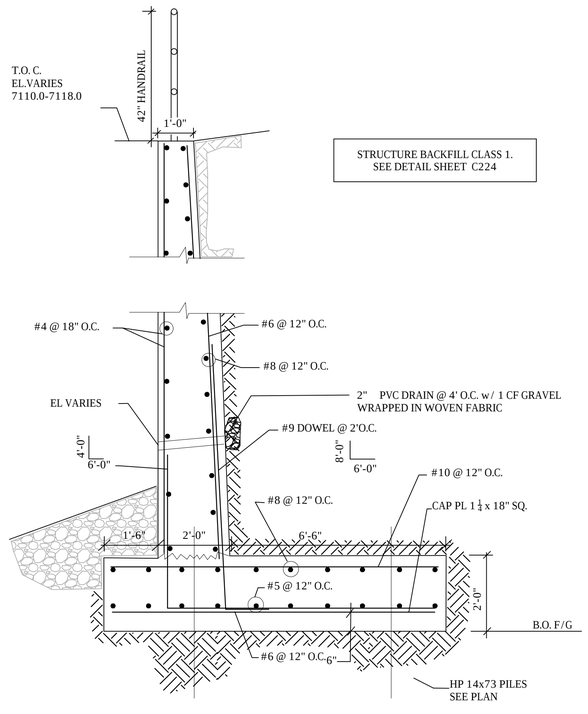
NOTES:

1. PROVIDE TEMPORARY SHORING ON HEADWALL UNTIL BACKFILL OF ARCH IS COMPLETE.



TYP. BRIDGE FOOTER SECTION C C203

1"= 2'



TYP. WINGWALL SECTION D C203

1"= 2'

Kiowa Engineering Corporation
1604 South 21st Street
Colorado Springs, Colorado 80904
(719)630-7342

STERLING RANCH DEVELOPMENT
BRIARGATE BOULEVARD BRIDGE CONSTRUCTION DRAWINGS
FOOTER DETAILS
EL PASO COUNTY, COLORADO

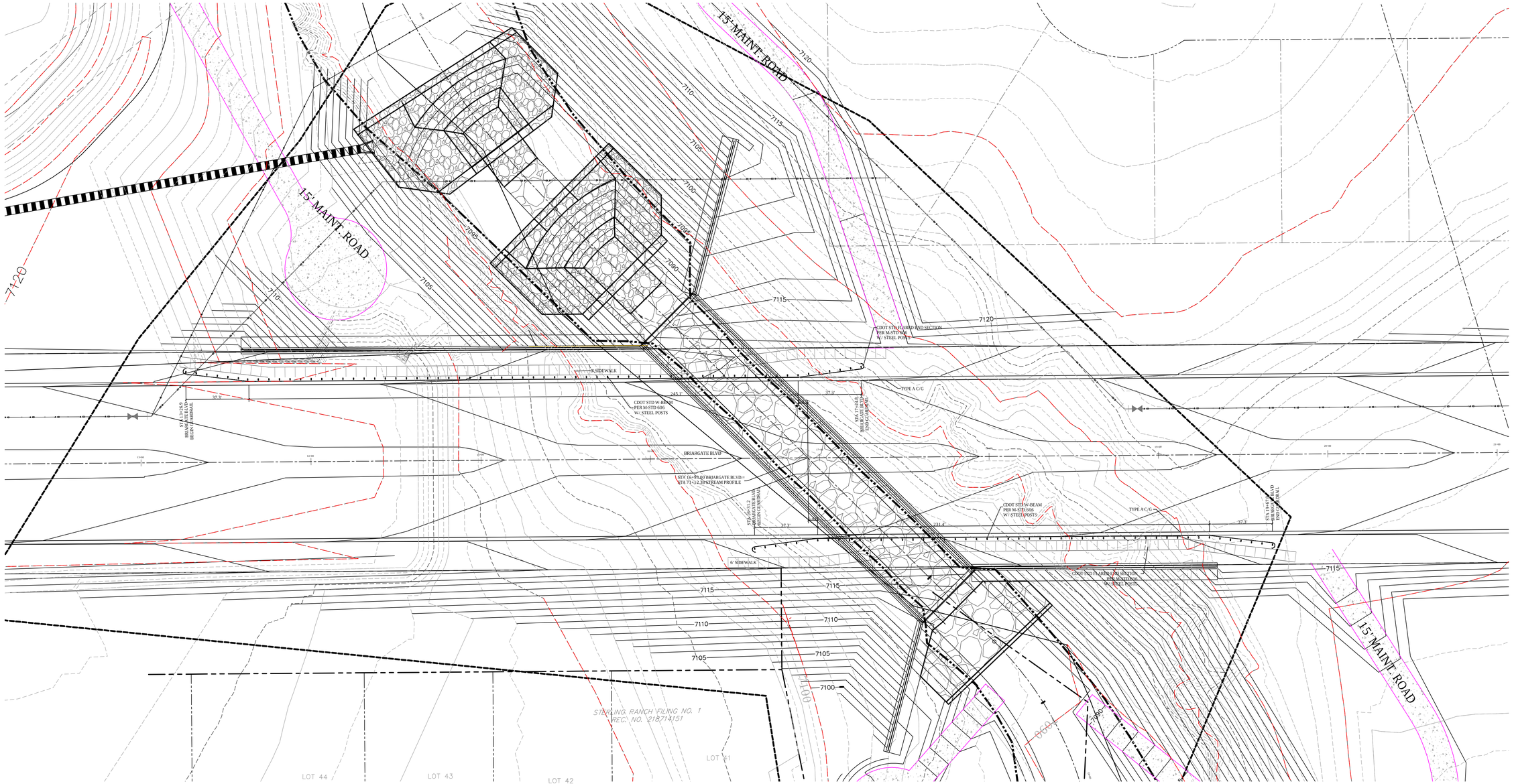
Project No.:	19032
Date:	12/6/21
Design:	TAC
Drawn:	PAV
Check:	
Revisions:	

C203

811 Know what's below. Call before you dig.

NOTES:

1. FOR GUARDRAIL DETAILS SEE SHEET C223



GUARDRAIL LAYOUT

1"= 20'

Know what's below. Call before you dig.

0 30' 60'

SCALE: 1"=30'

Kiowa Engineering Corporation
1604 South 21st Street
Colorado Springs, Colorado 80904
(719)630-7342

STERLING RANCH DEVELOPMENT

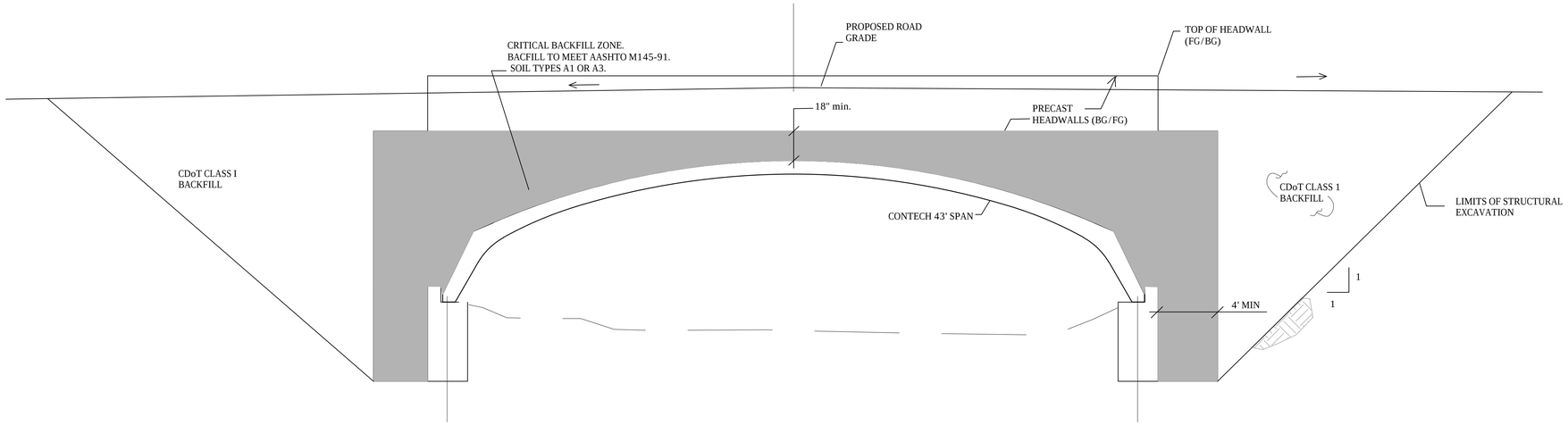
BRIARGATE BOULEVARD BRIDGE CONSTRUCTION DRAWINGS

GUARDRAIL PLAN

EL PASO COUNTY, COLORADO

Project No.:	19032
Date:	12/6/21
Design:	TAC
Drawn:	PAV
Check:	
Revisions:	

C204



BRIDGE BACKFILL SECTION

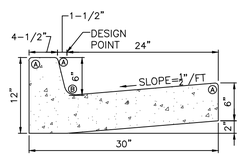
NTS

BACKFILL DESCRIPTION (AASHTO M 145-91)								
GROUP CLASSIFICATION	A-1		A-3	A-2				A-4
	A-1-a	A-1-b		A-2-4	A-2-5	A-2-6	A-2-7	
SIEVE ANALYSIS (100% PASSING 3" SIEVE)								
NO. 10	50 max							
NO.40	30 max	50 max	51 max					
NO. 200	15max	25 max	10 mac	35 max	35 max	35 max	35 max	35 min
CHARACTERISTICS OF FRACTION PASSING								
NO. 40								
LIQUID LIMIT				40 max	41 max	11 min	11 min	10 max
USUAL TYPES OF SIGNIFICANT CONSTITUENT MATERIALS								
	GRAVEL & SAND		SAND					
GENERAL RATING AS SUB-GRADE	EXCELLENT TO GOOD							FAIR TO POOR

NOTES:

1. PROVIDE TEMPORARY SHORING ON HEADWALL UNTIL BACKFILL OF ARCH IS COMPLETE.

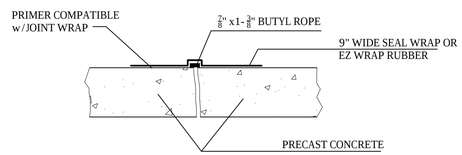
LENGTH FOR RADII	
A=1/2"	B=1-1/2"



EPC TYPE A
VERTICAL CURB AND GUTTER

NTS

EPC STD. SD_2-20



TYPICAL JOINT SEAL

NTS

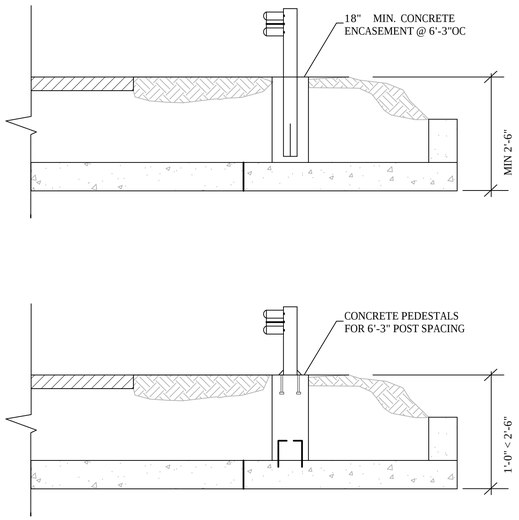
Know what's below.
Call before you dig.

Kiowa Engineering Corporation
1604 South 21st Street
Colorado Springs, Colorado 80904
(719)630-7342

STERLING RANCH DEVELOPMENT
BRIARGATE BOULEVARD BRIDGE CONSTRUCTION DRAWINGS
DETAILS
EL PASO COUNTY, COLORADO

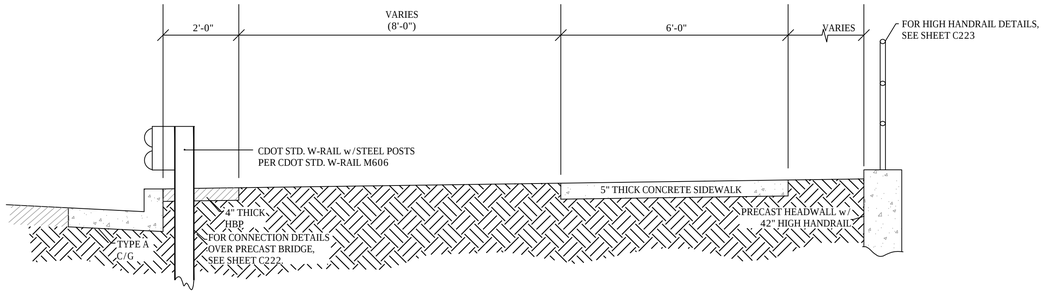
Project No.:	19032
Date:	12/6/21
Design:	TAC
Drawn:	PAV
Check:	
Revisions:	

C211



GUARDRAIL MOUNTING DETAILS

NTS



TYPICAL GUARDRAIL LAYOUT BRIARGATE BLVD

1"= 2'

NOTES:

1. GUARDRAIL POST SPACING OVER THE PRECAST SECTIONS SHALL BE IN CONFORMANCE WITH CDoT M-606.

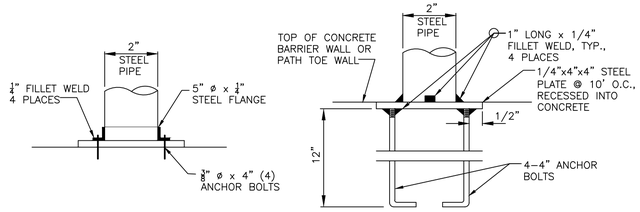
Know what's below.
Call before you dig.

Kiowa
Engineering Corporation
1604 South 21st Street
Colorado Springs, Colorado 80904
(719)630-7342

STERLING RANCH DEVELOPMENT
BRIARGATE BOULEVARD BRIDGE CONSTRUCTION DRAWINGS
GUARDRAIL DETAILS
EL PASO COUNTY, COLORADO

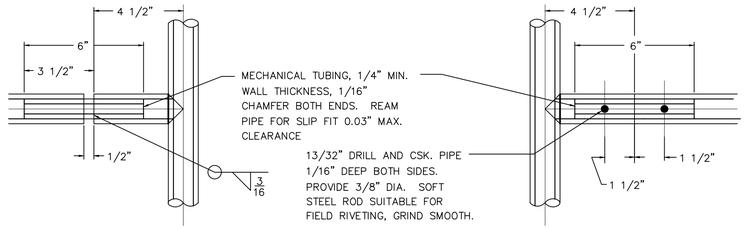
Project No.:	19032
Date:	12/6/21
Design:	TAC
Drawn:	PAV
Check:	
Revisions:	

C212



ALTERNATE HANDRAIL POST CONNECTION DETAIL

NTS

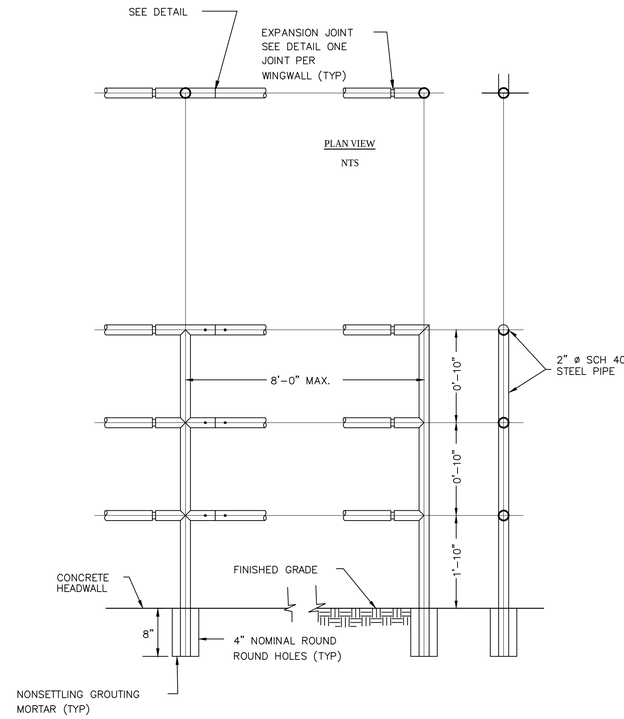


EXPANSION JOINT DETAIL

FIXED JOINT DETAIL

HANDRAIL DETAIL

NTS



INTERMEDIATE POST

CORNER POST

END POST

TYPICAL SLEEVE DETAIL

TYPICAL POSTHOLE DETAIL

ELEVATION

NTS

HANDRAIL PAINT NOTE:

HANDRAIL FINISH SHALL BE ONE COAT METAL PRIMER AND TWO COATS SHERWIN WILLIAMS "BRIDGE GREEN" COLOR, ACROLON 218 HS ACRYLIC POLYURETHANE, SEMI-GLOSS. COLOR SHALL BE VERIFIED BY THE ENGINEER.

BRIDGE GREEN CUSTOM MANUAL MATCH				
844 COLORANT	OZ	32	64	128
LB-LAMP BLACK	2	16	–	–
PG-PHTH GREEN	10	–	–	–
TW-WHITE	2	46	–	–
YO-YELLOW OX	–	50	–	–
PB-PHTH	–	50	–	–
4 GALLON KIT		ULTRADEEP		
B65T00654		640335618		

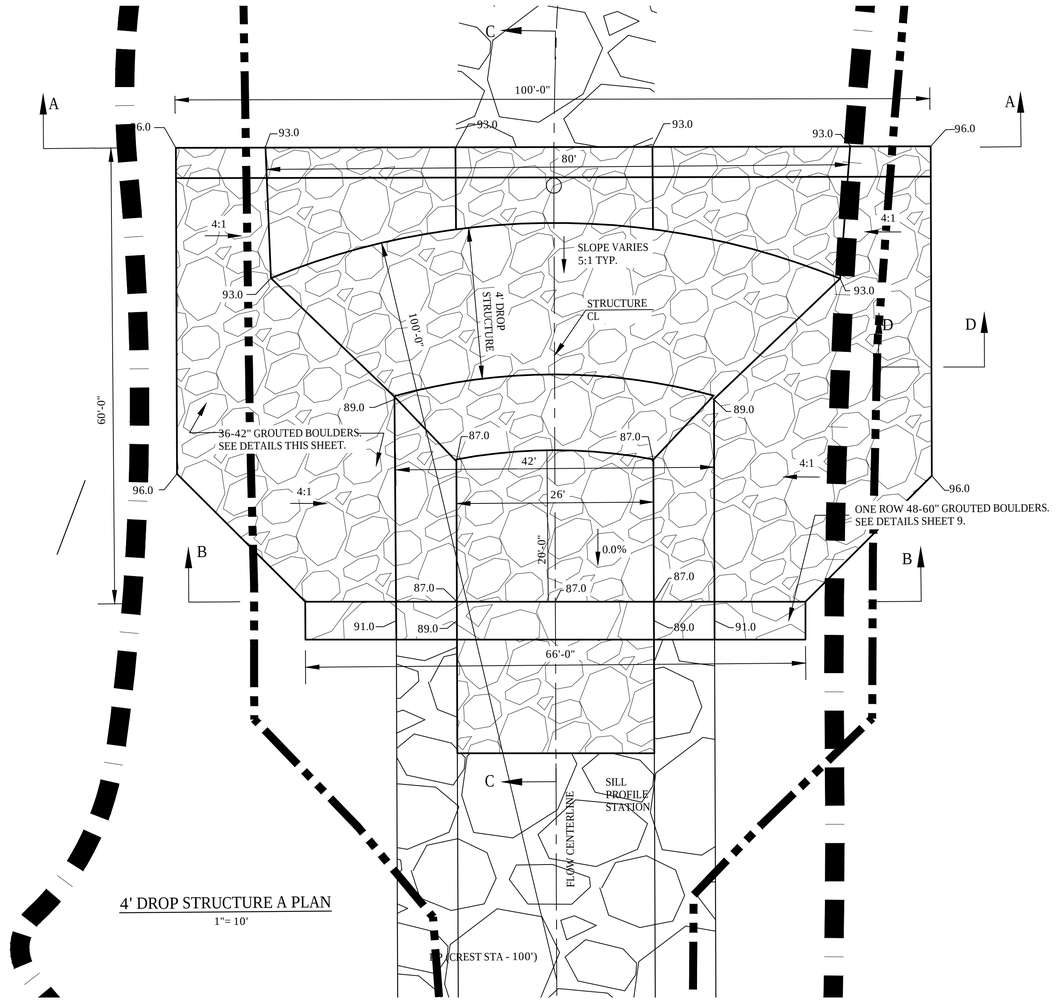
Kiowa
Engineering Corporation
1604 South 21st Street
Colorado Springs, Colorado 80904
(719)630-7342

STERLING RANCH DEVELOPMENT
BRIARGATE BOULEVARD BRIDGE CONSTRUCTION DRAWINGS
HANDRAIL DETAILS
EL PASO COUNTY, COLORADO

Project No.:	19032
Date:	12/6/21
Design:	TAC
Drawn:	PAV
Check:	
Revisions:	

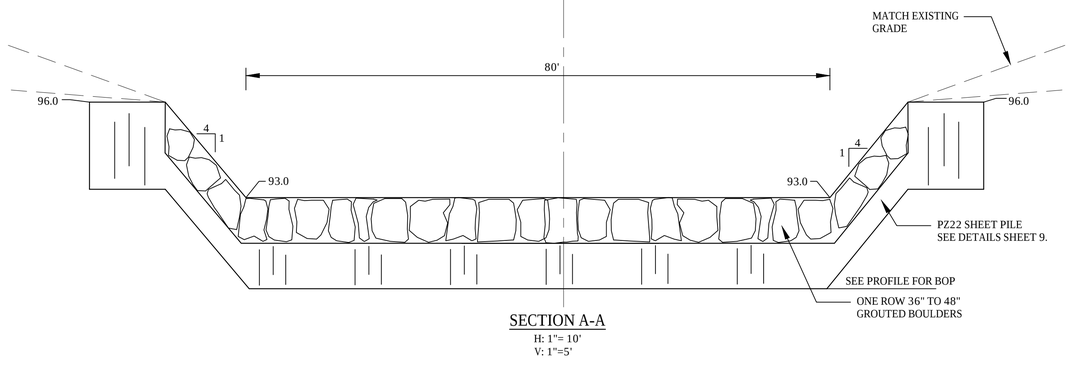
C213

Know what's below.
Call before you dig.



4' DROP STRUCTURE A PLAN

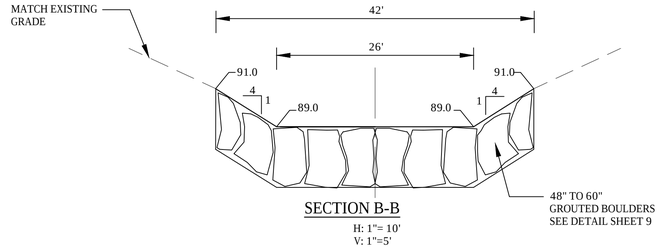
1"= 10'



SECTION A-A

H: 1"= 10'

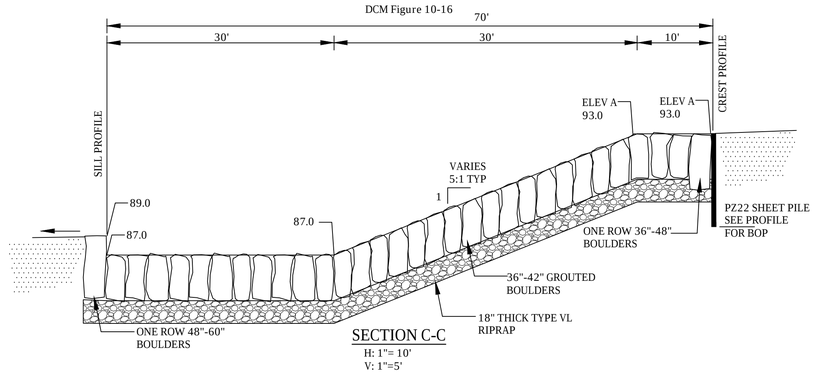
V: 1"=5'



SECTION B-B

H: 1"= 10'

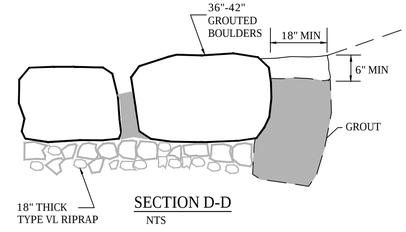
V: 1"=5'



SECTION C-C

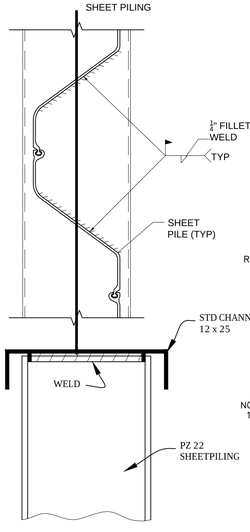
H: 1"= 10'

V: 1"=5'



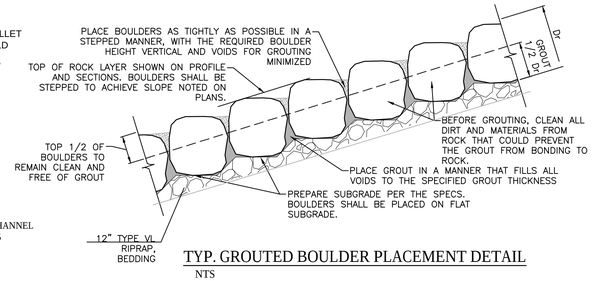
SECTION D-D

NTS



TYPICAL SHEET PILE CAP DETAILS

NTS



TYP. GROUTED BOULDER PLACEMENT DETAIL

NTS

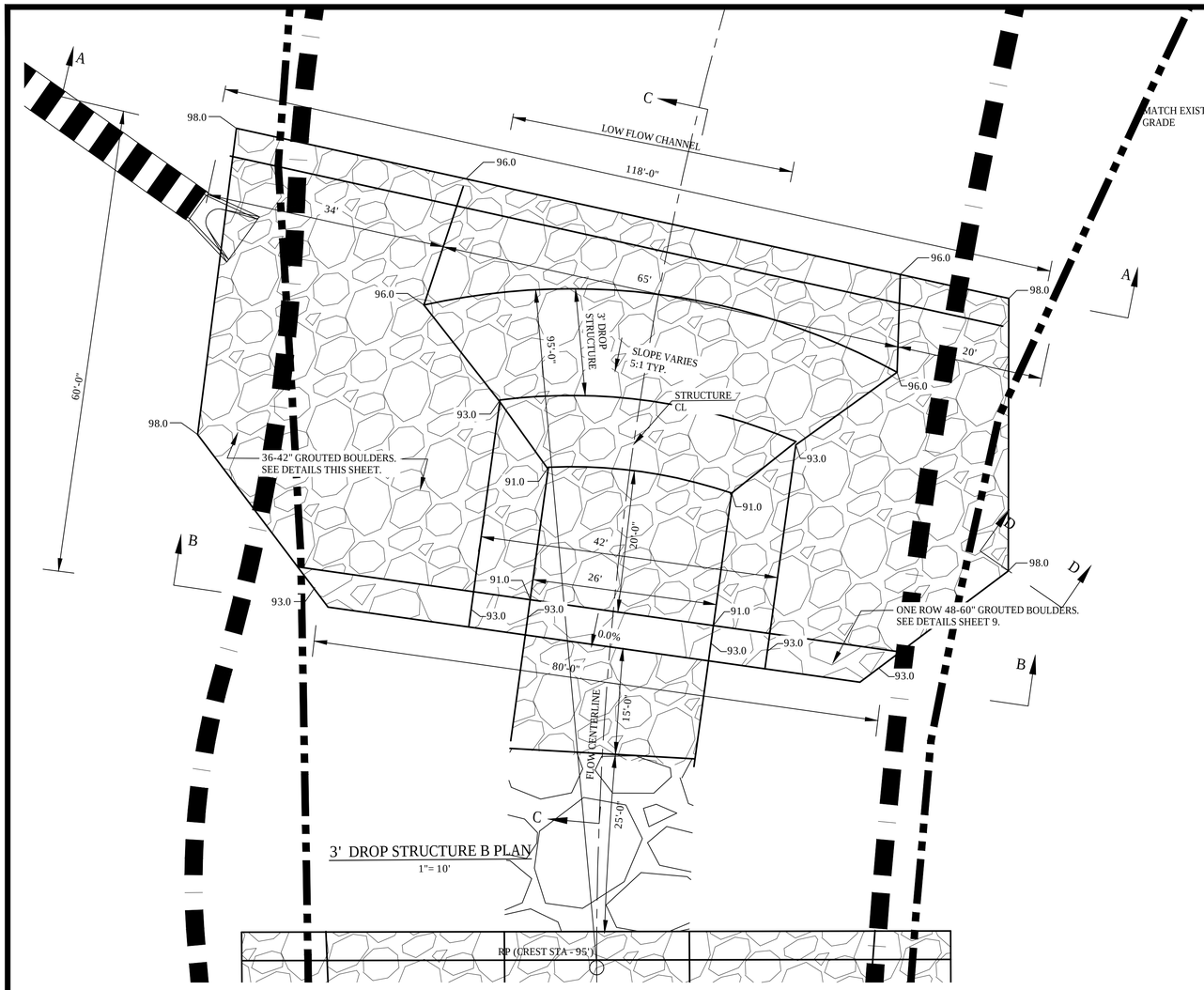
NOTES:
1. SEE ALSO DRAINAGE CRITERIA MANUAL VOL. 1 FIGURE 10-16

Kiowa
Engineering Corporation
1604 South 21st Street
Colorado Springs, Colorado 80904
(719) 630-7342

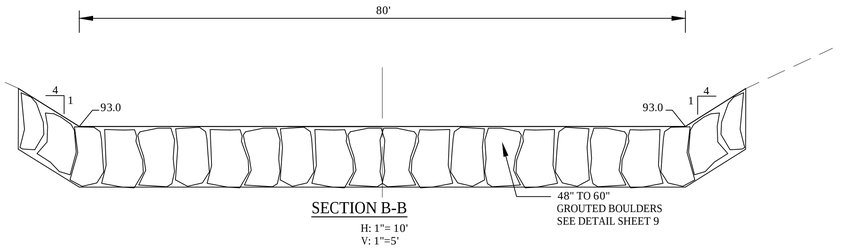
STERLING RANCH DEVELOPMENT
BRIARGATE BOULEVARD BRIDGE CONSTRUCTION PLANS
4' DROP STRUCTURE A DETAILS
EL PASO COUNTY, COLORADO

Project No.:	19032
Date:	12/6/21
Design:	TAC
Drawn:	PAV
Check:	
Revisions:	

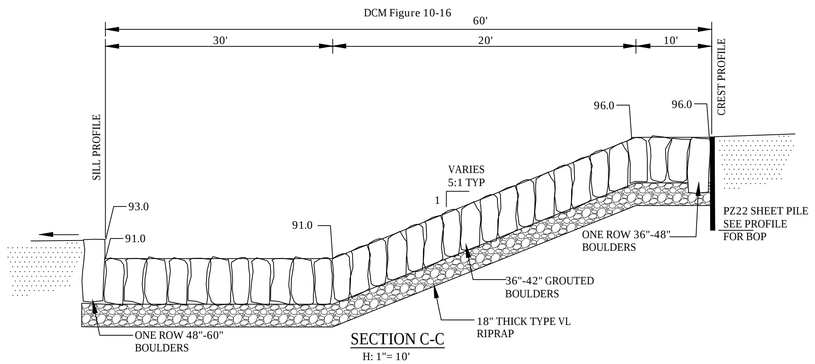
C301



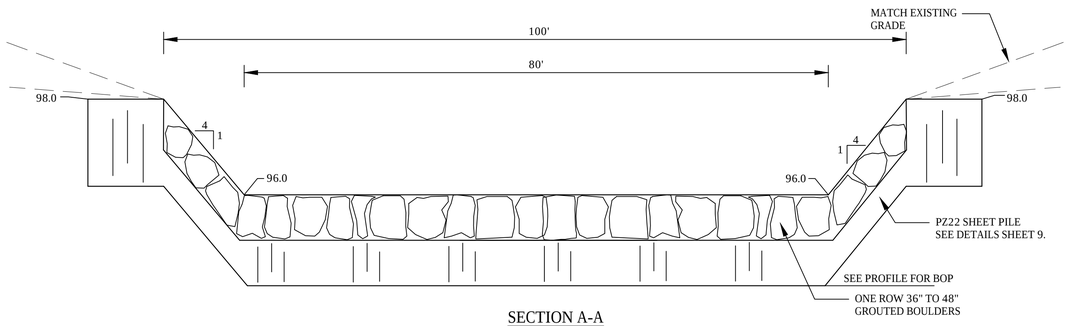
3' DROP STRUCTURE B PLAN
1"= 10'



SECTION B-B
H: 1"= 10'
V: 1"=5'



SECTION C-C
H: 1"= 10'
V: 1"=5'



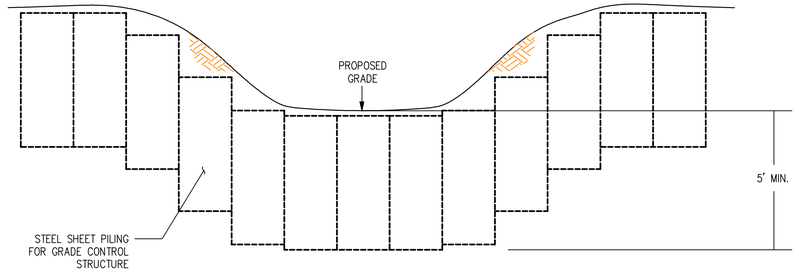
SECTION A-A
H: 1"= 10'
V: 1"=5'

Kiowa Engineering Corporation
1604 South 21st Street
Colorado Springs, Colorado 80904
(719) 630-7342

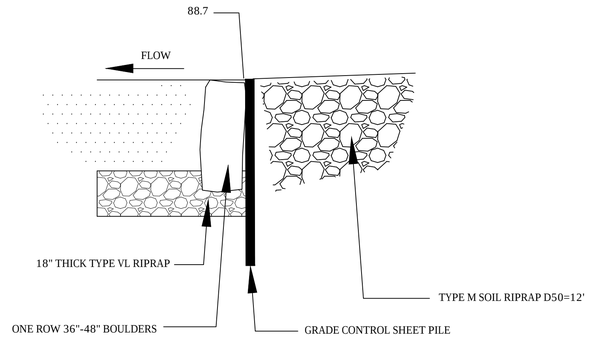
STERLING RANCH DEVELOPMENT
BRIARGATE BOULEVARD BRIDGE CONSTRUCTION PLANS
3' DROP STRUCTURE B DETAILS
EL PASO COUNTY, COLORADO

Project No.:	19032
Date:	12/6/21
Design:	TAC
Drawn:	PAV
Check:	
Revisions:	

C302

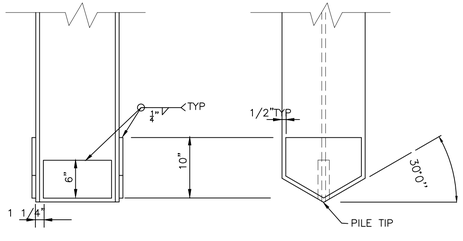


GRADE CONTROL PILE DETAIL



SECTION C-C

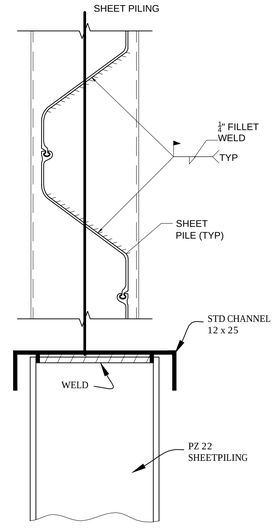
H: 1"= 5'
V: 1"=5'



PILE TIP DETAIL

NTS

AN APPROVED COMMERCIAL PILE MAY BE USED



SHEET PILE CAP DETAIL

NTS

Kiowa Engineering Corporation
1604 South 21st Street
Colorado Springs, Colorado 80904
(719) 630-7342

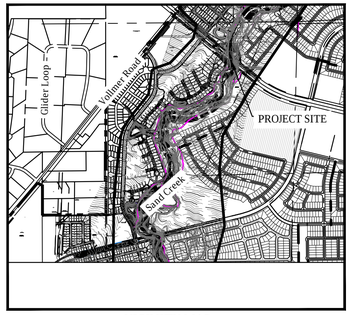
STERLING RANCH DEVELOPMENT
BRIARGATE BOULEVARD BRIDGE CONSTRUCTION PLANS
DROP STRUCTURE DETAILS
EL PASO COUNTY, COLORADO

Project No.:	19032
Date:	12/6/21
Design:	TAC
Drawn:	PAV
Check:	
Revisions:	

C303

STERLING RANCH DEVELOPMENT
BRIARGATE BOULEVARD BRIDGE
GRADING & EROSION CONTROL PLANS
EL PASO COUNTY, COLORADO

Kiowa Project No. 19032
12/6/2021



VICINITY MAP
SCALE: N.T.S.

GENERAL NOTES

1. Profile design lines are based on centerline, as shown, unless otherwise noted.
2. All new construction to conform to the specifications of El Paso County Department of Public Works. Any asphalt removed is to be replaced to meet the specifications of the El Paso County Public Works Department.
3. For pavement design, curb and gutter, and sidewalks see individual plan and profile sheets. Pavement design to be based on Resistance Value 'R' derived from Hveem tests and are to be approved by the Engineering Division of the El Paso County Planning and Community Development prior to work above subgrade.
4. At intersections, all curb returns will have 20-foot radius unless otherwise noted.
5. All existing utilities have been shown according to the best available information. The contractor is responsible for field location and verification prior to beginning work. If it appears that there could be a conflict with any utilities, whether indicated on the plans or not, the contractor is to notify the engineer and owner immediately. The contractor is responsible for the protection and repair (if necessary) of all utilities..
6. A Pre-Construction meeting shall be held with the El Paso County Planning and Community Development prior to any construction.
7. Approved plans, Engineering Criteria Manual, etc. is required to be on-site at all times during construction..
8. All necessary permits, such as SWMP, ESQCP, Fugitive Dust, Access, C.O.E. 404, etc. shall be obtained prior to construction.
9. All handicap ramps to be per El Paso County Standard SD_2-40.
10. The contractor shall coordinate locations and layout with the El Paso County Planning and Community Development on the placement of any pedestrian ramps prior to construction of the curb.
11. Where appropriate, neatly saw cut all existing concrete and asphalt. Repair/replace all disturbed existing items with like materials and thicknesses.
12. All disturbed areas shall be revegetated with native grasses within 21 days of excavation per Erosion Control Plan.
13. The prepared Erosion/Sediment Control Plan is to be considered a part of these plans and its requirements adhered to during the construction of this project.
14. All storm and sanitary sewer pipe lengths and slopes are figured from center of manhole or bend. Pipe lengths are given as a horizontal length.
15. All storm sewer bedding to be per CDoT Standards.
16. All storm sewer pipe shall be Class III B Wall unless otherwise shown on the storm sewer plan and profile sheets.
17. All wyes and bends used in construction of storm sewer facilities shall be factory fabricated, unless approved by the El Paso County Planning and Community Development.
18. Construction and materials used in all storm and sanitary sewer manholes shall be per specifications. Storm sewer radial deflections to be grouted or installed per manufacturer's recommendations.
19. Storm sewer manholes sizes as follows unless otherwise shown:
    18" thru 36" use 48" I.D. manhole
    42" thru 48" use 60" I.D. manhole
    54" thru 60" use 72" I.D. manhole
    NOTE: Manhole sizes tabulated here shall be increased, if necessary, to accommodate incoming laterals.
20. All horizontal stationing is based on the 'Face of Curb', unless otherwise shown.
21. All vertical design and top of curb are based on the design point shown in the typical cross section.
22. The curb line design point is located at the intersection of the face and top of curb for the Type III Standard 6-inch vertical curb. See typical street section for design point locations. .
23. Vertical curb to be used between curb returns (CR) and at curb inlets. Transitions from ramp to vertical curb shall be 10-feet unless otherwise approved by the El Paso County Public Services Department. All other curb & gutter to be ramp curb & gutter.
24. Cross pans to be per El Paso County Standard Detail SD_2-26.
25. Curb returns shall be straight graded from CR to CR unless otherwise noted.
26. Inlets are Type 'R' inlets (CDOT STD M-604-12) unless otherwise noted.

BENCHMARK:
THE TOP OF AN ALUMINUM SURVEYORS CAP, STAMPED "8953"
NORTHING = 411416.273
EASTING = 235167.071
ELEVATION = 7023.42

THE TOP OF RED PLASTIC SURVEYORS CAP, ILLEGIBLE
NORTHING = 410095.404
EASTING = 235052.131
ELEVATION = 7000.40

THE TOP OF RED PLASTIC SURVEYORS CAP, STAMPED "38141"
NORTHING = 411399.962
EASTING = 233849.817
ELEVATION = 7030.82

BASIS OF BEARING
THE SOUTH LINE OF THE SOUTHWEST QUARTER ($SW\frac{1}{4}$) OF SECTION 34, TOWNSHIP 12 SOUTH, RANGE 65 WEST OF THE 6TH P.M. AS MONUMENTED AT THE SOUTHWEST CORNER OF SAID SOUTHWEST QUARTER ($SW\frac{1}{4}$) BY A 2-1/2" ALUMINUM CAP STAMPED "LS 11624" AND AT THE SOUTHEAST CORNER OF SAID SOUTHWEST QUARTER ($SW\frac{1}{4}$) BY A 2-1/2" ALUMINUM CAP STAMPED "LS11624", SAID LINE BEARS N 89°14'14" E, A DISTANCE OF 2,722.56 FEET.

Know what's **below.**
Call before you dig.

STATEMENTS

Design Engineer's Statement:

This grading and erosion control plan was prepared under my direction and supervision and is correct tot he best of my knowledge and belief. Said plan has been prepared according to the criteria established by the Country for grading and erosion control plans. I accept responsibility for any liability caused by any negligent acts, error or omissions on my part in preparing this plan.

_____ _____
Todd Cartwright, P.E. #33365 Date
For and on behalf of Kiowa Engineering Corp.

Owner/Developer's Statement:

I, the owner/developer have read and will comply with the requirements of the Grading and Erosion Control Plan.

_____ _____
James Morley Date
Sterling Ranch Metropolitan District

El Paso County:

County plan review is provided only for general conformance with County Design Criteria. The County is not responsible for the accuracy and adequacy of the design, dimensions, and/or elevations which shall be confirmed at the job site. The County through the approval of this document assumes no responsibility for completeness and/or accuracy of this document.

Filed in accordance with the requirements of the El Paso County Land Development Code, Drainage Criteria Manual Volumes 1 and 2, and Engineering Criteria Manual as amended.

In accordance with ECM Section 1.12, these construction documents will be valid for construction for a period of 2 years from the date signed by the El Paso County Engineer. If construction has not started within those 2 years the plans will need to be resubmitted for approval, including payment of review fees at the Planning and Community Development Directors discretion.

_____ _____
Jennifer Irvine, P.E., Date
County Engineer / ECM Administrator

EL PASO COUNTY STANDARD NOTES

1. All drainage and roadway construction shall meet the standards and specifications of the City of Colorado Springs/El Paso County Drainage Criteria Manual, Volumes 1 and 2, and the El Paso County Engineering Criteria Manual.
2. Contractor shall be responsible for the notification and field notification of all existing utilities, whether shown on the plans or not, before beginning construction. Location of existing utilities shall be verified by the contractor prior to construction. Call 811 to contact the Utility Notification Center of Colorado (UNCC).
3. Contractor shall keep a copy of these approved plans, the Grading and Erosion Control Plan, the Stormwater Management Plan (SWMP), the soils and geotechnical report, and the appropriate design and construction standards and specifications at the job site at all times, including the following:
   a. El Paso County Engineering Criteria Manual (ECM)
   b. City of Colorado Springs/El Paso County Drainage Criteria Manual, Volumes 1 and 2
   c. Colorado Department of Transportation (CDOT) Standard Specifications for Road and Bridge Construction
   d. CDOT M & S Standards
4. Notwithstanding anything depicted in these plans in words or graphic representation, all design and construction related to roads, storm drainage and erosion control shall conform to the standards and requirements of the most recent version of the relevant adopted El Paso County standards, including the Land Development Code, the Engineering Criteria Manual, and the Drainage Criteria Manual Volume 2. Any deviations from regulations and standards must be requested, and approved, in writing. Any modifications necessary to meet criteria after-the-fact will be entirely the developer's responsibility to rectify.
5. It is the design engineer's responsibility to accurately show existing conditions, both onsite and offsite, on the construction plans. Any modifications necessary due to conflicts, omissions, or changed conditions will be entirely the developer's responsibility to rectify.
6. Contractor shall schedule a pre-construction meeting with El Paso County Planning and Community Development (PCD) - Inspections, prior to starting construction.
7. It is the contractor's responsibility to understand the requirements of all jurisdictional agencies and to obtain all required permits, including but not limited to El Paso County Erosion and Stormwater Quality Control Permit (ESQCP), Regional Building Floodplain Development Permit, U.S. Army Corps of Engineers-issued 401 and/or 404 permits, and county and state fugitive dust permits.
8. Contractor shall not deviate from the plans without first obtaining written approval from the design engineer and PCD. Contractor shall notify the design engineer immediately upon discovery of any errors or inconsistencies.
9. All storm drain pipe shall be Class III RCP unless otherwise noted and approved by PCD.
10. Contractor shall coordinate geotechnical testing per ECM standards. Pavement design shall be approved by El Paso County PCD prior to placement of curb and gutter and pavement.
11. All construction traffic must enter/exit the site at approved construction access points.
12. Sight visibility triangles as identified in the plans shall be provided at all intersections. Obstructions greater than 18 inches above flowline are not allowed within sight triangles.
13. Signing and striping shall comply with El Paso County Department of Public Works and MUTCD criteria. [If applicable, additional signing and striping notes will be provided.]
14. Contractor shall obtain any permits required by El Paso County Department of Public Works, including Work Within the Right-of-Way and Special Transport permits.
15. The limits of construction shall remain within the property line unless otherwise noted. The owner/developer shall obtain written permission and easements, where required, from adjoining property owner(s) prior to any off-site disturbance, grading, or construction.

INDEX OF SHEETS

ABBREVIATIONS

ASSY	= ASSEMBLY	MIN.	= MINIMUM
BNDY	= BOUNDARY	NTS	= NOT TO SCALE
BOP	= BOTTOM OF PIPE	OD	= OUTSIDE DIAMETER
CL	= CENTERLINE	PC	= POINT OF HORIZONTAL CURVATURE
CRA	= CONCRETE REVERSE ANCHOR	PP	= PROPOSED
CTRB	= CONCRETE THRUST BLOCK	PT	= POINT OF HORIZONTAL TANGENCY
CR	= POINT OF CURB RETURN	PVC	= POLY VINYL CHLORIDE PIPE
DIP	= DUCTILE IRON PIPE	PVC	= POINT OF VERTICAL CURVATURE
EL	= ELEVATION	PVI	= POINT OF VERTICAL INTERSECTION
ESMT	= EASEMENT	PVT	= POINT OF VERTICAL TANGENCY
EX.	= EXISTING	RCB	= REINFORCED CONCRETE BOX
FC	= FACE OF CURB	RCP	= REINFORCED CONCRETE PIPE
FES	= FLARED END SECTION	ROW	= RIGHT OF WAY
FLG	= FLANGE	RT	= RIGHT
FL	= FLOWLINE	SHT	= SHEET
GB	= GRADE BREAK	SS	= SANITARY SEWER
HP	= HIGH POINT	STA	= STATION
HORIZ	= HORIZONTAL	STD	= STANDARD
HYD	= HYDRANT	TA	= TOP OF ASPHALT
I.D.	= INSIDE DIAMETER	TC	= TOP OF CURB
LT	= LEFT	TOP	= TOP OF PIPE
LF	= LINEAR FEET	TOR	= TOP OF ROCK
LP	= LOW POINT	TYP	= TYPICAL
MAX	= MAXIMUM	VC	= VERTICAL CURVE
MH	= MANHOLE	VERT	= VERTICAL

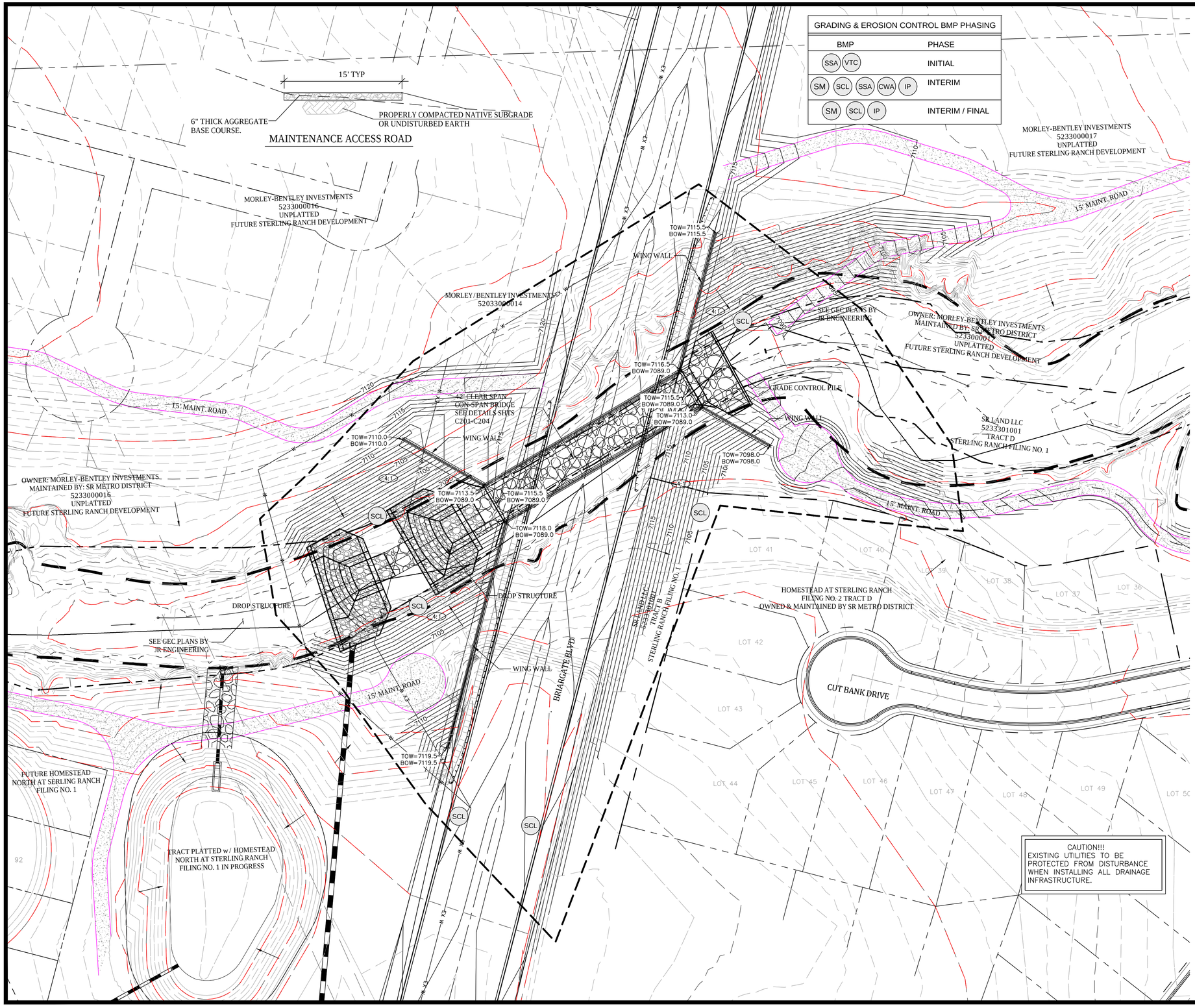
Kiowa Engineering Corporation
Celebrating 30 years
1604 South 21st Street
Colorado Springs, Colorado 80904
(719) 630-7342

STERLING RANCH DEVELOPMENT
BRIARGATE BOULEVARD BRIDGE GRADING & EROSION CONTROL PLANS
COVER SHEET
EL PASO COUNTY, COLORADO

Project No.:	19032
Date:	12/6/2021
Design:	TAC
Drawn:	PAV
Check:	
Revisions:	

GEC0

EPC FILE NO. CDR 204 CDR2113



GRADING & EROSION CONTROL BMP PHASING	
BMP	PHASE
SSA, VTC	INITIAL
SM, SCL, SSA, CWA, IP	INTERIM
SM, SCL, IP	INTERIM / FINAL

GRAPHIC SCALE

0 50 75 100

(IN FEET)

1 inch = 50 ft.

LEGEND

- VTC — VEHICLE TRACKING CONTROL
- IP — INLET PROTECTION
- CWA — CONCRETE WASHOUT AREA
- SCL — SEDIMENT CONTROL LOGS
- SSA — STABILIZED STAGING AREA
- SM — SEED AND MULCH
- TRM — TURF REINFORCEMENT MAT
- ECB — EROSION CONTROL BLANKET
- TOR — TOP OF SOIL/RIPRAP
- LIMITS OF GRADING & CONSTRUCTION
- EXISTING FEMA 100 YEAR FLOODPLAIN
- PROFILE CENTERLINE
- PROPERTY LINE

BANK LINING LEGEND

- GROUTED BOULDER 36"-48"
- TYPE M SOIL RIPRAP D50=12"
- TURF REINFORCED MAT
- WETLAND MITIGATION VEGETATION
- FLOW DIRECTION

NOTES:

1. CONTRACTOR TO IDENTIFY MATERIAL AND SOIL STOCKPILES AREA ON THE SWMP PRIOR TO THE COMMENCEMENT OF MOBILIZATION AND PROVIDE PERIMETER CONTROL CONSTRUCTION FENCE. CONTRACTOR SHALL IDENTIFY STABILIZED STAGING AREA ON THE PLAN, THE LOCATION OF VEHICLE AND EQUIPMENT STORAGE AND MAINTENANCE, STORAGE AREAS FOR FERTILIZERS AND PESTICIDES, ON SITE WASTE MANAGEMENT MEASURES SUCH AS PORTOLETS, TRASH ROLL-OFF AND CONCRETE TRUCK AND EQUIPMENT WASHING AREA PRIOR TO THE COMMENCEMENT OF LAND DISTURBING ACTIVITIES.

2. CONTRACTOR TO IDENTIFY STABILIZED STAGING AREA PRIOR TO THE COMMENCEMENT OF MOBILIZATION.

3. CONSTRUCTION FENCING SHALL BE PROVIDED AT LIMITS OF GRADING/CONSTRUCTION AS PART OF THE INSTALLATION OF THE INITIAL BMPs.

4. CONTRACTOR SHALL PROVIDE CONSTRUCTION FENCING AROUND AREAS TO REMAIN UNDISTURBED BUT WITHIN LIMITS OF GRADING.

5. VEHICLE TRACKING BMPs FOR THIS PROJECT WILL BE LOCATED OFFSITE FROM THE WORK SHOWN ON THESE PLANS. VEHICLE TRACKING OFFSITE FROM THE PROJECT SHALL BE MAINTAINED CONTINUOUSLY THROUGHOUT THE PERIOD OF CONSTRUCTION.

6. THERE WILL BE NO DEDICATED ASPHALT OR CONCRETE BATCH PLANS REQUIRED FOR THIS PROJECT.

7. EXISTING VEGETATION IS MAINLY GRASSES AND HERBS WITH SMALLER AMOUNTS OF SHRUBS. EXISTING VEGETATION IS ESTIMATED AT 80%, BUT CONTRACTOR SHALL FIELD VERIFY PRIOR TO CONSTRUCTION.

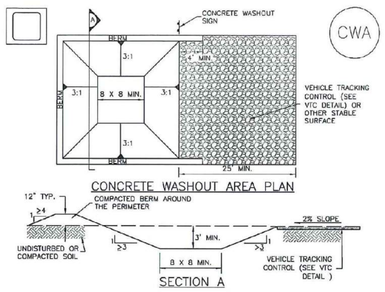
8. CONTRACTOR TO ESTABLISH CUT/FILL AREAS IN ACCORDANCE WITH PROPOSED GRADING IN PLANS.

Kiowa Engineering Corporation
Celebrating 30 years
1604 South 21st Street
Colorado Springs, Colorado 80904
(719) 630-7342

STERLING RANCH DEVELOPMENT
BRIARGATE BOULEVARD BRIDGE GRADING & EROSION CONTROL PLANS
GRADING AND EROSION CONTROL PLAN
EL PASO COUNTY, COLORADO

Project No.:	19032
Date:	12/6/2021
Design:	TAC
Drawn:	PAV
Check:	
Revisions:	

GEC1



CONCRETE WASHOUT AREA PLAN

SECTION A

CWA–1. CONCRETE WASHOUT AREA

CWA INSTALLATION NOTES

1. SEE PLAN VIEW FOR:
   –CWA INSTALLATION LOCATION.

2. DO NOT LOCATE AN UNLINED CWA WITHIN 400' OF ANY NATURAL DRAINAGE PATHWAY OR WATERBODY, DO NOT LOCATE WITHIN 1,000' OF ANY WELLS OR DRINKING WATER SOURCES. IF SITE CONSTRAINTS MAKE THIS INFEASIBLE, OR IF HIGHLY PERMEABLE SOILS EXIST ON SITE, THE CWA MUST BE INSTALLED WITH AN IMPERMEABLE LINER (16 MIL MIN. THICKNESS) OR SURFACE STORAGE ALTERNATIVES USING PREFABRICATED CONCRETE WASHOUT DEVICES OR A LINED ABOVE GROUND STORAGE ARE SHOULD BE USED.

3. THE CWA SHALL BE INSTALLED PRIOR TO CONCRETE PLACEMENT ON SITE.

4. CWA SHALL INCLUDE A FLAT SUBSURFACE PIT THAT IS AT LEAST 8' BY 8' SLOPES LEADING OUT OF THE SUBSURFACE PIT SHALL BE 3:1 OR FLATTER. THE PIT SHALL BE AT LEAST 3' DEEP.

5. BERM SURROUNDING SIDES AND BACK OF THE CWA SHALL HAVE MINIMUM HEIGHT OF 1'

6. VEHICLE TRACKING PAD SHALL BE SLOPED 2% TOWARDS THE CWA.

7. SIGNS SHALL BE PLACED AT THE CONSTRUCTION ENTRANCE, AT THE CWA, AND ELSEWHERES AS NECESSARY TO CLEARLY INDICATE THE LOCATION OF THE CWA TO OPERATORS OF CONCRETE TRUCKS AND PUMP RIGS.

8. USE EXCAVATED MATERIAL FOR PERIMETER BERM CONSTRUCTION.

CWA MAINTENANCE NOTES

1. INSPECT BMPs EACH WORKDAY, AND MAINTAIN THEM IN EFFECTIVE OPERATING CONDITION. MAINTENANCE OF BMPs SHOULD BE PROACTIVE, NOT REACTIVE. INSPECT BMPs AS SOON AS POSSIBLE (AND ALWAYS WITHIN 24 HOURS) FOLLOWING A STORM THAT CAUSES SURFACE EROSION, AND PERFORM NECESSARY MAINTENANCE.

2. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN BMPs IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.

3. WHERE BMPs HAVE FAILED, REPAIR OR REPLACEMENT SHOULD BE INITIATED UPON DISCOVERY OF THE FAILURE.

4. THE CWA SHALL BE REPAIRED, CLEANED, OR ENLARGED AS NECESSARY TO MAINTAIN CAPACITY FOR CONCRETE WASTE. CONCRETE MATERIALS, ACCUMULATED IN PIT, SHALL BE REMOVED ONCE THE MATERIALS HAVE REACHED A DEPTH OF 2'.

5. CONCRETE WASHOUT WATER, WASTED PIECES OF CONCRETE AND ALL OTHER DEBRIS IN THE SUBSURFACE PIT SHALL BE TRANSPORTED FROM THE JOB SITE IN A WATER–TIGHT CONTAINER AND DISPOSED OF PROPERLY.

6. THE CWA SHALL REMAIN IN PLACE UNTIL ALL CONCRETE FOR THE PROJECT IS PLACED.

7. WHEN THE CWA IS REMOVED, COVER THE DISTURBED AREA WITH TOP SOIL, SEED AND MULCH OR OTHERWISE STABILIZED IN A MANNER APPROVED BY THE LOCAL JURISDICTION.

(DETAIL ADAPTED FROM DOUGLAS COUNTY, COLORADO AND THE CITY OF PARKER, COLORADO. NOT AVAILABLE IN AUTOCAD).

NOTE: MANY JURISDICTIONS HAVE BMP DETAILS THAT VARY FROM UDFCD STANDARD DETAILS. CONSULT WITH LOCAL JURISDICTIONS AS TO WHICH DETAIL SHOULD BE USED WHEN DIFFERENCES ARE NOTED.

PROJECT SPECIFIC GRADING AND EROSION CONTROL NOTES

1. All earthwork required of this construction shall be completed in accordance with all applicable sections of the Project Specifications and Soil Investigation Report (Geotechnical Report).
2. Rubbish including timber, concrete rubble, trees, brush, and asphalt shall not be backfilled adjacent to any of the structures or be in the placement of any unclassified fill. The Contractor shall be responsible for the removal and hauling of such materials to a suitable spoil area. Costs associated with the removal of such materials shall be paid for as documented in the Project Specifications.
3. Excess excavation shall become the property of the Contractor and shall be disposed of at the Contractor's expense. The cost of haulage and spoiling of excess excavated materials shall be paid for as documented in the Project Specifications.
4. Water shall be used as a dust palliative as required and shall be included in the cost for earthwork item(s). No separate payment will be made for dust control associated with the site construction.
5. The road grades shall be cleared of vegetation and the topsoil stockpiled for later use.
6. All grading shall be in conformance with the Geotechnical Report for the area.
7. Placement of fill for roadway embankments shall be completed in conformance with the Geotechnical Report.
8. Grading contours shown on this plan are to final grade.
9. Compaction under filled areas, including roadway and detention basin embankments, shall be 95 percent of the maximum Standard Proctor Density (ASTM D698) at two (2) percent of optimum moisture content.
10. No rubble or debris shall be placed in the backfill under any of the proposed buildings, streets, curb & gutter, sidewalk and drainage structures or within five (5) feet of a building footprint. Properly graded rubble may be used in some locations as specified and verified by the Geotechnical Engineer.
11. Contractor is responsible for reviewing the site prior to bidding to verify site conditions.
12. Contractor is responsible for providing erosion control measures as approved by the El Paso County PCD Engineering Division and as may be required by the El Paso County Inspector.
13. All slopes equal to or greater than 3:1 shall require anchored soil retention blanket (SRB), Geocoir 700 or equal.
14. The Developer is responsible for maintaining erosion control measures until a mature stage of vegetation is established.
15. All soils used for fill must be approved by a representative of the Geotechnical Engineer.
16. All natural ground to receive fill must be properly scarified, watered and compacted prior to placing fill.
17. The Contractor is solely responsible for the design, maintenance and operation of any required dewatering system. The Contractor shall perform such independent investigation as he deems necessary to satisfy himself as to the subsurface groundwater conditions and unstable soil conditions to be encountered throughout the construction. Contractor shall coordinate the dewatering system with El Paso County when associated with public facilities.
18. No fill shall be placed, spread or rolled while it is frozen, thawing or during unfavorable weather conditions. When the work is interrupted by heavy rain, fill operations shall not be resumed until a representative of the Geotechnical Engineer indicates that the moisture content and density of the previously placed fill are as specified. Fill surfaces may be scarified and recompacted after rainfall if necessary, to obtain proper moisture density relation.
19. Additional erosion control structures and/or grading may be required at the time of construction.
20. Sediment removal for erosion control facilities shall be performed continuously for proper function.
21. Base mapping was provided by MS Civil Engineers The date of the last survey update was 2019.
22. Proposed Construction Schedule:
    Begin Construction: pending
    End Construction: pending
    Total Site Area = 60 Acres
23. Area to be disturbed = 47.3 Acres (est.)
    Existing ~~100-year runoff~~ coefficient = 0.25
    Proposed 100-year runoff coefficient = 0.25
    Existing Hydrologic Soil Groups: HSG A & B
    Site is currently undeveloped and covered with native grasses on mild to oderate to steep slopes (1%-4%).
24. Site is located in the Sand Creek Drainage Basin.

CLASSIFICATION AND GRADATION OF RIPRAP

Riprap Designation	% Smaller than Given Size by Weight	Intermediate Rock Dimension (inches)	d_{50}* (inches)
Type VL	70–100	12	
	50–70	9	
	35–50	6	6**
	2–10	2	
Type L	70–100	15	
	50–70	12	
	35–50	9	9**
	2–10	3	
Type M	70–100	21	
	50–70	18	
	35–50	12	12**
	2–10	4	

* d_{50}=Mean Particle Size (Intermediate Dimension) by weight.
** Mix VL, L AND M Riprap with 35% Topsoil (by Volume) and bury with 4–6 inches of Topsoil, all vibration compacted & revegetate.
(Table MD–7: Classification and Gradation of Ordinary Riprap. *UDFCD, Drainage Criteria Manual, Vol. 1*)

Kiowa Engineering Corporation
Celebrating 30 years
1604 South 21st Street
Colorado Springs, Colorado 80904
(719) 630-7342

STERLING RANCH DEVELOPMENT
BRIARGATE BOULEVARD BRIDGE GRADING & EROSION CONTROL PLANS
NOTES AND SPECIFICATIONS
EL PASO COUNTY, COLORADO

Project No.:	19032
Date:	12/6/2021
Design:	TAC
Drawn:	PAV
Check:	
Revisions:	

GEC2

SEEDING AND MULCHING INSTALLATION NOTES

1. SEE PLAN VIEW FOR:
   - AREA OF SEEDING AND MULCHING.
   - TYPE OF SEED MIX
2. ALL BRANDS FURNISHED SHALL BE FREE FROM SUCH NOXIOUS SEEDS AS RUSSIAN OR CANADIAN THISTLE, COARSE FESCUE, EUROPEAN BINDWEED, JOHNSON GRASS, KNAP WEED AND LEAFY SPURGE.
3. THE SEEDER SHALL FURNISH TO THE CONTRACTOR A SIGNED STATEMENT CERTIFYING THAT THE SEED FURNISHED IS FROM A LOT THAT HAS BEEN TESTED BY A RECOGNIZED LABORATORY. SEED WHICH HAS BECOME WET, MOLDY OR OTHERWISE DAMAGED IN TRANSIT OR IN STORAGE WILL NOT BE ACCEPTABLE. SEED TICKETS SHALL BE PROVIDED TO REGULATING AGENCY UPON REQUEST.
4. DRILL SEEDING MIX SHALL CONFORM TO THE TABLE ON THE RIGHT.
5. IF THE SEED AVAILABLE ON THE MARKET DOES NOT MEET THE MINIMUM PURITY AND GERMINATION PERCENTAGES SPECIFIED, THE SUBCONTRACTOR MUST COMPENSATE FOR A LESSER PERCENTAGE OF PURITY OR GERMINATION BY FURNISHING SUFFICIENT ADDITIONAL SEED TO EQUAL THE SPECIFIED PRODUCT. THE TAGS FROM THE SEED MIXES MUST BE SUPPLIED TO CONTRACTOR AND FORWARDED TO THE REGULATING AGENCY'S GESC INSPECTOR.
6. THE FORMULA USED FOR DETERMINING THE QUANTITY OF PURE LIVE SEED (PLS) SHALL BE (POUNDS OF SEED) X (PURITY) X (GERMINATION) = POUNDS OF PURE LIVE SEED (PLS).
7. PERMANENT SEED MIX SHALL BE USED UNLESS OTHERWISE APPROVED BY THE REGULATING AGENCY.
8. ALL AREAS TO BE SEEDED AND MULCHED SHALL HAVE NATIVE TOPSOIL OR APPROVED SOIL AMENDMENTS SPREAD TO A DEPTH OF AT LEAST 6 INCHES (LOOSE DEPTH). HAUL ROADS AND OTHER COMPACTED AREAS SHALL BE LOOSENED TO A DEPTH OF 6 INCHES PRIOR TO SPREADING TOPSOIL.
9. SOIL IS TO BE THOROUGHLY LOOSENED (TILLED) TO A DEPTH OF AT LEAST 6 INCHES PRIOR TO SEEDING. THE TOP 6 INCHES OF THE SEED BED SHALL BE FREE OF ROCKS GREATER THAN 4 INCHES AND SOIL CLODS GREATER THAN 2 INCHES. SEEDING OVER ANY COMPACTED AREAS THAT HAVENT BEEN THOROUGHLY LOOSENED SHALL BE REJECTED.
10. SEED IS TO BE APPLIED USING A MECHANICAL DRILL TO A DEPTH OF 1/4 INCH. ROW SPACING SHALL BE NO MORE THAN 6 INCHES. MATERIAL USED FOR MULCH SHALL CONSIST OF LONG-STEMMED STRAW. AT LEAST 50 PERCENT OF THE MULCH, BY WEIGHT, SHALL BE 10 INCHES OR MORE IN LENGTH. MULCH SHALL BE APPLIED AND MECHANICALLY ANCHORED TO A DEPTH OF AT LEAST 2 INCHES. MULCH SHALL BE APPLIED AT A RATE OF 4000 LB. OF STRAW PER ACRE.
11. IF THE PERMITTEE DEMONSTRATES TO THE REGULATING AGENCY THAT IT IS NOT POSSIBLE TO DRILL SEED, SEED IS TO BE UNIFORMLY BROADCAST AT TWO TIMES THE DRILLED RATE, THEN LIGHTLY HARROWED TO PROVIDE A SEED DEPTH OF APPROXIMATELY 1/4 INCH, THEN ROLLED TO COMPACT, THEN MULCHED AS SPECIFIED ABOVE.
12. SEEDING AND MULCHING SHALL BE COMPLETED WITHIN 30 DAYS OF INITIAL EXPOSURE OR 7 DAYS AFTER GRADING IS SUBSTANTIALLY COMPLETE IN A GIVEN AREA (AS DEFINED BY THE REGULATING AGENCY). THIS MAY REQUIRE MULTIPLE MOBILIZATIONS FOR SEEDING AND MULCHING.
13. MULCH SHALL BE APPLIED WITHIN 24 HOURS OF SEEDING.
14. TACKIFIER SHOULD BE UTILIZED TO HELP WITH STRAW DISPLACEMENT.

SEEDING AND MULCHING MAINTENANCE NOTES

1. SEEDED AND MULCHED AREAS SHALL BE INSPECTED FOR REQUIRED COVERAGE MONTHLY FOR A PERIOD OF TWO YEARS FOLLOWING INITIAL SEEDING. REPAIRS AND RE-SEEDING AND MULCHING SHALL BE UNDERTAKEN AFTER THE FIRST GROWING SEASON FOR ANY AREAS FAILING TO MEET THE REQUIRED COVERAGE.
2. REQUIRED COVERAGE FOR STANDARD, OPEN SPACE AND LOW GROWTH SEED MIXES SHALL BE DEFINED AS FOLLOWS:
   1. THREE (3) PLANTS PER SQUARE FOOT WITH A MINIMUM HEIGHT OF 3 INCHES. THE 3 PLANTS PER SQUARE FOOT SHALL BE OF THE VARIETY AND SPECIES FOUND IN THE DOUGLAS COUNTY-APPROVED MIX.
   2. NO BARE AREAS LARGER THAN 4 SQUARE FEET (TWO-FEET BY TWO-FEET OR EQUIVALENT).
   3. FREE OF ERODED AREAS.
   4. FREE FROM INFESTATION OF NOXIOUS WEEDS IN ACCORDANCE WITH SECTION 6.4 OF THE GESC CRITERIA MANUAL.
3. REQUIRED COVERAGE FOR TURF GRASS AREAS SHALL BE DEFINED AS FOLLOWS:
   1. AT LEAST 80% VEGETATIVE COVER OF GRASS SPECIES PLANTED.
   2. NO BARE AREAS LARGER THAN 4 SQUARE FEET (TWO-FEET BY TWO-FEET OR EQUIVALENT.
   3. FREE OF ERODED AREAS.
   4. FREE FROM INFESTATION OF NOXIOUS WEEDS IN ACCORDANCE WITH SECTION 6.4 OF THE GESC CRITERIA MANUAL.
4. RILL AND GULLY EROSION SHALL BE FILLED WITH TOPSOIL PRIOR TO RESEEDING. THE RESEEDING METHOD SHALL BE APPROVED BY THE COUNTY.

SEED MIX

AREAS DISTURBED BY THE EARTHWORK SHALL BE PERMANENTLY REVEGETATED WITH NATIVE GRASSES. NATIVE SEED MIX FOR THIS PROJECT SHALL BE AS FOLLOWS:

SPECIES		pls/acre
WESTERN WHEAT GRASS	*Pascopyrum smithii*	3.0
SIDEOATS GRAMA	*Bouteloua curtipendula*	2.0
SLENDER WHEAT GRASS	*Elymus trachycaulus*	2.0
LITTLE BLUESTEM	*Schizachyrium scoparium*	2.0
BLUE GRAMA	*Bouteloua gracilis*	0.5
SWITCH GRASS	*Panicum virgatum*	2.0
JUNE GRASS	*Koeleria cristata*	0.5
SAND DROPSEED	*Sporobolus cryptandrus*	0.5
		12.5 lbs

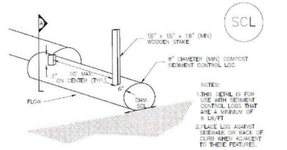
SEEDING APPLICATION: DRILL SEED 1/4" TO 1/2" INTO TOPSOIL IN AREAS INACCESSIBLE TO A DRILL, HAND BROADCAST AT DOUBLE THE RATE AND RAKE 1/4" TO 1/2" INTO THE TOPSOIL.
MULCHING APPLICATION: 1-1/2 TONS NATIVE HAY PER ACRE, MECHANICALLY CRIMPED INTO THE TOPSOIL OR HYDROMULCH.

SEEDING AND MULCH

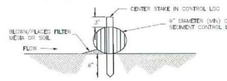
SM

NTS

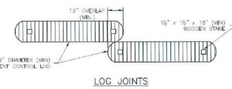
SC-2 Sediment Control Log (SCL)



COMPOST SEDIMENT CONTROL LOG (WEIGHTED)



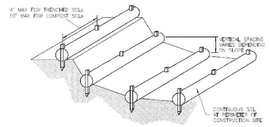
SECTION (A)
COMPOST SEDIMENT CONTROL LOG



LOG JOINTS

SCL-2. COMPOST SEDIMENT CONTROL LOG (WEIGHTED)

Sediment Control Log (SCL) SC-2



SCL-3. SEDIMENT CONTROL LOGS TO CONTROL SLOPE LENGTH

SC-2 Sediment Control Log (SCL)

SEDIMENT CONTROL LOG INSTALLATION NOTES

1. SEE PLAN VIEW FOR LOCATION AND LENGTH OF SEDIMENT CONTROL LOGS.
2. SEDIMENT CONTROL LOGS THAT ACT AS A PERIMETER CONTROL SHALL BE INSTALLED PRIOR TO ANY UPGRADIENT LAND-DISTURBING ACTIVITIES.
3. SEDIMENT CONTROL LOGS SHALL CONSIST OF STRAW, COMPOST, EXCELSIOR OR COCONUT FIBER, AND SHALL BE FREE OF ANY NOXIOUS WEED SEEDS OR DEFECTS INCLUDING RIPS, HOLES AND CYNICUS WEAR.
4. SEDIMENT CONTROL LOGS MAY BE USED AS SMALL CHECK DAMS IN DITCHES AND SWALES. HOWEVER, THEY SHOULD NOT BE USED IN PERENNIAL STREAMS.
5. IT IS RECOMMENDED THAT SEDIMENT CONTROL LOGS BE TRENCHED INTO THE GROUND TO A DEPTH OF APPROXIMATELY ⅓ OF THE DIAMETER OF THE LOG. IF TRENCHING TO THIS DEPTH IS NOT FEASIBLE AND/OR DESIRABLE (SHORT TERM INSTALLATION WITH DESIRE NOT TO DAMAGE LANDSCAPED) A LESSER TRENCHING DEPTH MAY BE ACCEPTABLE WITH MORE ROBUST STAKING. COMPOST LOGS THAT ARE 8 LB/FT DO NOT NEED TO BE TRENCHED.
6. THE UPHILL SIDE OF THE SEDIMENT CONTROL LOG SHALL BE BACKFILLED WITH SOIL OR FILTER MATERIAL THAT IS FREE OF ROCKS AND DEBRIS. THE SOIL SHALL BE TIGHTLY COMPACTED INTO THE SHAPE OF A RIGHT TRIANGLE USING A SHOVEL OR WEIGHTED LAWN ROLLER OR BLOWN IN PLACE.
7. FOLLOW MANUFACTURERS' GUIDANCE FOR STAKING. IF MANUFACTURERS' INSTRUCTIONS DO NOT SPECIFY SPACING, STAKES SHALL BE PLACED ON 4' CENTERS AND EMBEDDED A MINIMUM OF 6" INTO THE GROUND. 3" OF THE STAKE SHALL PROTRUDE FROM THE TOP OF THE LOG. STAKES THAT ARE BROKEN PRIOR TO INSTALLATION SHALL BE REPLACED. COMPOST LOGS SHOULD BE STAKED TO CONTOUR.

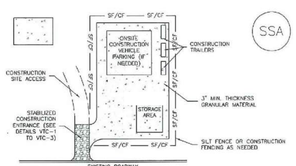
SEDIMENT CONTROL LOG MAINTENANCE NOTES

1. INSPECT BMPs EACH WORKDAY, AND MAINTAIN THEM IN EFFECTIVE OPERATING CONDITION. MAINTENANCE OF BMPs SHOULD BE PROACTIVE, NOT REACTIVE. INSPECT BMPs AS SOON AS POSSIBLE (AND ALWAYS WITHIN 24 HOURS) FOLLOWING A STORM THAT CAUSES SURFACE EROSION, AND PERFORM NECESSARY MAINTENANCE.
2. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN BMPs IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.
3. WHERE BMPs HAVE FAILED, REPAIR OR REPLACEMENT SHOULD BE INITIATED UPON DISCOVERY OF THE FAILURE.
4. SEDIMENT ACCUMULATED UPSTREAM OF SEDIMENT CONTROL LOG SHALL BE REMOVED AS NEEDED TO MAINTAIN FUNCTIONALITY OF THE BMP, TYPICALLY WHEN DEPTH OF ACCUMULATED SEDIMENTS IS APPROXIMATELY ½ OF THE HEIGHT OF THE SEDIMENT CONTROL LOG.
5. SEDIMENT CONTROL LOG SHALL BE REMOVED AT THE END OF CONSTRUCTION. COMPOST FROM COMPOST LOGS MAY BE LEFT IN PLACE AS LONG AS BAGS ARE REMOVED AND THE AREA SEEDED. IF DISTURBED AREAS EXIST AFTER REMOVAL, THEY SHALL BE COVERED WITH TOP SOIL, SEEDED AND MULCHED OR OTHERWISE STABILIZED IN A MANNER APPROVED BY THE LOCAL JURISDICTION.

(DETAILS ADAPTED FROM TOWN OF PARKER, COLORADO, JEFFERSON COUNTY, COLORADO, DOUGLAS COUNTY, COLORADO, AND CITY OF AURORA, COLORADO, NOT AVAILABLE IN AUTOCAD)

NOTE: MANY JURISDICTIONS HAVE BMP DETAILS THAT VARY FROM UDFCD STANDARD DETAILS. CONSULT WITH LOCAL JURISDICTIONS AS TO WHICH DETAIL SHOULD BE USED WHEN DIFFERENCES ARE NOTED.

Stabilized Staging Area (SSA) SM-6



SSA-1. STABILIZED STAGING AREA

STABILIZED STAGING AREA INSTALLATION NOTES

1. SEE PLAN VIEW FOR:
   -LOCATION OF STAGING AREA(S).
   -CONTRACTOR MAY ADJUST LOCATION AND SIZE OF STAGING AREA WITH APPROVAL FROM THE LOCAL JURISDICTION.
2. STABILIZED STAGING AREA SHOULD BE APPROPRIATE FOR THE NEEDS OF THE SITE. OVERSIZING RESULTS IN A LARGER AREA TO STABILIZE FOLLOWING CONSTRUCTION.
3. STAGING AREA SHALL BE STABILIZED PRIOR TO OTHER OPERATIONS ON THE SITE.
4. THE STABILIZED STAGING AREA SHALL CONSIST OF A MINIMUM 3" THICK GRANULAR MATERIAL.
5. UNLESS OTHERWISE SPECIFIED BY LOCAL JURISDICTION, ROCK SHALL CONSIST OF DOT SECT. #103, AASHTO #3 COARSE AGGREGATE OR 6" (MINUS) ROCK.
6. ADDITIONAL PERIMETER BMPs MAY BE REQUIRED INCLUDING BUT NOT LIMITED TO SILT FENCE AND CONSTRUCTION FENCING.

STABILIZED STAGING AREA MAINTENANCE NOTES

1. INSPECT BMPs EACH WORKDAY, AND MAINTAIN THEM IN EFFECTIVE OPERATING CONDITION. MAINTENANCE OF BMPs SHOULD BE PROACTIVE, NOT REACTIVE. INSPECT BMPs AS SOON AS POSSIBLE (AND ALWAYS WITHIN 24 HOURS) FOLLOWING A STORM THAT CAUSES SURFACE EROSION, AND PERFORM NECESSARY MAINTENANCE.
2. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN BMPs IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.
3. WHERE BMPs HAVE FAILED, REPAIR OR REPLACEMENT SHOULD BE INITIATED UPON DISCOVERY OF THE FAILURE.
4. ROCK SHALL BE REAPPLIED OR REGRADED AS NECESSARY IF RUTTING OCCURS OR UNDERLYING SUBGRADE BECOMES EXPOSED.

SM-6 Stabilized Staging Area (SSA)

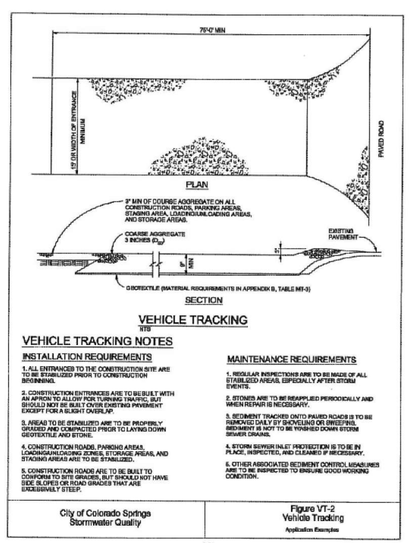
STABILIZED STAGING AREA MAINTENANCE NOTES

5. STABILIZED STAGING AREA SHALL BE ENLARGED IF NECESSARY TO CONTAIN PARKING, STORAGE, AND UNLOADING/LOADING OPERATIONS.
6. THE STABILIZED STAGING AREA SHALL BE REMOVED AT THE END OF CONSTRUCTION. THE GRANULAR MATERIAL SHALL BE REMOVED OR, IF APPROVED BY THE LOCAL JURISDICTION, USED ON SITE, AND THE AREA COVERED WITH TOPSOIL, SEEDED AND MULCHED OR OTHERWISE STABILIZED IN A MANNER APPROVED BY LOCAL JURISDICTION.

NOTE: MANY MUNICIPALITIES PROHIBIT THE USE OF RECYCLED CONCRETE AS GRANULAR MATERIAL FOR STABILIZED STAGING AREAS DUE TO DIFFICULTIES WITH RE-ESTABLISHMENT OF VEGETATION IN AREAS WHERE RECYCLED CONCRETE WAS PLACED.

NOTE: MANY JURISDICTIONS HAVE BMP DETAILS THAT VARY FROM UDFCD STANDARD DETAILS. CONSULT WITH LOCAL JURISDICTIONS AS TO WHICH DETAIL SHOULD BE USED WHEN DIFFERENCES ARE NOTED.

(DETAILS ADAPTED FROM DOUGLAS COUNTY, COLORADO, NOT AVAILABLE IN AUTOCAD)



VEHICLE TRACKING

VEHICLE TRACKING NOTES

INSTALLATION REQUIREMENTS

1. ALL ENTRANCES TO THE CONSTRUCTION SITE ARE TO BE STABILIZED PRIOR TO CONSTRUCTION BEGINNING.
2. CONSTRUCTION ENTRANCES ARE TO BE BUILT WITH AN APRON TO ALLOW FOR TURNING TRAFFIC, BUT SHOULD NOT BE BUILT OVER EXISTING PAVEMENT EXCEPT FOR A SLIGHT OVERLAP.
3. AREAS TO BE STABILIZED ARE TO BE PROPERLY GRADED AND COMPACTED PRIOR TO LAYING DOWN GEOTEXTILE AND STONE.
4. CONSTRUCTION ROADS, PARKING AREAS, LOADING/UNLOADING ZONES, STORAGE AREAS, AND STAGING AREAS ARE TO BE STABILIZED.
5. CONSTRUCTION ROADS ARE TO BE BUILT TO CONFORM TO SITE GRADES, BUT SHOULD NOT HAVE SIDE SLOPES OR ROAD GRADES THAT ARE EXCESSIVELY STEEP.

MAINTENANCE REQUIREMENTS

1. REGULAR INSPECTIONS ARE TO BE MADE OF ALL STABILIZED AREAS, ESPECIALLY AFTER STORM EVENTS.
2. STONES ARE TO BE REAPPLIED PERIODICALLY AND WHEN REPAIR IS NECESSARY.
3. SEDIMENT TRACKED ONTO PAVED ROADS IS TO BE REMOVED DAILY BY SHOVELING OR BROOMING. SEDIMENT IS NOT TO BE WASHED DOWN STORM SEWER DRAINS.
4. STORM SEWER INLET PROTECTION IS TO BE IN PLACE, INSPECTED, AND CLEANED IF NECESSARY.
5. OTHER ASSOCIATED SEDIMENT CONTROL MEASURES ARE TO BE INSPECTED TO ENSURE GOOD WORKING CONDITION.

City of Colorado Springs Stormwater Quality | Figure VT-2 Vehicle Tracking Application Examples

3-54

Standard Notes for El Paso County Grading and Erosion Control Plans

Revised 7/02/19

1. Stormwater discharges from construction sites shall not cause or threaten to cause pollution, contamination, or degradation of State Waters. All work and earth disturbance shall be done in a manner that minimizes pollution of any on-site or off-site waters, including wetlands.
2. Notwithstanding anything depicted in these plans in words or graphic representation, all design and construction related to roads, storm drainage and erosion control shall conform to the standards and requirements of the most recent version of the relevant adopted El Paso County standards, including the Land Development Code, the Engineering Criteria Manual, the Drainage Criteria Manual, and the Drainage Criteria Manual Volume 2. Any deviations from regulations and standards must be requested, and approved, in writing.
3. A separate Stormwater Management Plan (SMWP) for this project shall be completed and an Erosion and Stormwater Quality Control Permit (ESQCP) issued prior to commencing construction. Management of the SWMP during construction is the responsibility of the designated Qualified Stormwater Manager or Certified Erosion Control Inspector. The SWMP shall be located on site at all times during construction and shall be kept up to date with work progress and changes in the field.
4. Once the ESQCP is approved and a "Notice to Proceed" has been issued, the contractor may install the initial stage erosion and sediment control measures as indicated on the approved GEC. A Preconstruction Meeting between the contractor, engineer, and El Paso County will be held prior to any construction. It is the responsibility of the applicant to coordinate the meeting time and place with County staff.
5. Control measures must be installed prior to commencement of activities that could contribute pollutants to stormwater. Control measures for all slopes, channels, ditches, and disturbed land areas shall be installed immediately upon completion of the disturbance.
6. All temporary sediment and erosion control measures shall be maintained and remain in effective operating condition until permanent soil erosion control measures are implemented and final stabilization is established. All persons engaged in land disturbance activities shall assess the adequacy of control measures at the site and identify if changes to those control measures are needed to ensure the continued effective performance of the control measures. All changes to temporary sediment and erosion control measures must be incorporated into the Stormwater Management Plan.
7. Temporary stabilization shall be implemented on disturbed areas and stockpiles where ground disturbing construction activity has permanently ceased or temporarily ceased for longer than 14 days.
8. Final stabilization must be implemented at all applicable construction sites. Final stabilization is achieved when all ground disturbing activities are complete and all disturbed areas either have a uniform vegetative cover with individual plant density of 70 percent of pre-disturbance levels established or equivalent permanent alternative stabilization method is implemented. All temporary sediment and erosion control measures shall be removed upon final stabilization and before permit closure.
9. All permanent stormwater management facilities shall be installed as designed in the approved plans. Any proposed changes that affect the design or function of permanent stormwater management structures must be approved by the ECM Administrator prior to implementation.
10. Earth disturbances shall be conducted in such a manner so as to effectively minimize accelerated soil erosion and resulting sedimentation. All disturbances shall be designed, constructed, and completed so that the exposed area of any disturbed land shall be limited to the shortest practical period of time. Pre-existing vegetation shall be protected and maintained within 50 horizontal feet of a waters of the state unless shown to be infeasible and specifically requested and approved.
11. Compaction of soil must be prevented in areas designated for infiltration control measures or where final stabilization will be achieved by vegetative cover. Areas designated for infiltration control measures shall also be protected from sedimentation during construction until final stabilization is achieved. If compaction prevention is not feasible due to site constraints, all areas designated for infiltration and vegetation control measures must be loosened prior to installation of the control measure(s).
12. Any temporary or permanent facility designed and constructed for the conveyance of stormwater around, through, or from the earth disturbance area shall be a stabilized conveyance designed to minimize erosion and the discharge of sediment off site.
13. Concrete wash water shall be contained and disposed of in accordance with the SWMP. No wash water shall be discharged to or allowed to enter State Waters, including any surface or subsurface storm drainage system or facilities. Concrete washouts shall not be located in an area where shallow groundwater may be present, or within 50 feet of a surface water body, creek or stream.
14. During dewatering operations of uncontaminated ground water may be discharged on site, but shall not leave the site in the form of surface runoff unless an approved State dewatering permit is in place.
15. Erosion control blanketing or other protective covering shall be used on slopes steeper than 3:1.
16. Contractor shall be responsible for the removal of all wastes from the construction site for disposal in accordance with local and State regulatory requirements. No construction debris, tree slash, building material wastes or unused building materials shall be buried, dumped, or discharged at the site.
17. Waste materials shall not be temporarily placed or stored in the street, alley, or other public way, unless in accordance with an approved Traffic Control Plan. Control measures may be required by El Paso County Engineering if deemed necessary, based on specific conditions and circumstances.
18. Tracking of soils and construction debris off-site shall be minimized. Materials tracked off-site shall be cleaned up and properly disposed of immediately.
19. The owner/developer shall be responsible for the removal of all construction debris, dirt, trash, rock, sediment, soil, and sand that may accumulate in roads, storm drains and other drainage conveyance systems and stormwater appurtenances as a result of site development.
20. The quantity of materials stored on the project site shall be limited, as much as practical, to that quantity required to perform the work in an orderly sequence. All materials stored on-site shall be stored in a neat, orderly manner, in their original containers, with original manufacturer's labels.
21. No chemical(s) having the potential to be released in stormwater are to be stored or used onsite unless permission for the use of such chemical(s) is granted in writing by the ECM Administrator. In granting approval for use of such chemical(s), special conditions and monitoring may be required.
22. Bulk storage of allowed petroleum products or other allowed liquid chemicals in excess of 55 gallons shall require adequate secondary containment protection to contain all spills onsite and to prevent any spilled materials from entering State Waters, any surface or subsurface storm drainage system or other facilities.
23. No person shall cause the impediment of stormwater flow in the curb and gutter or ditch except with approved sediment control measures.
24. Owner/developer and their agents shall comply with the "Colorado Water Quality Control Act" (Title 25, Article 8, CRS), and the "Clean Water Act" (33 USC 1344), in addition to the requirements of the Land Development Code, DCM Volume II and the ECM Appendix I. All appropriate permits must be obtained by the contractor prior to construction (1041, NPDES, Floodplain, 404, fugitive dust, etc.). In the event of conflicts between these requirements and other laws, rules, or regulations of other Federal, State, local, or County agencies, the most restrictive laws, rules, or regulations shall apply.
25. All construction traffic must enter/exit the site only at approved construction access points.
26. Prior to construction the permittee shall verify the location of existing utilities.
27. A water source shall be available on site during earthwork operations and shall be utilized as required to minimize dust from earthwork equipment and wind.
28. The Sub-Surface Soil INvestigation, Sterling Ranch Bridges prepared by Entech Engineering shall be considered a part a part of these plans.
29. At least ten (10) days prior to the anticipated start of construction, for projects that will disturb one (1) acre or more, the owner or operator of construction activity shall submit a permit application for stormwater discharge to the Colorado Department of Public Health and Environment, Water Quality Division. The application contains certification of completion of a stormwater management plan (SWMP), of which this Grading and Erosion Control Plan may be a part. For information or application materials contact:

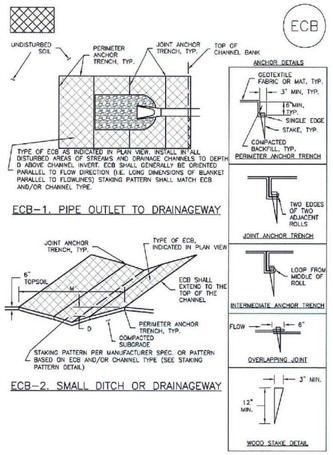
Colorado Department of Public Health and Environment
Water Quality Control Division
WQCD - Permits
4300 Cherry Creek Drive South
Denver, CO 80246-1530
Attn: Permits Unit

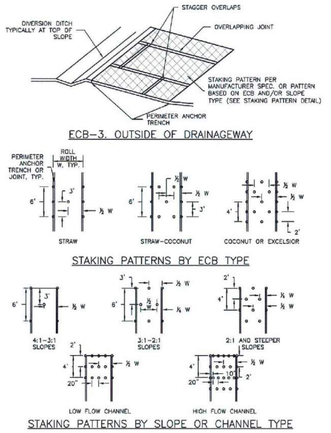
Kiowa Engineering Corporation
Celebrating 30 years
1604 South 21st Street
Colorado Springs, Colorado 80904
(719) 630-7342

STERLING RANCH DEVELOPMENT
BRIARGATE BOULEVARD BRIDGE GRADING & EROSION CONTROL PLANS
NOTES AND SPECIFICATIONS
EL PASO COUNTY, COLORADO

Project No.:	19032
Date:	12/6/2021
Design:	TAC
Drawn:	PAV
Check:	
Revisions:	

GEC3





EROSION CONTROL BLANKET INSTALLATION NOTES

1. SEE PLAN VIEW FOR:
   –LOCATION OF ECB.
   –TYPE OF ECB (STRAW, STRAW–COCONUT, COCONUT, OR EXCELSIOR).
   –AREA, A, IN SQUARE YARDS OF EACH TYPE OF ECB.

2. 100% NATURAL AND BIODEGRADABLE MATERIALS ARE PREFERRED FOR RECPs, ALTHOUGH SOME JURISDICTIONS MAY ALLOW OTHER MATERIALS IN SOME APPLICATIONS.

3. IN AREAS WHERE ECBs ARE SHOWN ON THE PLANS, THE PERMITTEE SHALL PLACE TOPSOIL AND PERFORM FINAL GRADING, SURFACE PREPARATION, AND SEEDING AND MULCHING. SUBGRADE SHALL BE SMOOTH AND MOIST PRIOR TO ECB INSTALLATION AND THE ECB SHALL BE IN FULL CONTACT WITH SUBGRADE. NO GAPS OR VOIDS SHALL EXIST UNDER THE BLANKET.

4. PERIMETER ANCHOR TRENCH SHALL BE USED ALONG THE OUTSIDE PERIMETER OF ALL BLANKET AREAS.

5. JOINT ANCHOR TRENCH SHALL BE USED TO JOIN ROLLS OF ECBs TOGETHER (LONGITUDINALLY AND TRANSVERSELY) FOR ALL ECBs EXCEPT STRAW WHICH MAY USE AN OVERLAPPING JOINT.

6. INTERMEDIATE ANCHOR TRENCH SHALL BE USED AT SPACING OF ONE–HALF ROLL LENGTH FOR COCONUT AND EXCELSIOR ECBs.

7. OVERLAPPING JOINT DETAIL SHALL BE USED TO JOIN ROLLS OF ECBs TOGETHER FOR ECBs ON SLOPES.

8. MATERIAL SPECIFICATIONS OF ECBs SHALL CONFORM TO TABLE ECB–1.

9. ANY AREAS OF SEEDING AND MULCHING DISTURBED IN THE PROCESS OF INSTALLING ECBS SHALL BE RESEEDED AND MULCHED.

10. DETAILS ON DESIGN PLANS FOR MAJOR DRAINAGEWAY STABILIZATION WILL GOVERN IF DIFFERENT FROM THOSE SHOWN HERE.

TABLE ECB–1. ECB MATERIAL SPECIFICATIONS

TYPE	COCONUT CONTENT	STRAW CONTENT	EXCELSIOR CONTENT	RECOMMENDED NETTING**
STRAW*	–	100%	–	DOUBLE/ NATURAL
STRAW–COCONUT	30% MIN	70% MAX	–	DOUBLE/ NATURAL
COCONUT	100%	–	–	DOUBLE/ NATURAL
EXCELSIOR	–	–	100%	DOUBLE/ NATURAL

*STRAW ECBs MAY ONLY BE USED OUTSIDE OF CHANNELS AND DRAINAGE CHANNELS.
**ALTERNATE NETTING MAY BE ACCEPTABLE IN SOME JURISDICTIONS.

EROSION CONTROL BLANKET MAINTENANCE NOTES

1. INSPECT BMPs EACH WORKDAY, AND MAINTAIN THEM IN EFFECTIVE OPERATING CONDITION. MAINTENANCE OF BMPs SHOULD BE PROACTIVE, NOT REACTIVE. INSPECT BMPs AS SOON AS POSSIBLE (AND ALWAYS WITHIN 24 HOURS) FOLLOWING A STORM THAT CAUSES SURFACE EROSION, AND PERFORM NECESSARY MAINTENANCE.

2. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN BMPs IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.

3. WHERE BMPs HAVE FAILED, REPAIR OR REPLACEMENT SHOULD BE INITIATED UPON DISCOVERY OF THE FAILURE.

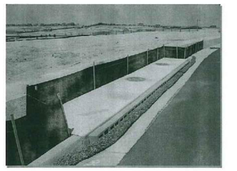
4. ECBs SHALL BE LEFT IN PLACE TO EVENTUALLY BIODEGRADE, UNLESS REQUESTED TO BE REMOVED BY THE LOCAL JURISDICTION.

5. ANY ECB PULLED OUT, TORN, OR OTHERWISE DAMAGED SHALL BE REPAIRED OR REINSTALLED. ANY SUBGRADE AREAS BELOW THE GEOTEXTILE THAT HAVE ERODED TO CREATED A VOID UNDER THE BLANKET, OR THAT REMAIN DEVOID OF GRASS SHALL BE REPAIRED, RESEEDED AND MULCHED AND THE ECB REINSTALLED.

NOTE: MANY JURISDICTIONS HAVE BMP DETAILS THAT VARY FROM UDFCD STANDARD DETAILS. CONSULT WITH LOCAL JURISDICTIONS AS TO WHICH DETAIL SHOULD BE USED WHEN DIFFERENCES ARE NOTED.

(DETAILS ADAPTED FROM DOUGLAS COUNTY, COLORADO AND TOWN OF PARKER COLORADO, NOT AVAILABLE IN AUTOCAD)

Description



Photograph IP-1. Inlet protection for a curb opening inlet.

Inlet protection consists of permeable barriers installed around an inlet to filter runoff and remove sediment prior to entering a storm drain inlet. Inlet protection can be constructed from rock socks, sediment control logs, silt fence, block and rock socks, or other materials approved by the local jurisdiction. Area inlets can also be protected by over-excavating around the inlet to form a sediment trap.

Appropriate Uses

Install protection at storm sewer inlets that are operable during construction. Consider the potential for tracked-out sediment or temporary stockpile areas to contribute sediment to inlets when determining which inlets must be protected. This may include inlets in the general proximity of the construction area, not limited to downgradient inlets. Inlet protection is not a stand-alone BMP and should be used in conjunction with other upgradient BMPs.

Design and Installation

To function effectively, inlet protection measures must be installed to ensure that flows do not bypass the inlet protection and enter the storm drain without treatment. However, designs must also enable the inlet to function without completely blocking flows into the inlet in a manner that causes localized flooding. When selecting the type of inlet protection, consider factors such as type of inlet (e.g., curb or area, sump or on-grade conditions), traffic, anticipated flows, ability to secure the BMP properly, safety and other site-specific conditions. For example, block and rock socks will be better suited to a curb and gutter along a roadway, as opposed to silt fence or sediment control logs, which cannot be properly secured in a curb and gutter setting, but are effective area inlet protection measures.

Several inlet protection designs are provided in the Design Details. Additionally, a variety of proprietary products are available for inlet protection that may be approved for use by local governments. If proprietary products are used, design details and installation procedures from the manufacturer must be followed. Regardless of the type of inlet protection selected, inlet protection is most effective when combined with other BMPs such as curb socks and check dams. Inlet protection is often the last barrier before runoff enters the storm sewer or receiving water.

Design details with notes are provided for these forms of inlet protection:

IP-1. Block and Rock Sock Inlet Protection for Sump or On-grade Inlets

IP-2. Curb (Rock) Socks Upstream of Inlet Protection, On-grade Inlets

Inlet Protection (various forms)	
Functions	
Erosion Control	No
Sediment Control	Yes
Site/Material Management	No

IP-3. Rock Sock Inlet Protection for Sump/Area Inlet

IP-4. Silt Fence Inlet Protection for Sump/Area Inlet

IP-5. Over-excavation Inlet Protection

IP-6. Straw Bale Inlet Protection for Sump/Area Inlet

CIP-1. Culvert Inlet Protection

Proprietary inlet protection devices should be installed in accordance with manufacturer specifications.

More information is provided below on selecting inlet protection for sump and on-grade locations.

Inlets Located in a Sump

When applying inlet protection in sump conditions, it is important that the inlet continue to function during larger runoff events. For curb inlets, the maximum height of the protective barrier should be lower than the top of the curb opening to allow overflow into the inlet during larger storms without excessive localized flooding. If the inlet protection height is greater than the curb elevation, particularly if the filter becomes clogged with sediment, runoff will not enter the inlet and may bypass it, possibly causing localized flooding, public safety issues, and downstream erosion and damage from bypassed flows.

Area inlets located in a sump setting can be protected through the use of silt fence, concrete block and rock socks (on paved surfaces), sediment control logs/straw wattles embedded in the adjacent soil and stacked around the area inlet (on pervious surfaces), over-excavation around the inlet, and proprietary products providing equivalent functions.

Inlets Located on a Slope

For curb and gutter inlets on paved sloping streets, block and rock sock inlet protection is recommended in conjunction with curb socks in the gutter leading to the inlet. For inlets located along unpaved roads, also see the Check Dam Fact Sheet.

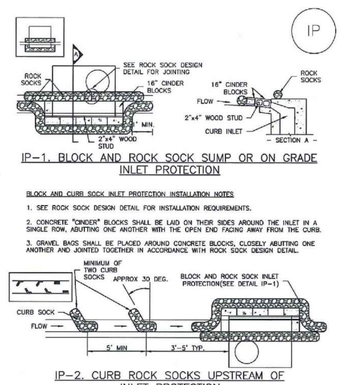
Maintenance and Removal

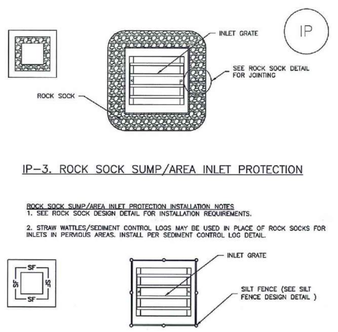
Inspect inlet protection frequently. Inspection and maintenance guidance includes:

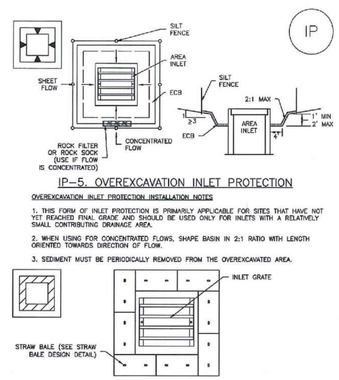
- Inspect for tears that can result in sediment directly entering the inlet, as well as result in the contents of the BMP (e.g., gravel) washing into the inlet.
- Check for improper installation resulting in untreated flows bypassing the BMP and directly entering the inlet or bypassing to an unprotected downstream inlet. For example, silt fence that has not been properly trenched around the inlet can result in flows under the silt fence and directly into the inlet.
- Look for displaced BMPs that are no longer protecting the inlet. Displacement may occur following larger storm events that wash away or reposition the inlet protection. Traffic or equipment may also crush or displace the BMP.
- Monitor sediment accumulation upgradient of the inlet protection.

- Remove sediment accumulation from the area upstream of the inlet protection, as needed to maintain BMP effectiveness, typically when it reaches no more than half the storage capacity of the inlet protection. For silt fence, remove sediment when it accumulates to a depth of no more than 6 inches. Remove sediment accumulation from the area upstream of the inlet protection as needed to maintain the functionality of the BMP.
- Proprietary inlet protection devices should be inspected and maintained in accordance with manufacturer specifications. If proprietary inlet insert devices are used, sediment should be removed in a timely manner to prevent devices from breaking and spilling sediment into the storm drain.

Inlet protection must be removed and properly disposed of when the drainage area for the inlet has reached final stabilization.







KiOWa Engineering Corporation
Celebrating 30 years
1604 South 21st Street
Colorado Springs, Colorado 80904
(719) 630-7342

STERLING RANCH DEVELOPMENT
BRIARGATE BOULEVARD BRIDGE GRADING & EROSION CONTROL PLANS
NOTES AND SPECIFICATIONS
EL PASO COUNTY, COLORADO

Project No.:	19032
Date:	12/6/2021
Design:	TAC
Drawn:	PAV
Check:	
Revisions:	

GEC4

19032 Sand Creek at Sterling Ranch/drawings/Const dwg/1-BB/19032 BB GEC 01-04.dwg

APPENDIX D: Sterling Ranch 404 Permit

Appendix D

Sterling Ranch 404 Permit

NOT SIGNED
6-24-16

DEPARTMENT OF THE ARMY
ALBUQUERQUE DISTRICT, CORPS OF ENGINEERS
200 SOUTH SANTA FE AVENUE, SUITE 301
PUEBLO, COLORADO 81003-4270

REPLY TO
ATTENTION OF

February 18, 2016

Regulatory Division

SUBJECT: Action No. SPA-2015-00428-SCO, Sterling Ranch Residential Development Project, El Paso County, Colorado

Jim Morley
SR Land, LLC
20 Boulder Crescent Suite 201
Colorado Springs, CO 80903

Mr. Morley:

Enclosed for your review and signature are two copies of the draft permit for Action No. SPA-2015-00428-SCO discharge dredged and fill material into waters of the United States.

You may either sign the permit or object to the permit and request the permit to be modified in accordance with the enclosed Notification of Administrative Appeal Options and Process and Request For Appeal (NAAOP-RFA). If you elect to object to this permit, you must complete Section II (Request for Appeal or Objections to an Initial Proffered Permit) of the enclosure and return to: U.S. Army Corps of Engineers, Attn: Mr. Tom Cavanaugh, Administrative Appeal Review Officer, 1455 Market Street, Room 1760, San Francisco, CA 94103-1399, within 60 days of the date of this letter.

If you elect to sign the permit, please ensure that both copies are signed and dated and return them to the attention of the Regulatory Division at the address above. Your signature on the permit indicates that you accept the permit in its entirety and forfeit all rights to appeal the permit or its terms and conditions, and denotes your assurance that the work will be conducted in accordance with the plans, description, and all terms and conditions of the permit.

A fee in the amount of $100.00 for commercial project must be paid before the permit can be issued. Your check should be made payable to the "Finance and Accounting Officer, UFC, Albuquerque", and mailed to the attention of the Regulatory Division at the above address.

Within ten days, both signed copies of the accepted permit should be returned to us. One copy of the signed permit will be returned to you. The permit is not valid until signed by the U.S. Army Corps of Engineers. If you have any questions concerning this

permit, please contact me at 719-543-6915 or by e-mail at van.a.truan@usace.army.mil.

Sincerely,

Van Truan
Chief, Southern Colorado
Regulatory Branch

Enclosures

SIGNED

DEPARTMENT OF THE ARMY
ALBUQUERQUE DISTRICT, CORPS OF ENGINEERS
200 SOUTH SANTA FE AVENUE, SUITE 301
PUEBLO, COLORADO 81003-4270

REPLY TO
ATTENTION OF

February 29, 2016

Regulatory Division

SUBJECT: Action No. SPA-2015-00428-SCO, Sterling Ranch Residential Development Project, El Paso County, Colorado

Jim Morley
SR Land, LLC
20 Boulder Crescent Suite 201
Colorado Springs, CO 80903

Mr. Morley:

You are hereby authorized under Section 404 of the Clean Water Act to discharge dredged and fill material into waters of the United States to conduct work in associated with construction of the Sterling Ranch Residential Development in accordance with Action Number SPA-2015-00428-SCO. A copy of the permit is enclosed.

To use this permit, you must ensure that the work is conducted in accordance with the terms and conditions of the permit. You must submit revised drawings to us for approval prior to construction should any changes be found necessary in either the location or plans for the work. Approval of revised plans may be granted if they are found not contrary to the public interest.

This permit is not an approval of the project design features, nor does it imply that the construction is adequate for its intended purpose. This permit does not authorize any injury to property or invasion of rights or any infringement of Federal, state or local laws or regulations. You must possess the authority, including property rights, to undertake the proposed work.

Enclosed is a compliance certification form. Upon completion of the project, please sign and date the form and return it to this office.

If you have any questions concerning our regulatory program, please contact me at 719-543-6915 or by e-mail at van.a.truan@usace.army.mil. At your convenience,

please complete a Customer Service Survey at http://per2.nwp.usace.army.mil/survey.html.

Sincerely,

Van Truan
Chief, Southern Colorado
Regulatory Branch

Enclosure(s)

Certification of Compliance
with Department of the Army Permit

Action Number: SPA-2015-00428-SCO

Name of Permittee: SR Land, LLC

Upon completion of the activity authorized by this permit and any mitigation required by the permit, sign this certification and return it to the following address:

Van Truan
Albuquerque District, U.S. Army Corps of Engineers
200 South Santa Fe Avenue, Suite 301
Pueblo, Colorado 81003-4270

Please note that your permitted activity is subject to a compliance inspection by an U.S. Army Corps of Engineers representative. If you fail to comply with this permit, you are subject to permit suspension, modification, or revocation.

Please enclose photographs showing the completed project (if available).

I hereby certify that the work authorized by the above referenced permit has been completed in accordance with the terms and conditions of the said permit, and required mitigation was completed in accordance with the permit conditions.

Date Work Started _____

Date Work Completed _____

_____ _____
Date Signature of Permittee

DEPARTMENT OF THE ARMY PERMIT

Permittee Jim Morley

Permit No. SPA-2015-00428-SCO

Issuing Office Albuquerque District, U.S. Army Corps of Engineers

NOTE: The term "you" and its derivatives, as used in this permit, means the permittee or any future transferee. The term "this office" refers to the appropriate district or division office of the Corps of Engineers having jurisdiction over the permitted activity or the appropriate official of that office acting under the authority of the commanding officer.

You are authorized to perform work in accordance with the terms and conditions specified below.

Project Description: The Sterling Ranch Residential Development Project includes installation of attendant utilities, channel improvements to the main stem of Sand Creek, three off-line stormwater detention ponds, development of two permanent residential access roads and associated culverts, and development of residential units. Permanent impacts to waters of the US will result from construction of the residential access roads and associated culverts, and construction of residential units in the unnamed western tributary to Sand Creek. Total cumulative permanent impacts from the discharge of fill material into waters/wetlands of the US from the proposed project will total 4.21 acres and 5,048 linear feet within the main channel of Sand Creek and its western tributary. The project will be constructed in accordance with the attached drawings, entitled, "Sterling Ranch Wetland Impact Location Map, Sterling Ranch Sketch Plan figure number 8, and Sterling Ranch Channel Improvements & Mitigation Plan sheets 1 through 3 dated October 13, 2015, in Sand Creek, El Paso County, Colorado, Application by Jim Morley, Application No. SPA-2015-00428-SCO".

Project Location: The project is located on 1,443.7 acres northeast of the intersection of Black Forest Road and Woodmen Road in unincorporated El Paso County, Colorado. The property is on the United States Geological Survey (USGS) Falcon Quadrangle on portions of Sections 27, 28, 32, 33, and 34 in Township 12 South, Range 65 West and the northwest portion of Section 4, Township 13 South, Range 65 West. The approximate coordinates of the project center are 39.964483 latitude and -104.664944 longitude (WGS 84 datum).

Permit Conditions: In accordance with the attached Colorado Department of Public Health and Environment Section 401 Water Quality Certification pages 1 through 6 of 6, dated February 4, 2016.

General Conditions:

1. The time limit for completing the work authorized ends on March 1, 2021. If you find that you need more time to complete the authorized activity, submit your request for a time extension to this office for consideration at least one month before the above date is reached.

2. You must maintain the activity authorized by this permit in good condition and in conformance with the terms and conditions of this permit. You are not relieved of this requirement if you abandon the permitted activity,

although you may make a good faith transfer to a third party in compliance with General Condition 4 below. Should you wish to cease to maintain the authorized activity or should you desire to abandon it without a good faith transfer, you must obtain a modification of this permit from this office, which may require restoration of the area.

3. If you discover any previously unknown historic or archeological remains while accomplishing the activity authorized by this permit, you must immediately notify this office of what you have found. We will initiate the Federal and state coordination required to determine if the remains warrant a recovery effort or if the site is eligible for listing in the National Register of Historic Places.

4. If you sell the property associated with this permit, you must obtain the signature of the new owner in the space provided and forward a copy of the permit to this office to validate the transfer of this authorization.

5. If a conditioned water quality certification has been issued for your project, you must comply with the conditions specified in the certification as special conditions to this permit. For your convenience, a copy of the certification is attached if it contains such conditions.

6. You must allow representatives from this office to inspect the authorized activity at any time deemed necessary to ensure that it is being or has been accomplished in accordance with the terms and conditions of your permit.

Special Conditions:

1. The permittee shall implement and abide by the compensatory mitigation plan titled Conceptual Mitigation Plan for Sterling Ranch Residential Development, prepared by CORE Consultants, Inc. on October 29, 2015 except where changes are necessary to comply with special conditions listed below. The permittee shall implement the mitigation plan concurrently with the construction of the project and complete the initial construction and plantings associated with the mitigation work prior to EITHER the initiation of operation OR completion of construction of the project. Completion of all elements of this mitigation plan is a requirement of this permit.

2. The permittee shall submit annual compensatory mitigation site monitoring reports to the Corps Albuquerque District Office by December 31st of each year, beginning in 2016, for a minimum of 3 years or until the Corps has determined that the mitigation performance standards and success criteria have been met. The monitoring reports shall be prepared in accordance with Corps Regulatory Guidance Letter 08-03 (Minimum Monitoring Requirements for Compensatory Mitigation Projects Involving the Restoration, Establishment, and/or Enhancement of Aquatic Resources) and current Corps Albuquerque District Mitigation Monitoring Guidelines available at http://www.spa.usace.army.mil/Missions/RegulatoryProgramandPermits/Mitigation.aspx. The mitigation monitoring reports shall at a minimum include the following:

a. Comparison of pre-construction site conditions to an as-built survey as submitted in accordance with Special Condition 4.

b. A map showing the wetland AND/OR Ordinary High Water Mark (OHWM) delineation, and aerial photos marked to show the wetland AND/OR OHWM boundary.

c. Photographs (minimum 5) from fixed photographic monitoring points with a location reference map and indicating camera orientation.

d. All data collected to document whether the mitigation site is achieving performance standards described in the mitigation plan and a narrative discussion of progress made toward meeting performance standards.

e. Fish and wildlife observations at the mitigation site.

f. Summary statement regarding the perceived success of the mitigation project and any potential problem areas. Suggestions and a timetable for corrections should be included if it is anticipated that project goals may not be met.

g. Date(s) of field inspection(s).

3. In order to assist the Corps in scheduling compliance inspections, the permittee shall notify the Corps Albuquerque District Office, in writing, at least 7 calendar days in advance of the initiation of mitigation construction AND no later than 15 calendar days following completion of construction activities.

4. Within 60 days after completion of construction of the mitigation project, the permittee shall submit as-built drawings and a description of the work conducted to the Corps Albuquerque District Office. The drawings shall include the following:

a. The Department of the Army Action Number.

b. A plan view drawing of the location of the authorized work footprint (as shown in permit drawings) with an overlay of the work as constructed in the same scale. The drawing should show all "earth disturbance," wetland impacts, structures, and the boundaries of any on-site and/or off-site mitigation or avoidance areas. The drawings shall contain, at a minimum, 1-foot OR greater topographic contours of the entire site.

c. Ground photographs of the completed work. The camera positions and view-angles of the ground photographs shall be identified on a map, aerial photograph, or project drawing.

d. A description of all deviations between the work as authorized by the permit and the work as constructed. Clearly indicate on the as-built drawings the location of any deviations.

5. Your responsibility to complete the required compensatory mitigation as set forth in Special Condition No. 1 will not be considered fulfilled until you have demonstrated mitigation success and have received written verification from the U.S. Army Corps of Engineers.

Further Information:

1. Congressional Authorities: You have been authorized to undertake the activity described above pursuant to:

( ) Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403).

(X) Section 404 of the Clean Water Act (33 U.S.C. 1344).

( ) Section 103 of the Marine Protection, Research and Sanctuaries Act of 1972 (33 U.S.C. 1413).

2. Limits of this authorization.

a. This permit does not obviate the need to obtain other Federal, state, or local authorizations required by law.

b. This permit does not grant any property rights or exclusive privileges.

c. This permit does not authorize any injury to the property or rights of others.

d. This permit does not authorize interference with any existing or proposed Federal project.

3. Limits of Federal Liability. In issuing this permit, the Federal Government does not assume any liability for the following:

a. Damages to the permitted project or uses thereof as a result of other permitted or unpermitted activities or from natural causes.

b. Damages to the permitted project or uses thereof as a result of current or future activities undertaken by or on behalf of the United States in the public interest.

c. Damages to persons, property, or to other permitted or unpermitted activities or structures caused by the activity authorized by this permit.

d. Design or construction deficiencies associated with the permitted work.

e. Damage claims associated with any future modification, suspension, or revocation of this permit.

4. Reliance on Applicant's Data: The determination of this office that issuance of this permit is not contrary to the public interest was made in reliance on the information you provided.

5. Reevaluation of Permit Decision. This office may reevaluate its decision on this permit at any time the circumstances warrant. Circumstances that could require a reevaluation include, but are not limited to, the following:

a. You fail to comply with the terms and conditions of this permit.

b. The information provided by you in support of your permit application proves to have been false, incomplete, or inaccurate (See 4 above).

c. Significant new information surfaces which this office did not consider in reaching the original public interest decision.

Such a reevaluation may result in a determination that it is appropriate to use the suspension, modification, and revocation procedures contained in 33 CFR 325.7 or enforcement procedures such as those contained in 33 CFR 326.4 and 326.5. The referenced enforcement procedures provide for the issuance of an administrative order requiring you to comply with the terms and conditions of your permit and for the initiation of legal action where appropriate. You will be required to pay for any corrective measures ordered by this office, and if you fail to comply with such directive, this office may in certain situations (such as those specified in 33 CFR 209.170) accomplish the corrective measures by contract or otherwise and bill you for the cost.

6. Extensions. General condition 1 establishes a time limit for the completion of the activity authorized by this

permit. Unless there are circumstances requiring either a prompt completion of the authorized activity or a reevaluation of the public interest decision, the Corps will normally give favorable consideration to a request for an extension of this time limit.

Your signature below, as permittee, indicates that you accept and agree to comply with the terms and conditions of this permit.

(PERMITTEE) 2/23/2016 (DATE)

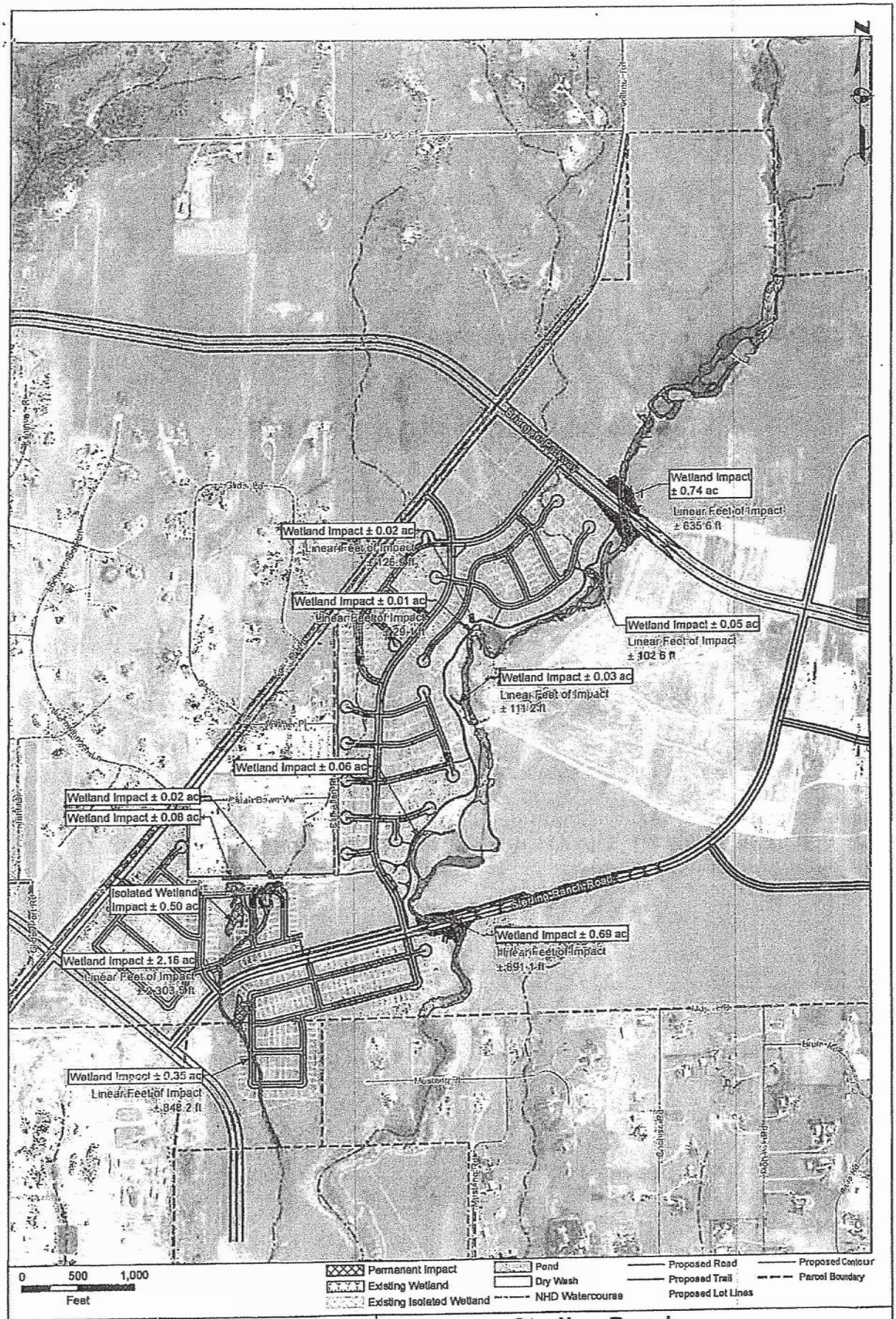
This permit becomes effective when the Federal official, designated to act for the Secretary of the Army, has signed below.

(FOR THE DISTRICT ENGINEER) 29 Feb 2016 (DATE)

Patrick J. Dagon
Lieutenant Colonel, U.S. Army
District Commander

When the structures or work authorized by this permit are still in existence at the time the property is transferred, the terms and conditions of this permit will continue to be binding on the new owner(s) of the property. To validate the transfer of this permit and the associated liabilities associated with compliance with its terms and conditions, have the transferee sign and date below.

(TRANSFERREE) (DATE)



CORE CONSULTANTS

CIVIL ENGINEERING
DEVELOPMENT CONSULTING
LAND SURVEYING

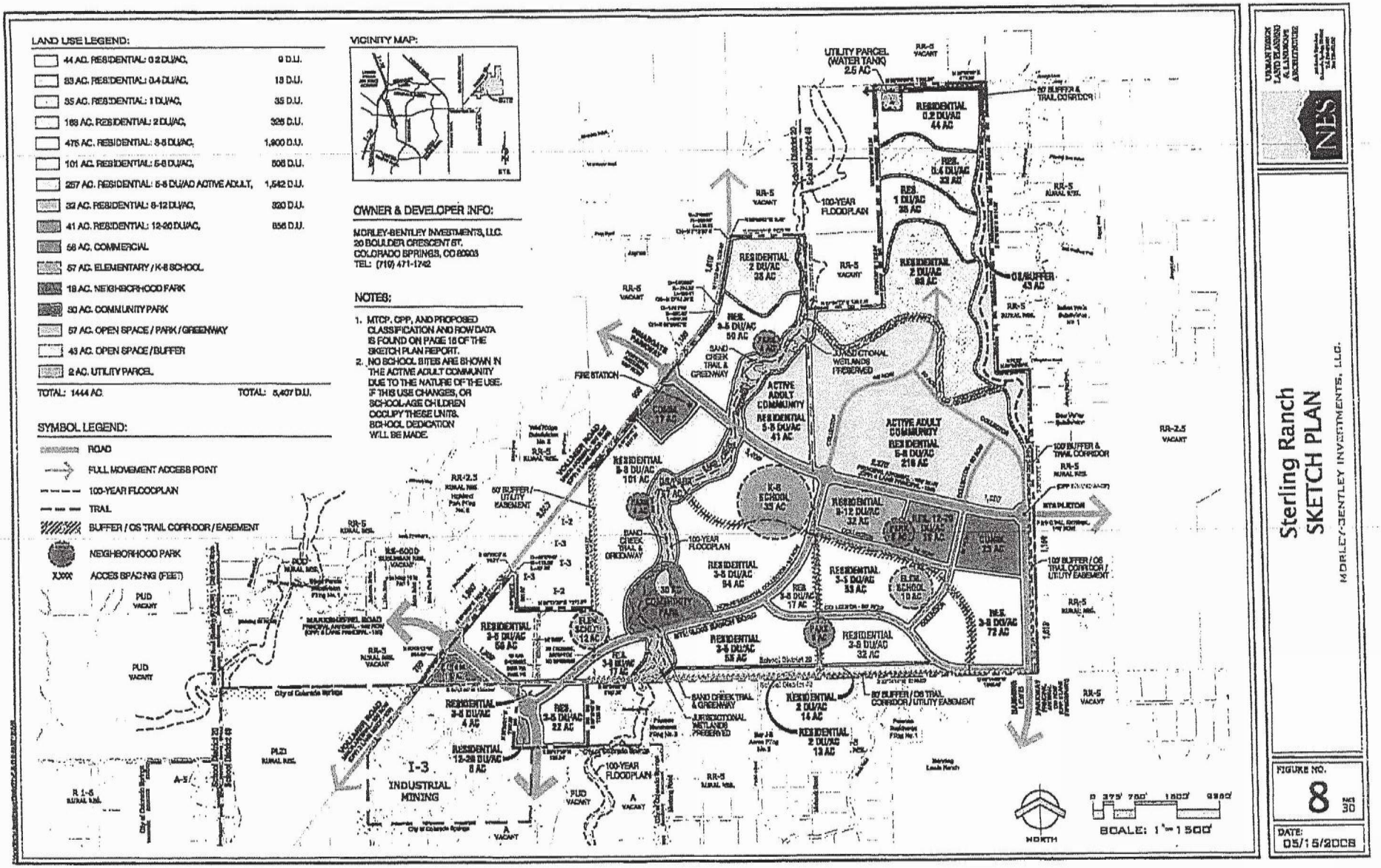
303.703.4444
1950 W. Littleton Blvd., Ste. 109
Littleton, CO 80120

Sterling Ranch

Wetland Impact Location Map

El Paso County, Colorado

Date: 10/13/2015
Project #: 15-001



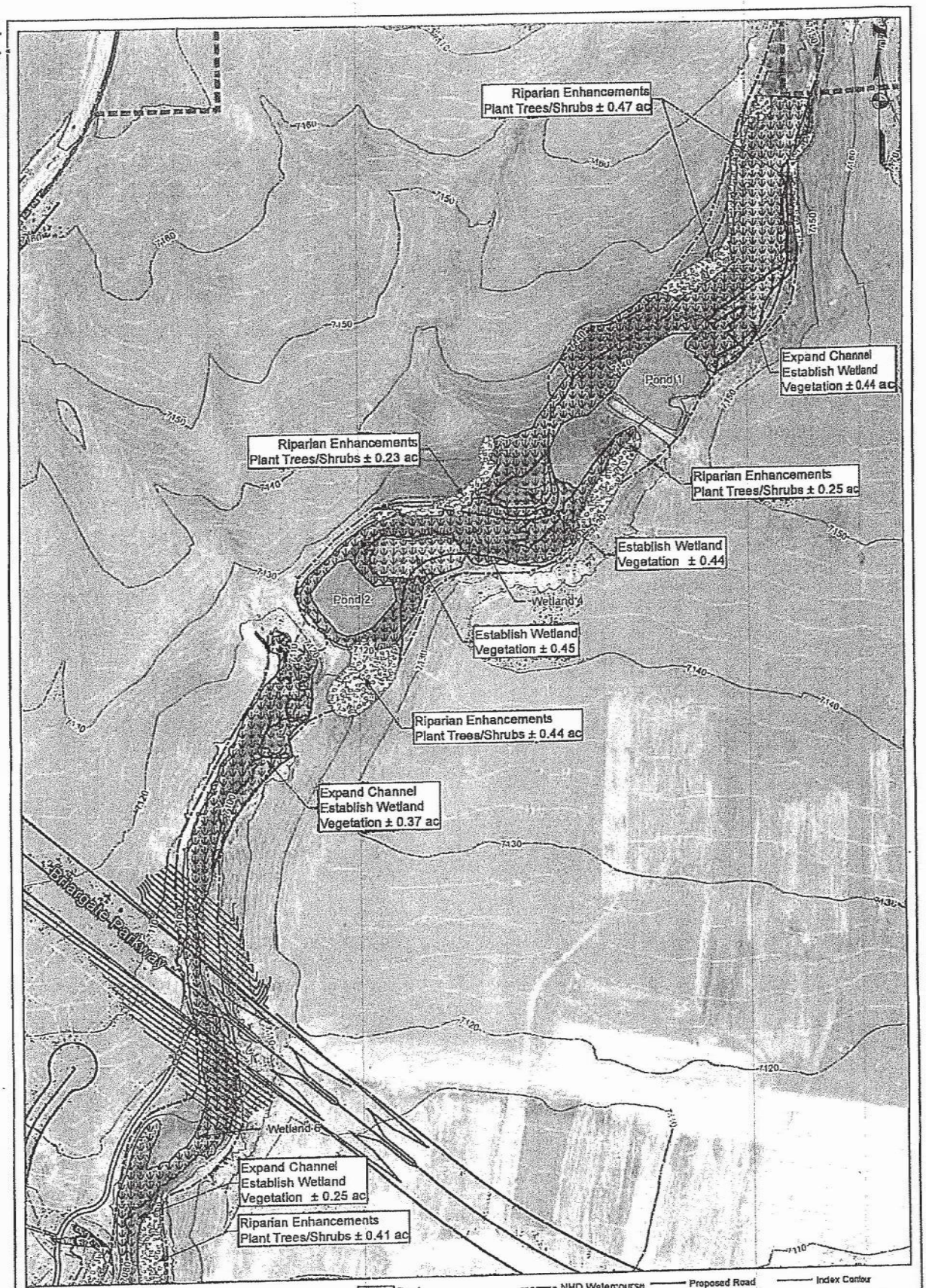
NES

Sterling Ranch SKETCH PLAN

MORLEY-BENTLEY INVESTMENTS, LLC.

FIGURE NO. 8 SHEET 30

DATE: 05/15/2008



CORE CONSULTANTS

CIVIL ENGINEERING
DEVELOPMENT CONSULTING
LAND SURVEYING

303.703.4444
1950 W. Littleton Blvd., Ste. 105
Littleton, CO 80120

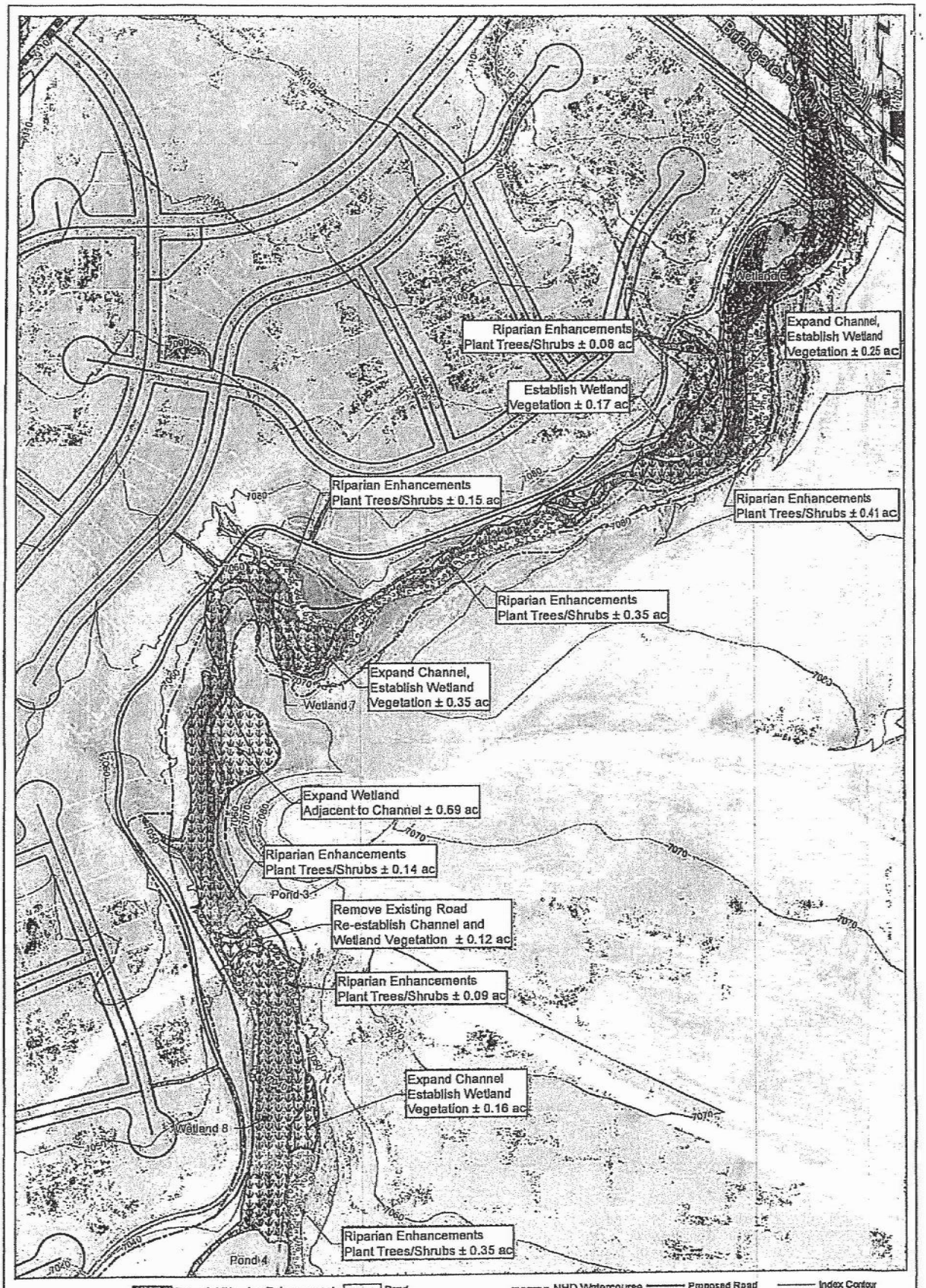
Sterling Ranch

Channel Improvements & Mitigation Plan

Sheet 1

El Paso County, Colorado

Date: 10/13/2015
Project #: 15-001



CORE CONSULTANTS

CIVIL ENGINEERING
DEVELOPMENT CONSULTING
LAND SURVEYING

303.703.4444
1950 W. Littleton Blvd., Ste. 105
Littleton, CO 80120

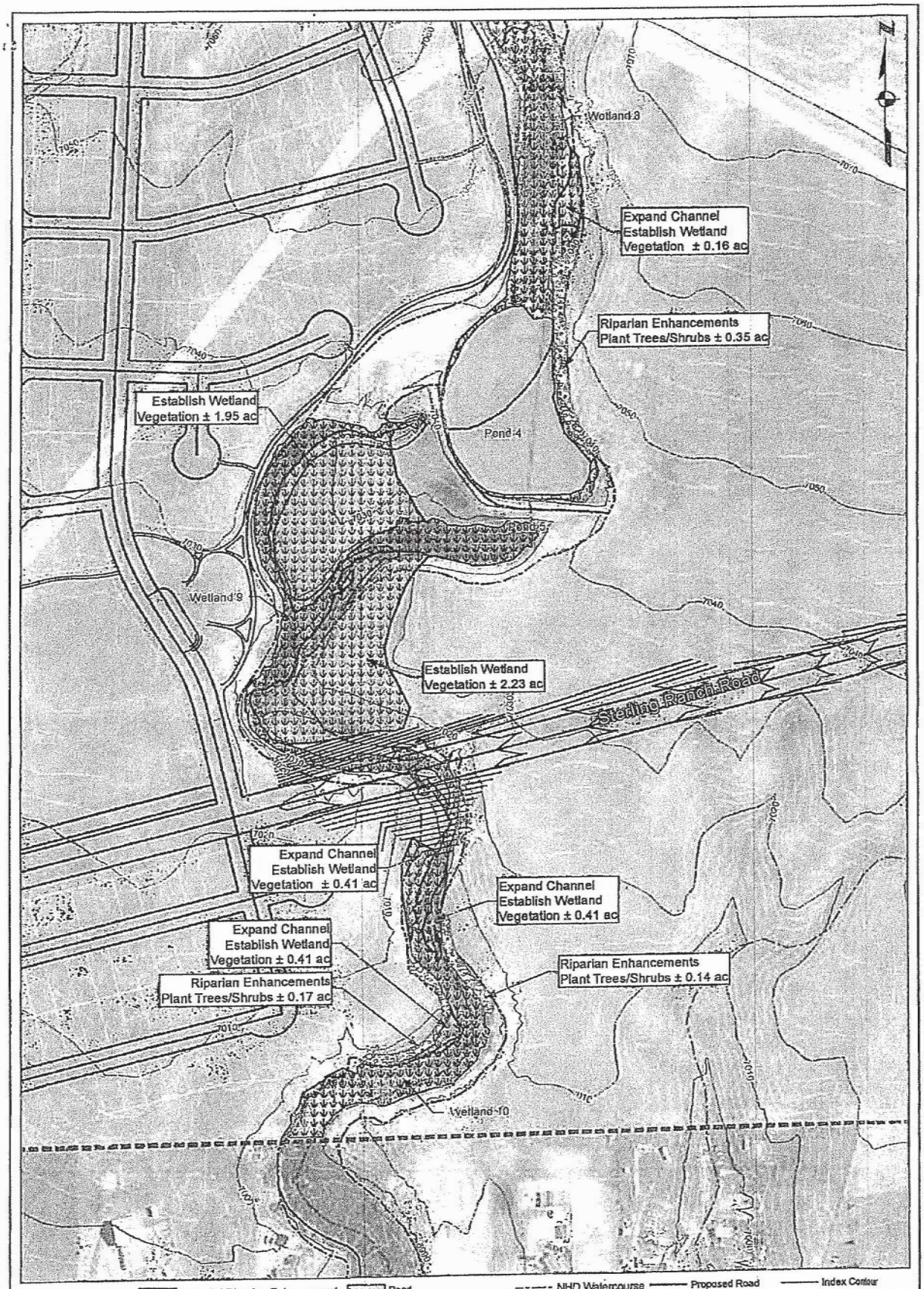
Sterling Ranch

Channel Improvements & Mitigation Plan

Sheet 2

El Paso County, Colorado

Date: 10/13/2015
Project #: 15-001



CORE CONSULTANTS
CIVIL ENGINEERING
DEVELOPMENT CONSULTING
LAND SURVEYING
303.703.4444
1950 W. Littleton Blvd., Ste 105
Littleton, CO 80120

Sterling Ranch

Channel Improvements & Mitigation Plan

Sheet 3

El Paso County, Colorado

Date: 10/13/2015
Project #: 15-001

PUBLIC NOTICE

US Army Corps of Engineers®
Albuquerque District
Project

Permit Application No.:	SPA-2015-00428-SCO
Project Name:	Sterling Ranch Residential Development Project
Applicant:	SR Land, LLC
Waterway:	Sand Creek
Public Notice Date:	December 9, 2015
Comment Due Date:	January 9, 2016
USACE Contact Phone:	(719) 543-8102

Reply To:

Southern Colorado Regulatory Office
US Army Corps of Engineers, Albuquerque District
200 South Santa Fe Avenue, Suite 301
Pueblo, Colorado 81003-4270

PERMIT APPLICATION UNDER SECTION 404 OF THE CLEAN WATER ACT (33 USC 1344)

Summary of Proposed Project: We are requesting public comment on the following project before the above comment due date. The application is for a permit to place dredged/fill material into waters of the US associated with the construction of a residential development in Sand Creek and one tributary located near Falcon, El Paso County, Colorado. Details of the proposed project are provided below.

Name of Applicant: SR Land, LLC, 20 Boulder Crescent, Suite 201, Colorado Springs, CO 80903.

Location: The project is located on 1,443.7 acres northeast of the intersection of Black Forest Road and Woodmen Road in unincorporated El Paso County, Colorado. The property is on the United States Geological Survey (USGS) Falcon Quadrangle on portions of Sections 27, 28, 32, 33, and 34 in Township 12 South, Range 65 West and the northwest portion of Section 4, Township 13 South, Range 65 West. The approximate coordinates of the project center are 39.964483 latitude and -104.664944 longitude (WGS 84 datum).

Description of Work: The Sterling Ranch Residential Development Project includes installation of attendant utilities, channel improvements to the main stem of Sand Creek, three off-line stormwater detention ponds, development of two permanent residential access roads and associated culverts, and development of residential units. Permanent impacts to waters of the US will result from construction of the residential access roads and associated culverts, and construction of residential units in the unnamed western

tributary to Sand Creek. Total cumulative permanent impacts to waters of the US from the proposed project will total 4.21 acres and 5,048 linear feet within the main channel of Sand Creek and its western tributary.

Purpose and Need: The project purpose is twofold: (1) the development of a medium sized single-family residential development and associated facilities and infrastructure on multiple parcels of land which will be incorporated in the City of Colorado Springs; and (2) creek channel improvements for hydrology and stormwater capability through control of flood water conveyance, establishing improved grade control, and facilitating improved water quality.

Likewise, the project need is twofold: (1) to satisfy market demand for additional housing in the City of Colorado Springs, El Paso County, based on recent County and City economic development reports; and (2) to address a County-wide high-priority stormwater management project while simultaneously managing an increase in stormwater runoff to Sand Creek via channel improvements.

Mitigation: Mitigation for impacts to wetlands and waters of the US on the Sterling Ranch project site is proposed within the Middle Fountain Creek watershed and includes creation of 4.21 acres of emergent wetlands located within and adjacent to the main channel of Sand Creek, with improvements throughout to allow for construction and reestablishment of wetlands.

Plans and Data: Drawings showing the location of the work site and other data are enclosed with this notice. If additional information is desired, it may be obtained from the applicant, or from:

Christopher M. Grosso
U.S. Army Corps of Engineers
Southern Colorado Regulatory Office
200 South Santa Fe Avenue, Suite 301
Pueblo, Colorado 81003-4270
(719) 543-8102
Fax No. (719) 543-9475
E-mail: Christopher.M.Grosso@usace.army.mil

Statement of Findings: The Corps consulted district files and records, the latest version of the National Register of Historic Places (NRHP), and state records of NRHP-eligible and potentially eligible historic properties to determine if there are any historic properties that may be affected by the proposed undertaking. Based on this initial information, the Corps has made a preliminary determination that the proposed project will not affect any historic properties that meet the criteria for inclusion in the NRHP.

The Corps has reviewed the U.S. Fish and Wildlife Service's latest published version of Federally-listed endangered and threatened species located in El Paso County, Colorado to determine if any listed species or their critical habitat may occur in the proposed project area. The Corps has made a preliminary determination that the

proposed project will not affect any Federally-listed endangered or threatened species or their critical habitat that are protected by the Endangered Species Act.

The applicant is required to obtain water quality certification, under Section 401 of the Clean Water Act, from the Colorado Department of Public Health and Environment. Section 401 requires that any applicant for an individual Section 404 permit provide proof of water quality certification to the Corps of Engineers prior to permit issuance.

In accordance with environmental procedures and documentation required by the National Environmental Policy Act of 1969, an environmental assessment will be prepared for this project. Upon completion, the assessment may be seen at the U.S. Army Corps of Engineers, Albuquerque District Office, at the address given above.

Comments: Any comments concerning this project should be received by the District Engineer no later than January 9, 2016. Comments received after the end of the Public Notice comment period will not be considered. However, more time may be given if a request, with a valid reason, is received prior to the suspense date. The Corps of Engineers is soliciting comments from the public; federal, state, and local agencies and officials; Indian tribes; and other interested parties in order to consider and evaluate the impacts of this proposed activity. Any comments received will be considered by the Corps of Engineers to determine whether to issue, modify, condition, or deny a permit for this proposal. To make this decision, comments are used to assess impacts on endangered species, historic properties, water quality, general environmental effects, and the other public interest factors listed below. Comments are used in the preparation of an Environmental Assessment and/or an Environmental Impact Statement pursuant to the National Environmental Policy Act. Comments are also used to determine the need for a public hearing and to determine the overall public interest of the proposed activity.

The decision whether to issue a permit will be based on an evaluation of the probable impact, including cumulative impacts, of the proposed activity on the public interest. That decision will reflect the national concern for both protection and utilization of important resources. The benefit which reasonably may be expected to accrue from the proposal must be balanced against its reasonably foreseeable detriments. The evaluation of the impact of this activity will include application of the guidelines promulgated by the Administrator, EPA, under authority of Section 404(b) of the Clean Water Act. All factors relevant to the proposal and the cumulative effects will be considered; among these are conservation, economics, aesthetics, general environmental concerns, wetlands, historic properties, fish and wildlife values, flood hazards, floodplain values, land use, navigation, shore erosion and accretion, recreation, water supply and conservation, water quality, energy needs, safety, food and fiber production, mineral needs, considerations of property ownership, and, in general, the needs and welfare of the people.

If the District Engineer determines that the project complies with the 404(b) (1) guidelines, he will grant the permit unless issuance would be contrary to the public interest.

Any person may request a public hearing. The request must be submitted, in writing, to the District Engineer within 21 days of the date of this notice and must clearly set forth the reasons for holding a public hearing.

Patrick J. Dagon
Lieutenant Colonel, U.S. Army
District Commander

Enclosures:
Sheet 1 of 2 – Wetland Location Map
Sheet 2 of 2 – Wetland Impact Location Map

NEWS RELEASE

COLORADO
Department of Public
Health & Environment

Dedicated to protecting and improving the health and environment of the people of Colorado

February 4, 2016

SR Land, LLC
Attn: Jim Morley
20 Boulder Crescent, Ste. 201
Colorado Springs, CO 80903

Re: Section 401 Water Quality Certification
Colorado 401 Certification No.: 4378
US Corps of Engineers 404 Permit No.: SPA-2015-00428-SCO
Description: Construction of a residential development
Location: Latitude: 38.962389, Longitude -104.675084 in El Paso County, Colorado
Watercourse: Sand Creek and tributaries, Arkansas River Basin, Segment COARFO04 of Fountain Creek Sub-basin
Designation: Use Protected

Dear Mr. Morley:

The Colorado Department of Public Health and Environment (CDPHE), Water Quality Control Division (Division) has completed its review of the subject Clean Water Act (CWA) Section 404 Permit Application, and our preliminary determination with the issuance of the State of Colorado 401 Certification Public Notice (5 CCR 1002-82.5(B)). This segment is designated "Use Protected" thus no antidegradation review is required (5 CCR 1002-31.8(2)).

This letter shall serve as official notification that the Division is issuing "Regular Certification" in accordance with 5 CCR 1002-82.5(A)(2).

The 401 Certification issued by the Division pursuant to 5 CCR 1002-82.3(C) shall apply to both the construction and operation of the project for which a federal license or permit is required, and shall apply to the water quality impacts associated with the project. This certification does not constitute a relinquishment of the Division's authority as defined in the Colorado Water Quality Control Act, nor does it fulfill or waive any other local, state, or federal regulations.

If you have any questions or need additional information, please contact me at (303) 692-3586.

Sincerely,

John C. Hranac
Water Quality Assessor
Environmental Data Unit
Water Quality Control Division

Attachment

cc: US Army Corps of Engineers, Southern Colorado Regulatory Office
Applicant's Agent, Mr. Chris Haas - CORE Consultants, Inc.
File

Certification Requirements:

(A) The following requirements shall apply to all certifications:

(1) Authorized representatives from the Division shall be permitted to enter upon the site where the construction activity or operation of the project is taking place for purposes of inspection of compliance with BMPs and certification conditions.

(2) In the event of any changes in control or ownership of facilities where the construction activity or operation of the project is taking place, the successor shall be notified in writing by his predecessor of the existence of the BMPs and certification conditions. A copy of such notification shall be provided to the Division.

(3) If the permittee discovers that certification conditions are not being implemented as designed, or if there is an exceedance of water quality standards despite compliance with the certification conditions and there is reason to believe that the exceedance is caused, in whole or in part, by the project, the permittee shall verbally notify the Division of such failure or exceedance within two (2) working days of becoming aware of the same. Within ten (10) working days of such notification, the permittee shall provide to the Division, in writing, the following:

(a) In the case of the failure to comply with the certification conditions, a description of (i) the nature of such failure, (ii) any reasons for such failure, (iii) the period of non-compliance, and (iv) the measures to be taken to correct such failure to comply; and

(b) In the case of the exceedance of a water quality standard, (i) an explanation, to the extent known after reasonable investigation, of the relationship between the project and the exceedance, (ii) the identity of any other known contributions to the exceedance, and (iii) a proposal to modify the certification conditions so as to remedy the contribution of the project to the exceedance.

(4) Any anticipated change in discharge location and/or quantities associated with the project which may result in water quality impacts not considered in the original certification must be reported to the Division by submission of a written notice by the permittee prior to the change. If the change is determined to be significant, the permittee will be notified within ten days, and the change will be acknowledged and approved or disapproved.

(5) Any diversion from or bypass of facilities necessary to maintain compliance with the terms and conditions herein is prohibited, except (i) where unavoidable to prevent loss of life or severe property damage, or (ii) where excessive storm drainage or runoff would damage any facilities necessary for compliance with limitations and prohibitions herein. The Division shall be notified immediately in writing of each such diversion or bypass.

(6) At least fifteen days prior to commencement of a project in a watercourse, which the Division has certified, or conditionally certified, the permittee shall notify the following:

(a) Applicable local health departments;

(b) Owners or operators of municipal and domestic water treatment intakes which are located within twenty miles downstream from the site of the project; and

(c) Owners or operators of other intakes or diversions which are located within five miles downstream from the site of the project.

The permittee shall maintain a list of the persons and entities notified, including the date and form of notification.

(7) Immediately upon discovery of any spill or other discharge to waters of the state not authorized by the applicable license or permit, the permittee shall notify the following;

(a) Applicable local health departments;

(b) Owners or operators of municipal and domestic water treatment intakes which are located within twenty miles downstream from the site of the project; and

(c) Owners or operators of other intakes or diversions which are located within five miles downstream from the site of the project.

The permittee shall maintain a list of the persons and entities notified, including the date and form of notification.

(8) Construction operations within watercourses and water bodies shall be restricted to only those project areas specified in the federal license or permit.

(9) No construction equipment shall be operated below the existing water surface unless specifically authorized by the 401 certification issued by the Division.

(10) Work should be carried out diligently and completed as soon as practicable. To the maximum extent practicable, discharges of dredged or fill material shall be restricted to those periods when impacts to designated uses are minimal.

(11) The project shall incorporate provisions for operation, maintenance, and replacement of BMPs to assure compliance with the conditions identified in this section, and any other conditions placed in the permit or certification. All such provisions shall be identified and compiled in an operation and maintenance plan which will be retained by the project owner and available for inspection within a reasonable timeframe upon request by any authorized representative of the Division.

(12) The use of chemicals during construction and operation shall be in accordance with the manufacturers' specifications. There shall be no excess application and introduction of chemicals into state waters.

(13) All solids, sludges, dredged or stockpiled materials and all fuels, lubricants, or other toxic materials shall be controlled in a manner so as to prevent such materials from entering state waters.

(14) All seed, mulching material and straw used in the project shall be state-certified weed-free.

(15) Discharges of dredged or fill material in excess of that necessary to complete the project are not permitted.

(16) Discharges to state waters not identified in the license or permit and not certified in accordance therewith are not allowed, subject to the terms of any 401 certification.

(17) Except as otherwise provided pursuant to subsection 82.7(C), no discharge shall be allowed which causes non-attainment of a narrative water quality standard identified in the Basic Standards and Methodologies for Surface Waters, Regulation #31 (5 CCR 1002-31), including, but not limited to discharges of substances in amounts, concentrations or combinations which:

(a) Can settle to form bottom deposits detrimental to beneficial uses; or

(b) Form floating debris, scum, or other surface materials sufficient to harm existing beneficial uses; or

(c) Produce color, odor, or other conditions in such a degree as to create a nuisance or harm existing beneficial uses or impart any undesirable taste to significant edible aquatic species, or to the water; or

(d) Are harmful to the beneficial uses or toxic to humans, animals, plants, or aquatic life; or

(e) Produce a predominance of undesirable aquatic life; or

(f) Cause a film on the surface or produce a deposit on shorelines.

(B) Best Management Practices:

(1) Best management practices are required for all projects for which Division certification is issued except for section 402 permits. Project applicants must select BMPs to be employed in their project. A listing and description of best management practices is located in Appendix I of Regulation No. 82: 401 Certification Regulation 5 CCR 1002-82.

(2) All requests for certifications which require BMPs shall include a map of project location, a site plan, and a listing of the selected BMPs chosen for the project. At a minimum, each project must provide for the following:

(a) Permanent erosion and sediment control measures that shall be installed at the earliest practicable time consistent with good construction practices and that shall be maintained and replaced as necessary throughout the life of the project.

(b) Temporary erosion and sediment control measures that shall be coordinated with permanent measures to assure economical, effective, and continuous control throughout the construction phase and during the operation of the project.